CITYTUTOR DC

Sixth Grade Math Lesson Materials

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Effective Date: January 1, 2023

Updated: August 16, 2023

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G6 Unit 1:

Area and Surface Area

G6 U1 Lesson 1

Explore the meaning of area

CITYTUTOR DC

G6 U1 Lesson 1 - Students will explore the meaning of area

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slides 2): Today we will be exploring the meaning of area. Believe it or not, you already know a lot about the concept of area! In third, fourth, and fifth grades you identified and calculated the area of squares and rectangles.

Let's Review (Slide 3): Let's brainstorm, **tell me what you remember about area?** Possible Student Answers, Key Points:

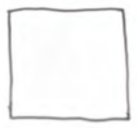
- The amount of space inside of a shape.
- We can tile to find the total area of rectangles.
- We can skip count to find the total area of rectangles.
- We can multiply the length times the width to find the area of rectangles.
- We can cut shapes into smaller shapes, like rectangles, to find the area.

You remember more than most students remember, good recall! You're right, area is the amount of space inside a shape.

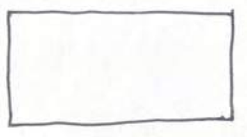
Let's Talk (Slide 4): Today we're going to focus on revisiting the area concept you first learned in elementary school. When we talk about the area we are talking about the measure of the amount of space inside two-dimensional or 2D figures. **Can you think of some real-world examples where we need to know the area of an object?** Possible Student Answers, Key points:

- Painting walls
- Installing carpet
- Measuring home or room size
- Tiling a bathroom floor
- Windows

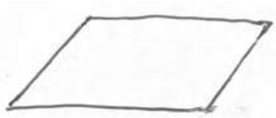
That's right, area is everywhere in real life! I'm going to draw some examples of two-dimensional figures called polygons. As I draw them, try to remember their names.



What shape is this? It's a square! That's right! This is a square because it has four equal sides that are all the same exact length. It also has 90 degree angles meaning the "L" shapes are formed in the corners. Point to the area of this square…that's right it's the INSIDE of the shape.



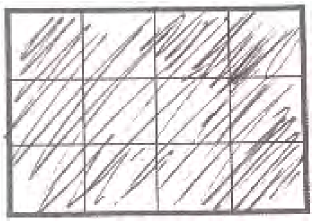
Now let's look at another, what shape is this? It's a rectangle! This is a rectangle because it has four sides and the opposite sides are the same length. We see that the top and bottom are the same length and the left and right are the same length. It also has 90 degree angles meaning the "L" shapes are formed in the corners. Point to the area of the rectangle…



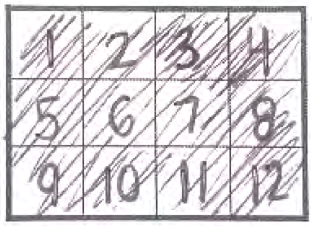
And one last one, look at this shape…what shape is this? A parallelogram! It's a parallelogram because it has four sides and the opposite sides are the same length. We see that the top and bottom are the same length and the left and right are the same length. And again, point to the area of the parallelogram…

These figures are called two-dimensional or 2D because they have height and width which are the two dimensions. But, they are flat and we can't hold them but we can draw them.

Let's Think (Slide 5): So, we know that area is the measure of the amount of space inside our polygons. Let's go on and think about how we can calculate area. Look at this shape, what 2-dimensional figure is shown? Rectangle and/or parallelogram! Let's determine its area.



I'm going to lightly shade the inside because you've already told me that area is the space inside the polygon. So I am shading the whole inside of this rectangle!



Now, to actually find the area as a specific calculation, I'm going to count the squares inside the rectangle because I notice that all the squares are the same size. Count with me, please…1, 2, 3…12! So, we know that the area of this rectangle is 12 because we counted 12 squares. When we say the measurement of area we have to say square units. So the area of this rectangle is 12 SQUARE units!

We just counted every single square by ones but look, I notice that there are equal groups. I see that we have equal groups in each row going across and in each column going up and down. When we look at the groups going across in rows we see 4 and 4 and 4 (*drag your finger across*), So, we can count our rows by skip counting by 4s, do it with me…4, 8, 12.

Now we can switch our brains around and look at the equal groups that are in the columns, going up and down. When I look at the columns I see 3 and 3 and 3 and 3 (*drag your finger across).* So, if we want to skip count the columns we'd count by 3 since there are 3 squares in each column. Do it with me…3, 6, 9, 12.

Whether we count one-by-one or skip count rows or skip count columns, we end up with 12 square units. I have 12 equally-sized **squares** inside the rectangle so the area of this rectangle is 12 **square units**.

So, 12 is the area and my units label "square units" because the squares inside give me "square" shaped units. Area is always measured in "squared units" even when finding the area of triangles which we will tackle later in this unit.

Let's Try it (Slide 6): Now let's look at our other polygons, their characteristics, and the area of some of them. Remember, illustrating a polygon and thinking about the characteristics of that polygon are helpful when trying to determine the area.

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WARM WELCOME

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Today we will explore the meaning of area.

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↺ Let's Review:

What do you remember about area?

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Let's Talk:

Can you think of some real-world examples where we need to know the area of an object?

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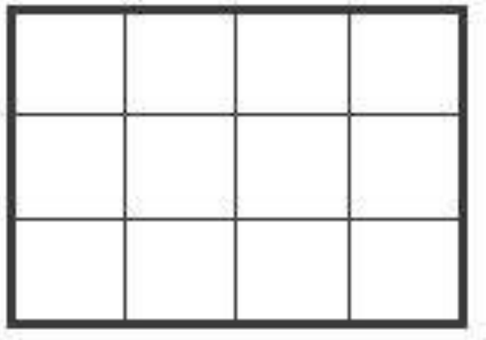
Let's Think:

Which 2-dimensional figure is shown? Let's determine its area.



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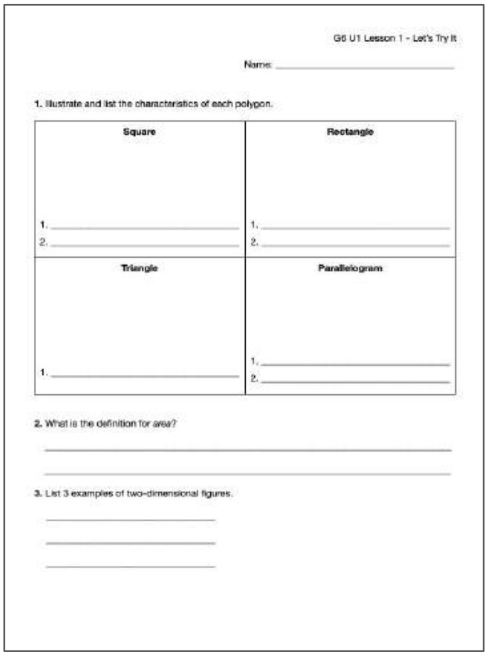
Let's Try It:

Let's explore the meaning of area together.



G6 U1 Lesson 1 - Let's Try It

Name: ______________________

1. Illustrate and list the characteristics of each polygon.

Square	Rectangle
1. ____________ 2. ____________	1. ____________ 2. ____________
Triangle	**Parallelogram**
1. ____________	1. ____________ 2. ____________

2. What is the definition for area?

____

____

3. List 3 examples of two-dimensional figures.

____

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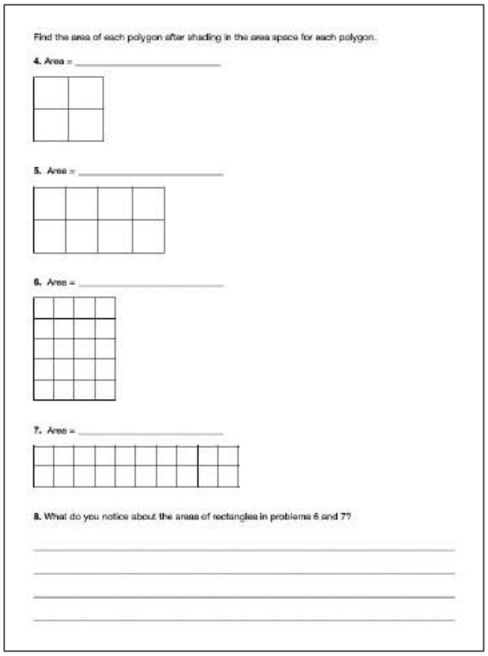

Find the area of each polygon after shading in the area space for each polygon.

4. Area = ______________

5. Area = ______________

6. Area = ______________

7. Area = ______________

8. What do you notice about the areas of rectangles in problems 6 and 7?

____

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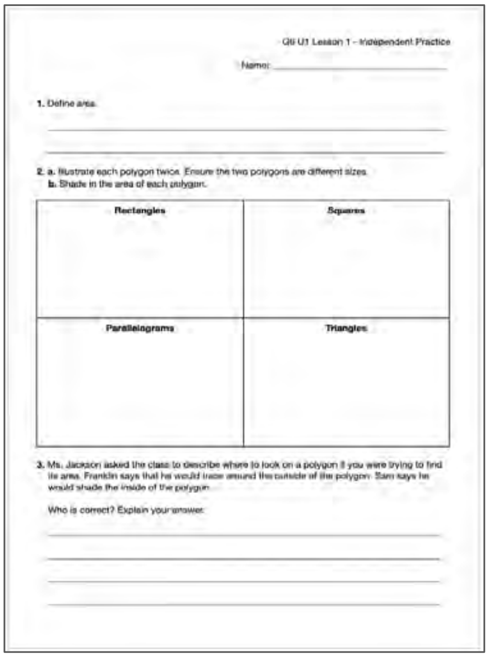
On your Own:

Now it’s time to explore the meaning of area on your own.



G3 U1 Lesson 1 – Independent Practice

Name: ______________________

1. Define area.

____

____

2. **a.** Illustrate each polygon twice. Ensure the two polygons are different sizes.
b. Shade in the area of each polygon.

Rectangles	**Squares**
Parallelograms	**Triangles**

3. Ms. Jackson asked the class to describe where to look on a polygon if you were trying to find its area. Franklin says that he would trace around the outside of the polygon. Sam says he would shade the inside of the polygon.

Who is correct? Explain your answer.

____

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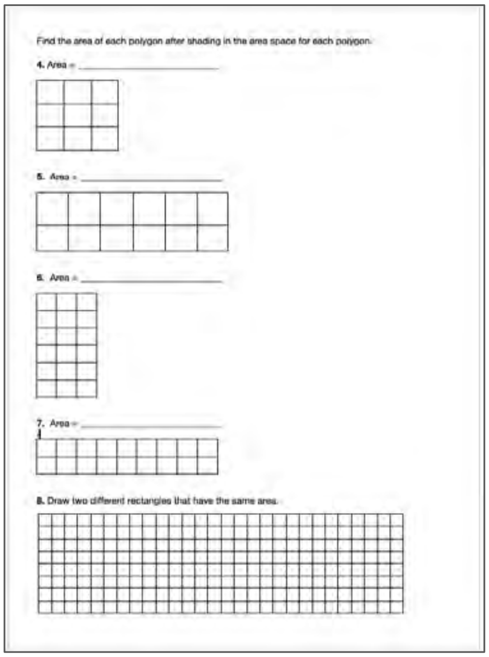

Find the area of each polygon after shading in the area space for each polygon.

4. Area = ______________________

5. Area = ______________________

6. Area = ______________________

7. Area = ______________________

8. Draw two different rectangles that have the same area.

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Name: ______________________________

1. Illustrate and list 2 characteristics of each polygon.

Square a. ______________________________ b. ______________________________	**Rectangle** a. ______________________________ b. ______________________________
Triangle a. ______________________________ b. ______________________________	**Parallelogram** a. ______________________________ b. ______________________________

2. What is the definition for area?

____

____

3. List 3 examples of two-dimensional figures.

____

____

____

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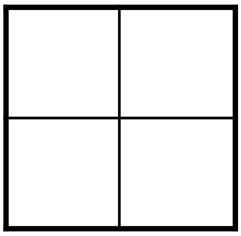
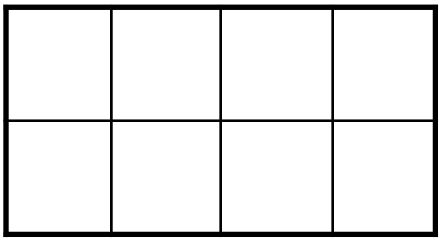
Find the area of each polygon after shading in the area of each polygon.

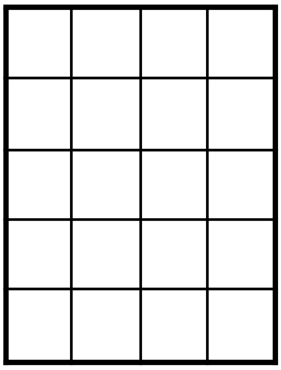
4. Area = ______________________________



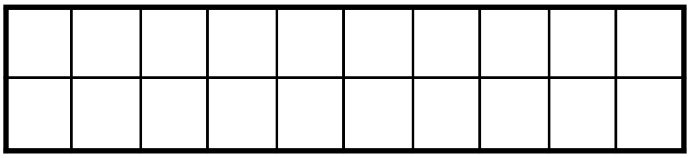
5. Area = ______________________________



6. Area = ______________________________



7. Area = ______________________________



8. How are the rectangles in problems 6 and 7 similar? How are they different?

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Name: ___________________________________

1. Define area.

____

____

2. **a.** Illustrate each polygon twice. Ensure the two polygons are different sizes.
b. Shade in the area of each polygon.

Rectangles	**Squares**
Parallelograms	**Triangles**

3. Ms. Jackson asked the class to describe where to look on a polygon if you were trying to find its area. Franklin says that he would trace around the outside of the polygon. Sam says he would shade the inside of the polygon.

Who is correct? Explain your answer.

____

____

____

____

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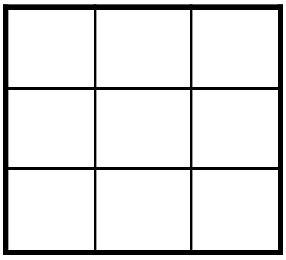
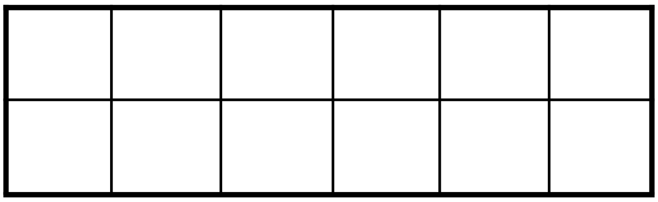
Find the area of each polygon after shading in the area of each polygon.

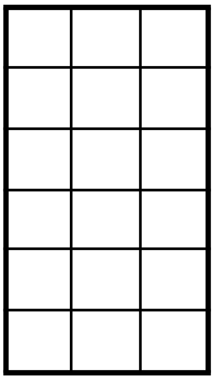
4. Area = ______________________________



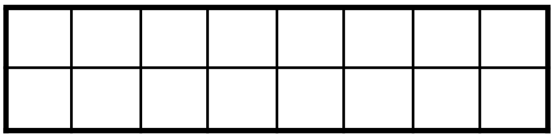
5. Area = ______________________________



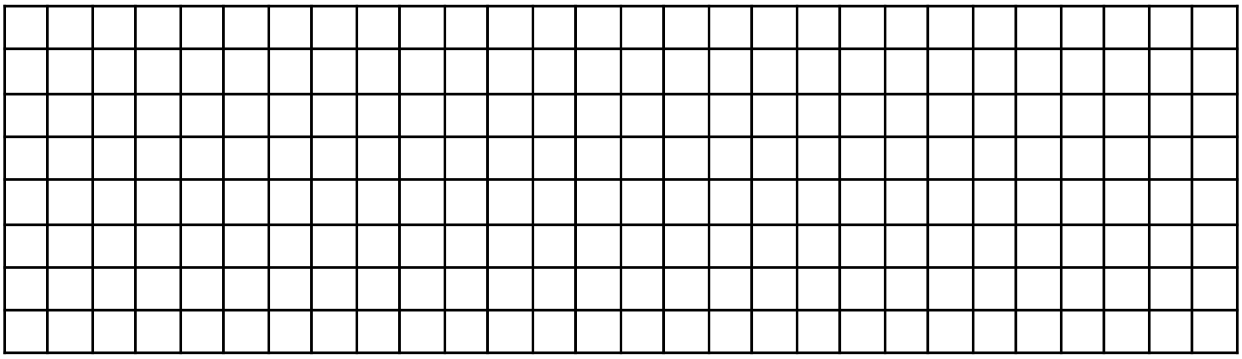
6. Area = ______________________________



7. Area = ______________________________



8. Draw two different rectangles that have the same area.



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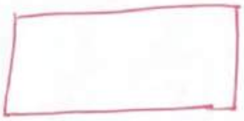
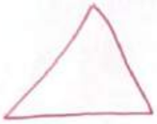
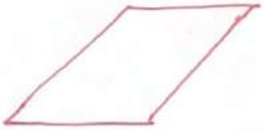
Name: ______________________ G6 U1 Lesson 1 - Let's Try It

1. Illustrate and list 2 characteristics of each polygon.

Square	**Rectangle**
	
a. 4 sides	a. 4 sides
b. All sides are equal length	b. Opposite sides are equal length
Triangle	**Parallelogram**
	
a. 3 sides	a. 4 sides
b. sides can be the same length or be different	b. Opposite sides are equal length

2. What is the definition for area?

The amount of space inside a flat, 2D figure.

3. List 3 examples of two-dimensional figures. (answers will vary.)

hexagon
square
rhombus
parallelogram
rectangle

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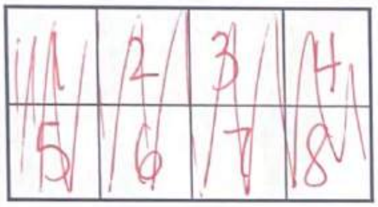
Find the area of each polygon after shading in the area of each polygon.

4. Area = 4 units^2 or 4 square units

5. Area = 8 square units



6. Area = 20 square units

7. Area = 20 square units

8. How are the rectangles in problems 6 and 7 similar? How are they different?

They are similar in that they both have an area of 20 square units. They are different in that the width and lengths are not the same.

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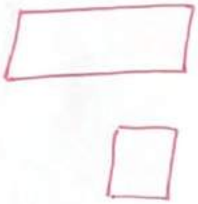
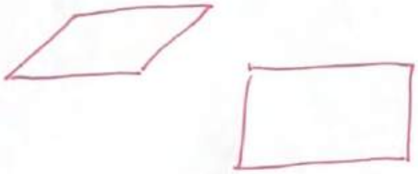
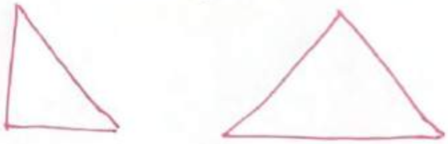
Name: ______________________ G6 U1 Lesson 1 - Independent Practice

1. Define area.

The amount of space inside a 2D, flat figure.

2. **a.** Illustrate each polygon twice. Ensure the two polygons are different sizes.
   b. Shade in the area of each polygon.

Rectangles 	**Squares** 
Parallelograms 	**Triangles** 

3. Ms. Jackson asked the class to describe where to look on a polygon if you were trying to find its area. Franklin says that he would trace around the outside of the polygon. Sam says he would shade the inside of the polygon.

Who is correct? Explain your answer.

Sam is correct. Shading the inside of a polygon will show the polygon's area or space within. Tracing around the outside is called the perimeter.

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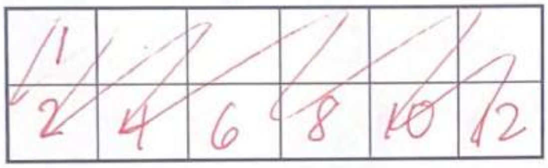
Find the area of each polygon after shading in the area of each polygon.

4. Area = 9 square units

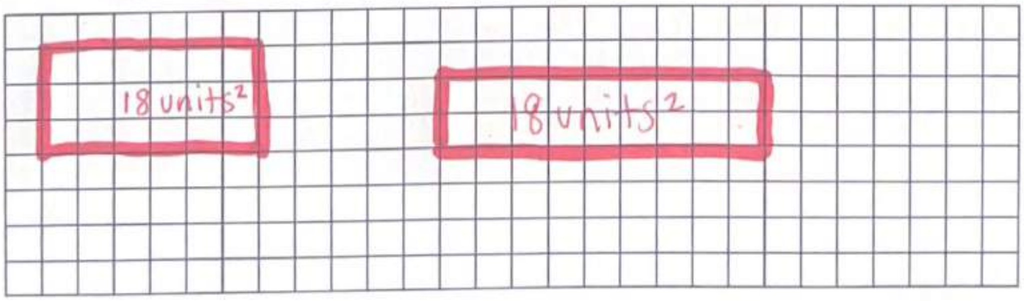
5. Area = 12 square units



6. Area = 18 square units

7. Area = 16 square units

8. Draw two different rectangles that have the same area. (answers will vary)



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G6 U1 Lesson 2

Decompose and compose polygons to calculate area

G6 U1 Lesson 2 - Students will decompose and compose polygons to calculate area

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue exploring area, which we know is the amount of space inside a two-dimensional figure. But today, we'll work on decomposing and composing polygons. You have worked with decomposing polygons starting in third grade. You called those shapes rectilinear meaning they were made of straight lines; many of them looked like the letter "L."

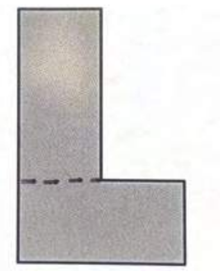
Let's Talk (Slide 3): What does it mean to decompose? What are some examples of things that decompose? Possible Student Answers, Key Points:

- I've heard of food decomposing in compost.
- I know that trash breaks down.
- I've also heard of paper, cardboard, clothing decomposing after we're done using it.
- We decompose tens and hundreds and thousands when we're talking about place value.

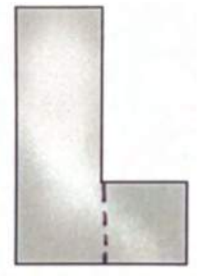
In this lesson we're going to do a few different things. First, this lesson focuses on decomposing or breaking down shapes or polygons into smaller parts. Then we'll practice composing which is the same as building or putting back together and finally we might spend some time rearranging the parts. Rearranging is the same as moving to a different place.

Let's Think (Slide 4): Let's start by looking at this polygon. What's the name of this polygon? How do you know? Hexagon, because it has 6 straight sides!

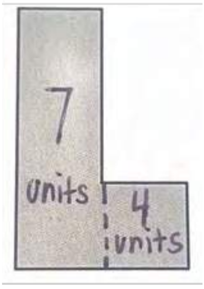
So let's think about some ways that we can decompose or break apart this polygon, simply, into squares, rectangles, and/or triangles. We know that if we're decomposing, we're cutting the polygon into two or more different parts.



One way that we can decompose our polygone is to cut it horizontally which means from side to side (*move your arms left to right to show horizontal*). Now, I could cut this horizontally in many different places. I could cut it here or here or here (*point to different spots*), but if I cut it there, I would still have a hexagon and a square or a rectangle. I want to think about a place that I can cut it so that it would leave me with two easy shapes, like two rectangles since rectangles are nice and easy to find the area of. So look, if I cut it right here from side to side, I would have one rectangle from the top and another rectangle from the bottom.



But guess what? We can also cut shapes vertically, or up and down (*move your arms up and down*). Just like we practiced when we were cutting the hexagon horizontally, I can cut this shape anywhere like here or here (*point to different spots*), but I want to think carefully about how to cut it so that I have two smaller, easier shapes–like rectangles and square. So look, if I cut it right here vertically, I would have one long rectangle and then a square!



Now let me show you why this type of decomposition is helpful. What if I told you that the area of this long rectangle was 7 square units and the area of this little square is *4 square units (label).* What could we do to find the area of the entire hexagon? Add the two areas together to find the total area of the polygon!

That's right! We add the separate parts together. We can add the area of this larger rectangle together with the area of this square . So the area of this hexagon would be 11 square units.

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We cut the hexagon into smaller shapes, a rectangle and a square, to help us find the area of the larger shape! We can always do that to help us find an area.

Let's Think (Slide 5): Now we have another shape, it's a parallelogram! Look closely at this shape, do you see any ways that we can decompose, or cut this shape, into smaller shapes? There are LOTS of ways! But just like with the hexagon we want to think carefully about how we cut this parallelogram so it helps us. Oh, some of you notice the 2 triangles and a rectangle! Do you see it? Let's see if we can cut this so that we have 2 triangles and 1 rectangle.

This is a little tricky but if I cut here, I have 1 triangle and a quadrilateral. But, I want to make 1 more cut so that I have 2 triangles and a rectangle.

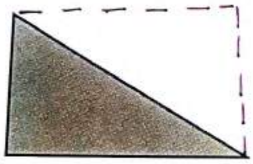
Now look, I can make another cut on the right side and now I have 2 triangles and 1 rectangle!

Let's Think (Slide 6): Now that we decomposed our parallelogram, how would we find its area? Add the three areas together to find the total area of the parallelogram. That's right, if we want to find the area of this parallelogram, we can add the area of all three parts together. We'd add the area of this triangle (*point to triangle on the left*) to the area of the rectangle (*point*) to the area of the triangle on the right and that would give us the whole area of the parallelogram.

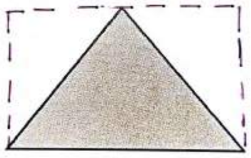
Let's Think (Slide 7): But, guess what? Another way to calculate the area of this parallelogram is to rearrange it, move around the parts.

Look, we can slide the decomposed triangle on the left side to match up with the right side of the polygon. We went from a slanted parallelogram made of one rectangle and two triangles to just one big rectangle! The best part is we already have experience calculating the area of rectangles. So we can always decompose and rearrange shapes to make them easier to work with.

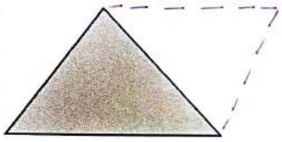
Let's Think (Slide 9): We just practiced decomposing or breaking shapes apart. But what about composing? Composing means to build or put back together. Let's work together to think about how each triangle can be composed into a parallelogram? Let's add to each triangle to see. *(Allow students to try this out and note that it may require a few tries).*



For the first one, we turned the triangle into a rectangle! We added another triangle that's the same exact size as our original triangle.



For the second triangle, it was a little different, we can make this one into two shapes that look different. First, let's make a parallelogram that is a rectangle. We need to add two, identical triangles to achieve that shape.



And the last one was even trickier! We already made it into a rectangle but we can also make this into just a parallelogram by spinning and adding a duplicate triangle.

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So, we just explored how we can decompose, compose, and rearrange shapes! We decomposed the hexagon into one rectangle and one square and then we decomposed the parallelogram by cutting it into 2 triangles and a rectangle. We also explored how to rearrange the parallelogram into a rectangle. And just now, we saw how we can compose, or build, new shapes by adding on to our original polygon. Next we'll explore how we can calculate the area of parallelograms and other polygons!

Let's Try it (Slide 10): Let's continue decomposing and composing polygons, together. Don't forget, since we don't yet have the formulas for the area of a triangle and parallelograms, we first decompose or compose our polygons into shapes that we do know how to calculate the area for like rectangles!

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WARM WELCOME

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Today we will decompose and compose polygons to calculate area.

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Let's Talk:

What does it mean to *decompose?*

What are some examples of things that decompose?

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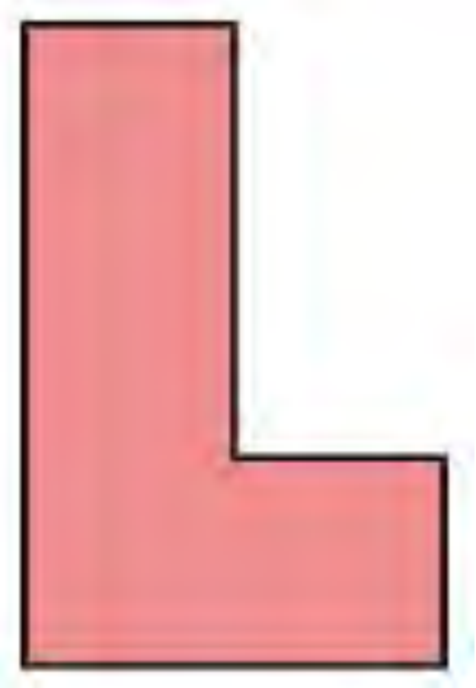
Let's Think:

How can we decompose or break apart this polygon, into squares, rectangles, and/or triangles?



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Let’s Think:

How would we decompose this parallelogram into 2 triangles and a rectangle?

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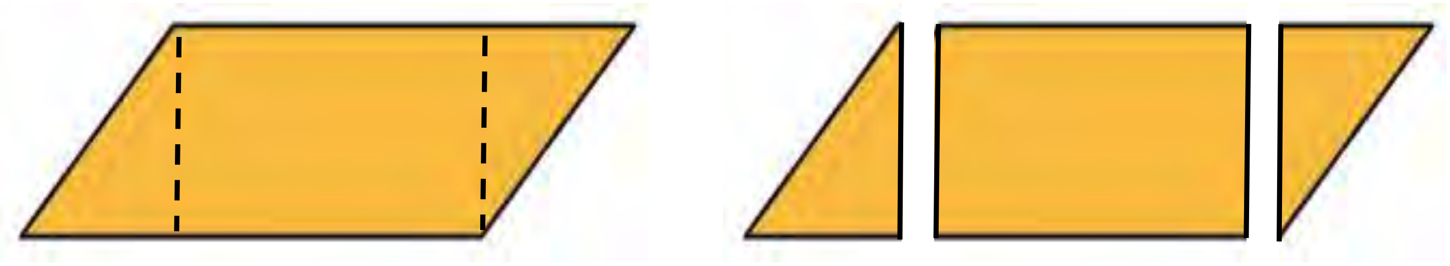
Let’s Think:

We decomposed this parallelogram into 2 triangles and 1 rectangle!

How can we find the area?



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Let's Think:

Another way to calculate the area is to rearrange the parallelogram into a rectangle.

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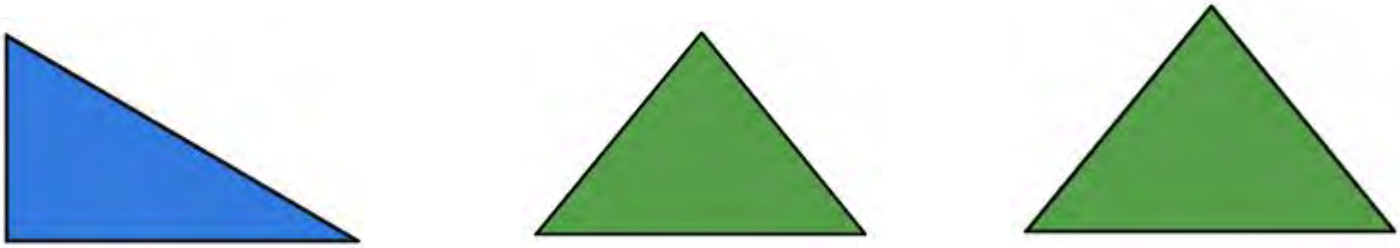
Let's Think:

But what about composing?
Composing means to build.
How can each triangle be composed into parallelograms?



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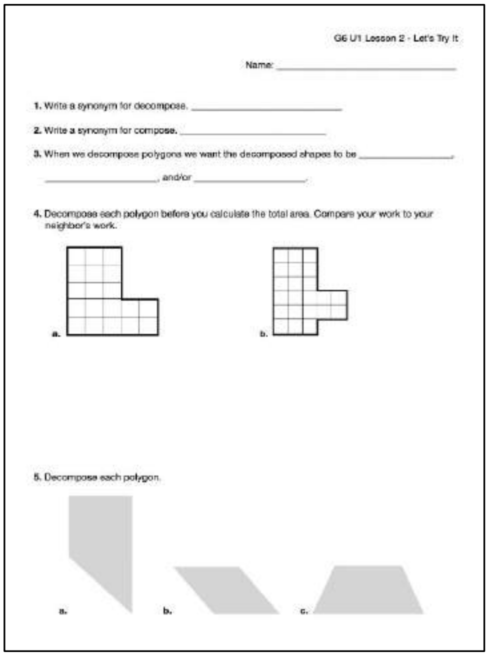
Let's Try It:

Let's explore decomposing and composing together.



G6 U1 Lesson 2 - Let's Try It

Name: ______________________

1. Write a synonym for decompose. ______________________

2. Write a synonym for compose. ______________________

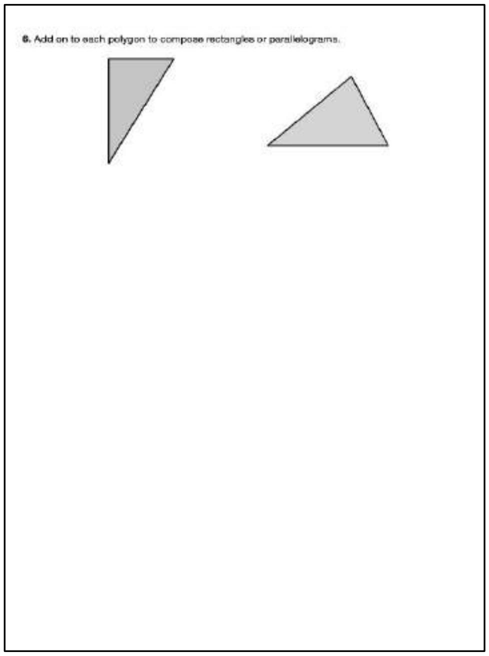
3. When we decompose polygons we want the decomposed shapes to be ______________, ______________, and/or ______________.

4. Decompose each polygon before you calculate the total area. Compare your work to your neighbor's work.

a. b.

5. Decompose each polygon.

a. b. c.



6. Add on to each polygon to compose rectangles or parallelograms.

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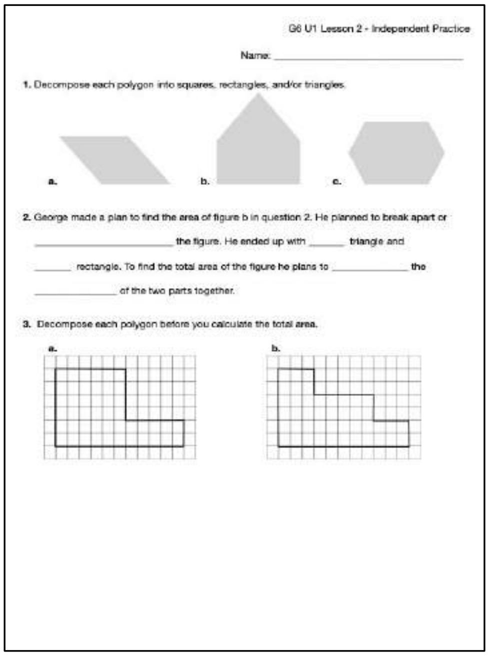
On your Own:

Now it's time to explore decomposing and composing on your own.



G6 U1 Lesson 2 - Independent Practice

Name: ______________________

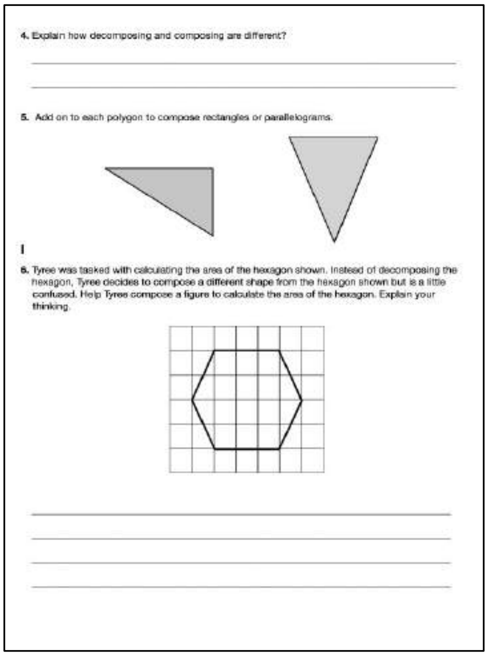
1. Decompose each polygon into squares, rectangles, and/or triangles.

a. b. c.

2. George made a plan to find the area of figure b in question 2. He planned to break apart or ______________ the figure. He ended up with ______ triangle and ______ rectangle. To find the total area of the figure he plans to ____________ the ____________ of the two parts together.

3. Decompose each polygon before you calculate the total area.

a. b.



4. Explain how decomposing and composing are different?

5. Add on to each polygon to compose rectangles or parallelograms.

6. Tyree was tasked with calculating the area of the hexagon shown. Instead of decomposing the hexagon, Tyree decides to compose a different shape from the hexagon shown but is a little confused. Help Tyree compose a figure to calculate the area of the hexagon. Explain your thinking.

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Name: ______________________________

1. Write a synonym for decompose. ______________________________

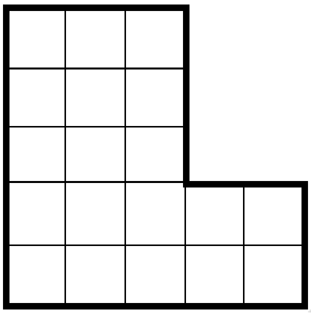
2. Write a synonym for compose. ______________________________

3. When we decompose polygons we want the decomposed shapes to be ____________________,

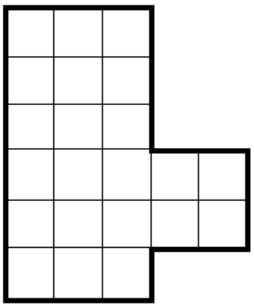
______________________, and/or ______________________.

4. Decompose each polygon before you calculate the total area. Compare your work to your neighbor’s work.

a.

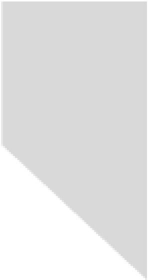


b.



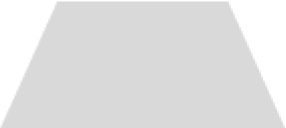
5. Decompose each polygon.

a.

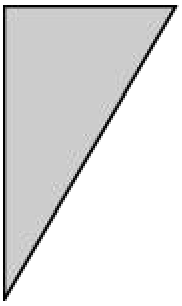


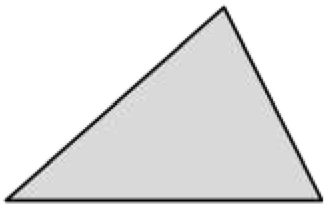
b.

c.



6. Add on to each polygon to compose rectangles or parallelograms.





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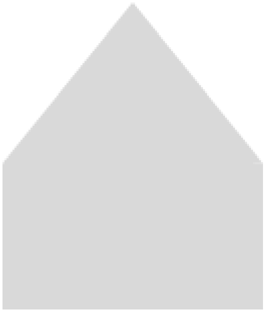
Name: ______________________________ G6 U1 Lesson 2 - Independent Practice

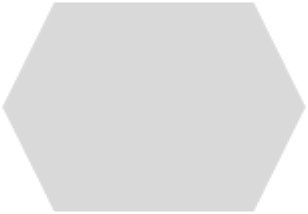
1. Decompose each polygon into squares, rectangles, and/or triangles.

a.

b.



c.



2. George made a plan to find the area of figure b in question 2. He planned to break apart or

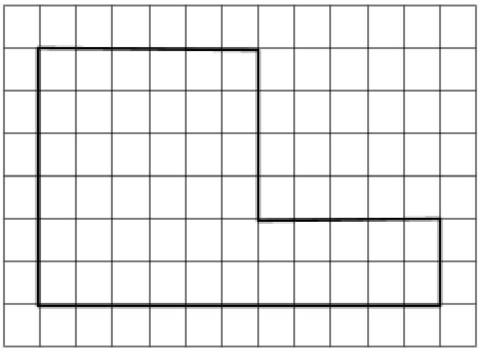
______________________ the figure. He ended up with ______ triangle and

______ rectangle. To find the total area of the figure he plans to ____________ the

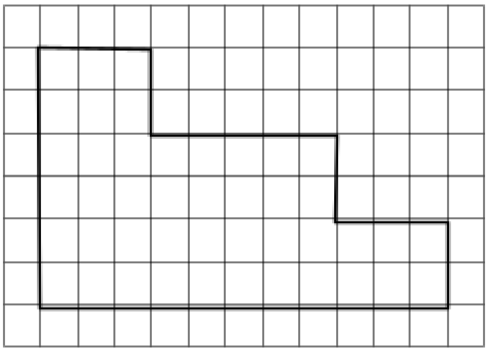
_____________ of the two parts together.

3. Decompose each polygon before you calculate the total area.

a.



b.



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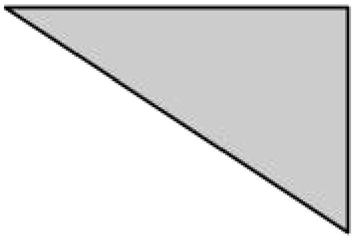
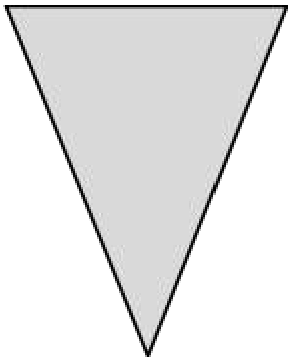
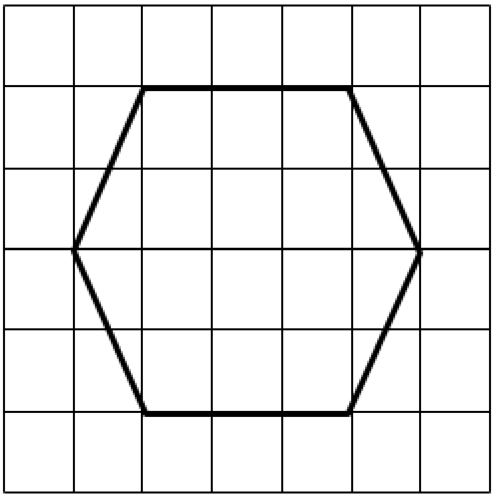
4. Explain how decomposing and composing are different?

5. Add on to each polygon to compose rectangles or parallelograms.





6. Tyree was tasked with calculating the area of the hexagon shown. Instead of decomposing the hexagon, Tyree decides to compose a different shape from the hexagon shown but is a little confused. Help Tyree compose a figure to calculate the area of the hexagon. Explain your thinking.



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Name: ____________________

G6 U1 Lesson 2 - Let's Try It

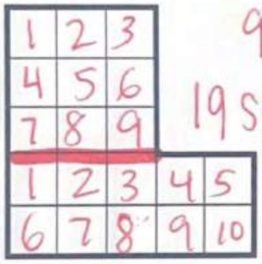
1. Write a synonym for decompose. break apart

2. Write a synonym for compose. build

3. When we decompose polygons we want the decomposed shapes to be rectangles, squares, and/or triangles. (could also put parallelograms)

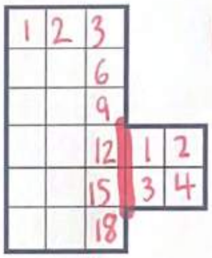
4. Decompose each polygon before you calculate the total area. Compare your work to your neighbor's work.

a.



9+10=
19 sq.units

b.



18+4=22 sq.units

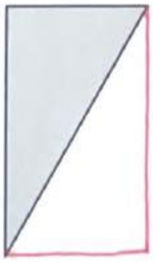
5. Decompose each polygon. (answers will vary)

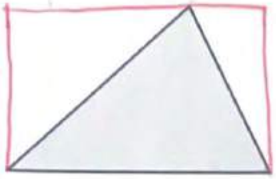
a.

b.

c.

6. Add on to each polygon to compose rectangles or parallelograms.





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Name: ______________________ G6 U1 Lesson 2 - Independent Practice

1. Decompose each polygon into squares, rectangles, and/or triangles. (answers will vary)

a.

b.

c.

2. George made a plan to find the area of figure b in question 2. He planned to break apart or

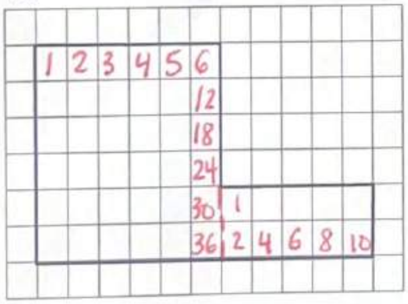
decompose the figure. He ended up with 1 triangle and

1 rectangle. To find the total area of the figure he plans to add the

areas of the two parts together.

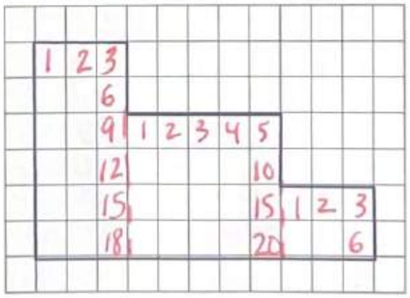
3. Decompose each polygon before you calculate the total area. (decompositions will vary)

a.



$36+10=46$ units^2

b.



$18+20+6=44$ units^2

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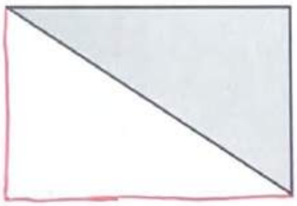
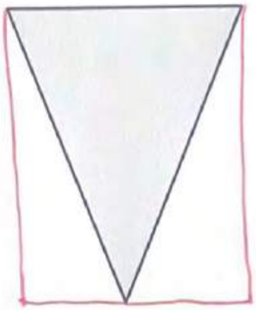
4. Explain how decomposing and composing are different?

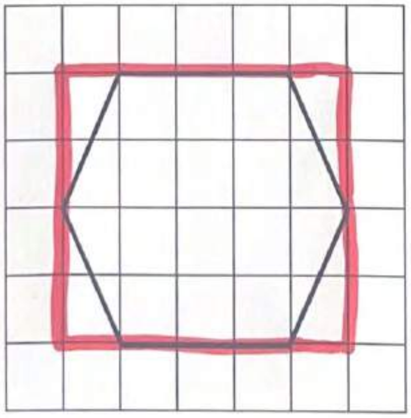
Decomposing is breaking apart which is the opposite of composing which is building.

5. Add on to each polygon to compose rectangles or parallelograms.





6. Tyree was tasked with calculating the area of the hexagon shown. Instead of decomposing the hexagon, Tyree decides to compose a different shape from the hexagon shown but is a little confused. Help Tyree compose a figure to calculate the area of the hexagon. Explain your thinking.



Tyree can compose a rectangle or parallelogram to help him find the area because we know how to find area of rectangles easily.

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G6 U1 Lesson 3

Calculate the area of polygons using composition, decomposition, and subtraction

G6 U1 Lesson 3 - Students will calculate the area of polygons using composition, decomposition, and subtraction

Warm Welcome (Slide 1): Tutor choice.

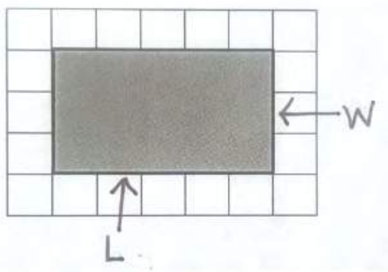
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be using what we learned in the last lesson about composing, decomposing, and rearranging polygons to determine the actual area of polygons. Instead of counting the square units, we will be using the area formula to calculate the area.

Let's Talk (Slide 3): In mathematics we often use formulas to solve problems. A formula is a fact or rule that uses symbols and numbers to find an answer. **Why do you think formulas are important in mathematics?** Possible Student Answers, Key Points:

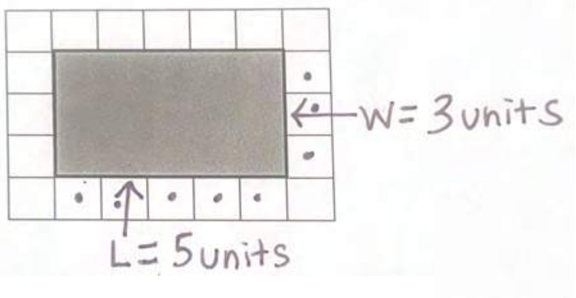
- To find the answer faster
- To make less work for us
- To understand parts of the problem
- To simplify the problem
- To help us know how to solve in a structured way

The area formula you will use in this lesson is the same one you learned in third grade to find the area of squares and rectangles. When you want to find the area of a square or rectangle, you can multiply the rows by the columns. In other words, you can multiply the length times the width to find the total area.

Let's Think (Slide 4): Let's use that formula to calculate the area of this rectangle without counting each square unit, individually. So we know that to find the area of this rectangle we can multiply the number of rows by the number of columns, in other words we can multiply length times the width.



First, we label the rectangle's length and width.



Next, we calculate the actual length and width of the rectangle. Let's start with the width. To find how long that side is, we count the squares along that side. Here we have a width of 3 square units. For the length we do the same. We count 1, 2, 3, 4, 5 square units so this rectangle is 5 square units long.

$A = l \times w$

$A = 5 \times 3$

$A = 15$ sq. units

Finally, we can apply our formula by writing the formula, substituting the information we know into the formula and then solving the formula.

Let's Think (Slide 5): Let's look at a more challenging problem. Listen as I read the problem, "Nelson is designing a model house. Each square on the grid is 1 square unit. The figure shown represents one wall of the model house and the window on that wall. Let's calculate the area of the wall, not including the window."

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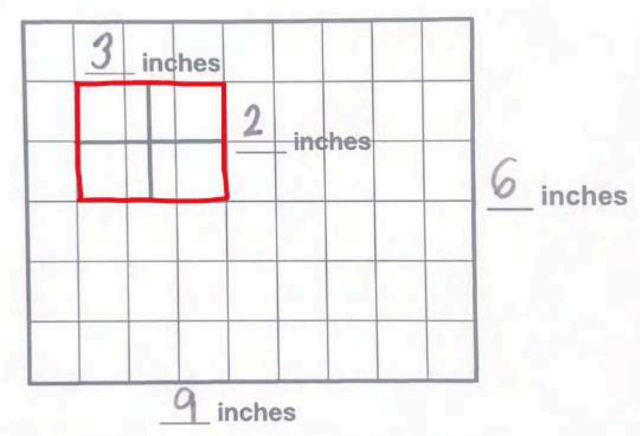
Let's stop and think about this question. Retell it to yourself and ask yourself, what is happening in this problem? Interesting! So, there is a small house and we're looking at one wall of the ouse. The wall has a window. We need to find the area of the wall without the window included.

Let's Think (Slide 6): We are missing the measurements of both the wall and window.



Before we answer the question, let's work together to calculate the missing measurements. The window is kind of tricky because of the window pane in the middle but we want to know the length of the whole window (*outline*). We know that it's 3 inches by 2 inches.

Now let's look at the walls. We see that the wall is 9 inches by 6 inches (*label lengths as you talk*).

$A = \underline{9} \times \underline{6}$

So, to calculate the area of the wall without the window we first need to calculate the area of the big wall. Let's fill in our area formula and solve for the area? A = 9 x 6; 54 square inches

So, what do we need to do next? Possible Student Answers, Key Points:

- We need to find the area of the window next!
- Then we can subtract or take away the area of the window from the wall to find the area of the wall without the window.
- Because the window isn't a part of the wall, it's cut out.

$A = \underline{3} \times \underline{2}$

So, let's use our area formula to find the area of JUST the window. A = 3 x 2, so the area of JUST the window is 6 square inches.

total wall: 54 sq. in.
window: − 6 sq. in.
48 sq. in.

The area of the model house's wall without the window is 48 sq. in.

Now, we can finally find the area of the wall without the window! To do that, we need to start with the area of the WHOLE wall and take away the area of the window, since it's cut out of the wall.

So we know that the area of the wall is 54 square inches and that the area of the window is 6 square inches. When we subtract them from one another we find that the area of the wall is 48 square inches.

Let's Think (Slide 7): Nice work, let's look at the next slide to continue to think about how the area formula can be helpful for us. Let's think about how we calculate the area of the shaded region on the grid shown?

Some of you are thinking that we can just count the green tiles inside of the shape, but can you see why it might be hard to count the green tiles to find the area? Possible Student Answers, Key Points:

- Because some of the squares within the shaded region aren't complete squares.
- Because some of the tiles are cut off.

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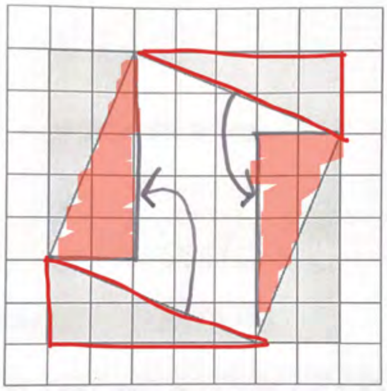
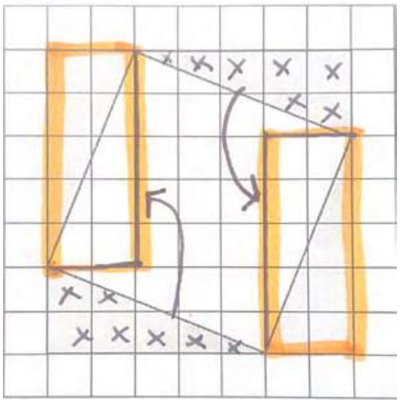
- It would be hard to know how much of each tile to count because it's not full tiles.

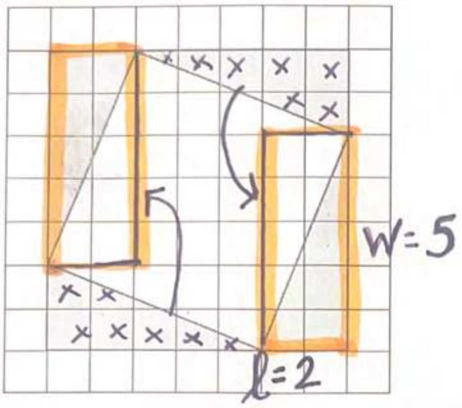
We can use the larger green triangles themselves! We know from the last lesson that triangles can come together to compose rectangles so let's apply that knowledge now to calculate the area of the shaded region.



Look, we can rearrange the triangles to make rectangles. So, we moved each triangle, using an arrow to show where we are moving each triangle.



Next we highlight the rectangles we composed to show our NEW shape. And to show that we moved the bottom and top rectangles, let's put x's in the grid areas for those triangles.



Now we are ready to calculate the area of each rectangle and add those areas together. As always we start out by writing the area formula for the figure. Next, we substitute into the formula and calculate the area. The length is 2 and the width is 5, and 2x5 is 10.

Since our rectangles are identical then they both have an area of 10 square units. So, 10 + 10 = 20. We did it! The shaded region has an area of 20 square units.

Let's Try It (Slide 8): Now let's work together on more problem solving that involves area of polygons. Remember, the area formula for a square and a rectangle is A=LxW and it is important to label each side as the length or width on your polygon. And, if we don't have a rectangle or square, we can cut our shape and rearrange it to make it easier to solve!

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WARM WELCOME

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Today we will calculate the area of polygons using decomposition, composition, and subtraction.

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Let's Talk:

Let's brainstorm…

Why are formulas important in mathematics?

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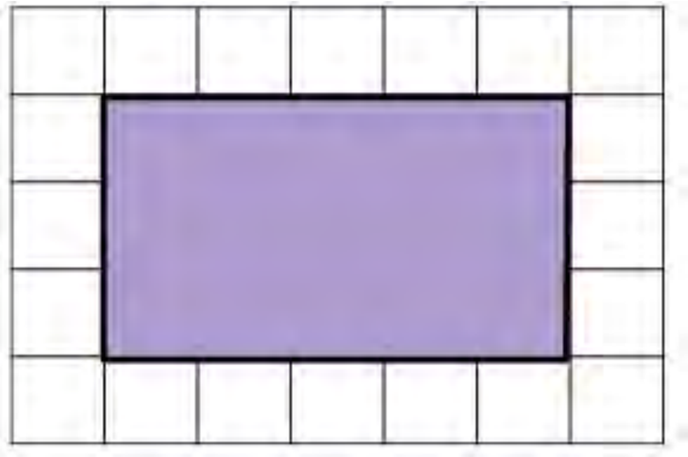
Let's Think:

Let's use the area formula.



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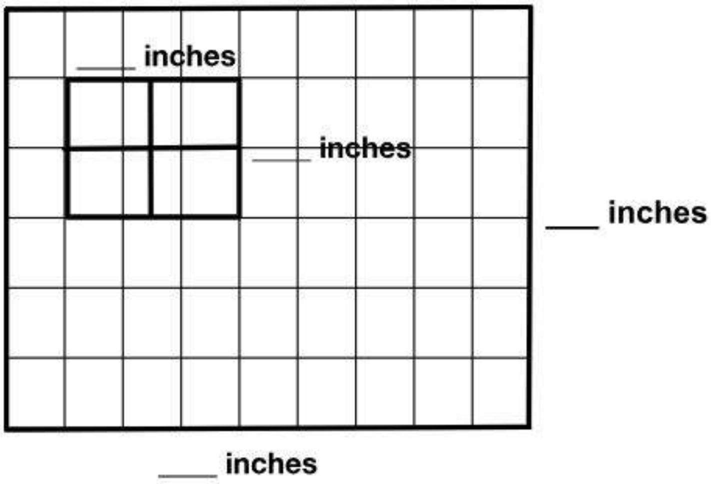
Let's Think:

Nelson is designing a model house. Each square on the grid is 1 square unit. The figure shown represents one wall of the model house and the window on that wall.

Let's calculate the area of the wall, not including the window.



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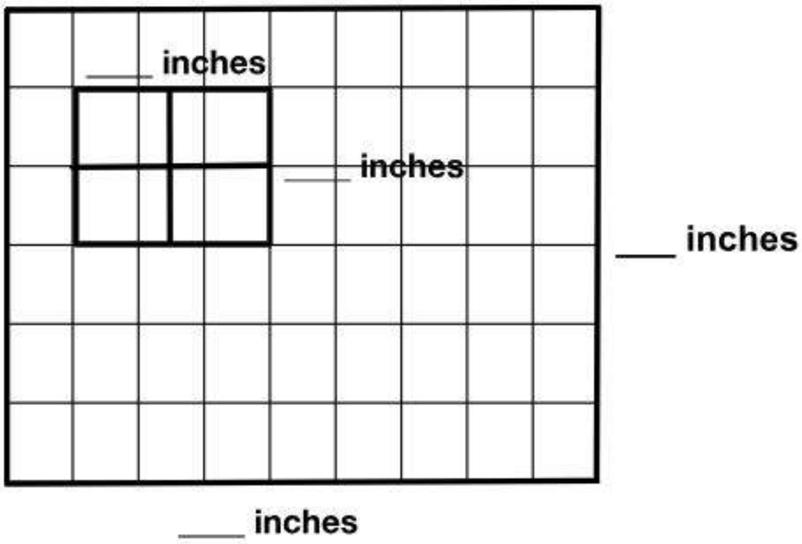
Let's Think:

Let's calculate the area of the wall, not including the window.



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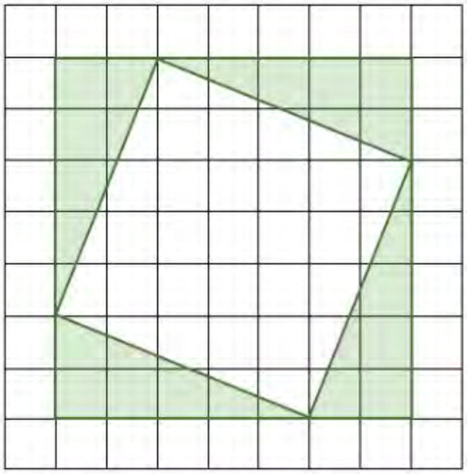
Let's Think:

How can we find the area of the green region? Can you see why we can't just count the squares inside the shaded region?



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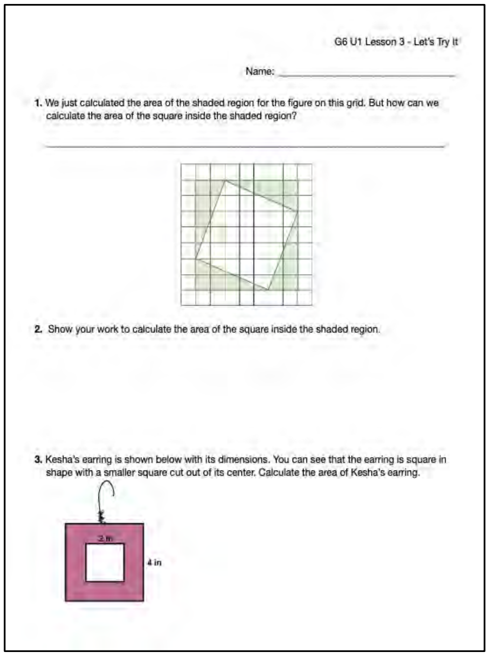
Let's Try It:

Let's explore calculating area through decomposition and composition together.



G6 U1 Lesson 3 - Let's Try It

Name: ______________________

1. We just calculated the area of the shaded region for the figure on this grid. But how can we calculate the area of the square inside the shaded region?

____

2. Show your work to calculate the area of the square inside the shaded region.

3. Kesha's earring is shown below with its dimensions. You can see that the earring is square in shape with a smaller square cut out of its center. Calculate the area of Kesha's earring.

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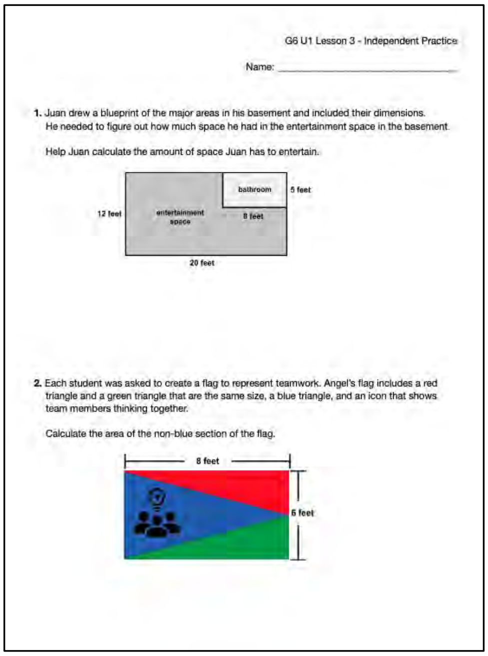
On your Own:

Now it’s time to explore calculating area through decomposition and composition on your own.



G6 U1 Lesson 3 - Independent Practice

Name: ______________________________

1. Juan drew a blueprint of the major areas in his basement and included their dimensions. He needed to figure out how much space he had in the entertainment space in the basement.

   Help Juan calculate the amount of space Juan has to entertain.

2. Each student was asked to create a flag to represent teamwork. Angel’s flag includes a red triangle and a green triangle that are the same size, a blue triangle, and an icon that shows team members thinking together.

   Calculate the area of the non-blue section of the flag.

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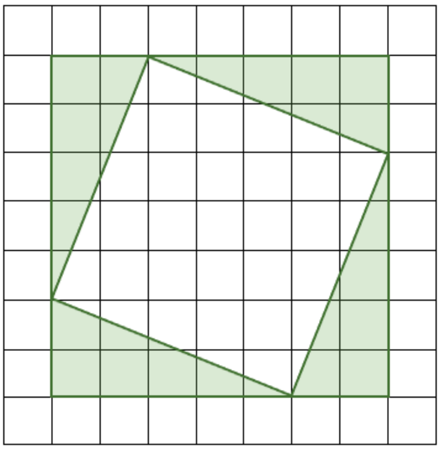
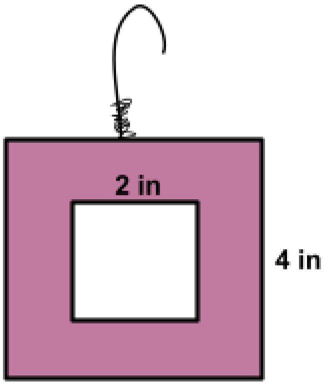
1. We just calculated the area of the shaded region for the figure on this grid. But how can we calculate the area of the square inside the shaded region?

____



2. Show your work to calculate the area of the square inside the shaded region.

3. Kesha’s earring is shown below with its dimensions. You can see that the earring is square in shape with a smaller square cut out of its center. Calculate the area of Kesha’s earring.



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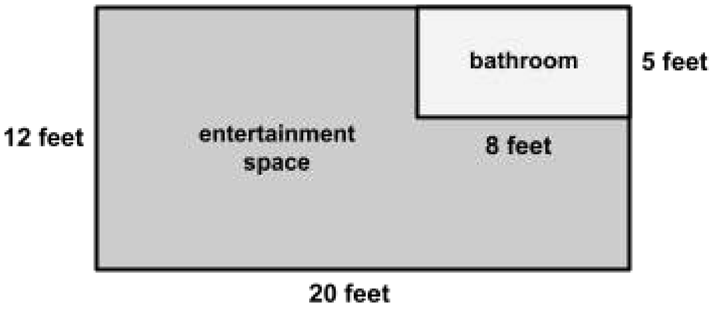
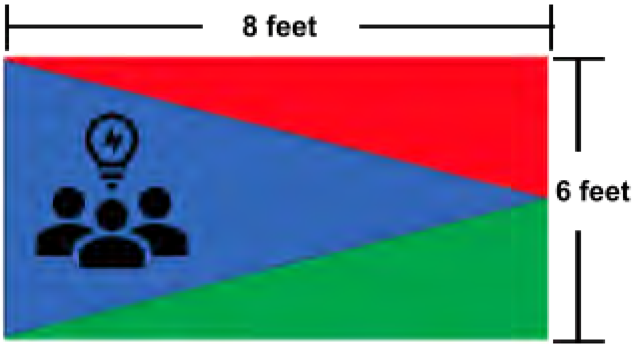
1. Juan drew a blueprint of the major areas in his basement and included their dimensions. He needed to figure out how much space he had in the entertainment portion in his basement.

Help Juan calculate the amount of space he has to entertain.



2. Each student was asked to create a flag to represent teamwork. Angel's flag includes a red triangle and a green triangle that are the same size as well as a blue triangle with an icon that shows team members thinking together.

Calculate the area of the non-blue section of the flag.



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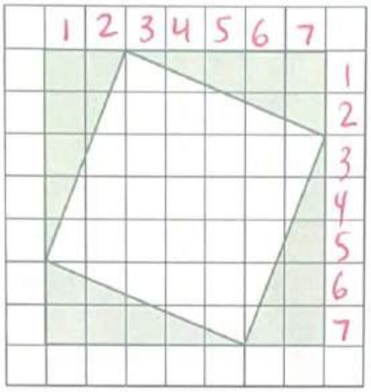
Name: ______________________________ G6 U1 Lesson 3 - Let's Try It

1. We just calculated the area of the shaded region for the figure on this grid. But how can we calculate the area of the square inside the shaded region?

We can calculate the total area then subtract the shaded region.



2. Show your work to calculate the area of the square inside the shaded region.

$A^{\text{total square}} = l \times w$

$A = 7 \times 7$

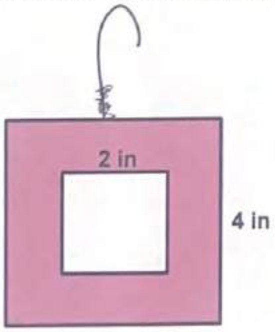
$A = 49$ sq. units

$A^{\text{total square}} = 49$

$A^{\text{shaded region}} = -20$

$A^{\text{square inside}} = 29$ sq. units

3. Kesha's earring is shown below with its dimensions. You can see that the earring is square in shape with a smaller square cut out of its center. Calculate the area of Kesha's earring.



$A^{\text{total square}} = l \times w$

$A = 4 \times 4$

$A = 16$ sq. units

$A^{\text{total square}} = 16$

$A^{\text{cut out}} = -4$

12 sq. units

$A^{\text{cut out}} = l \times w$

$A = 2 \times 2$

$A = 4$ sq. units

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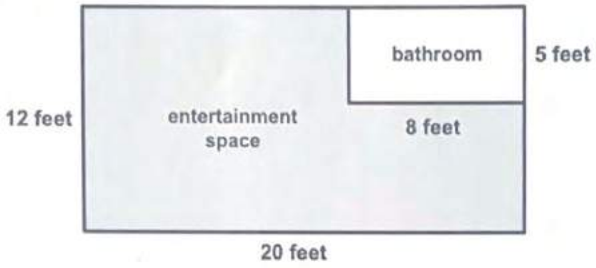
Name: ______________________________ G6 U1 Lesson 3 - Independent Practice

1. Juan drew a blueprint of the major areas in his basement and included their dimensions. He needed to figure out how much space he had in the entertainment portion in his basement.

   Help Juan calculate the amount of space he has to entertain.



Area = length x width

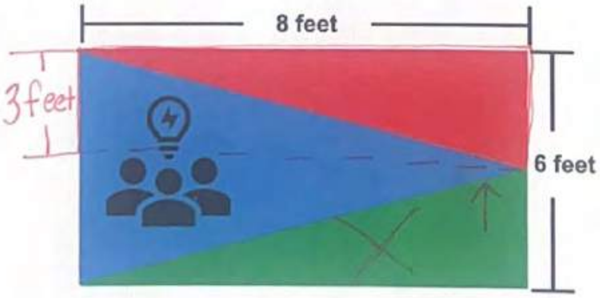
Area of entire basement = 20 x 12 = 240

-Area of bathroom = - 8 x 5 - 40

Area of entertaiment Space = 200 sq feet

2. Each student was asked to create a flag to represent teamwork. Angel's flag includes a red triangle and a green triangle that are the same size as well as a blue triangle with an icon that shows team members thinking together.

   Calculate the area of the non-blue section of the flag.



You can compose a rectangle with the two non-blue sections of the flag.

That rectangle has a length of 8ft and a width of 3feet. So, if A=l×w then A=8×3 which is 24 square feet.

The area of the non-blue section is $24ft^2$.

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G6 U1 Lesson 4

Use the characteristics of a parallelogram to calculate the area of parallelograms.

G6 U1 Lesson 4 - Students will use the characteristics of a parallelogram to calculate the area of parallelograms

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue exploring the attributes of parallelograms that we began exploring in lessons 1 and 2 along with continuing to explore how to calculate area of different polygons.

Let's Talk (Slide 3): Let's start with a question…w**hat does it mean to rearrange? When in your life have you rearranged something?** Possible Student Answers, Key Points:

- Rearrange means to move things around.
- I rearranged my bookshelf because I moved books around.
- We rearranged our classroom when we moved the desks around.
- My mom talks about rearranging her schedule, moving things around to make more time.

That's right! Rearranging means to move things around. You have lots of examples of rearranging, or moving, things! It's important to remember that when we rearrange things, the objects stay the same (we don't add anything or take anything away), we just reorganize them! So, today we will be looking at rearranging shapes to assist us with calculating the area of parallelograms.

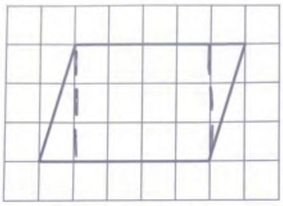
Let's Think (Slide 4): Most people think parallelograms are always slanted like some of the ones we see on the slide. But the definition for a parallelogram does not say a parallelogram must be slanted! Look at the other polygons on this slide.**Think about the attributes of a parallelogram and talk to your neighbor about what you notice.** Possible Student Answers, Key Points:

- The square and rectangle both have 4 straight sides and the opposite sides of a square and a rectangle are parallel and the same length. So, that means a rectangle and a square are also parallelograms.
- Parallelograms have two sets of parallel sides.

That's right! All parallelograms really aren't slanted. A square and a rectangle are also parallelograms. I'm sure you're wondering why this is so important! Well, it's important because we already know how to calculate the area of squares and rectangles AND we know that we can decompose and rearrange shapes to make them easier to work with. So, if we can decompose and rearrange slanted parallelograms to compose squares and rectangles then we can easily calculate the area of slanted parallelograms.

Let's Think (Slide 5): Let's look at this parallelogram here on the slide. I notice that it's slanted, which makes it really hard to calculate the area because we don't know how to count these pieces (*point to the slanted edges*), since this isn't a whole square inside the parallelogram. So, let's think about how we can decompose this shape and rearrange it to make a square or rectangle so that it's easier to calculate the area! And that's right, we explored decomposing and rearranging polygons in our last lesson.

In our last lesson we explored how we can cut a slanted parallelogram into 2 triangles and 1 square or rectangle. And we can do the same thing here, watch me.



First we want to decompose the parallelogram into squares/rectangles and triangles. Let's start right at the top left corner and cut down, that helps us make sure that we're cutting a triangle with a point at the top! Now, we can go to the bottom corner and cut up. Look, now we have a triangle here, a rectangle, and another upside down triangle!

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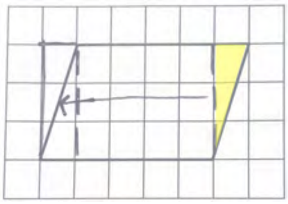
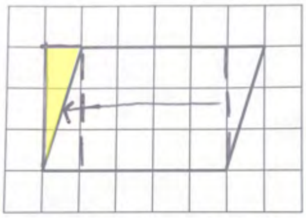
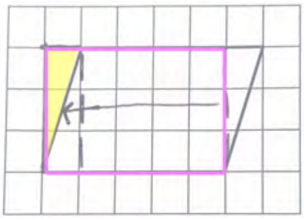


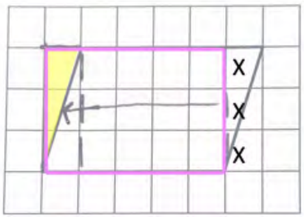
Now, let's try moving or rearranging a part of our parallelogram. We can stop the parallelogram from being slanted by moving a piece from the left to the right side of the parallelogram (or from right to left). Look at this triangle (*shade it in*), I can move it over here to make a rectangle. We want to draw an arrow to show where we are moving the triangle.



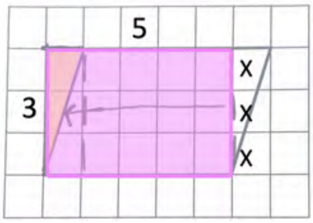
Now look, we cut the parallelogram and moved this triangle over to the other side. It looks like we composed a rectangle.



Let’s highlight or trace the new composed shape. It is helpful to see the new figure we composed. Look, it’s a rectangle!



Finally, since we took this triangle and rearranged it to make a nice neat rectangle, crossing out the part we just moved is also helpful to alleviate confusion.



Now we are ready to calculate the area of our newly composed rectangle. I’m going to shade the inside to show what we’re calculating, just to make sure we can all see the new rectangle that we just made. We know that we can find the area of a rectangle by counting all the squares inside but a faster way is to multiply the length times the width. The width (*point*) is 3 and the length (*point*) is 5. That’s right, it makes sense we can multiply because there are 5 groups of 3 or 3 groups of 5 (drag finger across groups as you explain).

A = l × w
A = 5 × 3
A = 15 sq. units

So, in order to find the area, we can write the area formula, length times width. Next, we substitute into the formula…the length is 5 times the width which is 3. And now we can calculate the area. So, the area of the parallelogram is 15 square units.

Let’s Think (Slide 6): Let’s look at one more parallelogram before we get into practice. This one is a little tricky, the way we cut it is different. Look at it closely, how can we cut this parallelogram so that it can be rearranged into some friendly shapes. (*Give students time to look closely at the shape and talk*).

Let’s Think (Slide 7): The first thing we have to do is cut it. This is the hardest step because we have to find the best way to cut our parallelograms so that we can rearrange them to make friendly shapes like squares or rectangles. When we cut this one, we cut it right down the middle to make two triangles!

Let’s Think (Slide 8): Next, we have to rearrange it! Let’s move one triangle over so that we make a rectangle!

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Let's Think (Slide 9): Finally, let's trace the new figure and cross out the parts we don't need anymore. And now, look! We have a rectangle so we can calculate the area using our simple formula. Everybody, calculate the area of this rectangle. What is it? 9 square units! So the area of the parallelogram is also 9 square units since this is just the parallelogram rearranged!

Let's Try it (Slide 10-11): Let's continue working on decomposing and rearranging pieces of parallelograms to calculate their areas. Remember that rearranging a polygon means moving the decomposed part to the other side in order to compose a simpler shape with which to calculate the area.

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WARM WELCOME

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Today we will calculate the area of parallelograms.

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Let's Talk:

What does it mean to *rearrange*?

When in your life have you rearranged something?

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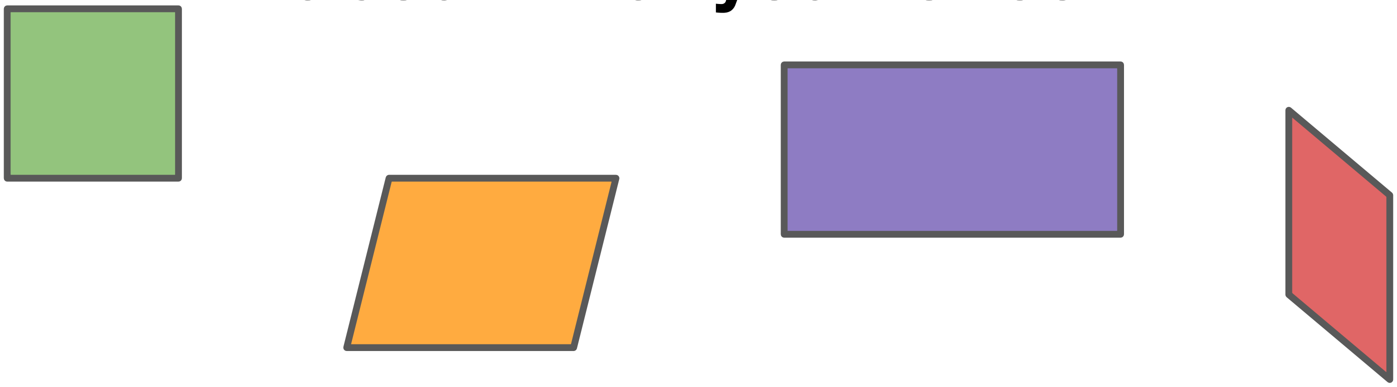
Let's Think:

Think about the attributes of a parallelogram and talk to your neighbor about what you notice.



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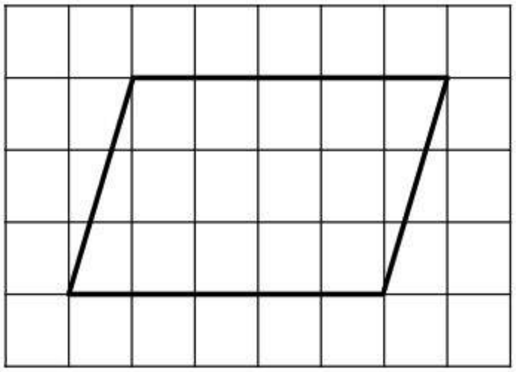
Let's Think:



How can we make a square or rectangle from this parallelogram by rearranging parts of the original figure?

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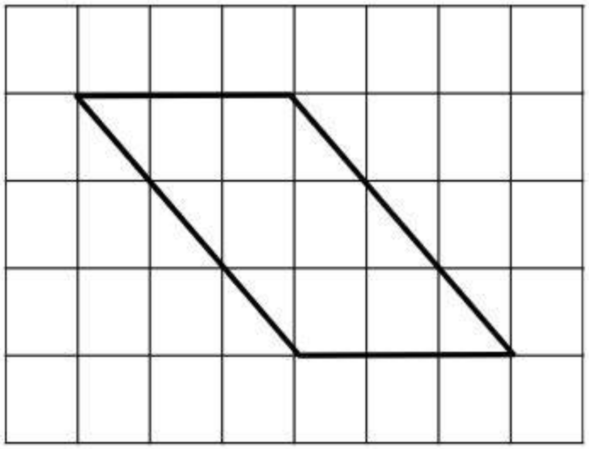
Let's Think:

How do we move or rearrange a part of this parallelogram to calculate its area?



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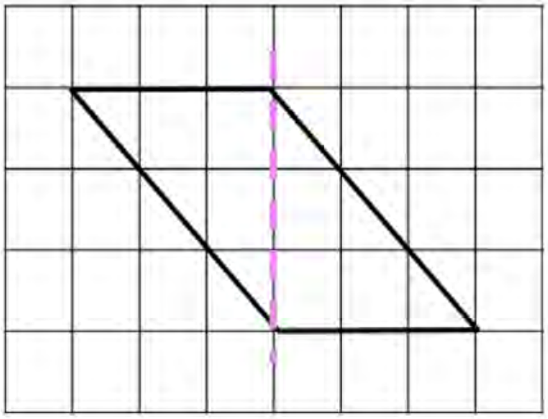
Let's Think:

Cut it! This one makes 2 triangles!



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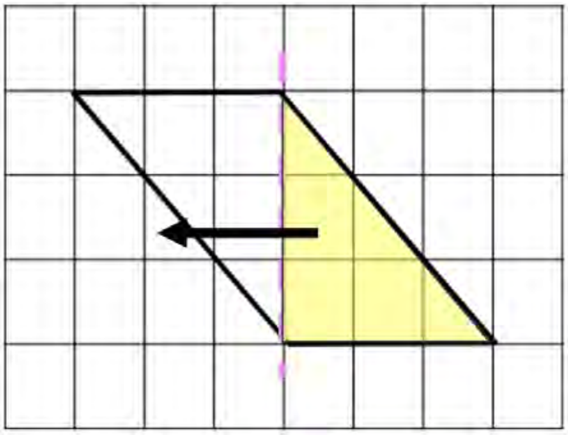
Let's Think:

Rearrange it!



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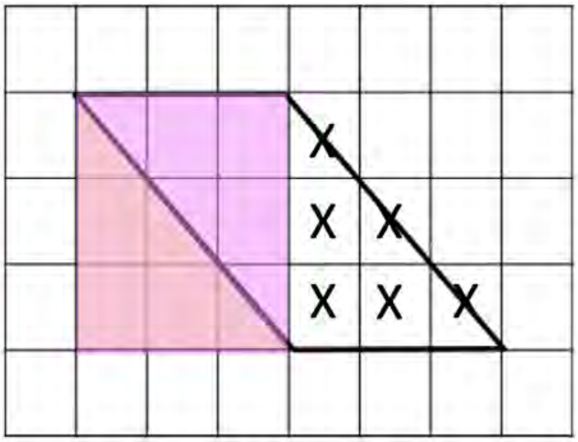
Let's Think:

Findt the new shape and calculate area!



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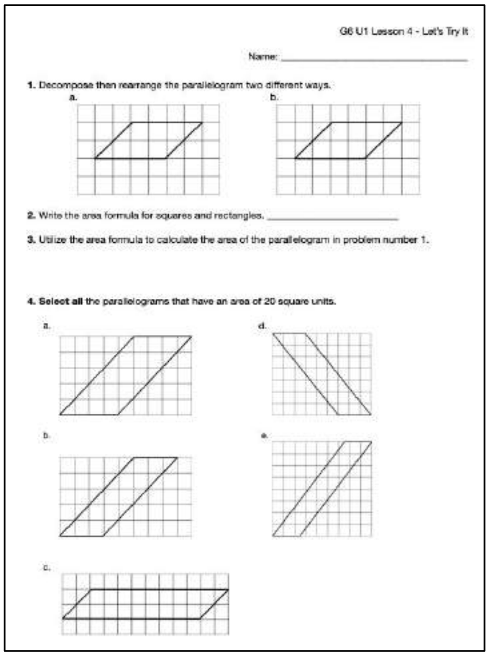
Let's Try It:

Let's explore calculating the area of parallelograms together.



G6 U1 Lesson 4 - Let's Try It

Name: ______________________

1. Decompose then rearrange the parallelogram two different ways.

a.

b.

2. Write the area formula for squares and rectangles. ______________

3. Utilize the area formula to calculate the area of the parallelogram in problem number 1.

4. **Select all** the parallelograms that have an area of 20 square units.

a.

d.

b.

e.

c.

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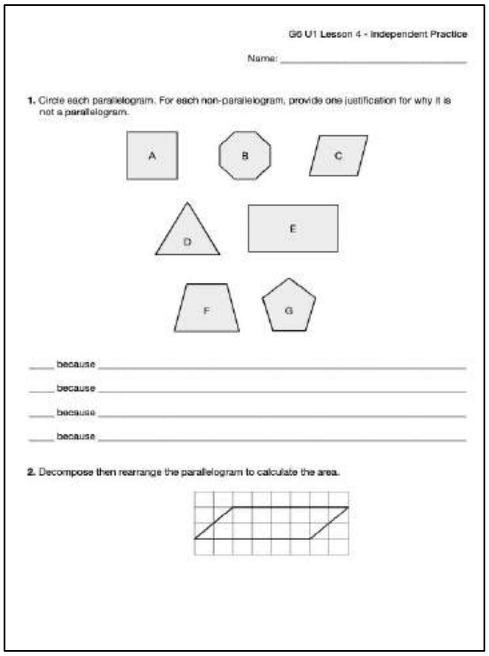
On your Own:

Now it’s time to explore calculating the area of parallelograms on your own.



G6 U1 Lesson 4 - Independent Practice

Name: ____________________

1. Circle each parallelogram. For each non-parallelogram, provide one justification for why it is not a parallelogram.

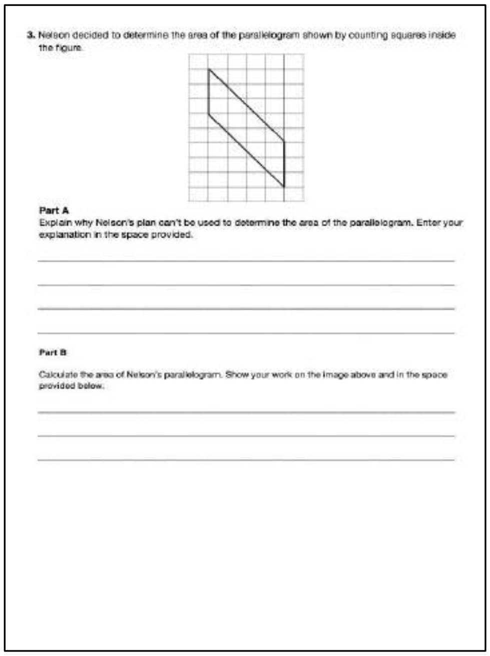
_____ because ____________________

_____ because ____________________

_____ because ____________________

_____ because ____________________

2. Decompose then rearrange the parallelogram to calculate the area.



3. Nelson decided to determine the area of the parallelogram shown by counting squares inside the figure.

Part A

Explain why Nelson's plan can't be used to determine the area of the parallelogram. Enter your explanation in the space provided.

Part B

Calculate the area of Nelson's parallelogram. Show your work on the image above and in the space provided below.

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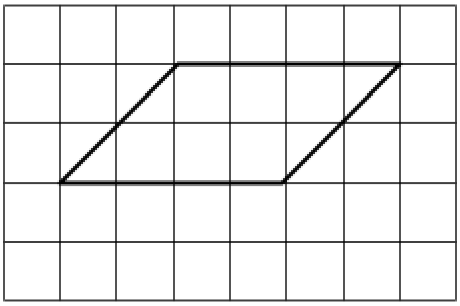
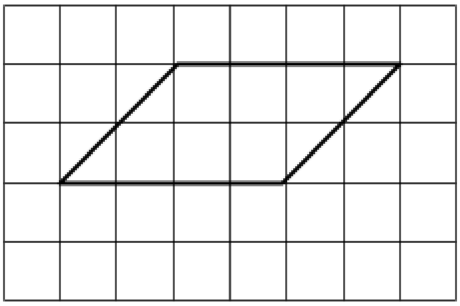
1. a. Decompose then rearrange the parallelogram that could be used to calculate area.
b. Compose a rectangle that could be used to calculate area.

a.



b.

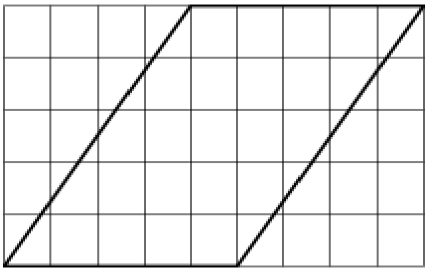


2. Write the area formula for squares and rectangles. ______________________

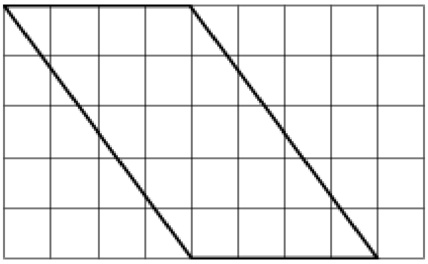
3. Utilize the area formula to calculate the area of the parallelogram in problem number 1.

4. Calculate the area of each parallelogram by decomposing or composing each parallelogram.

a.



b.



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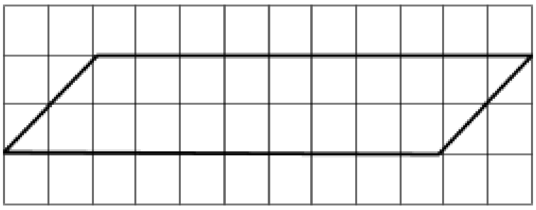
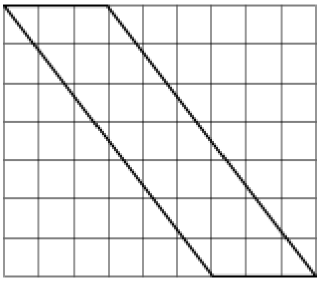
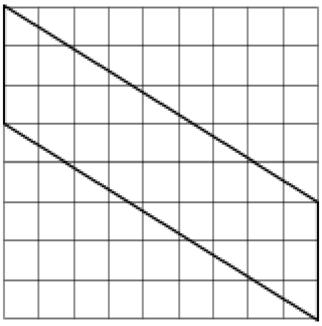
c.



d.

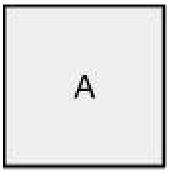


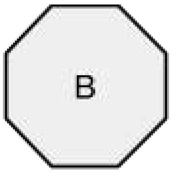
e.

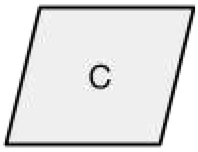


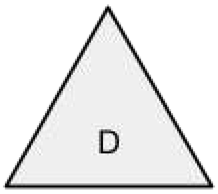
Name: ___________________________________ G6 U1 Lesson 4 - Independent Practice

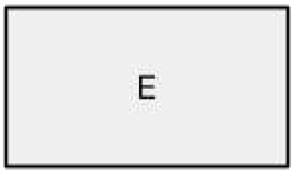
1. Circle each parallelogram. For each non-parallelogram, provide one justification for why it is not a parallelogram.

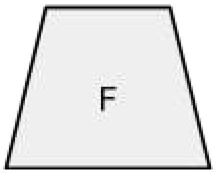












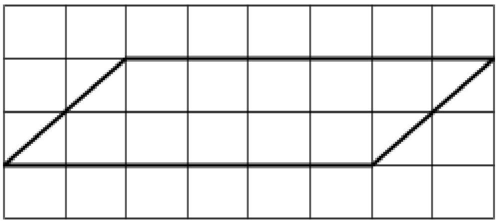
_____ because ____

_____ because ____

_____ because ____

_____ because ____

2. Decompose the parallelogram or compose a parallelogram to calculate the area.



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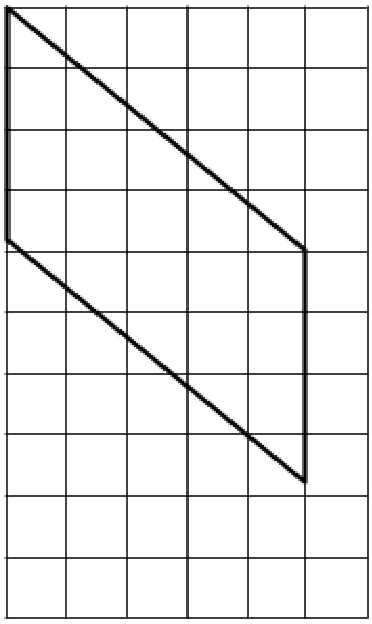
3. Nelson decided to determine the area of the parallelogram shown by counting squares inside the figure.



Part A

Explain why Nelson's plan can't be used to determine the area of the parallelogram. Enter your explanation in the space provided.

Part B

Calculate the area of Nelson's parallelogram. Show your work on the image above and in the space provided below.

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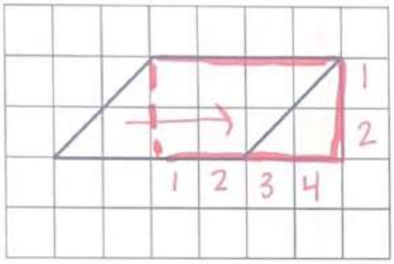
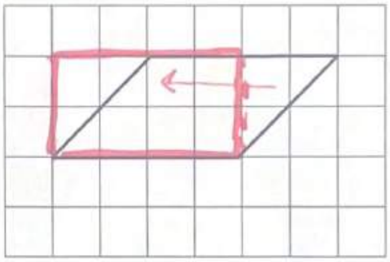
Name: ______________________ G6 U1 Lesson 4 - Let's Try It

1. a. Decompose then rearrange the parallelogram that could be used to calculate area.
b. Compose a rectangle that could be used to calculate area.

a.



b.



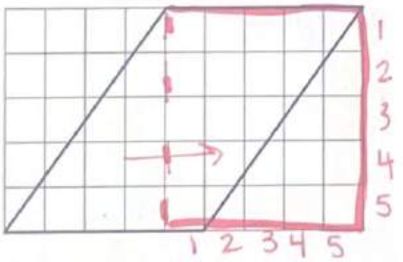
2. Write the area formula for squares and rectangles. A = length x width

3. Utilize the area formula to calculate the area of the parallelogram in problem number 1.

$A = l \times w$
$A = 4 \times 2$
A = 8 square units or 8 units^2

4. Calculate the area of each parallelogram by decomposing or composing each parallelogram.

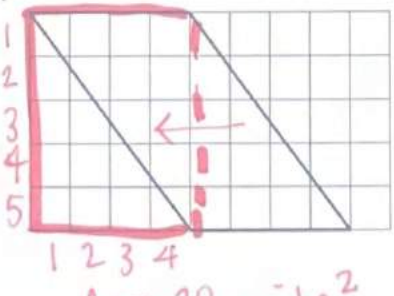
a.



A = 25 units^2

$A = l \times w$
$A = 5 \times 5$
A = 25 square units or 25 units^2

b.



A = 20 units^2

$A = l \times w$
$A = 4 \times 5$
A = 20 square units or 20 units^2

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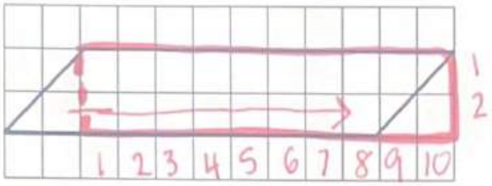
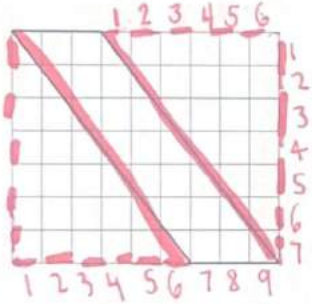
c.



A = 20 units^2

A = l x w
A = 10x2
A = 20 sq. units or 20 units^2

d.

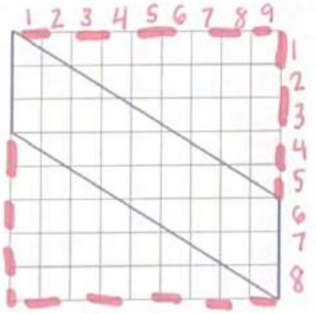


A = 21 units^2

Area of the entire composed rectangle is 9x7 or 63 units^2.

The two triangles formed together make a rectangle that has a length of 6 and a width of 7. So, A = l x w or A = 6x7 which is 42 units^2. 63 units^2 - 42 units^2 = 21 units^2

e.



Area of the entire composed rectangle is 9 x 8 or 72 units^2.

The two triangles formed together to make a rectangle that has a length of 9 units and a width of 5 units. So, A = l x w or A = 9 x 5 which is 45 units^2. 72 units^2 - 45 units^2 = 27 units^2

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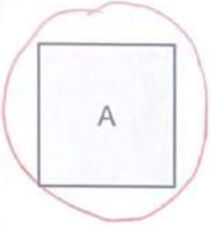
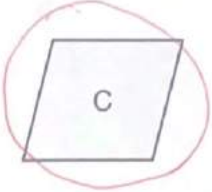
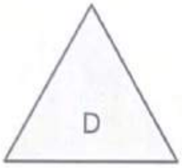
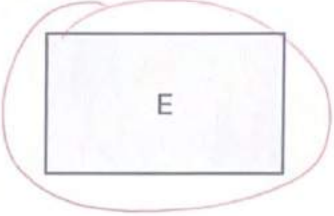
Name: ______________________ G6 U1 Lesson 4 - Independent Practice

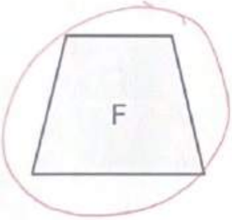
1. Circle each parallelogram. For each non-parallelogram, provide one justification for why it is not a parallelogram.

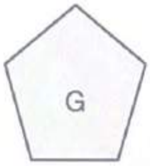












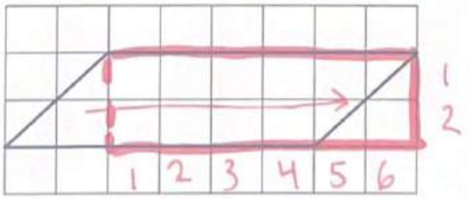
B because it does not have 4 sides (or 4 angles)

D because it does not have 4 sides

G because it has more than 4 sides

____ because ______________________

2. Decompose the parallelogram or compose a parallelogram to calculate the area.



A = length × width

A = 6×2

A = 12 square units or 12 units^2

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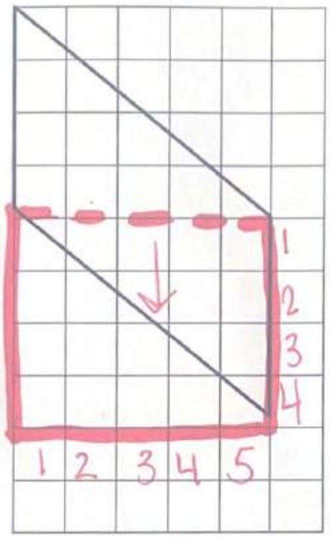
3. Nelson decided to determine the area of the parallelogram shown by counting squares inside the figure.



Part A

Explain why Nelson's plan can't be used to determine the area of the parallelogram. Enter your explanation in the space provided.

Nelson's plan can't be used to determine the area of the parallelogram because the are not whole or complete squares within the parallelogram.

Part B

Calculate the area of Nelson's parallelogram. Show your work on the image above and in the space provided below.

The area = length x width so, area = 5 x 4 or 20 square units.

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G6 U1 Lesson 5

Use the formula for area to find the area of any parallelogram

CITYTUTOR DC

G6 U1 Lesson 5 - Students will calculate the area of parallelograms using the area formula

Warm Welcome (Slide 1): Tutor choice.

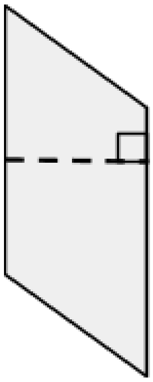
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will revisit the area of parallelograms but focus specifically on utilizing the formula for determining the area of slanted parallelograms as opposed to determining area of parallelograms only on a grid.

Let's Talk (Slide 3): Let's brainstorm: One of the words we will be using in our work today is the word base. **What do you think of when you hear the word *base*?** Possible Student Answers, Key Points:

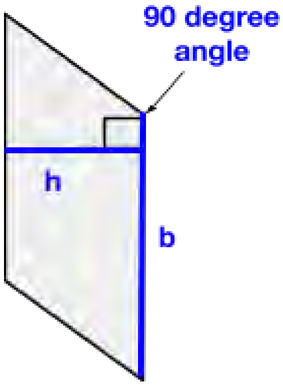
- The bottom of something, I hear the word base in basement, etc.
- Note: Some students may say they think of *bass* as in music. That is a different word and is spelled differently making "base" and "bass" homophones which are words that are pronounced the same but have different spellings and/or meanings. Musically, *bass* is a deep or low tone so in some ways the meanings have similarities.

Good thinking! Base is usually thought of as the bottom of something like the basement is the bottom floor of a house. Today we will be exploring where the height and base are located on a parallelogram. But, identifying the base can sometimes be tricky so let's get ready.

Let's Think (Slide 4): Some of you already had knowledge of some of the vocabulary we will be using today. Terms such as "base" and "height" and how to use them may not be new to you. Labeling the base and height of a polygon are very important. Many students get confused but there is an easy way to remember which is which and where they are located.

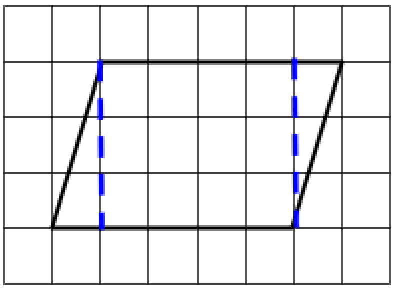


The base is always on the side or solid line where the 90 degree angle sits or touches so it's not always on the bottom. A 90 degree angle forms an "L" shape *(make an "L" with your fingers).* You can be sure an angle is 90 degrees when you see the box like we see on the figure *(point to box).* The height is located perpendicular to the base. Perpendicular sounds confusing but perpendicular lines are just lines that form a letter "T' shape. The height is never, ever on the slanted side because if you think about it, you would never lean to the side if you were going to measure your height. Instead you would stand straight up to measure your height.

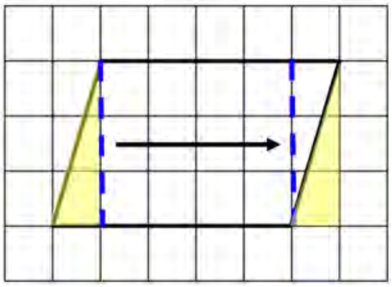


Based on the descriptions we just discussed, where do you think we should label the base, height, and 90 degree angle of this parallelogram *(point to image)*? The dotted line is the height, the base touches the angle and the angle is the box. That's right! The easiest to label is the 90 degree angle because it is a box. The height is actually the dotted line because the base is the solid line where the 90 degree box touches. Great thinking. We're part of the way there to calculating the area of parallelograms!

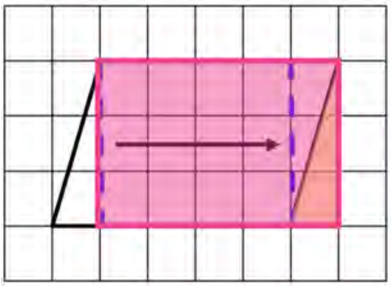
Let's Think (Slide 5): Next, let's connect the knowledge we have about parallelograms on a grid to what we are learning about parallelograms off a grid. On a grid is when we have the polygon on top of the tiles *(point).* Off the grid is when we see the polygon without the tiles *(point).*



As a recap of our previous lessons, let's calculate the area using the grid. If we remember, our first step is to decompose the polygon. We can break this parallelogram into 1 rectangle and 2 triangles. Watch as I decompose this polygon.

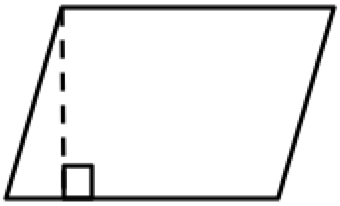


Our second step is to rearrange the polygon to create a rectangle. We recall that rearranging means to *move around*. Look at how we moved the triangle from the left to the right side.

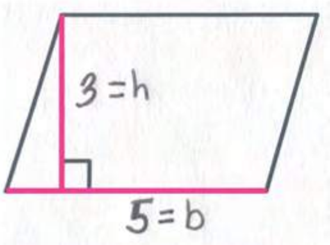


And now, we have a rectangle! I'm going to highlight to make it easy to see our new rearranged shape! Last thing is to count the squares inside the parallelogram or we can use the area formula to calculate the area of the parallelogram but we are just going to practice our skip counting skills in two ways as we find the area.

We can find the area a few different ways. We can count all of the square tiles, we can skip count or we can use the area formula. Pick one and find the area of the shape. What is the area? 15 square units!

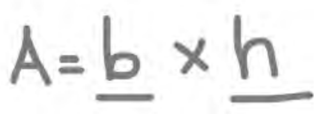


But, what happens when our parallelogram is off the grid? Let me show you. We need to identify and label the measurements for the base and height, if they are told to us. In our parallelogram we were not told the base and height but we can figure it out from our rectangle on the grid polygon we just worked with. The length of our rectangle was 5 units squares and the width was 3 units or squares. With a parallelogram, we call the length the "base" and we call the width the "height." So, base and height are used instead of length and width.



Let's label our parallelogram. We remember from earlier in the lesson that the height is perpendicular to the base and forms the letter "T" so the vertical line is the height and it is 3 units high.The base is the solid line where the 90 degree angle touches. The base measures 5 units long.

Similar to the area formula for a square or rectangle, the formula for the area of a parallelogram is Area = base (or length) x height (or width). We know this to be true because we already explored the area of parallelograms many times. Each time we composed rectangles from those slanted parallelograms and then used the area formula for rectangles to calculate the area.



When we substitute into our newly learned area formula, Area = base x height, we get A = 5 x 3. So, the area of this slanted parallelogram is 15 square units.

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We found it with the formula! We notice that the area of our parallelogram on the grid and the area of our parallelogram off the grid are the same, 15 square units.

We have just proven that we can use a grid or not use the grid to calculate the area of parallelograms! On the grid we decompose and rearrange the parallelogram before counting the squares within our polygon.

Off the grid we identify the 90 degree angle then label the base and height of the parallelogram so we can apply the area formula which is area = base x height. In the next lesson, we'll explore how we can calculate the area of triangles!

Let's Try it (Slide 6): Let's continue working on utilizing the formula for parallelograms to calculate their areas. Don't forget, the area formula for parallelograms is slightly different from the area formula for squares and rectangles because it uses the term base instead of length and height instead of width.

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WARM WELCOME

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Today we will use the area formula for parallelograms to calculate the area of slanted parallelograms.

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Let's Talk:

What do you think of when you hear the word *base*?

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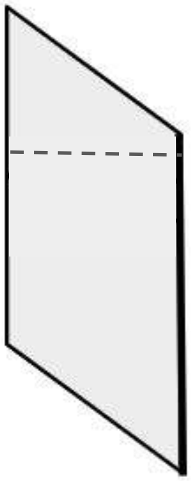
Let's Think:

How do we label the parts of a parallelogram?



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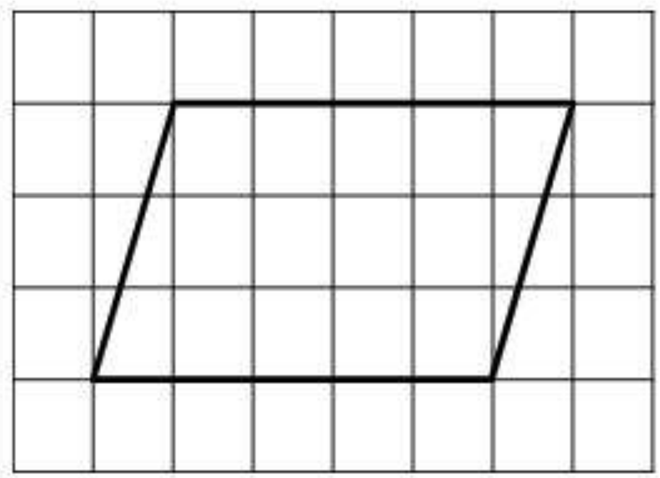
Let's Think:

Let's connect parallelograms on the grid to parallelograms off the grid.



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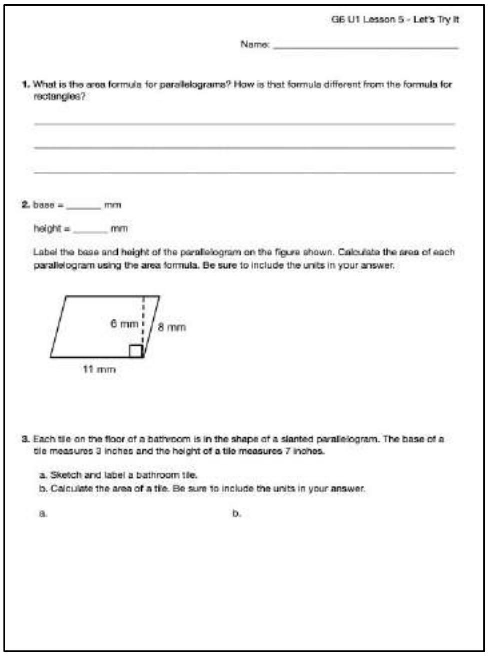
Let's Try It:

Let's explore using the formula to calculate the area of parallelograms together.



G6 U1 Lesson 5 - Let's Try It

Name: ______________________

1. What is the area formula for parallelograms? How is that formula different from the formula for rectangles?

____

____

____

2. base = ______ mm

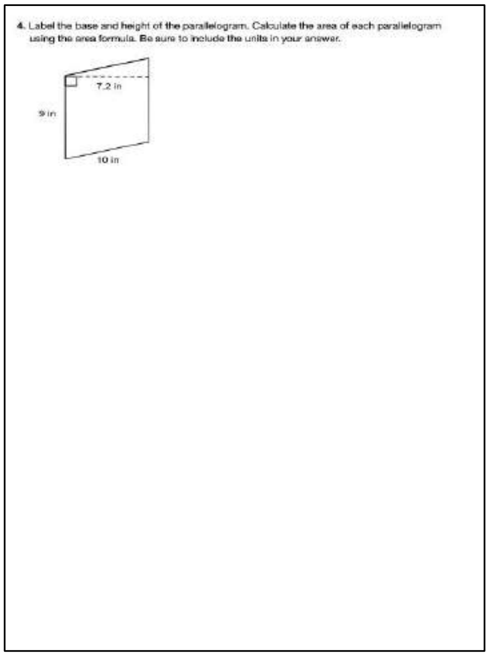
height = ______ mm

Label the base and height of the parallelogram on the figure shown. Calculate the area of each parallelogram using the area formula. Be sure to include the units in your answer.

3. Each tile on the floor of a bathroom is in the shape of a slanted parallelogram. The base of a tile measures 3 inches and the height of a tile measures 7 inches.

a. Sketch and label a bathroom tile.
b. Calculate the area of a tile. Be sure to include the units in your answer.

a. b.



4. Label the base and height of the parallelogram. Calculate the area of each parallelogram using the area formula. Be sure to include the units in your answer.

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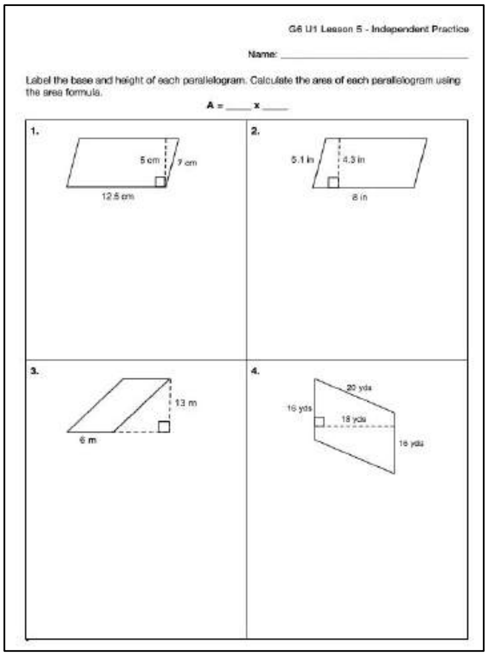
On your Own:

Now it’s time to explore using the formula to calculate the area of parallelograms on your own.



G6 U1 Lesson 5 - Independent Practice

Name: ______________________

Label the base and height of each parallelogram. Calculate the area of each parallelogram using the area formula.

A = _____ **x** _____

1.
5 cm
7 cm
12.5 cm

2.
5.1 in
4.3 in
8 in

3.
13 m
6 m

4.
20 yds
15 yds
18 yds
15 yds

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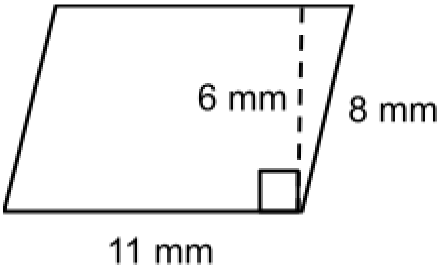
1. What is the area formula for parallelograms? How is that formula different from the formula for rectangles?

____

____

2. Label the base and height of the parallelogram on the figure shown.



3. What are the base and height of the figure?

base = _______ mm

height = _______ mm

4. Calculate the area of the parallelogram using the area formula. Be sure to include the units in your answer.

Each tile on the floor of a bathroom is in the shape of a slanted parallelogram. The base of a tile measures 3 inches and the height of a tile measures 7 inches.

5. Sketch and label a bathroom tile.

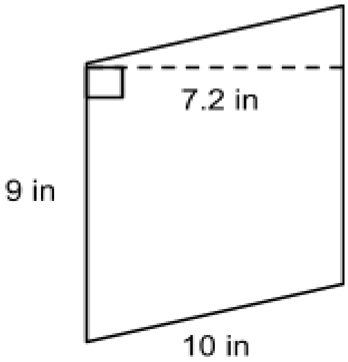
6. Write the area formula for a parallelogram. ________________________

7. Calculate the area of a tile. Be sure to include the units in your answer.

8. Label the base and height of the parallelogram.

base = _______ in

height = _______ in

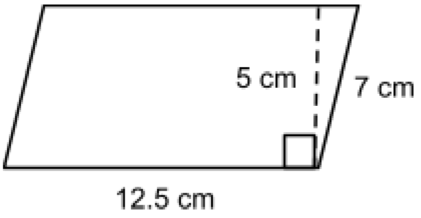
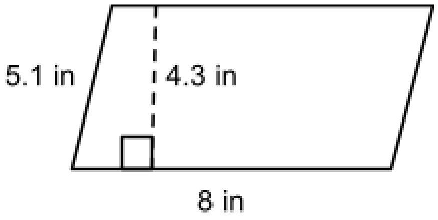
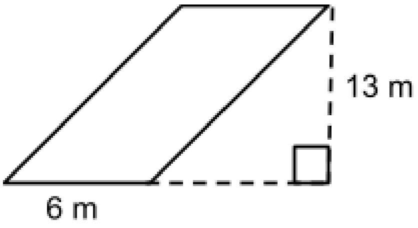
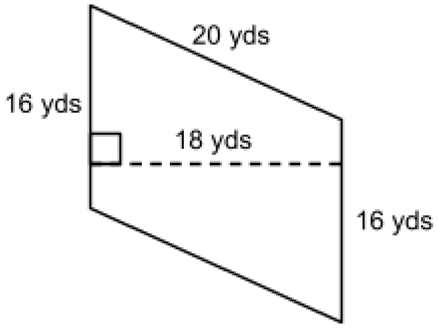


9. Calculate the area of each parallelogram using the area formula. Be sure to include the units in your answer.

Name: ___________________________________ G6 U1 Lesson 5 - Independent Practice

Label the base and height of each parallelogram. Calculate the area of each parallelogram using the area formula.

A = _____ x _____

1. 	**2.** 
3. 	**4.** 

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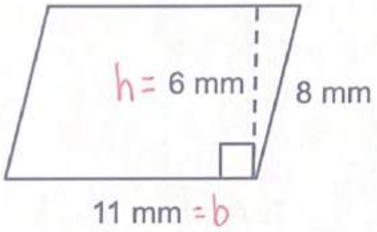
Name: ____________________ G6 U1 Lesson 5 - Let's Try It

1. What is the area formula for parallelograms? How is that formula different from the formula for rectangles?

Area of a parallelogram is A = base × height. The rectangle formula uses length & width instead of base & height.

2. Label the base and height of the parallelogram on the figure shown.



3. What are the base and height of the figure?

base = 11 mm

height = 6 mm

4. Calculate the area of the parallelogram using the area formula. Be sure to include the units in your answer.

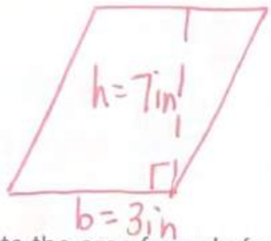
A = base × h

A = 11 × 6

A = 66 square millimeters or 66 mm^2

Each tile on the floor of a bathroom is in the shape of a slanted parallelogram. The base of a tile measures 3 inches and the height of a tile measures 7 inches.

5. Sketch and label a bathroom tile.



6. Write the area formula for a parallelogram. $A=b \times h$

7. Calculate the area of a tile. Be sure to include the units in your answer.

$A=b \times h$

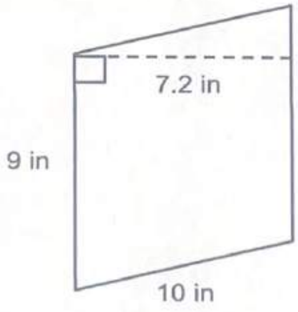
$A=3 \times 7$

$A=21 \text{ in}^2$

8. Label the base and height of the parallelogram.

base = 9 in

height = 7.2 in



9. Calculate the area of each parallelogram using the area formula. Be sure to include the units in your answer.

$A=b \times h$

$A=9 \times 7.2$

$$\begin{array}{rl} {}^{1}7.\underline{2} & ① \\ \times\ 9 & \downarrow \\ \hline 64.8 & ① \end{array}$$

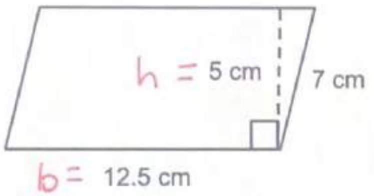
$A=64.8 \text{ in}^2$

Name: ______________________ G6 U1 Lesson 5 - Independent Practice

Label the base and height of each parallelogram. Calculate the area of each parallelogram using the area formula.

A = b x h

1.



$A = b \times h$

$A = 12.5 \times 5$

1 2

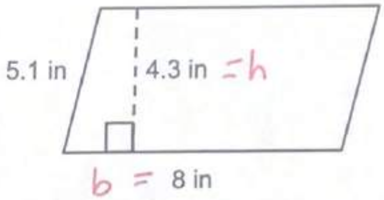
12.5 ①

x 5 ↓

62.5 ①

$A = 62.5\,cm^2$

2.



$A = b \times h$

$A = 8 \times 4.3$

2

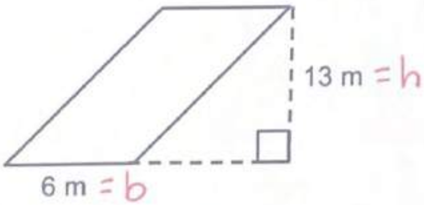
4.3 ①

x 8 ↓

34.4 ①

$A = 34.4\,in^2$

3.



$A = b \times h$

$A = 6 \times 13$

1

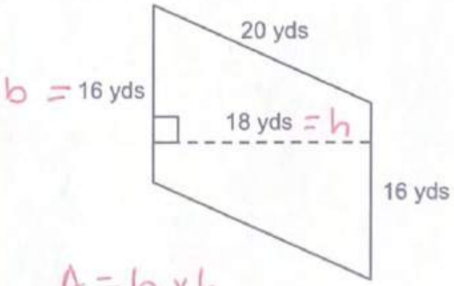
13

x 6

78

$A = 78\,m^2$

4.



$A = b \times h$

$A = 16 \times 18$

4

16

x18

128

+160

288

$A = 288\,yds^2$

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G6 U1 Lesson 6

Use parallelograms to find the area of triangles, identify base and corresponding height of a triangle

G6 U1 Lesson 6 - Students will use parallelograms to calculate the area of triangles

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we use what we know about parallelograms to calculate the area of triangles. When we were working with parallelograms, we learned that we can decompose and rearrange shapes to help us find areas. Working with triangles is a new concept but we're ready for it because of our hard work with the area of parallelograms of squares, rectangles, and slanted parallelograms!

Let's Talk (Slide 3): Let's brainstorm: **How are triangles and squares alike? How are they different?**
Possible Student Answers, Key Points:

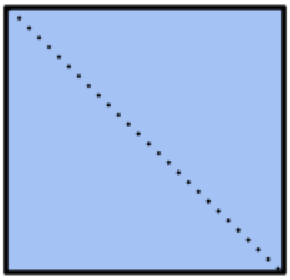
- They both have straight sides
- They both have angles
- They're both closed figures and can be small or large, etc.
- Triangles only have three sides while squares have four
- The sides of a square are always the same length but the sides of triangles can be different lengths

You're on it today! Triangles and squares are alike because they both have straight sides, they both have angles, they both are closed figures with no openings, and they both can be small or large. Triangles and squares are different because triangles only have three sides while squares have four. They are also different because the four sides of a square are always the same length while the three sides of triangles are not always the same length. Today our knowledge of triangles and squares is going to come in handy as we calculate the area of triangles.

Let's Think (Slide 4): To recap, parallelograms have specific attributes that make them parallelograms. Who can name those attributes? They have four straight sides, the opposite sides that are parallel, and the opposite sides that are the same length.

That's right! Parallelograms have four straight sides. The opposite sides are parallel to one another and those opposite sides are the same length.

Let's decompose a square parallelogram. This parallelogram is also called a square. We call it a parallelogram because it has the attributes of a parallelogram; it has four straight sides, the opposite sides are parallel to one another, and the opposite sides are the same length. We call it specifically a square because, in addition to the attributes of a parallelogram, ALL the sides of the square are equal to one another, not just opposite sides!



We can decompose this square many different ways, but what if we draw a diagonal from one angle to another angle on this square, **what do you notice?**

Interestingly, we notice that we just made two, equally-sized triangles..1, 2 *(point)* and each triangle is half the size of the square! If we folded along this line, each triangle could be the exact same size.

Well look at that! We can decompose or break down a square parallelogram in half to make two, equally-sized triangles. If the triangles are equally-sized that means that the areas of the two triangles will be the same. So, if we know the area of the square then we can also easily find the area of each triangle because it would be HALF of the area of the square. For example, If I told you the area of this square was 4 square units, then you'd know the area of this triangle was 2 square units and the area of the other triangle would also be 2 square units. Let's look more closely at how that works.

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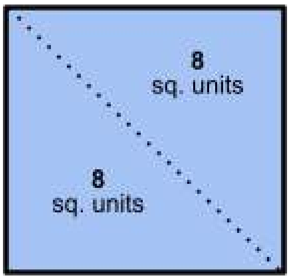
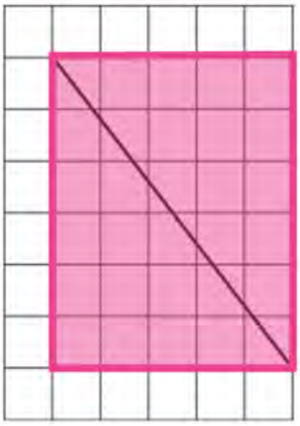
Let's Think (Slide 5): Now that we have our two, equal-sized triangles that are each half the size of the square we want to calculate the area of each triangle. I'm going to tell you the area of our square. Ready? Our square has an area of 16 square inches. Since we have already decomposed the square into two, equally-sized triangles and now that we know the area of the square, we are able to calculate the area of each of those triangles!



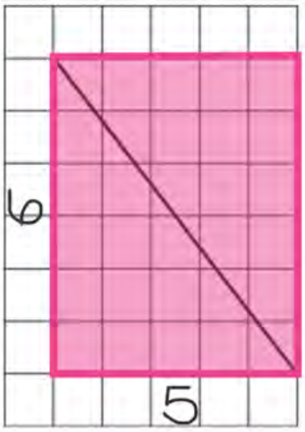
So how do we figure that out? Well, if the whole square has an area of 16 square inches and we just split that square in half to get two *(hold up two fingers)* equally-sized triangles. Let's try it. What is half of 16? 8 That's right! 16 split into two equal pieces is 8 and it is also 8 because 16 divided by 2 equals 8. Good thinking!

Let's Think (Slide 6): Sometimes we start with a triangle and not a parallelogram though. It's tough to count the number of square units inside a triangle sometimes because all the squares aren't always complete squares. In the triangle on the grid we see that we have some complete squares but we also have some partial squares *(point)*. It's nearly impossible to correctly piece all those partial squares together to make whole squares!



When it's really tough to piece partial squares together we instead compose a parallelogram. We recall that composing means to build onto a polygon. Let's build onto this triangle to make a parallelogram.

What type of parallelogram do you think we can compose from this triangle? Rectangle. That's right! We can make a rectangle. We know it's a rectangle because the polygon has four straight sides, the opposite sides are parallel and the same length, and it has four 90 degree angles. Let's compose that rectangle.

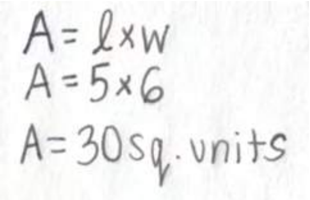


We are still working to find the area of the original triangle. But, since we have a rectangle we can use the area formula for a rectangle or Area = length x width to calculate the area of our newly composed rectangle. We need to first know our length and width and can figure this out by counting the squares along the bottom and side.

Along the bottom we have 1, 2, 3, 4, 5 units *(point to each square as you count).*

Along the side we have 1, 2, 3, 4, 5, 6 units *(point to each square as you count).*

So, we have a length of 5 units and a width of 6 units.



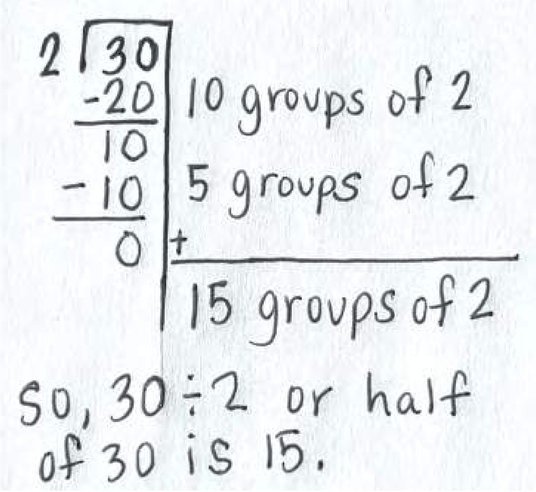
A = l x w
A = 5 x 6
A = 30 sq. units

Our next step is to calculate the area of the composed rectangle. We know that we can use the area formula to find the area. So Area= 5 x 6, that's easy math! So the area of the composed rectangle equals 30 square units.

But, we're not done! We don't want to area of the WHOLE rectangle, we just want the area of the triangle that we started with.

Hmm, How do we find the area of our original triangle? Well, let's think about our example where we started with a square and cut it in half. Each of our triangles ended up being half the area of the square.

Same thing will happen here! To find the area of our original triangle we need to take half the area of our rectangle or half of 30. It's time for division!



2 ⟌ 30
-20 | 10 groups of 2
10
-10 | 5 groups of 2
0 | +
15 groups of 2

So, 30 ÷ 2 or half of 30 is 15.

Taking half of something means to divide it into two equal parts or divide by 2. Let's do the division together using the partial quotients method where we keep making groups of 2 until there aren't any groups of 2 left to make.

I begin by asking myself, "How many groups of 2 can I make if I have 30?" I can at least make 10 groups of 2 which gives me 20 in total.

Next, I subtract 30 minus 20 and I am left with 10. I now only have 10 left with which to make groups of 2. I then ask myself, "How many groups of 2 can I make from the 10 I have left?" I can make exactly 5 groups which gives me 10 in total. So, I subtract 10 minus 10 and am left with 0!

My last step is to add together the groups of 2 that I have made. 10 groups of 2 plus 5 groups of 2 gives me 15 total groups of 2 as my answer.

So, 30 divided by 2 or half of 30 gives us an area of 15 square units for our original triangle.

We have just figured out that we can decompose a parallelogram into two, equally-sized triangles or we can compose a parallelogram from a triangle to more easily calculate the area of a triangle as long as we keep in mind that those triangles are half the size of the parallelograms. We'll keep all this in mind as we explore the area formula for triangles in upcoming lessons.

Let's Try it (Slide 7): Let's continue our work with decomposing and composing parallelograms to calculate the area of triangles. But, remember that triangles are half the size of parallelograms and triangles can be made into parallelograms to calculate the area of triangles.

Note: The Common Core State Standards do not teach long division until later units in sixth grade, students learned to use the partial quotient method (modeled in this lesson) in fifth grade.

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WARM WELCOME

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Today we will calculate the area of triangles using our knowledge of parallelograms.

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Let’s Talk:

How are triangles and squares alike?
How are they different?

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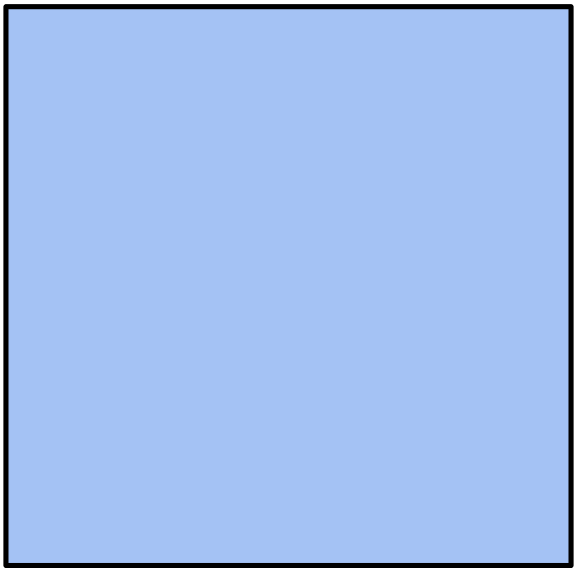
Let’s Think:

Let’s decompose this square.



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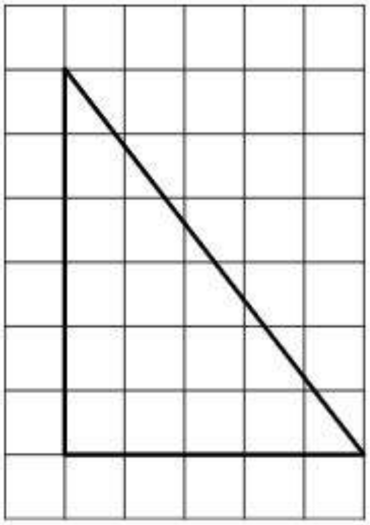
Let's Think:

How can we compose a parallelogram from this triangle?



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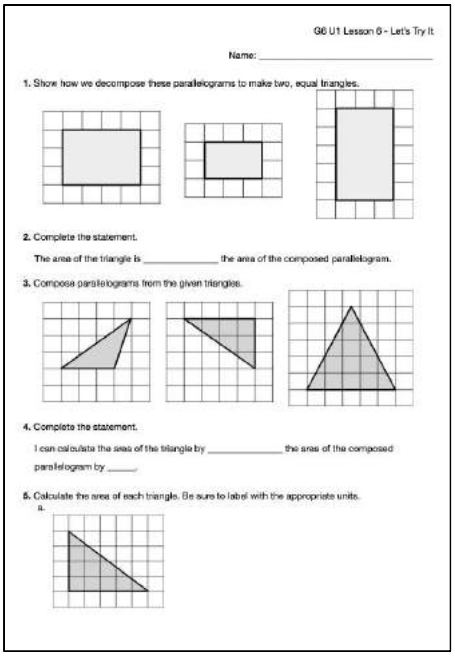
Let's Try It:

Let's explore calculating the area of triangles using parallelograms together.



G6 U1 Lesson 6 - Let's Try It

Name: ______________________

1. Show how we decompose these parallelograms to make two, equal triangles.

2. Complete the statement.

The area of the triangle is ____________ the area of the composed parallelogram.

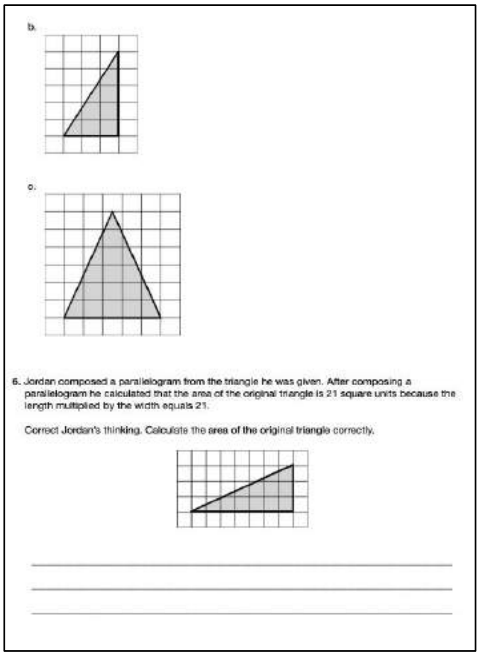
3. Compose parallelograms from the given triangles.

4. Complete the statement.

I can calculate the area of the triangle by ____________ the area of the composed parallelogram by _____.

5. Calculate the area of each triangle. Be sure to label with the appropriate units.

a.



b.

c.

6. Jordan composed a parallelogram from the triangle he was given. After composing a parallelogram he calculated that the area of the original triangle is 21 square units because the length multiplied by the width equals 21.

Correct Jordan's thinking. Calculate the area of the original triangle correctly.

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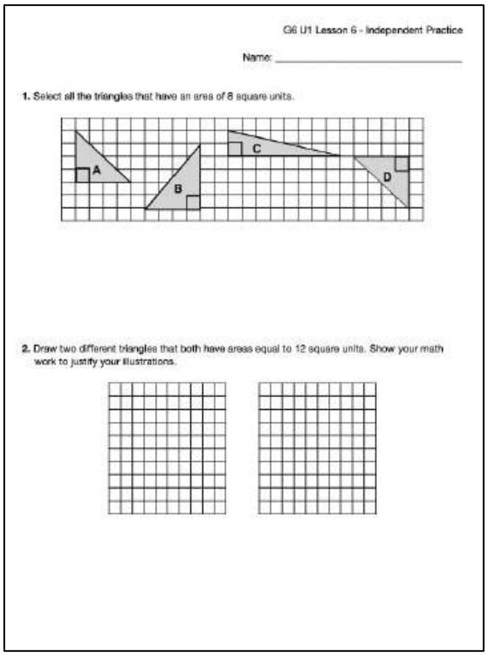
On your Own:

Now it’s time to explore calculating the area of triangles using parallelograms on your own.



G6 U1 Lesson 6 - Independent Practice

Name: ______________________

1. Select all the triangles that have an area of 8 square units.

2. Draw two different triangles that both have areas equal to 12 square units. Show your math work to justify your illustrations.

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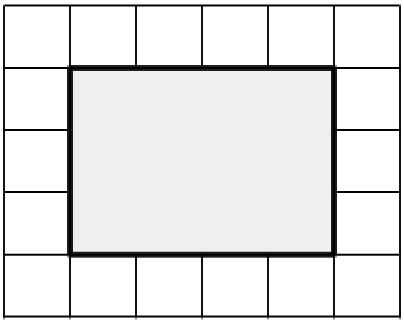
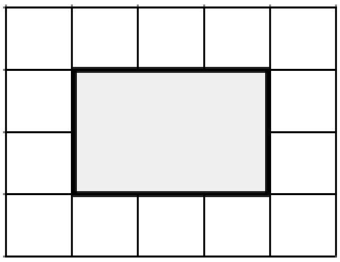
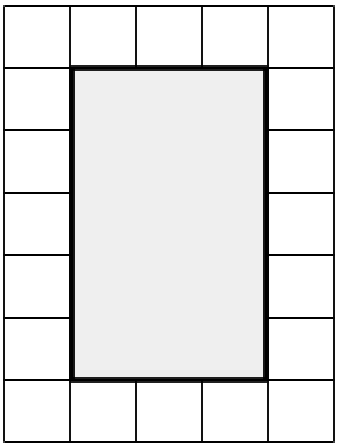
1. Show how we decompose these parallelograms to make two, equal triangles.



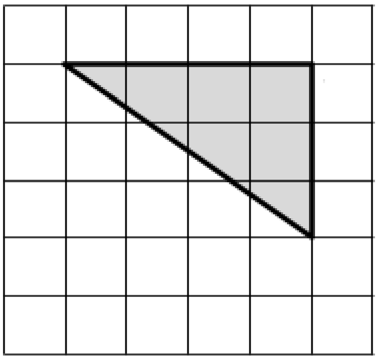


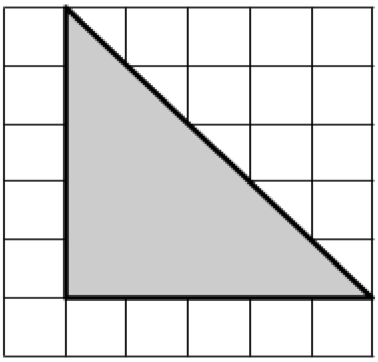


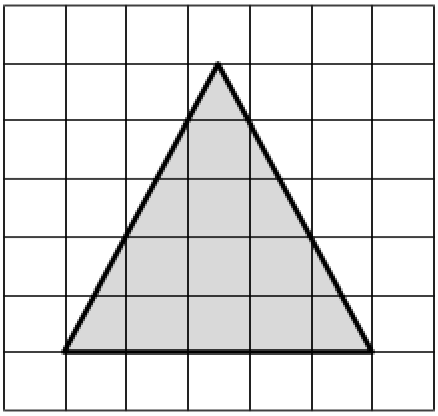
2. Complete the statement.

The area of the triangle is _______________ the area of the composed parallelogram.

3. Compose parallelograms from the given triangles.





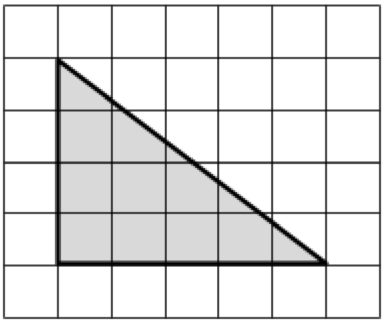


4. Complete the statement.

I can calculate the area of the triangle by _______________ the area of the composed parallelogram by ______.

Calculate the area of each triangle. Be sure to label with the appropriate units.

5.



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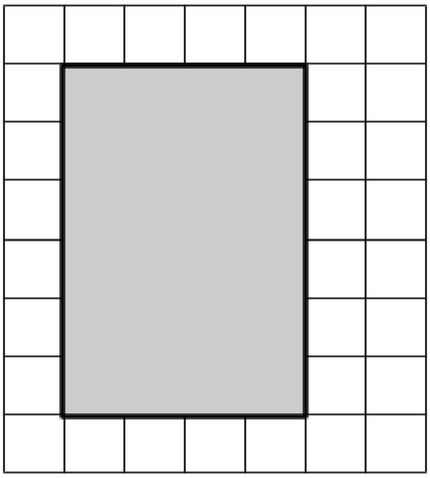

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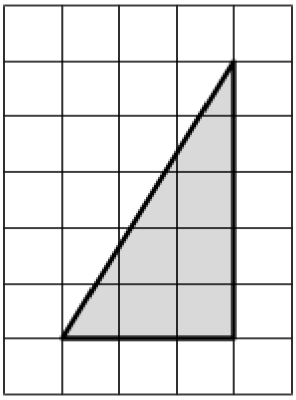
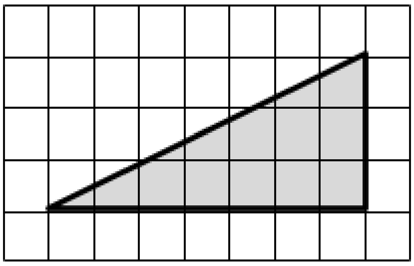


8. Jordan composed a parallelogram from the triangle he was given. After composing a parallelogram he calculated that the area of the original triangle is 21 square units because the length multiplied by the width equals 21.

Correct Jordan's thinking. Calculate the area of the original triangle, correctly.



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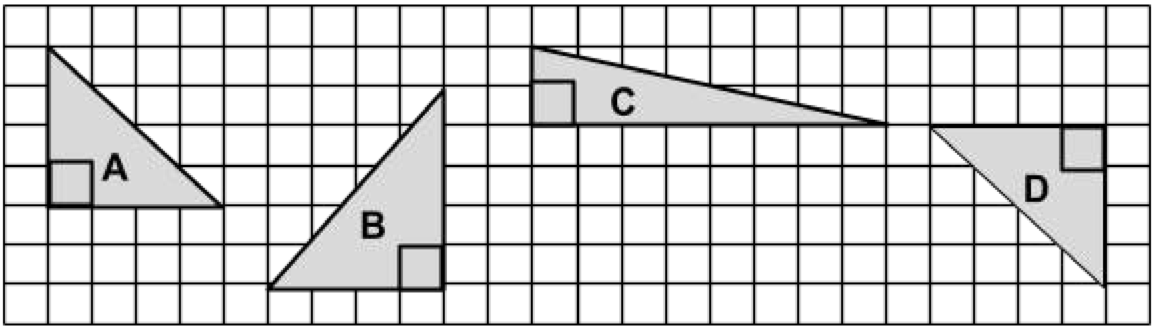
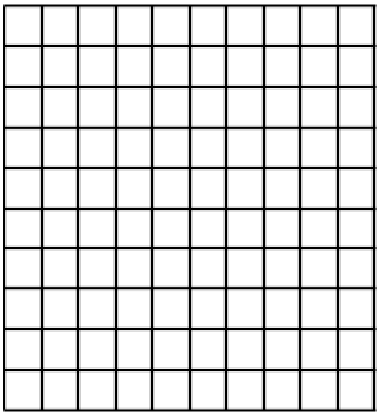
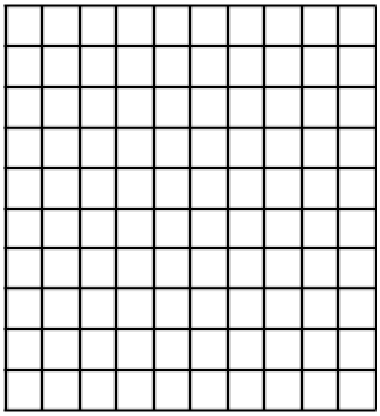
Name: ___________________________________ G6 U1 Lesson 6 - Independent Practice

1. Select all the triangles that have an area of 8 square units.



2. Draw two different triangles that both have areas equal to 12 square units. Show your math work to justify your illustrations.





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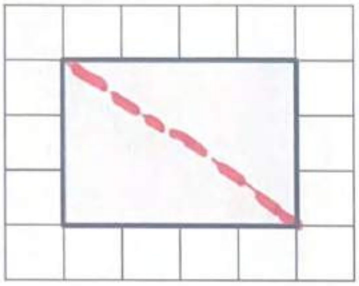
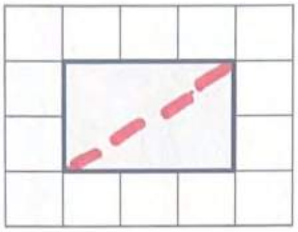
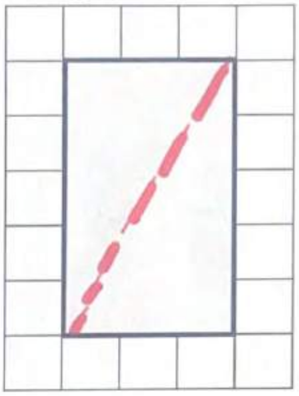
Name: ______________________ G6 U1 Lesson 6 - Let's Try It

1. Show how we decompose these parallelograms to make two, equal triangles.



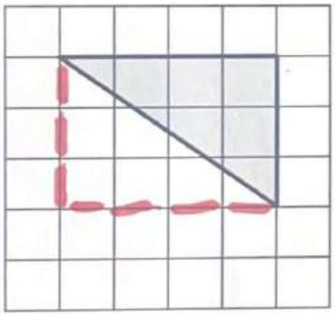


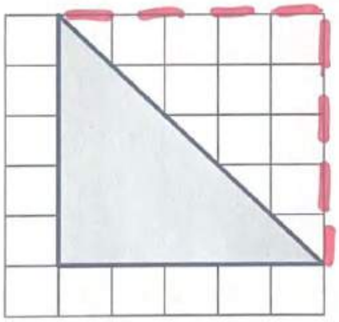


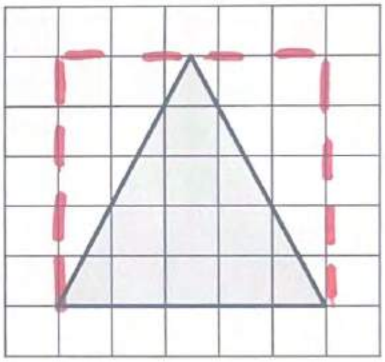
2. Complete the statement.

The area of the triangle is half the area of the composed parallelogram.

3. Compose parallelograms from the given triangles.





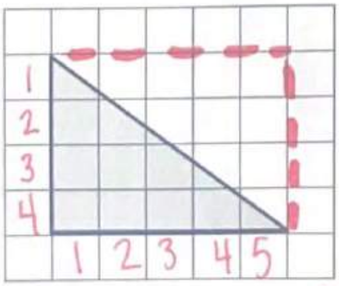


4. Complete the statement.

I can calculate the area of the triangle by dividing the area of the composed parallelogram by 2.

Calculate the area of each triangle. Be sure to label with the appropriate units.

5.



$A = 10 \text{ units}^2$

$A_{\text{rectangle}} = l \times w$

$A = 5 \times 4$

$A = 20$ sq. units

$A_{\text{triangle}} = \frac{20}{2}$ or 10 units^2

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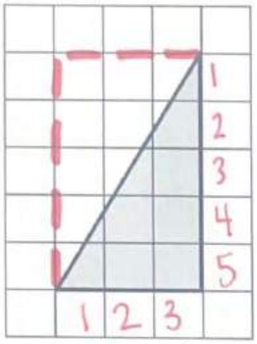
6.



A = 7½ units²

$A_{rectangle} = l \times w$

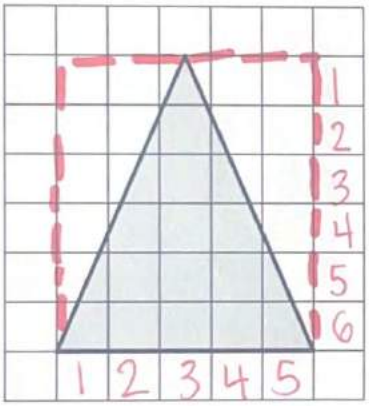
A = 5 × 3

A = 15 sq. units

$A_{triangle} = \frac{15}{2}$

$$\begin{array}{r|l} 2\overline{)15} & \\ -12 & 6 \text{ groups of } 2 \\ 3 & \\ -2 & 1 \text{ group of } 2 \\ 1 & + \\ & 7 \text{ R1 OR } 7\frac{1}{2} \end{array}$$

7.



A = 15 unit²

$A_{rectangle} = l \times w$

A = 5 × 6

A = 30 sq. units

$A_{triangle} = \frac{30}{2} = 15$ sq. units

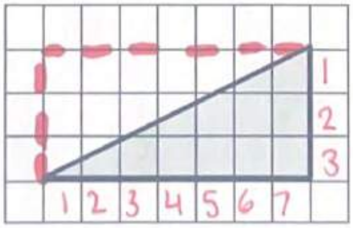
8. Jordan composed a parallelogram from the triangle he was given. After composing a parallelogram he calculated that the area of the original triangle is 21 square units because the length multiplied by the width equals 21.

Correct Jordan's thinking. Calculate the area of the original triangle, correctly.

$A_{parallelogram} = l \times w$

A = 7 × 3

A = 21 sq. units



$A_{triangle} = \frac{21}{2}$

$$\begin{array}{r|l} 2\overline{)21} & \\ -20 & 10 \text{ groups of } 2 \\ 1 & \\ & 10 \text{ R1 OR } 10\frac{1}{2} \end{array}$$

After composing a parallelogram the area of the composed parallelogram is 21 square units. The are of the original triangle is half of 21 square units or 10½ square units.

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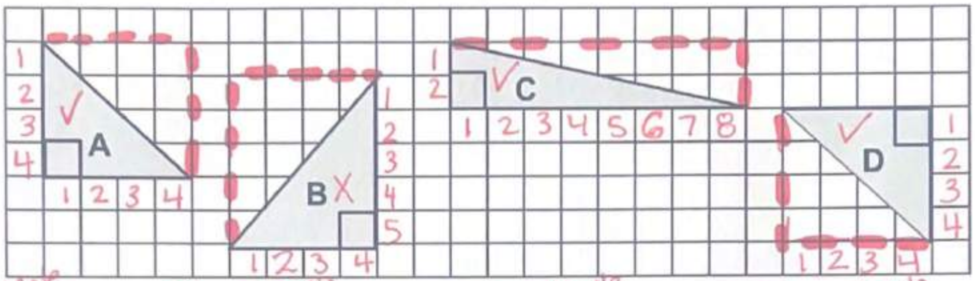
Name: ______________________________ G6 U1 Lesson 6 - Independent Practice

1. Select all the triangles that have an area of 8 square units.



A) $A^{rectangle} = l \times w$

$A = 4 \times 4$

$A^{triangle} = \frac{16}{2}$

$A = 8 \text{ units}^2$

B) $A^{rectangle} = l \times w$

$A = 4 \times 5$

$A^{triangle} = \frac{20}{2}$

$A = 10 \text{ units}^2$

C) $A^{rectangle} = l \times w$

$A = 8 \times 2$

$A^{triangle} = \frac{16}{2}$

$A = 8 \text{ units}^2$

D) $A^{rectangle} = l \times w$

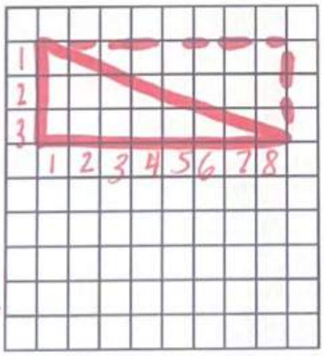
$A = 4 \times 4$

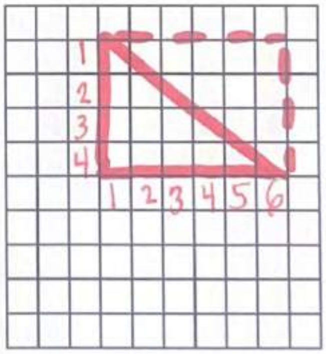
$A^{triangle} = \frac{16}{2}$

$A = 8 \text{ units}^2$

2. Draw two different triangles that both have areas equal to 12 square units. Show your math work to justify your illustrations.

If I want a triangle with area of 12 then I need a rectangle with rectangle double the area or $12 \times 2 = 24 \text{ units}^2$.





Factors that equal 24 are
1x24
2x12
3x8
4x6

$A^{rectangle} = l \times w$

$A = 8 \times 3$

$A^{triangle} = \frac{24}{2}$

A = 12 sq.units

$A^{rectangle} = l \times w$

$A = 6 \times 4$

$A^{triangle} = \frac{24}{2}$

A = 12 sq. units

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G6 U1 Lesson 7

Calculate the area of triangles using the area formula

G6 U1 Lesson 7 - Students will calculate the area of triangles using the area formula

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue calculating the area of triangles by using our knowledge of composing and decomposing parallelograms. In our last lesson we discovered that we could find the area of triangles by composing and decomposing parallelograms. In this lesson we will see how that knowledge can help us write the formula for calculating the area of triangles.

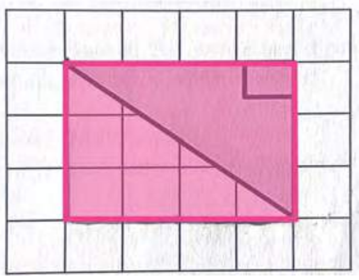
Let's Talk (Slide 3): Let's start with a brainstorm, **what does half mean? Give an example.** Possible Student Answers, Key Points:

- Half is when you split something into two pieces.
- You can split a whole into two halves.
- You can split the class into two halves.
- Half of 4 is 2.

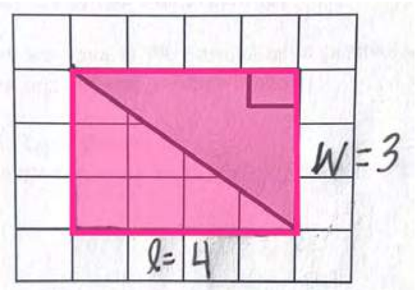
You're right, half is when we split something into two parts or two groups! That's going to be important today. Let me show you.

Let's Think (Slide 4): Yesterday, we decomposed a parallelogram to get two, equally-sized triangles. We learned that the area of a triangle is half the area of a composed parallelogram. In our last lesson we also saw that we can calculate the area of a triangle by dividing the area of a parallelogram by 2 which means dividing in half. Let's build on this knowledge today.

Can you think of what we could use to more efficiently find the area of triangles? A formula! That's right! Using a formula is the more efficient or faster method because you don't need to compose or decompose, you simply need to substitute into your formula. Keep in mind that you could still compose and decompose parallelograms to calculate the area of triangles, if you wanted. But, formulas are just simpler and have fewer steps.



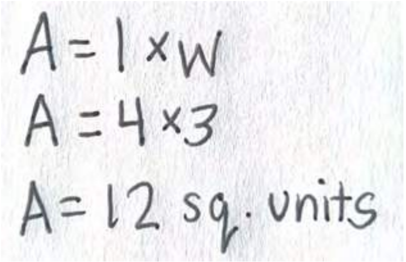
Let's revisit a problem we solved yesterday. Remember that to find the area of this triangle we first composed or built a parallelogram, in this case we composed a rectangle, like this.



After composing our rectangle, we label the length and width of our rectangle by counting along the bottom and side of the polygon.

So our length is 4 units.

And our width is 3 units.



$A = l \times W$

$A = 4 \times 3$

$A = 12$ sq. units

Okay, now we can calculate the area of the rectangle! The area formula for rectangles says A =L x W. Now, we can substitute numbers into the formula, so the area of the rectangle is 12 square units.

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Can anyone remember why is it important to calculate the area of the rectangle like we just did? Since the triangle is half of the rectangle we can divide the rectangle's area by 2. Right, our triangle has an area that is half the area of the rectangle we composed. So that means we can just divide the area of the rectangle by 2 to find the area of our triangle.

$12 \div 2 = 6$ sq. units

Let's do the calculations to find the area of the triangle. The rectangle's area is 12 square units divided in half or 12 divided by 2. Half of 12 is 6. So that area of our original triangle, 6 square units.

Let's Think (Slide 5): Let's recap our calculation steps:

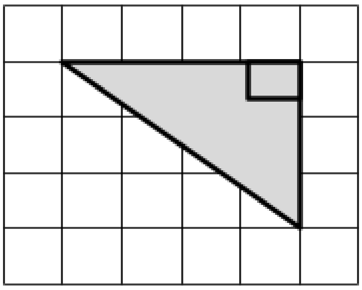
- First, we multiplied the length by the width.
- Then, we divided that answer by 2.

Guess what? We can put this into an area formula for triangles but first let's discuss the parts of a triangle. Just like with the area formula for parallelograms off the grid that we learned a couple lessons ago, we don't use length and width to label triangles, instead we use "base" for the length and "height" for the width.

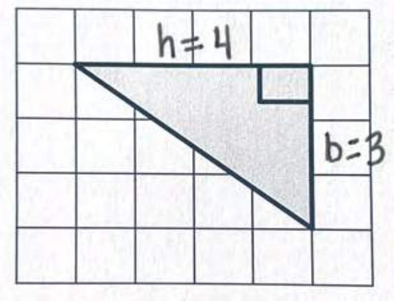
So, our calculation steps for the area of a triangle would be to multiply the base by the height, first. Then, divide that answer by 2.

- Here's what the formula for those steps looks like: $A = \frac{b\ x\ h}{2}$ *(write on slide)*
- Or you can write the formula as $A = \frac{1}{2}\ x\ b\ x\ h$ *(write on slide)*

Using formulas is a more efficient method for solving because formulas are faster than composing and decomposing.



Even though we know the area of this triangle is 6 square units, let's solve using both versions of our area formulas. Remember that the variable "b" represents the base on the triangle, the "h" represents the height of the triangle, and we divide by 2 or take half because triangles are half the size of parallelograms.



Let's label the base and the height. We're old pros at counting the sides of polygons at this point. There are 1, 2, 3, 4 units in the base and 1, 2, 3 units in the height.

Note: this triangle doesn't have a dotted line that indicates the height. If students ask where the dotted line is located, draw their attention to the 90 degree angle and trace the "L" shape. Use that to identify the base, then trace a dotted line for the height over the solid line.

$A = \frac{b \times h}{2}$

$A = \frac{3 \times 4}{2} = \frac{12}{2}$

$A = 6$ sq. units

Now that we have our base and height we can substitute them into our formula. Let's start with the formula *(write the area formula)*. We replace the base with 3 and the height 4 as we rewrite our formula. We multiply 3 by 4 next to get 12 so we now have $\frac{12}{2}$ as our answer. One last step! 12 divided by 2 is 6. So the area of our triangle is 6 square units.

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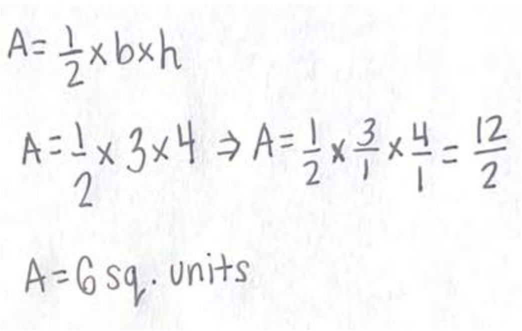
Let’s look at the other formula for calculating the area of a triangle. Our other area formula says area equals one-half multiplied by the base multiplied by the height. Have you stopped to think of why there are two formulas for the area of a triangle? I notice that there aren’t really two different formulas in meaning, just different in the way they are written. There is one formula written two different ways! Both formulas solve for the area of a triangle, both formulas have a base and a height, and both divide by 2. Remember from the last lesson that dividing a number by 2 and taking half of a number result in the same exact answer because they are actually the same thing!



$A=\frac{1}{2}\times b\times h$

$A=\frac{1}{2}\times 3\times 4 \Rightarrow A=\frac{1}{2}\times\frac{3}{1}\times\frac{4}{1}=\frac{12}{2}$

$A=6$ sq. units

We know that the base is 3 units and the height is 4 units. Let’s substitute them into our formula. We replace the base with 3 and the height 4 as we rewrite our formula. It can seem tricky because there is a fraction but we can do this!

The whole numbers 3 and 4 need to be made into fractions by putting a fraction bar and the number 1 as the denominator. Next, we multiply straight across; 1 x 3 x 4 which equals 12 as our numerator then 2 x 1 x1 which equals 2 as our denominator.

We end up with $\frac{12}{2}$ as our answer. Almost there…12 divided by 2 is 6. So the area of our triangle is 6 square units. We made it!

There we have it. We now have multiple ways to determine the area of triangles. One way is to compose or decompose parallelograms, find the area of that parallelogram, then divide by 2. A second way is to substitute into one of the area formulas. Whichever way you choose you will achieve the same answer for the area of a triangle.

Let’s Try it (Slide 6-7): Let’s continue our work using the area formulas for triangles to calculate the area of triangles. Remember that the area formula for a triangle is still just half the area formula for a parallelogram.

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WARM WELCOME

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Today we will calculate the area of triangles using the area formula.

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Let’s Talk:

What does half mean?
Give an example.

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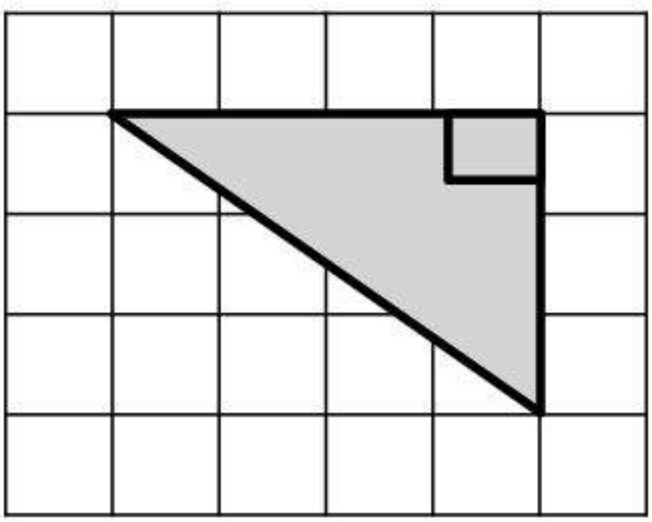
Let’s Think:

Let’s revisit how we calculate the area of this figure.



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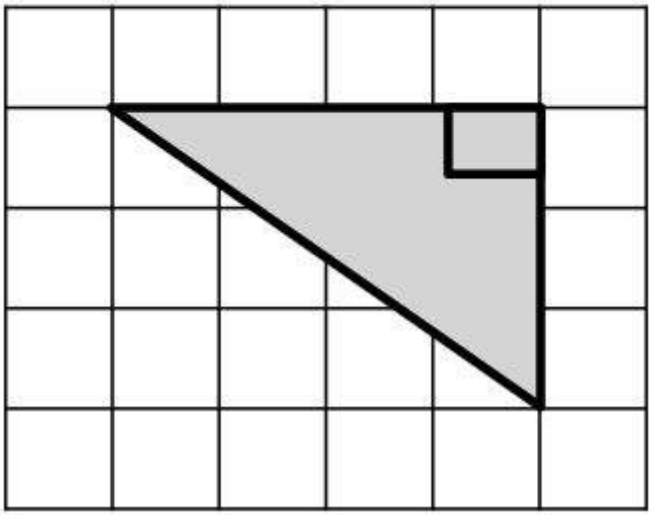
Let's Think:

Using a formula is a more efficient method for solving .



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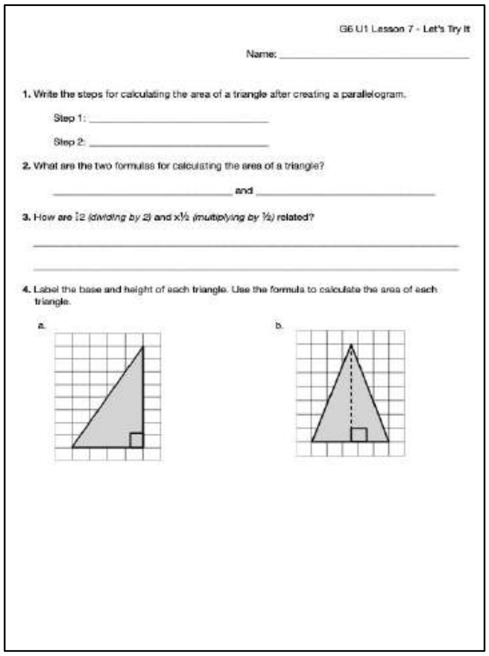
Let's Try It:

Let's explore using a formula to calculate the area of triangles together.



G6 U1 Lesson 7 - Let's Try It

Name: ______________________

1. Write the steps for calculating the area of a triangle after creating a parallelogram.

Step 1: ______________________

Step 2: ______________________

2. What are the two formulas for calculating the area of a triangle?

______________________ and ______________________

3. How are ÷2 *(dividing by 2)* and x½ *(multiplying by ½)* related?

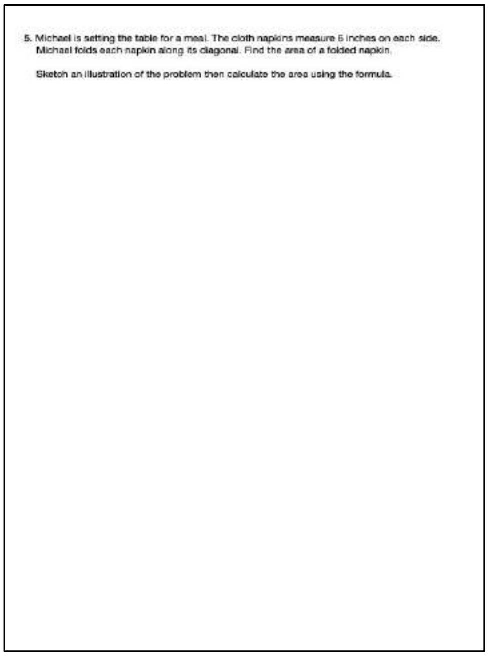
____

____

4. Label the base and height of each triangle. Use the formula to calculate the area of each triangle.

a.

b.



5. Michael is setting the table for a meal. The cloth napkins measure 6 inches on each side. Michael folds each napkin along its diagonal. Find the area of a folded napkin.

Sketch an illustration of the problem then calculate the area using the formula.

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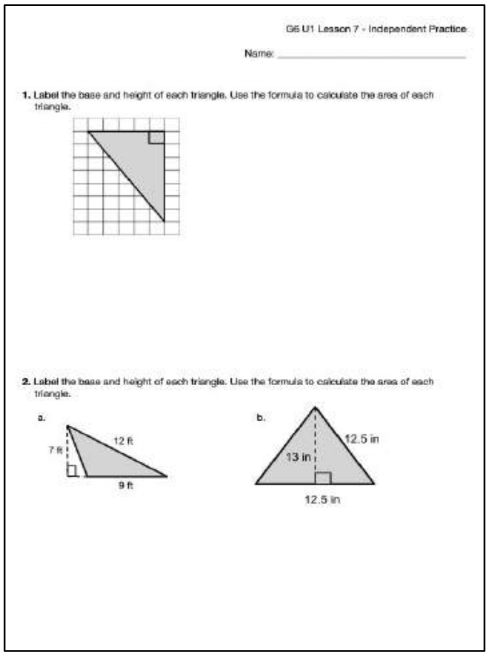
On your Own:

Now it’s time to explore using a formula to calculate the area of triangles on your own.

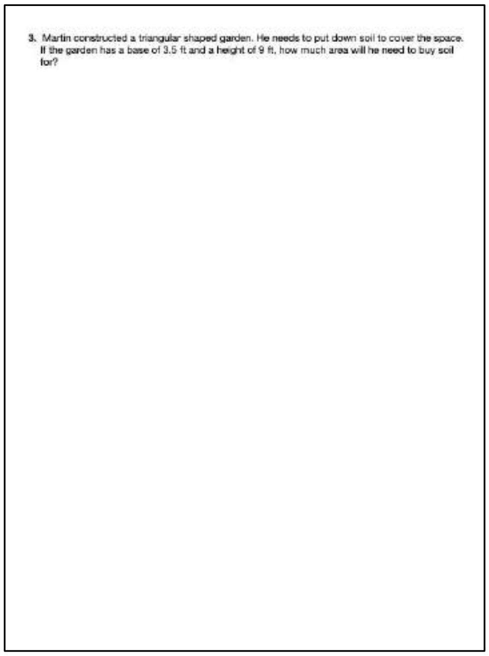


G6 U1 Lesson 7 - Independent Practice

Name: ______________________

1. Label the base and height of each triangle. Use the formula to calculate the area of each triangle.

2. Label the base and height of each triangle. Use the formula to calculate the area of each triangle.



3. Martin constructed a triangular shaped garden. He needs to put down soil to cover the space. If the garden has a base of 3.5 ft and a height of 9 ft, how much area will he need to buy soil for?

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1. Write the steps for calculating the area of a triangle after creating a parallelogram around the triangle.

Step 1: ________________________________

Step 2: ________________________________

2. What are the two formulas for calculating the area of a triangle?

________________________________ and ________________________________

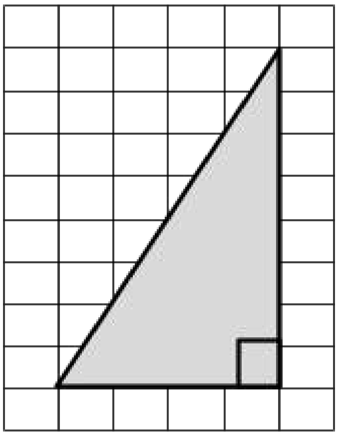
3. How are ÷2 *(dividing by 2)* and x½ *(multiplying by ½)* related?

____

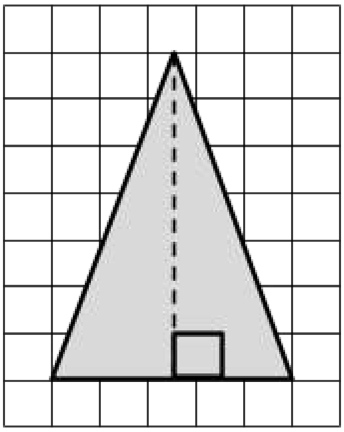
____

4. Label the base and height of each triangle. Use both formulas to calculate the area of each triangle.

a.



b.



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5. Michael is setting the table for a meal. The cloth napkins measure 6 inches on each side. Michael folds each napkin along its diagonal. Find the area of a folded napkin.

Sketch an illustration of the problem then calculate the area using both formulas.

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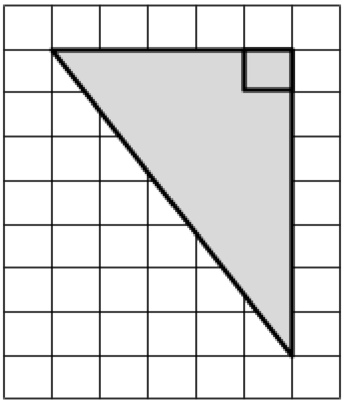
1. Label the base and height of the triangle.

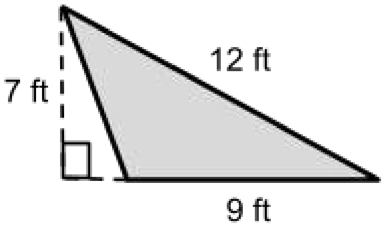
2. Use the formula to calculate the area of the triangle.



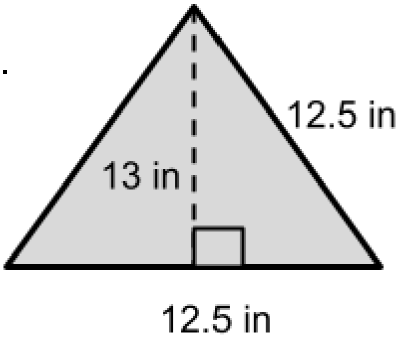
3. Label the base and height of each triangle.

4. Use both formulas to calculate the area of each triangle.

a.



b.



5. Martin constructed a triangular shaped garden. He needs to put down soil to cover the space. If the garden has a base of 3.5 ft and a height of 9 ft, how much area will he need to buy soil for?

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Name: ______________________________ G6 U1 Lesson 7 - Let's Try It

1. Write the steps for calculating the area of a triangle after creating a parallelogram around the triangle.

Step 1: Multiply length by width

Step 2: Divide by 2

2. What are the two formulas for calculating the area of a triangle?

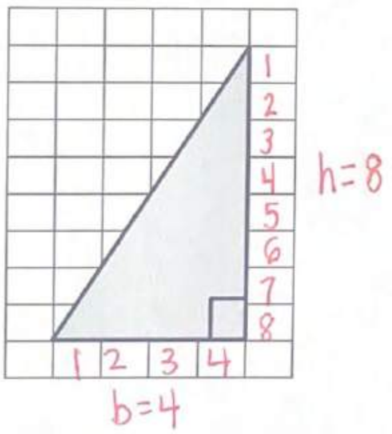
$A = \frac{1}{2} \times b \times h$ and $A = \frac{b \times h}{2}$

3. How are ÷2 *(dividing by 2)* and x½ *(multiplying by ½)* related?

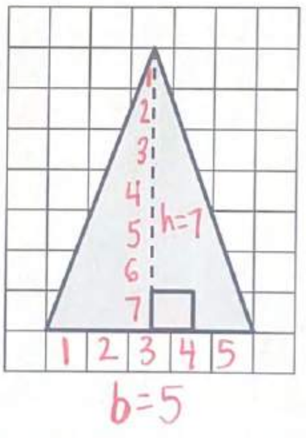
They are both equal to one another. They are the same thing.

4. Label the base and height of each triangle. Use both formulas to calculate the area of each triangle.

a.



b.



$A = \frac{b \times h}{2}$

$A = \frac{4 \times 8}{2}$

$A = \frac{32}{2}$

$A = 16$ sq. units

$2\overline{)32}$
-20 10 groups of 2
12
-12 6 groups of 2
0
$+$
16

$A = \frac{1}{2} \times b \times h$

$A = \frac{1}{2} \times 4 \times 8$

$A = \frac{1}{2} \times \frac{4}{1} \times \frac{8}{1}$

$A = \frac{32}{2}$

$A = 16$ sq. units

$A = \frac{b \times h}{2}$

$A = \frac{5 \times 7}{2}$

$A = \frac{35}{2}$

$A = 17\frac{1}{2}$ sq. units

$A = \frac{1}{2} \times b \times h$

$A = \frac{1}{2} \times 5 \times 7$

$A = \frac{1}{2} \times \frac{5}{1} \times \frac{7}{1}$

$A = \frac{35}{2}$

$A = 17\frac{1}{2}$ sq. units

$2\overline{)35}$
-20 10 groups of 2
15
-10 5 groups of 2
5
-4 2 groups of 2
1
$+$
17

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5. Michael is setting the table for a meal. The cloth napkins measure 6 inches on each side. Michael folds each napkin along its diagonal. Find the area of a folded napkin.

Sketch an illustration of the problem then calculate the area using both formulas.

$A = \frac{b \times h}{2}$

$A = \frac{6 \times 6}{2}$

$A = \frac{36}{2}$

$A = 18 \text{ in}^2$

$2 \overline{)36}$

-20 | 10 groups of 2

16

-16 | 8 groups of 2

0 | +

18

$A = \frac{1}{2} \times b \times h$

$A = \frac{1}{2} \times 6 \times 6$

$A = \frac{1}{2} \times \frac{6}{1} \times \frac{6}{1}$

$A = \frac{36}{2}$

$A = 18 \text{in}^2$

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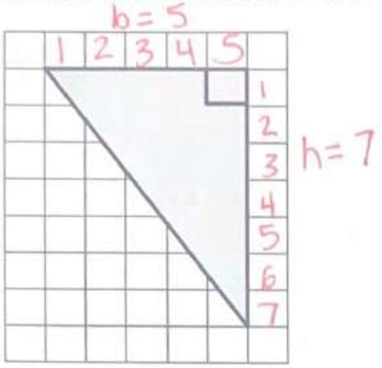
Name: ______________________ G6 U1 Lesson 7 - Independent Practice

1. Label the base and height of the triangle.

2. Use the formula to calculate the area of the triangle.



$A=\frac{b\times h}{2}$

$A=\frac{5\times 7}{2}$

$A=\frac{35}{2}$

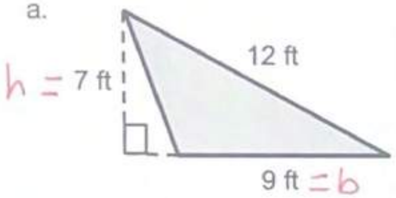
$A=17\frac{1}{2}$ sq. units

$$\begin{array}{r|l} 2\overline{)35} & \\ -30 & 15 \text{ groups of } 2 \\ \hline 5 & \\ -4 & 2 \text{ groups of } 2 \\ \hline 1 & + \\ & \overline{17} \end{array}$$

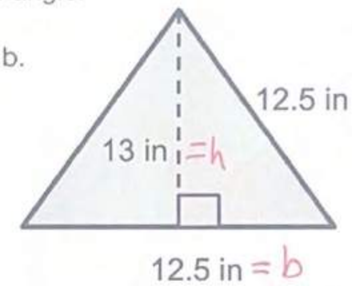
3. Label the base and height of each triangle.

4. Use both formulas to calculate the area of each triangle.

a.



b.



$$\begin{array}{r|l} 2\overline{)63} & \\ -60 & 30 \text{ groups of } 2 \\ \hline 3 & \\ -2 & 1 \text{ group of } 2 \\ \hline 1 & + \\ & \overline{31} \end{array}$$

$A=\frac{b\times h}{2}$

$A=\frac{9\times 7}{2}$

$A=\frac{63}{2}$

$A=31\frac{1}{2}ft^2$

$$\begin{array}{r} 12.5 ① \\ \times\ 13 \\ \hline 375 \\ +1250 \\ \hline 162.5 ① \end{array}$$

$$\begin{array}{r|l} 2\overline{)162} & \\ -160 & 80 \text{ group of } 2 \\ \hline 2 & \\ -2 & 1 \text{ group of } 2 \\ \hline 0 & + \\ & \overline{81} \end{array}$$

$A=\frac{1}{2}\times b\times h$

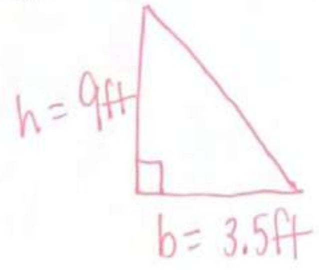
$A=\frac{1}{2}\times 12.5\times 13$

$A=\frac{1}{2}\times\frac{12.5}{1}\times\frac{13}{1}$

$A=\frac{162.5}{2}=81\frac{1}{4}\ in^2$

Also take half $(\frac{1}{2})$ of a half (.5) to get $\frac{1}{4}$. So, $81\frac{1}{4}$.

5. Martin constructed a triangular shaped garden. He needs to put down soil to cover the space. If the garden has a base of 3.5 ft and a height of 9 ft, how much area will he need to buy soil for?



$A=\frac{b\times h}{2}$

$A=\frac{3.5\times 9}{2}$

$A=\frac{31.5}{2}$

$A=15\frac{3}{4}ft^2$

$$\begin{array}{r} {}^{4}3.5 ① \\ \times\ 9 \\ \hline 31.5 ① \end{array}$$

$$\begin{array}{r|l} 2\overline{)31} & \\ -20 & 10 \text{ groups of } 2 \\ \hline 11 & \\ -10 & 5 \text{ groups of } 2 \\ \hline 1 & + \\ & \overline{15\frac{1}{2}} \end{array}$$

Also take half $(\frac{1}{2})$ of a half (.5) to get $\frac{1}{4}$. So $\frac{1}{4}+\frac{1}{2}=15\frac{3}{4}$.

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G6 U1 Lesson 8

Use nets to calculate surface area of rectangular prisms

CITYTUTOR DC

G6 U1 Lesson 8 - Students will use nets to calculate surface area of rectangular prisms

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be exploring 3D figures and a new concept called surface area. You did not explore this math concept in elementary school but your knowledge of area will certainly come in handy.

Note: It would help students if they can see 3D figures in real life. You may consider bringing in actual real-world objects that are in the shape of the 3D shape shown below as visuals (tissue box, cardboard box, etc).

Let's Talk (Slide 3): Let's brainstorm, **what do you know about 3-dimensional shapes? And, what do you know about 2-dimensional shapes?** Possible Student Answers, Key Points:

- 2-D shapes are flat like squares, rectangles, parallelograms, and triangles
- They are called 2-dimensional because they are flat but they have length and width only or base and height only.
- 3-D shapes are solids like cubes or rectangular prisms.
- We can pick up 3-D shapes and look at them from many different angles.
- 3-D shapes have a length width AND depth.

You remember a lot. Yes, 2D or 2-dimensional figures are flat but they have length/base and width/height. Examples of 2D figures we have been working with are squares, rectangles, parallelograms, and triangles. But, those aren't the only 2D figures that exist. You've also heard of others like pentagons, hexagons, and octagons and there even some you may not have heard of like dodecagons which are 12-sided figures!

I see that you also remember quite a bit about 3D shapes as well! Let's learn a little more about 3D shapes.

Let's Think (Slide 4): 3D stands for 3-dimensional and these figures are different from two-dimensional figures because they are not flat, you can hold these figures in your hands. Think of a can, a box or even a basketball! Two-dimensional figures all have length, width, AND height not just length and width like with 2-dimensional figures.

There are many different types of 3D figures, like we see on this slide. Read them with me…

Just like 2D shapes, 3D figures have important attributes as well.

- 3D shapes sometimes have a vertex or vertices, which is an angular point or/corner.
- 3D shapes also have more than one face which is a flat/curved surface
- And, 3D shapes usually have more than one edge which is where two faces meet.

You actually know some about 3-dimensional figures because you first learned about them in kindergarten and even worked with a couple types in fifth grade.

Guess what? We can calculate area of three-dimensional figures even though they are not flat like 2-dimensional figures. We are going to start our work on that concept today.

Earlier in the lesson I said that we will be calculating the surface area of 3D figures. But what is surface area? It's the area of the surface of our 3D figures *(point to all the faces on the cube).* We already know that area is the amount of space inside a flat, 2D figure. Well, did you know that each face of a 3D figure is a flat, 2D figure? *(point to the cube's faces).* If we look at the cube we see it has many square faces, 6 square faces to be exact! All those flat, 2D figures come together to make a 3D figure.

Can you identify the 2D faces on our triangular prism? Triangles and rectangles. Yes, we see 2 triangles and 3 rectangles to be specific.

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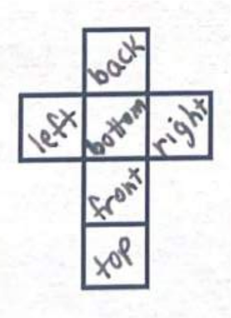
Thinking about the surface of something, surface means the outside part. Think of the surface as the outside part you touch if you are holding an object. Close your eyes and imagine holding a box of tissues. What parts are your hands touching? The outside part. Exactly! You are touching the outside or surface of the tissue box. So when we are looking to calculate the surface area we are trying to calculate how much space is around the outside of an object.

Another way to think about this is like wrapping paper, the surface area is like wrapping paper around the outside, or surface, of a 3D shape.

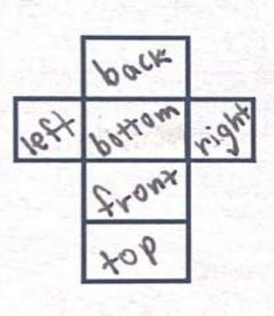
Let's Think (Slide 6): Remember all that great work we did in lessons 1-7? Well we're still going to use that knowledge in this lesson when we calculate the area of 2D figures such as squares, rectangles, and triangles on our way to calculating the total surface area of 3D figures!

A way to assist with calculating the surface area of 3-dimensional figures is with a picture called a *net*. Nets basically unfold or open up the 3D figure to give you a flat image of the figure *(point to the nets)*. Each 3D figure has its own net. Here are the 3D figures along with their nets we will be working with today:

Let's practice labeling the faces of our cube and rectangular prism nets. We notice that all faces of the cube net are squares but not all the faces of the rectangular prism are rectangles. But, both nets are labeled the same! When we label each net we look for their bottom face, top face, front face, back face, left face, and right face. I always begin with labeling the bottom face. Once I've identified the bottom face it makes it easier to identify the others because their position is based on the placement of the bottom face.



Let's label the nets! I begin by tracing the net like a "t" with my finger *(trace).* These particular nets for cubes and rectangular prisms form a lowercase "t." I notice that there is only one face that I cross over both times when I make the "t" shape. I label that face as the *bottom face.* Then I label the other faces based on that bottom face. Left face and right faces are in a row, alongside the bottom face. Let's label the left and right faces now.



Let's do the same with our rectangular prism. Let's take a second to try and visualize folding the rectangular prism. Start by placing the bottom face directly on the ground *(mimic each motion as you say them aloud)*. Next, fold upward the right and left faces, then fold upward the back and front faces. Lastly, fold the top face downward. You have just made a box in the shape of a rectangular prism or cube!

Let's Think (Slide 7): Now that we have labeled the faces we can calculate the surface area of a rectangular prism. Just by looking, we can tell some things about the size of the faces. Look at the net to see what you notice. Possible Student Answers, Key Points:

- The top and bottom faces are the same size
- The left and right faces are the same size
- The front and back faces are the same size

I see that as well. In a rectangular prism the left and right faces are the same size, the front and the back faces are the same size, and the top and bottom faces are the same size. That will be very helpful with the math we are about to do.

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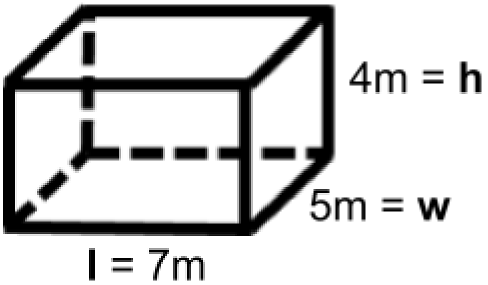

Let’s calculate the surface area of the rectangular prism by finding the area of each face.

Labeling the length, width, and height measurements is an important step to calculating surface area. So, let’s label those measurements on the rectangular prism.

Let’s use these measurements to find the area of each face by using the area formula for rectangles…A = l x w. We won’t always use length and width by one another but we will still always multiply two measures to find the area. The table will help keep us organized.

Area of the front/back is A = l x h	front 7 x 4 = 28	back 7 x 4 = 28

If we look at the front face you see that it is made up of length and height. Since the length is 7m and the height is 4m we multiply 7 by 4 to get 28 sq. meters*.* Because the front and back faces are the same size we multiply 7 by 4, again.

Area of the top/bottom is A = l x w	top 7 x 5 = 35	bottom 7 x 5 = 35

The bottom face is made of the length and width *(trace).* Since the length is 7m and the width is 5m we multiply 7 by 5 to get 35 sq. meters*.* Because the bottom and top faces are the same size we multiply 7 by 5, again.

Area of the left/right is A = w x h	left 5 x 4 = 20	right 5 x 4 = 20

Almost there, the right face is made of the height and width *(trace).* Since the length is 4m and the width is 5m we multiply 4 by 5 to get 20 sq. meters*.* Because the right and left faces are the same size we multiply 4 by 5, again.

The very last step is to add all the areas together; 28 + 28 + 35 + 35 + 20 + 20 or 166. So, the surface area of the rectangular prism is 166 square meters. That means that the space around the outside of the figure measures 166 square meters.

Let’s quickly review the process for calculating surface area of a rectangular prism.

- First, label or draw and label the net.
- Then, label the measurements with length, width, and height.
- Next we find the area of each face using our formulas.
- Lastly, we add all the areas together to find the total surface area. We’ll use this knowledge to calculate the area of rectangular prisms and other 3D figures in upcoming lessons.

Let’s Try it (Slide 9): Let’s continue calculating the surface area of rectangular prisms using nets and our formulas. Remember, labeling your net will be very helpful when trying to determine if you are multiplying the length or width or height by one another.

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WARM WELCOME

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Today we will use nets to calculate surface area of rectangular prisms.

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Let's Talk:

What do you know about 3-dimensional shapes?

What do you know about 2-dimensional shapes?

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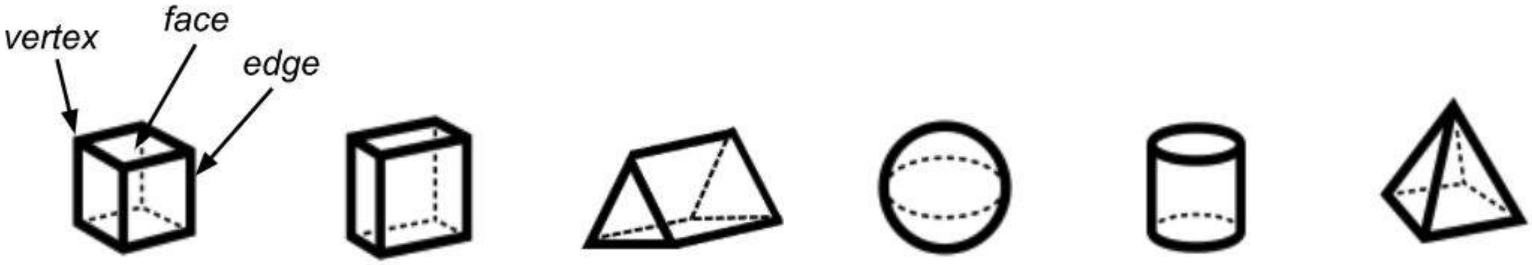
Let's Think:



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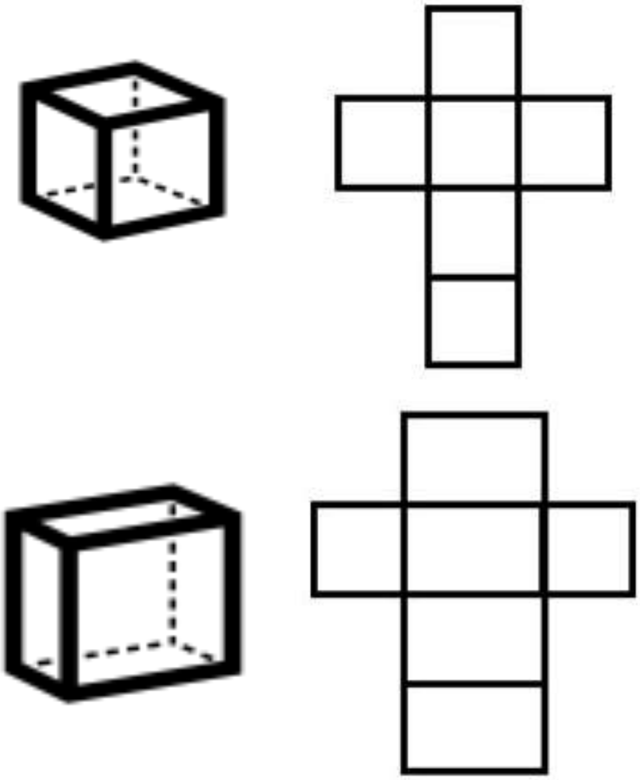
Let's Think:

Let's label each net's face with their bottom, top, front, back, left, and right.



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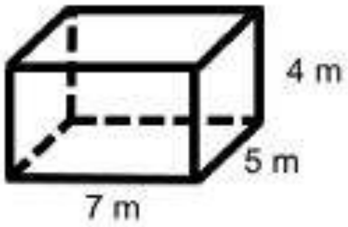
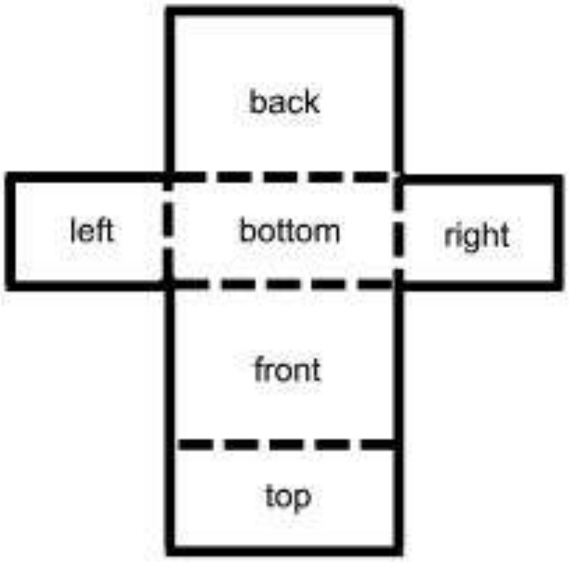
Let's Think:

What can we tell about the size of the faces of a rectangular prism?





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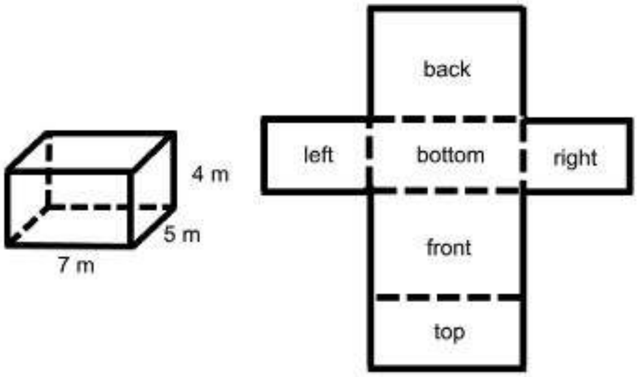
Let's Think:

Let's calculate the area of each face.



Area of front/back A = l X h	front	back
Area of top/bottom **A = l x w**	**top**	**bottom**
Area of left/right **A = w x h**	**left**	**right**

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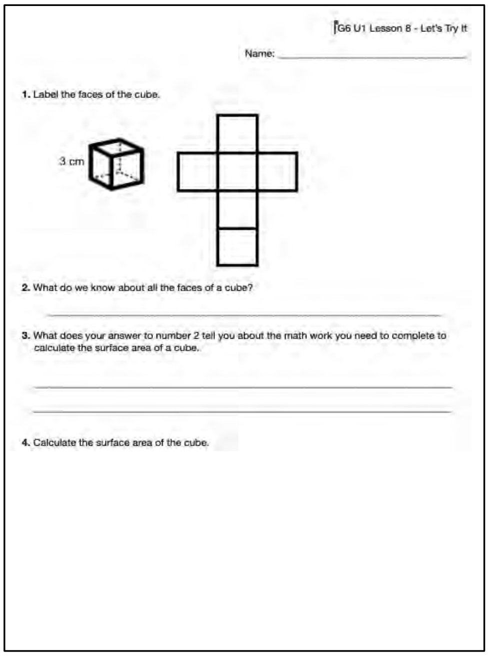
Let's Try It:

Let's explore explore using nets to calculate surface area of rectangular prisms together.



G6 U1 Lesson 8 - Let's Try It

Name: ______________________

1. Label the faces of the cube.

2. What do we know about all the faces of a cube?

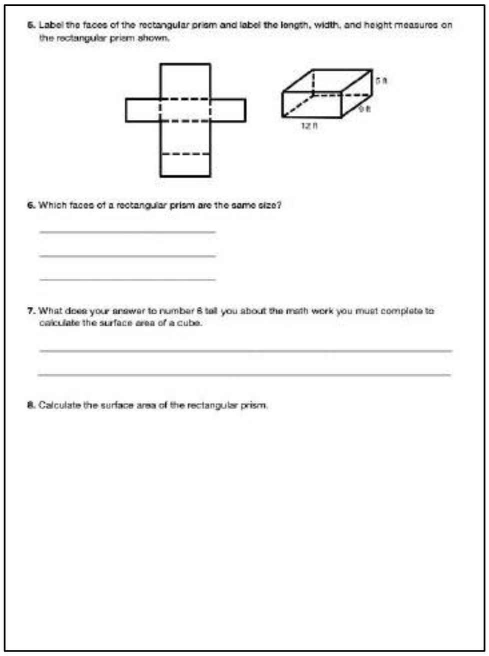
____

3. What does your answer to number 2 tell you about the math work you need to complete to calculate the surface area of a cube.

____

____

4. Calculate the surface area of the cube.



5. Label the faces of the rectangular prism and label the length, width, and height measures on the rectangular prism shown.

6. Which faces of a rectangular prism are the same size?

____

____

____

7. What does your answer to number 6 tell you about the math work you must complete to calculate the surface area of a cube.

____

____

8. Calculate the surface area of the rectangular prism.

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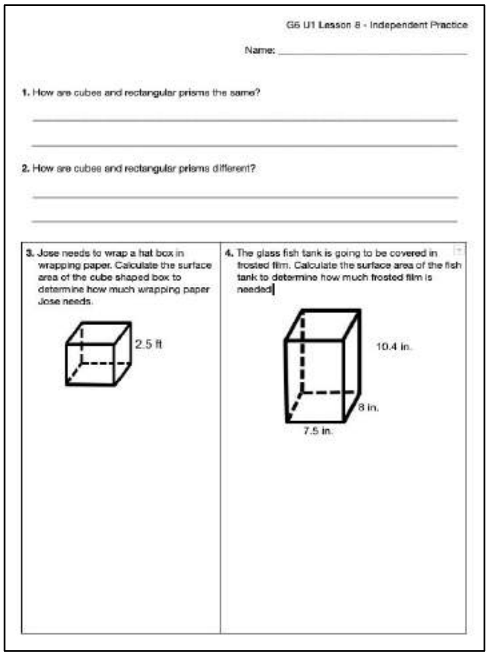
On your Own:

Now it’s time to explore using nets to calculate surface area on your own.



G6 U1 Lesson 8 - Independent Practice

Name: ______________________

1. How are cubes and rectangular prisms the same?

____

____

2. How are cubes and rectangular prisms different?

____

____

3. Jose needs to wrap a hat box in wrapping paper. Calculate the surface area of the cube shaped box to determine how much wrapping paper Jose needs.

4. The glass fish tank is going to be covered in frosted film. Calculate the surface area of the fish tank to determine how much frosted film is needed.

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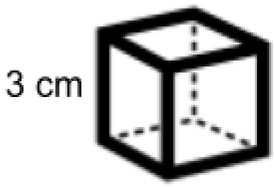
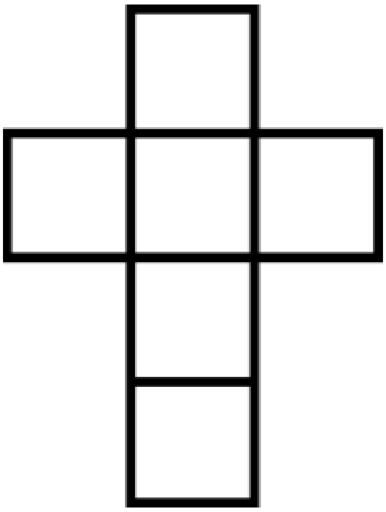
Name: ___________________________________

G6 U1 Lesson 8 - Let’s Try It

1. Label the faces of the cube.





2. What do we know about all the faces of a cube?

____

3. What does your answer to number 2 tell you about the math work you could complete to calculate the surface area of a cube.

____

____

4. Calculate the surface area of the cube.

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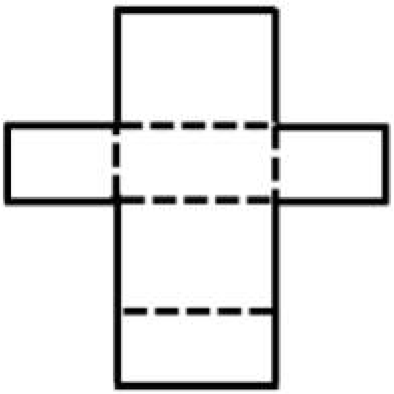
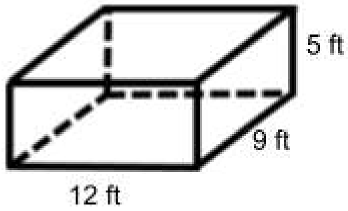
5. Label the faces of the rectangular prism.

6. Label the length, width, and height measures on the rectangular prism shown.





7. Which faces of a rectangular prism are the same size?

____

____

____

8. What does your answer to number 6 tell you about the math work you must complete to calculate the surface area of a cube.

____

____

____

9. Calculate the surface area of the rectangular prism.

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Name: ___________________________________

G6 U1 Lesson 8 - Independent Practice

1. How are cubes and rectangular prisms the same?

____

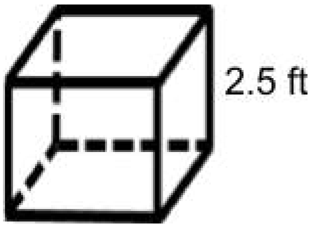
____

2. How are cubes and rectangular prisms different?

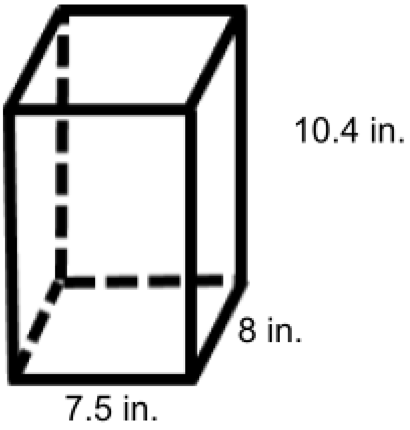
____

____

3. Jose needs to wrap a hat box in wrapping paper. Calculate the surface area of the cube shaped box to determine how much wrapping paper Jose needs.



4. The glass fish tank is going to be covered in frosted film. Calculate the surface area of the fish tank to determine how much frosted film is needed.



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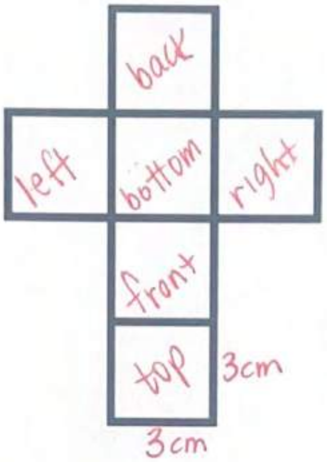
Name: ______________________ G6 U1 Lesson 8 - Let's Try It

1. Label the faces of the cube.



2. What do we know about all the faces of a cube?

All the faces of a cube are the same size.

3. What does your answer to number 2 tell you about the math work you could complete to calculate the surface area of a cube.

I could multiply by 6 after I find the surface area of one face.

4. Calculate the surface area of the cube.

Find the area of one face $A = l \times w$ so, $A = 3 \times 3$ OR $9 cm^2$.

Next, I multiply that area ($9cm^2$) by 6 to get $54 cm^2$ for the total surface area of the cube.

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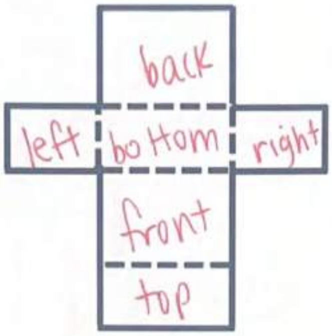
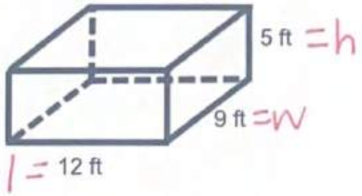
5. Label the faces of the rectangular prism.

6. Label the length, width, and height measures on the rectangular prism shown.





7. Which faces of a rectangular prism are the same size?

left and right

back and front

top and bottom

8. What does your answer to number 7 tell you about the math work you must complete to calculate the surface area of a cube.

I could find the area of only three faces like the left, back, and top then multiply each by 2 or double each. Or add the areas and double.

9. Calculate the surface area of the rectangular prism.

$L|R \rightarrow A = w \times h = 9 \times 5 = 45\,ft^2 \times 2 = 90\,ft^2$

$Ba|F \rightarrow A = l \times h = 12 \times 5 = 60\,ft^2 \times 2 = 120\,ft^2$

$T|Bo \rightarrow A = l \times w = 12 \times 9 = 108\,ft^2 \times 2 = +\,216\,ft^2$

$\overline{426\,ft^2}$

$$\begin{array}{r} {}^{1}\\ 45 \\ \times\,2 \\ \hline 90 \end{array} \qquad \begin{array}{r} {}^{1}\\ 108 \\ \times\;2 \\ \hline 216 \end{array}$$

The surface area of the rectangular prism is 426 ft.

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Name: ______________________ G6 U1 Lesson 8 - Independent Practice

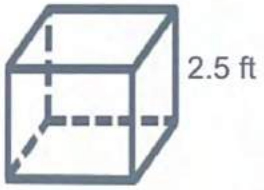
1. How are cubes and rectangular prisms the same?

The have the same faces.

2. How are cubes and rectangular prisms different?

The cube has faces that are all the same size while rectangular prisms do not.

3. Jose needs to wrap a hat box in wrapping paper. Calculate the surface area of the cube shaped box to determine how much wrapping paper Jose needs.



1 2
2.5 ①
×2.5 ①
125
+500
6.25 ②

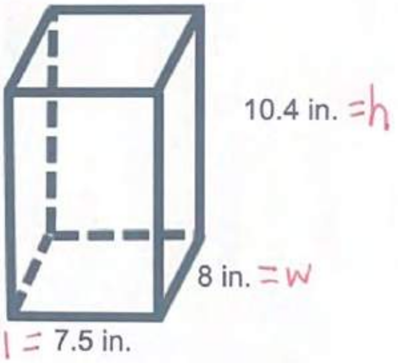
one face → A = w×h = 2.5×2.5 = 6.25ft²

6.25 × 6 faces

1 3
6.25 ②
× 6
37.50 ②

Surface Area = 37.5ft²

4. The glass fish tank is going to be covered in frosted film. Calculate the surface area of the fish tank to determine how much frosted film is needed.



L/R → A = w×h = 8×10.4 = 83.2

Ba/F → A = l×h = 7.5×10.4 = 78

T/Bo → A = l×w = 7.5×8 = + 60

221.2 in²
× 2
442.4in²

3
10.4 ①
× 8
83.20 ①

2 2
10.4 ①
× 7.5 ①
520
+7280
78.00 ②

4
7.5 ①
× 8
60.0 ①

The surface area is 442.4in².

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G6 U1 Lesson 9

Use nets to calculate surface area of triangular prisms

CITYTUTOR DC

G6 U1 Lesson 9 - Students will using nets to calculate surface area of triangular prisms

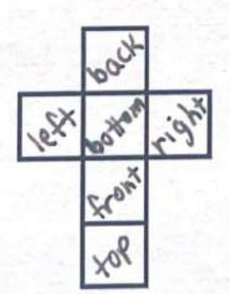
Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue exploring 3D figures and surface area which is the amount of space covering the outside of a 3D figure. In the last lesson we used our knowledge of 2D, or 2-dimensional, figures like squares and rectangles to calculate the surface area of 3D rectangular prisms. We recall that we can also hold 3D or 3-dimensional figures because they are not flat…3-dimensional figures all have length, width, AND height.

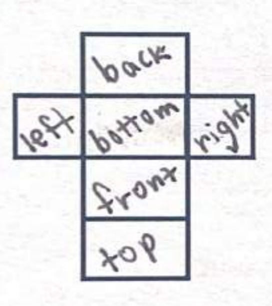
Let's Talk (Slide 3): Let's brainstorm, **have any of you seen a 3D movie? Describe that experience.**
Possible Student Answers, Key Points:
- It's like people are jumping off the screen.
- It's different from a 2D movie because it's like you can pick things up.

3D movies are very exciting! As you mentioned, 3D movies are different from 2D movies just like 3D figures are different from 2D figures. Both examples of 3D have a level of depth that makes the movie or object pop-out. Elements of 3D movies make you think you can grab a hold of the characters or objects and in real-life 3D objects can actually be held, our world is made of 3D objects!

Let's Think (Slide 4): In the last lesson we thought about our figures as being unfolded and used nets that showed the flat faces of each prism. We saw that each 3D figure has its own net, made up of 2D shapes. Here are the nets we worked with in the last lesson. We remember that the nets for cubes and rectangular prisms are labeled the same way. Let's label each face of those nets now *(write the label for each face on the image).*



Let's start by tracing the net like a "t" with my finger*.* We label the face that we cross over both times when we make the "t" shape as the *bottom face.* The left face and right faces are in a row next to the bottom face.



Next up are the vertical faces; front, back, and top. Again, we are using the bottom face to position the front and back faces. The face above the bottom face we label the back face and we label the front face on the other side. It is the face touching the bottom face.

Let's Think (Slide 5): Today our focus is on another 3D figure, the triangular prism. When you hear the name *triangular prism* what shape do you think of? Triangles That's what I think of as well, triangles! I even hear the word triangle in triang…ular.

Here is an image of a rectangular prism and its net. We notice that this triangular prism is different from a cube and rectangular prism because cubes and rectangular prisms can be made of squares and rectangles but triangular prisms can be made of squares, rectangles, AND triangles.

We notice the triangular prism is specifically made of 2 triangles, here on the front and back *(trace)* and 3 rectangles wrapped around the sides *(trace).* We can label the net for a triangular prism even more easily than we label the nets for cubes and rectangular prisms because there are fewer faces on the triangular prism and they are less confusing because they aren't all rectangular.

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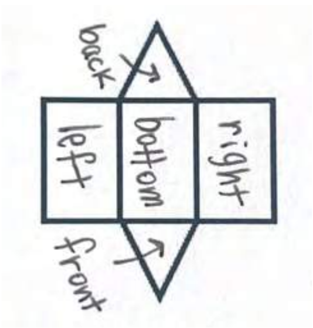


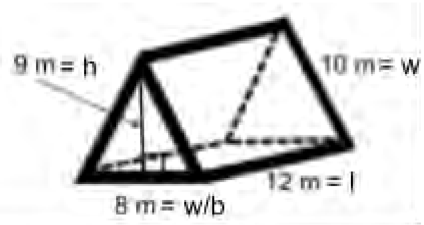
Let’s label the net of the triangular prism. When we label the net we still begin with the bottom face like with the rectangular prism’s net. Once we’ve identified the bottom face it makes it easier to identify the others because their position is based on the placement of the bottom face.

Look at the middle rectangle *(point). We label this face the bottom face. The rectangles to the left and right of the bottom face are labeled as such*. And finally, we’re left with two triangles to label. We are going to use the bottom face to position the front and back faces just like with the rectangular prisms. We label the back face above the bottom face and label the front face on the other side touching the bottom face. That’s it! We have labeled our triangular prism.

We are finally ready to calculate the surface area of this triangular prism. Just like we did with the rectangular prism…

- The first step was to label the net.
- Now, we label each measurement.
- Next, we complete the table with the area of each face using our formulas.
- Lastly, we add all the areas together to find the total surface area.

Let’s Think (Slide 7): Let’s get to it! Now that we have the dimensions, let’s calculate the surface area of the triangular prism.



Labeling the length, width, and height measurements is an important step to calculating surface area. So let’s label those measurements on the triangular prism.

The bottom face is a rectangle and it is made of the length and width *(trace).* Since the length is 12m and the width is 8m we multiply 12 by 8 to get 96 sq. meters *(fill in the table).*

Area of front/back A = ½ xbxh	**front** A = ½ x 8 x 9 A = ½ x 72 A = 36	**back** A = 36
Area of left/right A = l x w	**left** A = 12 x 10 A = 120	**right** A = 120
Area of bottom A = l x w	**bottom** A = 12 x 8 A = 92	

Let’s start with the front and back faces. We see that they are the same size. The front face is a triangle and is made of the base and height *(trace).* Since the base is 8m and the height is 9m. The formula for finding the area of a triangle is ½ x b x h. So, we multiply ½ by 8 by 9. Let’s do the math together.

In this particular triangular prism, the left and right faces are rectangular and they are the same size. The right face is made of the measures length and width *(trace).* Since the length is 12m and the width is 10m we multiply 12 by 10 to get 120 sq. meters*.* Because the left and right faces are the same size we multiply 12 by 10, again.

And finally, let’s do the bottom. The bottom is a rectangle and we find the area of a rectangle by multiplying the length and width, which is 12 and 8. So the area of the bottom is 92.

Does anyone remember our final step in calculating the surface area? Add the areas of the faces together That’s right! We add the areas of our faces together. The surface area of the triangular prism equals 36 + 36 + 120 + 120 + 96 or 408 square units.

When calculating the surface area of triangular prisms we see that the overall process…

- We start by labeling the net.
- Then carefully labeling the measurements.
- Next we find the area of each face using our formulas/

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- And finally we add all the areas together to find the total surface area.

While the process is the same for rectangular prisms and triangular prisms, there are differences in the 2D figures that make up each prism so we have to be careful to use the right area formula AND the right measurements to find the area of each face.

Let's Try it (Slide 8): Let's continue calculating the surface area of triangular prisms using nets and our formulas. Don't forget, labeling your net will be very helpful when trying to determine if you are multiplying the length/base or width or height by one another.

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WARM WELCOME

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Today we will use nets to calculate the surface area of triangular prisms.

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Let’s Talk:

Have any of you seen a 3D movie?

Describe that experience.

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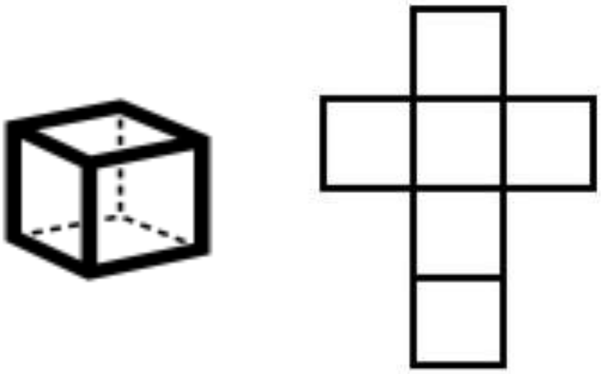
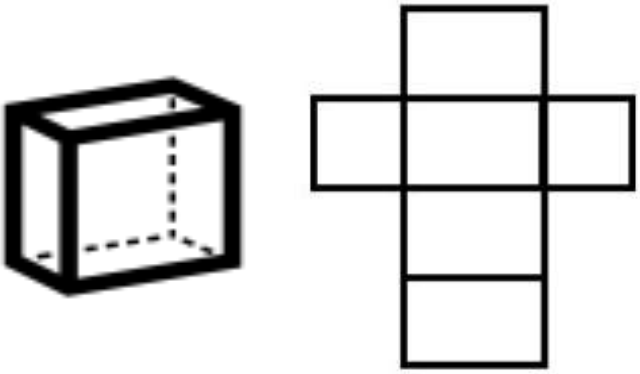
Let’s Think:

Let’s label each net’s faces.





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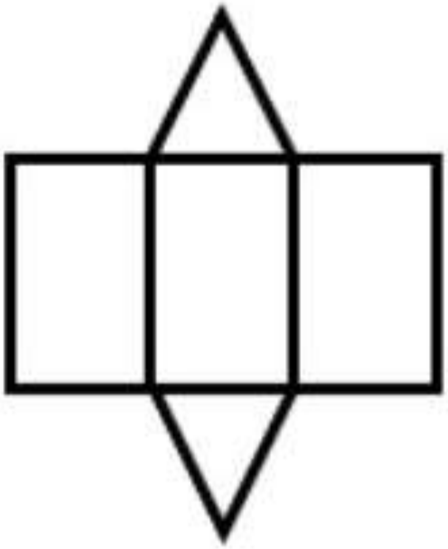
Let's Think:

When you hear the name *triangular prism* what shape do you think of?



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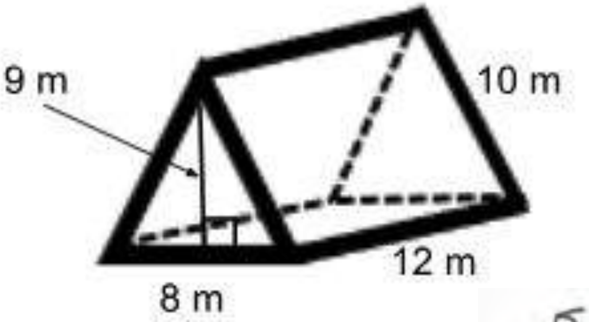
Let's Think:

Let's calculate the area of each face.



Area of front/back	**front**	**back**
Area of left/right	**left**	**right**
Area of bottom	**bottom**	

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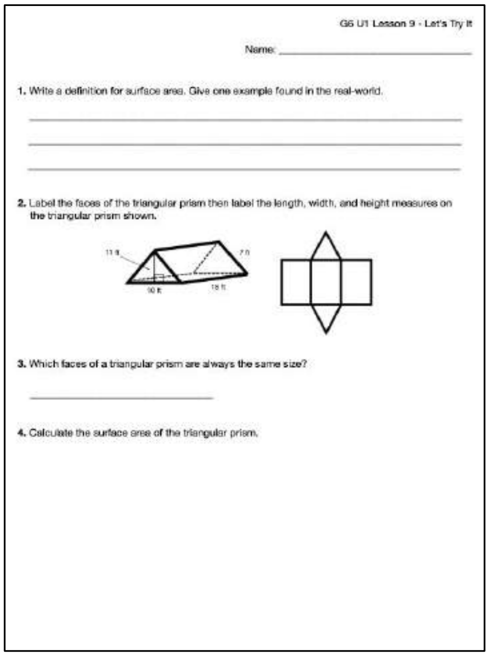
Let’s Try It:

Let’s explore explore using nets to calculate surface area of triangular prisms together.



G6 U1 Lesson 9 - Let's Try It

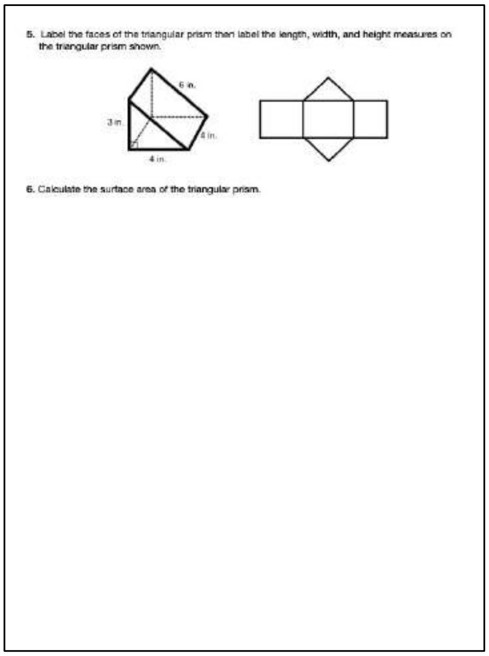
Name: ______________________

1. Write a definition for surface area. Give one example found in the real-world.

2. Label the faces of the triangular prism then label the length, width, and height measures on the triangular prism shown.

3. Which faces of a triangular prism are always the same size?

4. Calculate the surface area of the triangular prism.



5. Label the faces of the triangular prism then label the length, width, and height measures on the triangular prism shown.

6. Calculate the surface area of the triangular prism.

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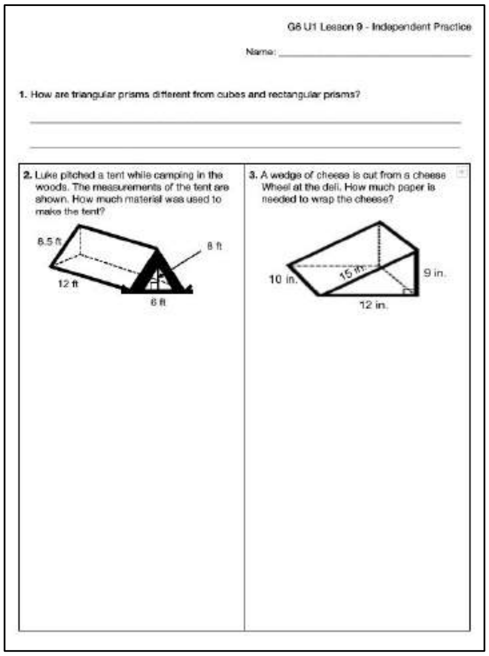
On your Own:

Now it’s time to explore using nets to calculate surface area on your own.



G6 U1 Lesson 9 - Independent Practice

Name: ______________________

1. How are triangular prisms different from cubes and rectangular prisms?

2. Luke pitched a tent while camping in the woods. The measurements of the tent are shown. How much material was used to make the tent?

3. A wedge of cheese is cut from a cheese Wheel at the deli. How much paper is needed to wrap the cheese?

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Name: ___________________________________ G6 U1 Lesson 9 - Let's Try It

1. Write a definition for surface area. Give one example found in the real-world.

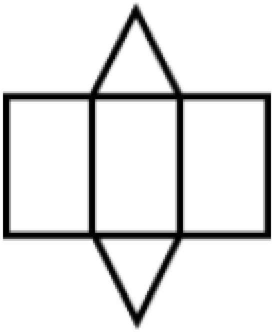
____

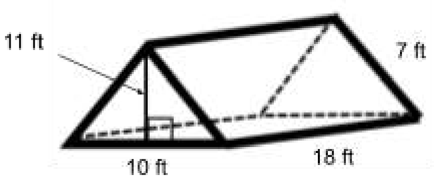
____

____

2. Label the faces of the triangular prism.

3. Label the length/base, width, and height measures on the triangular prism shown.





4. Which are the only faces of a triangular prism that are always the same size?

____

5. Calculate the surface area of the triangular prism.

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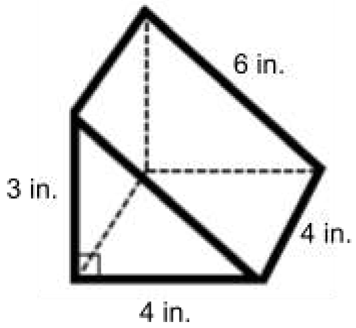
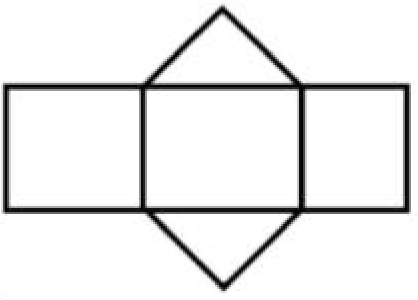
6. Label the faces of the triangular prism.

7. Label the length, width, and height measures on the triangular prism shown.





8. Calculate the surface area of the triangular prism.

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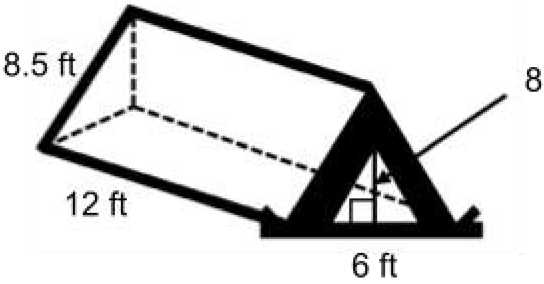
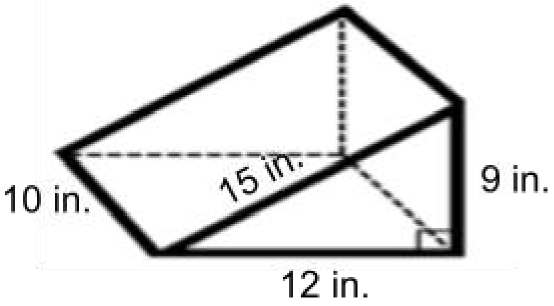
1. How are triangular prisms different from cubes and rectangular prisms?

____

____

2. Luke pitched a tent while camping in the woods. The measurements of the tent are shown. How much material was used to make the tent? 	**3.** A wedge of cheese is cut from a cheese wheel at the deli. How much paper is needed to wrap the cheese? 

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Name: ______________________________

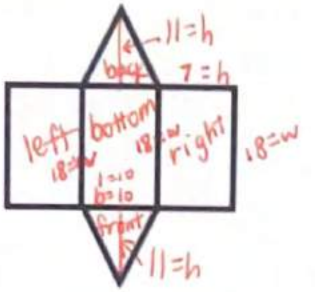
G6 U1 Lesson 9 - Let's Try It

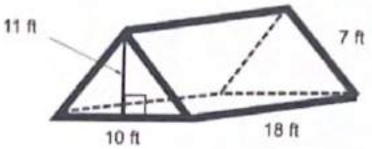
1. Write a definition for surface area. Give one example found in the real-world. (answers will var

Surface area is the amount of space around the outside of a 3D object. An example is wrapping a box to ship it.

2. Label the faces of the triangular prism.

3. Label the length/base, width, and height measures on the triangular prism shown.





4. Which are the only faces of a triangular prism that are always the same size?

the triangular pieces

5. Calculate the surface area of the triangular prism.

front/back $= \frac{1}{2} \times b \times h = \frac{1}{2} \times \frac{10}{1} \times \frac{11}{1} = \frac{110}{2} = 55 \times 2 = \boxed{110}$

bottom $= l \times w = 10 \times 18 = \boxed{180}$

left $= h \times w = 7 \times 18 = \boxed{126}$

right $= h \times w = 7 \times 18 = \boxed{126}$

$110 + 180 + 126 + 126 = 542 \text{ ft}^2$

The surface area is 542 ft^2.

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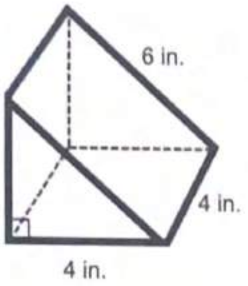
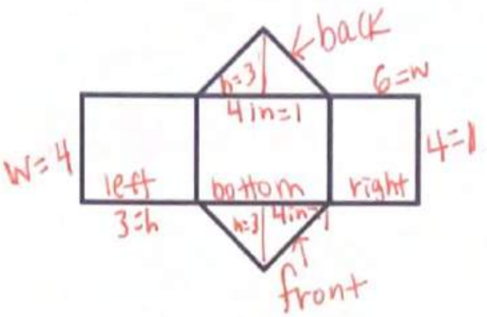
6. Label the faces of the triangular prism.

7. Label the length, width, and height measures on the triangular prism shown.





8. Calculate the surface area of the triangular prism.

$$\text{front / back} = \frac{1}{2} \times b \times h = \frac{1}{2} \times \frac{4}{1} \times \frac{3}{1} = \frac{12}{2} = 6 \times 2 = \boxed{12}$$

$$\text{bottom} = l \times w = 4 \times 4 = \boxed{16}$$

$$\text{left} = h \times w = 3 \times 4 = \boxed{12}$$

$$\text{right} = l \times w = 4 \times 6 = \boxed{24}$$

$$12 + 16 + 12 + 24 = 64 \text{ in}^2$$

The surface area is 64 in^2.

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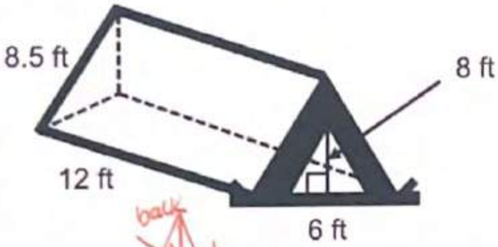
Name: ______________________________

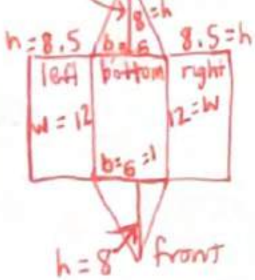
G6 U1 Lesson 9 - Independent Practice

1. How are triangular prisms different from cubes and rectangular prisms?

Triangular prisms are made of rectangles & triangles as opposed to just rectangles

2. Luke pitched a tent while camping in the woods. The measurements of the tent are shown. How much material was used to make the tent?





front/back = $\frac{1}{2}\times b\times h=\frac{1}{2}\times\frac{6}{1}\times\frac{8}{1}=\frac{48}{2}=24$

$24\times2=\boxed{48}$

left/right = $h\times w=8.5\times12$

$$\begin{array}{r} 12 \\ \times 8.5 \\ \hline 60 \\ +960 \\ \hline 102.0 \end{array}$$

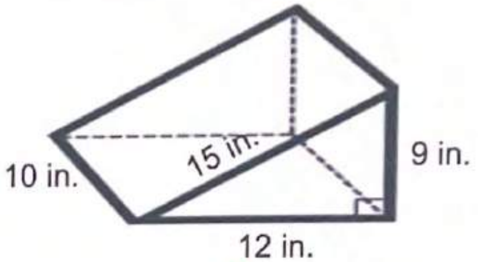
$102\times2=\boxed{204}$

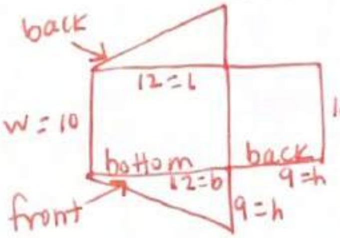
bottom = $l\times w=6\times12=\boxed{72}$

$48+204+72=324$

The surface area is 324ft².

3. A wedge of cheese is cut from a cheese wheel at the deli. How much paper is needed to wrap the cheese?





front/back = $\frac{1}{2}\times b\times h=\frac{1}{2}\times\frac{12}{1}=\frac{9}{1}=\frac{108}{2}=54$

$54\times2=\boxed{108}$

bottom = $l\times w=12\times10=\boxed{120}$

back = $h\times w=9\times10=\boxed{90}$

$108+120+90=318$

318 in² of paper is needed to wrap the cheese.

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G6 U1 Lesson 10

Use nets to calculate surface area of rectangular and triangular prisms

CITYTUTOR DC

G6 U1 Lesson 10 - Students will use nets to calculate surface area of rectangular and triangular prisms

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue exploring 3D figures and surface area, which is the amount of space covering the outside of a 3D figure. The last two lessons were focused on using our knowledge of 2D or two-dimensional figures like squares, rectangles, and triangles to calculate the surface area of 3D prisms. We focused specifically on these 3D figures…the cube, rectangular prism, and triangular prism.

Our nets were very helpful because they made it easier for us to identify the number of faces in the figure so that when we calculate the surface area we know how many faces to add together.

Let's Talk (Slide 3): Let's brainstorm, look around this room, which objects might we measure the surface area of? Possible Student Answers, Key Points:

- The tissue box
- A soda can
- A book
- A water bottle

Those are all 3D figures that we can measure the surface area of, let's continue exploring.

Let's Think (Slide 4): Let's look at a few 3D figures and count how many faces are on each 3D figure shown?

- What's the name of the first shape? Cube! How many faces does it have and what shape are they? 6 faces that are all squares!
- What's the name of the next shape? Rectangular prism! How many faces does it have and what shape are they? 6 faces that are rectangles and squares!
- And finally, what's the name of the last shape? Triangular prism! How many faces does it have and what shape are they? 5 faces! A triangular prism has a left and right, bottom, front and back.

Let's Think (Slide 5): Before we continue calculating the surface area of 3D figures let's also revisit how we find the surface area. Let's imagine that we are trying to explain how to find the surface area of a 3D figure to a friend or family member. List out the steps as clearly as possible.

- So, if I'm calculating the area of a 3D prism what do I do first? Label the faces. Right. First, I have to label the faces.
- Then I have to label the length/base, width, and height measurements–I have to be careful here!
- And the last thing I do is…what? Add the areas together. Right, I add all the areas together to find the surface area. Nice job, now let's use this process to calculate the area of prisms.

Let's Think (Slide 6): But before we begin, **what is the most challenging part of the process for you and what are some things you can do to make it easier?** Possible Student Answers, Key Points:

- It's hard to label the net - Remember to trace it to find the bottom, lose your eyes and imagine you're cutting along the edges, imagine you're wrapping it with wrapping paper, look for a similar object around the room.
- Figuring out the dimensions of each face - Think about what you know about different 2D shapes and their sides, label the length, width, and height.
- Remembering the area formulas - Use an anchor chart, write them down, use what you know about quadrilaterals and triangles to help you.
- Adding the areas back together - Stack them up and use place value to add them, look for combinations or doubles facts that you know.

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Those are interesting reflections! Remember to follow all the steps we named in the process and not give up or give in but to instead ask questions when you are experiencing challenges with the process.

Let's Try it (Slide 7): Let's continue practicing calculating the surface area of 3D prisms using nets and continuing to practice asking for help when you require it. Remember, the process for calculating the surface area of 3D figures becomes easier and easier the more we engage in problem solving.

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WARM WELCOME

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Today we will use nets to calculate surface area of rectangular and triangular prisms.

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Let's Talk:

Looking around this room, which objects can we measure the surface area of?

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Let's Think:

How many faces are on each 3D figure? Name each face.

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Let’s Think:

How do we find the surface area of a 3D figure?

Let’s try be a as concise as possible.

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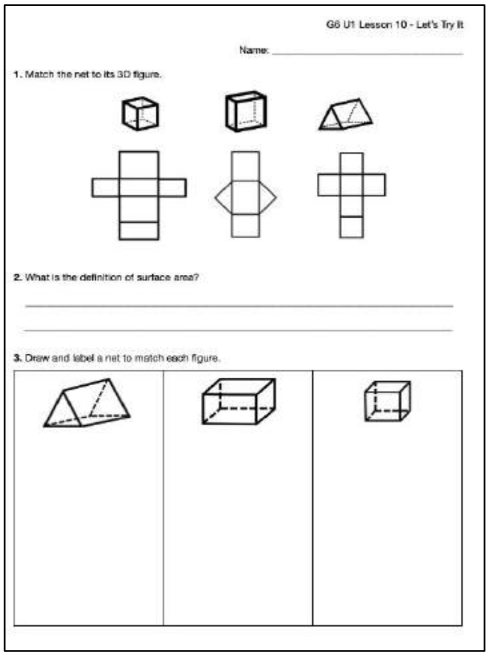
Let’s Try It:

Let’s explore explore using nets to calculate surface area of prisms together.



G6 U1 Lesson 10 - Let's Try It

Name: ______________________

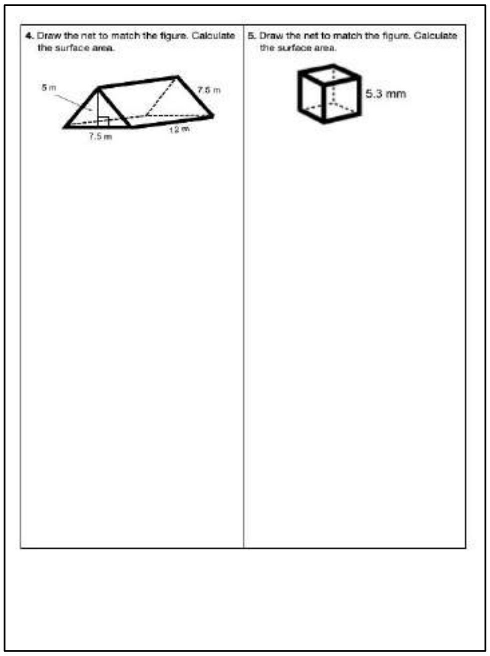
1. Match the net to its 3D figure.

2. What is the definition of surface area?

____

____

3. Draw and label a net to match each figure.



4. Draw the net to match the figure. Calculate the surface area.

5. Draw the net to match the figure. Calculate the surface area.

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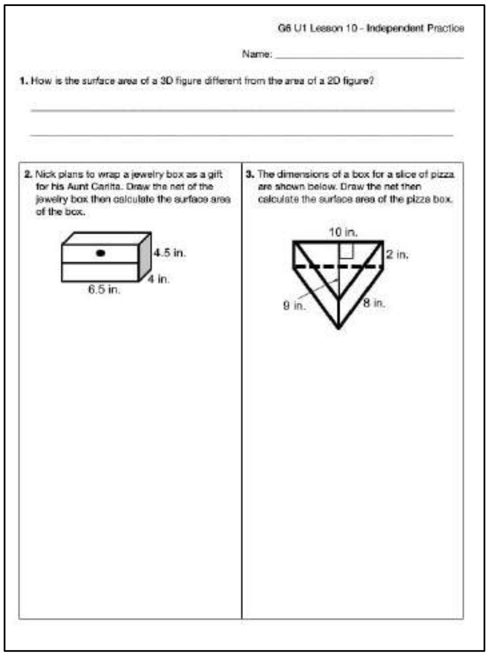
On your Own:

Now it’s time to explore using nets to calculate surface area on your own.



G6 U1 Lesson 10 - Independent Practice

Name: ____________________

1. How is the surface area of a 3D figure different from the area of a 2D figure?

2. Nick plans to wrap a jewelry box as a gift for his Aunt Carlita. Draw the net of the jewelry box then calculate the surface area of the box.

3. The dimensions of a box for a slice of pizza are shown below. Draw the net then calculate the surface area of the pizza box.

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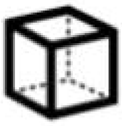
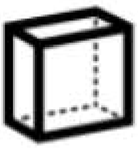
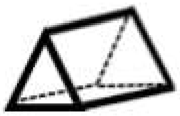
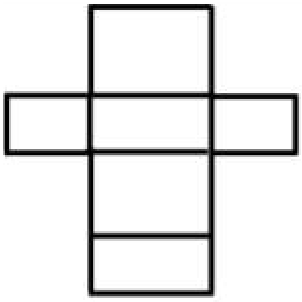
Name: ___________________________________

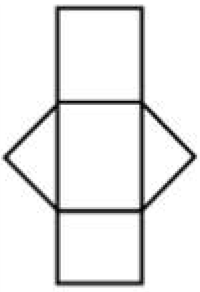
1. Match the net to its 3D figure.

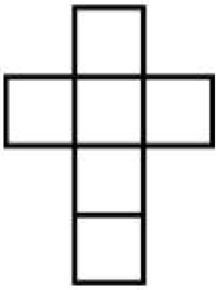












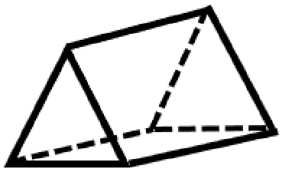
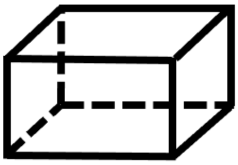
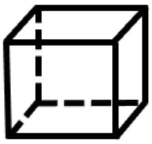
2. What is the definition of surface area?

____

____

3. Name each 3D figure.

4. Draw and label a net to match each figure.

 ________________________ ________________________	 ________________________ ________________________	 ________________________

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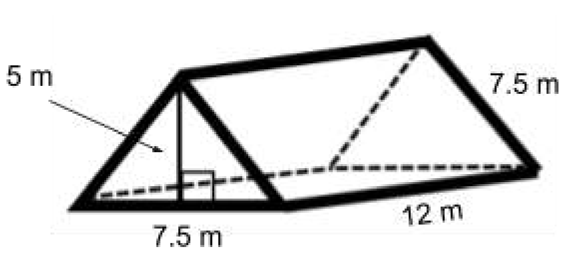

5. Name each 3D figure.

____

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6. Draw the net to match the figure.

7. How do we calculate the surface area of this figure?

____

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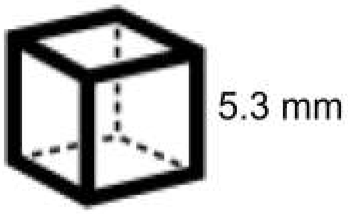
____

8. Calculate the surface area.



9. Name each 3D figure.

____

____

10. Draw the net to match the figure.

11. How do we calculate the surface area of this figure?

____

____

____

____

12. Calculate the surface area.

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1. How is the surface area of a 3D figure different from the area of a 2D figure?

____

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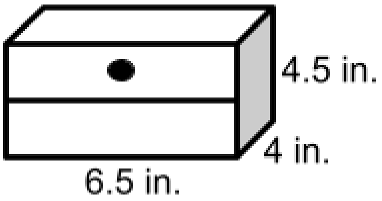
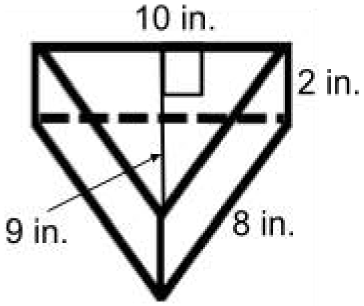
Nick plans to wrap a jewelry box as a gift for his Aunt Carilta.	The dimensions of a box for a slice of pizza are shown below.
	
2. Name the shape of the jewelry box. _________________________________ _________________________________	**5.** Name the shape of the jewelry box. _________________________________ _________________________________
3. Draw the net to match the figure.	**6.** Draw the net to match the figure.
4. How much wrapping paper is needed to wrap the box if the paper does not overall?	**7.** How much cardboard is needed to construct the pizza box?

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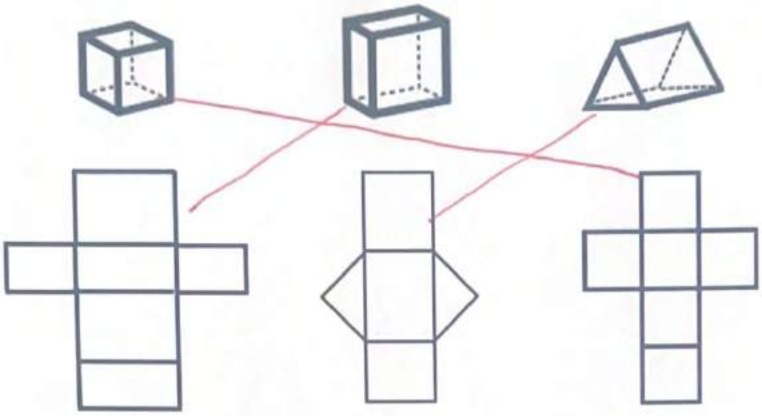
Name: ______________________ G6 U1 Lesson 10 - Let's Try It

1. Match the net to its 3D figure.

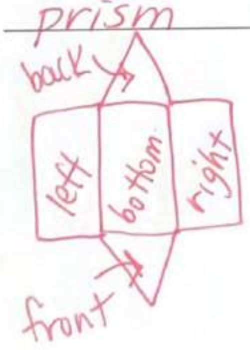
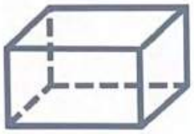
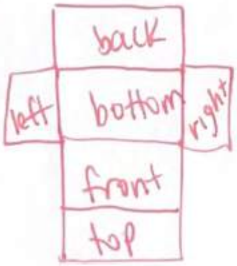
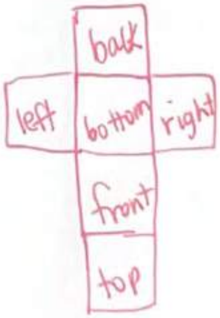


2. What is the definition of surface area?

The amount of space around the outside of a 3D object.

3. Name each 3D figure.

4. Draw and label a net to match each figure.

 triangular prism  	 rectangular prism  	Also  rectangular prism Cube 

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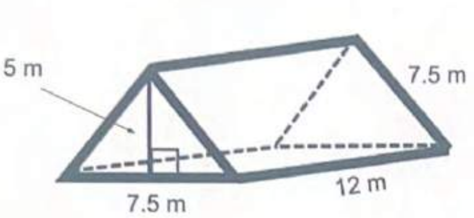


5. Name each 3D figure.

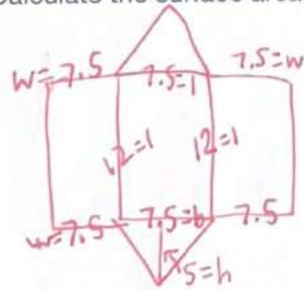
triangular prism

6. Draw the net to match the figure.

7. How do we calculate the surface area of this figure?

1. Calculate area of triangles
2. Calculate area of bottom.
3. Calculate area of left.
4. Calculate area of right.

8. Calculate the surface area.



front/back $= \frac{1}{2}\times b\times h = \frac{1}{2}\times\frac{7.5}{1}\times\frac{5}{1} = \frac{37.5}{2} =$

$18.75\times2 = \boxed{37.5}$

bottom $= l\times w = 7.5\times12 = \boxed{90}$

left $= l\times w = 12\times7.5 = \boxed{90}$

right $= l\times w = 12\times7.5 = \boxed{90}$

$37.5+90+90+90 = 307.5\ m^2$

9. Name each 3D figure.

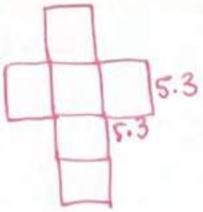
rectangular prism OR cube

10. Draw the net to match the figure.

11. How do we calculate the surface area of this figure?

1. Calculate the area of one face
2. Multiply that area by 6.

12. Calculate the surface area.



one face $= 5.3\times5.3 = 28.09$

$28.09\times6 = 168.54\ mm^2$

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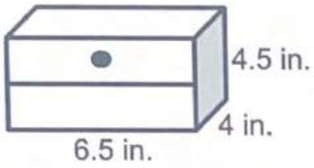
Name: ______________________________ G6 U1 Lesson 10 - Independent Practice

1. How is the surface area of a 3D figure different from the area of a 2D figure?

A 2D figure is flat so it has one area. a 3D figure has many faces so it has many areas.

Nick plans to wrap a jewelry box as a gift for his Aunt Carilta.

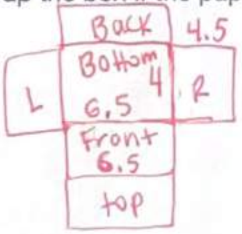


2. Name the shape of the jewelry box.

rectangular prism

3. Draw the net to match the figure.

4. How much wrapping paper is needed to wrap the box if the paper does not overall?



left/right $= 4.5 \times 4 = 18 \times 2 = \boxed{36}$

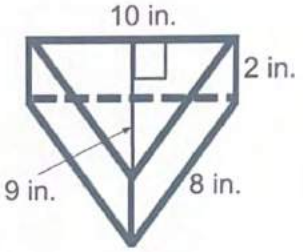
bottom/top $= 6.5 \times 4 = 26 \times 2 = \boxed{52}$

front/back $= 6.5 \times 4.5 = 29.25 \times 2 = \boxed{58.5}$

$36 + 52 + 58.5 = 146.5 in^2$

$146.5 in^2$ of wrapping paper is needed.

The dimensions of a box for a slice of pizza are shown below.

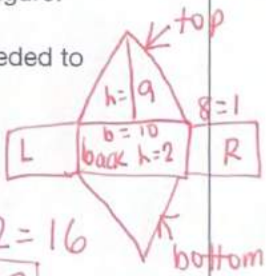


5. Name the shape of the box.

triangular prism

6. Draw the net to match the figure.

7. How much cardboard is needed to construct the pizza box?



left/right $= l \times h = 8 \times 2 = 16$

$16 \times 2 = \boxed{32}$

back $= l \times h = 10 \times 2 = \boxed{20}$

top/bottom $= \frac{1}{2} \times b \times h = \frac{1}{2} \times \frac{10}{1} \times \frac{9}{1} = \frac{90}{2} = 45 \times 2 = \boxed{90}$

$32 + 20 + 90 = 142 in^2$

$142 in^2$ of cardboard is needed to construct the box.

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G6 U1 Lesson 11

Explore volume of 3-dimensional figures

CITYTUTOR DC

G6 U1 Lesson 11 - Students will explore volume of three-dimensional figures

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be exploring another measurement of three-dimensional figures. Today we will be calculating volume. Volume is a concept you first learned in fifth grade when you focused on packing cubes into rectangular prisms and utilized the volume formula. In this lesson we are going to revisit all you learned in fifth grade while including fractional measurements and a twist on the volume formula!

Let's Talk (Slide 3): But before we get to new learning, let's revisit what was learned in fifth grade. Volume is the amount of space inside a 3D object kind of like the area of 2D shapes. **Can you think of some real-world examples where we might need to know the volume of the object? Look around the room and think about why knowing the volume might be helpful.** Possible Student Answers, Key Points:

- The volume of a box for packing clothes
- The volume of a pool to fill it with water
- Volume of a cup if you're pouring juice into it
- The volume of a container so you know how much stuff you can fit into it

Good examples! The correct examples all have the same thing in common, they are basically vessels or containers that hold things within them. A pool holds water inside of it, a cup can hold juice, a box can hold pencils or even clothes. Remember that volume is the amount of space inside a 3D figure.

Let's Think (Slide 4): Let's continue reviewing what we remember from fifth grade. I've started packing this rectangular prism with unit cubes. Does anyone remember how I would finish packing the prism to determine how many cubes would fit inside meaning, the volume of the prism? Keep adding cubes, side-by-side and row-by-row until the entire prism is full. That's right! We would continue stocking or adding cubes beside one another, row-by-row and column-by-column until the entire prism is filled.

But how would we determine the volume once it's packed full of cubes? We count the total number of cubes. Yes, we would count the number of cubes one at a time or we could count how many cubes cover the bottom and see how many stacks of those we'd need to fill it…there are a few ways to do it!

But most times we don't have cubes, sometimes the numbers are too large to represent easily with cubes, and at other times the measurements of the prisms are fractions or decimals, which are even harder to work with. That's why we can use a formula instead of cube packing to determine the volume of prisms.

The volume formula for cubes and rectangular prisms isn't very complicated. The volume, or amount of space inside a 3D figure, is calculated by multiplying the length by the width by the height…V = l x w x h. Those three dimensions mean we use a 3 for the exponent in the answer. For example, cm^3, centimeters to the third power or centimeters cubed. The reason that we can multiply length times width times height is because we can find how many cubes it takes to fill the bottom (*point).* And then we can multiply that to figure out how many layers we need to fill the whole figure (*use hands to show stacking*).

Guess what? There's another volume formula we could use! The other formula is volume equals base times height. If we compare the formulas V = l x w x h and V = B x h we can see that they have similarities and differences. **How are they the same? And how are they different?** Possible Student Answers, Key Points:

- Both have a V for volume and an h for height.
- One has an l x w and the other has a B.
- They both use multiplication.

This is interesting! We've seen L x W before, to find the area of a rectangle! Does the L x W part of the formula remind you of anything? Yes, L x W is the area formula for squares and rectangles.

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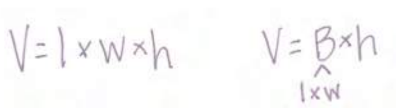
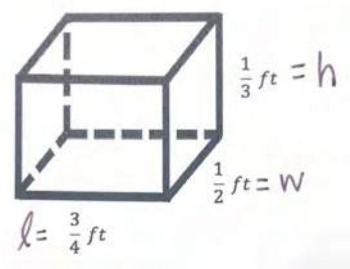
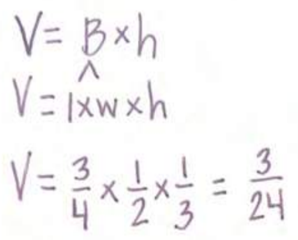


That's right! L x W is the area formula for squares and rectangles. So, you've just identified what the big B stands for, the area of the rectangular shaped base or bottom of our 3D prism.

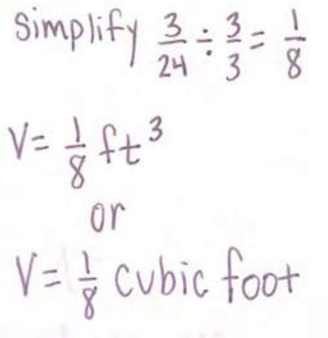


Let's use the big B formula to calculate the volume of this rectangular prism. First we label the length, width, and height.



Next, we write the formula for the volume of a rectangular prism which is V = B x H*.* We just observed that the big B represents the area of the base or bottom which is rectangular shaped so, big B is really just the length multiplied by the width or L x W*.*

Then, we substitute our measurements into our formula. Remember, when we multiply fractions we just multiply the numerators straight across and multiply the denominators straight across, we simplify our answer if it needs to be simplified. So the volume is $\frac{3}{24}$ cubic feet but it's also a fraction that is not simplified.

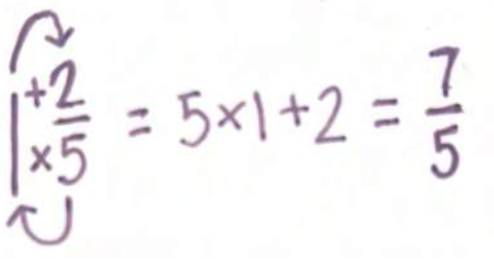


Let's simplify together. If we divide $\frac{3}{24} \div \frac{1}{1}$ you are still left with $\frac{3}{24}$ so that's no help! Let's try $\frac{3}{24} \div \frac{3}{3}$. That's it! $\frac{3}{24}$ simplifies to $\frac{1}{8}$.

So, our final answer is the volume of the rectangular prism is ⅛ cubic foot or ⅛ ft^3.

Let's Think (Slide 6): Before we continue with volume let's revisit converting mixed numbers to improper fractions. This is going to be helpful because we just multiplied with proper fractions meaning the numerator was smaller than the denominator. All we had to do was multiply straight across then simplify to solve. But if we have mixed numbers there is a process to complete before we just multiply straight across.

We are going to work on converting a mixed number to an improper fraction. It'll be quick! Let's look at the mixed number $1\frac{2}{5}$. It is considered a mixed number because it has a whole number, the 1 *(point)*, and a fractional part, $\frac{2}{5}$ *(point)*.



Our first step in converting a mixed number into an improper fraction is to multiply the denominator by the whole number which means multiplying 5 by the whole number 1, so 5 x 1 equals 5. Next we take that answer, 5, and add it to the numerator, 2…5 + 2 equals 7. We keep the denominator the same so $1\frac{2}{5}$ converted to an improper fraction is $\frac{7}{5}$.

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So if we’re working with a mixed number…a whole number and a fraction…we multiply the denominator by the whole number then add the numerator. Then, we place that answer over the same denominator. Once we do that, we’re ready to multiply straight across with our converted mixed number.

Let’s Try it (Slide 7): Now let’s practice more with the volume formula and fractions while calculating the volume of rectangular prisms. Remember that volume measures the amount of space inside a 3D object and we multiply the length by the width by the height to calculate the volume.

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WARM WELCOME

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Today we will explore the volume of 3-dimensional figures.

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Let's Talk:

Can you think of some real-world examples where we might need to know the volume of the object?

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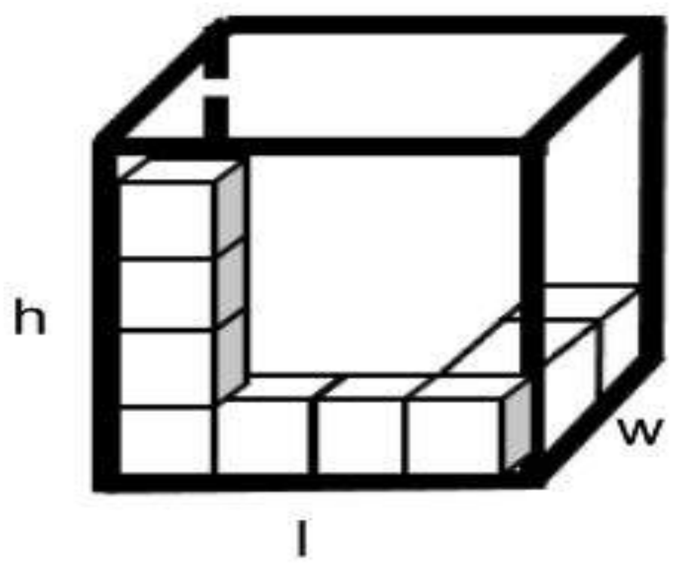
Let's Think:

How would I finish packing the prism to determine the volume?



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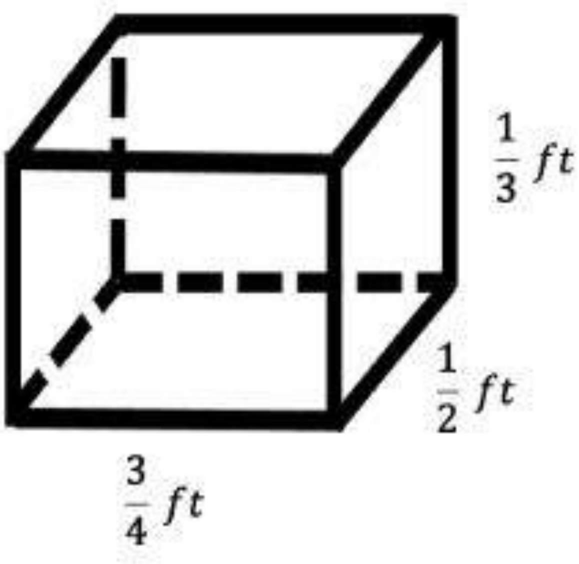
Let's Think:

Let's use the volume formula.



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Let's Think:

What is the process for converting mixed numbers to improper fractions?

$$1\frac{2}{5}$$

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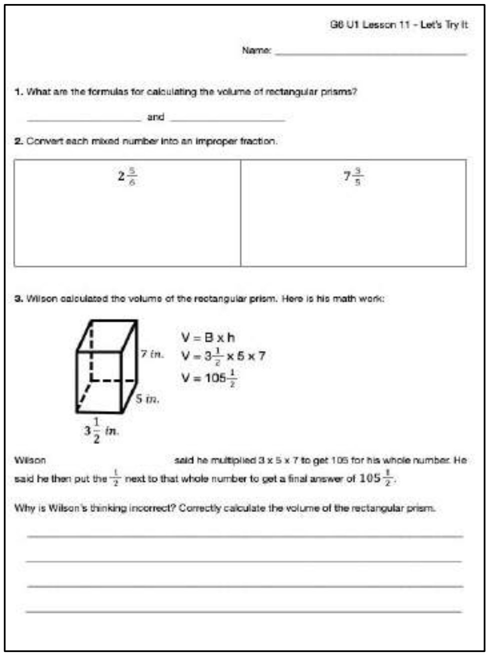
Let’s Try It:

Let’s explore volume together.



G6 U1 Lesson 11 - Let's Try It

Name: ____________________

1. What are the formulas for calculating the volume of rectangular prisms?

____________ and ____________

2. Convert each mixed number into an improper fraction.

$2\frac{5}{6}$	$7\frac{3}{5}$

3. Wilson calculated the volume of the rectangular prism. Here is his math work:

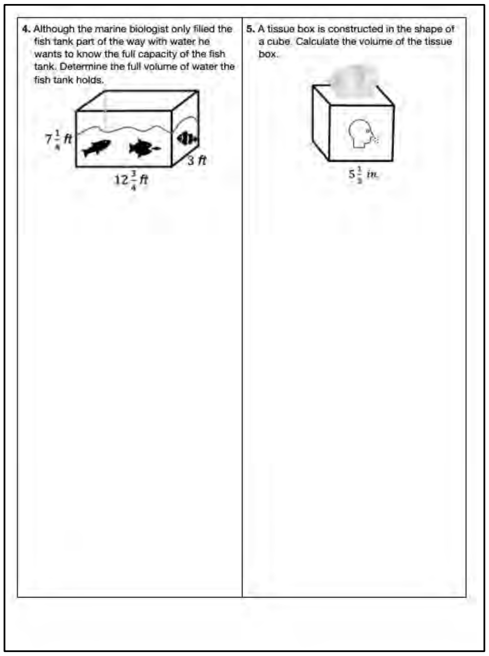
V = B x h

V = $3\frac{1}{2}$ x 5 x 7

V = $105\frac{1}{2}$

Wilson said he multiplied 3 x 5 x 7 to get 105 for his whole number. He said he then put the $\frac{1}{2}$ next to that whole number to get a final answer of $105\frac{1}{2}$.

Why is Wilson’s thinking incorrect? Correctly calculate the volume of the rectangular prism.



4. Although the marine biologist only filled the fish tank part of the way with water he wants to know the full capacity of the fish tank. Determine the full volume of water the fish tank holds.

5. A tissue box is constructed in the shape of a cube. Calculate the volume of the tissue box.

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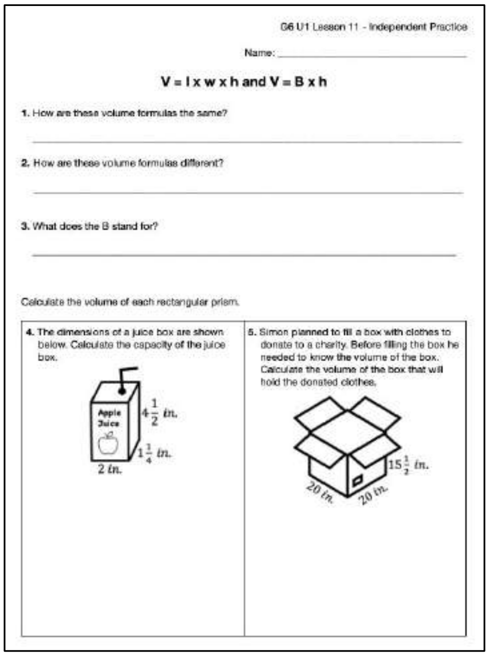
On your Own:

Now it’s time to explore volume on your own.



G6 U1 Lesson 11 - Independent Practice

Name: ____________________

V = l x w x h and V = B x h

1. How are these volume formulas the same?

2. How are these volume formulas different?

3. What does the B stand for?

Calculate the volume of each rectangular prism.

4. The dimensions of a juice box are shown below. Calculate the capacity of the juice box.

5. Simon planned to fill a box with clothes to donate to a charity. Before filling the box he needed to know the volume of the box. Calculate the volume of the box that will hold the donated clothes.

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Name: ______________________________

G6 U1 Lesson 11 - Let's Try It

1. What are the formulas for calculating the volume of rectangular prisms?

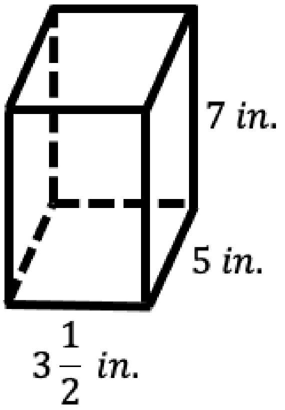
____________________ and ____________________

2. Describe the steps for converting mixed numbers into improper fractions.

3. Convert each mixed number into an improper fraction.

$2\frac{5}{6}$	$7\frac{3}{5}$

4. Wilson calculated the volume of the rectangular prism. Here is his math work:



V = B x h

V = $3\frac{1}{2}$ x 5 x 7

V = $105\frac{1}{2}$

Wilson said he multiplied 3 x 5 x 7 to get 105 for his whole number. He said he then put the $\frac{1}{2}$ next to that whole number to get a final answer of $105\frac{1}{2}$.

Why is Wilson's thinking incorrect? Correctly calculate the volume of the rectangular prism.

____

____

____

____

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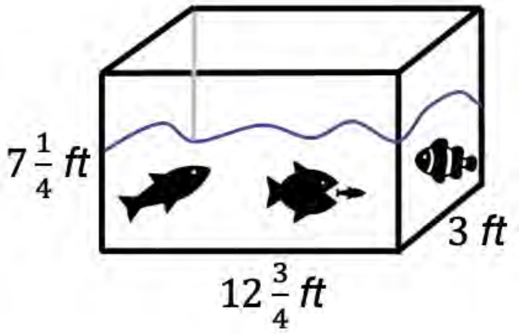
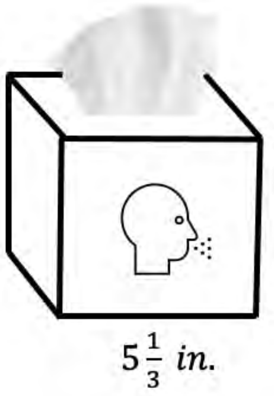
Although the marine biologist only filled the fish tank part of the way with water he wants to know the full capacity of the fish tank.

5. Determine the full capacity of water the fish tank holds.



A tissue box is constructed in the shape of a cube.

6. Calculate the volume of the tissue box.



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V = l x w x h and V = B x h

1. How are these volume formulas the same?

____

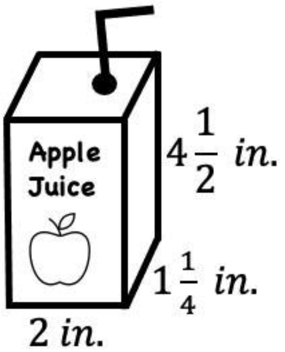
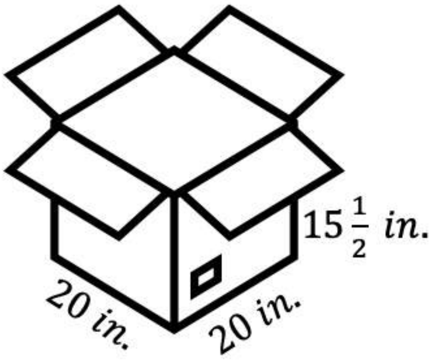
2. How are these volume formulas different?

____

3. What does the B stand for?

____

Calculate the volume of each rectangular prism.

4. The dimensions of a juice box are shown below. Calculate the capacity of the juice box.  	**5.** Simon planned to fill a box with clothes to donate to a charity. Before filling the box he needed to know the volume of the box. Calculate the volume of the box that will hold the donated clothes. 

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Name: ______________________________ G6 U1 Lesson 11 - Let's Try It

1. What are the formulas for calculating the volume of rectangular prisms?

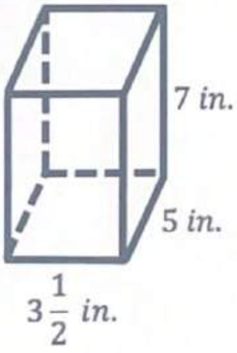
V = l × w × h and V = Bh

2. Describe the steps for converting mixed numbers into improper fractions. Multiply then add.

3. Convert each mixed number into an improper fraction.

$\overset{+}{\underset{\times}{2}}\frac{5}{6}$ $6 \times 2 + 5 = 12 + 5 = \frac{17}{6}$	$\overset{+}{\underset{\times}{7}}\frac{3}{5}$ $5 \times 7 + 3 = \frac{38}{5}$

4. Wilson calculated the volume of the rectangular prism. Here is his math work:



$V = B \times h$

$V = 3\frac{1}{2} \times 5 \times 7$

$V = 105\frac{1}{2}$

$\overset{+}{\underset{\times}{3}}\frac{1}{2} = \frac{7}{2}$

Wilson said he multiplied 3 x 5 x 7 to get 105 for his whole number. He said he then put the $\frac{1}{2}$ next to that whole number to get a final answer of $105\frac{1}{2}$.

Why is Wilson's thinking incorrect? Correctly calculate the volume of the rectangular prism.

The mixed number must be converted into an improper fraction before multiplying. Volume = $\frac{7}{2} \times \frac{5}{1} \times \frac{7}{1}$. $\frac{245}{2}$ is equal to $122\frac{1}{2}$.

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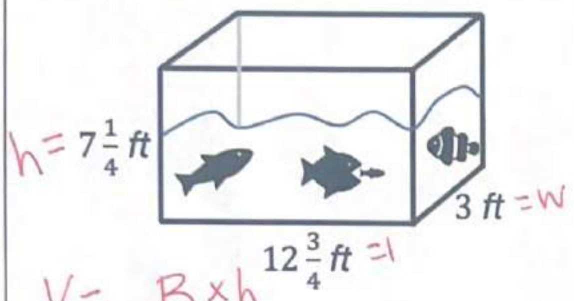
Although the marine biologist only filled the fish tank part of the way with water he wants to know the full capacity of the fish tank.

5. Determine the full capacity of water the fish tank holds.



$V = B \times h$

$V = l \times w \times h$

$V = 12\frac{3}{4} \times 3 \times 7\frac{1}{4}$ $12\frac{3}{4} = \frac{51}{4}$ $7\frac{1}{4} = \frac{29}{4}$

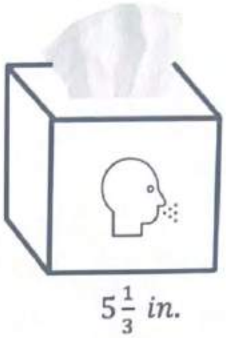
$V = \frac{51}{4} \times \frac{3}{1} \times \frac{29}{4} = \frac{4437}{16}$

16 | 4437
−3200 | 200
1237
−800 | 50
437
−160 | 10
277
−160 | 10
117
−96 | 6
21
−16 | 1
5 | +
277

$\boxed{V = 277\frac{5}{16} ft^3}$

A tissue box is constructed in the shape of a cube.

6. Calculate the volume of the tissue box.



$V = B \times h$

$V = l \times w \times h$

$V = 5\frac{1}{3} \times 5\frac{1}{3} \times 5\frac{1}{3}$ $5\frac{1}{3} = \frac{16}{3}$

$V = \frac{16}{3} \times \frac{16}{3} \times \frac{16}{3} = \frac{4096}{27}$

27 | 4096
−2700 | 100
1396 | 10
−270
1126
−1080 | 40
46
−27 | 1
19 | +
151

$\boxed{V = 151\frac{19}{27} in^3}$

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Name: ______________________

G6 U1 Lesson 11 - Independent Practice

V = l x w x h and V = B x h

1. How are these volume formulas the same?

They both have height as part of the formula.

2. How are these volume formulas different?

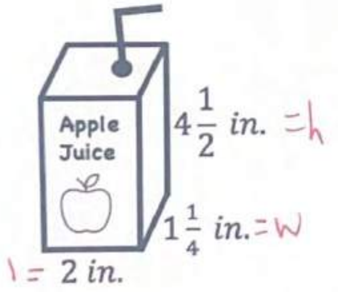
One has a "big B" while the other has length & width.

3. What does the B stand for?

length x width ; area of the base

Calculate the volume of each rectangular prism.

4. The dimensions of a juice box are shown below. Calculate the capacity of the juice box.



$V = B \times h$

$V = l \times w \times h$

$V = 2 \times 1\frac{1}{4} \times 4\frac{1}{2}$

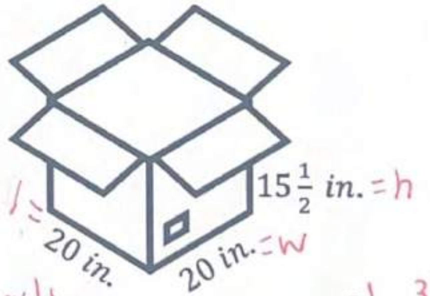
$V = \frac{2}{1} \times \frac{5}{4} \times \frac{9}{2} = \frac{90}{8} = \boxed{11\frac{2}{8} \text{ in}^3}$

$4\frac{1}{2} = \frac{9}{2}$

$1\frac{1}{4} = \frac{5}{4}$

$8\overline{)90}$
-80 10
10
-8 +1
2 11

5. Simon planned to fill a box with clothes to donate to a charity. Before filling the box he needed to know the volume of the box. Calculate the volume of the box that will hold the donated clothes.



$V = l \times w \times H$

$V = 20 \times 20 \times 15\frac{1}{2}$

$V = \frac{20}{1} \times \frac{20}{1} \times \frac{31}{2} = \frac{12400}{2}$

$\boxed{V = 6{,}200 \text{ in}^3}$

$15\frac{1}{2} = \frac{31}{2}$

$2\overline{)12400}$
-12000 6000
400 200
-400 +
0 6200

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G6 U1 Lesson 12

Differentiate between volume and surface area

G6 U1 Lesson 12 - Students will differentiate between volume and surface area

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): You've done some amazing work during this unit and you should be really proud of yourself and all you've accomplished! Today we are ending Unit 1 by putting together everything we learned to identify the difference between calculating volume and surface area with rectangular prisms.

Let's Talk (Slide 3): Let's start with a brainstorm, I want you to think of a real world example of where you'd have to find the volume and surface area of a 3D object. Possible Student Answers, Key Points:

- We could calculate the volume of a water bottle so we know how much water it holds.
- We could calculate the surface area of a box so that we can cover it in wrapping paper.
- We could calculate the volume of a box if we're packing things into it.
- We might use volume when we're cooking so we know about how much fits inside something.

Very creative! In the examples we notice that we can manipulate the outside of the object which is surface area and we can put something inside the object which is volume.

Let's Think (Slide 4): In our last lesson we re-explored the concept of volume, remember that volume is the amount of space *inside* an object. We also recalled that volume is measured by multiplying the length by the width by the height of an object.

We used the same volume formula from fifth grade, V = l x w x h and we were introduced to an alternate volume formula for rectangular prisms, V = B x h. Who can recall what the big B in the formula V = B x h means? The big B is the area of the base or l x w. Yes, the big B represents the area of the base of the rectangular prism or the area of the rectangle base. We know that the area formula for a rectangle is l x w so that means the big B is the same as length multiplied by width. This will come in handy as we continue to explore rectangular prisms to calculate both the volume and the surface area of figures.

Let's Think (Slide 5): So now, let's think about the difference between surface area and volume of 3D figures. **How are they similar and different?** Possible Student Answers, Key Points:

- Surface area is the amount of space around the outside of a 3D object
- Volume is the amount of space inside that object.

That's right! We've seen that when we talk about capacity, filling, and holding liquids we are referring to volume. But when we talk about wrapping and covering objects we are referring to surface area.

We also learned that volume and surface area are measured in different units. We use square units for surface area and cubic units for volume. We use square units and an exponent of 2 for surface area because area utilizes two measures, length multiplied by width. We use cubic units and an exponent of three for volume because area utilizes three measures, length multiplied by width multiplied by height.

Let's Think (Slide 6): Okay, last thing before we look at our first problem. Remember, the formulas for volume and area! Now, let's get to our problem for the day.

Let's Think (Slide 7): Michael is giving his best friend a sweater as a birthday gift. He plans to place the gift inside a box but he isn't sure if the box will be large enough and also doesn't know how much wrapping paper it will take to wrap the gift box.

Part A - What is the capacity of the gift box he plans to purchase?
Part B - What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box?

Let’s analyze Part A. First, we need to decide if we are trying to find the surface area or the volume for the box based on the question asked. The question asks about the box’s capacity and capacity is the amount of space inside an object. Does volume or surface area refer to the amount of space inside an object? Volume. Correct! Volume is the amount of space inside an object. Everyone, use your formula to find the box’s capacity.

Next, let’s analyze Part B. We need to decide if we are trying to find the surface area or the volume for the box based on the question asked. Who can help us? The question asks about the wrapping box and since you wrap the outside of the box we are focused on covering the surface with paper. Does volume or surface area refer to the outside of an object? Surface area. Right, again! Surface area is the amount of space around the outside of an object. Everyone, use your formula to find the box’s surface area.

We have learned so much about volume and surface area in this unit! Let’s ensure we continue to apply our knowledge about the processes like using nets to identify all our faces when necessary, labeling measurements before we begin calculating, as well as applying the correct formulas and calculating correctly as we problem solve.

Let’s Try it (Slide 8): Let’s continue this problem together now that we have analyzed each of the problem’s parts and decided which measurement and formulas we will use when solving. Remember that surface area focuses on the amount of space around the outside of a 3D object while volume focuses on the space inside a 3D object.

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WARM WELCOME

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Today we will differentiate between volume and surface area.

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Let's Talk:

Think of a real world example of where you'd have to find the volume and surface area of a 3D object.

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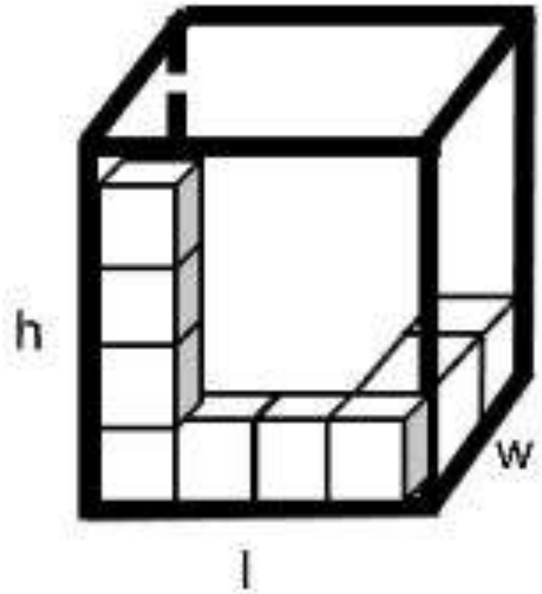
Let's Think:

What does the formula V = B x h mean?



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Let's Think: What is the difference between surface area and volume of 3D figures?

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Let's Think: Here are our important formulas.

Volume Formula: **l** x **w** x **h** or **B** x **h**

Surface Area Formula: **l** x **w** or **½** x **l** x **h**

(add area of all faces together)

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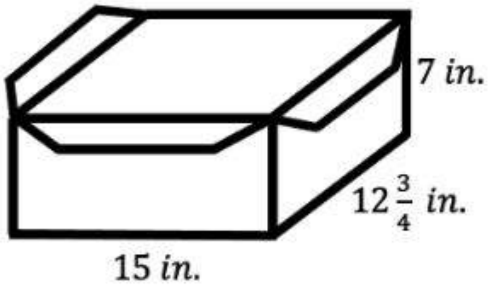
Let's Think:

Michael is giving his best friend a sweater as a birthday gift. He plans to place the gift inside a box but he isn't sure the box will be large enough and doesn't know how much wrapping paper it will take to wrap the gift box.



Part A -
What is the capacity of the gift box he plans to purchase?

Part B -
What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box?

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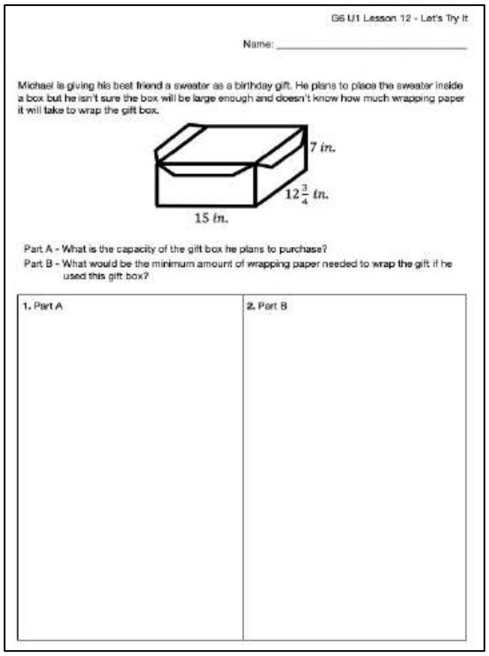
Let's Try It:

Let's explore explore surface area and volume together.



G6 U1 Lesson 12 - Let's Try It

Name: ______________________

Michael is giving his best friend a sweater as a birthday gift. He plans to place the sweater inside a box but he isn't sure the box will be large enough and doesn't know how much wrapping paper it will take to wrap the gift box.

Part A - What is the capacity of the gift box he plans to purchase?
Part B - What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box?

1. Part A	2. Part B

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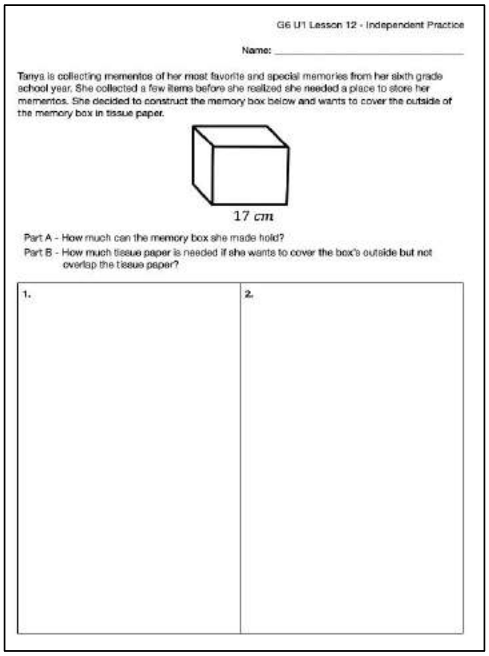
On your Own:

Now it’s time to explore surface area and volume on your own.



G6 U1 Lesson 12 - Independent Practice

Name: ______________________

Tanya is collecting mementos of her most favorite and special memories from her sixth grade school year. She collected a few items before she realized she needed a place to store her mementos. She decided to construct the memory box below and wants to cover the outside of the memory box in tissue paper.

Part A - How much can the memory box she made hold?

Part B - How much tissue paper is needed if she wants to cover the box's outside but not overlap the tissue paper?

1.	2.

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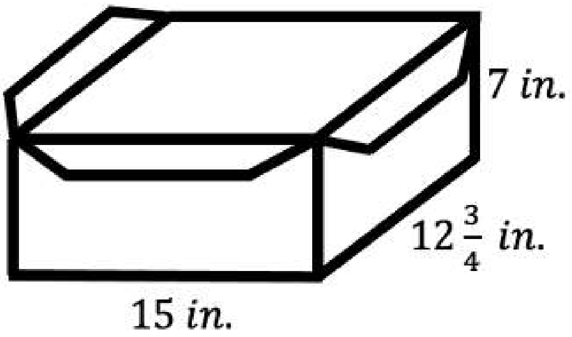
Name: ___________________________________ G6 U1 Lesson 12 - Let's Try It

Michael is giving his best friend a sweater as a birthday gift. He plans to place the sweater inside a box but he isn't sure the box will be large enough and doesn't know how much wrapping paper it will take to wrap the gift box.



Part A - What is the capacity of the gift box he plans to purchase?

Part B - What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box?

1. Part A	**2.** Part B

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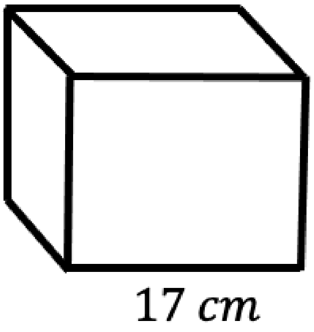
Name: ___________________________________ G6 U1 Lesson 12 - Independent Practice

Tanya is collecting mementos of her most favorite and special memories from her sixth grade school year. She collected a few items before she realized she needed a place to store her mementos. Tanya decided to construct the memory box shown below and wants to cover the outside of the memory box in tissue paper and stickers.



Part A - How much can the memory box Tanya made hold?

Part B - How much tissue paper is needed if she wants to cover the box’s outside but not overlap the tissue paper?

1. Part A	**2.** Part B

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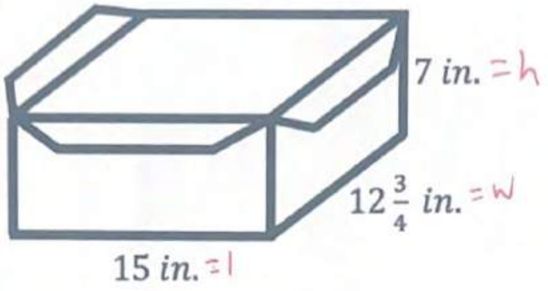
Name: ______________________________ G6 U1 Lesson 12 - Let's Try It

Michael is giving his best friend a sweater as a birthday gift. He plans to place the sweater inside a box but he isn't sure the box will be large enough and doesn't know how much wrapping paper it will take to wrap the gift box.



Part A - What is the capacity of the gift box he plans to purchase? volume

Part B - What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box? Surface area

1. Part A

$V = l \times w \times h$

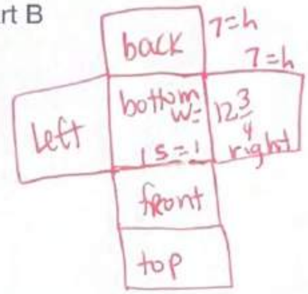
$V = 15 \times 12\frac{3}{4} \times 7$ $12\frac{3}{4} = \frac{51}{4}$

$V = \frac{15}{1} \times \frac{51}{4} \times \frac{7}{1} = \frac{5355}{4}$

$$\begin{array}{r|l} 4\,\overline{)5355} & \\ -4000 & 1000 \\ 1355 & \\ -800 & 200 \\ 555 & \\ -400 & 100 \\ 155 & \\ -120 & 30 \\ 35 & \\ -32 & 8 \\ 3 & + \\ & 1338 \end{array}$$

$\boxed{V = 1338 \text{ in}^3}$

2. Part B



bottom/top $= 15 \times 12\frac{3}{4} = \frac{15}{1} \times \frac{51}{4} = \frac{765}{4} \times \frac{2}{1} = \frac{1530}{4}$ $\boxed{382\frac{2}{4}}$

front/back $= 15 \times 7 = 105 \times 2 = \boxed{210}$

left/Right $= 12\frac{3}{4} \times 7 = \frac{51}{4} \times \frac{7}{1} = \frac{357}{4} \times \frac{2}{1} = \frac{714}{4}$ $\boxed{178\frac{2}{4}}$

$$\begin{array}{r|l} 4\,\overline{)1530} & \\ -1200 & 300 \\ 330 & \\ -320 & 80 \\ 10 & \\ -8 & 2 \\ 2 & + \\ & 382\frac{2}{4} \end{array}$$

$$\begin{array}{r|l} 4\,\overline{)714} & \\ -400 & 100 \\ 314 & \\ -200 & 50 \\ 114 & \\ -80 & 20 \\ 34 & \\ -32 & 8 \\ 2 & + \\ & 178\,2/4 \end{array}$$

$178\frac{2}{4} + 382\frac{2}{4} + 210 = 771 \text{ in}^2$

$\boxed{\text{Surface area} = 771 \text{in}^2}$

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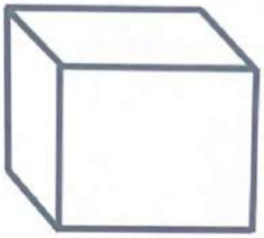
Name: ______________________________ G6 U1 Lesson 12 - Independent Practice

Tanya is collecting mementos of her most favorite and special memories from her sixth grade school year. She collected a few items before she realized she needed a place to store her mementos. Tanya decided to construct the memory box shown below and wants to cover the outside of the memory box in tissue paper and stickers.



17 cm

Part A - How much can the memory box Tanya made hold? volume

Part B - How much tissue paper is needed if she wants to cover the box's outside but not overlap the tissue paper? surface area

1. Part A	2. Part B
$V = l \times w \times h$ $V = 17 \times 17 \times 17$ $\boxed{V = 4{,}913\, cm^3}$	one face → $17 \times 17 = 289$ 289×6 faces $= 1{,}734\, cm^2$ $\boxed{\text{Surface area} = 1{,}734\, cm^2}$

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CITYTUTOR DC

G6 Unit 2:

Ratios

G6 U2 Lesson 1

Use ratio language and notation to describe an association between two or more quantities

CITYTUTOR DC

G6 U2 Lesson 1 - Students will use ratio language to describe the relationship between two or more quantities

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We are beginning a new and exciting unit today! Our new unit focuses on ratios. You aren't expected to know what ratios are or how to work with them yet but, guess what? You already have a lot of information in your brains that will help you with ratios. For example, in third grade you learned about measurement conversions and in fourth grade you learned to work with two-column tables. What you know about multiplication, division, and fractions are going to be key to exploring and understanding ratios in this unit.

Let's Talk (Slide 3): So, let's open with a brainstorm…**what does it mean to compare two things?**

Possible Student Answers, Key Points:

- Comparing two things is figuring out whether one is bigger or smaller than the other.
- Comparing is seeing how two things are the same or how they're different.

Interesting thoughts! Comparing two things means to look at how those two things are the same and how those things are different from one another. In reading, you might have heard this idea called comparing and contrasting.

Let's Think (Slide 4): Let's explore ratios in a bit more detail. The word ratio may sound strange but the concept is actually very simple. A ratio is a comparison between two different quantities or amounts. Just like a lot of ideas in math, ratios can be represented in a few different ways. We can represent rations with words, symbols, AND numbers!

word → to
colon → :
fraction → $\frac{1}{2}$

When we're using words we use the word "TO," and when we represent ratios with symbols we use a COLON, which you've seen before in books, and finally we can use numbers to represent ratios, and when we use numbers they're actually fractions!

Although a ratio or comparison can be written three different ways the value of the comparison is still the same.

It's just like writing a number a few different ways–as the number like 2, or as the word like TWO, or as a picture (*draw 2 circles*). Or, if you wrote your name in block letters, then bubble letters, and then in cursive, is your name still the same name? Yes. Of course it's still the same name. Your name just looks different. This is the same with ratios. They can be written three different ways but it's still the same comparison. Let me show you what I mean.

Let's Think (Slide 5): Here is an example of the number of cowboys and clowns seen at a rodeo. We can write a ratio comparing the number of cowboys and the number of clowns. Comparing the number of cowboys to the number of clowns is considered a ratio because a ratio is simply a comparison between two or more quantities or amounts. When I look at the cowboys and clowns as one big group *(circle the entire group)* I count 6 cowboys and count 3 clowns. So as a ratio, for every 6 cowboys there are 3 clowns. To write the ratio or comparison of cowboys to clowns in words it would say "for every 6 cowboys there are 3 clowns." But what is that ratio written three different ways?

6 to 3

Well, we need to write the ratio using the word "to" so that would be 6 to 3 *(write).*

6:3

We can also write the ratio using a colon so that would be 6:3 *(write).*

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$\frac{6}{3}$

Lastly, we can write the ratio, or comparison, as a fraction. The fraction would be $\frac{6}{3}$.

There we go! We've just written the ratio of cowboys to clowns three different ways, let's reread them together describing the cowboys and clowns. The words are easy, read those with me…six to three. Now let's read the colon, this colon means "TO," so we also read this as six to three. And finally, this fraction we read the same way…six to three. So for every 6 cowboys there are 3 clowns.

With ratios we are always thinking about making groups and ensuring our groups are identical meaning that our groups have equal amounts in them. Let's look at our image of cowboys and clowns again and think about another way we can write a ratio for the same picture.

Instead of looking at the WHOLE group, we can see if we can make smaller groups that have the same relationship.

I see 2 cowboys here and 1 clown, and I see another 2 cowboys and 1 clown, and I see ANOTHER 2 cowboys and 1 clown (*circle and point*). We placed 2 cowboys and 1 clown in a group because every time we see 2 cowboys, we see 1 clown. Notice, our groups are all the same, we have 2 cowboys and 1 clown in every single group.

Cowboys to clowns
2 to 1
2 : 1
$\frac{2}{1}$

Let's write our new ratio "for every 2 cowboys there is 1 clown," three different ways? Correct.

First, we can use words to show the ratio…two to one.

Now we can use a symbol, the colon, it means the same thing…two to one.

Finally, we need to write the ratio or comparison as a fraction. That would be $\frac{2}{1}$.

There we go! We've written another ratio of cowboys to clowns three different ways.

Let's Think (Slide 6): Now, look at this slide, look at it carefully…how is it the same or different from the slide we were just working on? Possible Student Answers, Key Points:

- They're the exact same, it's asking us to compare the same to things.
- The picture is the same.
- Instead of asking us to compare cowboys to clowns, it's asking us to do the opposite.

Hmm, interesting thoughts! This is the exact same picture but instead of asking us to compare COWBOYS to CLOWNS, it says to compare CLOWNS to COWBOYS. Just like when we compare 2 and 4 and we can say, 2 is less than 4 or 4 is greater than 2. We can do the same with ratios. So, we compare in the same order as you read this sentence, from left to right–like when we compare numbers. First you count and write the number of cowboys, then you count and write the number of clowns. To count the clowns first results in an answer that compares clowns to cowboys, not cowboys to clowns.

It may seem like a minor difference but it's actually a very important difference. We started out saying a ratio or comparison for cowboys and clowns is "for every 6 cowboys there are 3 clowns." But, instead of cowboys to clowns we could think in terms of "clowns to cowboys." That would change the ratio, verbally

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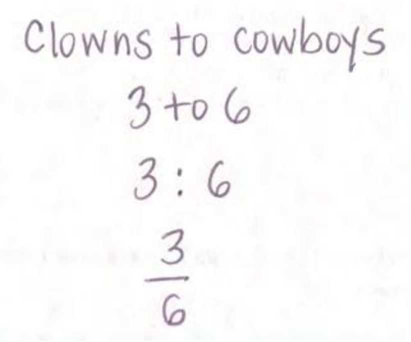
and in writing, because it changes the order and the meaning! Let's use words, symbols, and a fraction to compare clowns to cowboys.



Clowns to cowboys

3 to 6

3 : 6

$\frac{3}{6}$

For every 3 clowns, there are 6 cowboys. So we can say 3 to 6 to compare clowns to cowboys.

We can use a colon to show the same ratio…3:6.

And finally, we can use a fraction… so that would be $\frac{3}{6}$.

Remember, ratios are comparisons of quantities or amounts. In addition to paying attention to the order of the quantities that we're comparing. We also learned that we can group quantities in different ways to write different ratios for the same group. When we regrouped our comparison of cowboys to clowns we were able to make more, smaller groups.

Let's Try it (Slide 8): Let's continue writing ratios as we compare quantities to one another. Remember that we will write all our ratios three different ways; using the word "to," using a colon, and as a fraction. The key is, the order you read the ratio comparison is the order you write the ratio comparison.

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WARM WELCOME

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Today we will use ratio language to describe the relationship between two or more quantities.

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Let’s Talk:

What does it mean to compare two things?

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Let’s Think:

What are ratios and how are they written?

A **ratio** is a comparison between two different quantities.

WORDS:

SYMBOLS:

NUMBERS:

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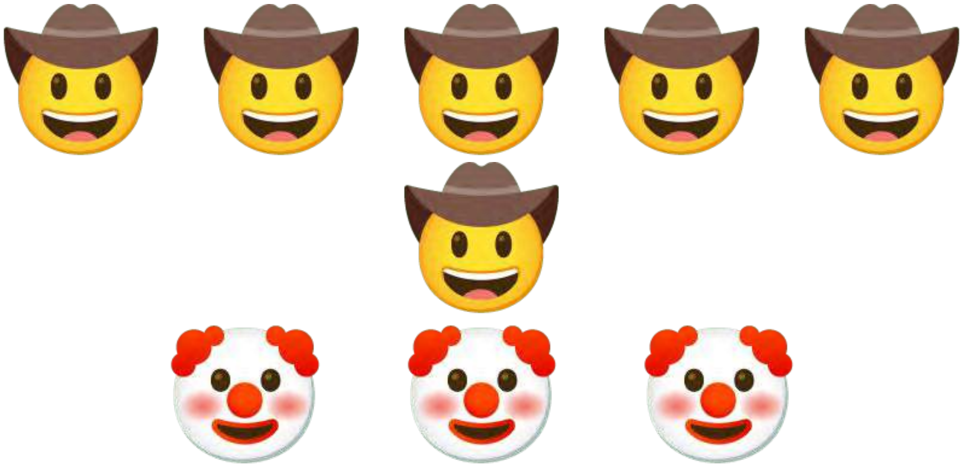
Let's Think:

Let's write a ratio comparing the amount of **cowboys** to **clowns**.



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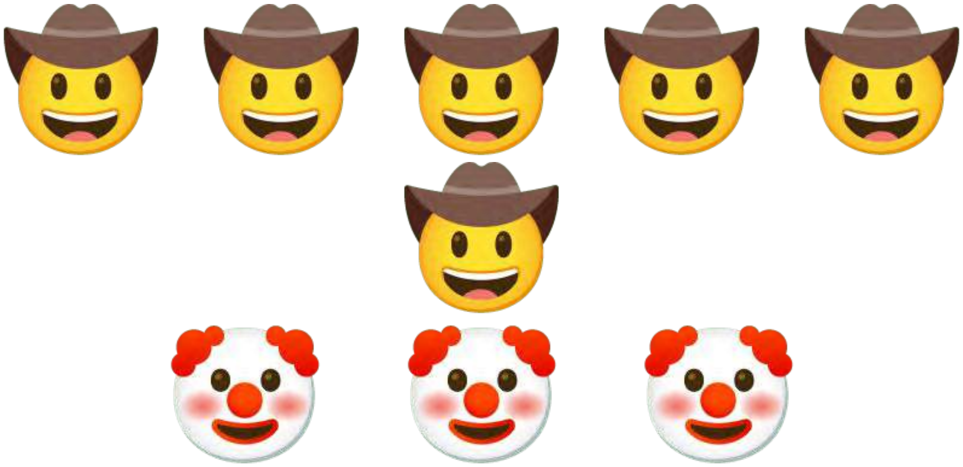
Let's Think:

Let's write a ratio comparing the amount of **clowns** to **cowboys**.



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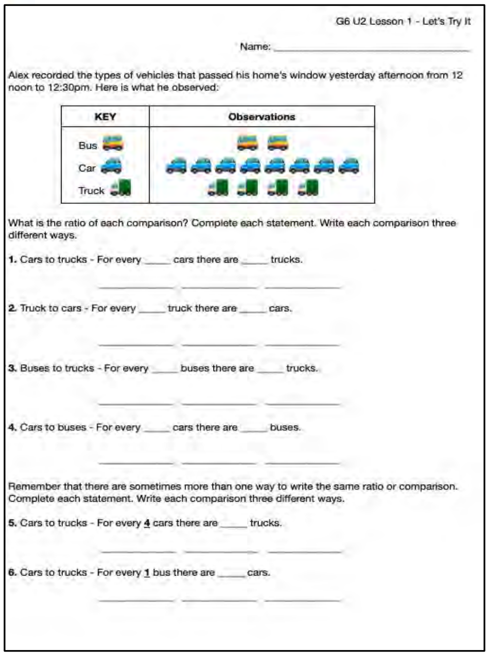
Let's Try It:

Let's explore using ratio language together.



G6 U2 Lesson 1 - Let's Try It

Name: ______________________

Alex recorded the types of vehicles that passed his home's window yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:

KEY	Observations
Bus 🚌 Car 🚙 Truck 🚛	🚌 🚌 🚙 🚙 🚙 🚙 🚙 🚙 🚙 🚙 🚛 🚛 🚛 🚛

What is the ratio of each comparison? Complete each statement. Write each comparison three different ways.

1. Cars to trucks - For every ____ cars there are ____ trucks.

__________ __________ __________

2. Truck to cars - For every ____ truck there are ____ cars.

__________ __________ __________

3. Buses to trucks - For every ____ buses there are ____ trucks.

__________ __________ __________

4. Cars to buses - For every ____ cars there are ____ buses.

__________ __________ __________

Remember that there are sometimes more than one way to write the same ratio or comparison. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every 4 cars there are ____ trucks.

__________ __________ __________

6. Cars to trucks - For every 1 bus there are ____ cars.

__________ __________ __________

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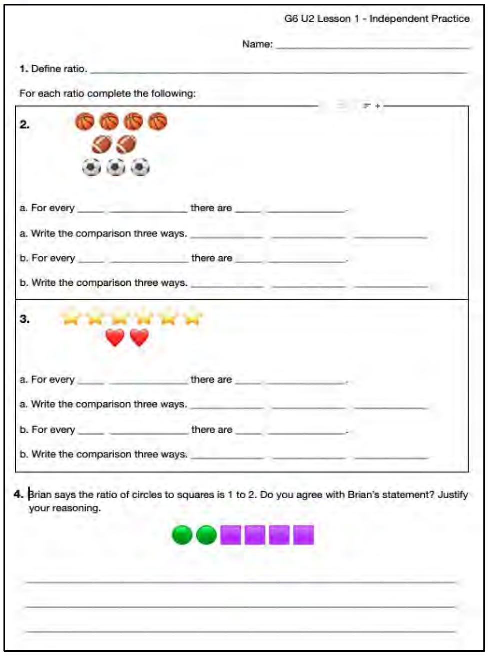
On your Own:

Now it's time to explore using ratio language on your own.



G6 U2 Lesson 1 - Independent Practice

Name: ______________________

1. Define ratio. ______________________________

For each ratio complete the following:

2. 🏀 🏀 🏀 🏀
🏈 🏈
⚽ ⚽ ⚽

a. For every ____ __________ there are ____ __________.

a. Write the comparison three ways. __________ __________ __________

b. For every ____ __________ there are ____ __________.

b. Write the comparison three ways. __________ __________ __________

3. ⭐ ⭐ ⭐ ⭐ ⭐ ⭐
❤️ ❤️

a. For every ____ __________ there are ____ __________.

a. Write the comparison three ways. __________ __________ __________

b. For every ____ __________ there are ____ __________.

b. Write the comparison three ways. __________ __________ __________

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.

● ● ■ ■ ■ ■

____

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Name: ___________________________________ G6 U2 Lesson 1 - Let’s Try It

Alex recorded the types of vehicles that passed his home yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:

KEY	**Observations**
Bus 🚌	🚌 🚌
Car 🚙	🚙 🚙 🚙 🚙 🚙 🚙 🚙 🚙
Truck 🚛	🚛 🚛 🚛 🚛

Complete each ratio statement. Write each comparison three different ways.

1. Cars to trucks - For every _____ cars there are _____ trucks.

______________ ______________ ______________

2. Truck to cars - For every _____ truck there are _____ cars.

______________ ______________ ______________

3. Buses to trucks - For every _____ buses there are _____ trucks.

______________ ______________ ______________

4. Buses to cars - For every _____ buses there are _____ cars.

______________ ______________ ______________

Remember that there are sometimes more than one way to write the same ratio or comparison. Regroup the vehicles. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every **4** cars there are _____ trucks.

______________ ______________ ______________

6. Trucks to cars - For every _____ cars there are _____ trucks.

______________ ______________ ______________

7. Buses to cars - For every _____ bus there are _____ cars.

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______________ ______________ ______________

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Name: ________________________________ G6 U2 Lesson 1 - Independent Work

1. Define ratio. ____

For each ratio complete the following:

2.

a. For every _____ ______________ there are _____ ______________.

a. Write the comparison three ways. ______________ ______________ ______________

b. For every _____ ______________ there are _____ ______________.

b. Write the comparison three ways. ______________ ______________ ______________

3.

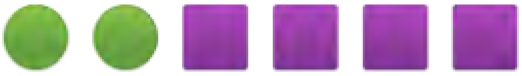
a. For every _____ ______________ there are _____ ______________.

a. Write the comparison three ways. ______________ ______________ ______________

b. For every _____ ______________ there are _____ ______________.

b. Write the comparison three ways. ______________ ______________ ______________

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.



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Alex recorded the types of vehicles that passed his home yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:

KEY	Observations
Bus 🚌	🚌 🚌
Car 🚙	🚙 🚙 🚙 🚙 🚙 🚙 🚙 🚙
Truck 🚚	🚚 🚚 🚚 🚚

Complete each ratio statement. Write each comparison three different ways.

1. Cars to trucks - For every 8 cars there are 4 trucks.

8:4 8 to 4 $\frac{8}{4}$

2. Truck to cars - For every 4 truck there are 8 cars.

4:8 4 to 8 $\frac{4}{8}$

3. Buses to trucks - For every 2 buses there are 4 trucks.

2:4 2 to 4 $\frac{2}{4}$

4. Buses to cars - For every 2 buses there are 8 cars.

2:8 2 to 8 $\frac{2}{8}$

Remember that there are sometimes more than one way to write the same ratio or comparison. Regroup the vehicles. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every **4** cars there are 2 trucks.

8÷2= 4 4÷2= 2 4:2 4 to 2 $\frac{4}{2}$

6. Trucks to cars - For every 2 cars there are 1 trucks.

4÷4= 1 8÷4= 2 2:1 2 to 1 $\frac{2}{1}$

7. Buses to cars - For every 1 bus there are 4 cars.

2÷2= 1 8÷2= 4 1:4 1 to 4 $\frac{1}{4}$

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Name: ______________________ G6 U2 Lesson 1 - Independent Practice

1. Define ratio. A comparison between two different quantities.

For each ratio complete the following:

2.

(answers will vary)

a. For every 2 footballs there are 3 soccer balls.

a. Write the comparison three ways. 2 : 3 2 to 3 $\frac{2}{3}$

b. For every 3 soccer balls there are 4 basketballs.

b. Write the comparison three ways. 3 : 4 3 to 4 $\frac{3}{4}$

3.

(answers will vary)

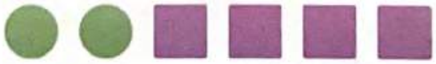
a. For every 2 hearts there are 6 stars.

a. Write the comparison three ways. 2 : 6 2 to 6 $\frac{2}{6}$

b. For every 6 stars there are 2 hearts.

b. Write the comparison three ways. 6 : 2 6 to 2 $\frac{6}{2}$

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.



Yes, I agree with Brian's statement. If you make groups you could put 1 circle and 2 squares in each group.

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G6 U2 Lesson 2

Draw a diagram that represents a ratio and explain what the diagram means

G6 U2 Lesson 2 - Students will construct a diagram to represent a ratio

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In this unit's first lesson we learned that ratios are a comparison of quantities or amounts. We looked at groupings of quantities and determined how they compared to one another based on the amount on each group–like cowboys and clowns. Today we will continue comparing quantities and writing ratios but will also use diagrams to represent our ratios. Remember, when we say we are comparing quantities we are looking to see how things are alike and how they are different.

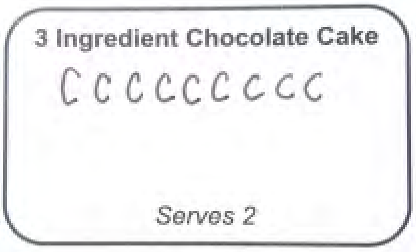
Let's Talk (Slide 3): Let's brainstorm…**have you ever used a recipe to cook or bake? How would you describe the components or parts of a recipe?** Possible Student Answers, Key Points:

- Recipes have ingredients and a specific amount for each ingredient
- Recipes have number amounts for each ingredient
- Recipes give directions for cooking, temperature for the oven, etc.
- Recipes get messed up if you don't follow the directions.

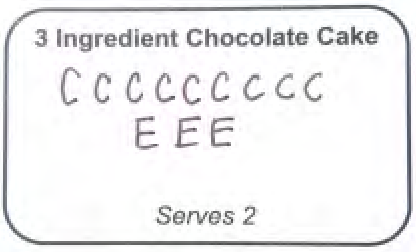
We may have some future chefs in our group! A recipe has a list of ingredients, the temperature to cook or bake the food, specific amounts of ingredients that need to be put together to make a food dish, and even lists the number of servings in a dish. Guess what? Recipes are actually based on ratios. We'll explore ratios through a recipe in today's lesson.

Let's Think (Slide 4): A great way to compare ratio quantities is with diagrams. A diagram is a visual representation that shows the relationship or connection between information. In the last lesson, we started with pictures of objects, in this lesson we will work with written statements of quantities or amounts–like recipes! Visual diagrams can be made to represent information.

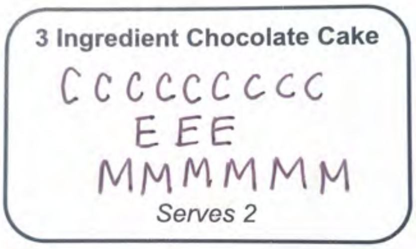
For example, in this recipe, if we know the original amount of ingredients you can construct your diagrams. Let's look at this recipe for 3 Ingredient Chocolate Cake that has a serving size of 2 people; the ingredients are listed: *(read the recipe aloud).*



Let's make a diagram to represent the ingredients in our recipe. First we need a key or code for our diagram. Let's use C to represent chocolate chips, E to represent eggs, and M to represent milk. We will include 9 Cs on our diagram because the recipe says we need 9 ounces of chocolate chips and we are using C to represent chocolate chips.



How many Es should we include on our diagram and how do you know? 3 Es because there are 3 eggs. Correct. The recipe says we need 3 large eggs so let's put 3 Es below our 9 Cs in our diagram .



Our last ingredient in our recipe is milk. We'll use M to represent the milk needed for the recipe. The recipe calls for 6 tablespoons of milk so let's write 6 Ms under the 3 eggs we just include on the diagram/

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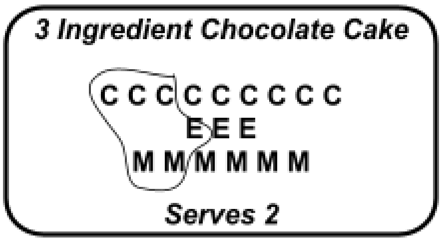
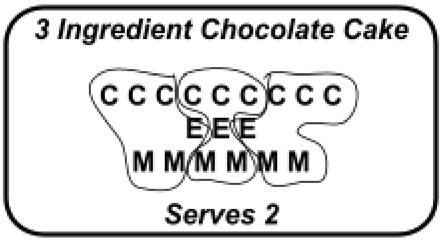
This diagram we completed represents the recipe's ingredient amounts. What could we add to the diagram if we wanted to make it easier for people to understand the ingredients needed? The units of measure like ounces for the chocolate chips and tablespoon for the milk or a key for the codes that are used. Great ideas! If a person read the ingredients as it's currently written on our diagram they would need to guess about the 3 ingredients needed to make the cake. They may guess correctly or they may not. By adding the measurement units and a key anyone could understand which ingredients they needed. But, we won't be adding those things to our diagram though since no one is actually going to be making the cake.

Let's Think (Slide 5): Before we manipulate our recipe, let's look at our ratio of ingredients. Remember, we have to say the ratio in the order that we were asked. So, our ratio of eggs to chocolate chips to milk is 3 to 9 to 6 or 3:9:6. But just like in our last lesson, we can make groups of smaller quantities or amounts.



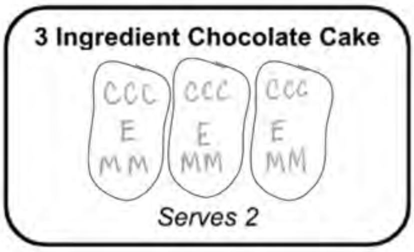
Let's analyze our diagram further by grouping the ingredients to make smaller, equal groups of ingredients. One reason to make smaller, equally-sized groups of ingredients is to make a smaller size cake if you didn't necessarily need a cake that is the size of the cake in the original recipe.

Is there a way to make smaller, equally-sized groups of ingredients? Well, we see that for every 3 ounces of chocolate chips I need 1 egg and 2 tablespoons of milk so that will form my first group *(circle that complete group of ingredients).*



Let's continue making complete groups of ingredients that each include 3 ounces of chocolate chips, 1 egg, and 2 tablespoons of milk.

Are there any ingredients left outside of a group? No. Nice, so that means we split our recipe ingredients evenly into groups. If we had ingredients left over or outside of a group then that would mean the number of ingredients that made up a group was incorrect and we would need to start over with grouping our ingredients.



I'm going to make our diagram look more clear and more organized *(redraw).* Now that it's more organized, we can look for the ratio of eggs to chocolate chips to milk and clearly see that in addition to our original ratio of 3:9:6 we also have a ratio of 1:3:2 meaning we need 1 large egg to 3 ounces chocolate chips to 2 tablespoons of milk to make our delicious chocolate cake.

One of the most important things to remember when making smaller groups of ratios is that the groups must all have the same quantity or amount inside. We call that being "within ratio." If you ever group quantities and have any left over then you are no longer within ratio and need to regroup. We will continue building on this concept of ratios based on the quantity or amount in a group in upcoming lessons.

Let's Try it (Slide 6): Let's continue comparing quantities and using diagrams to represent ratios. Remember that when we construct our diagrams from the original ratio we need to split the quantity evenly between our groups–every group has to have the exact same thing!

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WARM WELCOME

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Today we will construct diagrams to represent ratios.

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Let's Talk:

Have you ever used a recipe to cook or bake?

How would you describe the components or parts of a recipe?

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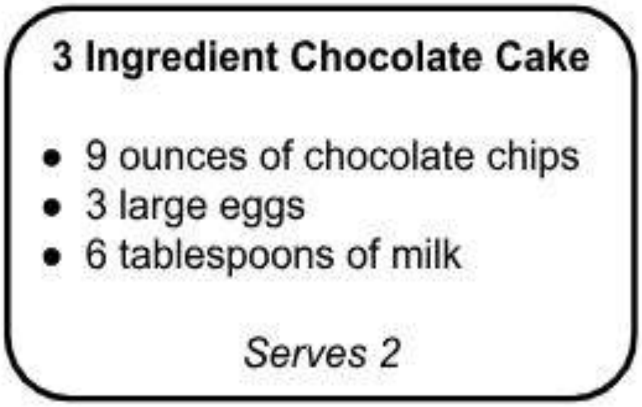
Let's Think:

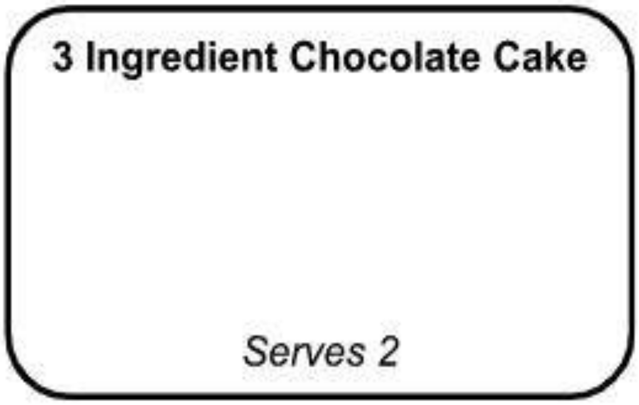
Let's draw a diagram to represent the ratio of chocolate chips to eggs to milk.



3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2



3 Ingredient Chocolate Cake

Serves 2

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Let's Think:

Can we write another ratio to represent the same quantities?

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

C C C C C C C C C
E E E
M M M M M M

Serves 2

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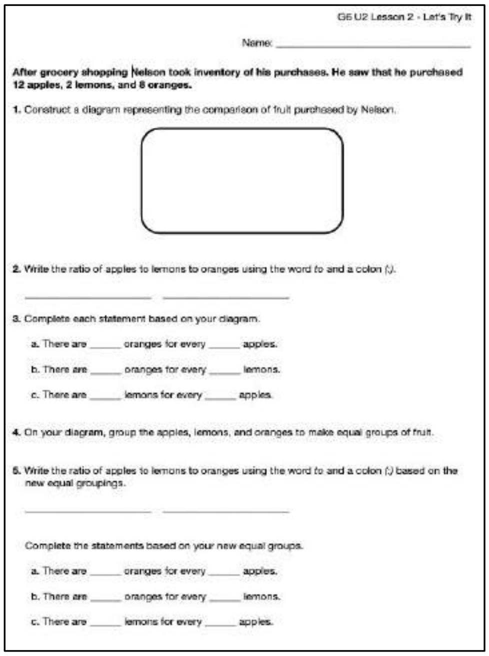
Let's Try It:

Let's explore constructing ratio diagrams together.



G6 U2 Lesson 2 - Let's Try It

Name: ______________________

After grocery shopping Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.

2. Write the ratio of apples to lemons to oranges using the word *to* and a colon (:).

______________ ______________

3. Complete each statement based on your diagram.

a. There are ______ oranges for every ______ apples.
b. There are ______ oranges for every ______ lemons.
c. There are ______ lemons for every ______ apples.

4. On your diagram, group the apples, lemons, and oranges to make equal groups of fruit.

5. Write the ratio of apples to lemons to oranges using the word *to* and a colon (:) based on the new equal groupings.

______________ ______________

Complete the statements based on your new equal groups.

a. There are ______ oranges for every ______ apples.
b. There are ______ oranges for every ______ lemons.
c. There are ______ lemons for every ______ apples.

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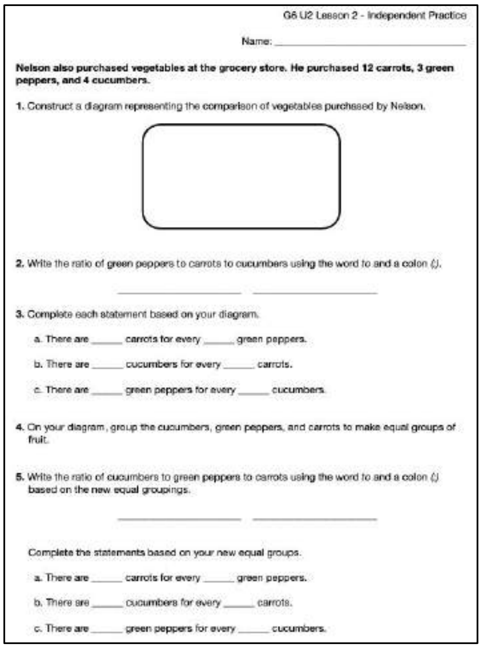
On your Own:

Now it’s time to explore constructing ratio diagrams on your own.



G6 U2 Lesson 2 - Independent Practice

Name: ______________________________

Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 4 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon (:).

__________________ __________________

3. Complete each statement based on your diagram.

   a. There are _____ carrots for every _____ green peppers.

   b. There are _____ cucumbers for every _____ carrots.

   c. There are _____ green peppers for every _____ cucumbers.

4. On your diagram, group the cucumbers, green peppers, and carrots to make equal groups of fruit.

5. Write the ratio of cucumbers to green peppers to carrots using the word *to* and a colon (:) based on the new equal groupings.

__________________ __________________

Complete the statements based on your new equal groups.

   a. There are _____ carrots for every _____ green peppers.

   b. There are _____ cucumbers for every _____ carrots.

   c. There are _____ green peppers for every _____ cucumbers.

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Name: ________________________________ G6 U2 Lesson 2 - Let's Try It

After grocery shopping, Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.

2. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)*.

_____________________ _____________________

3. Complete each statement based on your diagram.

a. There are ______ oranges for every ______ apples.

b. There are ______ oranges for every ______ lemons.

c. There are ______ lemons for every ______ apples.

4. On your diagram, group the lemons, apples, and oranges to make equal groups of fruit.

5. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)* based on the new equal groupings.

_____________________ _____________________

6. Complete the statements based on your new equal groups.

a. There are ______ orange(s) for every ______ apple(s).

b. There are ______ orange(s) for every ______ lemon(s).

c. There are ______ lemon(s) for every ______ apple(s).

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Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 9 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)*.

_______________________ _______________________

3. Complete each statement based on your diagram.

a. There are ______ carrots for every ______ green peppers.

b. There are ______ cucumbers for every ______ carrots.

c. There are ______ green peppers for every ______ cucumbers.

d. There are ______ cucumbers for every ______ green peppers.

4. On your diagram, group the green peppers, carrots and cucumbers to make equal groups of fruit.

5. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)* based on the new equal groupings.

_______________________ _______________________

6. Complete the statements based on your new equal groups.

a. There are ______ carrot(s) for every ______ green pepper(s).

b. There are ______ cucumber(s) for every ______ carrot(s).

c. There are ______ green pepper(s) for every ______ cucumber(s).

d. There are ______ cucumber(s) for every ______ green pepper(s).

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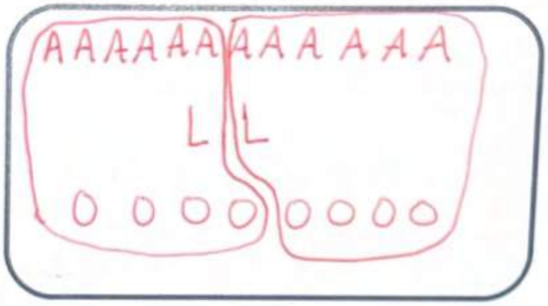
Name: ______________________ G6 U2 Lesson 2 - Let's Try It

After grocery shopping, Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.



L : A : O

2. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)*.

2 : 12 : 8 2 to 12 to 8

3. Complete each statement based on your diagram.

a. There are 8 oranges for every 12 apples.

b. There are 8 oranges for every 2 lemons.

c. There are 2 lemons for every 12 apples.

4. On your diagram, group the lemons, apples, and oranges to make equal groups of fruit.

See diagram above.

L : A : O

5. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)* based on the new equal groupings.

1 : 6 : 4 1 to 6 to 4

6. Complete the statements based on your new equal groups.

a. There are 4 orange(s) for every 6 apple(s).

b. There are 4 orange(s) for every 2 lemon(s).

c. There are 1 lemon(s) for every 6 apple(s).

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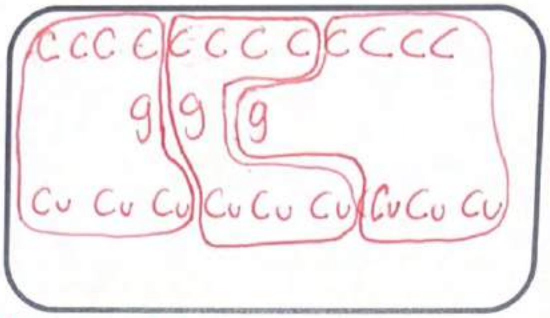
Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 9 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.



g : C : CU

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)*.

3 : 12 : 9 ______ 3 to 12 to 9 ______

3. Complete each statement based on your diagram.

a. There are 12 carrots for every 3 green peppers.

b. There are 9 cucumbers for every 12 carrots.

c. There are 3 green peppers for every 9 cucumbers.

d. There are 9 cucumbers for every 3 green peppers.

4. On your diagram, group the green peppers, carrots and cucumbers to make equal groups of fruit.

See diagram above.

g : C : CU

5. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)* based on the new equal groupings.

1 : 4 : 3 ______ 1 to 4 to 3 ______

6. Complete the statements based on your new equal groups.

a. There are 4 carrot(s) for every 1 green pepper(s).

b. There are 3 cucumber(s) for every 4 carrot(s).

c. There are 1 green pepper(s) for every 3 cucumber(s).

d. There are 3 cucumber(s) for every 1 green pepper(s).

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G6 U2 Lesson 3

Write equivalent ratios and explain why two ratios are equivalent or not equivalent

CITYTUTOR DC

G6 U2 Lesson 3 - Students will write equivalent ratios and explain why two ratios are or are not equivalent

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we continued comparing quantities and writing ratios but we incorporated making diagrams to represent our ratios. We recall that ratios are comparisons of quantities or amounts and they can be written using the “to,” with a colon, and as a fraction. Today we will use that knowledge of ratios and models to make equivalent ratios.

Let’s Talk (Slide 3): Let’s brainstorm…I just told you that today we’ll be working with equivalent ratios. We’ve heard the word “equivalent” a lot in our math careers. So, **what does equivalent mean? Give an example.** Possible Student Answers, Key Points:

- Equivalent means two things are the same.
- Equivalent means things are equal.
- For example, 2 and 2 are equivalent to 4.
- Another example is ½ is equivalent to 2/4.

Nice thinking! Equivalent means that two or more things are the same or equal! And you all have known the word equivalent since early elementary school. You worked on finding equivalent numbers and then equivalent fractions. So, today we’re going to extend what we know about equivalence to what we know about ratios.

Let’s Think (Slide 4): Before we get into exploring equivalent ratios, I want to come back to what we were talking about yesterday. Yesterday we worked with the 3 Ingredient Chocolate Cake recipe, I want to talk about why recipes are important. So, **why do you think recipes are important? What would happen if we didn’t follow the recipe?** Possible Student Answers, Key Points:

- The food wouldn’t taste right, it would be too sweet or too salty.
- The proportions would be all messed up, like too many chocolate chips or too much egg.

That’s right, recipes are important because the food doesn’t taste right if we don’t follow them. Recipes tell us exactly how much of each thing to put in so that the food is balanced. That’s going to be important to our work today.

Let’s Think (Slide 5): Let’s revisit our 3 Ingredient Chocolate Cake recipe from the last lesson. Many people choose to use a recipe exactly as it’s written. But, I see that this recipe says “SERVES 2” *(point),* but what if I want to make a cake for more than two people? For example, what if I want to make this cake for four people. I can’t just dump more of each ingredient in because it won’t taste right. I have to use the same ratio of ingredients so that it tastes right.

Another example of this is that restaurants often need to change a recipe to make more food because they need to make a lot of food to serve their customers. Using ratios, a restaurant can increase the amount of each ingredient to make larger batches of food at one time.

Let’s Think (Slide 6): We know that we can construct diagrams to represent ratios. Let’s think about how we can use a diagram to help us make a larger cake. But remember, the amount of the new ingredients needs to be within ratio of the original amount of each ingredient. Our recipe from our last lesson said that our cake needs 9 ounces of chocolate chips, 3 large eggs, and 6 tablespoons of milk. And. when we look at the bottom this recipe only serves 2 people.

So, if we want to serve 4 people we need to increase the recipe. Let’s construct a diagram to help us decide how much of each ingredient we will need to serve 4 people instead of 2 people. Yesterday, we used a key or code in the last lesson. We used C to represent chocolate chips, E to represent eggs, and M to represent milk in our diagram. Let’s continue using that key to create a diagram

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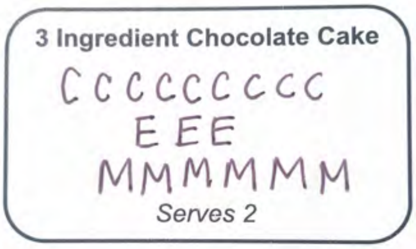
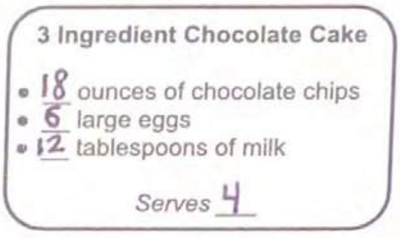
So we know that one cake serves two people and we want a cake that will serve four people, that means we need to DOUBLE our cake. So we need two times as many ingredients.



One recipe calls for 9 ounces chocolate chips, 3 eggs, and 6 tablespoons of milk. So, I will use my key to draw a digram to represent one recipe.

But, I need to double it. So I need to do the same amount of chocolate chips, eggs, and milk AGAIN. Remember, we have to use the same ratio to make sure that the cake tastes right.



3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

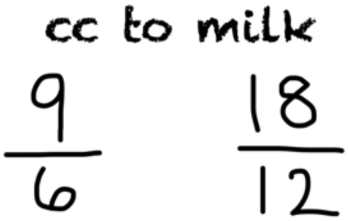
Serves 4

And now, figure out how much that is of each ingredient altogether. So I needed 9 ounces of chocolate chips and another 9, which is 18. I needed 3 eggs and another 3 eggs, that makes 6 eggs in total. And finally, I needed 6 tablespoons of milk and another 6 so that makes 12 tablespoons of milk in all.
And since we double the recipe, that means this new cake can serve twice as many people, so it serves 4!

If we use 18 ounces of chocolate chips, 6 large eggs, and 12 tablespoons of milk will the chocolate cake taste the same as when we use 9 ounces of chocolate chips, 3 eggs, and 6 tablespoons of milk? Yes because all we did was double the recipe. Absolutely! The cake will taste the same because we increased the ingredients within ratio of the original recipe instead of just adding more ingredients randomly.

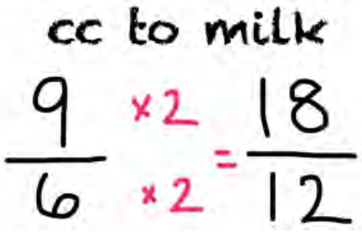
Let's Think (Slide 7): We know that another way to represent ratios is with fractions and you all already told me that we can write equivalent fractions. Remember, equivalent fractions are fractions that take up the same amount of space but have different numerators and denominators.

So, we can also construct equivalent fractions to determine other ratios or ingredients. In the case of our cake, we originally had a ratio of 9 ounces of chocolate chips to 6 tablespoons of milk.



As a fraction that would be 9/6. When we increased the ingredients in the recipe our ratio of chocolate chips to milk became 18/12.

When we look at the two fractions, we see that they are equivalent to one another.



We doubled the recipe so if we multiply 9, the amount of chocolate chips by 2 and 6, the amount of milk, by 2 the new fraction is 18/2. We created equivalent fractions, or in this case, equivalent ratios! We multiplied the numerator and denominator by the same amount.

We can use this idea to find equivalent ratios. For example, if we wanted to TRIPLE the recipe and make a cake that serves…2 and 2 and 2…6 people! We could just multiply all of the ingredients by 3.

We have learned two ways to find equivalent ratios so far, diagrams and equivalent fractions; we still have lots more to learn about ratios as we progress through this unit and the next unit. One thing to keep in mind as we continue working with equivalent fractions is that you must multiply both the numerator and the denominator of a fraction by the same factors in order to achieve equivalency.

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Let's Try it (Slide 8-9): Let's continue comparing quantities and using diagrams to create equivalent ratios. Remember that when we construct our diagrams from the original ratio we make exact copies of that original ratio to continue our diagram model.

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WARM WELCOME

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Today we will write equivalent ratios.

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Let's Talk:

What does equivalent mean?
Give an example.

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Let's Think:

Why are recipes important?

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Let’s Think:

How can I make the same cake but for FOUR people?

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

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Let’s Think:

Let’s double our recipe using a diagram.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

Serves 2

+

3 Ingredient Chocolate Cake

Serves 2

=

3 Ingredient Chocolate Cake

- __ ounces of chocolate chips
- __ large eggs
- __ tablespoons of milk

Serves ___

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Let's Think:

Let's think about equivalent fractions to represent ratios.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

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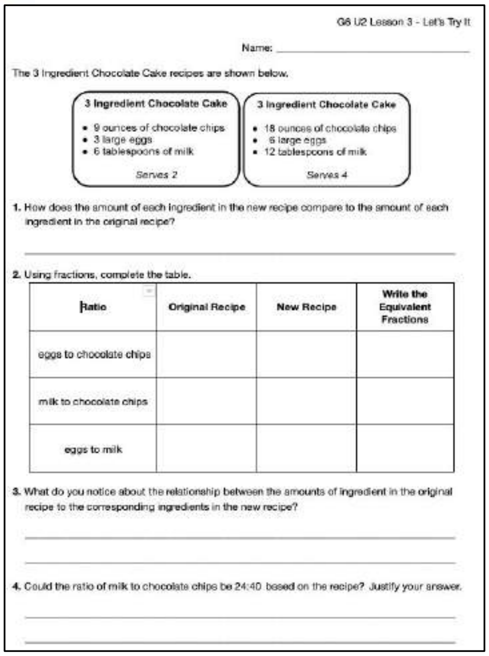
Let's Try It:

Let's explore equivalent ratios together.



G6 U2 Lesson 3 - Let's Try It

Name: ______________________

The 3 Ingredient Chocolate Cake recipes are shown below.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

Serves 4

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

____

2. Using fractions, complete the table.

Ratio	Original Recipe	New Recipe	Write the Equivalent Fractions
eggs to chocolate chips			
milk to chocolate chips			
eggs to milk			

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

____

____

4. Could the ratio of milk to chocolate chips be 24:40 based on the recipe? Justify your answer.

____

____

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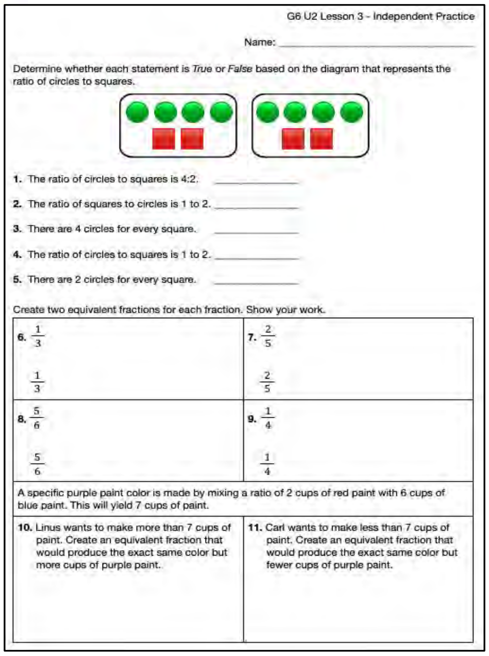
On your Own:

Now it’s time to explore equivalent ratios on your own.



G6 U2 Lesson 3 - Independent Practice

Name: ______________________

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.

1. The ratio of circles to squares is 4:2. ____________

2. The ratio of squares to circles is 1 to 2. ____________

3. There are 4 circles for every square. ____________

4. The ratio of circles to squares is 1 to 2. ____________

5. There are 2 circles for every square. ____________

Create two equivalent fractions for each fraction. Show your work.

6. $\frac{1}{3}$ $\frac{1}{3}$	**7.** $\frac{2}{5}$ $\frac{2}{5}$
8. $\frac{5}{6}$ $\frac{5}{6}$	**9.** $\frac{1}{4}$ $\frac{1}{4}$

A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 7 cups of paint.

10. Linus wants to make more than 7 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint.	**11.** Carl wants to make less than 7 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint.

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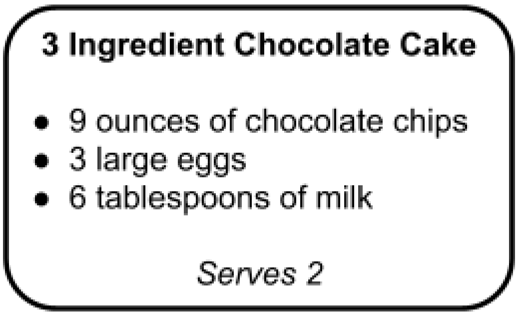
Name: ____________________________________

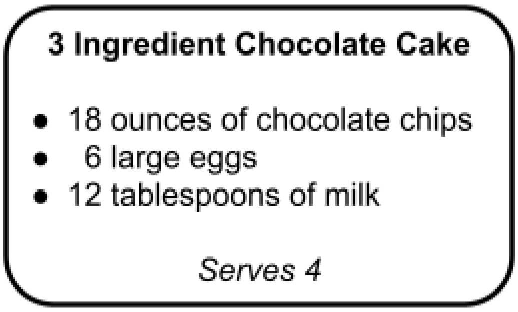
The 3 Ingredient Chocolate Cake recipes are shown below.



3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2



3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

Serves 4

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

____

2. Write each ratio as a fraction. Complete the table.

Ratio	Original Recipe	New Recipe	Write the Equivalent Fractions
eggs to chocolate chips			
milk to chocolate chips			
eggs to milk			

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

____

____

4. Could the ratio of milk to chocolate chips be 24:45 based on the recipe? Justify your answer.

____

____

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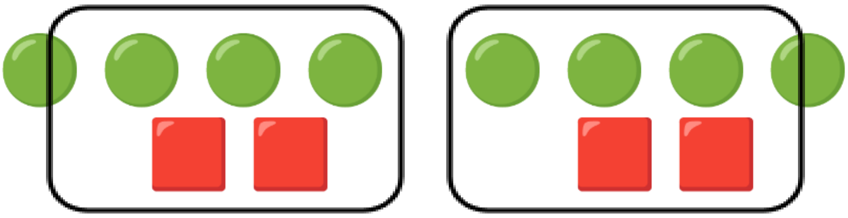
Name: ______________________________ G6 U2 Lesson 3 - Independent Practice

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.



1. The ratio of circles to squares is 4:2. _____________

2. The ratio of squares to circles is 1 to 2. _____________

3. There are 4 circles for every square. _____________

4. The ratio of circles to squares is 1 to 2. _____________

5. There are 2 circles for every square. _____________

Create two equivalent fractions for each fraction. Show your work.

<table>
<tr><td>6. $\frac{1}{3}$ $\frac{1}{3}$</td><td>7. $\frac{2}{5}$ $\frac{2}{5}$</td></tr>
<tr><td>8. $\frac{5}{6}$ $\frac{5}{6}$</td><td>9. $\frac{1}{4}$ $\frac{1}{4}$</td></tr>
<tr><td colspan="2">A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 8 cups of paint.</td></tr>
<tr><td>10. Linus wants to make more than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint.</td><td>11. Carl wants to make less than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint.</td></tr>
</table>

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Name: ______________________________ G6 U2 Lesson 3 - Let's Try It

The 3 Ingredient Chocolate Cake recipes are shown below.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

Serves 4

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

The new recipe's ingredients are double the original recipe's.

2. Write each ratio as a fraction. Complete the table.

Ratio	Original Recipe	New Recipe	Write the Equivalent Fractions
eggs to chocolate chips	$\frac{3}{9}$	$\frac{6}{18}$	$\frac{3}{9} = \frac{6}{18}$
milk to chocolate chips	$\frac{6}{9}$	$\frac{12}{18}$	$\frac{6}{9} = \frac{12}{18}$
eggs to milk	$\frac{3}{6}$	$\frac{6}{12}$	$\frac{3}{6} = \frac{6}{12}$

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

The ingredients in the original recipe are half the Corresponding ingredients in the new recipe.

4. Could the ratio of milk to chocolate chips be 24:45 based on the recipe? Justify your answer.

$\frac{6}{9} \neq \frac{24}{25}$. No because milk is 4 times the amount while Choco. chips are 5 times the amount. So the ratios aren't equivalent.

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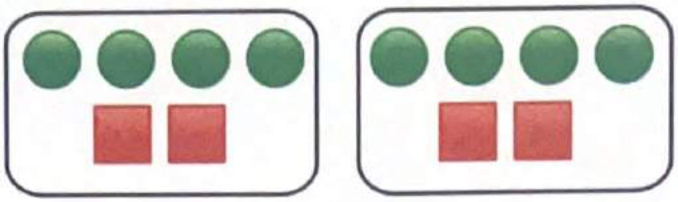
Name: ______________________________

G6 U2 Lesson 3 - Independent Practice

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.



1. The ratio of circles to squares is 4:2. True
2. The ratio of squares to circles is 1 to 2. True
3. There are 4 circles for every square. False
4. The ratio of circles to squares is 1 to 2. False
5. There are 2 circles for every square. True

Create two equivalent fractions for each fraction. Show your work. (answers will vary)

6. $\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$ $\frac{1}{3} \times \frac{6}{6} = \frac{6}{18}$	**7.** $\frac{2}{5} \times \frac{9}{9} = \frac{18}{45}$ $\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$
8. $\frac{5}{6} \times \frac{3}{3} = \frac{15}{18}$ $\frac{5}{6} \times \frac{5}{5} = \frac{25}{30}$	**9.** $\frac{1}{4} \times \frac{6}{6} = \frac{6}{24}$ $\frac{1}{4} \times \frac{9}{9} = \frac{9}{36}$
A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 8 cups of paint.	
10. Linus wants to make more than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint. (answers will vary) $\frac{\text{red}}{\text{blue}} = \frac{2}{6} \times \frac{3}{3} = \frac{6}{18}$ $6 + 18$ 24 cups of paint 6 cups of red & 18 cups of blue paint.	**11.** Carl wants to make less than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint. (answers will vary) $\frac{\text{red}}{\text{blue}} = \frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$ $1 + 3$ 4 cups of paint 1 cup of red & 3 cups of blue paint

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G6 U2 Lesson 4

Use double number line diagrams to find and represent equivalent ratios

CITYTUTOR DC

G6 U2 Lesson 4 - Students will use double number lines to find and represent equivalent ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we explored creating and identifying equivalent ratios using diagrams and equivalent fractions. Today we will explore another model for visually representing ratios. This model is called a “double number line.” Although we are working with ratios using a new model, everything we learned in our first few lessons will still apply; the order of your ratio still matters and we must still create equivalent ratios.

Let’s Talk (Slide 3): Let’s open by studying an image. **What do you notice and wonder about the image on this slide?** Possible Student Answers, Key Points:

- There are two number lines, one is hovering above the other.
- The tick marks are the exact same size and they are perfectly lined up.
- They both start at 0 but nothing is labeled.
- I wonder what each tick represents and how we can fill out the number line.

Good observations! This is a double number line! This is a tool that we’ll use today to find equivalent ratios. And you’re right, a double number line has two number lines and looks like one is hovering or floating above the other. Each number line has tick marks that align perfectly with the tick marks on the other number line. You all also noticed that the tick marks on a number line are equally spaced.

Let’s Think (Slide 4): So, let’s think back to our last lesson. What are the two ways we know how to find equivalent ratios? We used a diagram and we used equivalent fractions! We multiplied the numerator and denominator by the same number. That’s exactly what we did! We began by making a ratio in fraction form. The next step was to multiply the numerator and denominator by the same number or factor.

$$\frac{2}{5}$$

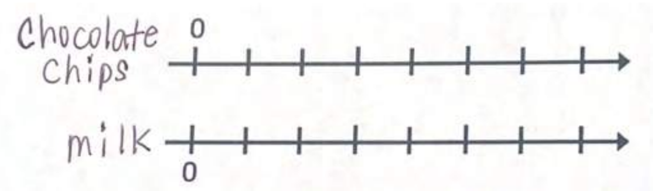
Let’s look at an example. We want to create an equivalent ratio for 2:5, we read that as two to five. For example the ratio of 2 eggs for every 5 cups of flour, in other words 2 to 5. Another way to write that ratio is as a fraction, two is the numerator and 5 is the denominator.

$$\frac{2 \times 6}{5 \times 6} = \frac{12}{30}$$

We can create equivalent ratios by multiplying the numerator and the denominator by the same factor. If we were to increase by a factor of 6 we would multiply the numerator, 2, by 6 to get 12. And multiply the denominator, 5, by 6 to get 30. So if we use 12 eggs, we’d need to use 30 cups of flour!

This knowledge will come in handy today as we add to prior learning with double number lines. You already know regular number lines are labeled in equal increments from your previous years in math. Let’s continue creating those equal increments and introduce using the information from diagrams and written statements to construct our double number lines.

Let’s Think (Slide 5): Revisiting our 3 Ingredient Chocolate Cake recipe we can use a double number line to find equivalent ratios of ingredients. Let’s give it a try. We can use the double number line to determine how many ounces of chocolate chips and how much milk we would need to make enough cake to serve a different number of people, other than the 2 people that the original recipe serves.



Let’s start by labeling each number line. Since we are looking to determine the ratio of chocolate chips to milk, we use chocolate chips and milk as our labels *(label).*

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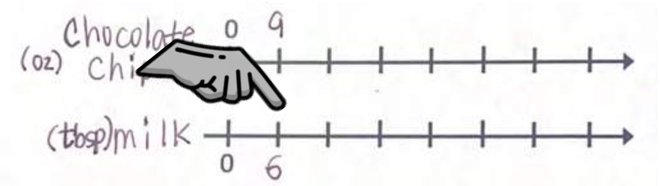
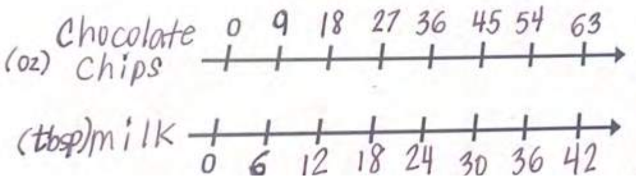


Next we notice each number line starts with 0. The recipe tells us that we use 9 ounces of chocolate chips for every 6 tbsp of milk to make our cake. So we label 9 on the chocolate chips number line and 6 on the tick mark directly below that location on the milk number line. This makes sense because to make 1 recipe we need 9 ounces of chocolate chips and 6 tablespoons of milk (*point).*



We continue the double number line by skip counting from 9 for the chocolate chips and from 6 for the tablespoons of milk.

You have been using skip counting since elementary school! It's just saying our multiplication math facts in order. Let's start with 9s…9, 18, 27, 36, 45, 54, 63. And if that's hard we can always press and count on 9 more.

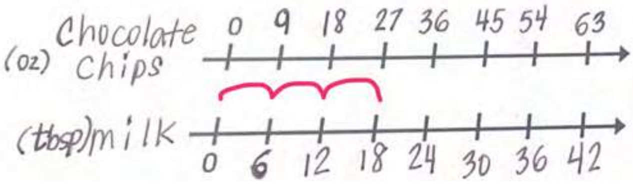
Let's do the same with our 6s…6, 12, 18, 24, 30, 36, 42.

Great work! Once our number lines are complete we are able to analyze the information of the double number line set to determine how much milk and and how many ounces of chocolate chips we'll need as we increase the recipe to serve more people. Our double number line assists us in finding equivalent ratios.

For example, if we use 27 ounces of chocolate chips, how many tablespoons of milk would you need to include so that the cake tastes the same even though you added more of each ingredient? 18 tablespoons of milk. That's right! First, we look at the double number line and we find the 27 on the chocolate chip number line. When we move straight down to the matching tick mark on the other number line we see that 18 tablespoons of milk is needed if we use 27 ounces of chocolate chips.

Now, here's a tricky question. If we use 27 ounces of chocolate chips, and 18 tablespoons of milk…**how many people could we serve with the cake?** Possible Student Answers, Key Points:

- Three people because it's three tick marks in.
- Six people because if you triple the recipe, each recipe serves 2 people.



Interesting! This is a very challenging question but we have all of the information we need. When we use 27 ounces of chocolate chips and 18 tablespoons of milk, we have done the recipe…1, 2, 3 times (*show hops on the number line*). But, each recipe serves 2 people so we can serve 6 people with this cake!

Nice work, this is just the start of using double number lines! If you can quickly recall your multiplication facts it will be easier to skip count as you fill in both number lines. The great part is that once the number lines are completed you have so much information displayed for you to analyze. As we continue constructing double number lines you will see how they can be used to find equivalent fractions that result in smaller quantities and even very large quantities compared to the original ratio.

Let's Try it (Slide 6): Let's continue using double number lines to find equivalent ratios. Constructing double number lines can seem daunting but as we continue to practice they will become an easy, useful

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tool. Remember that our tick marks keep our information organized and make the information easy to read. They should always align between both number lines.

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WARM WELCOME

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Today we will use double number lines to calculate equivalent ratios.

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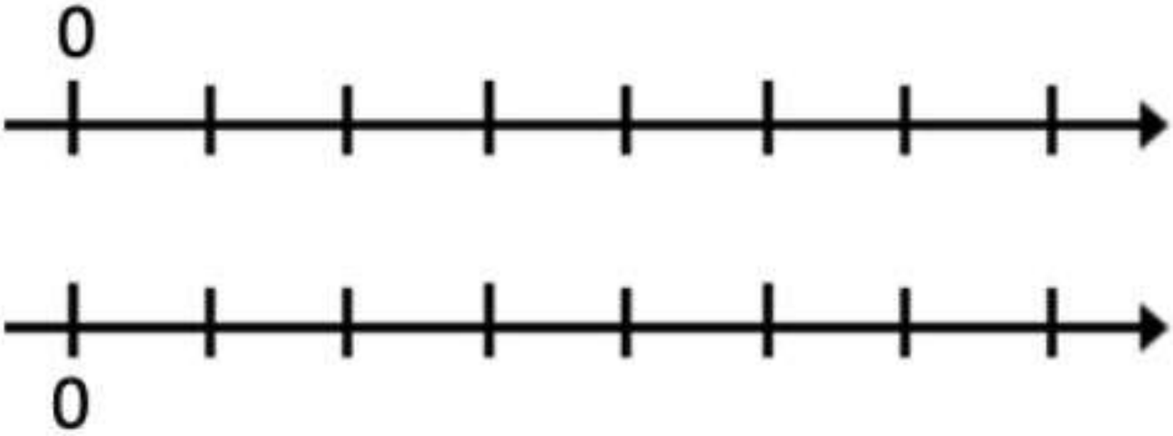
Let's Talk: What do you notice about the image below?



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Let's Think: How can we create equivalent ratio for **2:5**?

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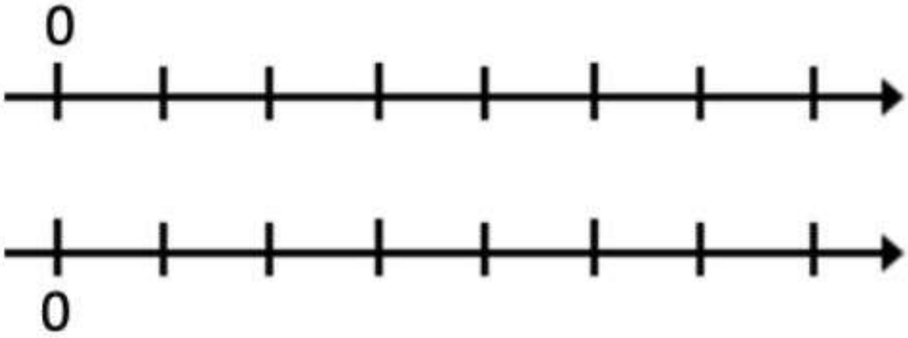
Let’s Think:

Let’s use the double number line to calculate equivalent ratios.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2



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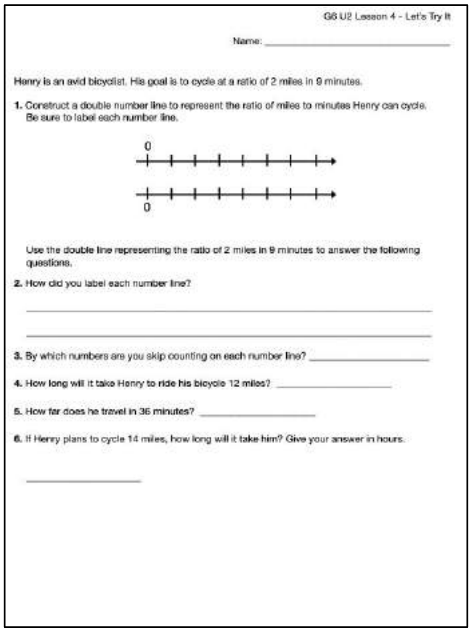
Let’s Try It:

Let’s explore constructing double number lines to calculate equivalent ratios together.



G6 U2 Lesson 4 - Let's Try It

Name: ____________________

Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle. Be sure to label each number line.

Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

____

____

3. By which numbers are you skip counting on each number line? ____________

4. How long will it take Henry to ride his bicycle 12 miles? ____________

5. How far does he travel in 36 minutes? ____________

6. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

____

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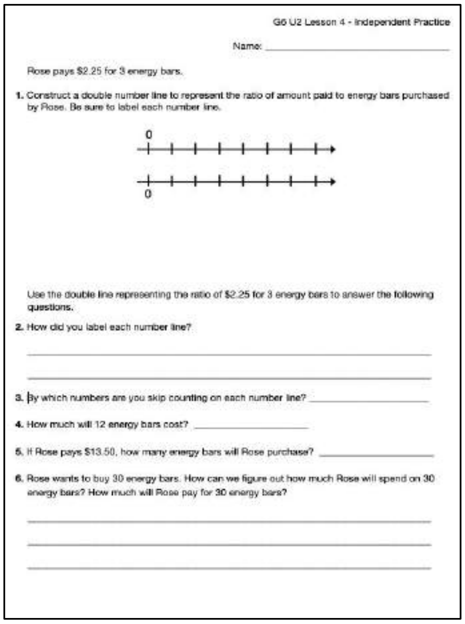
On your Own:

Now it’s time to explore constructing double number lines and equivalent ratios on your own.



G6 U2 Lesson 4 - Independent Practice

Name: ______________________

Rose pays $2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of amount paid to energy bars purchased by Rose. Be sure to label each number line.

Use the double line representing the ratio of $2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

____

____

3. By which numbers are you skip counting on each number line? ____________

4. How much will 12 energy bars cost? ____________

5. If Rose pays $13.50, how many energy bars will Rose purchase? ____________

6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

____

____

____

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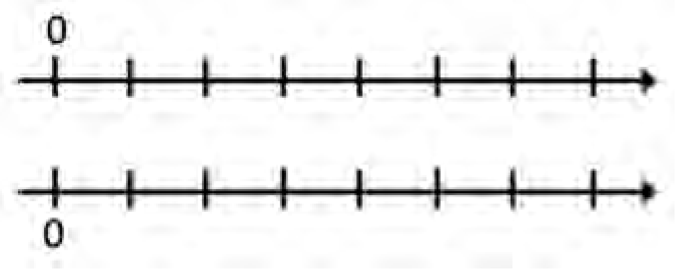
Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle.



Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

____

3. By which numbers are you skip counting on each number line? _______________________

4. How long will it take Henry to ride his bicycle 12 miles? ______________________

5. How far does he travel in 36 minutes? ______________________

6. How many more miles did Henry cycle in 45 minutes compared to 27 minutes? ____________

7. How many fewer minutes did he cycle over 6 miles compared to 14 miles? ____________

8. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

____

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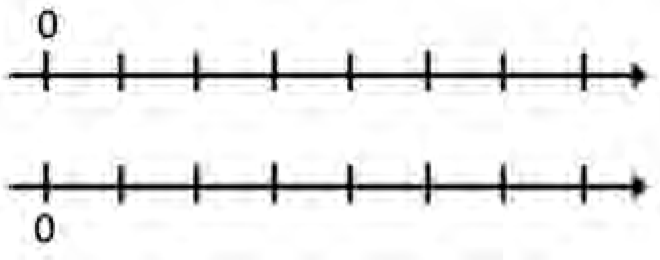
A recipe for Pico de Gallo is shown.

Pico de Gallo

2 cups tomatoes
¾ cup onion
½ cup cilantro
¼ Tbsp oregano

Yield 3 cups

9. Construct a double number line to represent the ratio of tomatoes to onions.



10. How did you label each number line?

____

11. By which numbers are you skip counting on each number line? ________________________

12. How many cups of tomatoes would be required for 2¼ cups of onions? __________________

13. How many cups of onions would you use for 10 cups of tomatoes? __________________

14. Write your own question based on the double number line. Provide the answer.

____

____

____

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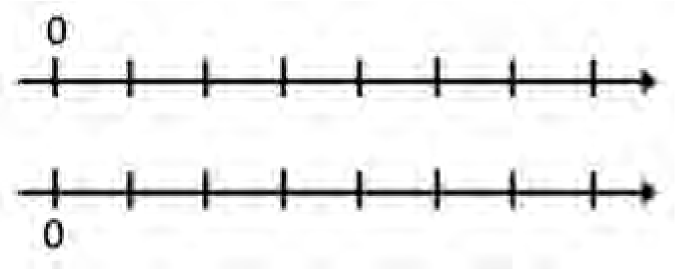
Rose pays $2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of the amount paid to energy bars purchased by Rose.



Use the double line representing the ratio of $2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

____

3. By which numbers are you skip counting on each number line? ______________________

4. How much will 12 energy bars cost? ______________________

5. If Rose pays $13.50, how many energy bars will Rose have purchased? _______________

6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

____

____

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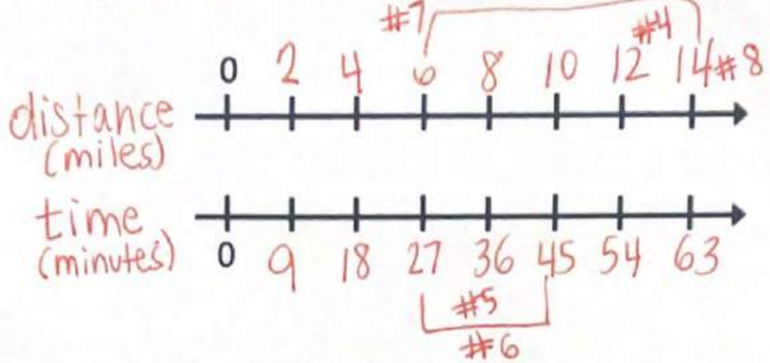
Name: ____________________

G6 U2 Lesson 4 - Let's Try It

Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle.



Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

Distance in miles & time in minutes

3. By which numbers are you skip counting on each number line? 2 & 9

4. How long will it take Henry to ride his bicycle 12 miles? 54 minutes

5. How far does he travel in 36 minutes? 8 miles

subtract

6. How many more miles did Henry cycle in 45 minutes compared to 27 minutes? 4miles

10 miles - 6miles

subtract

7. How many fewer minutes did he cycle over 6 miles compared to 14 miles? 36mins

27 mins 63mins

8. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

1 hour 3mins

63 minutes

60 + 3 mins

↓

1 houR +3 mins

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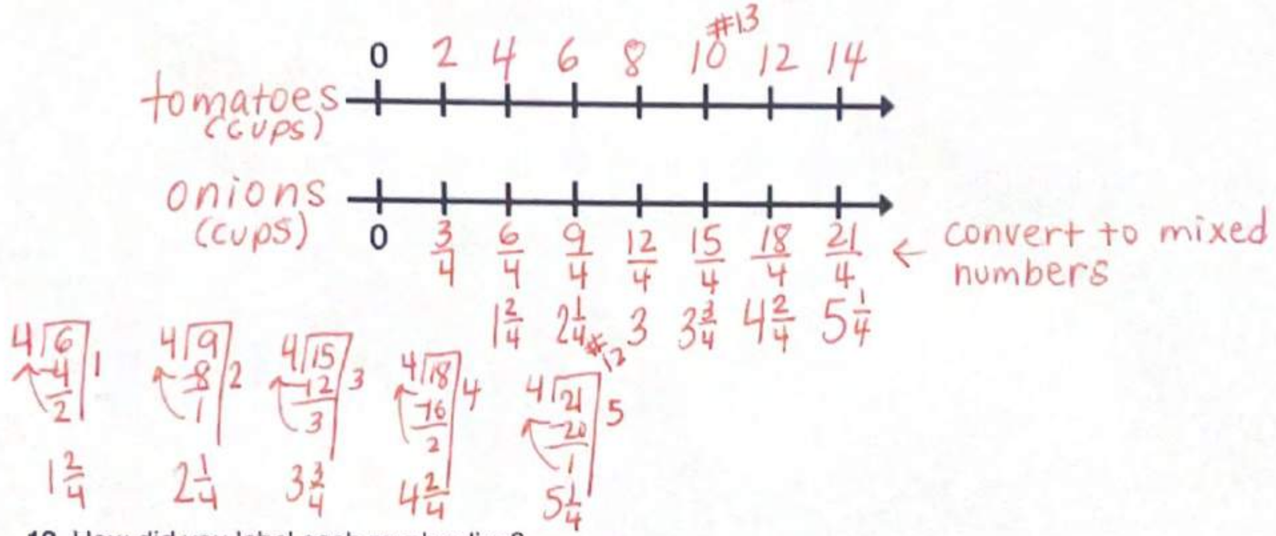
A recipe for Pico de Gallo is shown.

Pico de Gallo

2 cups tomatoes
¾ cup onion
½ cup cilantro
¼ Tbsp oregano

Yield 3 cups

9. Construct a double number line to represent the ratio of tomatoes to onions.



10. How did you label each number line?

Tomatoes in cups & onions in cups

11. By which numbers are you skip counting on each number line? $2 \,\&\, \frac{3}{4}$

12. How many cups of tomatoes would be required for 2¼ cups of onions? 6 cups

13. How many cups of onions would you use for 10 cups of tomatoes? $3\frac{3}{4}$ cups

14. Write your own question based on the double number line. Provide the answer. (answers will vary)

How many more cups of onions are needed for 8 versus 2 cups of tomatoes? $3 - \frac{3}{4} = 2\frac{1}{4}$ cup more

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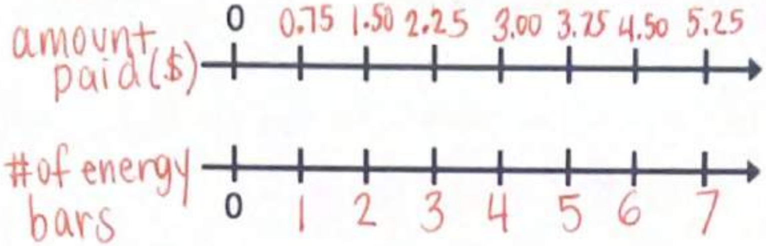
Name: ______________________________ G6 U2 Lesson 4 - Independent Practice

Rose pays $2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of the amount paid to energy bars purchased by Rose.



Use the double line representing the ratio of $2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

Amount paid in dollars & number of energy bars.

3. By which numbers are you skip counting on each number line? 1 & 0.75

3 ⟌ 2.25 → ②
-210 | 70
15 | 5
-15 | +
0 | .75 ②

4. How much will 12 energy bars cost? $9.00

Double 6 bars | OR | multiply by unit rate

4.50×2 = 9.00 | 12 × .75 = 9.00

5. If Rose pays $13.50, how many energy bars will Rose have purchased? 18 bars

.75 ⟌ 13.50 ⇒ 75 ⟌ 1350
-750 | 10
600
-600 | 8
0 | +
18

6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

Multiply 30 bars by the unit rate which is the Cost of 1 bar. 30×0.75 = $22.50

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G6 U2 Lesson 5

Use equivalent ratios to find unit prices

G6 U2 Lesson 5 - Students will use equivalent ratios to calculate unit prices

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last lesson on constructing double number lines was foundational for the ratio work ahead. We learned that double number lines have two number lines, one hovering above the other. Their tick markers are perfectly lined up to represent each ratio. This alignment is crucial to finding equivalent ratios. Today we will experience "jumping" on our number lines as opposed to always skip counting like in our previous lesson.

Let's Talk (Slide 3): I want to start with telling you about my friend Martin. Martin loves to read and he is a pretty quick reader. He can read 3 pages per minute. **If we know he can read 3 pages per minute, what else do we know?** Possible Student Answers, Key Points:

- We know that he can read 6 pages in 2 minutes.
- We know he can read 9 pages in 3 minutes.

That's right! If we know that Martin can read 3 pages per minute, or 3 pages for every 1 minute…we can use what we know to create equivalent ratios.

Let's Think (Slide 4): So, we know that fractions and skip counting on double number lines are ways to find equivalent ratios and in this lesson we are going to add to that knowledge by learning about *unit rate*. The term *unit rate* is composed of the terms *unit* and *rate*.

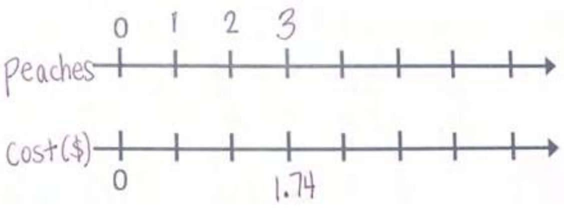
We'll start with rate. A rate is a special ratio that compares quantities with different units like when we talk about the cost of items. The collective term **unit rate** is a type of rate that only focuses on the quantity of 1 when comparing. It may seem a little confusing but it will become much more clear as we continue working.

Here are a few examples of unit rates.

- Imagine I bought a six pack of soda. I know the cost of the whole pack of soda, but unit rate would tell me how much ONE soda costs.
- Or imagine that I run 5 miles, but the unit rate tells me how fast I ran ONE mile.

Let's Think (Slides 5): Look at this sign that I saw at the grocery store. This dash means for so it says 3 peaches for $1.74, in other words three peaches cost $1.74.

Have you ever been to a grocery store and seen a price tag similar to this? Have you ever wondered why they didn't just say how much 1 of the item costs? I certainly have! It's confusing because we don't always want three peaches, so finding the unit rate or the cost of just 1 peach can be helpful. Let's use the double number line to help us.



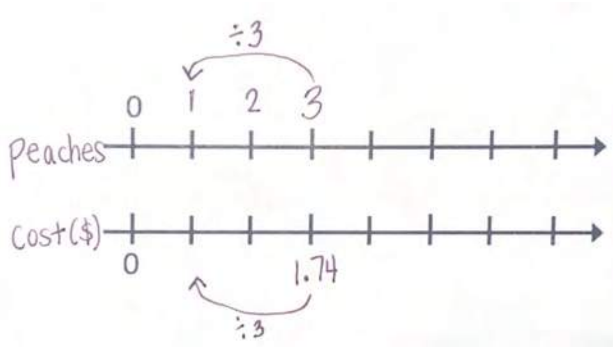
Let's begin by labeling each number line, we're talking about peaches and price, or cost. So let's label the top oneness peaches and the other is labeled cost.

On the peaches number line we can start at 0 and count by one stopping at the third tick mark because we know the price of 3 peaches. And, we know that three peaches cost $1.74 so I am going to put 1.74 on the third tick mark.

Next, we are going to think backwards. In the last lesson we made equivalent ratios by multiplying by whole numbers. But, we are going to use the opposite of multiplication which is division to work backwards to figure out how much ONE peach costs.

Think about this simple math fact family: 3 x 2 = 6 and 2 x 3 = 6. Does anyone know the division facts in our fact family? 6 ÷ 3 = 2 and 6 ÷ 2 = 3 Exactly! 6 divided by 3 equals 2 and 6 divided by 2 equals 3. Our fact family proves that multiplication and division are opposites. So just like our simple fact family, we will be working backwards by dividing to find smaller quantity equivalent ratios, in this case unit price, just like we multiplied to find larger quantity equivalent ratios.

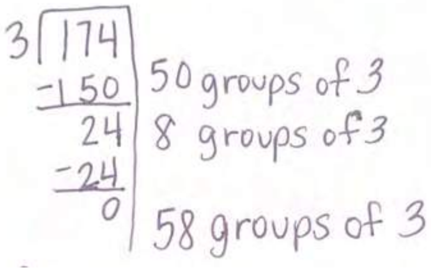
Now remember, ratios are just fractions. To create equivalent fractions we multiplied by the same factor on top and on the bottom of our fraction. That rule works here as well.



We are going to divide by the same number on the top number line and on the bottom number line. Since we know the price of 3 peaches and we want to know the unit price or the price of just 1 peach then we need to figure out what number we will divide 3 by to get to 1.

That's easy; it's 3! 3 divided by 3 equals 1. If we divide by 3 on the top number line then we must also divide by 3 on the bottom number line. So, our math problem will be 1.74 divided by 3.

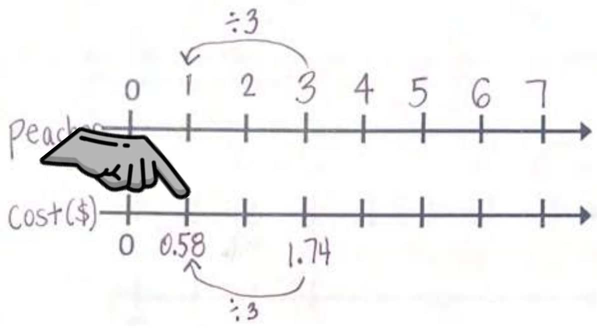
Let's do the math together for 1.74 divided by 3. We begin by thinking of $1.74 as all pennies which would be 174 pennies. This will make our division easier! We need to figure out how many groups of 3 we have in the bigger group of 174.



We have at least 50 groups of 3, which is 150 total, and 174 minus 150 leaves us with 24 remaining to be put into groups.

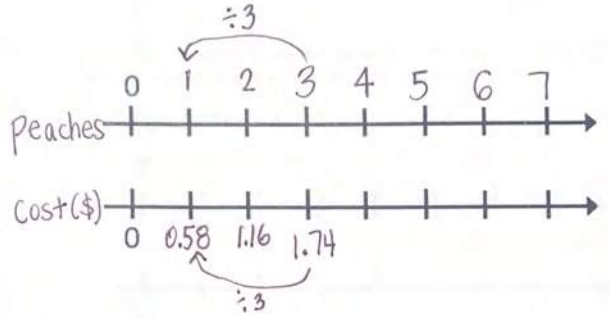
Now, we need to figure out how many groups of 3 we have in the bigger group of 24. That's an easier one, we have 8 groups of 3 because 8 multiplied by 3 is 24. And, 24 minus 24 leaves us with 0 or nothing remaining to put into groups. 50 groups of 3 plus 8 groups of 3 gives us 58 groups of 3.

So, 174 divided by 3 is 58. Almost there! The last thing we need to do is write 58 pennies as dollars and cents…58 pennies is the same as $0.58.



Let's go back to our double number line and label it. We now see that 1 peach costs $0.58. We call the value of 1 thing or quantity the **unit rate** or price. So the unit rate of peaces is $0.58, in other words one peach costs 58 cents!

And unit rate is helpful because if we know the unit rate or price of 1 peach then we can figure out the price or cost of any amount of peaches! Let's continue using our double number line to find the price of other numbers of peaches.



First, let's complete the peaches number line by counting on the peaches number line.

Next, we use our unit rate also known as the unit price, 1 peach is $0.58. If we know 1 peach is $0.58 we can multiply 0.58 by 2 peaches to calculate the cost of 2 peaches. 0.58 x 2 = $1.16 for 2 peaches.

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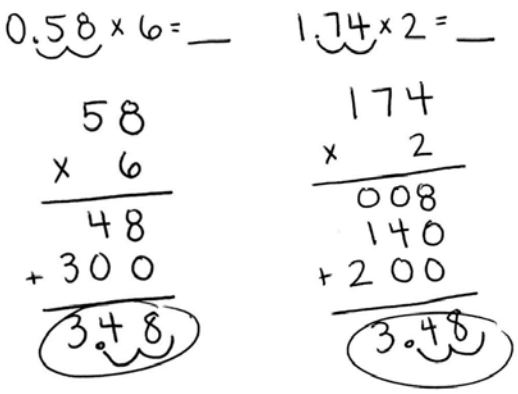
Let's Think (Slide 6): Now let's imagine we want to calculate the cost of six peaches. This is when unit rate is helpful, we could again use our unit price.



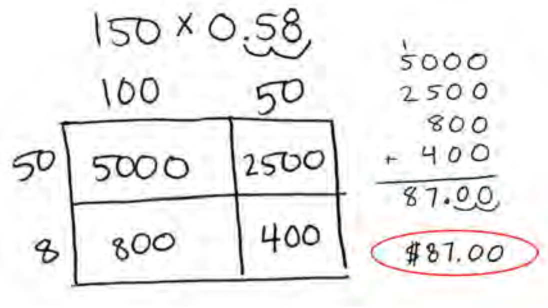
If 1 peach costs $0.58 then we could multiply 0.58 by 6 to calculate the price of 6 peaches. But there is more than one way! We know the price of 3 peaches.

We also know that 3 peaches multiplied by 2 is equal to 6 peaches. So, we can also multiply $1.74 by 2 to calculate the price of 6 peaches.

Aren't double numbers interesting to work with?

Let's Think (Slide 8): One last thing to consider. We are not limited to the tick marks on a double number line. Consider this math problem, "A school cafeteria wants to purchase 150 peaches for a special lunchtime smoothie." The number 150 won't fit on our current number line but that doesn't mean we can't figure it out. How do you think we could calculate the price for 150 peaches? Possible Student Answers, Key Points:

- If we know the price of one peach we can just multiply that by 150.
- Use the unit rate/unit price and multiply $0.58 by 150.
- We know the price of 3 so we could multiply that by 50.



I like how you're thinking! This is why unit rate is helpful! If we know the price of one thing, we can find the price of more than 1 thing. Let's find out the price of 150 peaches. We need to multiply the unit rate, $0.58 by 150, let's use the partial product method.

So, 150 peaches will cost $87!

Wow! We did some deep thinking today. We explored unit rate/unit price to find the cost of one thing. Then we used the price of that one thing to find the cost or price for other, larger quantities. We will continue applying our newly acquired unit rate knowledge in upcoming lessons.

Let's Try it (Slide 8-9): Let's continue applying unit rate/unit price to our double number lines. In our next problem we will see an example of when unit rate/unit price is helpful because of the quantities we are given. Remember that multiplying by the same number for the denominator and numerator creates equivalent ratios and dividing by the same number for the denominator and numerator also creates equivalent ratios.

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WARM WELCOME

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Today we will use equivalent ratios to calculate unit prices.

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Let's Talk:

If Martin can read 3 pages per minute, what else do we know?

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Let's Think:

- ***unit rate*** **is composed of the terms** ***unit*** **and** ***rate***
- ***unit*** **means 1 and** ***rate*** **is a special ratio that compares quantities with different units**
- ***unit rate*** **is a type of rate that focuses on the quantity of 1 when comparing.**

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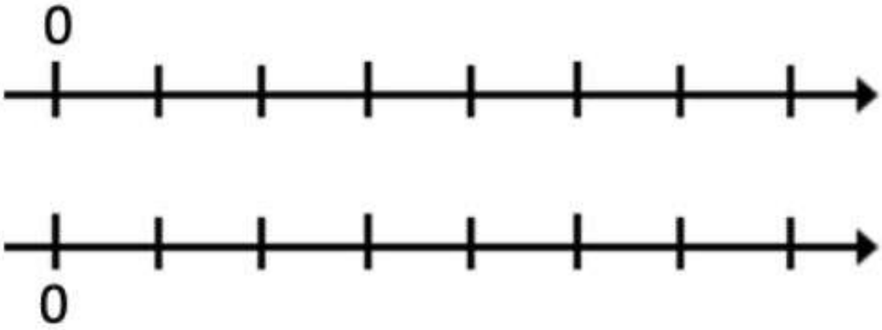
Let's Think:

Look at this sign at the grocery store.



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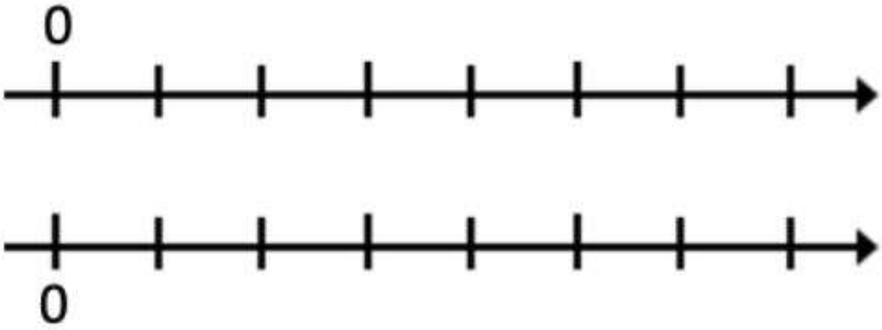
Let's Think:

How much will 6 peaches cost?



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Let’s Think:

Imagine a school cafeteria wants to purchase 150 peaches for a special lunchtime smoothie.

How can we calculate the price of 150 peaches?

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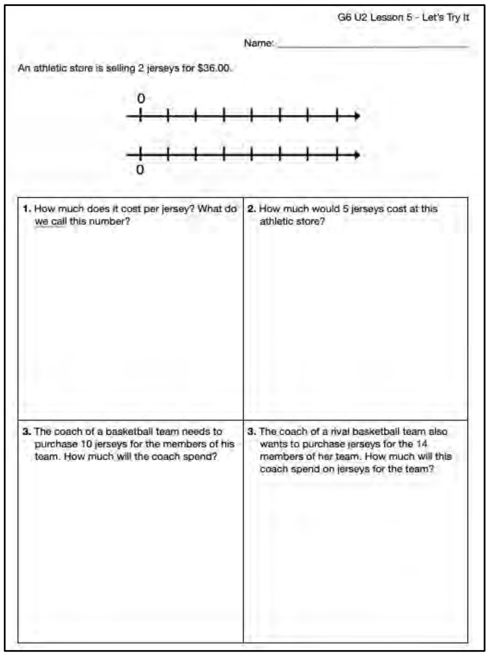
Let’s Try It:

Let’s explore using equivalent ratios to calculate unit rate/unit price together.



G6 U2 Lesson 5 - Let's Try It

Name:________________________

An athletic store is selling 2 jerseys for $36.00.

1. How much does it cost per jersey? What do we call this number?

2. How much would 5 jerseys cost at this athletic store?

3. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend?

3. The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

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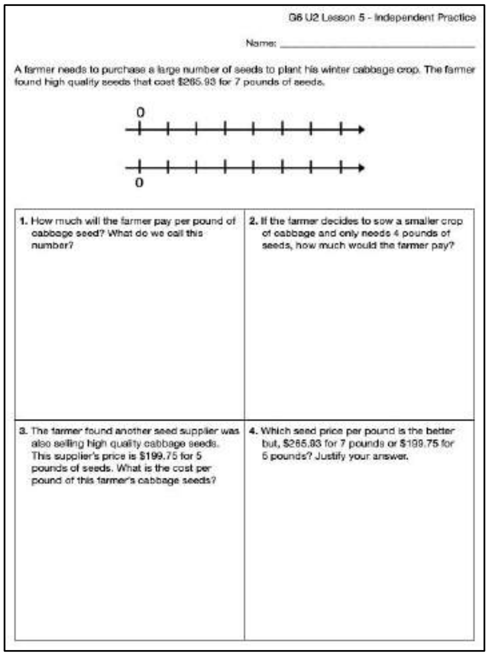
On your Own:

Now it’s time to explore using equivalent ratios to calculate unit rate/unit price on your own.



G6 U2 Lesson 5 - Independent Practice

Name: ____________________

A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.

1. How much will the farmer pay per pound of cabbage seed? What do we call this number?

2. If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay?

3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier's price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer's cabbage seeds?

4. Which seed price per pound is the better but, $265.93 for 7 pounds or $199.75 for 5 pounds? Justify your answer.

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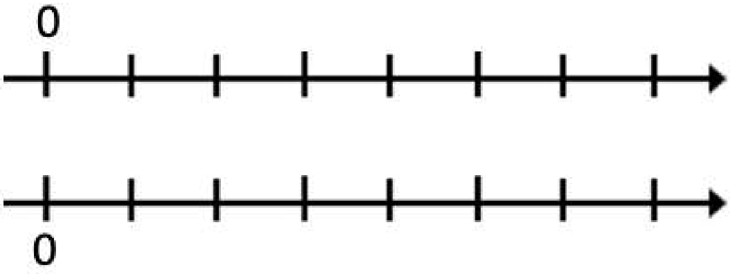
An athletic store is selling 2 jerseys for $36.00.



1. How much does it cost per jersey? What do we call this number?

2. How much would 5 jerseys cost at this athletic store?

3. Could you use the double number line to determine your answer? If so, explain how.

____

____

4. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend? Show two different ways to calculate your solution.

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5. The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

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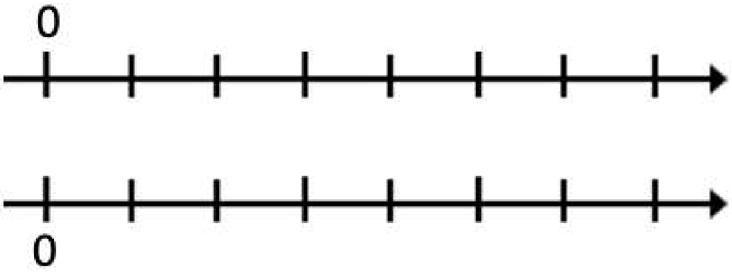
Name: ___________________________________ G6 U2 Lesson 5 - Independent Practice

A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.



1. How much will the farmer pay per pound of cabbage seed? What do we call this number?	**2.** If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay?
3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier's price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer's cabbage seeds?	**4.** How much money would the famer save by buying from the first seed supplier?

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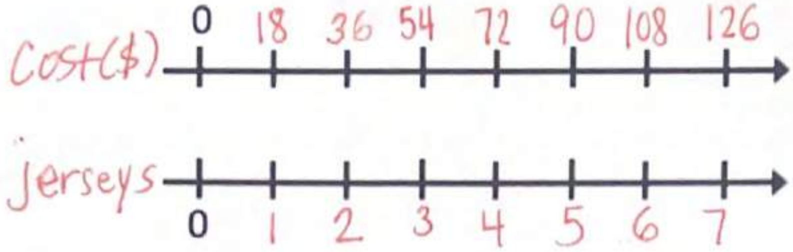
An athletic store is selling 2 jerseys for $36.00.



1. How much does it cost per jersey? What do we call this number?

2⟌36

-30 | 15

6

-6 | +3

0 | 18

$18 per jersey. We call this the unit rate.

2. How much would 5 jerseys cost at this athletic store?

18 x 5 =$90 for 5 jerseys

3. Could you use the double number line to determine your answer? If so, explain how.

We could complete the number line to include 5 jerseys and the cost of those 5 jerseys.

4. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend? Show two different ways to calculate your solution.

Multiply by unit rate

18x10=$180 for 10 jerseys

OR

Double Cost of 5 jerseys

5 jerseys costs $90

x 2

$180 for 10 jerseys

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5. The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

Double 7 jerseys

$126 for 7 jerseys
x 2
$252 for 14 jerseys

OR

Multiply by the unit rate

18×14= $252 for 14 jerseys

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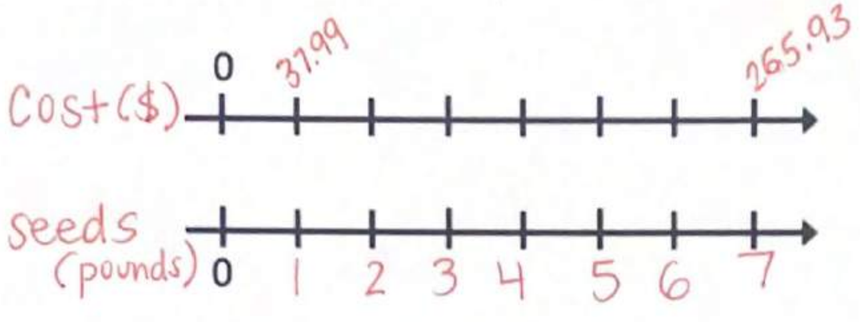
Name: ______________________________

G6 U2 Lesson 5 - Independent Practice

A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.



1. How much will the farmer pay per pound of cabbage seed? What do we call this number?

7 | 265.93 → ②
-21000 | 3000
5593
-4900 | 700
693
-630 | 90
63
-63 | 9
0 | +
3799, ②

$37.99 per pound of Cabbage Seed

2. If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay?

37.99
× 4
$151.96

$151.96 for 4 pounds of cabbage seed.

3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier's price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer's cabbage seeds?

5 | 199.75 → ②
-15000 | 3000
4975
-4500 | 900
475
-450 | 90
25 | 5
+
3995, ②

$39.95 per pound of Cabbage Seed

4. How much money would the famer save by buying from the first seed supplier?

8 18 15
$39.95
- 37.99
$ 1.96

The farmer would save $1.96.

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G6 U2 Lesson 6

Use ratios and diagrams to understand how fast things move

CITYTUTOR DC

G6 U2 Lesson 6 - Students will use ratios and diagrams to understand how fast things move

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last lesson helped us to visually see why double number lines are so important for understanding and calculating equivalent ratios and the special type of ratio called *unit rate*. We saw that when we know the unit rate we are able to determine any number of other quantities within ratio to one another. In our last lesson we looked specifically at unit rate as it related to price. In this lesson we will look at speed or how fast things move.

Let's Talk (Slide 3): Let's go back to the last lesson, **what is unit rate and why is it helpful?** Possible Student Answers, Key Points:

- Unit rate is the rate of 1, for example how much ONE peach costs.
- Unit rate is helpful because if we know how much one thing costs we can multiply by any amount and figure out how much other quantities cost.
- Unit rate can be helpful at the grocery store to help us know how much stuff costs

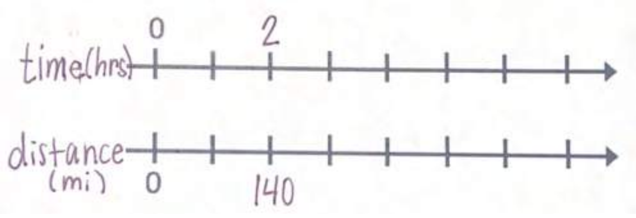
Nice examples of buying or paying for one thing at a store. Our exploration into unit rate and price are showing us that math really is all around us and we use math much more often than we may realize!

Let's Think (Slide 4): Let's continue exploring more unit ratio math in the real-world. You encounter speed, or how fast things move, in your daily life. In ratio form, speed can look like a comparison of distance to time. Some examples include feet per minute, yards per second, or even miles per hour which is the ratio with which you are probably most familiar because that is how a car's speed is calculated. For example, the speed limit is 50 miles per hour. Let's investigate a math problem where we'll look at speed and unit rate.

Let's Think (Slides 5): Listen as I read this slide, Steven and his friends are traveling from their home in Washington, DC to the beach in New Jersey. Before leaving, they decided to record how long it would take them to get to a restaurant for lunch along the way. They recorded that they traveled 140 miles in 2 hours

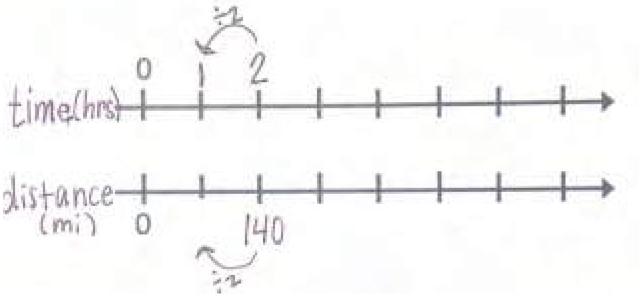
Interesting, so it took them 2 hours to travel 140 miles. Let's use the double number line to calculate the unit rate or how far they traveled in just 1 hour.

Remember that when we travel by car in the United States, we record our speed as a unit rate, we say "miles per hour." "Per hour" means how many miles in 1 hour so that makes it a unit rate.



So, on our double number line we will use one number line for distance or miles and the other number line for time or hours.

Next we place 2 on the time number line to represent 2 hours and 140 at the same point to represent 140 miles in 2 hours. Notice we are leaving space for our unit rate of 1 hour on the number line, because we don't know that yet.



Our next step is to think about how to calculate the unit rate or the distance at 1 hour. Well, we know the distance for 2 hours but need the distance for 1 hour so we divide 2 by 2 on the top number line. And remember, what we do to the top we have to do to the bottom. So, if we divide by 2 on the top number line then we must also divide by 2 on the bottom number line.

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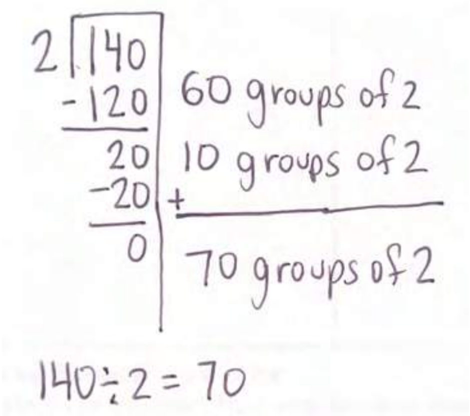
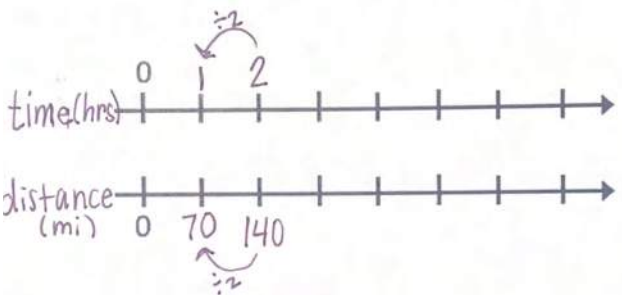


Our math problem will be 140 divided by 2. Let's do the division for 140 by 2. We need to figure out how many groups of 2 we have in the bigger group of 140. We have at least 60 groups of 2 or 120 total. Next, we need to figure out how many groups of 2 we have in the bigger group of 20. That's an easier one, we have 10 groups of 2 because 10 multiplied by 2 is 20. And, 20 minus 20 leaves us with 0 or nothing remaining to put into groups. Last, 60 groups of 2 plus 10 groups of 2 gives us 70 groups of 2. So, 140 divided by 2 is 70! And look, that makes sense because half of 14 is 7, so half of 140 is 70.



Let's place 70 on the distance number line directly under the tick mark with 1. Now we see that the friends traveled 70 miles in 1 hour so their speed was 70 miles per 1 hour or 70 miles per hour; this is our unit rate. Also, 2:140 and 1:70 are equivalent ratios.

Do you see how all of your hard work with ratios is paying off? We were able to construct a double number line using our initial ratio of 140 miles in 2 hours then use that ratio to calculate the unit rate or how far the friends traveled in 1 hour. Remember that unit rate is the amount per 1.

And this unit rate can help us calculate how far they can go in 3 or 4 or 5 hours. And guess what? In our next lesson we will be introduced to a new ratio diagram to help us think about ratios.

Let's Try it (Slide 7): Let's continue using unit rates to calculate equivalent fractions from our double number lines. Remember, whichever operation and number you use to calculate with on one number line, you must also use that operation and number on the other number line. That is the only way to create equivalent fractions or ratios.

WARM WELCOME

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Today we will use ratios and diagrams to understand how fast things move.

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Let's Talk:

What is unit rate? Why is it helpful?

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Let's Think:

You encounter speed, or how fast things move, in your daily life. In ratio form, speed can look like a comparison of distance to time.

So, speed is how far you go over a period of time.

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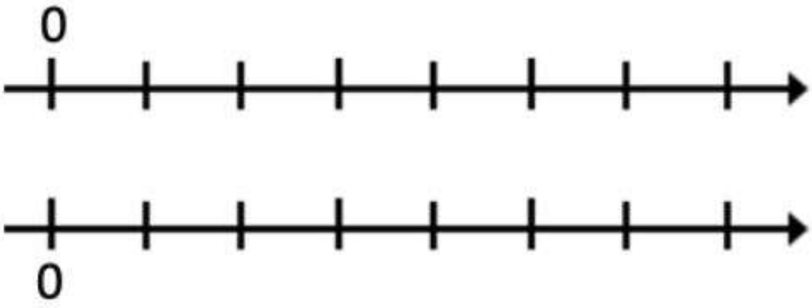
Let’s Think:

Steven and his friends are traveling from their home in Washington, DC to the beach in New Jersey. Before leaving, they decided to record how long it would take them to get to a restaurant for lunch along the way.

They recorded that they traveled 140 miles in 2 hours.



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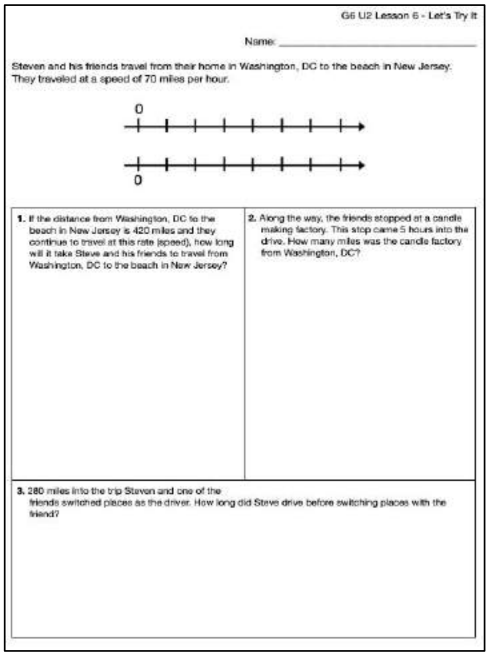
Let’s Try It:

Let’s explore how fast things move together.



G6 U2 Lesson 6 - Let’s Try It

Name: ______________________

Steven and his friends travel from their home in Washington, DC to the beach in New Jersey. They traveled at a speed of 70 miles per hour.

1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this rate (speed), how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?

2. Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?

3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?

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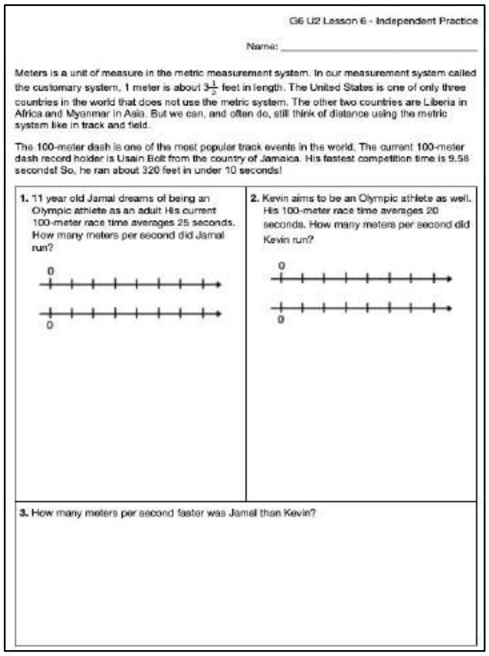
On your Own:

Now it's time to explore how fast things move on your own.



G6 U2 Lesson 6 - Independent Practice

Name: ____________________

Meters is a unit of measure in the metric measurement system. In our measurement system called the customary system, 1 meter is about $3\frac{1}{2}$ feet in length. The United States is one of only three countries in the world that does not use the metric system. The other two countries are Liberia in Africa and Myanmar in Asia. But we can, and often do, still think of distance using the metric system like in track and field.

The 100-meter dash is one of the most popular track events in the world. The current 100-meter dash record holder is Usain Bolt from the country of Jamaica. His fastest competition time is 9.58 seconds! So, he ran about 320 feet in under 10 seconds!

1. 11 year old Jamal dreams of being an Olympic athlete as an adult His current 100-meter race time averages 25 seconds. How many meters per second did Jamal run?

2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second did Kevin run?

3. How many meters per second faster was Jamal than Kevin?

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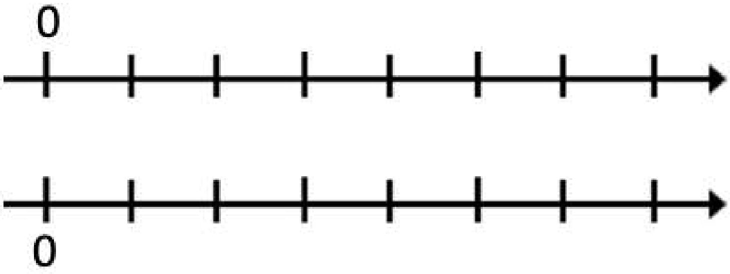
Steven and his friends travel from their home in Washington, DC to a beach in New Jersey. They traveled at an average speed of 70 miles per hour.



1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this speed, how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?

2. Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?

3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?

4. They also stopped for a bathroom break 2½ hours into the trip. How many miles had they traveled when they stopped for the break?

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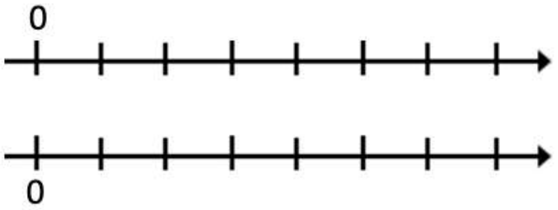
Name: ___________________________________ G6 U2 Lesson 6 - Independent Practice

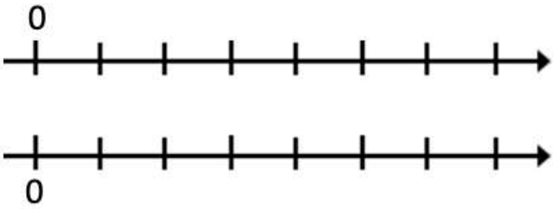
Meters is a unit of measure in the metric measurement system. In our measurement system called the customary system, 1 meter is about $3\frac{1}{3}$ feet in length. The United States is one of only three countries in the world that does not use the metric system. The other two countries are Liberia in Africa and Myanmar in Asia. But we can, and often do, still think of distance using the metric system like in track and field.

The 100-meter dash is one of the most popular track events in the world. The current 100-meter dash record holder is Usain Bolt from the country of Jamaica. His fastest competition time is 9.58 seconds! That means, he ran about 320 feet in under 10 seconds!

1. 11 year old Jamal dreams of being an Olympic athlete. His current 100-meter race time averages 25 seconds. How many meters per second is Jamal running?



2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second is Kevin running?



3. Who runs faster? How many meters per second faster is that runner?

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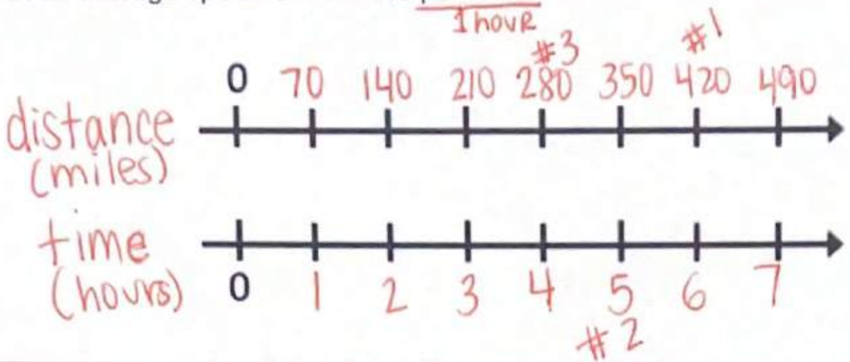
Name: ______________________

G6 U2 Lesson 6 - Let's Try It

Steven and his friends travel from their home in Washington, DC to a beach in New Jersey. They traveled at an average speed of 70 miles per hour.



1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this speed, how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?

6 hours to the beach

2. Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?

350 miles from Washington DC

3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?

Steve drove 4 hours before switching with a friend.

4. They also stopped for a bathroom break 2½ hours into the trip. How many miles had they traveled when they stopped for the break?

$2\frac{1}{2} \times 70$

↓

$\frac{5}{2} \times \frac{70}{1} = \frac{350}{2} = 175$

$$\begin{array}{r|l} 2\ \overline{)\,350} & \\ -300 & 150 \\ 50 & \\ -50 & 25 \\ 0 & + \\ & \overline{175} \end{array}$$

175 miles before a break.

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G6 U2 Lesson 6 - Independent Practice

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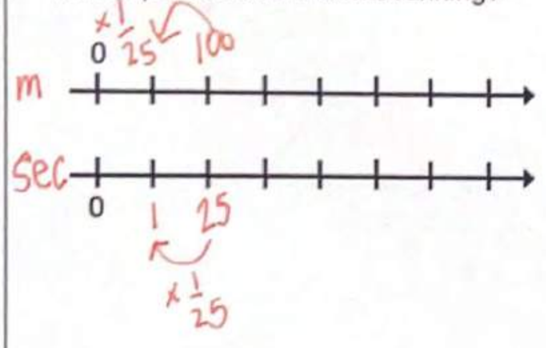
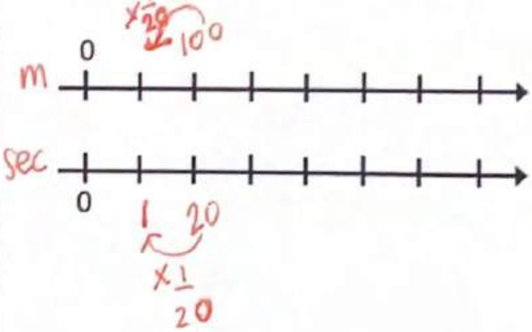
1. 11 year old Jamal dreams of being an Olympic athlete. His current 100-meter race time averages 25 seconds. How many meters per second is Jamal running?



$\frac{100}{1} \times \frac{1}{25} = \frac{100}{25} = 4 m/s$

2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second is Kevin running?



$\frac{100}{1} \times \frac{1}{20} = \frac{100}{20} = 5 m/s$

3. Who runs faster? How many meters per second faster is that runner?

Kevin ran faster than Jamal. Kevin ran 5m/s while Jamal ran 4m/s. Kevin ran 1m/s faster than Jamal.

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G6 U2 Lesson 7

Use tables to find equivalent ratios

G6 U2 Lesson 7 - Students will use tables to calculate equivalent ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last few lessons have focused on using double number lines to find equivalent ratios. In this lesson we will explore how tables can help us find equivalent ratios. You used tables in elementary school when looking at data. Using tables with ratios is an important skill in sixth grade math all the way through Algebra 1 which is a high school course.

Let's Talk (Slide 3): Let's brainstorm, **what do you know about tables? How can they help us in math?**
Possible Student Answers, Key Points:

- They have rows and columns.
- They have headings.
- Sometimes, they contain data, the information can be used to make graphs.
- Tables are a way to visually represent information in a way that is easy to see and analyze.

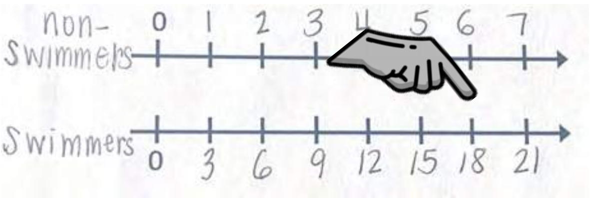
That was long ago but you remember a lot about tables. You may remember using tables connected to graphs like bar graphs, line graphs, and even pictographs. Tables contain information that is often used to make graphs. We have also used tables in the past to help us solve problems.

Let's Think (Slide 4): When reading tables we need to be able to name the parts that they are made of. The most important parts of tables are columns and rows. Recognizing the difference between columns and rows is the first step to fully understanding tables. There are some real-world examples that make it easier to differentiate between columns and rows.

In the real world, the tall structures in front of some buildings are called columns. Notice they go from near the top of the building to the ground, up and down. In that same way, columns on a mathematical table go up and down as well

For rows we think of the nursery rhyme *Row, Row, Row Your Boat*. When you row a boat you use oars and you move the oars from side-to-side. We can also think of rows in a movie theater, they go from side to side. In that same way, rows on a table go from side-to-side, left to right and right to left.

Let's Think (Slide 5): Let's look at a ratio example with which we will use a table to display our information. A summer camp has a strict ratio of campers who can't swim to those campers who can swim. Their ratio of summers who can't swim to those who can is 1:3. What do you think the ratio 1:3 means in this situation? For every 1 camper who can't swim, there are 3 campers who can swim. Nice thinking! The 1:3 ratio means that for every 1 non-swimming camper, there are 3 campers who can swim that are attending the camp.



FIrst, let's complete a double number line to show the information we already have about the campers. To construct a double number line we first label each number line. Next add 1 on the non-swimmer number line and 3 on the swimmer number line at the first tick marks after the zeros.

Based on the double number line, if there are 6 non-swimmers, how many swimmers can attend the camp? 18 swimmers. That's right! Looking at the double number line we see 6 on the top number line for non-swimmers and when we follow that down to its matching tick mark we see 18 on the swimmers number line.

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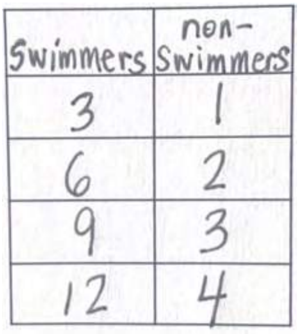
Now, let’s use our double number line to put the same information into a table.



Swimmers	non-Swimmers
3	1
6	2
9	3
12	4

The top row of a table is always labeled with headings to describe the quantities we’re comparing. In this problem the headings are swimmers and non-swimmers.

Next we will fill in the table being careful to place the information under the correct heading. First, we know that for every 3 swimmers, there can be one non-swimmer (*fill in row*). Just like we can skip count on the double number, we do the same thing with the table. So..3, 6, 9, 12 in the swimmers column. And then we can fill in the information for the non-swimmers, we’ll just count by 1.

You may not have noticed yet but if you were to turn your table onto its side it looks really similar to our double number lines.

Just like with the double number line there are so many questions we could ask and answer with our table. What if we were asked to determine how many non-swimmers are attending the camp if 9 swimmers were attending the camp? 3 non-swimmers. Yes. Both our table and double number show us that if 9 swimmers attend camp then 3 non-swimmers can attend camp.

So we have learned to use diagrams, double number lines, and tables to represent our ratios. All of these tools but let’s talk about limitations. No diagram is perfect. Sometimes there isn’t enough space for your numbers or ratios, sometimes the diagram isn’t long enough to include your data. Also, skip counting can result in long tables that take up a lot of room. There will be solutions to these table limitations in upcoming lessons but, for now, focus on mastering either the double number line diagram, the table, or both! As mathematicians, it is really important that we can represent our information and numbers in a visual way.

Let’s Try it (Slide 8): Let’s continue our work with double number lines and corresponding ratio tables. Don’t forget, just like with double number lines, you must ensure that you are correctly placing information with the correct heading/label. That is the only way to create accurate equivalent fractions or ratios.

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WARM WELCOME

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Today we will use ratio tables to calculate equivalent ratios.

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Let’s Talk:

What do you know about tables? How can they help us in math?

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Let’s Think:

Let’s ensure we can read tables, correctly.

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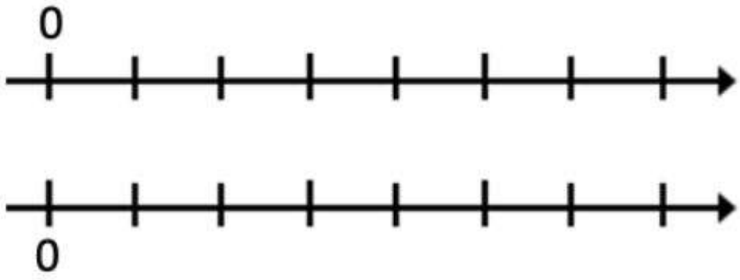
Let's Think:

A summer camp has a strict ratio of campers who can't swim to those campers who can swim. Their ratio is 1:3.



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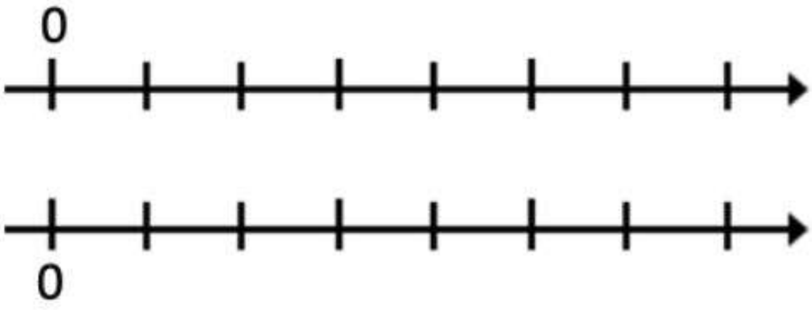
Let's Think:

Let's complete a double number line then translate that information into a table.



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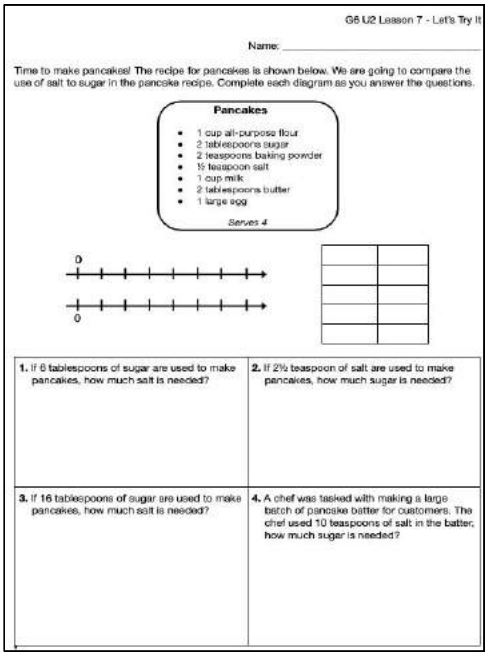
Let's Try It:

Let's explore using ratio tables together.



G6 U2 Lesson 7 - Let's Try It

Name: ______________________

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram as you answer the questions.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4

1. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?

2. If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?

3. If 16 tablespoons of sugar are used to make pancakes, how much salt is needed?

4. A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed?

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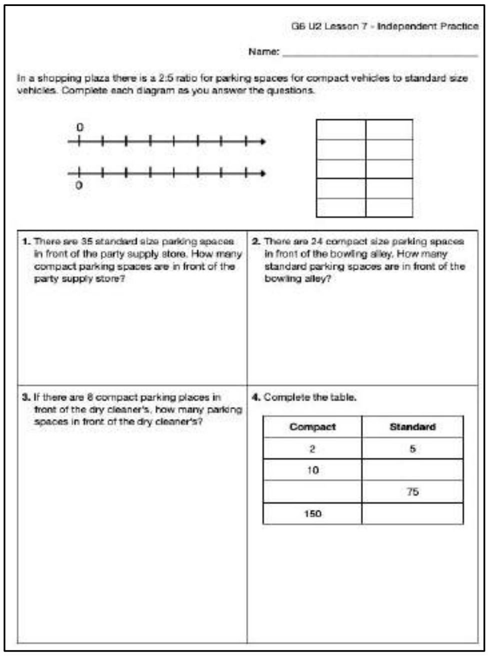
On your Own:

Now it's time to explore ratio tables on your own.



G6 U2 Lesson 7 - Independent Practice

Name: ______________________

In a shopping plaza there is a 2:5 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram as you answer the questions.

1. There are 35 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?

2. There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?

3. If there are 8 compact parking places in front of the dry cleaner's, how many parking spaces in front of the dry cleaner's?

4. Complete the table.

Compact	Standard
2	5
10	
	75
150	

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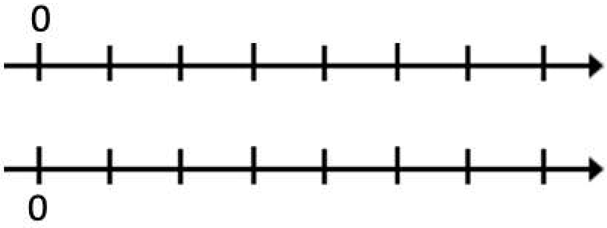
Name: ___________________________________

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram based on the information.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4



1. Where do you see the unit rate on the double number line and table?

____

____

2. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?	**3.** If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?

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4. If 18 tablespoons of sugar are used to make pancakes, how much salt is needed?

5. A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed?

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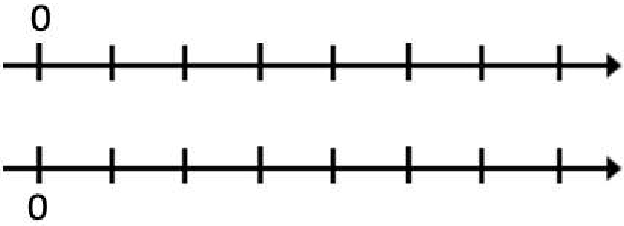
Name: ______________________________ G6 U2 Lesson 7 - Independent Practice

In a shopping plaza there is a 2:6 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram based on the information.



1. Calculate the unit rate for compact vehicles to standard size vehicles. Add the unit rate to your double number line and table.

____

____

2. There are 42 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?

3. There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?

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4. Complete the table.

Compact	Standard
2	6
10	
	90
150	

5. Wayne believes he counts 12 compact spaces in front of the dry cleaner's and 25 standard size spaces. Is Wayne correct? Explain your answer and justify your reasoning.

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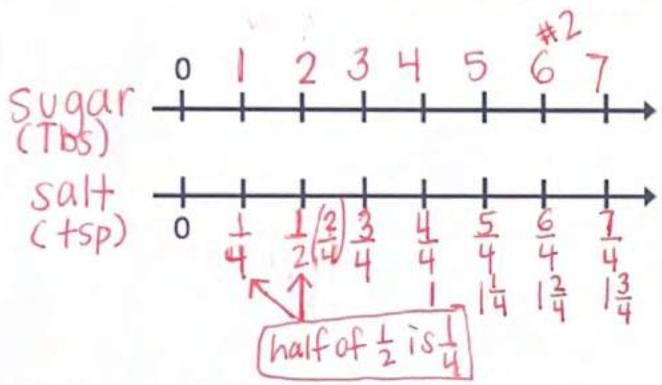
Name: ______________________________ G6 U2 Lesson 7 - Let's Try It

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram based on the information.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4



sugar	salt
1	1/4
2	½
6	3/2 = 1½
10	2½
18	4½

×3 ×5 ×3

×3 ×5 ×3

$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=2\frac{1}{2}$ So multiply $\frac{1}{2}$ by 5

1. Where do you see the unit rate on the double number line and table?

Unit rate is the first tick mark after zero and on the table it is the row below the labels/headings.

2. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?

$1\frac{1}{2}$ tsp of salt

3. If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?

The table tells me that I need to multiply by 5 to go from ½ to 2½. So, 2×5 = 10 tbs of sugar.

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4. If 18 tablespoons of sugar are used to make pancakes, how much salt is needed?

On the table I can multiply 6 by 3 to get 18. So, I also multiply $1\frac{1}{2}$ by 3.

$1\frac{1}{2} \times 3$

$\Downarrow$

$\frac{3}{2} \times \frac{3}{1} = \frac{9}{2} = 4\frac{1}{2}$ $\quad 2\overline{)9}$ -8 1 4

18 Tbs sugar needs $4\frac{1}{2}$ tsp of sugar

5. A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed?

The double number line tells me 1 tsp of salt needs 4 Tbs of sugar.

$\begin{matrix} \text{salt} \\ \text{sug.} \end{matrix} \frac{1}{4} \times \frac{10}{10} = \frac{10}{40}$

So 40 Tbs of sugar

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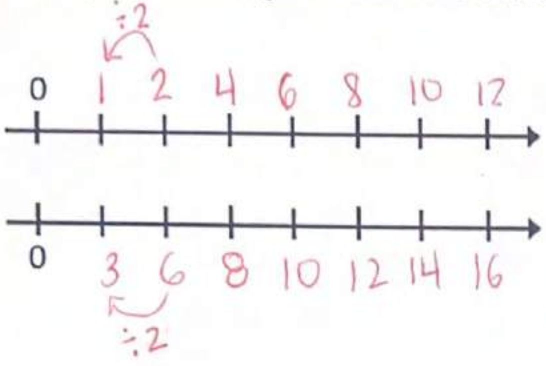
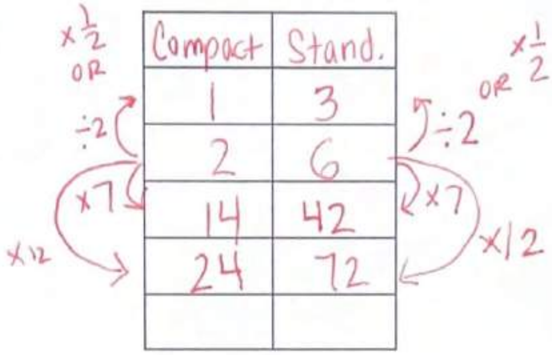
In a shopping plaza there is a 2:6 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram based on the information.





Compact	Stand.
1	3
2	6
14	42
24	72

1. Calculate the unit rate for compact vehicles to standard size vehicles. Add the unit rate to your double number line and table.

Make compact spaces the unit rate because
2÷6 isn't a whole space but 2÷2 will.

2. There are 42 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?

$\frac{2}{6} \times \frac{7}{7} = \frac{?}{42}$ $\frac{\text{compact}}{\text{standard}}$

$2 \times 7 = 14$

14 compact parking spaces

3. There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?

$\frac{2}{6} \times \frac{12}{12} = \frac{24}{?}$ $\frac{\text{compact}}{\text{standard}}$

$6 \times 12 = 72$

72 standard cards

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4. Complete the table.

Compact	Standard
2	6
10	30
30	90
150	450

×15 ×5

×5

×5 ×15

×5

5. Wayne believes he counts 12 compact spaces in front of the dry cleaner's and 25 standard size spaces. Is Wayne correct? Explain your answer and justify your reasoning.

$$\frac{\text{Compact}}{\text{Standard}} = \overset{\times 6}{\underset{\text{not } \times 6}{\frac{2}{6} = \frac{12}{25}}}$$

Wayne is incorrect. The ratios $\frac{2}{6}$ and $\frac{12}{25}$ are not equivalent. If Wayne counted 12 compact spaces he would have also counted 36 standard spaces and not 25 to be within the 2 to 6 space ratio

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G6 U2 Lesson 8

Solve equivalent ratio problems by finding the rate per 1 in a table

G6 U2 Lesson 8 - Students will solve equivalent ratio problems using unit rate in a table

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've already learned so much in this ratio unit! We learned that ratios are comparisons of quantities. We also learned that unit rate tells us the quantity of something per one. And finally, we learned to use diagrams such as double number lines and tables to visually represent information and find equivalent ratios. When we incorporated tables after learning double number lines we found that sometimes there are limitations. In this lesson we will eliminate the most glaring limitation of tables as we learn to be even more efficient by first calculating the unit rate before other equivalent ratios.

Let's Talk (Slide 3): Let's start with a brainstorm, **how are double number lines and tables alike? How are they different?** Possible Student Answers, Key Points:

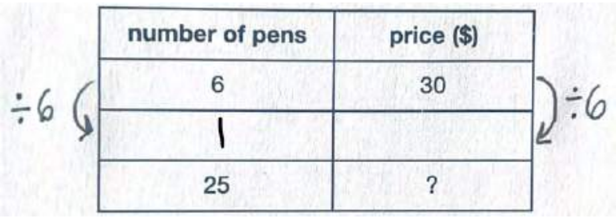
- Tables and double number lines both have headings or labels.
- They both have numbers, ratios, and are organized.
- They both can help us find equivalent ratios either by multiplying or dividing.
- They're different because tables have columns and rows while double number lines have tick marks.
- Tables are constructed vertically while double number lines are constructed horizontally.

Nice responses. Tables and double number lines both organize information and have headings/labels, numbers, and ratios. They are different because tables have columns and rows and are constructed vertically or up and down while double number lines are marked incrementally with tick marks and are constructed horizontally or from side-to-side.

Let's Think (Slide 4): Most of the double number lines and tables with ratios that we've constructed so far have followed skip counting patterns or they have had compatible or friendly numbers. But, today our focus is on tables with unit rates where skip counting isn't always helpful and numbers aren't always compatible or friendly.

Let's look at this table. What does our table tell us so far? There are 6 pens and they cost $30, also there are 25 pens but we don't know how much they cost. That's right! Our table tells us that you can buy 6 pens for $30 but that we don't yet know the cost of 25 pens.

If we considered buying 25 pens and wanted to know the price it would be easiest to know the price of 1 pen first. That's why there's an empty space on the table underneath the original ratio. In previous lessons we may have jumped directly from 6 to 25 by multiplying but this problem doesn't contain compatible or friendly numbers. Compatible numbers are considered friendly because it is easy to calculate between them, think along the lines of fact families. We can easily decide what to multiply 6 by to reach 24; 24 would be easy because 6 x 4 equals 24 but 25 isn't that easy. There is no whole number you can multiply by 6 to give you 25.



number of pens	price ($)
6	30
1	
25	?

So, instead let's find the price of 1 pen which is our unit rate. We need to somehow go from 6 pens to 1 pen on the table. In terms of calculating you would divide by 6 because 6 divided by 6 equals 1. But, when we deal with ratios we want to start speaking in terms of multiplying instead of just dividing. So what multiplication problem is equivalent or the same as dividing by 6? Multiplying by ⅙.

Note: This concept requires a strong number sense; if students struggle to come up with the answer then pose this problem to get them thinking "If you divided by 2, what would be the equivalent or same thing in division?" the answer is multiply by ½; the posed problem is more accessible because dividing by 2 is the same as taking one-half.

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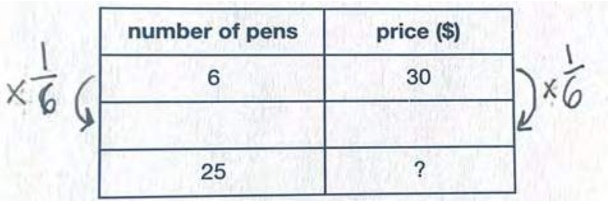
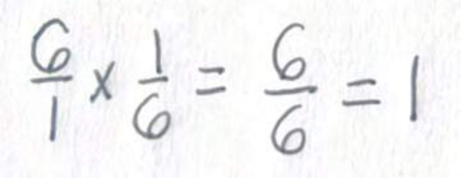
So, let’s multiply both sides of the table by ⅙ instead of dividing by 6.



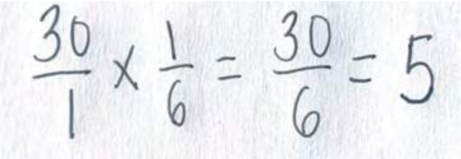
number of pens	price ($)
6	30
25	?

Let’s draw arrows from 6 to the empty space underneath it and from 30 to the empty space underneath it. Next, we write *x* ⅙ next to each arrow, remember this is the same as dividing by 6.



$$\frac{6}{1}\times\frac{1}{6}=\frac{6}{6}=1$$

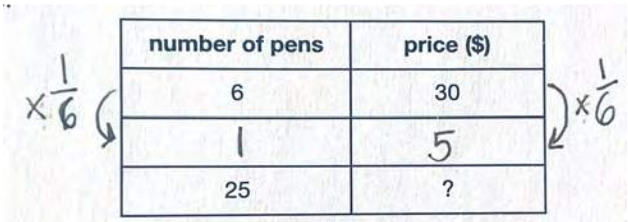
Let’s look again at the math for $\frac{6}{1}$ multiplied by $\frac{1}{6}$ equals $\frac{6}{6}$ or 1. Now we have the factor we need to calculate our unit rate.



$$\frac{30}{1}\times\frac{1}{6}=\frac{30}{6}=5$$

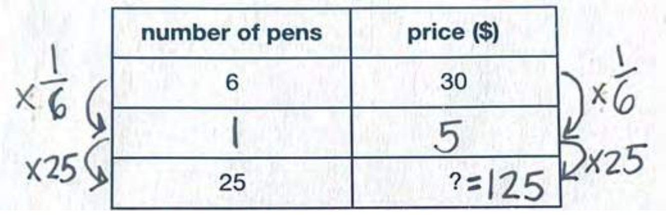
So, we know we’re finding the price of ONE pen. Now we need to know exactly how much is costs. So we’ll multiply 60 by ⅙ as well.

Let’s put this new information on our table. We see that the price for 1 pen is $5. This is our unit rate and it will help us to determine the price for 25 pens!



number of pens	price ($)
6	30
1	5
25	?

The same way we figured out that we needed to multiply 6 by ⅙ to give us 1, we now need to figure out what we multiply by 1 to give us 25. It’s simpler though because 1 and 25 are compatible numbers; 1 multiplied by 25 equals 25.



number of pens	price ($)
6	30
1	5
25	?=125

So, on each side of our table we draw an arrow and multiply by 25. When we multiply 5 by 25 we see that the price of 25 pens is $125.00 *(write 125 in the table last row, price column).*

Believe it or not, we can now use our unit rate of 1 pen for $5 to find the price of any number of pens, even one million pens! That is the power of unit rate! Once you have calculated the unit rate or amount per 1 of something then you can create an infinite number of equivalent ratios just like 1:$5, 6:$30, and also 25:$125.

Let’s Try it (Slide 6): Let’s continue our work with tables and unit rate to determine our equivalent ratios. Remember unit rate is amount per 1 of something; per 1 dog, per 1 car, per 1 pen, etc.

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WARM WELCOME

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Today we will solve equivalent ratio problems using unit rate in a table.

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Let's Talk:

How are double number lines and tables alike? How are they different?

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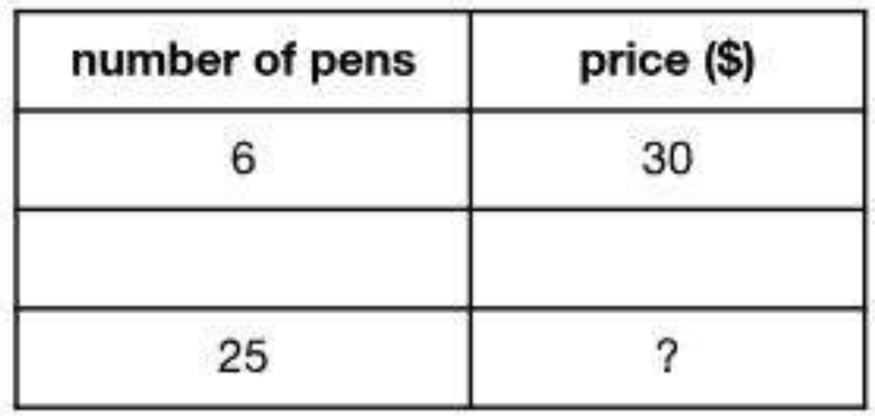
Let's Think:

What does this table tell us so far?



number of pens	price ($)
6	30
25	?

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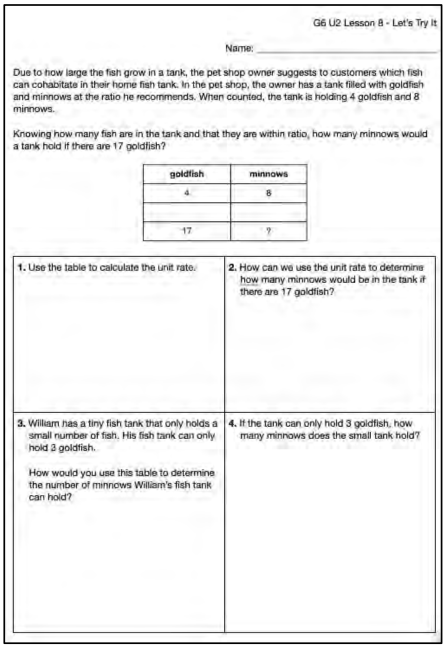
Let's Try It:

Let's explore unit rate in tables together.



G6 U2 Lesson 8 - Let's Try It

Name: ______________________

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?

goldfish	minnows
4	8
17	?

1. Use the table to calculate the unit rate.

2. How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?

3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish.

How would you use this table to determine the number of minnows William's fish tank can hold?

4. If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

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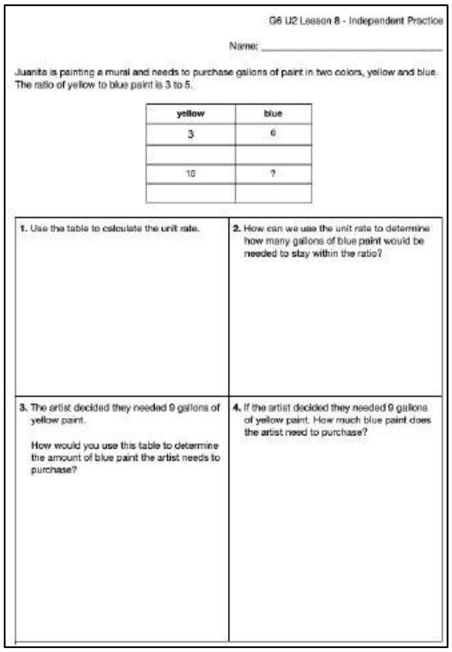
On your Own:

Now it's time to explore unit rate in tables on your own.



G6 U2 Lesson 8 - Independent Practice

Name: ______________________

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

yellow	blue
3	6
10	?

1. Use the table to calculate the unit rate.

2. How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?

3. The artist decided they needed 9 gallons of yellow paint.

How would you use this table to determine the amount of blue paint the artist needs to purchase?

4. If the artist decided they needed 9 gallons of yellow paint. How much blue paint does the artist need to purchase?

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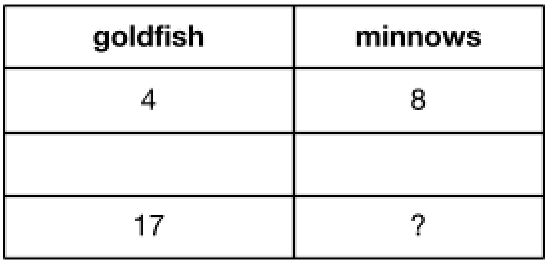
Name: ___________________________________

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?



goldfish	minnows
4	8
17	?

1. Use the table to calculate the unit rate.

2. How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?

3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish.

How would you use this table to determine the number of minnows William’s fish tank can hold?

4. If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

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Name: ___________________________________ G6 U2 Lesson 8 - Independent Practice

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

yellow	blue
3	5
10	?

1. Use the table to calculate the unit rate.

2. How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?

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How would you use this table to determine the amount of blue paint the artist needs to purchase?

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Name: ______________________________

G6 U2 Lesson 8 - Let's Try It

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?

	goldfish	minnows	
	4	8	
×$\frac{1}{4}$	1	2	×$\frac{1}{4}$
×17	17	? 34	×17

1. Use the table to calculate the unit rate.

See table

	g	m	
	4	8	
×$\frac{1}{4}$	1	2	×$\frac{1}{4}$

1 goldfish for every 2 minnows

2. How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?

See table

	g	m	
	1	2	
×17	17	34	×17

34 minnows for 17 goldfish

3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish.

How would you use this table to determine the number of minnows William's fish tank can hold?

I would use the unit rate of goldfish to minnows then, multiply by 3.

	g	m	
	1	2	
×3	3	?	×3

4. If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

	g	m	
	1	2	
×3	3	6	×3

6 minnows for every 3 goldfish

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Name: ______________________________

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

	yellow	blue	
	3	5	
$\times\frac{1}{3}$	1	$5/3 = 1\frac{2}{3}$	$\times\frac{1}{3}$
$\times 10$	10	?	$\times 10$

1. Use the table to calculate the unit rate.

see table

	y	b	
	3	5	
$\times\frac{1}{3}$	1	$\frac{5}{3}$ OR $1\frac{2}{3}$	$\times\frac{1}{3}$

2. How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?

Multiply the unit rate by 10 on each side. So, $\frac{5}{3} \times \frac{10}{1} = \frac{50}{3}$ OR $16\frac{2}{3}$ gallons of blue paint.

$3\overline{)50}$
-30 10
20
-18 6
2 $\frac{2}{3}$
16

3. The artist decided they needed 9 gallons of yellow paint.

How would you use this table to determine the amount of blue paint the artist needs to purchase?

Multiply by 3 on both sides because 3 x 3 will give you 9 gallons of yellow paint. So, you also multiply 5 gallons of blue paint by 3.

4. If the artist decided they needed 9 gallons of yellow paint. How much blue paint does the artist need to purchase?

	y	b	
	3	5	
$\times 3$	9	15	$\times 3$

15 gallons of blue paint.

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G6 U2 Lesson 9

Solve word problems involving equivalent ratios

G6 U2 Lesson 9 - Students will solve word problems involving equivalent ratios

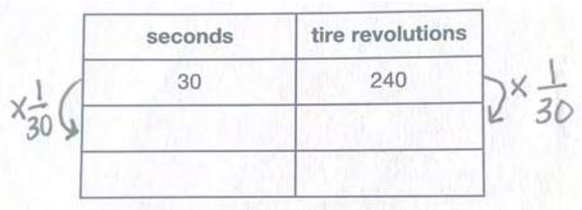
Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our second-to-last lesson in Unit 2 we are incorporating everything that we have learned about ratios. Now that you know so much, it's time for you to begin making decisions about how you are going to solve the ratio problems and which diagram you will utilize. You may decide to use a double number line or a table depending on the size of the number in your ratios and the compatibility of the numbers but also depending on your comfort level with the diagrams and the math calculations.

Let's Talk (Slide 3): So, let's open with a brainstorm. **Do you prefer double number lines or tables? Why?**

Those are interesting reasons for choosing a double number line or a table to solve ratio problems. Your decision can be anything from the amount of space you have to write, preferring to see your information organized vertically which means up and down versus horizontally which means from side-to-side, or even how easy or difficult the diagram is to draw freehand. Regardless of your reasoning, be sure to continue using a diagram when solving ratio math problems.

Let's Think (Slides 4): Let's continue with another ratio word problem. When driving 25 miles per hour, the average car's wheels revolve or rotate 240 times in 30 seconds. What is the unit rate for revolutions per second of this car's tires?



seconds	tire revolutions
30	240

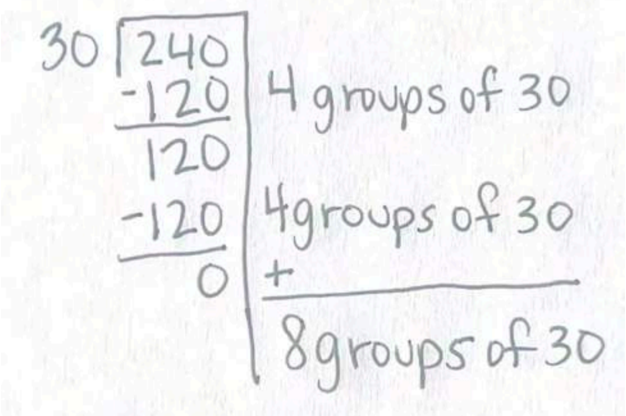
Let's start with what we know. We know that a car's wheels revolve 240 times in 30 seconds. We are trying to calculate the unit rate for revolutions per second. So, to go from 30 seconds to 1 second for unit rate we need to figure out what to multiply by. Well, let's multiply by the reciprocal of 30 which is $\frac{1}{30}$ because the reciprocal of a number is 1 divided by that number. Multiplying by $\frac{1}{30}$ on both sides of the table is the way to go.

$$\frac{30}{1} \times \frac{1}{30} = \frac{30}{30} = 1$$

Let's do the math together. $\frac{30}{1}$ multiplied by $\frac{1}{30}$ equals $\frac{30}{30}$ or 1! Of course it's 1 because we're solving for unit rate, which means rate of 1.

$$\frac{240}{1} \times \frac{1}{30} = \frac{240}{30} = 8$$

Next, we'll calculate $\frac{240}{1}$ multiplied by $\frac{1}{30}$ which equals $\frac{240}{30}$. Time to divide, again.



```
30 ⟌240  | 4 groups of 30
   -120  |
    120  | 4groups of 30
   -120  | +
      0  | 8groups of 30
```

Let's do the division for 240 by 30 together. We need to figure out how many groups of 30 we have in the bigger group of 240. We have at least 4 groups of 30 or 120 total And, 240 minus 120 leaves us with 120 remaining to be put into groups. Next, we need to figure out how many groups of 30 we have in the bigger group of 120. We can make 4 groups of 30 again because 4 multiplied by 30 is 120. And, 120 minus 120 leaves us with zero or nothing remaining to put into groups. 4 groups of 30 plus 4 groups of 30 gives us 8 groups of 30!

So, 240 divided by 30 is 8! The unit rate for revolutions per second is 8:1 or 8 revolutions per second.

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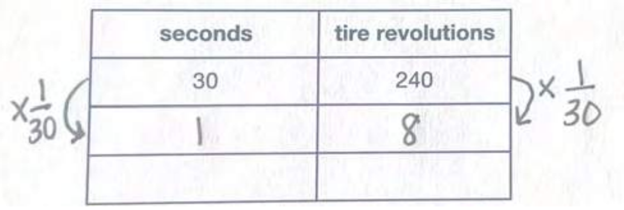
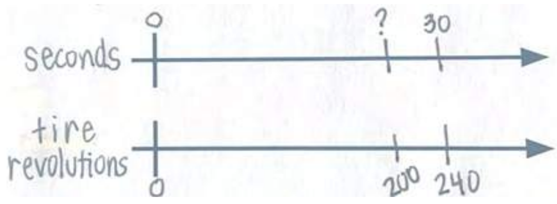


seconds	tire revolutions
30	240
1	8

Even though we've just identified the unit rate we still want to put the results of our math on our table because sometimes it's easier to understand the data in diagram form. We place the 1 under the seconds column and the 8 under the tire revolutions column. Again we see that the tire revolves 8 times per second also, 30:240 and 1:8 are equivalent ratios. Great work!

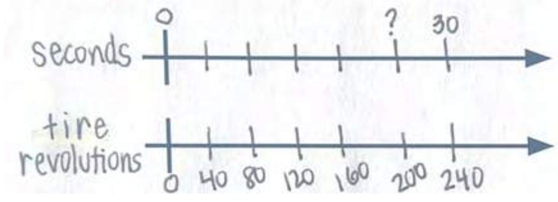
Let's Think (Slide 5): Nick calculated that the tires revolved 200 times. How many seconds did it take for the tires to revolve 200 times? Let's use the original information about the problem and a double number line to calculate the seconds.



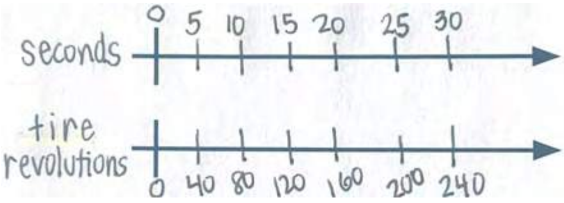
Let's construct our double number line. First label each number line with seconds and tire revolutions. Next let's put the information we know about the ratio from the problem on the number lines. Place 30 on the seconds number line near the right side and 240 on the tire revolutions number line directly underneath the 30 tick mark.

Next we place 200 revolutions on the tire revolutions number line and a question mark for the seconds on the tick mark that is directly above the tick mark with 200.

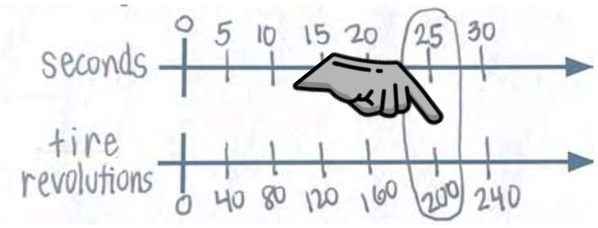
At this point my double number line has all the information we have been given but it has some gaps that we need to fill.



But how to fill that gap? Since 200 and 240 have 40 spaces in between let's try to skip count by 40s in the gap on the tire revolutions number line. Let's skip count together…40, 80, 120, 160. As I mark a tick on the tire revolutions number line, I have to make the same tick up top for the seconds number line.



Now. to figure out the numbers that go with the blank tick marks on the seconds number line we just count the spaces between the tick marks between 0 and 30. There are 6 spaces so we divide 30 by 6 and I get 5. That lets us know we need to count by 5 on the seconds number line. Ready? 5, 10, 15, 20, 25.



We can now answer the question that was posed by looking at the double number line for 200 tire revolutions. We see that 200 tire revolutions corresponds or matches to 25 seconds. That means it took 25 seconds for the tires to revolve 200 times.

Whew, we used a lot of skills to solve these ratio problems. We constructed diagrams based on information given to us in the problem, we used what we know about fractions to find unit rate, not to mention all of the calculations we had to complete. Nice work, everyone! Although we only have one lesson remaining in this unit we will continue using our ratio knowledge into Unit 3.

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Let's Try it (Slide 6-7): Let's continue solving real-world experiences involving ratio relationships. Remember you may choose to display the information in any form of ratio diagram with which you are most comfortable and you will still reach the same solution.

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WARM WELCOME

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Today we will solve word problems involving equivalent ratios.

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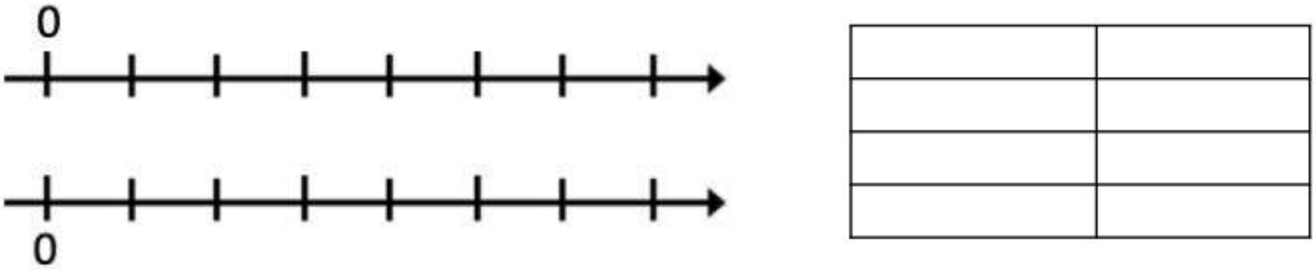
Let's Talk:

Which ratio diagram do you prefer? Why?



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Let's Think:

When driving 25 miles per hour, the average car's wheels revolve 240 times in 30 seconds.

What is the unit rate for revolutions per sec?

seconds	tire revolutions
30	240

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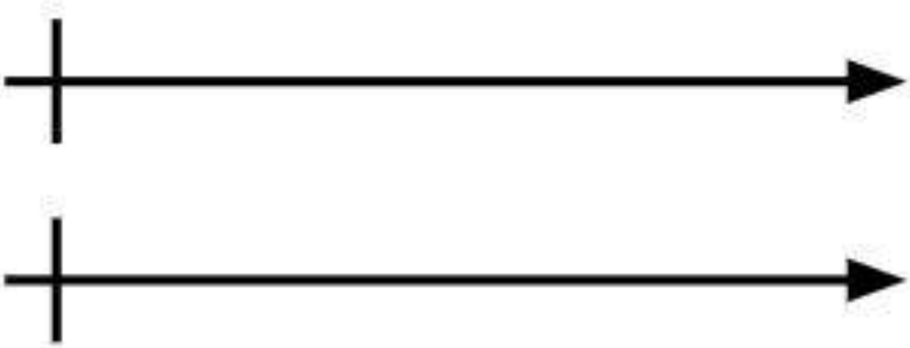
Let's Think:

Nick calculated that the tires revolved 200 times.

How many seconds did it take for the tires to revolve 200 times?



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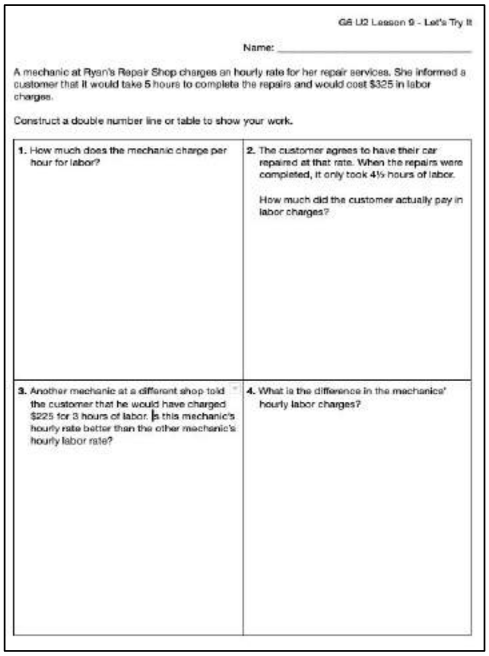
Let's Try It:

Let's explore solving problems involving equivalent ratios together.



G6 U2 Lesson 9 - Let's Try It

Name: ______________________

A mechanic at Ryan's Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete the repairs and would cost $325 in labor charges.

Construct a double number line or table to show your work.

1. How much does the mechanic charge per hour for labor?
2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor.

   How much did the customer actually pay in labor charges?
3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?
4. What is the difference in the mechanics' hourly labor charges?

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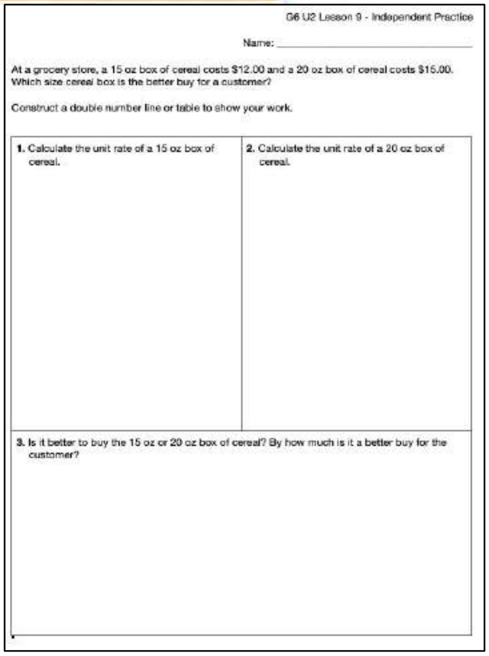
On your Own:

Now it’s time to explore solving problems involving equivalent ratios on your own.



G6 U2 Lesson 9 - Independent Practice

Name: ______________________

At a grocery store, a 15 oz box of cereal costs $12.00 and a 20 oz box of cereal costs $15.00. Which size cereal box is the better buy for a customer?

Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.

2. Calculate the unit rate of a 20 oz box of cereal.

3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?

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Name: ___________________________________

A mechanic at Ryan's Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete repairs and would cost $325 in labor charges.

Construct a double number line or table to represent the given information.

1. How much does the mechanic charge per hour for labor?

2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor.

Using your diagram from question 1, calculate how much the customer actually paid in labor charges?

3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?

4. What is the difference in the mechanics' hourly rates for labor charges?

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Name: ______________________________ G6 U2 Lesson 9 - Independent Practice

At a grocery store, a 15 oz box of cereal costs $12.00 and a 20 oz box of cereal costs $15.00. Which size cereal box is the better buy for a customer?

Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.	**2.** Calculate the unit rate of a 20 oz box of cereal.
3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?	

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Name: ______________________

A mechanic at Ryan's Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete repairs and would cost $325 in labor charges.

Construct a double number line or table to represent the given information.

1. How much does the mechanic charge per hour for labor?

$5\overline{)325}$
-300 | 60
25
-25 | 5
0 | + 65

hours	cost
5	325
1	65

$\times\frac{1}{5}$ $\times\frac{1}{5}$

$\frac{325}{1}\times\frac{1}{5}=\frac{325}{5}$

$65 per hour of labor

2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor.

Using your diagram from question 1, calculate how much the customer actually paid in labor charges?

hours	cost
5	325
1	65
$\frac{9}{2}=4\frac{1}{2}$	292.50

$\times\frac{9}{2}$ $\times\frac{9}{2}$

$2\overline{)585}$
-500 | 250
85
-80 | 40
5
-4 | +2
1 | 292

$\frac{65}{1}\times\frac{9}{2}=\frac{585}{2}=292\frac{1}{2}$

50¢

$292.50 in actual cost

3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?

hours	cost
3	225
1	75

$\times\frac{1}{3}$ $\times\frac{1}{3}$

$\frac{225}{1}\times\frac{1}{3}=\frac{225}{3}$

$3\overline{)225}$
-210 | 70
15
-15 | 5
0 | + 75

No, the rate is not better at this mechanic.

4. What is the difference in the mechanics' hourly rates for labor charges?

subtract

$75
-$65

$10 difference in the hourly rates.

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Name: ______________________________

G6 U2 Lesson 9 - Independent Practice

At a grocery store, a 15 oz box of cereal costs $12.00 and a 20 oz box of cereal costs $15.00. Which size cereal box is the better buy for a customer?

Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.

15 |12.00 → ②
− 600 | 40
600
− 600 | 40
\+
.80 ②

$0.80 per oz.

2. Calculate the unit rate of a 20 oz box of cereal.

20 |15.00 → ②
−1400 | 70
100
−100 | 5
0
.75 ②

$0.75 per oz.

3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?

It is better to buy the 20 oz box of cereal because you pay less per ounce. It is a better buy by 5¢.

7 10
$0.~~80~~
-$0.75
$0.05

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G6 U2 Lesson 10

Apply number lines, tables, and tape diagrams to solve problems about ratios

CITYTUTOR DC

G6 U2 Lesson 10 - Students will use number lines and tables to solve problems about ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We have arrived at the final lesson in our first ratios unit! You now have so many strategies to use when confronted with a ratio problem. We know that when comparing quantities it's often helpful to calculate the unit rate because from the unit rate we will be able to find an infinite number of equivalent ratios. But, we also know that using the unit rate isn't the only way to create equivalent ratios. Today we will continue applying our strategies and use diagrams to calculate those equivalent quantities.

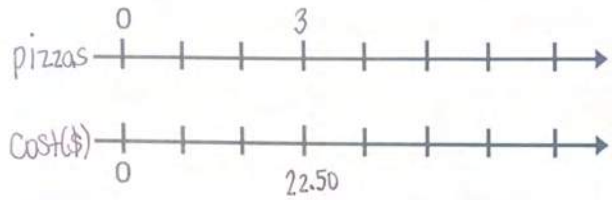
Let's Talk (Slide 3): Let's open by collecting everything we've learned in this unit. **What do you know about ratios?** Possible Student Answers, Key Points:

- Ratios are a way to compare quantities.
- We have to pay attention to the order when we're writing ratios.
- We can use "to" and a colon and fractions to represent ratios.
- We can use what we know about multiplication and division to write equivalent ratios.
- Unit rate is important because it tells us the ratio of a rate of 1 and then we can find anything.

Wow, did you all just hear how much you've learned about ratios? It's been 12 lessons and we've learned so much!

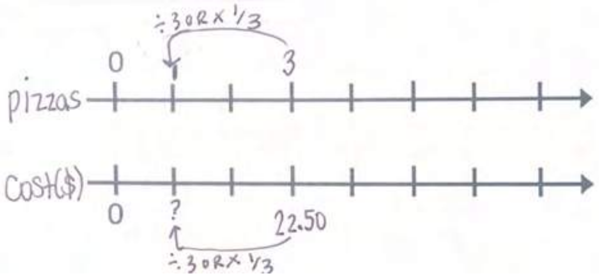
Let's Think (Slide 4): Let's solve a ratio word problem where we construct these diagrams. "A pizza parlor had a dinner special on large pizzas. The special advertises 3, one-topping pizzas for $22.50." Seeing the special, Alison decided to order 1 pepperoni pizza for herself. How much did Alison pay for her pizza?

We have been discussing that we can use *any* of our diagrams to solve ratio problems. Which one do you prefer? Interesting! Let's use the double number line to solve.

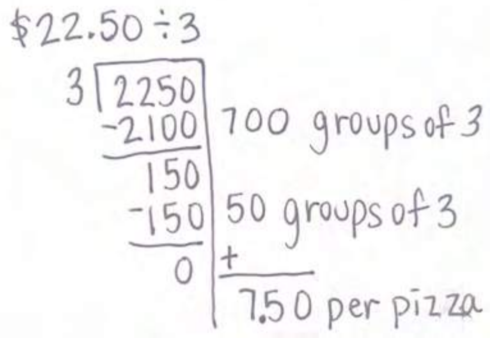


To construct the double number line we first include the information we are given in the problem including the labels for each number line…pizzas and cost.

Our problem tells us that 3 pizzas cost $22.50 so let's skip 3 spaces on the pizzas number line and write 3. Next we write 22.50 directly underneath the tick mark with the 3 because, again, three pizzas costs $22.50.



Next we find the unit rate or cost of 1 pizza for Alison. What will we multiply 3 by to get 1? The reciprocal of 3 or ⅓ That's right! Multiplying reciprocals results in an answer of 1. If we multiply by ⅓ on the top number line then we need to do the same on the bottom number line. Let's do the math.



First, let's move the decimal over, so $22.50 would be 2250. This will make our division easier! We need to figure out how many groups of 3 we have in the bigger group of 2250. We have at least 700 groups of 3 or 2100 total. And, 2250 minus 2100 leaves us with 150 remaining to be put into groups. Next, we need to figure out how many groups of 3 we have in the bigger group of 150. That's an easier one, we have 50 groups of 3 because 50 multiplied by 3 is 150. And, 150 minus 150 leaves us with 0 or nothing remaining to put into groups. Finally, let's add up what we did…700 groups of 3 plus 50

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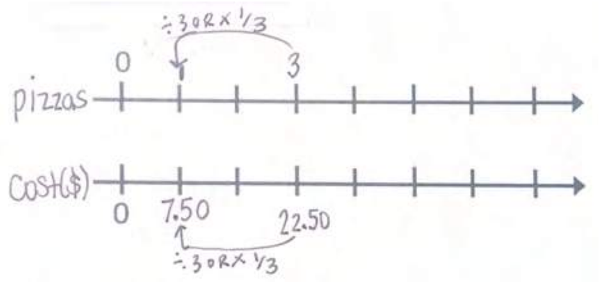
groups of 3 gives us 750 groups of 3. So, 2250 divided by 3 is 750. Almost there! We need to move the decimal point over two places. So 1 piece of pizza costs $7.50.



Let's fill-in the double number line with our unit rate by placing 7.50 on the tick mark directly under the tick mark for 1 pizza. Again, Alison paid $7.50 for 1 pepperoni pizza.

So, we just used a double number line to figure out how much Alison paid for 1 pizza, and we would've followed very similar steps to use the table to solve. Remember that diagrams are here to help you with the math. Today when you're solving choose the diagram that you have the most comfort with and is best suited for the problem being solved. Although this is the end of Unit 2 we will still be working with ratios and using our diagrams when solving in the next unit of study.

Let's Try it (Slide 6-7): Let's bring our unit to a close by exploring more real-world experiences involving ratio relationships. Don't forget that you can choose to display the information in any form of ratio diagram with which you are most comfortable and you will still reach the same solution.

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WARM WELCOME

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Today we will solve word problems involving equivalent ratios.

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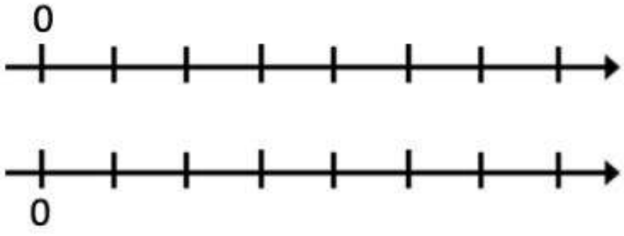
Let's Talk:

What do you know about ratios?



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Let's Think:

A pizza parlor had a dinner special on large pizzas. The special advertises 3, one topping pizzas for $22.50.

Seeing the special, Alison decided to order 1 pepperoni pizza for herself. How much did Alison pay for her pizza?

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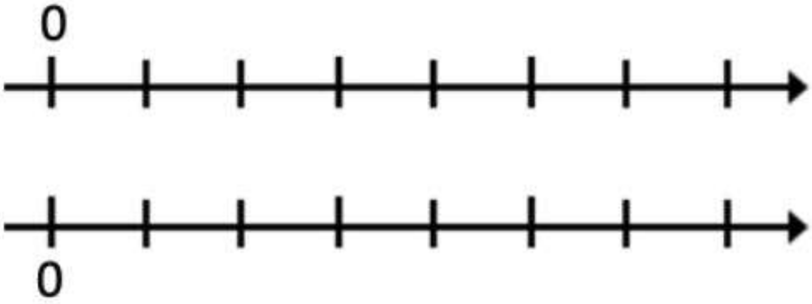
Let's Think:

Which representation are we going to use to solve this problem?



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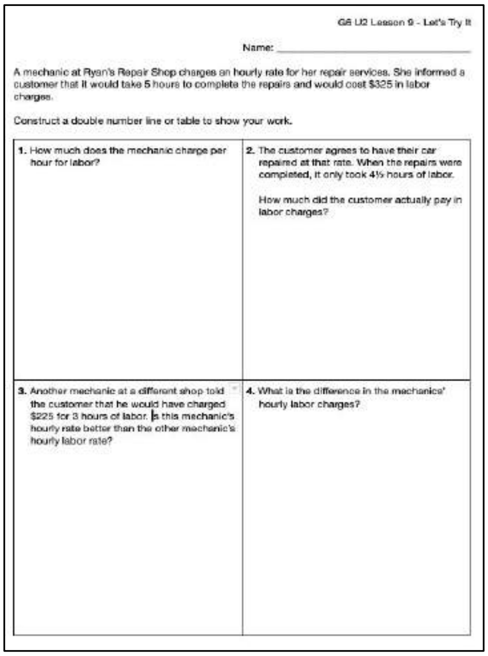
Let's Try It:

Let's explore solving problems involving equivalent ratios together.



G6 U2 Lesson 9 - Let's Try It

Name: ______________________

A mechanic at Ryan's Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete the repairs and would cost $325 in labor charges.

Construct a double number line or table to show your work.

1. How much does the mechanic charge per hour for labor?
2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor.

   How much did the customer actually pay in labor charges?
3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?
4. What is the difference in the mechanics' hourly labor charges?

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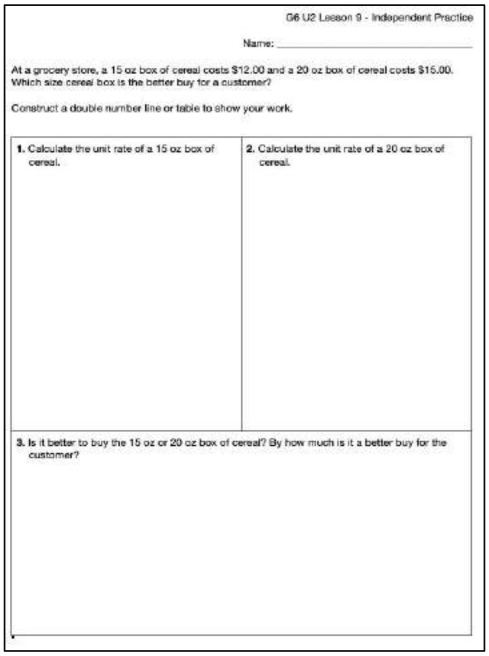
On your Own:

Now it’s time to explore solving problems involving equivalent ratios on your own.



G6 U2 Lesson 9 - Independent Practice

Name: ____________________________

At a grocery store, a 15 oz box of cereal costs $12.00 and a 20 oz box of cereal costs $15.00. Which size cereal box is the better buy for a customer?

Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.	**2.** Calculate the unit rate of a 20 oz box of cereal.

3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?

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It's time for movie night at school! A teacher orders 12 pizzas with the advertised pizza special. Recall the special advertised 3, one-topping pizzas for $22.50. Each pizza the teacher ordered was cut into 10 slices. How much did it cost per slice of pizza?

Construct a double number line or table to show your work.

1. What information do we need to know in order to calculate how much it costs per slice of pizza?

____

____

2. How much did it cost per slice of pizza?

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Ron began saving money out of his paychecks that he received every two weeks. He saved some money and put the rest in his checking account. Ron decided on a ratio of saving $8.00 for every $28.00 he put in his checking account.

Construct a double number line or table to represent this information.

1. How much did Ron put in his checking account for every dollar he saves?

2. How much would Ron have placed in his checking account when his savings account reached $50.00?

3. When checking his account one day, Ron discovered he had placed $350.00 in his checking account since he began saving money. How much money had Ron placed in savings since he began saving money using this ratio of funds per paycheck?

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Name: ______________________________

It's time for movie night at school! A teacher orders 12 pizzas with the advertised pizza special. Recall the special advertised 3, one-topping pizzas for $22.50. Each pizza the teacher ordered was cut into 10 slices. How much did it cost per slice of pizza?

Construct a double number line or table to show your work.

1. What information do we need to know in order to calculate how much it costs per slice of pizza?

You need to know how many slices were ordered in total and the total price paid.

2. How much did it cost per slice of pizza?

- 12 pizzas × 10 slices per pizza = 120 total slices
- 3 pizzas = $22.50

	Cost	pizzas	
$\times\frac{1}{3}$	22.50	3	$\times\frac{1}{3}$
$\times 12$	7.50	1	$\times 12$
	90	12	

So, it costs $90 for 12 pizzas or 120 total slices so now we divide $90 by 120 slices to find the cost per slice of pizza.

$$\frac{22.50}{1} \times \frac{1}{3} = \frac{22.50}{3}$$

$$\begin{array}{r|l} 3\,\overline{)\,22.50} \rightarrow ② & \\ -1500 & 500 \\ \hline 750 & \\ -750 & 250 \\ \hline 0 & + \\ \hline & 750\ ② \end{array}$$

$$\begin{array}{r|l} 120\,\overline{)\,90.00} \rightarrow ② & \\ -6000 & 50 \\ \hline 3000 & \\ -2400 & 20 \\ \hline 600 & \\ -600 & 5 \\ \hline 0 & + \\ \hline & .75\ ② \end{array}$$

It cost $0.75 per slice of pizza.

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Name: ______________________________ G6 U2 Lesson 10 - Independent Practice

Ron began saving money out of his paychecks that he received every two weeks. He saved some money and put the rest in his checking account. Ron decided on a ratio of saving $8.00 for every $28.00 he put in his checking account.

Construct a double number line or table to represent this information.

1. How much did Ron put in his checking account for every dollar he saves?

	savings	checking	
	8	28	
$\times\frac{1}{8}$	1	3.50	$\times\frac{1}{8}$
×50	50	175	×50
×2	100	350	×2

$\frac{28}{1}\times\frac{1}{8}=\frac{28}{8}$

$8\overline{)28}$ 3
-24
4

$3\frac{4}{8}=3\frac{1}{2}$
↑
50¢

so, $3.50

$3.50 in his checking for every $1.00 in his savings

2. How much would Ron have placed in his checking account when his savings account reached $50.00?

See table in #1.

$3.50 × 50 = $175.00

$175.00 is in checking if $50 is in his savings account.

3. When checking his account one day, Ron discovered he had placed $350.00 in his checking account since he began saving money. How much money had Ron placed in savings since he began saving money using this ratio of funds per paycheck?

See table in #1.

$50 × 2 = $100

$100 is in his savings account since Ron began saving money.

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CITYTUTOR DC

G6 Unit 3:

Unit Rate and Percentage

G6 U3 Lesson 1

Reason about ratios and solve problems using tape diagrams

CITYTUTOR DC

G6 U3 Lesson 1 - Students will reason about ratios and solve problems using tape diagrams

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Welcome to Unit 3! In this unit we will continue to focus on ratios or the comparison of quantities. We have so far utilized double number lines and tables to organize and analyze ratio information. Today we will be exploring ratios and tape diagrams. A tape diagram is a new diagram for us that we will only add to our toolkit for solving ratio problems.

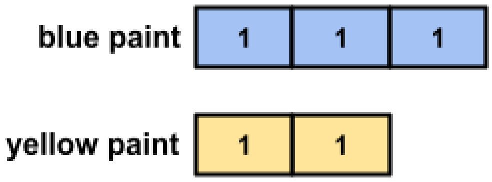
Let's Talk (Slide 3): We spent a lof time using exploring ratios in our last unit. We are going to build on those understandings in this unit. So, let's open with a brainstorm…**think of an example scenario that involves ratios.** Possible Student Answers, Key Points:

- When I'm making pancakes, for every cup of mix, I need half of a cup of milk.
- When I'm cooking, I use a recipe which tells me exactly how much of each ingredient to include in relation to the other ingredients.
- When I'm shopping at the store, I use the unit rate to calculate the price of ONE item.

Great examples. We can compare the quantities of food items to other food items while other examples may compare the cost to the number of items purchased. Let's look at how to solve ratio problems such as these with our newest type of ratio diagram, the tape diagram.

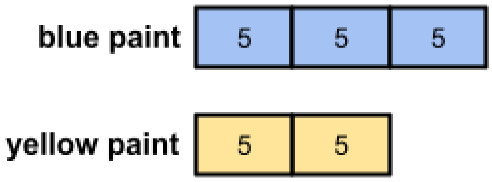
Let's Think (Slide 4): We began this lesson by saying that we would learn a new type of diagram. A tape diagram is just another way to visually represent ratio comparisons, just like the double number lines and tape diagrams we learned to use in Unit 2. Tape diagrams are composed of rectangular blocks that represent quantities, we've used a form of tape diagrams in math to solve story problems. When we duplicate these boxes we find equivalent ratios. The amount of boxes determines the values of what is being compared and the ratio of the quantities.

Here's an example of a simple tape diagram. The colors yellow and blue combine or mix to make the color green. The ratio of gallons of blue and yellow paint used to make green paint is shown on the tape diagram.



When we look at this tape diagram, we notice that the ratio of blue paint to yellow paint is 3 to 2 which means for every 3 gallons of blue paint we need 2 gallons of yellow paint.

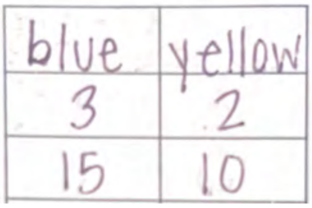
We can tell the ratio is 3:2 because we see 3 blue boxes and 2 yellow boxes. Let's put a number in each block. If the ratio is 3:2 that means the values we put in the 3 blue boxes should total 3. The only way for that to be true is for each box to equal 1 because 1 gallon plus 1 gallon plus 1 gallon equals 3 gallons of paint.That means each box for the yellow paint must also equal 1 gallon. So, if we want to mix green paint for every 3 gallons of blue, we need two gallons of yellow paint.



But here's the cool thing about tape diagrams, the boxes or blocks can represent any number! Instead of 1, let's make each block represent 5. Our tape diagram now represents a different quantity of blue and yellow paint. We now have…5, 10, 15 gallons of blue paint and 5, 10 gallons of yellow paint. The ratio of blue to yellow paint is now 15 to 10 according to the tape diagram and this tape diagram helped us create an equivalent ratio!

If we created equivalent fractions, what do we know about the color of the green paint when the ratio is 3 to 2 compared to 15 to 10? We have the same color green, or the same ratio. Correct! We would end up with the same exact shade of green because the amount of blue and yellow paint increased within the ratio so the shade of green color will be the same for both ratios of blue and yellow paint.

Let's Think (Slide 5): We learned two other ways to represent ratios in our last unit. Let's connect this tape diagram to the other diagrams we've learned in previous lessons. First, let's put the same information in a table.



blue	yellow
3	2
15	10

Let's start by labeling each column with blue and yellow as the table headings. Our tape diagram showed that for every 3 gallons of blue paint, we need 2 gallons of yellow paint (*write*). We also saw that another equivalent ratio is 15 gallons of blue paint to 10 gallons of yellow paint. That makes sense because to get from 3 to 15 we multiplied by 5 and to get from 2 to 10, we also have to multiply by 5!

Now let's show the same information on our double number line. First we need to label the top number line as blue and the bottom number line as yellow. Let's label the first tick mark as 0 and then from the tape diagram we know that for every 3 gallons of blue paint, we need 2 gallons of yellow paint. So I'll make sure that they are on the exact same tick. Now, we also know that an equivalent ratio is 15 gallons of blue to 10 gallons of yellow.

According to both diagrams, what are our equivalent ratios in fraction form?$\frac{3}{2}$ and $\frac{15}{10}$. That's right! Both diagrams also show that $\frac{3}{2}$ and $\frac{15}{10}$ are equivalent ratios.Tape diagrams involve using rectangular boxes to represent quantities. In this lesson we saw how our boxes, when grouped together, represent those quantities in the same way the individual rows represent the ratios on a table and the matching tick marks represent ratios on a double number line. We will continue to use tape diagrams as well as the other diagrams in our toolkit as we explore ratios throughout Unit 3.

Let's Try it (Slide 6-7): Let's continue applying our knowledge of ratios to tape diagrams. As we continue working with tape diagrams we will see and experience some of their benefits and some of their limitations just as we experienced benefits and limitations with our other diagrams, double number lines and tables. Don't forget, these experiences will help you decide which diagram is best when representing a ratio problem.

WARM WELCOME

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Today we will reason about ratios and solve problems using tape diagrams.

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Let’s Talk:

Think of an example of a scenario that involves ratios. Be ready to share.

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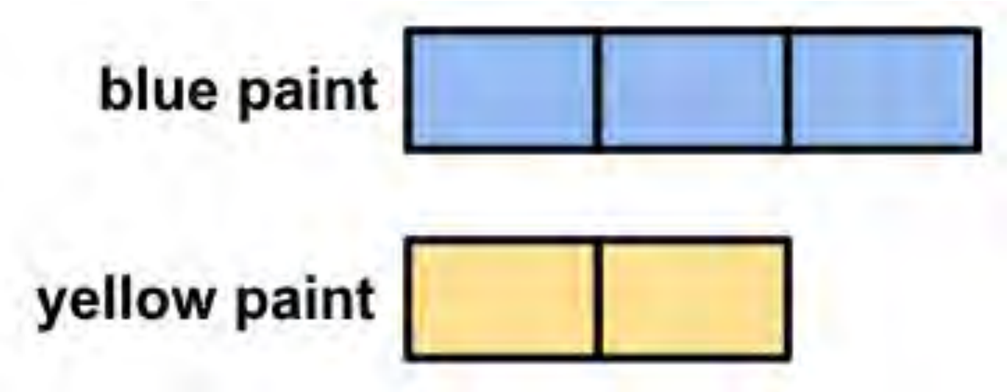
Let’s Think:

What could this tape diagram tell us about the ratio of blue paint to yellow paint?



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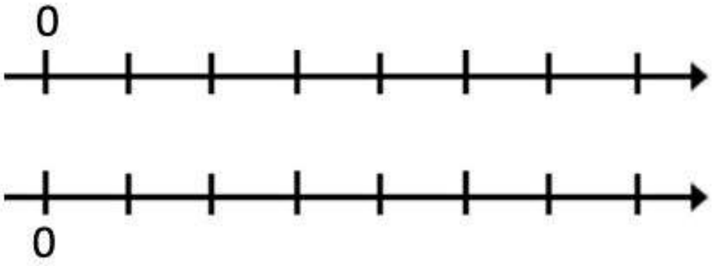
Let's Think:

Let's represent our tape diagram information using the other diagrams we've learned.



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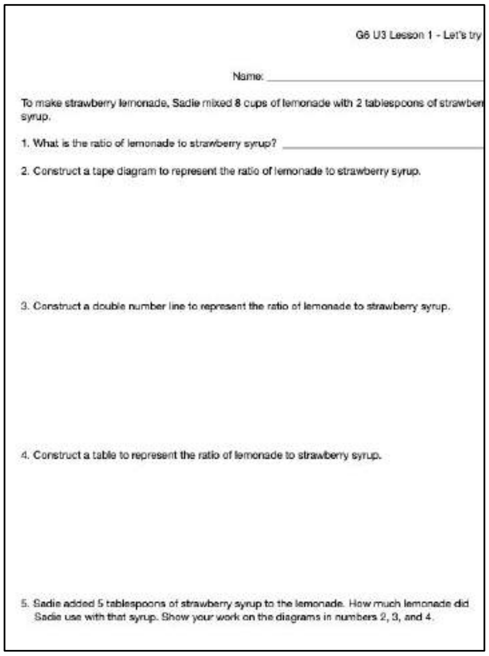
Let's Try It:

Let's explore using tape diagrams together.



G6 U3 Lesson 1 - Let's try

Name: ______________________

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawber syrup.

1. What is the ratio of lemonade to strawberry syrup? ______________________

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.

3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.

4. Construct a table to represent the ratio of lemonade to strawberry syrup.

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup. Show your work on the diagrams in numbers 2, 3, and 4.

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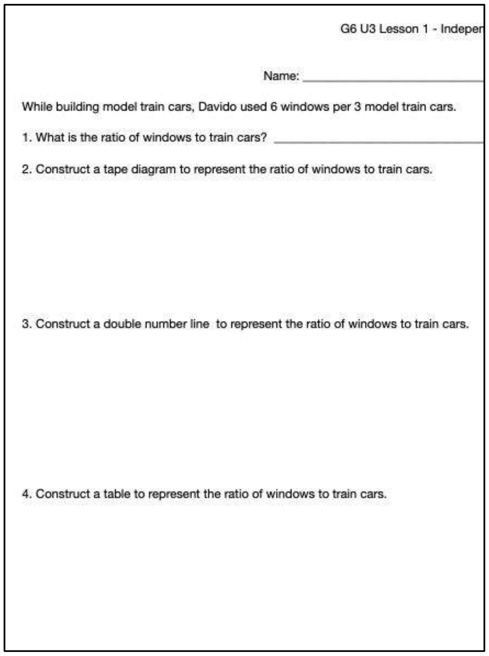
On your Own:

Now it’s time to explore using tape diagrams on your own.



G6 U3 Lesson 1 - Indepen

Name: ______________________

While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ______________________

2. Construct a tape diagram to represent the ratio of windows to train cars.

3. Construct a double number line to represent the ratio of windows to train cars.

4. Construct a table to represent the ratio of windows to train cars.

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Name: ______________________________________ G6 U3 Lesson 1 - Let's Try It

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawberry syrup.

1. What is the ratio of lemonade to strawberry syrup? ___________________________________

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.

3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.

4. Construct a table to represent the ratio of lemonade to strawberry syrup.

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup? Show your work on the diagrams in numbers 2, 3, and 4.

Name: ______________________________________ G6 U3 Lesson 1 - Independent Practice

While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ____________________________________

2. Construct a tape diagram to represent the ratio of windows to train cars.

3. Construct a double number line to represent the ratio of windows to train cars.

4. Construct a table to represent the ratio of windows to train cars.

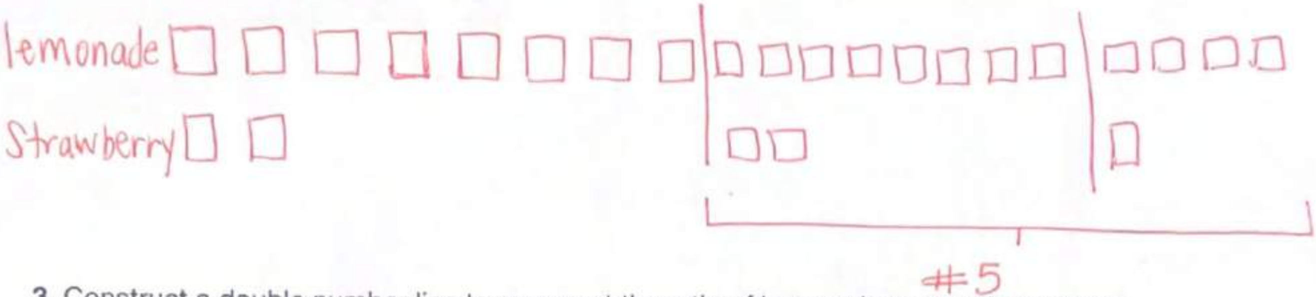
5. If Davido made 8 trains, how many windows did he use? Show your work on the diagrams in numbers 2, 3, and 4.

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawberry syrup.

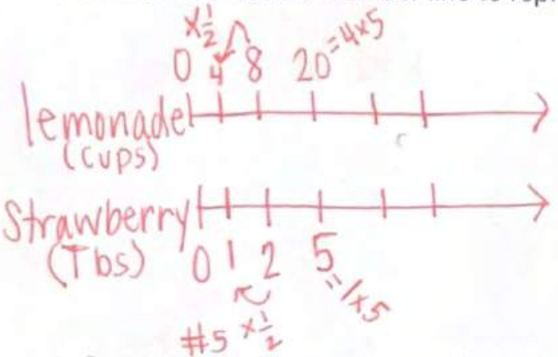
1. What is the ratio of lemonade to strawberry syrup? 8:2

L : S

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.



3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.



4. Construct a table to represent the ratio of lemonade to strawberry syrup.

Lemonade	Strawberry
8	2
$\times\frac{1}{2}$ 4	1 $\times\frac{1}{2}$
$\times 5$ 20	5 $\times 5$

>#5

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup? Show your work on the diagrams in numbers 2, 3, and 4.

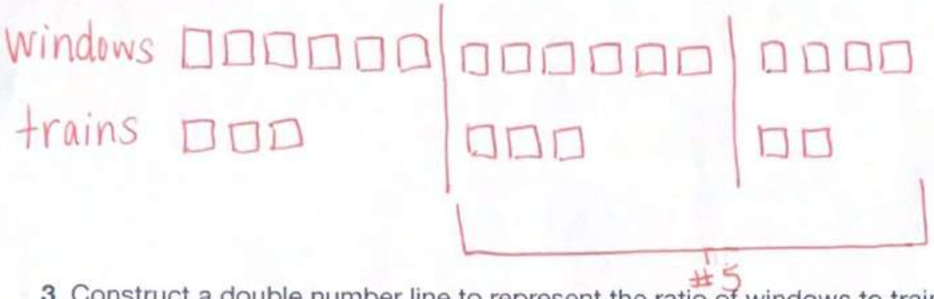
You need 20 cups of lemonade with 5 Tbs of strawberry syrup.

Name: ____________________ G6 U3 Lesson 1 - Independent Practice

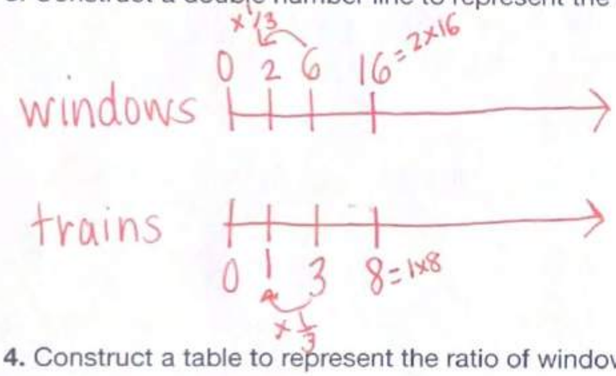
While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ____________________

2. Construct a tape diagram to represent the ratio of windows to train cars.



3. Construct a double number line to represent the ratio of windows to train cars.



4. Construct a table to represent the ratio of windows to train cars.

	windows	train	
	6	3	
$\times\frac{1}{3}$	2	1	$\times\frac{1}{3}$
$\times 8$	16	8	$\times 8$

5. If Davido made 8 trains, how many windows did he use? Show your work on the diagrams in numbers 2, 3, and 4.

Davido used 16 windows for 8 trains.

G6 U3 Lesson 2

Explore approximate and relative sizes for standard units of length, volume, and weight or mass

G6 U3 Lesson 2 - Students will explore approximate and relative size for standard units of measure

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we learned a third type of diagram to represent ratios. Our toolkit now includes double number lines, tables, and tape diagrams! We also saw how the information from one ratio problem could be represented in each of the three diagrams to represent the equivalent ratios 3:2 and 15:10. In this lesson we will switch gears a little to revisit the concept of measurement which you first explored in elementary school.

Let's Talk (Slide 3): So, measurement is the act of finding a number that shows the size or amount of something. We measure every day, often without realizing! **Can you think of when, what, or how you measure each day?** Possible Student Answers, Key Points:

- At breakfast, when we measure out the amount of pancake batter or a cup of juice.
- At the grocery store, when we buy a certain amount of oranges or apples or meat.
- When I'm telling time on my watch or phone, etc.
- When I'm running a race, I can time how long it takes.

Great thinking. We take and make measurements many, many times in our day from the moment we wake until we go to sleep at night. There are certain categories that measurements fit into. Those categories include…

- Length - How long something is, or the distance between two things
- Volume - How much space in a 3D figure, or the measure of liquid
- Temperature - How hot or cold something is
- And time - The time of day, or the time that is passing, or the time that it takes to get somewhere.

Let's Think (Slide 4): Think of some units of measure that fit within each category. Our category headings will be **weight and mass**, **length**, **volume**, **temperature**, and **time**.

- Weight and mass relate to how heavy something is
- Length relates to how long something is
- Volume relates to how much something can hold within itself
- And, our last two categories are temperature which speak to how hot or cold something is and time references when or how long something takes place.

Each of these categories have units that we measure in, so let's brainstorm together some units that flal under each of these measurement categories. I'll help you out by placing one unit of measure in each category to get us started. Ready?

- In the weight and mass category I'll put grams because I know I can measure something's weight in grams.
- In the length category I'll add meters because I know I can measure how long something is in meters.
- In the volume category I'll put liters because I can measure the soda in liters.
- In our second to last category, temperature, I'll put Kelvin which is a temperature unit used in science,
- In our last category, which is time, I'll add hours because I can measure time in hours.

We're off to a good start! Let's brainstorm some other units for each of our measurement categories.

- Let's start with weight and mass, what other units can we measure weight in? Think about measurements of weight we take at the doctor or at the grocery store.
- Now, let's work with length, I think this one will be the easiest, what else can we measure length in? What units are on a ruler or a tape measure?
- Now let's think about volume. When we measure volume, we're often measuring liquid. So think about units of measure for soda or milk or water. We also use a lot of volume recipes in cooking, think about the units you see in recipes.

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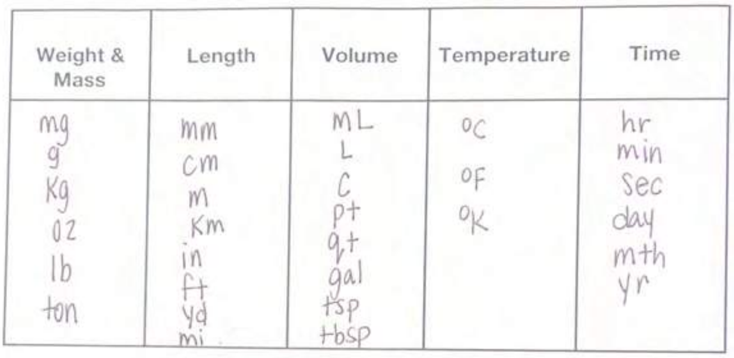
- Now let’s look at temperature, I put kelvin but there are two other ways to measure temperature that are common. Think about the weather forecast, what do you hear people saying with the degrees?
- And finally, time…what units can we measure time in? Think about the clock and then larger units of time.



Weight & Mass	Length	Volume	Temperature	Time
mg g Kg oz lb ton	mm cm m Km in ft yd mi	ML L C pt qt gal tsp tbsp	°C °F °K	hr min Sec day mth yr

Wow! You already know lots of units of measure. Let me add a few that we left off. Speak up if what I add sounds familiar to you *(add any missing units of measure to their appropriate category).*

Our world would be pretty chaotic without units of measure. Imagine a world without units to describe time or temperature measurements. Crazy for sure! What if we couldn’t tell how tall we are or our shoe size? Our world would definitely not be as orderly or make as much sense as it does now.

Let’s Try it (Slide 5): Let’s continue our measurement work by categorizing measurements based on their attributes and size. We put a lot of brain power into our chart. Remember to think about our measurements when you need to know which units of measure fall under which categories.

Note: Keep Slide 4 available for students to look at during work time, they can refer back to it if they need to.

WARM WELCOME

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Today we will explore approximate and relative size for standard units of measure.

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Let's Talk:

Can you think of when, what, or how you measure each day?

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Let's Think:

Think of some units of measure that fit within each category.

Weight & Mass	Length	Volume	Temperature	Time

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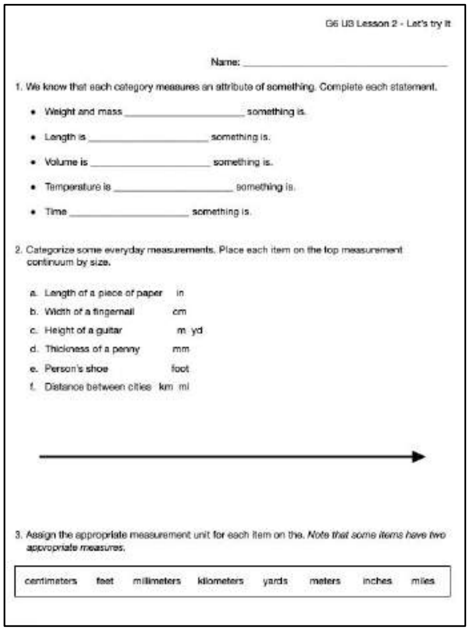
Let’s Try It:

Let’s explore units of measure together.



G6 U3 Lesson 2 - Let's try it

Name: ______________________________

1. We know that each category measures an attribute of something. Complete each statement.

- Weight and mass ____________________ something is.
- Length is ____________________ something is.
- Volume is ____________________ something is.
- Temperature is ____________________ something is.
- Time ____________________ something is.

2. Categorize some everyday measurements. Place each item on the top measurement continuum by size.

a. Length of a piece of paper in
b. Width of a fingernail cm
c. Height of a guitar m yd
d. Thickness of a penny mm
e. Person's shoe foot
f. Distance between cities km mi

3. Assign the appropriate measurement unit for each item on the. *Note that some items have two appropriate measures.*

centimeters feet millimeters kilometers yards meters inches miles

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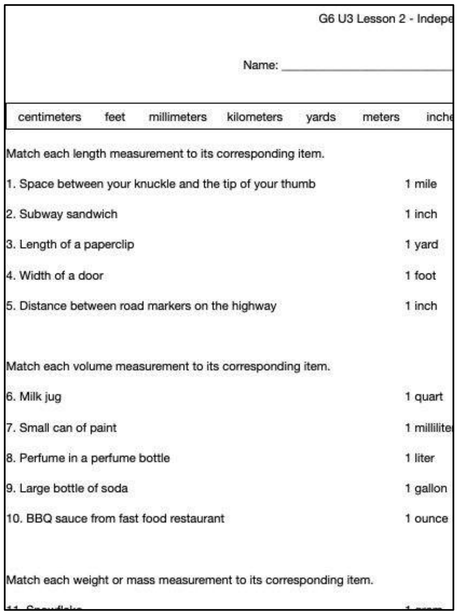
On your Own:

Now it’s time to explore units of measure on your own.



G6 U3 Lesson 2 - Indepe

Name: ______________________________

centimeters feet millimeters kilometers yards meters inche

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb	1 mile
2. Subway sandwich	1 inch
3. Length of a paperclip	1 yard
4. Width of a door	1 foot
5. Distance between road markers on the highway	1 inch

Match each volume measurement to its corresponding item.

6. Milk jug	1 quart
7. Small can of paint	1 millilite
8. Perfume in a perfume bottle	1 liter
9. Large bottle of soda	1 gallon
10. BBQ sauce from fast food restaurant	1 ounce

Match each weight or mass measurement to its corresponding item.

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Name: ____ G6 U3 Lesson 2 - Let's Try It

1. We know that each category measures an attribute of something. Complete each statement.

a. Weight and mass are h______ h__________ something is.

b. Length is h_______ l_________ something is.

c. Volume is h______ m________ something can hold.

d. Temperature is h_______ h_____ o___ c_______ something is.

e. Time is w________ o___ h______ l_______ something is taking place.

2. Categorize some everyday measurements. Place each item on the measurement continuum by size.

a. length of a piece of paper
b. width of a fingernail
c. height of a guitar
d. thickness of a penny
e. person's shoe
f. distance between cities

3. Assign the appropriate measurement unit from the box below to each item on the continuum. *Note that some items have more than one applicable measure.*

centimeters feet millimeters kilometers yards meters inches miles

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Name: ____________________________________ G6 U3 Lesson 2 - Independent Practice

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb

2. Subway sandwich

3. Length of a paperclip

4. Width of a door

5. Distance between road markers on the highway

1 mile

1 inch

1 yard

1 foot

1 inch

Match each volume measurement to its corresponding item.

6. Milk jug

7. Small can of paint

8. Perfume in a perfume bottle

9. Large bottle of soda

10. BBQ sauce from fast food restaurant

1 quart

1 fluid ounce

1 liter

1 gallon

1 ounce

Match each weight or mass measurement to its corresponding item.

11. Snowflake

12. Pineapple

13. Shark

14. Paperclip

15. Box of cereal

1 gram

1 milligram

1 pound

1 kilogram

1 ton

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Name: ________________________________

G6 U3 Lesson 2 - Let's Try It

1. We know that each category measures an attribute of something. Complete each statement.

a. Weight and mass are how heavy something is.

b. Length is how long something is.

c. Volume is how much something can hold.

d. Temperature is how hot or cold something is.

e. Time is when or how long something is taking place.

2. Categorize some everyday measurements. Place each item on the measurement continuum by size.

a. length of a piece of paper

b. width of a fingernail

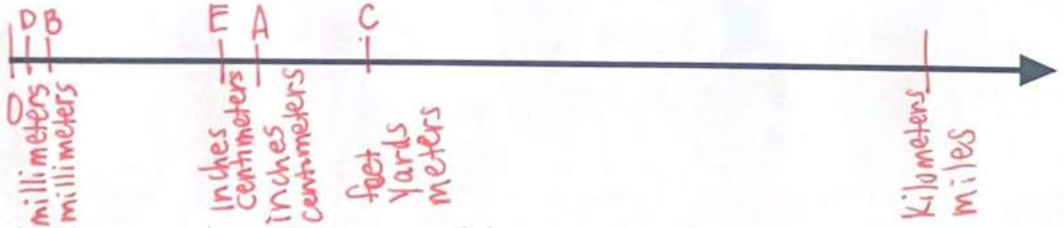
c. height of a guitar

d. thickness of a penny

e. person's shoe

f. distance between cities

(Note: E & A could be switched)



3. Assign the appropriate measurement unit from the box below to each item on the continuum. *Note that some items have more than one applicable measure.*

centimeters   feet   millimeters   kilometers   yards   meters   inches   miles

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Name: ____________________ G6 U3 Lesson 2 - Independent Practice

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb	1 inch	1 mile
2. Subway sandwich	1 foot	1 inch
3. Length of a paperclip	1 inch	1 yard
4. Width of a door	1 yard	1 foot
5. Distance between road markers on the highway	1 mile	1 inch

Match each volume measurement to its corresponding item.

6. Milk jug	1 gallon	1 quart
7. Small can of paint	1 quart	1 fluid ounce
8. Perfume in a perfume bottle	1 fluid ounce	1 liter
9. Large bottle of soda	1 liter	1 gallon
10. BBQ sauce from fast food restaurant	1 ounce	1 ounce

Match each weight or mass measurement to its corresponding item.

11. Snowflake	1 milligram	1 gram
12. Pineapple	1 Kilogram	1 milligram
13. Shark	1 ton	1 pound
14. Paperclip	1 gram	1 kilogram
15. Box of cereal	1 pound	1 ton

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G6 U3 Lesson 3

Use different units of measure to explore relative size

G6 U3 Lesson 3 - Students will use different units of measure to explore relative size

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue working with measurement units. In our last lesson we explored many measurement terms we already knew and maybe learned some new measurement terms, too. We organized these measurements into five categories: weight/mass, length, volume, temperature, and time. We did not work with the categories time and temperature but did focus on real-world examples of the other three categories. Today's lesson uses our knowledge of the size of measurement units and can be a little tricky but, I know we can get it. We will be exploring whether it takes more or less of a different-sized unit to measure the same quantity, amount, or thing.

Let's Talk (Slide 3): Let's brainstorm, one of the measurement equivalency or conversion that is common in the United States is 1 yard is equal to 3 feet. This conversion is shown on the slide in the form of a tape diagram. **Create an equivalent ratio based on the ratio of feet to yards that is shown. Explain your thinking.** Possible Student Answers, Key Points:

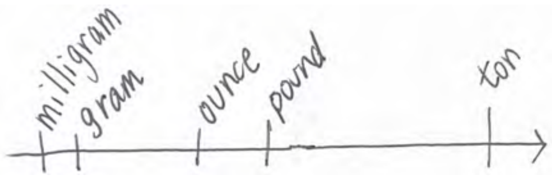
- 6 feet: 2 yards
- 9 feet to 3 yards
- We can multiply both by the same number, or we can use the tape diagram and add another box to each with 3 and 1 in them.

Nice thinking! We can create equivalent ratios visually with our boxes and by using fractions or multiplication and division. If we add another long box with 3 in it and another short box with 1 in it we will have visually created an equivalent ratio like 6 to 2 because 3 plus 3 equals 6 and 1 plus 1 equals 2. Using fractions, $\frac{3}{1}\ x\ \frac{2}{2}$ equals $\frac{6}{2}$. Either way 3 to 1 is equivalent to 6 to 2.

Let's Think (Slide 4): Identifying where, on the continuum of size, our measurements are positioned in relation to one another is an important first step for exploring whether it takes more or less of a different-sized unit to measure the same quantity or amount. Let's explore weights and masses. We are going to place each unit of measure shown in order from lightest to heaviest based on size on our continuum. Let's start by reading all of them…ton, ounce, kilogram, milligram, pound, gram!

Out of ton, ounce, kilogram, milligram, pound, and gram we can start by thinking which is the lightest and heaviest in size. Which measure is the lightest and which is heaviest? Milligram is the lightest and ton is the heaviest. Correct. Milligrams measure tiny objects like paper clips and tons measure really heavy things like cars so it is the greatest when you think of size. Let's place those at each end of our continuum.

That leaves an ounce, kilogram, pound, and gram. The next lightest unit of measure out of the four remaining units is a gram. Do you see that milli…gram has the word gram in it. Well, that's because 1,000 milligrams are the same as each 1 gram...that's what milli means, 1,000. Let's place the gram closer to the milligram.



Of the three units remaining…pound, kilogram, and ounce, ounce is next because an ounce of something is not as heavy as a pound or kilogram of something. An ounce is the next lightest unit followed by the pound. As a matter of fact, it takes 16 ounces just to equal 1 pound! Let's place the ounce then the pound after gram.

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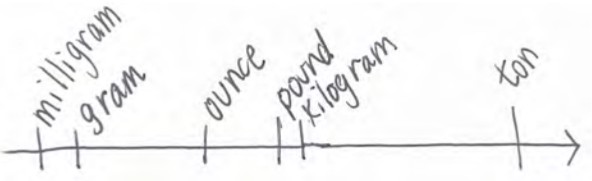

That only leaves a kilogram which is between the pound and ton. In terms of weight, a kilogram is a little more than twice the weight of a pound. And look, we see GRAM again in the word kilogram. But this time, it means that 1,000 grams make up 1 kilogram.

So looking at our continuum, we notice many things. Since milligrams are smaller, we notice it would take many milligrams to equal 1 gram *(point)*. We also see that ounces are smaller than pounds, so we notice it would take many ounces to equal 1 pound *(point)*, and it would take A LOT of kilograms to equal 1 ton, about 907 kilograms to be exact! To put these observations concisely, we need a lot more of a smaller unit to equal the weight of a larger unit.

Let's Think (Slide 5): To give you an idea of how big each of these units are, here are a few examples of things that weigh each unit.

- Let's start with the smallest, **milligrams**. Milligrams are teeny tiny, there aren't many things that we can see that weigh a milligram, but one example is a gnat, which are those tiny bugs that fly around in the summer.
- Now, let's move onto a gram. Paperclips weigh about 1 gram, pretty light.
- Now, ounce. A new unsharpened pencil weighs about 1 ounce.
- Now pound, a bag of bread weighs about 1 pound. There are a lot of things that weigh around 1 pound.
- Now, kilogram…a little bit heavier, a pineapple weighs about the same as 1 kilogram.
- And finally…a ton! Tons are heavy, heavy, heavy! A grown rhinoceros weighs about 1 ton…whew!

Notice that when we're measuring mass/weight, it's not about the size of the object but about how much it weighs. So something can be bigger than another thing but weigh less. These are good benchmarks to help us remember each unit of mass/weight.

Let's imagine that we weighed the same truck in kilograms and in tons. **Would it take more kilograms or tons to measure the weight of the truck?** Possible Student Answers, Key Points:

- It would take more kilograms because they're lighter than tons.
- It would take the same amount because you're measuring the same thing.

Those are interesting ideas. It would take MORE kilograms because they are lighter than tons, so we'd need more to weigh the same object.

Let's Think (Slide 6-7): We just looked at how units of mass/weight are related to each other. Now, let's switch measurement and focus on length…how long something is. Let's see if the same ideas apply to length.

Centimeters and inches are common units of measurement, you've been working with those units since first grade. First, using what you know, are centimeters and inches the exact same length? Look at the ruler to help you frame your thinking. No, they are not the exact same length, inches are longer than centimeters.

The ruler helps us compare the size of an inch to the size of a centimeter. We can see that 1 inch, the space between 1 and 2 is longer than 1 cm, the space between 1 and 2 along the bottom. In fact, 1 inch is the same length as about 2 ½ centimeters.

Let's Think (Slide 8): Knowing that a centimeter is smaller than an inch, if we were using centimeters and inches to measure this pencil, which unit, centimeters or inches, would you need more of and why? Possible Student Answers, Key Points:

- We would need more centimeters because centimeters are smaller than inches.
- We would need more inches because inches are bigger.

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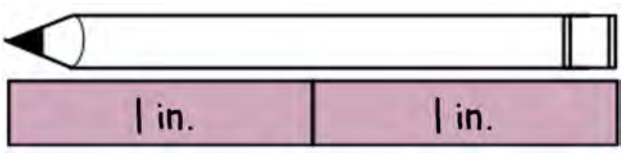
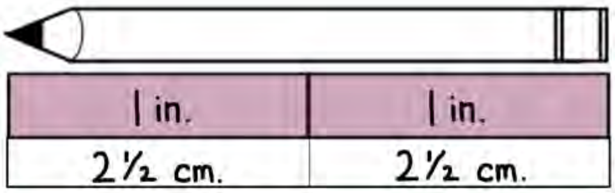
- We’d need the same amount because we’re measuring the same object.

Those are interesting ideas, it sounds like we’re not totally sure whether we’d need more inches, more centimeters, or the exact same amount. Let’s think carefully, we know that centimeters are smaller than inches, they take up less space. So, if we’re measuring the length of this pencil, we’d need MORE centimeters than inches.

Let’s Think (Slide 9): Let’s actually look at the pencil and use a tape diagram to help us think about this.



Let’s make one box equal to 1 inch. We see that this pencil measures 2 inches in length.



Now let’s think about measuring the same pencil with centimeters. We’ve learned earlier in the lesson that we need more centimeters to equal just 1 inch. And to be exact, we need about 2½ centimeters to equal 1 inch. So, every time we see 1 inch it is the same as 2½ centimeters. So for this inch we’d need 2½ *(point)* and for this inch we’d also need 2½ *(point).*

Now, we can calculate how many centimeters in length the pencil is by adding 2½ centimeters and another 2½ centimeters. Well, 2½ + 2½ = 5 because 2 plus 2 equals 4 and ½ plus ½ equals 1 whole. We end up with 5 wholes or 5. So, the pencil is about 5 centimeters long and exactly 2 inches long. Bringing it back to ratios, the ratio of centimeters to inches is 2½:1 and an equivalent ratio to that is 5:2.

We just explored how we need more kilograms than tons to measure the weight of a truck AND we need more centimeters than inches to measure the length of this pencil. That’s always going to be true, we’ll always need more little units than big units to measure the same object. This concept generalizes to weight, volume, temperature, and time. We will continue to think about size and ratios through our diagrams in our upcoming lessons.

Let’s Try it (Slide 10-11): Let’s continue our learning about size comparisons using the unit measures for weight, kilograms and pounds. Remember that the key idea is that we need more little units to measure up to one larger unit

WARM WELCOME

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Today we will use different units of measure to explore size.

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Let's Talk:

Create an equivalent ratio based on the ratio of feet to yards shown. Explain your thinking.

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Let's Think:

Place each measurement of weight/mass on the continuum based on size.

ton **ounce**

kilogram **milligram** **pound** **gram**

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Let's Think:

Here are a few examples of things that measure *about* the same as each unit of weight/mass.

1 milligram
a gnat

1 gram
a paperclip

1 ounce
a pencil

1 pound
a bag of bread

1 kilogram
a pineapple

1 ton
a rhino

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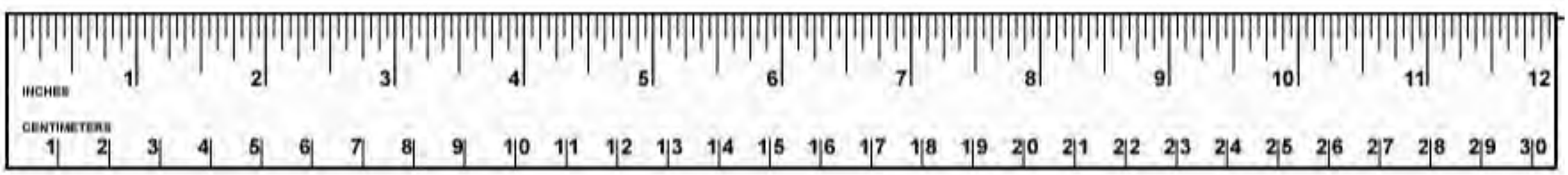
Let's Think:

Are centimeters and inches the exact same length? If not, which is longer?



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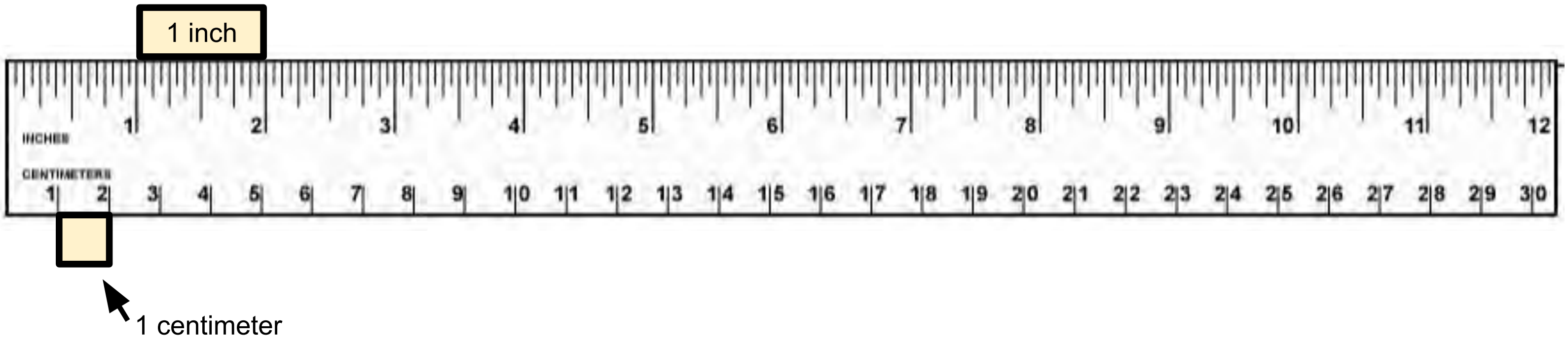
Let's Think:

It takes about 2.5 centimeters to make 1 inch.



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Let's Think:

If we were using centimeters and inches to measure a pencil, which measure, centimeters or inches, would you need more of and why?

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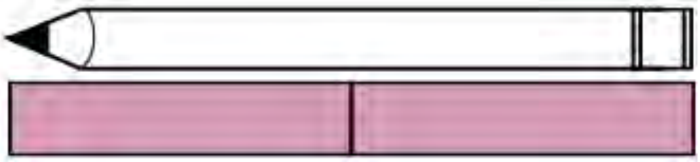
Let’s Think:

About how many centimeters in length does this pencil measure?



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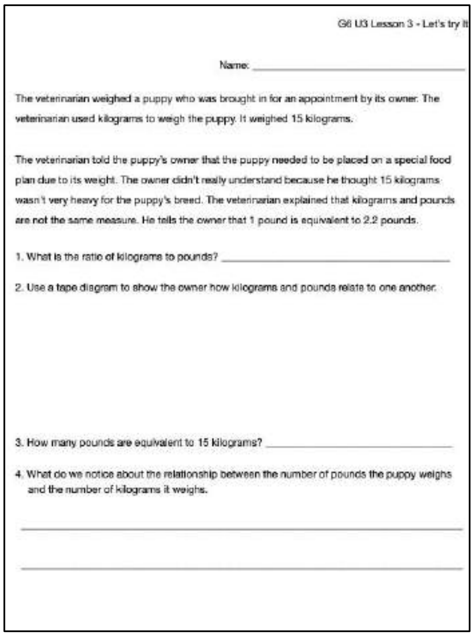
Let’s Try It:

Let’s explore using different units to measure size together.



G6 U3 Lesson 3 - Let's try It

Name: ______________________________

The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 15 kilograms.

The veterinarian told the puppy's owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn't really understand because he thought 15 kilograms wasn't very heavy for the puppy's breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 pound is equivalent to 2.2 pounds.

1. What is the ratio of kilograms to pounds? ______________________________

2. Use a tape diagram to show the owner how kilograms and pounds relate to one another.

3. How many pounds are equivalent to 15 kilograms? ______________________________

4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

____

____

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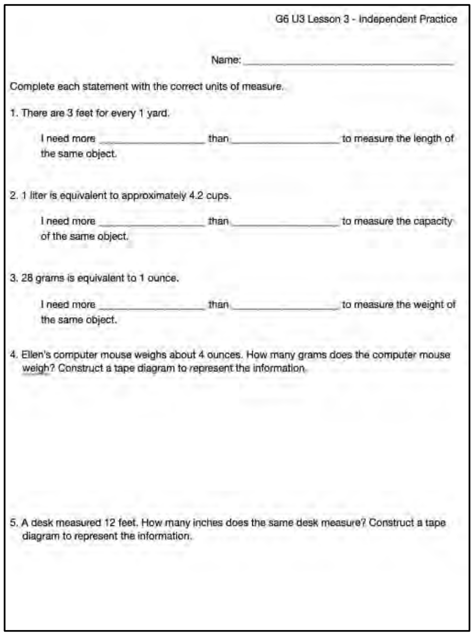
On your Own:

Now it’s time to explore using different units to measure size on your own.



G6 U3 Lesson 3 - Independent Practice

Name: ______________________________

Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more ________________ than ________________ to measure the length of the same object.

2. 1 liter is equivalent to approximately 4.2 cups.

I need more ________________ than ________________ to measure the capacity of the same object.

3. 28 grams is equivalent to 1 ounce.

I need more ________________ than ________________ to measure the weight of the same object.

4. Ellen's computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the information.

5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the information.

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The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 7 kilograms.

The veterinarian told the puppy's owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn't really understand because he thought 15 kilograms wasn't very heavy for the puppy's breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 kilogram is equivalent to 2.2 pounds.

1. What is the ratio of kilograms to pounds? ____

2. Use a tape diagram to show the owner how kilograms and pounds relate to one another when it comes to the puppy.

3. How many pounds are equivalent to 7 kilograms? _________________________________

4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

____

____

____

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Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more ____________________ than ____________________ to measure the length of the same object.

2. 1 liter is equivalent to approximately 4.2 cups.

I need more ____________________ than ____________________ to measure the capacity of the same object.

3. 28 grams is equivalent to 1 ounce.

I need more ____________________ than ____________________ to measure the weight of the same object.

4. Ellen's computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the number of grams.

5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the number of inches.

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Name: ______________________________ G6 U3 Lesson 3 - Let's Try It

The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 7 kilograms.

The veterinarian told the puppy's owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn't really understand because he thought 15 kilograms wasn't very heavy for the puppy's breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 kilogram is equivalent to 2.2 pounds.

1. What is the ratio of kilograms to pounds? 1 Kg to 2.2 pounds

2. Use a tape diagram to show the owner how kilograms and pounds relate to one another when it comes to the puppy.

Kg	1	1	1	1	1	1	1	
lbs	2.2	2.2	2.2	2.2	2.2	2.2	2.2	= 2.2×7 = 15.4

3. How many pounds are equivalent to 7 kilograms? 15.4 pounds

4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

We notice the number of pounds is more than the number of Kilograms. The pounds are 2.2 times the number of Kilogram.

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Name: ______________________ G6 U3 Lesson 3 - Independent Practice

Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more feet than yards to measure the length of the same object.

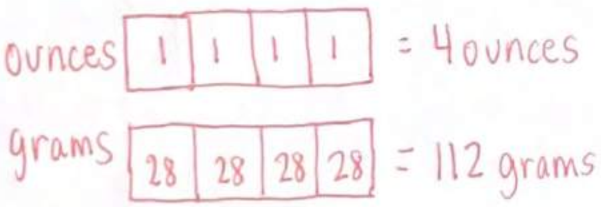
2. 1 liter is equivalent to approximately 4.2 cups.

I need more cups than liters to measure the capacity of the same object.

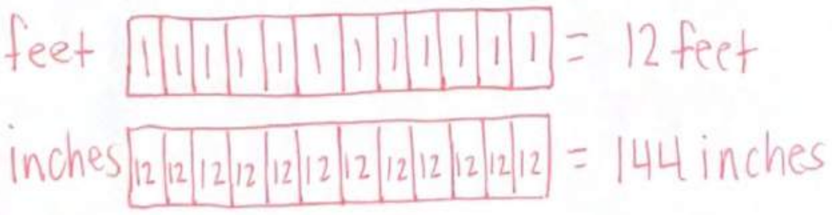
3. 28 grams is equivalent to 1 ounce.

I need more grams than ounces to measure the weight of the same object.

4. Ellen's computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the number of grams.



5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the number of inches. (there are 12 inches in 1 foot)



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G6 U3 Lesson 4

Convert measurement units using double number lines and tables

CITYTUTOR DC

G6 U3 Lesson 4 - Students will convert measurement units using double number lines and tables

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue using our measurement units to explore size. In our last two lessons we focused on measurement and the relationship between measurement units. We saw that when the units are larger we need fewer of them to measure an object versus when we were using small units and we needed more of those small units to measure the same object. In this lesson we will work with actual conversion equivalencies and our diagrams to convert between measurement units.

Let's Talk (Slide 3): Let's begin by looking at measurement unit abbreviations. Identify the abbreviation as I say the measurement unit aloud. Nice work, **now what do you notice and what do you wonder about the measurement abbreviations?** Possible Student Answers, Key Points:

- Pound, kilogram and centimeter have a two letter abbreviation while the others only have a one letter abbreviation
- Liter and cup can be written with lowercase or uppercase letters
- Most of the abbreviations include the first letters of the word, that makes them easy to remember.
- Why does lb stand for pound?

Those are all interesting noticings and wonderings! The hardest one to remember is lb. for pound, since it doesn't look like the word. This is because lb stands for *libra*. Libra is Latin in origin and means balance and weigh and pounds is a measure of weight.

Let's Think (Slide 4): Let's look at some common conversions between the metric and customary measurement systems. As a recap from a previous lesson and previous year's learning, the United States is one of only three countries in the world that does not use the metric system. In the United States our measurement system is called the customary system, in most other countries they use the metric system.

Today we will specifically focus on the following units of measurement. The first units of measure in each conversion set below is used in the customary system and the second units of measure are used in the metric system.

- In the customary system, we sometimes measure length in inches. In the metric system, we sometimes measure length in centimeters.
- In the customary system, we sometimes measure volume in cups. In the metric system, we sometimes measure volume in liters.
- And finally, in the customary system, we use pounds to measure weight. But in the metric system we often use kilograms.

Let's start by thinking about each unit of measurement and using what we know from previous lessons, let's decide which unit is smaller in each conversion set? Possible Student Answers, Key Points:

- Centimeters are smaller than inches.
- Cups are smaller than liters.
- Pounds are smaller than kilograms.

Yes, that's right! Now, let's think about exactly how many of each smaller unit it takes to make the bigger unit.

2.54cm = 1 in

We know that 1 centimeter is smaller than 1 inch. We need exactly 2.54 centimeters to equal up to just 1 inch *(write 2.54cm = 1 inch)*.

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4.2 c = 1 L

We also know that 1 cup is smaller than 1 liter. We need approximately 4.2 cups to equal up to just 1 liter *(write 4.2C ≈ 1L).*

2.2 lb = 1 kg

Lastly, 1 pound is smaller than 1 kilogram. We need approximately 2.2 pounds to equal up to just 1 kilogram *(write 2.2lb ≈ 1kg).*

Let's Think (Slide 5): When we think about comparing units of measure to one another we use actual number conversions to talk about their size. In previous years you learned some standard conversions that you are now just expected to have memorized like 12 inches equals 1 foot or that there are 16 cups in 1 gallon. Other times, like in this and previous lessons the conversion is given to you. Let's look at a couple examples of converting between units when given a conversion.

"If we weigh a bowling ball, would we need more pounds or more kilograms to equal the weight of the bowling ball?" We would need more pounds because pounds are smaller, or lighter. Well yes, we know from our work on the measurement continuum that pounds are smaller than kilograms so we would need more pounds to equal the weight of the bowling ball. As a reminder, the conversion between pounds and kilograms is 1 kilogram is approximately 2.2 pounds.

1 kg	1 kg	1 kg

The second part of this question says, what if the bowling ball weighed 3 kg. How much would it weigh in pounds? Let's try using a tape diagram to figure it out. First, let's draw three boxes, one for each kilogram since the bowling ball weighs 3 kgs.

1 kg	1 kg	1 kg
2.2 lb	2.2 lb	2.2 lb

Now, I know that 1 kg is the same as 2.2 lbs. So I can show that for every 1 kg, we need 2.2 lbs. So we need 2.2 lbs for this 1 kg (*point*) and another 2.2 lbs for this one (*point*) and another 2.2 lbs for the last kg.

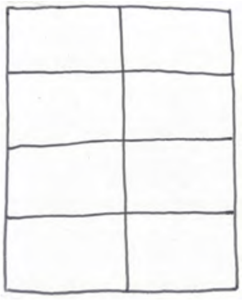
2.2 + 2.2 + 2.2 = 6.6 lb

Lastly, we need to add our pounds together to determine the weight of the bowling ball in pounds. We need to add 2.2 three times. Everybody do the math and tell me how many pounds we have…6.6 pounds!

3 kg is 6.6 lb

Terrific! We just calculated that a 3 kilogram bowling ball weighs 6.6 pounds.

As we have seen in previous ratio lessons, we can represent the same math problem using different diagram models. Let's represent our math problem about the bowling ball using a table. Our problem told us that the bowling ball weighed 3 kilograms and tasked us with calculating how much the bowling ball weighed in pounds.



To construct our table we must first draw our table including rows and columns. Our table needs two columns and at least three rows to include the headings, conversion, and a row to show how much the bowling ball weighs in pounds. Let's include an extra row, just in case.

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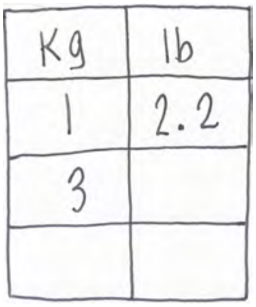
Kg	lb
1	2.2

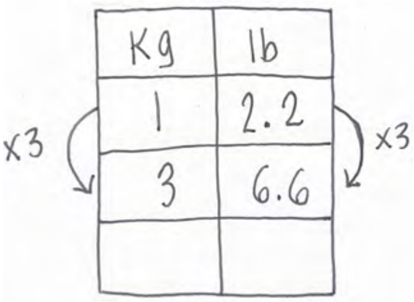
Next, let’s fill out the table starting with the headings, which will be the two units of measurement that we’re converting between.

Underneath the heading row let’s put the conversion by writing a 1 under the kilogram column and 2.2 under the pounds column because we know that 1 kg is the same as 2.2 pounds.



Kg	lb
1	2.2
3	

In the third row let’s write 3 in the kilogram column because that’s how much our bowling ball weighs in kg, and we’re trying to figure out how many pounds it weighs, so we’ll leave that blank.



Kg	lb
1	2.2
3	6.6

Now that we have our table completed it is time to calculate! Let’s use this arrow to show that we’re trying to figure out how we got from 1 to 3. That one is easy, we did 1x3 to get to 3.

We also have to multiply by 3 on the other side of our table. To find how many pounds the bowling ball is, we need to multiply 2.2 by 3. When we do it, we get 6.6 as the answer. Once again we see that a 3 kilogram bowling ball also weighs 6.6 pounds. This diagram makes it even more obvious what we are still creating equivalent ratios even when using unit conversions.

Wow! We are really piecing all your knowledge together to solve ratio math problems. While we didn’t solve the bowling ball problem using a double number line, these two problems illustrate for us, once again, that we can choose to represent our ratio information with more than one diagram and still achieve the same answer. We will of course continue to use these diagrams as we solve ratio math problems.

Let’s Try it (Slide 6-7): Let’s continue our conversions between various measurements of weight, length, and volume. Remember that finding equivalent ratios starts with the equivalent measures like 1 kilogram is equal to 2.2 pounds. If you know that unit conversion and use your diagrams then you can calculate equivalent ratios.

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WARM WELCOME

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Today we will use measurement conversions to explore size.

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Let’s Talk:

Let’s name the abbreviation for each measurement unit.

1. kilogram _______
2. liter _______
3. centimeter _______
4. inch _______
5. cup _______
6. pound _______

in L or l

kg C or c

lb cm

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Let’s Think:

Which measurement unit is smaller?

- ○ **Length: 1 in or 1 cm?**
- ○ **Volume: 1 C or 1 L?**
- ○ **Weight/Mass: 1 lb or 1 kg?**

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Let's Think:

If we weigh a bowling ball, would we need more pounds or more kilograms to equal the weight of the bowling ball?

What if the bowling ball weighed 3 kg. How much would it weigh in pounds? Explain using a tape diagram.

Now, show the same work in a table.

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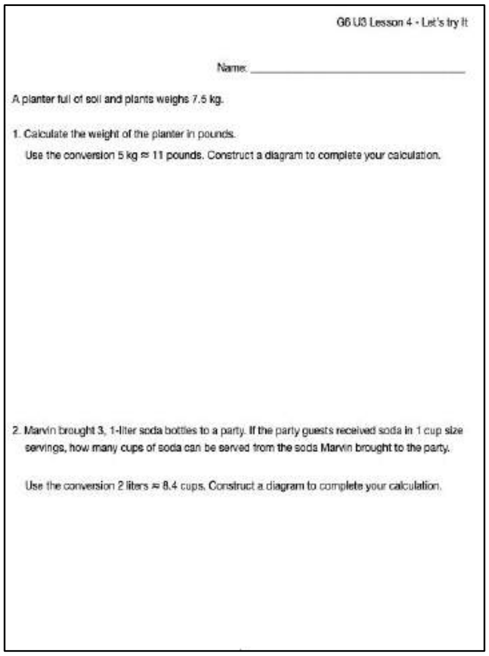
Let's Try It:

Let's explore converting measurement units using diagrams together.



G6 U3 Lesson 4 - Let's try It

Name: ______________________

A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.
   Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to complete your calculation.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

   Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to complete your calculation.

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On your Own:

Now it’s time to explore converting measurement units using diagrams on your own.

G6 U3 Lesson 4 - Independent Practice

Name: ______________________

The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won't fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to determine your solution.

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A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.

Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to determine the weight of the planter in pounds.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to determine how many cups of soda can be served from the soda Marvin brought.

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The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won't fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to justify your decision.

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Name: ______________________________ G6 U3 Lesson 4 - Let's Try It

A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.

Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to determine the weight of the planter in pounds.

	Kilograms	Pounds	
$\times\frac{1}{5}$	5	11	$\times\frac{1}{5}$
	1	$\frac{11}{5}$	$\times7\frac{1}{2}$
$\times7.5$ OR $7\frac{1}{2}$	$7\frac{1}{2}$	$16\frac{1}{2}$	

$\frac{11}{5}\times7\frac{1}{2}$

$\frac{11}{5}\times\frac{15}{2}=\frac{165}{10}=$ $10\overline{)165}$

−160 | 16

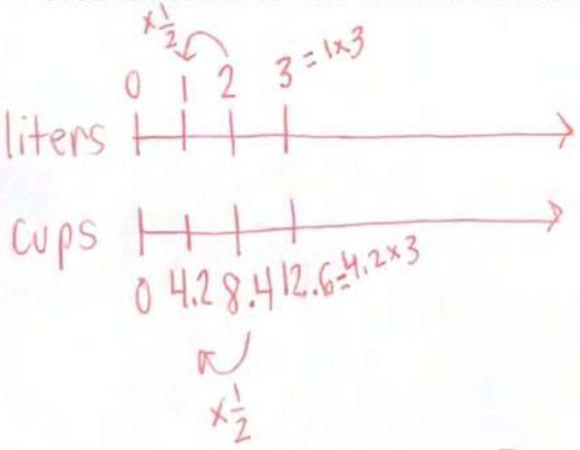
5

$16\frac{5}{10}\div\frac{5}{5}=16\frac{1}{2}$

The planter weighs $16\frac{1}{2}$ pounds.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to determine how many cups of soda can be served from the soda Marvin brought.



12.6 cups of soda can be served from the soda Marvin brought to the party.

$\frac{8.4}{1}\times\frac{1}{2}=\frac{8.4}{2}$

$2\overline{)8.4}$ ①

−80 | 40

4

−4 | +2

0 | 4.2 ①

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Name: ______________________________ G6 U3 Lesson 4 - Independent Practice

The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won't fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to justify your decision.

	inches	centimeters	
	2	5	
$\times\frac{1}{2}$	1	$\frac{5}{2}$	$\times\frac{1}{2}$
$\times 75$	75	$187\frac{1}{2}$	$\times 75$

$\frac{5}{2} \times \frac{75}{1} = \frac{375}{2}$

$$\begin{array}{r|l} 2\overline{)375} & \\ -200 & 100 \\ \hline 175 & \\ -100 & 50 \\ \hline 75 & \\ -60 & 30 \\ \hline 15 & \\ -10 & 5 \\ \hline 5 & \\ -4 & 2 \\ \hline 1 & + \\ & 187\frac{1}{2} \end{array}$$

The tv is $187\frac{1}{2}$ centimeters so it is too large to fit in the 160 cm space. The customer should not buy the 75 inch television.

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G6 U3 Lesson 5

Compare speeds and prices by calculating rates per 1

G6 U3 Lesson 5 - Students will compare speed and price using unit rate

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be revisiting a topic we began exploring in Unit 2. We were introduced to the concepts of speed and price as they relate to ratios in Unit 2. We learned that speed is the rate at which something moves compared to the time it takes. When traveling on the highway, we use a comparison of distance to time, we call that miles per hour. Price is a comparison of cost to quantity like $3.50 for 2 boxes of macaroni. In this lesson we will continue to explore ratios through real-world speed and price situations.

Let's Talk (Slide 3): Imagine that you're at the grocery store and you see this sign. It says that 3 apples cost $8. **How could we determine the price for more apples? Let's decide how many apples you want to buy and calculate the price.** Possible Student Answers, Key Points:

- 6 apples cost $16
- 15 apples cost $40
- 9 apples cost $24

Nice use of diagrams! I notice that most of us found the price of apples by using factors. It was easy to find the price of 3, 6, 9, 12, or 15 apples because we knew the ratio. It would've been harder to find the price of 4 apples because then we would've had to go back and find the unit rate first.

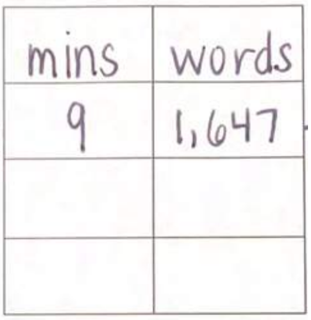
Let's Think (Slide 4): Have you ever heard of speed reading? It's exactly like it sounds, reading a lot in a little bit of time. Speed reading is typically recorded in words per minute or wpm. Annie Jones is the 6-time World's Speed Reading Champion. She was timed at reading 4,700 wpm with 67% comprehension. That means she read 4,700 words in one minute and when done, she proved that she understood at least 67% of what she read. The criteria for being a speed reader is reading 400-700 words per minute without losing comprehension. The average adult, non-speed reader, reads at a rate of about 250 words per minute.

Let's Think (Slide 5): So let's use what we just learned about speed readers to solve a problem. This says, Nelson tested two adults to determine if either of them meet the criteria as a speed reader. The results of the reading assessment are listed below:

- Participant #1: 1,647 words read in 9 minutes
- Participant #2: 1,975 words read in 5 minutes

Nelson is trying to figure out if either of the participants read between 400 and 700 words per minute. We will assume all of the readers could prove they understood at least 67% of what they read during the reading assessment.

Looking at the data someone may try to guess which participant is the speed reader. But, since we understand ratios we don't need to guess. The speed reading criteria says "per minute" so we know we can find the unit rate for each participant. Then we can compare the unit rates to the speed reading criteria. Let's start with participant #1.



mins	words
9	1,647

Participant #1 read 1,647 words in 9 minutes. Let's use a table to determine if Participant #1 meets the criteria as a speed reader.

Let's start with the headings, we know that we're looking at minutes and words. So, the information that we have is that it took 9 minutes to read 1,647 words, let me put those in the table.

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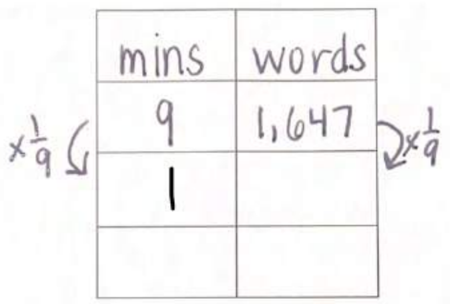
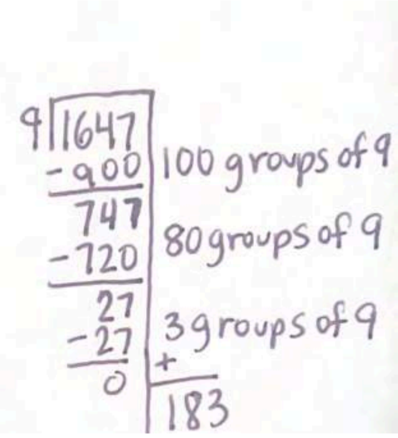


mins	words
9	1,647
1	

Now in order to figure out if this person is a speed reader, we need to figure out how many words they read in ONE minute, the unit rate. So, let me fill out 1 minute in the

Now let's draw an arrow to show that we need to figure out how to get from 9 to 1. To get from 9 to 1, we divided by 9 but that's the same thing as multiplying by the reciprocal of 9 which is $\frac{1}{9}$. So we need to write x$\frac{1}{9}$ next to both arrows and then multiply on both sides of the table.

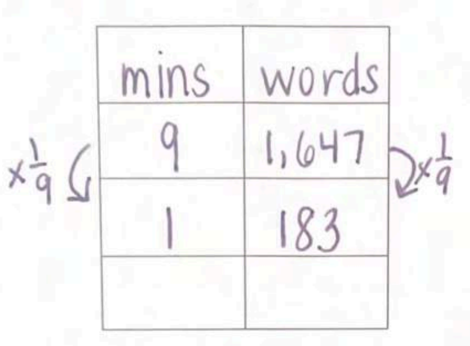
Time to calculate our words column! We need to divide 1,647 by 9.



Let's start by asking ourselves, "How many groups of 9 can we make if we have 1647?" We can at least make 100 groups of 9 which gives me 900 in total. Next, we subtract 1647 minus 900 and we are left with 747. We now only have 747 left with which to make groups of 9.

We then ask ourselves, "How many groups of 9 can we make from the 747 we have left?" We can make at least 80 groups which gives us 720 in total . So, I subtract 747 minus 720 and we are left with 27 in total to make more groups of 9.

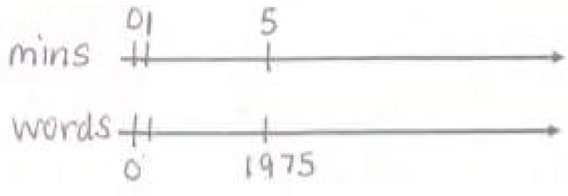
We, again, ask ourselves, "How many groups of 9 can we make from the 27?" We can make 3 groups which gives us 27 in total. So, I subtract 27 minus 27 and am left with 0! My last step is to add together the groups of 9 that I have made. 100 groups of 9 plus 80 groups of 9 plus 3 groups of 9 gives us 183 groups of 9 as my answer *(write 183 in the row next to 1 in the table).*



mins	words
9	1,647
1	183

So, Participant #1 read 183 words per minute. We'll keep this in mind as we determine how many words per minute Participant #2 read during the assessment.

Nelsen's data tells us that Participant #2 read 1,975 words in 5 minutes. Let's use a double number line to determine if Participant #2 meets the criteria as a speed reader.



We will begin completing the double number line starting with the headings which are minutes and words.

On the minutes number line we need to add a tick mark right after the 0 and label that tick mark 1 then add another tick mark and label that tick mark 5. On the word number line we need to place a blank tick mark directly under the tick mark labeled 1 and place a tick mark labeled 1,975 directly under the tick mark labeled 5. The reason the tick mark under the 1 is blank is because we still need to calculate the unit rate or how many words per minute Participant #2 read during the assessment.

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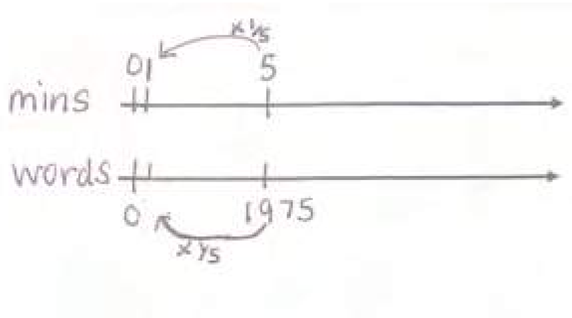
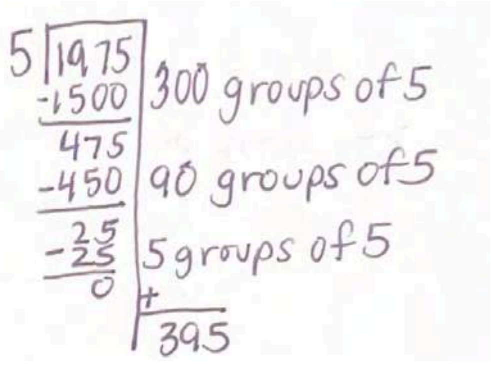


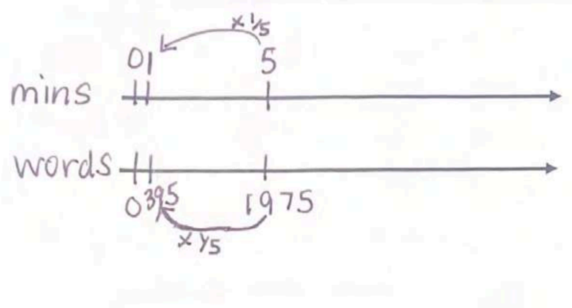
Next we draw our arrows. On the minutes number line draw an arrow from the 5 to the 1 and on the words number line we draw the arrow from 1975 to the empty tick mark next to the 0. In determining what we multiply by to get from 5 to 1 we use the reciprocal of 5 which is $\frac{1}{5}$ because the reciprocal of any number is just 1 divide by the number. So we need to write x$\frac{1}{5}$ next to both arrows and then multiply on the words number line.

Time to calculate! $\frac{1975}{1} x \frac{1}{5} = \frac{1975}{5}$. This answer will tell us how many words Participant #2 read per 1 minute on the reading assessment.



Let's start by asking ourselves, "How many groups of 5 can we make if we have 1975?" We can at least make 300 groups of 5 which gives me 1500 in total. Next, we subtract 1975 minus 1500 and we are left with 475. We now only have 475 left with which to make groups of 5.

We then ask ourselves, "How many groups of 5 can we make from the 475 we have left?" We can make at least 90 groups which gives us 450 in total. So, I subtract 475 minus 450 and we are left with 25 in total to make more groups of 5.



We, again, ask ourselves, "How many groups of 5 can we make from the 25?" We can make 5 groups which gives us 25 in total. So, I subtract 25 minus 25 and am left with 0! My last step is to add together the groups of 5 that I have made…300 groups of 5 plus 90 groups of 5 plus 5 groups of 5 gives us 395 as the answer.

So this participant read 395 words per minute.

Finally, let's go back to the information we know about speed reading. In thinking about whether either of the readers meet the criteria of a speed reader we first need to revisit the criteria for being a speed reader. Who can recall the criteria for being a speed reader? Reading 400-700 words per minute with 67% comprehension.

Did either of the participants read between 400 and 700 words per minute during the assessment? Who can explain? None of the participants met the criteria for being a speed reader because both were below 400 words per minute. That's right! Participant #1 read 183 words per minute and Participant #2 read 395 words per minute which means neither participant read a minimum of the 400 words required to be a speed reader. Participant #2 was so close at 395 words per minute but they still did not actually meet the criteria to be classified as a speed reader. So close yet so far!

Ratios really are all around us! While we can't all be speed readers we can improve upon a skill we possess. It may be improving upon our reading speed but it could also be improving upon a high score in a video game or something like perfecting bike stunts. Regardless, consider collecting data as you improve and maybe even writing and solving a ratio problem to track your improvement.

Let's Try it (Slide 6-7): Let's continue our exploration of speed and explore price. Remember that diagrams are helpful when making sense of ratios and it is your choice as to which diagram you will use to represent the information and calculate equivalent ratios.

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WARM WELCOME

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Today we will revisit speed and price in real-world situations.

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Let's Talk:

How could you determine the price for more apples? Decide how many apples you want to buy and calculate the price. Let's use a diagram to calculate.

Granny Smith Apples

3/$8

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Let's Think:

Have you ever heard of speed reading?

The criteria for being a speed reader is reading 400-700 words per minute without losing comprehension.

The average adult reads at a rate of 250 words per minute.

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Let’s Think:

Nelson tested two adults to determine if either of them meet the criteria as a speed reader.

Results of the reading assessment:

- Participant #1: 1,647 words read in 9 minutes
- Participant #2: 1,975 words read in 5 minutes

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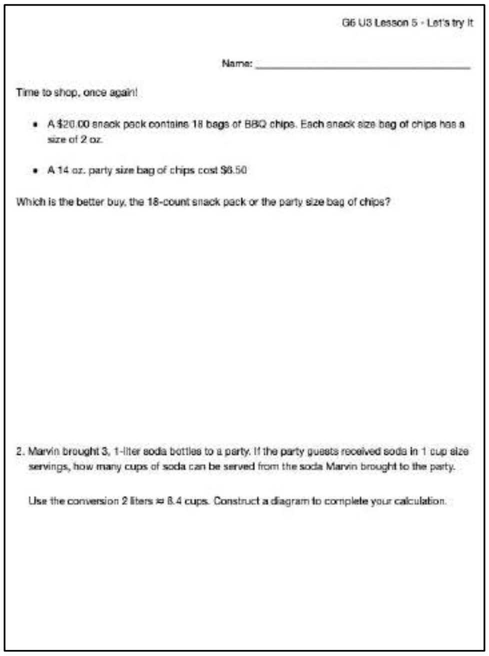
Let’s Try It:

Let’s explore comparing speed and price together.



G6 U3 Lesson 5 - Let's try It

Name: ____________________________

Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz. party size bag of chips cost $6.50

Which is the better buy, the 18-count snack pack or the party size bag of chips?

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to complete your calculation.

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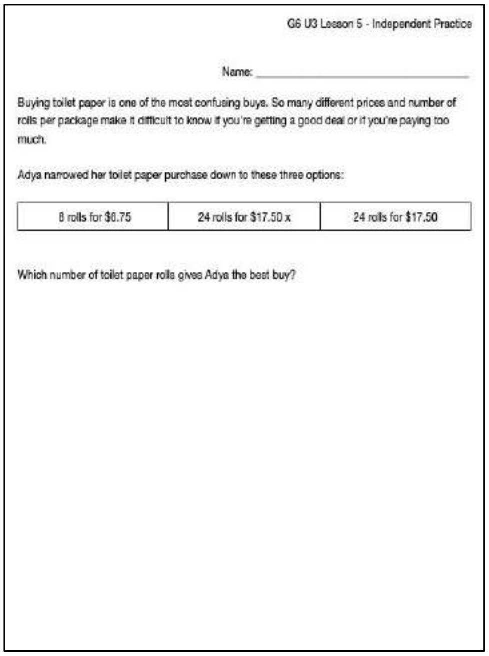
On your Own:

Now it’s time to explore comparing speed and price on your own.



G6 U3 Lesson 5 - Independent Practice

Name: ______________________________

Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you're getting a good deal or if you're paying too much.

Adya narrowed her toilet paper purchase down to these three options:

8 rolls for $6.75	24 rolls for $17.50 x	24 rolls for $17.50

Which number of toilet paper rolls gives Adya the best buy?

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1. A healthy adult takes an average of 9 minutes to run 1 mile. Cheetahs are the fastest land animals on Earth and far outpace humans. If a cheetah is clocked at running 30 miles per hour, how many **minutes** did it take the cheetah to run 1 mile?

2. Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz party size bag of BBQ chips costs $6.50.

Which is the better buy, the 18-count snack pack or the party size bag of chips?

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1. Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you're getting a good deal or if you're paying too much.

Adya narrowed her toilet paper purchase down to these three options for a brand of toilet paper:

8 rolls for \$6.75	24 rolls for \$17.50	32 rolls for \$28.80

Which price gives Adya the best buy?

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Name: ______________________________ G6 U3 Lesson 5 - Let's Try It

1. A healthy adult takes an average of 9 minutes to run 1 mile. Cheetahs are the fastest land animals on Earth and far outpace humans. If a cheetah is clocked at running 30 miles per hour, how many **minutes** did it take the cheetah to run 1 mile?

30 mile per hour

There are 60 minutes in 1 hour.

$\times\frac{1}{30}$

minutes	miles
60	30
$\frac{60}{30}=2$	1

$\times\frac{1}{30}$

$$\frac{60}{1}\times\frac{1}{30}=\frac{60}{30}=2$$

The cheetah can run 1 mile in 2 mins.

2. Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz party size bag of BBQ chips costs $6.50.

Which is the better buy, the 18-count snack pack or the party size bag of chips?

Snack pack

$\times\frac{1}{36}$

ounces	cost
36	20.00
1	0.55

$\times\frac{1}{36}$

$9\overline{)5.00}$ ②
−450 | 50
50
−45 | 5
5
\+
.55 ②

$$\frac{20}{1}\times\frac{1}{36}=\frac{20}{36}\div\frac{4}{4}=\frac{5}{9}$$

Snack pack is about $0.55/ounce

Party Size

$\times\frac{1}{14}$

ounces	cost
14	6.50
	0.46

$\times\frac{1}{14}$

$14\overline{)6.50}$ ②
−280 | 20
370
−280 | 20
90
−84 | 6
6
\+
.46 ②

Party size is about $0.46/ounce

The better buy is the party size bag of chips.

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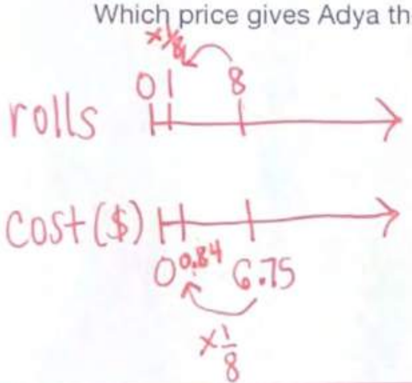
Name: ________________________________ G6 U3 Lesson 5 - Independent Practice

1. Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you're getting a good deal or if you're paying too much.

   Adya narrowed her toilet paper purchase down to these three options for a brand of toilet paper:

8 rolls for \$6.75	24 rolls for \$17.50	32 rolls for \$28.80

Which price gives Adya the best buy?



$\frac{6.75}{1} \times \frac{1}{8} = \frac{6.75}{8}$

$8\overline{)6.75}$ → ②

−640 | 80

35

−32 | +4 ②

3 | 84 3/8

8 rolls for \$6.75 is about \$0.84 per roll.

×1/24

rolls	cost
24	17.50
1	0.72

×1/24

$\frac{17.50}{1} \times \frac{1}{24} = \frac{17.50}{24}$

$24\overline{)17.50}$ → ②

−1200 | 50

550

−480 | 20

70

−48 | +2 ②

22 | 72 22/24

24 rolls for \$17.50 is about \$0.72 per roll.

×1/32

rolls	cost
32	28.80
1	0.90

×1/32

$\frac{28.80}{1} \times \frac{1}{32} = \frac{28.80}{32}$

$32\overline{)28.80}$ → ②

−320 | 10

2560

−960 | 30

1600

−1600 | 50

0 | + 90 ②

32 rolls for \$ 28.80 is about \$0.90 per roll.

The best buy is 24 rolls for \$17.50

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G6 U3 Lesson 6

Calculate and use two different unit rates to solve problems

G6 U3 Lesson 6 - Students will calculate and use two different unit rates to solve problems

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore unit rate two different ways using the same information. We have explored unit rate in multiple real-world representations many times so far. We know that ratios are comparisons of quantities and that unit rate focuses on the quantity of 1 when comparing. In this lesson we will focus specifically on using a table to find two different unit rates.

Let's Talk (Slide 3): Let's start with a conversation about unit rate, here are two. **Which unit rate is easier to understand the meaning of for you? Explain. ¼ cookie for $1 or $4 for 1 cookie.** Possible Student Answers, Key Points:

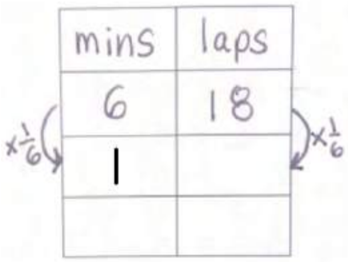
- $4 for 1 cookie is easy to understand because that tells me exactly how much 1 cookie costs.
- ¼ a cookie for $1 is the same thing but it's hard to understand because you never actually buy ¼ of a cookie.
- Whole numbers are easier to understand than fractions.
- ¼ a cookie for $1 makes sense because now I know exactly how much of a cookie $1 can buy.

There's no right answer here, it's how our brains work. But sometimes, fractions can get us turned around. For me, thinking of paying $4 for 1 cookie is a more friendly comparison in my mind while ¼ cookie for $1 does not and is tougher to visualize in the real-world. Hopefully after today's work our minds will be even more comfortable with fractions as parts of ratios.

Let's Think (Slide 4): It may seem odd to find two different unit rates with the same information as it requires you to focus on the problem from two different perspectives or viewpoints, but there are times when being able to interpret unit rate two different ways is necessary and helpful. This is especially true when you are tasked with finding a unit rate of a particular quantity instead of being able to choose for yourself. Let's look at Neil's latest exercise time recorded for his laps around a playground. Neil recorded that he ran 18 laps in 6 minutes. First, let's create our table and then calculate the unit rate two different ways using the same table.

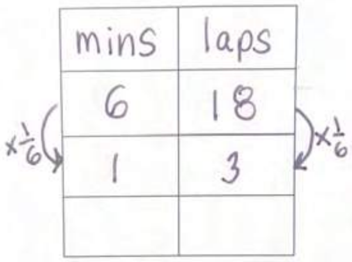
mins	laps
6	18

We know how to construct tables! Since our table is displayed for us we will begin filling in the table starting with the headings which are minutes and laps since Neil was recording his lap times in minutes. Now, let's fill out the information that we know. We know it took 6 minutes for Neil to run 18 laps, let's put each piece of information in the table.



mins	laps
6	18
1	

Now, let's find the unit rate. We can find two different unit rates for this problem. First, we can figure out how many laps Neil can run in ONE minute or we can find out how many minutes it takes Neil to run ONE lap. Let's start with the laps per ONE minute, so we'll put a 1 in the minute column. Now we need to figure out what number multiplied by 6 to give us 1. We always multiply by the reciprocal. The reciprocal of 6 which is ⅙ because the reciprocal of any number is just 1 divide by the number. So we need to write x ⅙ next to both arrows and reciprocals always multiply to 1.



mins	laps
6	18
1	3

Now, let's figure out how many laps Neil can go in ONE minute. This math is a bit easier than some of the other math we've done. This unit rate tells us that Neil can run 3 laps in 1 minute.

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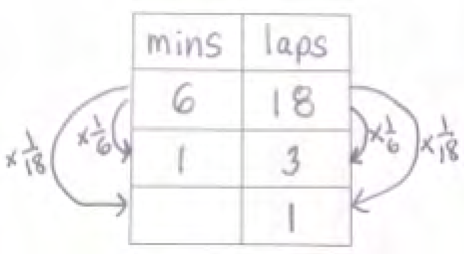
Ready to calculate the next unit rate? We are not making a new table! We are just going to continue using the table we've already constructed and use the extra space.



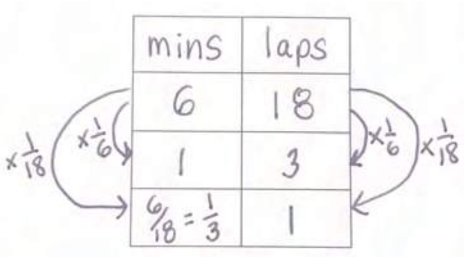
mins	laps
6	18
1	3
	1

Our first unit rate looked for laps per minute. Our second unit rate will look for minutes per lap. The "per lap" part of our unit rate means we put a 1 in the laps column in the fourth row under the 3. To best show that we can use the information we are given in a problem to solve for two different unit rates we are going to answer the question, What would we multiply by 18 to get 1. If you're thinking reciprocal then you are correct.

$$\frac{6}{1} \times \frac{1}{18} = \frac{6}{18}$$

$$\frac{6}{18} \div \frac{6}{6} = \frac{1}{3}$$

The reciprocal of 18 is $\frac{1}{18}$ so now let's multiply by $\frac{1}{18}$ on both sides of the table. We know that reciprocal always equal 1. Then calculate the minutes column, $\frac{6}{18}$ is the correct answer but it is not simplified. Does anyone know what factor we can use to simplify $\frac{6}{18}$? We can use factors 3 or 6. Yes. 3 will reduce the fraction but 6 will completely reduce the fraction. Now let's interpret or understand this second unit rate: It took Neil $\frac{1}{3}$ of a minute to run 1 lap around the playground.



mins	laps
6	18
1	3
$\frac{6}{18} = \frac{1}{3}$	1

So, our two different unit rates are "Neil ran 3 laps in 1 minute" and "it took Neil ⅓ of a minute to run 1 lap." Which unit rate is more difficult to understand the meaning of? Answers will vary. If you said "it took Neil ⅓ of a minute to run 1 lap" you are not alone. Most people find interpreting with numbers in fractional form to be a little challenging. Definitely more challenging than interpreting whole numbers.

As an extra challenge we could convert ⅓ of a minute to seconds. This would bring more clarity to the unit rate for many people. Quickly, if there are 60 seconds in 1 minute and you break that 60 seconds into three large groups, you would get 20 seconds in each group. So, ⅓ of a minute means it took 20 seconds for Neil to run 1 lap around the playground.

Using the same piece of information to calculate unit rate two different ways isn't necessarily more numerically challenging. The challenge comes in the interpretation of the answers especially when fractional answers are involved. The more time you spend working with fractions, the easier they become to understand.

Let's Try it (Slide 6): Let's continue exploring unit rate calculated two different ways using the same information and on the same table. Remember that although it may be easier to interpret a unit rate one way, it is important to also push yourself to try to understand the unit rate for a given problem from another viewpoint.

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WARM WELCOME

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Today we will explore unit rate two different ways using the same information.

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Let's Talk:

Which unit rate is easier to understand? Explain.

¼ cookie for $1

or

$4 for 1 cookie

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Let's Think:

Neil recorded the exercise time for his laps around a playground. Neil recorded that he ran 18 laps in 6 minutes.

Let's create our table and then calculate the unit rate two different ways using that same table.

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Let's Think:

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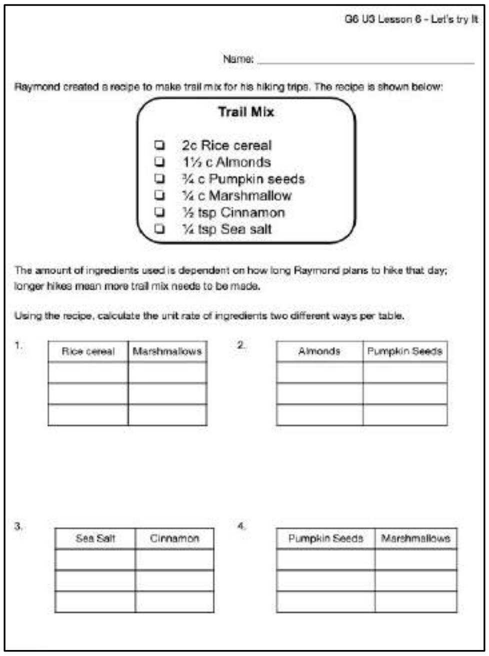
Let's Try It:

Let's explore using unit rates to solve problems together.



G6 U3 Lesson 6 - Let's try It

Name: ____________________

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

Rice cereal	Marshmallows

2.

Almonds	Pumpkin Seeds

3.

Sea Salt	Cinnamon

4.

Pumpkin Seeds	Marshmallows

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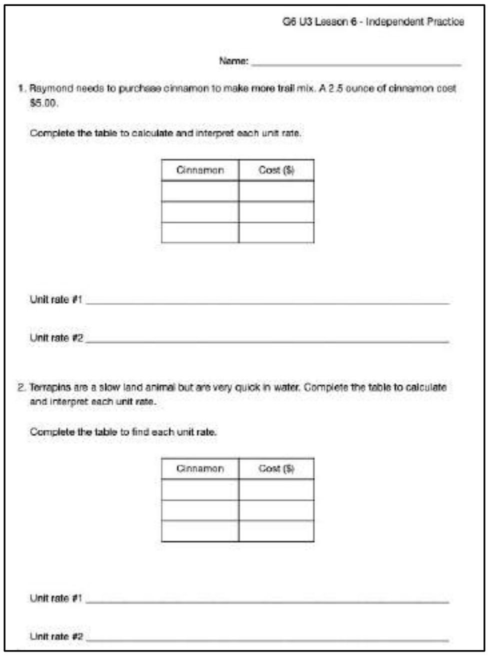
On your Own:

Now it’s time to explore unit rates to solve problems on your own.



G6 U3 Lesson 6 - Independent Practice

Name: ____________________________

1. Raymond needs to purchase cinnamon to make more trail mix. A 2.5 ounce of cinnamon cost $5.00.

Complete the table to calculate and interpret each unit rate.

Cinnamon	Cost ($)

Unit rate #1 ____

Unit rate #2 ____

2. Terrapins are a slow land animal but are very quick in water. Complete the table to calculate and interpret each unit rate.

Complete the table to find each unit rate.

Cinnamon	Cost ($)

Unit rate #1 ____

Unit rate #2 ____

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Name: ____

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made, shorter hikes mean less.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

Rice cereal	Marshmallows

2.

Almonds	Pumpkin Seeds

3.

Sea Salt	Cinnamon

4.

Pumpkin Seeds	Marshmallows

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1. Raymond needs to purchase cinnamon to make more trail mix. A 2½ ounce of cinnamon costs $5.00.

Complete the table to calculate the unit rate two different ways.

Unit rate #1: ______________________________

Unit rate #2: ______________________________

2. The average human swimming speed is about 2 miles per hour. A terrapin is a slow land animal but is very quick in water. Kim tracks a terrapin swimming 24 miles in 2 hours.

Complete the table to calculate the unit rate two different ways.

Unit rate #1: ______________________________

Unit rate #2: ______________________________

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Name: ______________________________ G6 U3 Lesson 6 - Let's Try It

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made, shorter hikes mean less.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

$\times\frac{1}{2}$ $\times\frac{4}{1}$

Rice cereal	Marshmallows
2	1/4
1	1/8
8	1

$\times\frac{4}{1}$ $\times\frac{1}{2}$

$\frac{1}{4}\times\frac{1}{2}=\frac{1}{8}$ $\frac{1}{4}\times\frac{4}{1}=\frac{4}{4}=1$

2.

$\times\frac{2}{3}$ $\times\frac{4}{3}$

Almonds	Pumpkin Seeds
1 1/2 or 3/2	3/4
1	1/2
2	1

$\times\frac{4}{3}$ $\times\frac{2}{3}$

$\frac{3}{4}\times\frac{2}{3}=\frac{6}{12}\div\frac{6}{6}=\frac{1}{2}$

$\frac{3}{2}\times\frac{2}{3}=\frac{6}{6}=1$

$\frac{3}{2}\times\frac{4}{3}=\frac{12}{6}=2$

$\frac{3}{4}\times\frac{4}{3}=\frac{12}{12}=1$

3.

$\times\frac{4}{1}$ $\times\frac{2}{1}$

Sea Salt	Cinnamon
1/4	1/2
1	2
1/2	1

$\times\frac{2}{1}$ $\times\frac{4}{1}$

$\frac{1}{2}\times\frac{4}{1}=\frac{4}{2}=2$ $\frac{1}{2}\times\frac{2}{1}=\frac{2}{2}=1$

$\frac{2}{1}\times\frac{1}{4}=\frac{2}{4}\div\frac{2}{2}=\frac{1}{2}$

4.

$\times\frac{4}{3}$ $\times\frac{4}{1}$

Pumpkin Seeds	Marshmallows
3/4	1/4
1	1/3
3	1

$\times\frac{4}{1}$ $\times\frac{4}{3}$

$\frac{3}{4}\times\frac{4}{3}=\frac{12}{12}=1$ $\frac{3}{4}\times\frac{4}{1}=\frac{12}{4}=3$

$\frac{1}{4}\times\frac{4}{3}=\frac{4}{12}\div\frac{4}{4}=\frac{1}{3}$ $\frac{1}{4}\times\frac{4}{1}=\frac{4}{4}=1$

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1. Raymond needs to purchase cinnamon to make more trail mix. A 2½ ounce of cinnamon costs $5.00.

Complete the table to calculate the unit rate two different ways.

$2\frac{1}{2} = \frac{5}{2}$

$\times\frac{1}{5}$

cost	ounces
$\times\frac{2}{5}$ 5	$\frac{5}{2}$ $\times\frac{2}{5}$
1	$\frac{1}{2}$
2	1

$\times\frac{1}{5}$

$\frac{5}{2} \times \frac{1}{5} = \frac{5}{10} \div \frac{5}{5} = \frac{1}{2}$

$\frac{1}{5} \times \frac{5}{1} = \frac{5}{5} = 1$

$\frac{5}{2} \times \frac{2}{5} = \frac{10}{10} = 1$

$\frac{5}{1} \times \frac{2}{5} = \frac{10}{5} = 2$

Unit rate #1: 1 ounce of cinnamon costs $2.00.

Unit rate #2: $1.00 worth of cinnamon weighs ½ ounce.

2. The average human swimming speed is about 2 miles per hour. A terrapin is a slow land animal but is very quick in water. Kim tracks a terrapin swimming 24 miles in 2 hours.

Complete the table to calculate the unit rate two different ways.

mins

$\frac{60}{1} \times \frac{1}{12} = \frac{60}{12}$

5mins

$\times\frac{1}{2}$

hours	miles
$\times\frac{1}{24}$ 2	24 $\times\frac{1}{24}$
1	12
$\frac{1}{12}$	1

$\times\frac{1}{2}$

$\frac{1}{2} \times \frac{2}{1} = \frac{2}{2} = 1$

$\frac{1}{2} \times \frac{24}{1} = \frac{24}{2} = 12$

$\frac{24}{1} \times \frac{1}{24} = \frac{24}{24} = 1$

$\frac{2}{1} \times \frac{1}{24} = \frac{2}{24} \div \frac{2}{2} = \frac{1}{12}$

Unit rate #1: The terrapin swam 1 mile in 1/12 of an hour (5 mins).

Unit rate #2: The terrapin swan 12 miles in 1 hour.

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G6 U3 Lesson 7

Use unit rates to solve problems involving constant speed

G6 U3 Lesson 7 - Students will use unit rate to solve problems comparing deals and distances

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Congratulations! We have come to our last lesson on ratio learning before we switch gears to learn a new concept that will still be related to ratios but with a twist. We've learned so much throughout these two units. We know that ratios are comparisons of quantities and diagrams can be used to visually represent ratios. In this lesson we will, once again, apply our ratio knowledge to different scenarios. Challenge yourself to choose the best diagram for organizing the information and calculate what is being asked for.

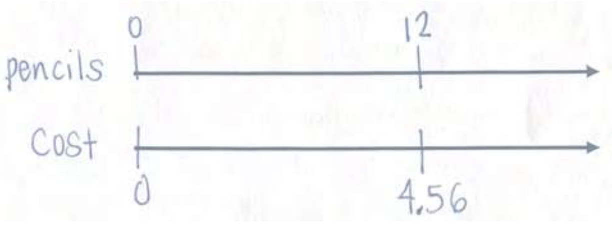
Let's Talk (Slide 3): We've built up quite a toolbox of tools to support our understanding of ratios. I know that all of us have a preferred tool. **Let's discuss which diagram we prefer and why. And then, let's list two ways that diagram is used to represent ratios.** Possible Student Answers, Key Points:

- I like tables because they're easy to look at and nicely organized. They utilize a vertical format, use boxes, and use columns and rows.
- I like double number lines because I've been using number lines since first grade. They utilize a horizontal format, use tick marks, and jumps on a number line.
- I like tape diagrams because they are similar to other tools I've used to solve word problems and fraction problems. They utilize squares to represent quantities, and are drawn horizontally.

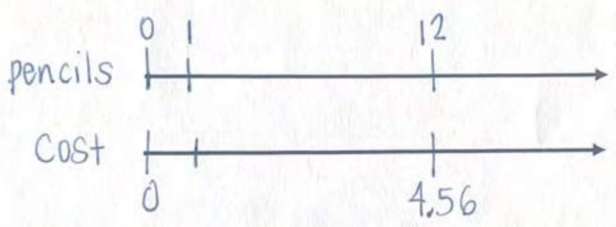
We have learned so much over the last unit and a half and we have worked very hard to understand the math! Certain components of each diagram have made them invaluable in our work. The tape diagram helps make ratios visual, the table aligns the information in a way that makes it easy to find unit rate, and the positioning of the numbers on a double number line makes it easy to see our ratios as fractions. They all help keep our work and thoughts organized.

Let's Think (Slide 4): Are we ready to continue applying all we know to solving ratio math problems? Great! Let's look at this problem. It's time for Clarence to buy classroom supplies. He went to two different stores, Target and Walmart. At Target, a box of 12 pencils costs $4.56. At Walmart, 30 pencils costs $12.30. Clarence wants to know which store has the better deal. This is confusing because we know how much GROUPS of pencils cost but we can't compare the price because the group size is different. So, let's calculate the cost of ONE pencil from each store.

Let's Think (Slides 5): Let's use what we know, and all of our different diagrams and tools, to help Clarence. Let's start with the information about Target. We know that 12 pencils cost $4.56. Let's use a double number line to help us find the price of 1 pencil at Target.



Based on the problem, we know this brand of pencils costs $4.56 for 12 pencils. Let's begin by labeling each number line, pencils and cost. What would we add to our double number line next? A tick mark for 12 pencils and a tick mark for $4.56. Yes, the tick mark for 12 is placed on the pencils number line with 4.56 on a tick mark directly below 12's tick mark.



Now, we need to figure out how much 1 pencil costs, so let's label 1 on the number line.

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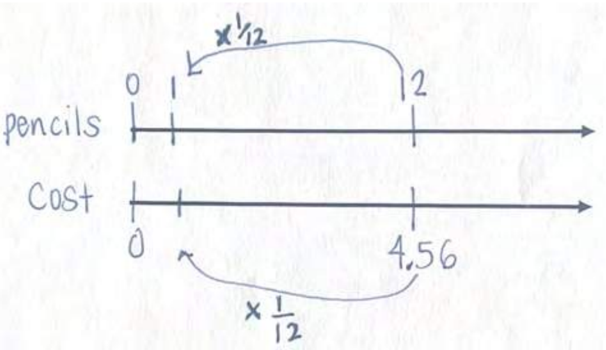
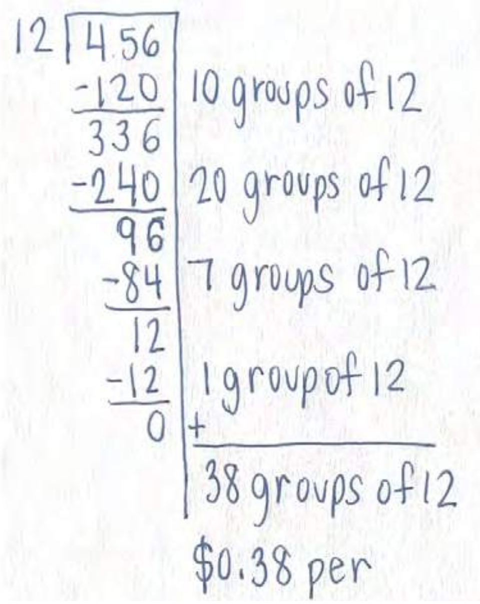


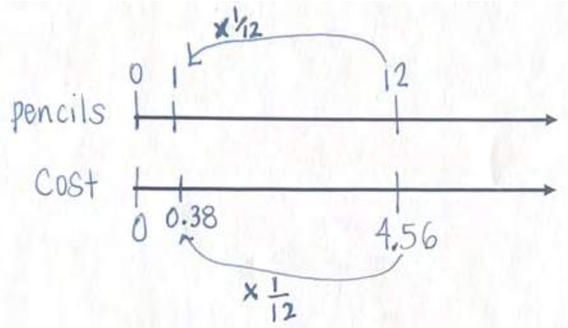
To get from 12 pencils to 1 pencil, we need to divide by 12 or multiply by 1/12.

Let’s calculate the unit rate or cost 1 pencil from this smaller pack. We are dividing 4.56 by 12. We can start by removing the decimal, or thinking of 4.56 as well pennies, so instead of 4.56 we can think of it as 456. This will make our division easier!



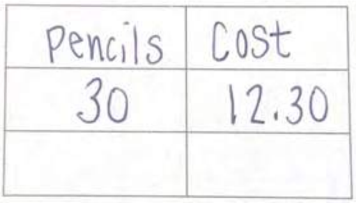
We need to figure out how many groups of 12 we have in the bigger group of 456. We have at least 10 groups of 12 or 120 total. Now, *456 minus 120 leaves us with 336 remaining to be put into groups.* Next, we need to figure out how many groups of 12 we have in the bigger group of 336. We have at least 20 groups of 12 because 20 multiplied by 12 is 240*. And,* 336 minus 240 leaves us with 96 remaining to put into groups. We can make at least 7 groups of 12, which is 96. And, 96 minus 84 leaves us with 12 remaining to put into groups. We can make exactly 1 more group of 12 and 12 minus 12 leaves us with 0 remaining to put into groups.

So, 38 groups of pennies needs to be written as money. In money, 38 pennies looks like $0.38. So, Clarence would pay $0.38 per pencil if he buys them from Target.



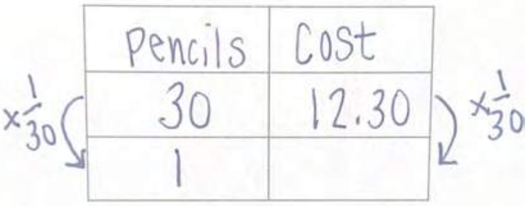
Let’s complete the double number line with our unit rate by placing $0.38 on the cost number line directly under 1 pencil. Again, 1 pencil in this smaller pack from Target costs $0.38.

Let’s Think (Slides 7-8): Now that we know how much each pencil costs on a box of 12 pencils, it’s time to calculate the pencil cost for the other brand at Walmart. Their pencils cost $12.30 for 30 pencils. Let’s solve one problem using a table.



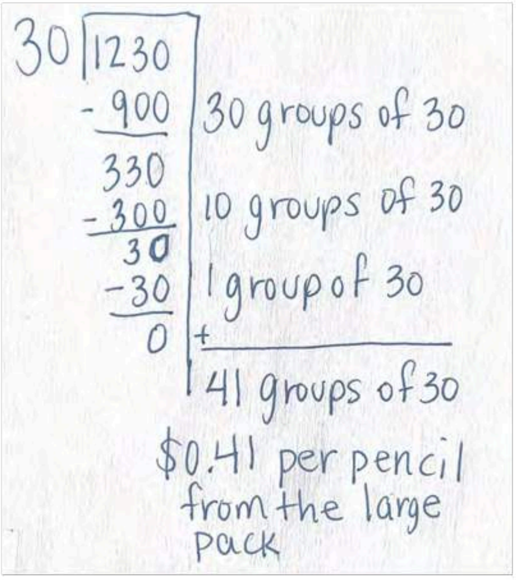
Pencils	Cost
30	12.30

Based on the problem we know this brand of pencils costs $12.30 for 30 pencils. Let’s begin by labeling each column, pencils and cost. What would we add to our table next? 30 under the pencil heading and 12.30 under the cost heading. Yes and we know the 30 and the 12.30 go in the second row of the table under those headings.



Pencils	Cost
30	12.30
1	

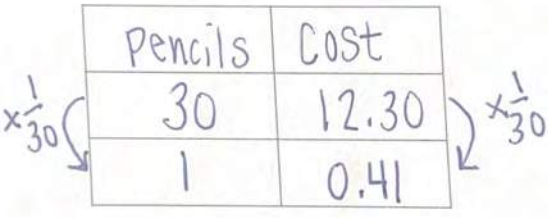
To get from 30 pencils to just 1 pencil, we need to divide by 30 or multiply by the reciprocal which is 1/30.



Let's calculate the unit rate or cost 1 pencil from this large pack from Walmart. We are dividing 12.30 by 30.

We begin by thinking of 12.30 as all pennies which would be 1230 pennies. This will make our division easier!

We need to figure out how many groups of 30 we have in the bigger group of 1230. We have at least 30 groups of 30 or 900 total. *And, 1230 minus 900 leaves us with 330 remaining to be put into groups.* Next, we need to figure out how many groups of 30 we have in the bigger group of 330. We have 10 groups of 30 because 10 multiplied by 30 is 300. And, 330 minus 300 leaves us with 30 remaining to put into groups. We can make exactly 1 group of 30. And, 30 minus 30 leaves us with 0 or nothing remaining to put into groups. So, 1230 divided by 30 makes 41 groups of pennies, which needs to be written as money. In money, 41 pennies looks like $0.41. So, Clarence would pay $0.41 per pencil with the large pack of pencils from Walmart.



Pencils	Cost
30	12.30
1	0.41

Let's complete the table with our unit rate by placing 0.41 in the row directly next to the 1 pencil. Again, 1 pencil in this large pack costs $0.41.

Now we know that if Clarnece buys the pencils from Target he'll pay $0.38 for 1 pencil. If he buys the pencils from Walmart, he'll pay $0.41 for 1 pencil. So, which is the better deal for Clarence? He should go to Target because 12 pencils for $4.56 because each of those pencils is $0.38 and each of the pencils in the larger pack cost $0.41.

Yes! Great summary! The results tell us that with the smaller pack it costs $0.38 per pencil while with the larger pack it costs $0.41 per pencil. If Clarence wants the best value he would buy the smaller pack of pencils because he pays less per pencil when compared to larger pack of pencils.

We used two different diagrams to represent our ratios but we could have chosen to complete all of our math calculations using just one type of diagram. Remember to choose the diagram with which you are the most comfortable working. The goal is still to choose a diagram though to display your math thinking and work. Even as we move onto other units, ensure that you are maintaining the habit of using diagrams to make your math visible .

Let's Try it (Slides 7-8): Let's wrap up this lesson by finding solutions to ratio problems using diagrams of your choosing. Remember that with ratios we utilize reciprocals to assist with calculating unit rate. The reciprocal of a number is 1 divide by that number. When multiplied together, reciprocals always equal 1.

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WARM WELCOME

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Today we will apply our knowledge of ratios to different scenarios.

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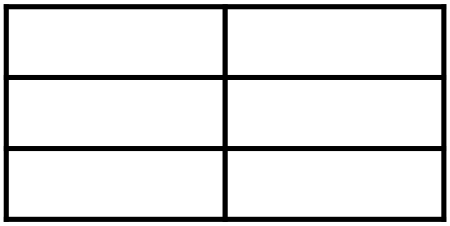
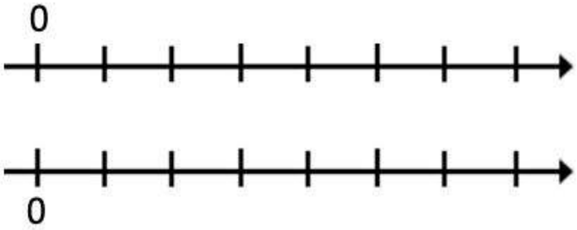
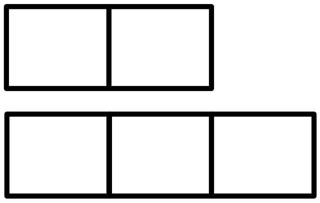
Let’s Talk:

What’s your prefered diagram? Why? List two ways that diagram is used to represent ratios.







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Let’s Think:

Time to buy classroom supplies!

Target is selling a box of 12 pencils for $4.56.
Walmart is selling a box of 30 pencils for $12.30.

Which store is offering the better deal?

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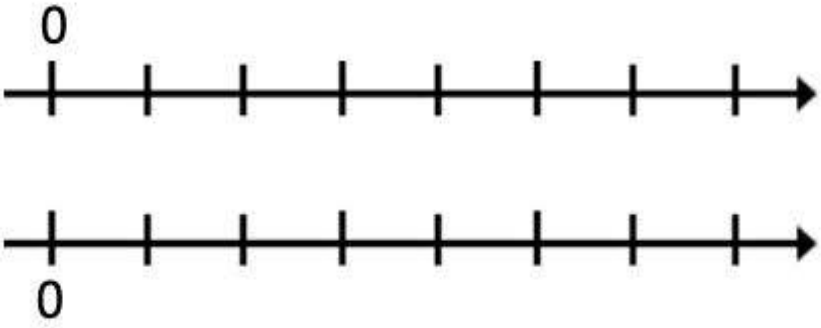
Let’s Think:

Target: A box of 12 pencils costs $4.56.



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Let’s Think:

Walmart: $12.30 for 30 pencils.

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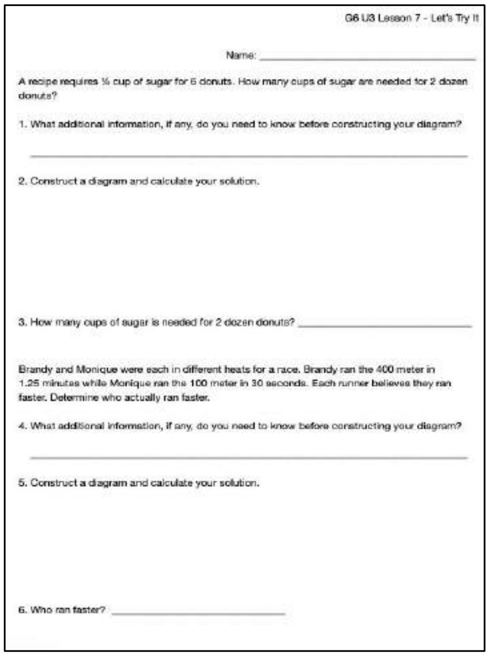
Let's Try It:

Let's explore using unit rate to compare deals and distance together.



G6 U3 Lesson 7 - Let's Try It

Name: ______________________

A recipe requires ½ cup of sugar for 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How many cups of sugar is needed for 2 dozen donuts? ______________________

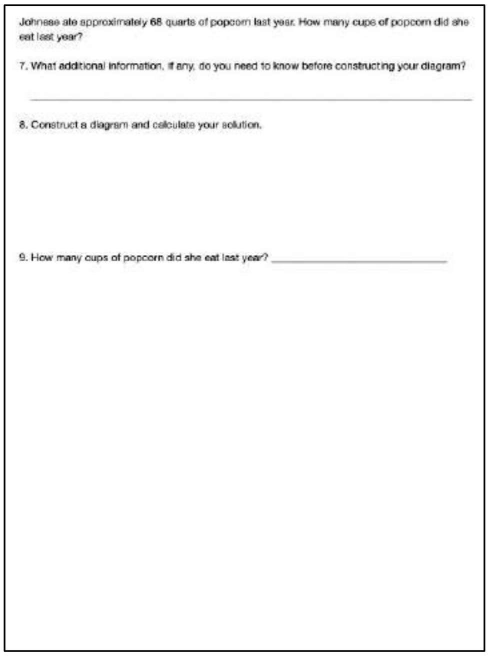
Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran faster. Determine who actually ran faster.

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. Who ran faster? ______________________



Johnese ate approximately 68 quarts of popcorn last year. How many cups of popcorn did she eat last year?

7. What additional information, if any, do you need to know before constructing your diagram?

____

8. Construct a diagram and calculate your solution.

9. How many cups of popcorn did she eat last year? ______________________

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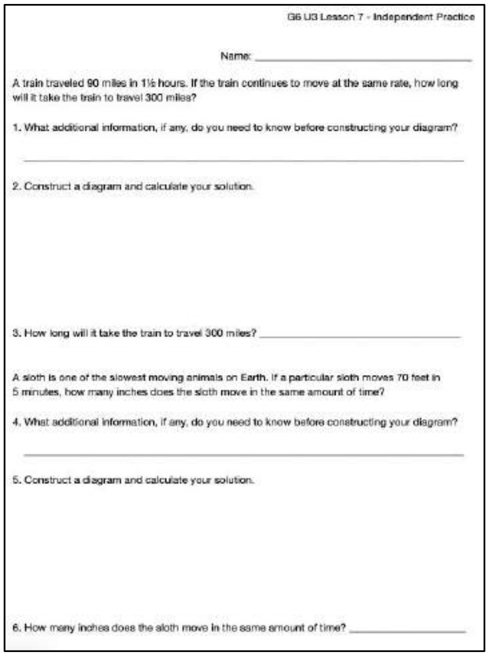
On your Own:

Now it's time to explore using unit rate to compare deals and distance on your own.



G6 U3 Lesson 7 - Independent Practice

Name: ______________________

A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How long will it take the train to travel 300 miles? ______________________

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in 5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. How many inches does the sloth move in the same amount of time? ______________________

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A recipe requires ¼ cup of sugar to make 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How many cups of sugar is needed to make 2 dozen donuts? ____________________________

Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran the fastest. Determine who actually ran the fastest.

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. Who ran the fastest? ________________________________

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Johnese drank approximately 68 cups of soda last year. How many quarts of soda did she drink last year?

7. What additional information, if any, do you need to know before constructing your diagram?

____

8. Construct a diagram and calculate your solution.

9. How many quarts of soda did she drink last year? ______________________________

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A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How long will it take the train to travel 300 miles? ___________________________________

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in 5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. How many inches does the sloth move in the same amount of time? ____________________

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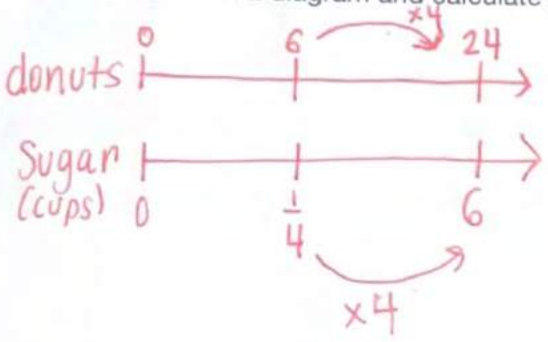
Name: ______________________________ G6 U3 Lesson 7 - Let's Try It

A recipe requires ¼ cup of sugar to make 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

How many donuts are in 2 dozen.

2. Construct a diagram and calculate your solution.



1 dozen = 12 donuts so, 2 dozen = 24 donut.

$\frac{4}{1} \times \frac{1}{4} = \frac{4}{4} = 1$

3. How many cups of sugar is needed to make 2 dozen donuts? 1 cup of sugar

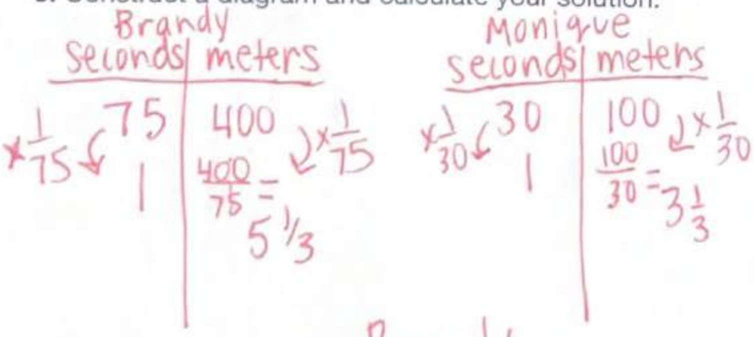
75secs

Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran the fastest. Determine who actually ran the fastest.

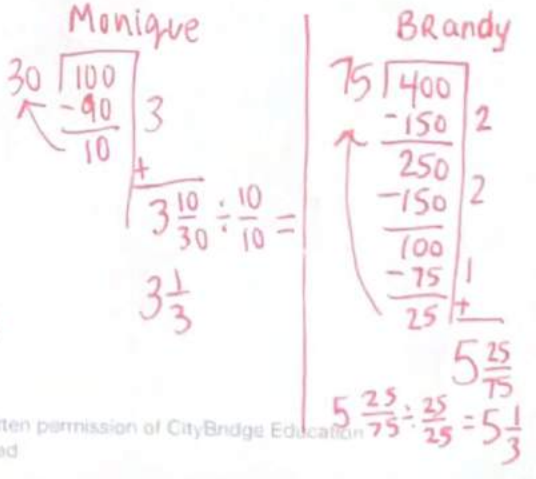
4. What additional information, if any, do you need to know before constructing your diagram?

How many seconds are in a minute or vice versa.

5. Construct a diagram and calculate your solution.



1.25 minutes × 60 seconds = 75 seconds



6. Who ran the fastest? Brandy

She ran $5\frac{1}{3}$ meters in 1 second vs Monique who ran only $3\frac{1}{3}$ meters in 1 second.

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Johnese drank approximately 68 cups of soda last year. How many quarts of soda did she drink last year?

7. What additional information, if any, do you need to know before constructing your diagram?

How many cups are equivalent to a quart.

1 quart = 4 cups

8. Construct a diagram and calculate your solution.

$$\begin{array}{r|c|c|l} & \text{quarts} & \text{cups} & \\ \hline \times\frac{1}{4} & 1 & 4 & \times\frac{1}{4} \\ & \frac{1}{4} & 1 & \\ \times 68 & 17 & 68 & \times 68 \end{array}$$

$$\frac{68}{1} \times \frac{1}{4} = \frac{68}{4}$$

$$\begin{array}{r|l} 4\overline{)68} & \\ -40 & 10 \\ 28 & \\ -28 & 7 \\ 0 & +\underline{} \\ & 17 \end{array}$$

9. How many quarts of soda did she drink last year? 17 quarts

Name: ______________________

G6 U3 Lesson 7 - Independent Practice

A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

No additional information is needed.

2. Construct a diagram and calculate your solution.

	hours	miles	
$\times\frac{1}{90}$	$1\frac{1}{2}=\frac{3}{2}$	90	$\times 90$
	$\frac{3}{180}$	1	
$\times 300$	5	300	$\times 300$

$\frac{3}{2}\times\frac{1}{90}=\frac{3}{180}$

$\frac{3}{180}\times\frac{300}{1}=\frac{900}{180}$

$$\begin{array}{r|l} 180\overline{)900} & \\ -720 & 4 \\ 180 & \\ -180 & 1 \\ 0 & +\\ & 5 \end{array}$$

3. How long will it take the train to travel 300 miles? 5 hours

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in 5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

How many inches in 1 foot.

1 foot = 12 inches

5. Construct a diagram and calculate your solution.

	inches	feet	
$\times 70$	12	1	$\times 70$
	840	70	

6. How many inches does the sloth move in the same amount of time? 840 inches

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G6 U3 Lesson 8

Understand percentages as rates per 100

G6 U3 Lesson 8 - Students will understand percentages as rates per 100

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Wow! You've really worked hard with ratios over our first two units. For the remainder of this third unit we will be applying everything we've learned about ratios to a new concept we call percentages. You've experienced percents in your everyday life and you may not have even realized it! Today we will begin exploring percentages, looking at how they relate to one another and how they show up in the real-world every day.

Let's Talk (Slide 3): Let's brainstorm, **what do you know about percentages? Where have you seen percentages in your everyday life?** Possible Student Answers, Key Points:

- Percentages are like fractions or decimals
- Sometimes we talk about grades or assignments with percentages.
- On my phone, my battery has a percentage to show how much of the battery is left.

Those are great real-world examples of percentages! Even though you may not have much experience with percentages in a school setting doesn't mean that percentages aren't a part of your everyday life. From phone battery power levels to test scores to sales at stores, we experience percentages all the time.

Let's Think (Slide 4): But what exactly is a percent or percentage? Well, it is a comparison of a part to a whole. So that means a percent is really just a ratio!

Just like with ratios we can write percentages as a fraction where the part is the numerator and the whole is the denominator. We can write a percent with a colon, like a ratio, where we're comparing part to whole. And lastly, we can write a percent with the word "to" as in "part to whole". Remember when I said that percentages are really just ratios because they are a comparison? Well now we see that percentages are even written the same as ratios on our diagrams!

Let's continue by thinking about percentages as a scale. Normally we see and think of percents as being from 0 to 100 like with a phone. In fact, percent means "out of 100." The battery can be at 0% meaning the phone is dead, the battery can also be at 100% meaning the battery is completely full. But, did you know that you can actually have more than 100%? Think of a test or quiz. If the assessment has an extra credit question and you answer every question and the extra credit question on the test correctly, your score would be more than or above 100%.

Let's Think (Slide 5): Let's look at a real-world example where percentages can be applied. "Sixth grade students at Springfield Middle School were asked their favorite color." The results are shown in the table.

Let's use the data contained in the table to explore percentages. How many students were polled about their favorite color? 100 students. That's correct! We know 100 students were polled or asked about their favorite color because we totaled all the responses in our table. We counted how many people voted for all of the colors and found out that 100 students were asked. The number 100 is the most important number when thinking about percentages. All percentages are based out of 100. Remember, percent means "out of 100."

Key	Color	Number
R	Red	30
B	Blue	37
G	Green	5
P	Purple	20
O	Other	8

Let's visually represent the color choices of the 100 students on a 10 by 10 grid made of 100 squares. But, to do that we need a key. A key is a code that represents each piece of data in your information set. We used a key in Unit 2 when we worked with ratios and the chocolate cake recipe. To make this key simple we will use the first letter of each color as our code. You could of course actually use colors as the key instead of letters if you had the right colors. We could even use symbols. But, we'll just use the first letter of each color name. Let's write the first letter of each color in the table/

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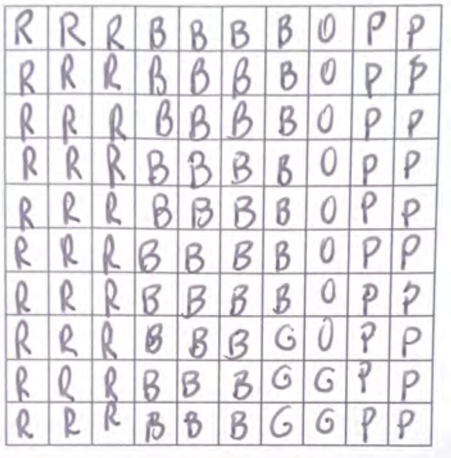


R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	G	O	P	P
R	R	R	B	B	B	G	G	P	P
R	R	R	B	B	B	G	G	P	P

Now let's use our key to complete the grid. Our table tells us that 30 students selected Red as their favorite color when asked. Since the table is made in rows and columns of ten we can simply skip count by ten to see which blocks we will write an R inside of*…*10, 20, 30*.* All the columns I traced will be coded with an R.

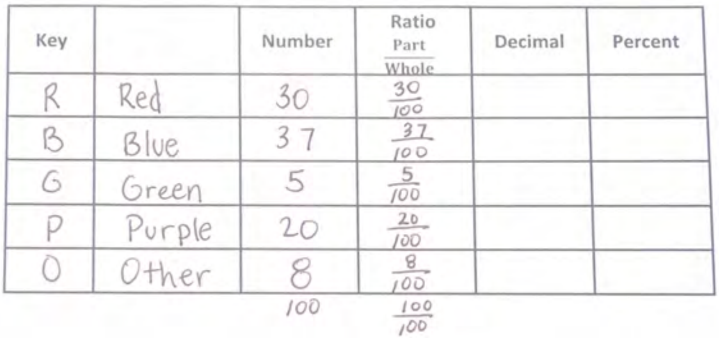
Let's do our 37 Blue blocks. 10, 20, 30, 31, 32, 33, 34, 35, 36, 37*.*

Are we ready for the Green blocks? There are only 5 so let's begin where Blue stops and then count two more over to the right*.*

Because 20 people chose Purple as their favorite color we're going to use the two columns to the right to fill with Ps. We have eight blocks left. Those eight blocks represent the 8 people who chose a color other than red, blue, green or purple as their favorite color…other! We're done filling in all 100 blocks on our grid!

Let's Think (Slide 6): We now have a visual grid of the student responses to their favorite color. Let's complete a table that will lead us to the percentage of each favorite color.

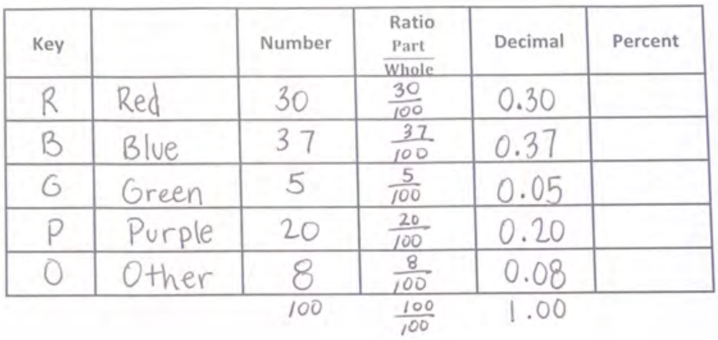
We already discussed that a percent is a ratio that is the comparison of the part to the whole. Based on our survey results, can anyone think of what represents our parts and what represents the whole? The number of each color chosen represents the part and the total number of survey participants is the whole. Nice thinking! The parts are seen in the individual answers to favorite colors on the grid and we found the whole when we totaled all the student responses.



Key		Number	Ratio Part Whole	Decimal	Percent
R	Red	30	$\frac{30}{100}$		
B	Blue	37	$\frac{37}{100}$		
G	Green	5	$\frac{5}{100}$		
P	Purple	20	$\frac{20}{100}$		
O	Other	8	$\frac{8}{100}$		
		100	$\frac{100}{100}$		

Let's write that ratio in the fraction form…part over whole. Red is 30 out of 100 or $\frac{30}{100}$, Blue is 37 out of 100 or $\frac{37}{100}$. *(Continue until finished with the fraction column).*

If we were to total these fractions we would get $\frac{100}{100}$ which accounts for all the student responses.



Key		Number	Ratio Part Whole	Decimal	Percent
R	Red	30	$\frac{30}{100}$	0.30	
B	Blue	37	$\frac{37}{100}$	0.37	
G	Green	5	$\frac{5}{100}$	0.05	
P	Purple	20	$\frac{20}{100}$	0.20	
O	Other	8	$\frac{8}{100}$	0.08	
		100	$\frac{100}{100}$	1.00	

Guess what? You already have the knowledge to convert a ratio or fraction into a decimal from fifth grade but here is a reminder, the way you correctly read a fraction is the way you write it as a decimal if the denominator is a power of 10. Since 100 is a power of…10 10x10 is 100, we just need to correctly read each fraction. So, $\frac{30}{100}$ is read as thirty hundredths. Thirty hundredths as a decimal is 0.30. Next, $\frac{37}{100}$ is read as thirty-seven hundredths. Thirty-seven hundredths as a decimal is 0.37. *(Continue until finished with the decimal column).*

Now, if we were to add up all of our decimals, the total would be 1.00 or 1.

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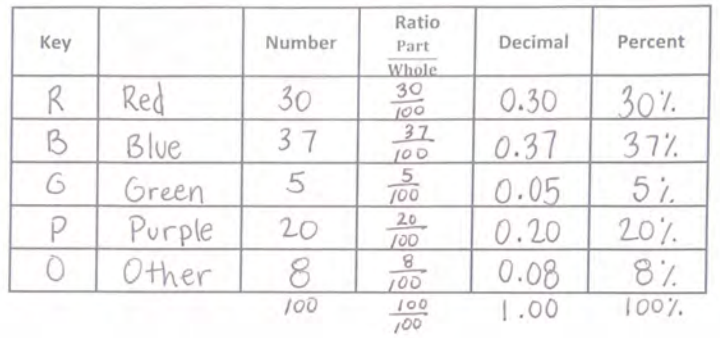

Key		Number	Ratio $\frac{\text{Part}}{\text{Whole}}$	Decimal	Percent
R	Red	30	$\frac{30}{100}$	0.30	30%
B	Blue	37	$\frac{37}{100}$	0.37	37%
G	Green	5	$\frac{5}{100}$	0.05	5%
P	Purple	20	$\frac{20}{100}$	0.20	20%
O	Other	8	$\frac{8}{100}$	0.08	8%
		100	$\frac{100}{100}$	1.00	100%

Our last column is the percent column. A decimal becomes a percent by multiplying the decimal by 100. You learned how to do this in fifth grade as well but here's a reminder. Multiplying a decimal by 100 involves shifting or moving the digits twice to the left on the place value chart. Why to the left? Because multiplying any number by 100 means the number gets larger and moving numbers to the left makes numbers larger. Think "left, larger." Let's shift the digits to left, being careful to leave the decimal point in its same position when we do.

For red, the decimal is 0.30, when the digits are shifted two place values to the left but the decimal point stays in its position, the number becomes 30. So, let's put 30% in the Red row. And, 0.37 becomes 37%. For green, 0.05 becomes 5%. Now looking at purple, 0.20 becomes 20%. Finally, other is 0.08 and that becomes 8%. We're done completing our table of values!

Now that we have the percentages, let's answer some questions! What percentage of survey participants chose Purple as their favorite color? 20%. That's correct. We see on the table in the purple row that 20% of the students chose purple as their favorite color.

Which color was chosen by 5% of the survey participants as their favorite color? Green! Yes. We see on the table in the Green row that 5% of the students chose green as their favorite color.

You may be thinking that all that work wasn't necessary because the percentages match the number of people who responded each time. Know that only works out that way because the total number of students asked their favorite color was 100. If 99 students, or 101, or even 1,573 students were asked their favorite color, the values in our table would not be so friendly. But, the process of converting numbers from decimals to percentages would be the same process whether 99, 100, 100 or even 1,573 students we asked their favorite color. The calculations from fractions to decimals would just be much more challenging. While we won't be relying on the grid in upcoming lessons, we will be focused on the knowledge that percentages are really just ratios and percent means "out of 100."

Let's Try it (Slide 6-7): Let's wrap up this lesson by finding solutions to ratio problems using diagrams. Remember that percentages are always out of the standard 100% and, again, percent means "out of 100."

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WARM WELCOME

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Today we will explore percents in the real-world.

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Let's Talk:

What do you know about percentages? Where have you seen percentages in your everyday life?

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Let's Think:

A percent, or a percentage, is a comparison of a part to a whole.

We can show percentages as FRACTIONS:

$$\frac{\textit{part}}{\textit{whole}}$$

We can show percentages with a RATIO:

part:whole

We can show percentages with WORDS:

part* to *whole

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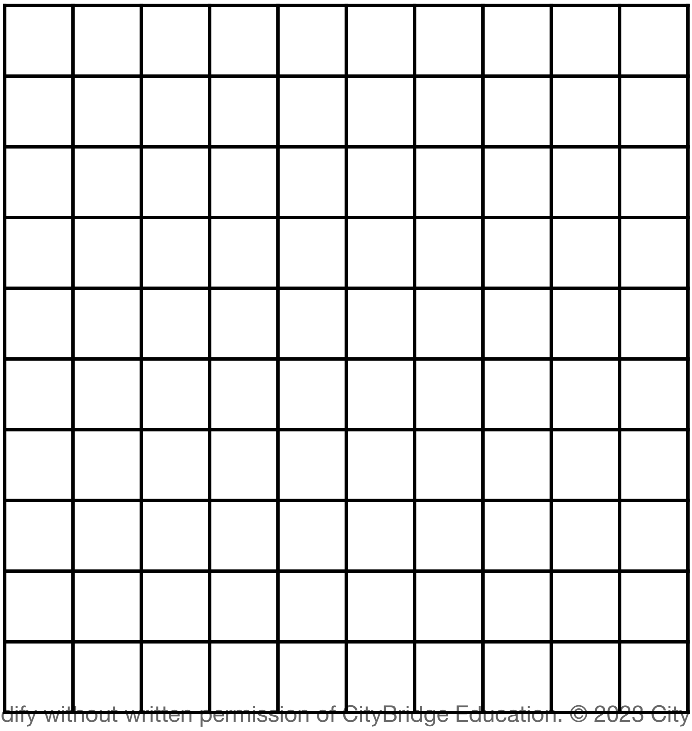
Let’s Think:

Key	Color	Number
	Red	30
	Blue	37
	Green	5
	Purple	20
	Other	8



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Let’s Think:

Key	Color	Number	Ratio	Decimal	Percent
R	Red	30			
B	Blue	37			
G	Green	5			
P	Purple	20			
O	Other	8			

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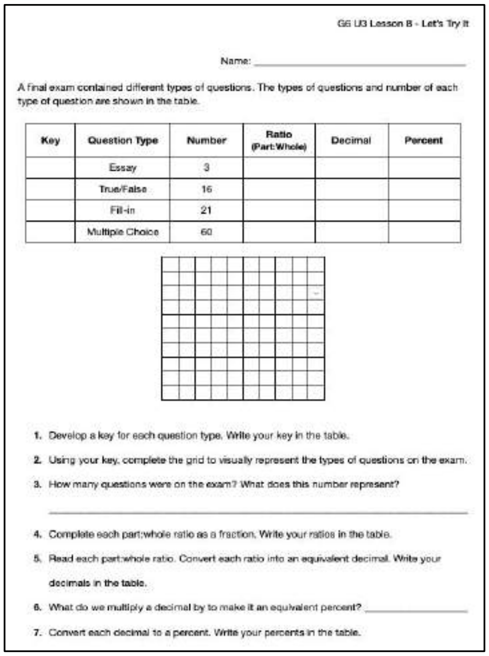
Let's Try It:

Let's explore percentages together.



G6 U3 Lesson 8 - Let's Try It

Name: ______________________

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

Key	Question Type	Number	Ratio (Part:Whole)	Decimal	Percent
	Essay	3			
	True/False	16			
	Fill-in	21			
	Multiple Choice	60			

1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the types of questions on the exam.
3. How many questions were on the exam? What does this number represent?

   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ______________
7. Convert each decimal to a percent. Write your percents in the table.

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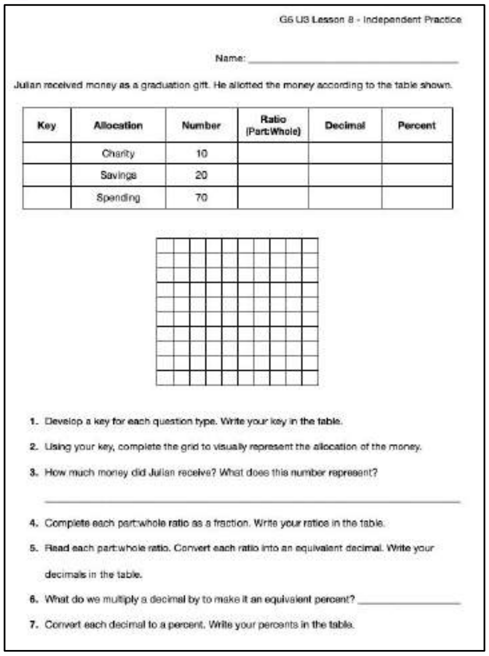
On your Own:

Now it's time to explore percentages on your own.



G6 U3 Lesson 8 - Independent Practice

Name: ______________________

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	Allocation	Number	Ratio (Part:Whole)	Decimal	Percent
	Charity	10			
	Savings	20			
	Spending	70			

1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?

   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ______________
7. Convert each decimal to a percent. Write your percents in the table.

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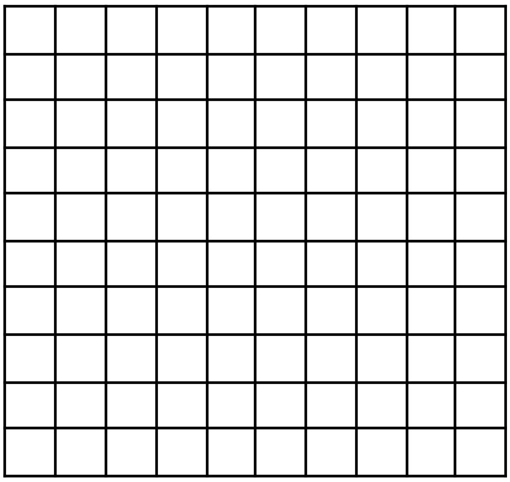
Name: ______________________________________

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

Key	Question Type	Number	Ratio (Part:Whole)	Decimal	Percent
	Essay	3			
	True/False	16			
	Fill-in	21			
	Multiple Choice	60			



1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the types of questions on the exam.
3. How many questions were on the exam? What does this number represent?

   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ____________________
7. Convert each decimal to a percent. Write your percents in the table.

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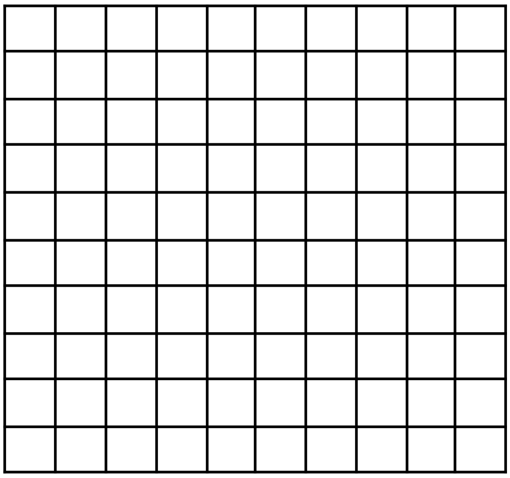
Name: ____________________________________ G6 U3 Lesson 8 - Independent Practice

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	**Allocation**	**Number**	**Ratio (Part:Whole)**	**Decimal**	**Percent**
	Charity	10			
	Savings	20			
	Spending	70			



1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?

   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ________________
7. Convert each decimal to a percent. Write your percents in the table.

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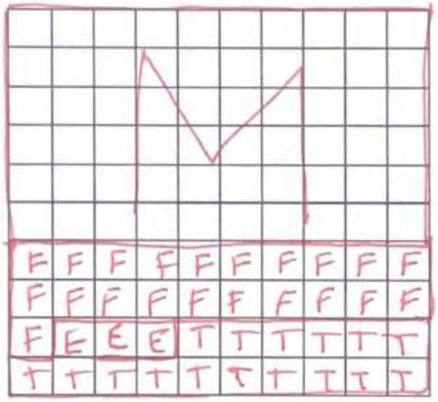
Name: ______________________________ G6 U3 Lesson 8 - Let's Try It

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

Key	Question Type	Number	Ratio (Part:Whole)	Decimal	Percent
E	Essay	3	$3:100 = \frac{3}{100}$	.03	3%
T	True/False	16	$16:100 = \frac{16}{100}$	.16	16%
F	Fill-in	21	$21:100 = \frac{21}{100}$	.21	21%
M	Multiple Choice	60	$60:100 = \frac{60}{100}$	.60	60%



1. Develop a key for each question type. Write your key in the table.

2. Using your key, complete the grid to visually represent the types of questions on the exam.

3. How many questions were on the exam? What does this number represent?

100 questions total. It represents the whole.

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.

5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.

6. What do we multiply a decimal by to make it an equivalent percent? 100

7. Convert each decimal to a percent. Write your percents in the table.

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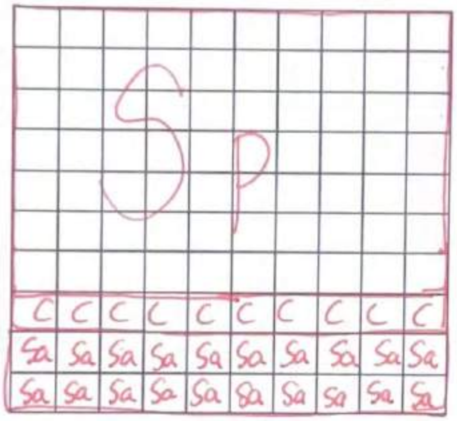
Name: ______________________________ G6 U3 Lesson 8 - Independent Practice

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	Allocation	Number	Ratio (Part:Whole)	Decimal	Percent
C	Charity	10	10:100 = $\frac{10}{100}$	.10	10%
Sa	Savings	20	20:100 = $\frac{20}{100}$	.20	20%
Sp	Spending	70	70:100 = $\frac{70}{100}$	.70	70%



1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?
   $100. This represents the whole amount received.
4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? 100
7. Convert each decimal to a percent. Write your percents in the table.

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G6 U3 Lesson 9

Use double number lines to calculate percentages

G6 U3 Lesson 9 - Students will use double number lines to calculate percentages

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will apply our knowledge of double number lines to calculating percentages we encounter in the real-world. In our first percentage lesson we discussed that while percentages can be greater than 100%, 100% represents the whole since percent means "out of 100" or even "per 100' if you think about ratio language.

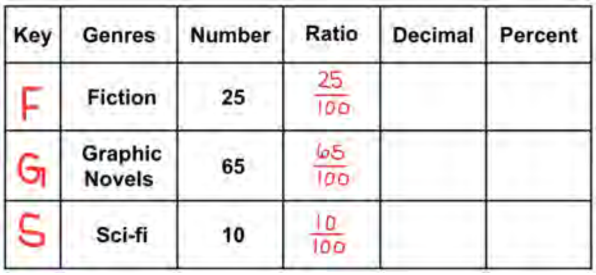
Let's Talk (Slide 3): So, let's open with a brainstorm. We know that percentages are always out of the standard 100% but you can have percentages that are less than and more than 100%.

Think of an example where you experienced a percentage less than 100%. Also think of a real-world example where a percentage more than100% couldn't exist. Possible Student Answers, Key Points:

- When my phone was at 35%
- When something was on sale for 50% off
- I got a score of 75% on a quiz
- You can't have more than 100% of your phone battery
- You can't fill your fuel tank more than 100%

Good thinking! Percentages can be tricky. Keep in mind that just because percentages are out of 100 doesn't mean they'll always be 100% and just because percentages can go beyond 100% that doesn't mean they can go beyond 100% in all instances. You can't charge your phone beyond 100%, either the phone's battery is full meaning 100% or it's not full. The battery can't be more than full. Also, most percentages we experience in our world are most often less than 100%. Staying with the phone example, after you have one phone conversation or scroll an app for more than five minutes your phone will no longer be at 100% and will continue to decrease throughout the day unless it is charged at some point in that day.

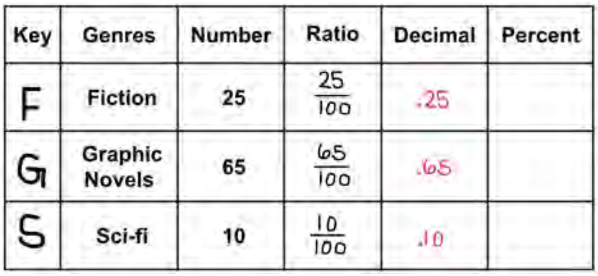
Let's Think (Slide 4): Yesterday we worked with a table to find percentages of numbers. We were able to relate numbers, ratios, decimals, and percentages to one another. Looking at this table that represents the type of books a student reads by genre, let's calculate the percentage of each genre read by a student over the course of a school year.



Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	25/100		
G	Graphic Novels	65	65/100		
S	Sci-fi	10	10/100		

Let's first choose a key to represent our book genres. Like yesterday, using the first letter of the genre is easy and makes sense. Next, let's complete the ratio column also known as the comparison of the part to the whole. The number of books in each genre are the parts and the total number of books is the whole. So, the total is 25 and 65 and 10, which is 100–that's a nice easy total to work with!

So, for fiction 25 out of 100 students chose that genre. So the ratio is 25/100. Now, how many students chose graphic novels? 65! That's right, 65 out of 100 students picked graphic novels so that ratio is 65/100. And finally, 10 out of 100 students chose sci-fi so that ratio is 10/100.



Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	25/100	.25	
G	Graphic Novels	65	65/100	.65	
S	Sci-fi	10	10/100	.10	

Now, let's write our ratios as decimals. Remember that decimals are written based on how the fractions are read when the denominator is 100. So, 25/100 is read as twenty-five hundredths (*point as you say it*) so the decimal will also read as twenty-five hundredths or 0.25. Now, graphic novels are sixty-five hundredths, which is 0.65. And finally, sci-fi is ten hundredths, which is 0.10.

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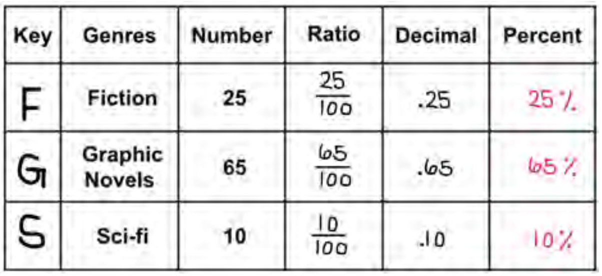
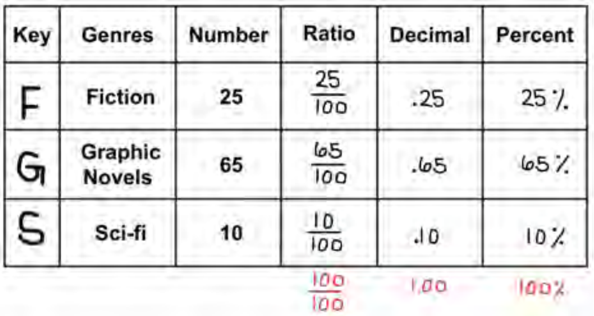


Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$	.25	25 %
G	Graphic Novels	65	$\frac{65}{100}$	.65	65 %
S	Sci-fi	10	$\frac{10}{100}$	.10	10 %

Finally, let's convert decimals to percentages by multiplying each decimal by 100 in the last column. In yesterday's lesson we reviewed the process for multiplying decimals by 100. We said multiplying a decimal by 100 involves shifting or moving the digits twice to the left because multiplying any number by 100 means the number gets larger and moving numbers to the left makes numbers larger. Let's shift the digits to the left, being careful to leave the decimal point in its same position.



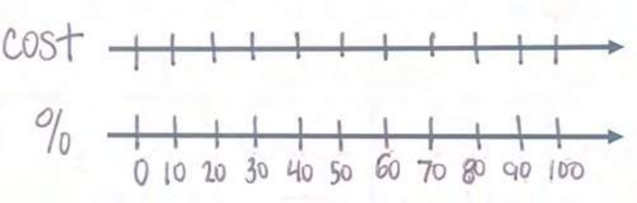
Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$	.25	25 %
G	Graphic Novels	65	$\frac{65}{100}$	.65	65 %
S	Sci-fi	10	$\frac{10}{100}$	.10	10 %
			$\frac{100}{100}$	1.00	100%

FInally, let's make sure that our parts all add up to the total. This is a good strategy to use to check our work. All of our ratios should add up to 100 out of 100. All of our decimals should add up to 1, or 1.00 and finally all of our percentages should add up to 100%!

Everyone, do the math and check!

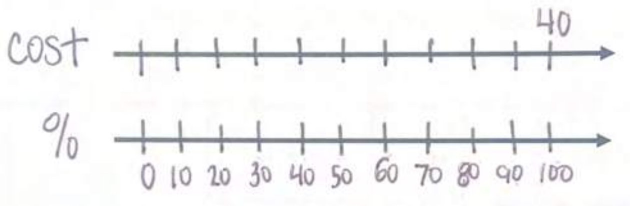
Let's Think (Slide 5): In our first lesson we also learned that percentages are really just ratios because percentages are a comparison of the part to the whole. We even wrote that ratio as a fraction. Just like with ratios, we can represent percents on a double number line by scaling from 0% to 100%. Let's use our double number line with a real-world percent scenario.

Listen as I read it, "At a store a $40.00 shirt is on sale for 20% off. How much does the shirt cost?" Let's stop and think for a second; what does 20% off mean? You pay less money for the shirt. Correct! Don't we all love a discount? 20% off means you pay 20% less than the full price for the shirt. It also means you only pay 80% of the full price of the shirt because 100% - 80% equals the 20% discount on the purchase of the shirt.



Let's start our double number line by labeling each number line. This shirt scenario deals with two things; money and percents so let's label the number lines cost and percent.

Next, let's label the bottom number line from 0 to 100, since it's percentages. Let's count the spaces between the tick marks so we can decide what we are skip counting by on our percent number line. Count with me. Since we counted 10 spaces that means this number line is divided into 10 equal spaces. And, 100 divided by 10 equals 10 so we need to skip count by 10 starting at 0%. Ready? Skip count with me - 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.



Let's finish constructing our double number line to represent the sale price of the shirt. We need to figure out what to skip count by on the cost number line but first we need to know what dollar amount is equal to 100% in this scenario. Ask yourself, if 100% is the whole, then what number originally represents the "whole" cost for the shirt? $40! That's right! Before any discount is applied to the price of the shirt it costs $40.00. Let's put 40 over 100% on our cost number line.

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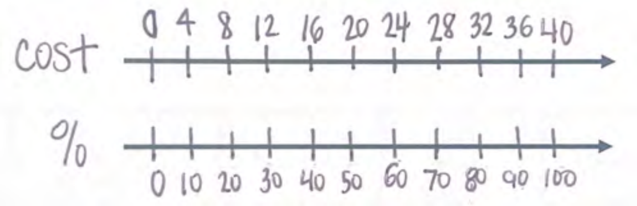


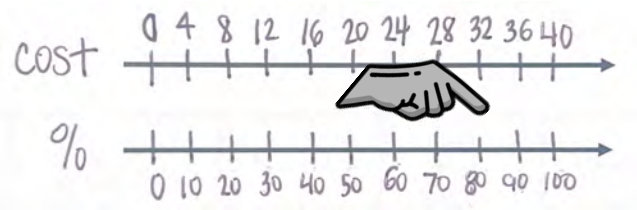
Now we can decide what to skip count by on the cost number line. We are starting at $0 and stopping at $40.00. There are ten spaces between $0 and $40.00 so we divide 40 by 10 and get 4. So, 4 is the number we will skip count by on the top number line. Let's do that aloud together. Ready? 4, 8, 12, 16, 20, 24, 28, 32, 36, 40.

Now that our double number line is complete, we can analyze the diagram to determine how much the $40.00 shirt costs if it is 20% off. We can figure this out two different ways.

First, look at the 20% increment. What is the cost, in dollars, represented by 20%? $8.00. If $8.00 is 20% of the cost that means that $8 is how much you take off the regular price. We know $8 represents the amount of money we take off because the problem stated "for 20% off" and that means to take money away or subtract.

So, we subtract $40 -$8 to get a sale price of $32 for the shirt. We did it! We found out how much the shirt would cost after the discount of 20% was taken off.

There's a second way we can use our double number line to determine how much the shirt costs at 20% off. If you had a test and your teacher said you lost 20 percentage points overall, what would be your score? 80%. That's right because 100% minus 20% equals 80%.



So, 20% off means you actually get 80%. What do we notice when we look at the 80% tick mark on our double number line? $32! Yes! If we are flexible in our thinking about percentages we can jump right to identifying the cost of the shirt with a 20% discount because getting a 20% discount is the same as paying 80% of the original price; in this scenario paying $32!

We have just explored two different ways to determine the percentage or part of a whole. If we keep in mind that percentages are out of 100 and use that knowledge as a base for calculating we will be able to manipulate percentages and see them in more than one way. Seeing percentages in more than one way will continue to come in handy in our upcoming lessons.

Let's Try it (Slide 6-7): Let's continue applying our knowledge of double number lines to percentages. Don't forget that percentages on double number lines are a great diagram for displaying information just like when we are calculating non-percentage ratios.

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WARM WELCOME

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Today we will use double number lines to calculate percentages.

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Let's Talk:

Think of an example where you experienced a percentage less than 100%.

Also, think of a real-world example where a percentage more than 100% couldn't exist.

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Let's Think: **Let's complete the table.**

Key	Genres	Number	Ratio	Decimal	Percent
	Fiction	25			
	Graphic Novels	65			
	Sci-fi	10			

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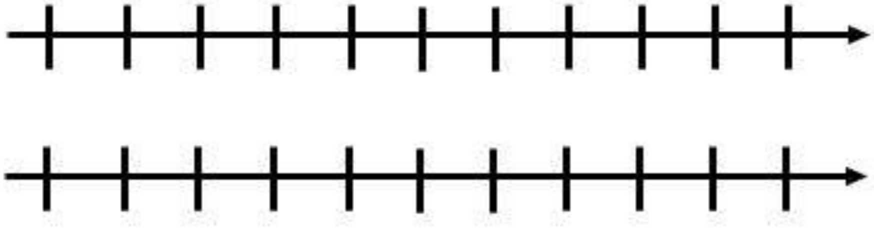
Let's Think:

At a store a $40.00 shirt is on sale for 20% off. How much does the shirt cost?



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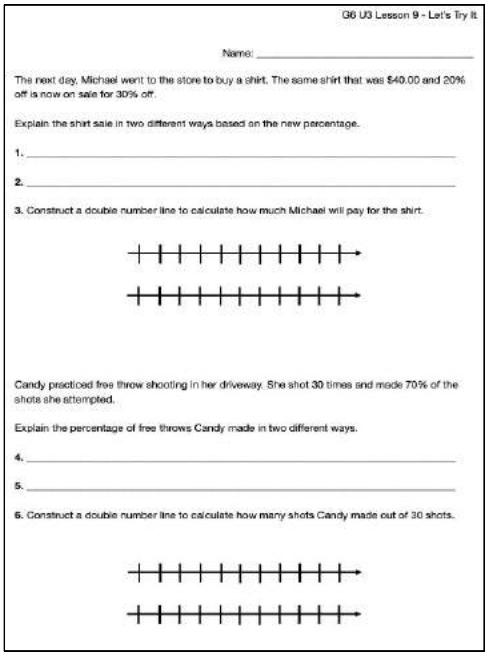
Let's Try It:

Let's explore percentages with double number lines together.



G6 U3 Lesson 9 - Let's Try It

Name: ____________________

The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. ____________________

2. ____________________

3. Construct a double number line to calculate how much Michael will pay for the shirt.

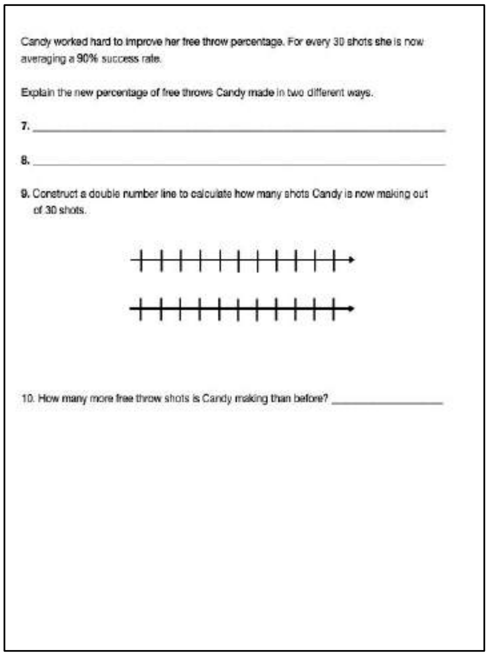
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. ____________________

5. ____________________

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. ____________________

8. ____________________

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.

10. How many more free throw shots is Candy making than before? ____________

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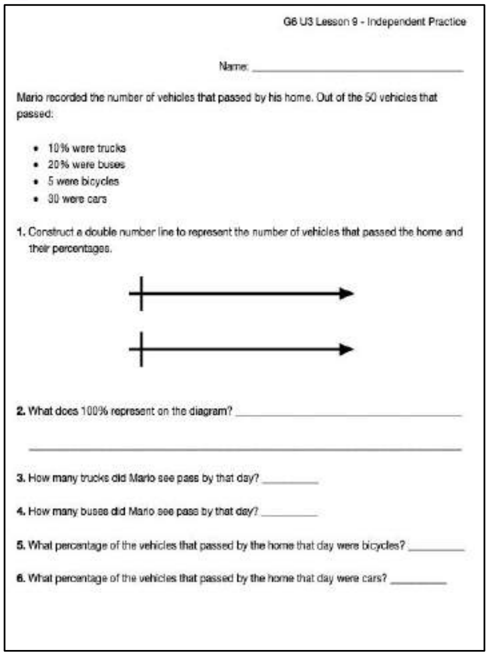
On your Own:

Now it's time to explore percentages with double number lines on your own.



G6 U3 Lesson 9 - Independent Practice

Name: ______________________________

Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.

2. What does 100% represent on the diagram? ______________________________

____

3. How many trucks did Mario see pass by that day? ________

4. How many buses did Mario see pass by that day? ________

5. What percentage of the vehicles that passed by the home that day were bicycles? ________

6. What percentage of the vehicles that passed by the home that day were cars? ________

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Name: ______________________________________ G6 U3 Lesson 9 - Let's Try It

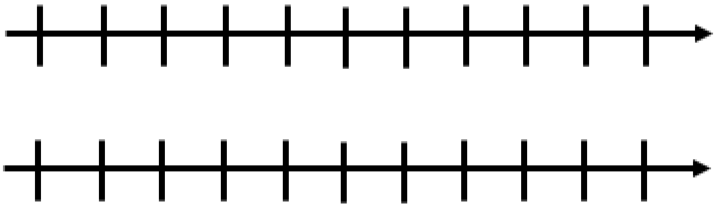
The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. ____

2. ____

3. Construct a double number line to calculate how much Michael will pay for the shirt.



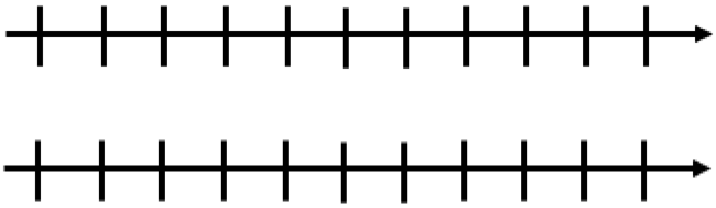
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. ____

5. ____

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



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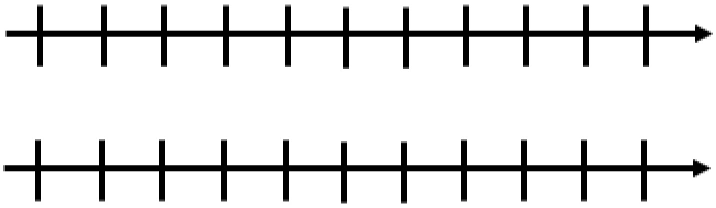
Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. ____

8. ____

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.



10. How many more free throw shots is Candy making than before? ____________________

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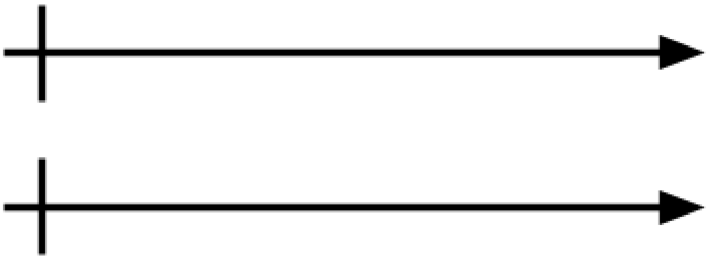
Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.



2. What does 100% represent on the diagram? ____

____

3. How many trucks did Mario see pass by that day? __________

4. How many buses did Mario see pass by that day? __________

5. What percentage of the vehicles that passed by the home that day were bicycles? __________

6. What percentage of the vehicles that passed by the home that day were cars? __________

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Name: ______________________________ G6 U3 Lesson 9 - Let's Try It

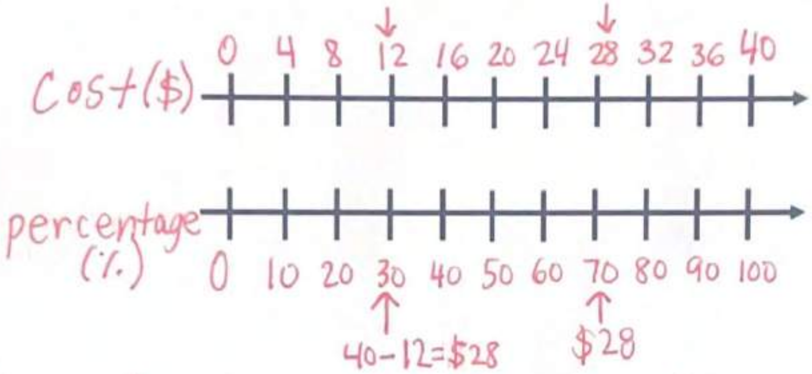
The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. The shirt is now on sale for 30% off.

2. The cost of the shirt is 70% of the original price.

3. Construct a double number line to calculate how much Michael will pay for the shirt.



40÷10 spaces=4s

The shirt now costs $28.00 after the discount.

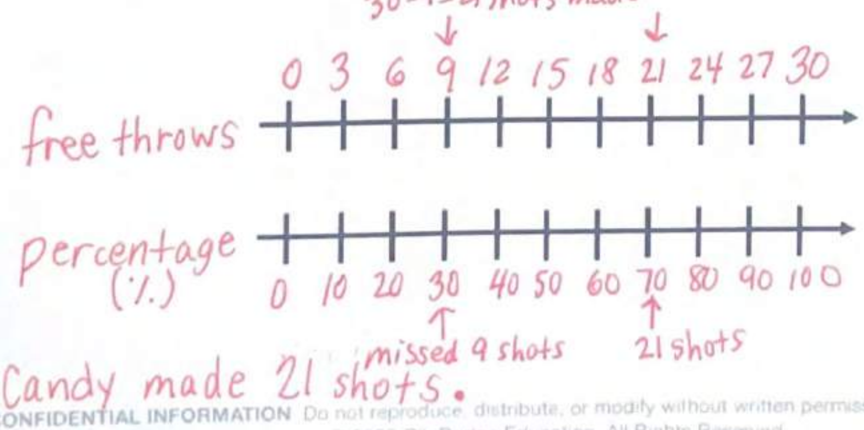
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. Candy made 70% of her shots.

5. Candy missed 30% of her shots.

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



30÷10 spaces=3s

Candy made 21 shots.

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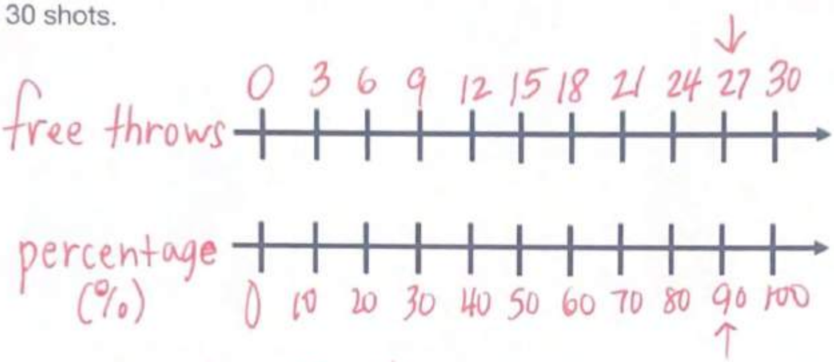
Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. Candy made 90% of her shots.

8. Candy missed 10% of her shots.

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.



30 ÷ 10 spaces = 3s

She made 27 shots.

10. How many more free throw shots is Candy making than before? 6 shots

improved 27
original −21
6 shot difference

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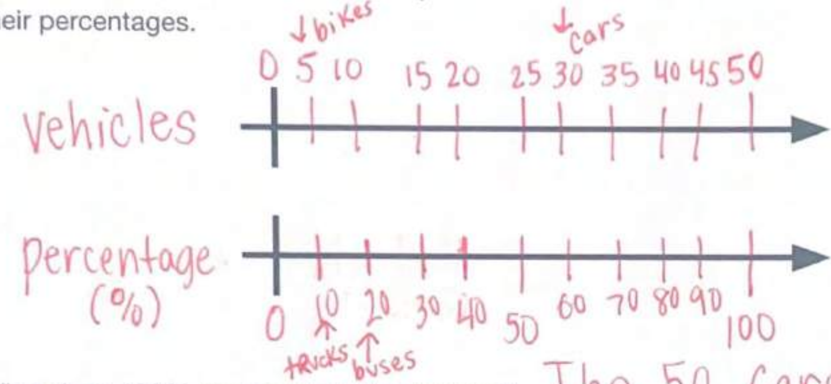
Name: ______________________ G6 U3 Lesson 9 - Independent Practice

Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.



50÷10 spaces = 5s

2. What does 100% represent on the diagram? The 50 Cars that passed by Mario's home.

3. How many trucks did Mario see pass by that day? 5

4. How many buses did Mario see pass by that day? 10

5. What percentage of the vehicles that passed by the home that day were bicycles? 10%

6. What percentage of the vehicles that passed by the home that day were cars? 60%

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G6 U3 Lesson 10

Use tape diagrams to calculate percentages

CITYTUTOR DC

G6 U3 Lesson 10 - Students will use tape diagrams to calculate percentages

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore tape diagrams as another way to visually represent the information that relates to percentages. So far in this unit we have explored percentages using grids, tables, and double number lines as representations. We recall that a percentage is a ratio that compares a part to the whole and it is out of 100.

Let's Talk (Slide 3): Let's look closely at this double number line. Look at the labels, the numbers, and all of the other information we can find. **Now, share two observations about data presented on the double number line.** Possible Student Answers, Key Points:

- We're looking at the percentage of miles biked by someone.
- The total amount of miles biked is 30 miles, that's 100% of the miles.
- Half, or 50% of the miles biked, is 15 miles.

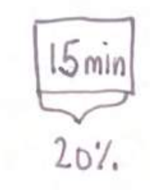
Great observations! We can see that the total miles biked was 30 miles. Also that 15 miles represents 50% of the miles biked while 27 miles represents 90% or almost all of the miles biked.

Let's Think (Slide 4): Let's revisit percentages on double number lines we began exploring in our last lesson. Here's our scenario, "Luke read a 120-page book." Let's answer some questions based on our double number line.

- **On the first day of reading, Luke read 30% of the book. How many pages did he read?** 36 pages. Correct! When we look at the diagram, 30% of the book is represented by having read 36 pages.
- Next question, **what percentage of the book does Luke have left to read after the first day of reading?** 70% of the book is remaining. Yes! If Luke has only read 30% of the book after the first day of reading then you subtract that 30% from 100% to get a difference of 70%.
- Last question, **how many pages represent the percentage of pages remaining in the book?** 84 pages. Right, again! When we look at the diagram, 70% of the book is represented by 84 pages or we could do 120, all the pages in the book, minus the 36 pages that Luke read, which is 84. Great thinking and use of the double number line!

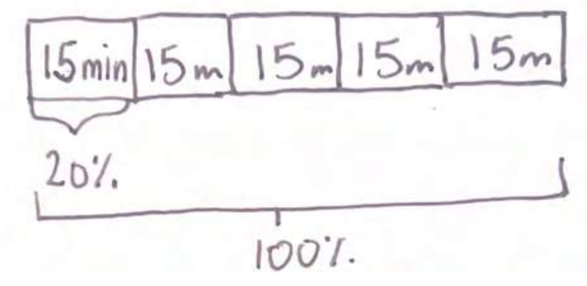
Let's Think (Slide 5): Let's use another diagram, a tape diagram, to display information about percentages. "Carlos started piano lessons last month. He has one lesson a week with a teacher and practices at home between lessons. Today Carlos practiced for 15 minutes. This practice time represents only 20% of the total time he is supposed to practice for the week." Let's construct a tape diagram to answer the following questions:

1. How much time is Carlos supposed to practice piano this week?
2. If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?
3. And lastly, Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?



To construct our tape diagram we must focus on the fact that Carlos practiced 15 minutes today and that time represented only 20% of the total time he needed to practice for the week. We'll start with making a box to represent 15 minutes and label that box 20% on the bottom.

Since percentages are out of 100, we want to continue our tape diagram through 100%. We already have 20% so how many total boxes will we need to reach 100%? 5 boxes. That's right. 5 boxes are needed because when we skip count from 20% to 100% we say 20, 40, 60, 80, 100 which includes five numbers so we need five total boxes in our tape diagram. Also, we know 20 multiplied by 5 equals 100.

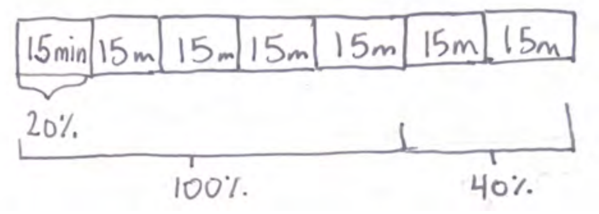


Let's continue our tape diagram by including five total boxes each with 15 min or 15m written inside. If we wanted to label the 100%, what would it represent in our problem? 100% represents the total time he is supposed to practice piano for the week. Yes, because the scenario says Carlos practiced 15 minutes and that made up 20% of the week's practice time. So, 100% would represent the total overall practice time for the week.

We can now answer questions 1 and 2 using our tape diagram.

1. **How much total time is Carlos supposed to practice piano this week?** 75 minutes. Correct! 15 added to itself five times or 15 minutes multiplied by five boxes give us 75 total minutes of practice time for the week.

2. **If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?** 45 minutes. This question is tougher. But, if you look at the tape diagram you will notice that each box represents or equals 20% *(point).* We would need three of those boxes to total 60% because through skip counting I count 20, 40, 60 so three boxes. If you total the minutes inside those three boxes then you get 15 added to itself three times or 15 times by 3 which is 45 minutes of practice time is equal to 60% of the practice time for the week.
3.
4. Let's reread the last question, **Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?** Our current tape diagram only shows 100% of the time. But, we can extend our diagram to include percents greater than 100! All we need to do is continue adding boxes of 15. We need two more boxes of 15 minutes to reach 140% because each box represents 20% and 20% plus 20% equals 40%. 2 We needed that 40% to add to the 100% we already had on our diagram.



After finishing our construction, how much time did Carlos end up practicing the difficult music piece?
105 minutes. Yes, 15 times by 7 equals 105. So, he practiced for 105 minutes which is the same as 1 hour and 45 minutes. So, 1 hour and 45 minutes is the amount of time Carlos ends up practicing.

We are nearly at the end of our work in Unit 3. Our ratio diagrams are really helping make our math easier to understand. In our next lesson we will continue to use tape diagrams as a means to display percentages. Remember that percentages are out of 100 but can be more or less depending on the scenario or depending on what is being asked based on the information.

Let's Try it (Slide 6-7): Let's continue applying our knowledge of tape diagrams to percentages. Remember that tape diagrams are constructed with equally-sized boxes. With percentages, each box represents the same percentage as well.

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WARM WELCOME

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Today we will use tape diagrams to calculate percentages.

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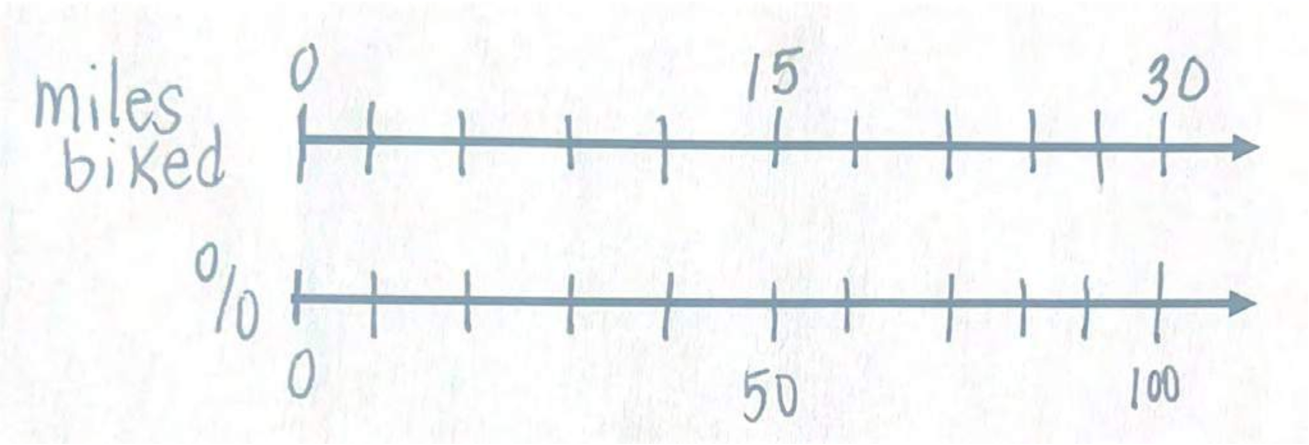
Let's Talk:

Make two observations about data presented on the double number line.



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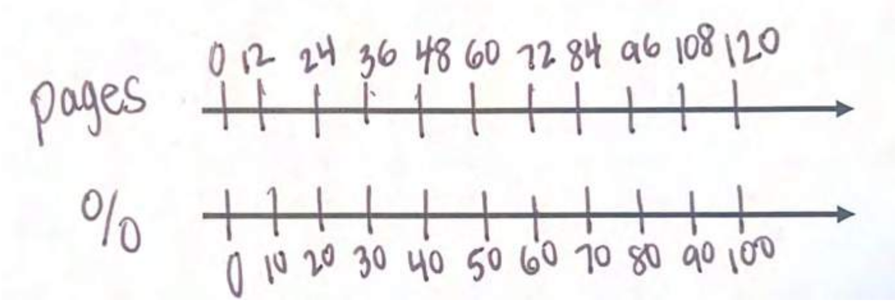
Let's Think:

Luke read a 120-page book.



1. On the first day of reading, Luke read 30% of the book. How many pages did he read?
2. What percentage of the book does Luke have left to read after the first day of reading?
3. How many pages does Luke have left to read after the first day of reading?

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Let's Think:

Today Carlos practiced piano for 15 minutes. This practice time represents only 20% of the total time he is supposed to practice for the week.

Let's construct a tape diagram to answer the following questions:

1. How much time is Carlos supposed to practice piano this week?
2. If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?
3. Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?

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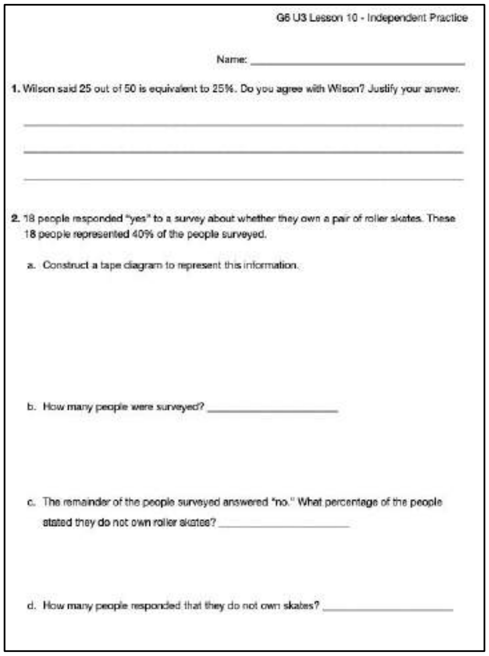
Let's Try It:

Let's explore percentages with tape diagrams together.



G6 U3 Lesson 10 - Independent Practice

Name: ____________________

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

____

____

____

2. 18 people responded "yes" to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.

b. How many people were surveyed? ____________

c. The remainder of the people surveyed answered "no." What percentage of the people stated they do not own roller skates? ____________

d. How many people responded that they do not own skates? ____________

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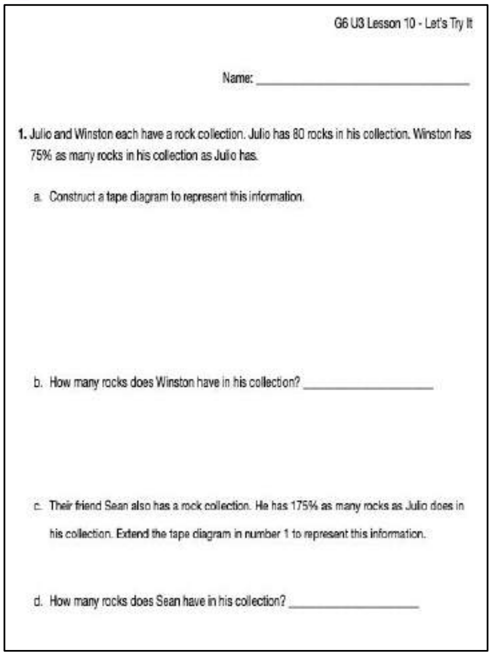
On your Own:

Now it’s time to explore percentages with tape diagrams on your own.



G6 U3 Lesson 10 - Let's Try It

Name: ______________________________

1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.

b. How many rocks does Winston have in his collection? ________________

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? ________________

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1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.

b. How many rocks does Winston have in his collection? _______________________

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? _______________________

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Name: ______________________________ G6 U3 Lesson 10 - Independent Practice

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

____

____

____

2. 18 people responded “yes” to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.

b. How many people were surveyed? ____________________

c. The remainder of the people surveyed answered “no.” What percentage of the people stated they do not own roller skates? ____________________

d. How many people responded that they do not own skates? ____________________

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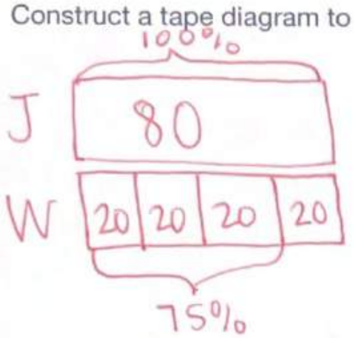
1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.



80÷4 spaces = 20

b. How many rocks does Winston have in his collection? 60 rocks

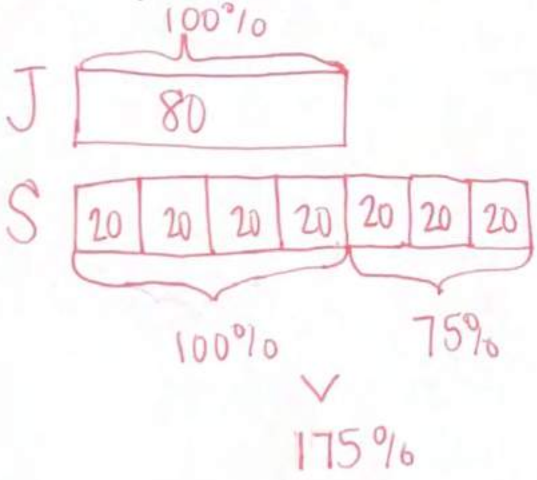
20+20+20=60

OR

20×3=60

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? 140 rocks



20×7=140

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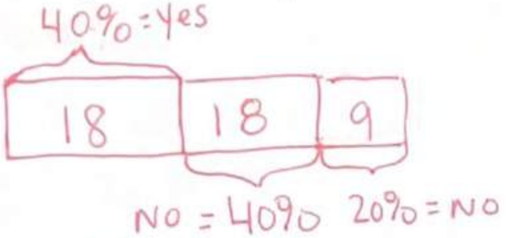
Name: ____________________ G6 U3 Lesson 10 - Independent Practice

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

No, I do not agree. 25 out of 50 is half and half is 50%, not 25%.

2. 18 people responded "yes" to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.



18+18+9=45

b. How many people were surveyed? 45 people

18+18+9=45

c. The remainder of the people surveyed answered "no." What percentage of the people stated they do not own roller skates? 60%

40%+20%=60%

d. How many people responded that they do not own skates? 27 people

18+9=27

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G6 U3 Lesson 11

Relate the benchmark percentages of 10%, 25%, 50%, and 75% to fractions, and solve problems with benchmark percentages

CITYTUTOR DC

G6 U3 Lesson 11 - Students will relate the benchmark percentages of 10%, 25%, 50%, and 75% to fractions

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be focusing on relating percentages to some fractions you know well and use often. Just like with those fractions, we call those commonly used percentages, "benchmark percentages." So far in this unit we have learned that percent means *out of 100* and that 100 represents the whole in a scenario. In our very first percentage lesson we learned that percentages were really just ratios because they compare a part to a whole. And we've been exploring how we can write percentages as fractions to represent the same thing.

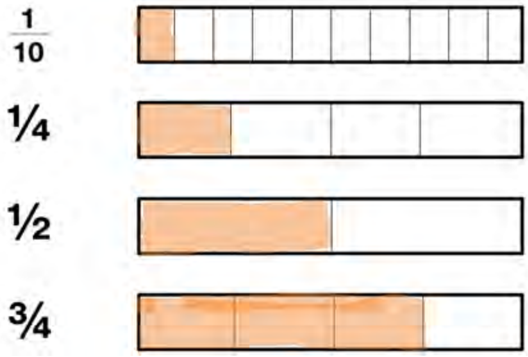
Let's Talk (Slide 3): Let's start with a brainstorm, remember in elementary school that benchmark fractions are commonly used fractions that can be helpful guides to identify other fractions. So, **think of some benchmark fractions you worked with in elementary school. And, share how these benchmark fractions can be helpful?** Possible Student Answers, Key Points:

- ½ is important because it can help you when you're comparing fractions, if you know one fraction is greater than ½ and another is smaller than you can compare those two fractions.
- Also, ¾ is important because it's halfway between ½ and 1 whole.
- And, ¼ is important because it's halfway between 0 and ½.
- 1/10 is also important because it's tens and we use tens a lot in place value.

You remember a lot considering elementary was years ago! Today we're going to be looking at 1/10, ¼, ½, and ¾ and think about how these benchmark fractions are related to important percentages.

Let's Think (Slide 4): Let's continue our journey all the way back to early elementary school! In early elementary school you first learned about fractions. You learned that fractions are parts of wholes, sound familiar? We know that ratios are also parts of wholes! In elementary school you shaded fractions and we're going to do a little of that now. Let's construct and shade each fraction.

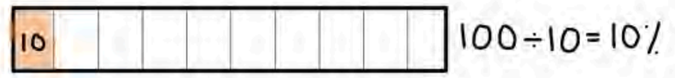
To construct each fraction we look to the denominator because it tells us how many boxes to break our bar into, in other words, the denominator tells us how many pieces there are in ONE whole.



For 1/10, the denominator of 10 *(point)* tells us to break the bar into ten, equally-sized pieces. The easiest way to do that is to split the bar in half then further segment the bar into five boxes on the left and five boxes on the right. Then, we'll have a total of ten boxes in the whole. Now, the numerator *(point)* tells us how many boxes to shade, so we'll shade ONE box.

Let's continue using this knowledge to construct and shade the remaining fractions. How many pieces in one whole? And how many pieces should I shade?

Let's Think (Slide 5): Believe it or not, we've just constructed tape diagrams for fractions but we can use the SAME tape diagrams to write equivalent percentages! We actually explored this in the previous percent lessons when we converted fractions to decimals and percents and when we constructed double number lines.



For one-tenth, we split the whole into 10 spaces and only shaded 1 of those spaces. If this were a tape diagram representing a percentage, we can figure out the percentage for each box by dividing using the whole, which with percentages is always 100. So, 100 divided by 10 equals 10 so each box represents 10%.

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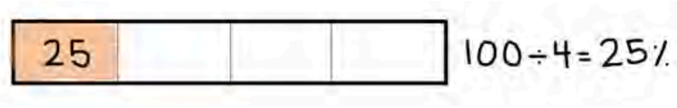

In the second tape diagram we made 4 spaces and shaded 1 of those spaces. To figure out how much each box represents, we can divide the whole, 100, by 4. When we do that we get 25. And we just have ONE box, so ¼ is the same as 25%.

Our next tape diagram is only split into 2 spaces. So, when we divide 100 by 2, we get 50. And we just have one box, so ½ is the same as 50%/

The last tape diagram may seem tougher because the numerator isn't 1 but we can do this. We split the whole into 4 spaces, so let's start by figuring out how much ONE box represents. We already know that 100 divided by 4 is 25. So, each box is worth 25. But, we shaded 3 of those spaces. So, 25 and 25 and 25 is 75–kind of like quarters–so ¾ is the same as 75%.

Let's look at our fractions. We see that each fraction has an equivalent percentage even though none of the denominators has a denominator of 100! Being able to identify and calculate the percentage of fractions with denominators that are not 100 is important because most fractions don't usually have a denominator of 100. But, understanding that percentages are parts of wholes and that percentages are out of 100 will help us easily find the equivalence between fractions and percents.

Let's Try it (Slide 5-6): Let's continue applying our knowledge of tape diagrams to percentages when the whole or the denominator isn't 100. Don't forget that ratios are just fractions because they are also comparisons.

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WARM WELCOME

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Today we will relate benchmark percentages to fractions.

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Let's Talk:

Think of some benchmark fractions you worked with in elementary school. How are they helpful?

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Let's Think:

Let's construct and shade each fraction and then write an equivalent percentage.

1. $\frac{1}{10}$
2. ¼
3. ½
4. ¾

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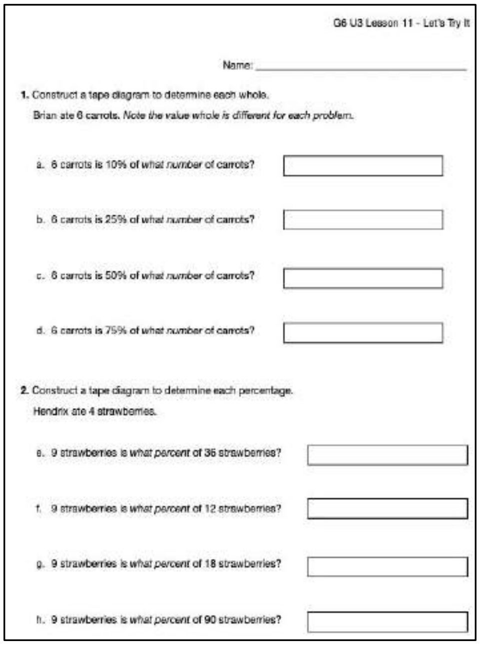
Let’s Try It:

Let’s explore percentages and fractions together.



G6 U3 Lesson 11 - Let's Try It

Name: ____________________

1. Construct a tape diagram to determine each whole.

Brian ate 6 carrots. *Note the value whole is different for each problem.*

a. 6 carrots is 10% of *what number* of carrots?

b. 6 carrots is 25% of *what number* of carrots?

c. 6 carrots is 50% of *what number* of carrots?

d. 6 carrots is 75% of *what number* of carrots?

2. Construct a tape diagram to determine each percentage.

Hendrix ate 4 strawberries.

e. 9 strawberries is *what percent* of 36 strawberries?

f. 9 strawberries is *what percent* of 12 strawberries?

g. 9 strawberries is *what percent* of 18 strawberries?

h. 9 strawberries is *what percent* of 90 strawberries?

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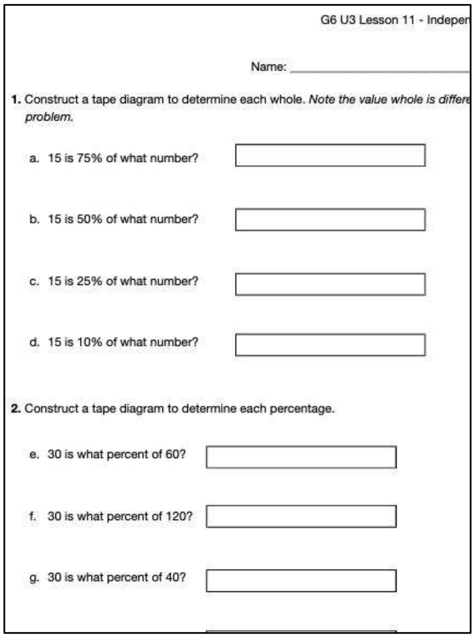
On your Own:

Now it’s time to explore percentages and fractions on your own.



G6 U3 Lesson 11 - Indepen

Name: ____________________

1. Construct a tape diagram to determine each whole. *Note the value whole is differe problem.*

a. 15 is 75% of what number?

b. 15 is 50% of what number?

c. 15 is 25% of what number?

d. 15 is 10% of what number?

2. Construct a tape diagram to determine each percentage.

e. 30 is what percent of 60?

f. 30 is what percent of 120?

g. 30 is what percent of 40?

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1. Construct a tape diagram to determine each whole.

Brian ate 6 carrots. *Note the value of the whole is different for each problem.*

a. 6 carrots is 10% of *what number* of carrots? ☐

b. 6 carrots is 25% of *what number* of carrots? ☐

c. 6 carrots is 50% of *what number* of carrots? ☐

d. 6 carrots is 75% of *what number* of carrots? ☐

2. Construct a tape diagram to determine each percentage.

Hendrix ate 4 strawberries.

e. 9 strawberries is *what percent* of 36 strawberries? ☐

f. 9 strawberries is *what percent* of 12 strawberries? ☐

g. 9 strawberries is *what percent* of 18 strawberries? ☐

h. 9 strawberries is *what percent* of 90 strawberries? ☐

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Name: ______________________________________ G6 U3 Lesson 11 - Independent Practice

1. Construct a tape diagram to determine each whole. *Note the value of the whole is different for each problem.*

a. 15 is 75% of *what number*?

b. 15 is 50% of *what number*?

c. 15 is 25% of *what number*?

d. 15 is 10% of *what number*?

2. Construct a tape diagram to determine each percentage.

e. 30 is *what percent* of 60?

f. 30 is *what percent* of 120?

g. 30 is *what percent* of 40?

h. 30 is *what percent* of 300?

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Name: ______________________________

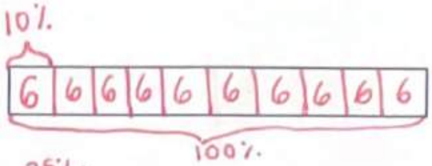
G6 U3 Lesson 11 - Let's Try It

1. Construct a tape diagram to determine each whole.

Brian ate 6 carrots. *Note the value of the whole is different for each problem.*

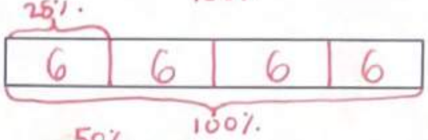
a. 6 carrots is 10% of *what number* of carrots?

60



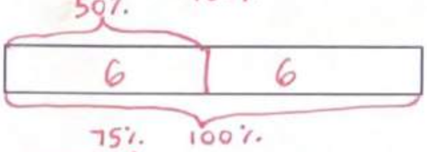
b. 6 carrots is 25% of *what number* of carrots?

24



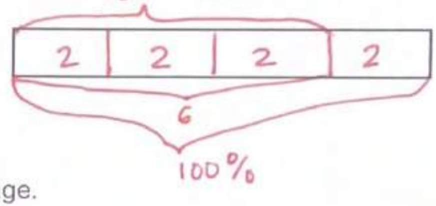
c. 6 carrots is 50% of *what number* of carrots?

12



d. 6 carrots is 75% of *what number* of carrots?

8

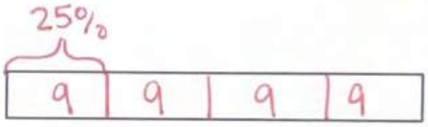


2. Construct a tape diagram to determine each percentage.

Hendrix ate 4 strawberries.

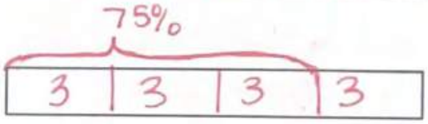
e. 9 strawberries is *what percent* of 36 strawberries?

25%



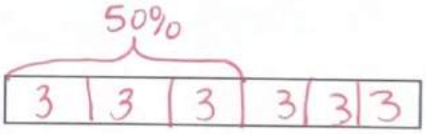
f. 9 strawberries is *what percent* of 12 strawberries?

75%



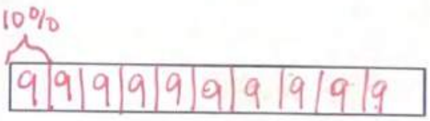
g. 9 strawberries is *what percent* of 18 strawberries?

50%



h. 9 strawberries is *what percent* of 90 strawberries?

10%



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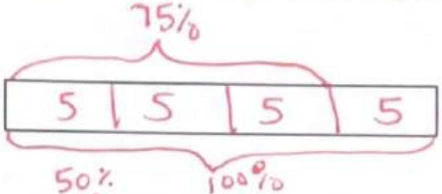
Name: ______________________________

G6 U3 Lesson 11 - Independent Practice

1. Construct a tape diagram to determine each whole. *Note the value of the whole is different for each problem.*

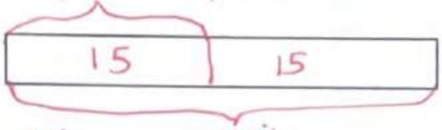
a. 15 is 75% of *what number*?

20



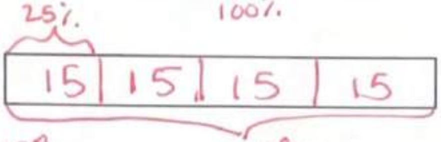
b. 15 is 50% of *what number*?

30



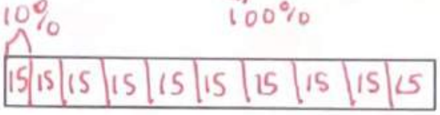
c. 15 is 25% of *what number*?

60



d. 15 is 10% of *what number*?

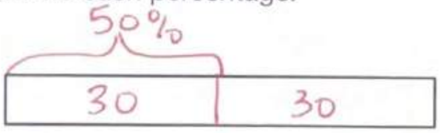
150



2. Construct a tape diagram to determine each percentage.

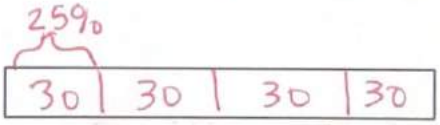
e. 30 is *what percent* of 60?

50%



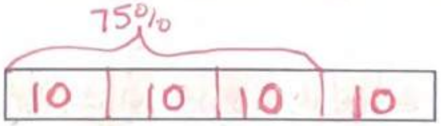
f. 30 is *what percent* of 120?

25%



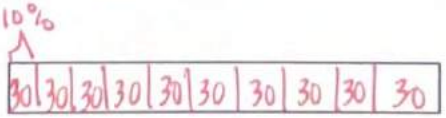
g. 30 is *what percent* of 40?

75%



h. 30 is *what percent* of 300?

10%



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G6 U3 Lesson 12

Solve percentage problems using multiplication and division

G6 U3 Lesson 12 - Students will solve percentage problems using multiplication and division

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Here we are, again! We've reached the end of learning about percentages and the end of Unit 3. We've seen how percentages are everywhere in the real-world and we explored how to use diagrams to display percentages. Today, in our final lesson in the unit, we will continue to explore real-world examples and concepts involving percentages through the use of equivalent ratios.

Let's Talk (Slide 3): Let's start with a brainstorm…sometimes you are given a scenario and then you can write your own questions. Let's try that, here's the scenario: Micheal has 60 cookies to sell. Twelve of the cookies are chocolate chip, nine of the cookies are sugar cookies, and the rest are oatmeal cookies. 15 total cookies have been sold so far. **Write a percentage problem to go along with this cookie scenario.**
Possible Student Answers, Key Points:

- What percentage of the cookies are chocolate chip?
- What percentage of the cookies have been sold?
- What percentage of the cookies were chocolate chip or sugar cookies?
- What percentage of cookies have not been sold?

Great, thought-provoking questions! There are so many different questions you could ask about the information we are provided in this scenario. Our questions can be posed around the percentage of each type of cookie or we could write questions around the selling of the cookies. Regardless, our questions involve comparisons–we're comparing a part of the cookies to the whole amount of cookies.

Let's Think (Slide 4): Today's learning involves our last way to model percentages. We call this model a "proportion." A proportion consists of two ratios or fractions that are equivalent to one another. And, this isn't brand new because we are old pros at constructing equivalent fractions by now!

$$\frac{1}{2} \begin{matrix} \times 50 = \\ = \\ \times 50 = \end{matrix} \frac{50}{100}$$

An example of a simple proportion is on the slide…one half is the same as fifth-one hundredths. We know they are equivalent or "proportional" because if you multiply the numerator and denominator by 50, you get 50/100.

A "percent proportion" also comes in this form of equivalent fractions, the only change is that in order to find a percent proportion, we have to make the denominator 100, since we know that percentages are out of 100.

Let's Think (Slide 5): Let's look at a problem that involves percentages so we can explore our percent proportion. Listen as I read this, "There are 32 students in a class. Eight of those students are wearing sneakers. What percent of the students are wearing sneakers?"

Let's start by writing our percent proportion. Our problem states two of the three missing components. Let's underline those two components in the problem and substitute them into the percent proportion. Let's read the problem again.

$$\frac{8}{32}$$

So, let's figure out the parts of our story. We know that there were 32 students in the class, that is ALL of the students in the class so that represents the WHOLE amount of students. It says that 8 students were wearing sneakers, in other words, part of that group of students are wearing sneakers. Another way to say that is 8 out of 32 students are wearing sneakers. So, let's write a fraction to show the part of the whole.

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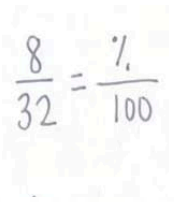
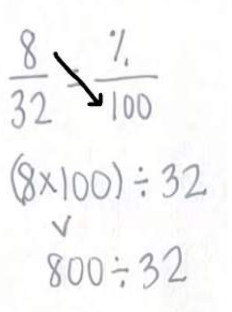


$\frac{8}{32} = \frac{\%}{100}$

Now, in order to figure out the percent proportion, we need to make the whole, or the denominator, out of 100–since that's what percentages are out of. So, let's write an equivalent fraction that has a denominator of 100, we'll keep the numerator blank because we don't know the percentage yet.

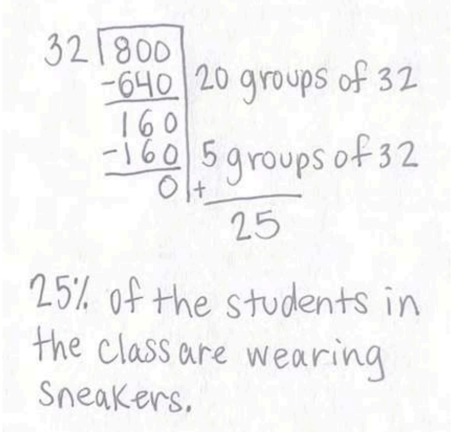


$\frac{8}{32} \searrow \frac{\%}{100}$

$(8\times100)\div32$

$800\div32$

To solve the proportion we cross multiply which is like multiplying diagonally, 8 x 100 *(write).* Then we divide by the number that's remaining, which is 32. So, 100 times by 8 is 800 and then we have to divide 800 by 32.



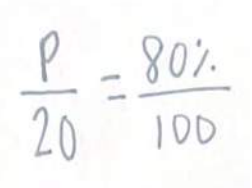
32 | 800
−640 | 20 groups of 32
160
−160 | 5 groups of 32
0 | +
25

25% of the students in the class are wearing sneakers.

Whew, 800 divided by 32…we can do this! Let's start with 20 groups of 32 which is 640*.* And, 800-640 is 160. So, we have 160 left to split. Well, 5 groups of 32 or 160. This leaves us with 0 or nothing to continue splitting. So, we made 25 groups. So, 25% of the students in the class are wearing sneakers.

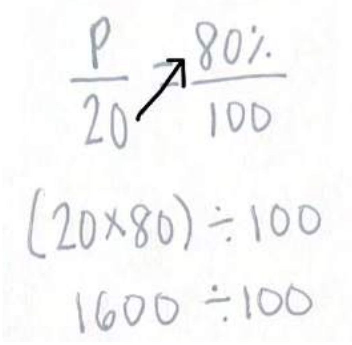
Let's Think (Slide 6): Let's continue! Here's another question…a test has 20 questions. Nicolas scored an 80%, how many questions did Nicolas get right?

Oh, this is interesting, this time we have DIFFERENT information but we can use what we know to answer the question. We know that there will be a part, a whole, and a percentage out of 100. Let's see what information we have here. The first part says that there are 20 questions on the test, that is all of the questions so that must be the whole. Then it says that Nicholas scored 80%, that doesn't tell us how many of the 20 questions he got right but it tells us the percentage, which is always out of 100. And it's asking us how many questions Nicholas got wrong.



$\frac{P}{20} = \frac{80\%}{100}$

So, we don't know how many questions Nicholas got wrong but we do know that the test was out of 20, so that is the whole. We also know that Nicholas got 80% so that's the percentage and we always know that percentages are out of 100. So now, we have our equivalent fraction set up and we can begin thinking about how we will solve it.



$\frac{P}{20} \nearrow \frac{80\%}{100}$

$(20\times80)\div100$

$1600\div100$

To solve the proportion we multiply 80 x 20 then divide by the number that's remaining, 100. Well, 80 times by 20 equals 8 x 2 which gives me 16 and I annex two zeros to get 1600*.* Look, these are easy numbers to divide, 1600 divided by 100, that's 16! In other words, 100 goes into 1600 sixteen times!

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$$\frac{P}{20} \nearrow \frac{80\%}{100}$$

$$(20 \times 80) \div 100$$

$$1600 \div 100$$

$$= 16$$

$$\frac{16}{20} = 80\%$$

So, 16 out of 20 questions is 80%. But, let's go back to the question. The question says how many questions did Nicholas get WRONG. We know he got 16 out of 20 RIGHT to get an 80% but in order to figure out how many he got wrong, we have to figure out the questions he didn't get. Well, 20 minus 16 is 4. So Nicholas got 4 questions wrong.

This scenario asked us to find the part while the previous problem asked us to find the percent, we're using the same idea to solve for two different things.

To solve these percent problems it is very important to always read the problem carefully, use the percent proportion, cross multiply, and then divide by whichever number remains after you cross multiplied. But remember, using the percent proportion is just one of many models you have in your toolkit to work with percentages. You can still utilize tape diagrams and double number lines to work with these types of percent problems.

Let's Try it (Slide 7-8): Let's wrap up this unit by applying percent proportions to real-world percent scenarios. Don't forget that percentages are ratios as well. Don't be leery about trying tape diagrams or double number lines to solve as well.

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WARM WELCOME

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Today we will explore real-world examples of percents through the use of equivalent fractions.

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Let’s Talk:

Michael has 60 cookies to sell.

- 12 of the cookies are chocolate chip.
- 9 of the cookies are sugar cookies and the rest are oatmeal cookies.
- 15 total cookies have been sold so far.

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Let’s Think:

Proportions consist of two ratios or fractions that are equivalent to one another.

$$\frac{1}{2} = \frac{50}{100} \qquad \frac{\textit{part}}{\textit{whole}} = \frac{\textit{percent}}{100}$$

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Let’s Think:

There are 32 students in a class. Eight of those students are wearing sneakers. What percentage of the students are wearing sneakers?

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Let’s Think:

A test has 20 questions. Nicolas scored an 80%, how many questions did Nicolas get right?

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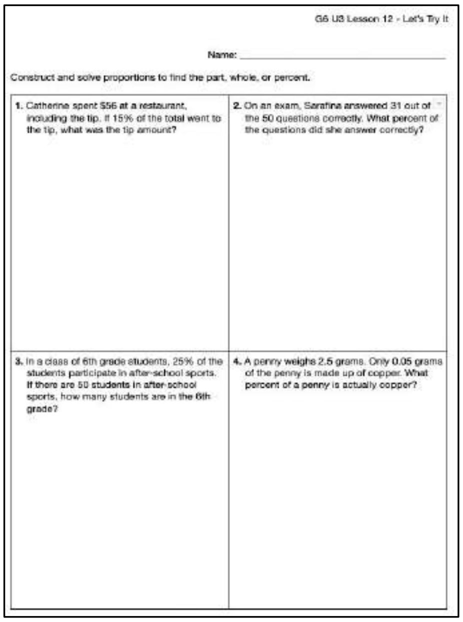
Let’s Try It:

Let’s explore percentages using multiplication and division together.



G6 U3 Lesson 12 - Let's Try It

Name: ______________________

Construct and solve proportions to find the part, whole, or percent.

1. Catherine spent $56 at a restaurant, including the tip. If 15% of the total went to the tip, what was the tip amount?
2. On an exam, Sarafina answered 31 out of the 50 questions correctly. What percent of the questions did she answer correctly?
3. In a class of 6th grade students, 25% of the students participate in after-school sports. If there are 50 students in after-school sports, how many students are in the 6th grade?
4. A penny weighs 2.5 grams. Only 0.05 grams of the penny is made up of copper. What percent of a penny is actually copper?

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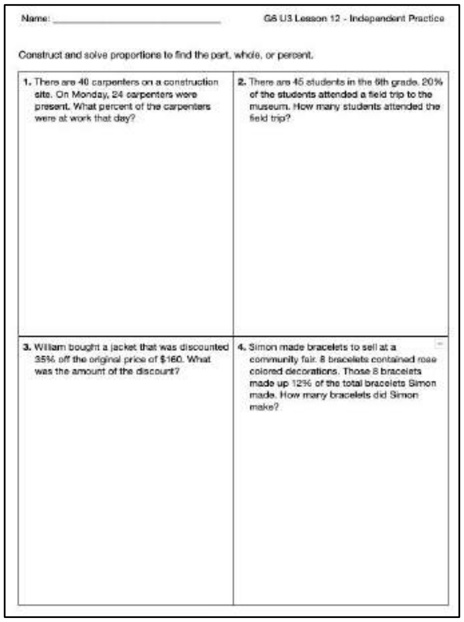
On your Own:

Now it’s time to explore percentages using multiplication and division on your own.



Name: ______________________

G6 U3 Lesson 12 - Independent Practice

Construct and solve proportions to find the part, whole, or percent.

1. There are 40 carpenters on a construction site. On Monday, 24 carpenters were present. What percent of the carpenters were at work that day?
2. There are 45 students in the 6th grade. 20% of the students attended a field trip to the museum. How many students attended the field trip?
3. William bought a jacket that was discounted 35% off the original price of $160. What was the amount of the discount?
4. Simon made bracelets to sell at a community fair. 8 bracelets contained rose colored decorations. Those 8 bracelets made up 12% of the total bracelets Simon made. How many bracelets did Simon make?

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Name: ____ G6 U3 Lesson 12 - Let's Try It

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Name: ______________________________ G6 U3 Lesson 12 - Independent Practice

Construct and solve proportions to find the part, whole, or percent.

1. There are 40 carpenters on a construction site. On Monday, 24 carpenters were present. What percent of the carpenters were at work that day?

2. There are 45 students in the 6th grade. 20% of the students attended a field trip to the museum. How many students attended the field trip?

3. William bought a jacket that was discounted 35% off the original price of $160. What was the amount of the discount?

4. Simon made bracelets to sell at a community fair. 9 bracelets contained rose colored decorations. Those 9 bracelets made up 12% of the total bracelets Simon made. How many bracelets did Simon make?

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Name: ______________________________

G6 U3 Lesson 12 - Let's Try It

Construct and solve proportions to find the part, whole, or percent.

$\frac{\text{Part}}{\text{Whole}} = \frac{\%}{100}$

1. Catherine spent $56 at a restaurant, including the tip. If 15% of the total went to the tip, what was the tip amount?

$\frac{P}{56} = \frac{15}{100}$

$56 \times 15 = 840 \div 100$

100 | 840

-800 | 8 groups of 100

40

$8\frac{40}{100}$ or 8.40

The tip amount was $8.40

2. On an exam, Sarafina answered 31 out of the 50 questions correctly. What percent of the questions did she answer correctly?

$\frac{31}{50} = \frac{\%}{100}$

$31 \times 100 = 3100 \div 50$

50 | 3100

-1500 | 30 groups of 50

1600

-1500 | 30 groups of 50

100

-100 | 2 groups of 50

0 | +

62

She answered 62% correctly.

3. In a class of 6th grade students, 25% of the students participate in after-school sports. If there are 50 students in after-school sports, how many students are in the 6th grade?

$\frac{50}{W} = \frac{25\%}{100}$

$50 \times 100 = 5000 \div 25$

25 | 5000

-1000 | 40 groups of 25

4000

-2000 | 80 groups of 25

2000

-2000 | 80 groups of 25

0 | +

200

There are 200 6th graders.

4. A penny weighs 2.5 grams. Only 0.05 grams of the penny is made up of copper. What percent of a penny is actually copper?

$\frac{0.05}{2.5} = \frac{\%}{100}$

$0.05 \times 100 = 5 \div 2.5$

2.5 | 5.0

-50 | 2 groups of 25

0

+

2

2% of a penny is cooper.

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Name: ______________________________

G6 U3 Lesson 12 - Independent Practice

$\frac{P}{W} = \frac{\%}{100}$

Construct and solve proportions to find the part, whole, or percent.

1. There are 40 carpenters on a construction site. On Monday, 24 carpenters were present. What percent of the carpenters were at work that day?

$\frac{24}{40} = \frac{\%}{100}$

24x100=2400÷40

40 | 2400
-1600 | 40 groups of 40
800
-800 | 20 groups of 40
000 | +
60 groups of 40

60% were at work

2. There are 45 students in the 6th grade. 20% of the students attended a field trip to the museum. How many students attended the field trip?

$\frac{P}{45} = \frac{20}{100}$

45x20=900÷100

100 | 900
-900 | 9 groups of 100
0

9 students attended the trip

3. William bought a jacket that was discounted 35% off the original price of $160. What was the amount of the discount?

$\frac{P}{160} = \frac{35}{100}$

160
x 35
800
+4800
5600

$160 \times 35 = \frac{56\cancel{00}}{1\cancel{00}}$

100 | 5600
-5000 | 50 groups of 100
600 | 6 groups of 100
-600
0 | +
56

The discount was $56.00

4. Simon made bracelets to sell at a community fair. 9 bracelets contained rose colored decorations. Those 9 bracelets made up 12% of the total bracelets Simon made. How many bracelets did Simon make?

$\frac{9}{W} = \frac{12}{100}$

100x9=900÷12

12 | 900

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CITYTUTOR DC

G6 Unit 4:

Arithmetic in Fractions and Base Ten

G6 U4 Lesson 1

Understand division with unit fractions

CITYTUTOR DC

G6 U4 Lesson 1 - Students will explore division with unit fractions

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore division with unit fractions. In fifth grade, you explored division with unit fractions, so we're going to come back to this before we get into division with non-unit fractions in the next lesson. Remember a unit fraction is a fraction where the numerator is 1. So, one-fourth (*write* $\frac{1}{4}$) is a unit fraction because there's a 1 as the numerator. One half (*write* $\frac{1}{2}$) is also a unit fraction. Today we're going to explore how to divide a whole number by unit fractions for example 5 ÷ $\frac{1}{4}$ (*write*) AND how to divide unit fractions by a whole number for example $\frac{1}{4}$ ÷ 5 (*write*). Perhaps some of you already know how to do this, if so, stick with me because it'll be important practice for our next lesson.

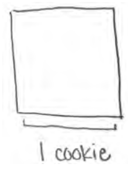
Let's Talk (Slide 3): So, before we start doing this math, I want to have a discussion. **Let's start by discussing, how are multiplication and division related?** Possible Student Answers, Key Points:

- Multiplication and division are opposites. Multiplication undoes division and division undoes multiplication.
- For example, 3 x 4 = 12 so 12 ÷ 4 = 3 (3 groups of 4 is 12 and 12 split into 4 groups is 3).

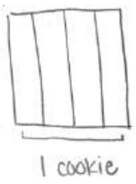
So, we know that multiplication and division are related. **Now let's think about how dividing with fractions is similar to multiplying with fractions…**Possible Student Answers, Key Points:

- If you're dividing a number by a unit fraction, you can just multiply by the denominator. Or, if you're multiplying a number by a unit fraction, you can just divide by the denominator.
- For example, dividing 8 by 4 gives the same result as multiplying 8 by $\frac{1}{4}$.

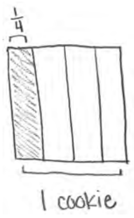
Let's Think (Slide 4): Those are interesting ideas, let's look at a problem to see how dividing with fractions is similar to multiplying with fractions. Let's start with thinking about what it means to divide a unit fraction by a whole number. Let's read the problem on the slide together, "Let's imagine that I want to share one-fourth of a cookie equally between 3 people." Okay, well let me make sure I understand this first, this means that I want to divide one-fourth into 3 equal pieces—I have one-fourth of a cookie and I want to split it equally between three people, that seems easy enough. Let's start by drawing a picture to help us this about how to solve this problem:



I am going to start with a bar or a box to show 1 whole cookie. Here's my cookie…I could draw a circle but it'll be easier to split a box. I'm going to label it 1 cookie so I remember this is 1 whole.



Now, I know that I have one-fourth of this cookie, so I need to split this cookie into four equal pieces, like this.



I'm going to shade in the one-fourth cookie that I have and I'll label it, like this.
And finally, I want to divide one fourth by 3. That means, I want to cut or split this one-fourth piece into three pieces. Well look, I can make 2 cuts going across and now I split this piece into 3 pieces, remember I have to do this to all of my fourths. Let's look this back over and see what we did, I started with 1 whole cookie, I split it into fourths and then I took each fourth and split it into three pieces.

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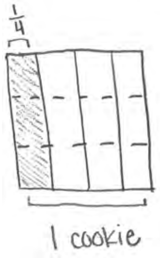


Now, here is where things get tricky. I cut my fourths so they aren't fourths anymore. Let's count to see how many pieces there are in the whole now. There are 12 pieces which means that I have twelfths now. And each person will get $\frac{1}{12}$. For example, if we were splitting it…I would get this piece (*point to one twelfth*), you would get this piece (*point to one twelfth*) and you would get this piece (*point again*). So we each get $\frac{1}{12}$.

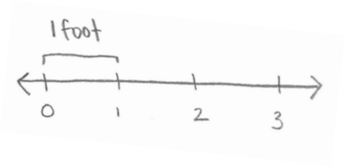
$$\frac{1}{4} \div 3 = \frac{1}{12}$$

Now let's write it as a number sentence. We just used our fraction model to show that, $\frac{1}{4}$ divided by 3 is $\frac{1}{12}$.

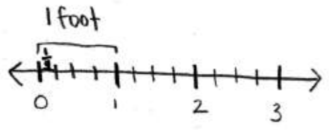
$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

So, if $\frac{1}{4}$ of a cookie is divided into 3 equal parts, each person will receive $\frac{1}{3}$ of the $\frac{1}{4}$ of the cookie. So, we could also write as multiplication, like this.

Let's Think (Slide 5): Now let's switch our brains to think about what it means to divide a whole number by a unit fraction. For example, let's read the problem on the slide together, "I want to cut a 3-foot string into ¼ foot sections." Let me make sure I understand this, I have 3 feet of string and I want to cut each foot into ¼ foot sections. In other words, I want to think about how many fourths of a foot there are in my 3 feet of rope. I could draw a bar model to help me solve but I can also use a number line, like this:



I know that I have three feet of rope so I'll draw 0 to 3 to represent the 3 one-foot sections of rope that I have. This is a foot (*point to 0-1*), this is a foot (*point to 1-2*) and this is a foot (*point to 2-3*). There are 3 feet of rope.



Now, I want to cut this into one-fourth foot sections. So, I want to cut EACH foot into fourths. I'll cut this foot into 4 pieces (*make 3 cuts*), I'll cut this foot into 4 pieces (*make 3 cuts*) and finally, I'll cut this fourth into 4 pieces (*make 3 cuts*). So, there are 4 fourths here and 4 fourths here and 4 fourths here (*point as you narrate*). That means that there are 4 and 4 and 4, which makes 12. So there are 12 one-fourth pieces of rope.

$$3 \div \frac{1}{4} = 12$$

$$3 \times 4 = 12$$

So, we just divided 3 by ¼ and got 12! We can also write it as multiplication and use the inverse. There are 4 fourths in each whole foot. To find the number of fourths in 3 feet, I can multiply 3 x 4 and get 12. When I divide 3 by ¼, I am dividing 3 into parts smaller than 1. So, there will be more than 3 of those parts.

Let's Try it (Slides 6-7): Now let's work on dividing with unit fractions together. We're going to work on this page together, step-by-step. Remember, when we are dividing, we are splitting or cutting.

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WARM WELCOME

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Today we will explore division with unit fractions.

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Let’s Talk:

How are multiplication and division related?

How is dividing with fractions similar to multiplying with fractions?

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Let’s Think:

What does it mean to divide a unit fraction by a whole number?

Let’s imagine that I want to share $\frac{1}{4}$ of a cookie equally between 3 people.

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Let's Think:

What does it mean to divide a whole number by a fraction?

Let's imagine I want to cut a 3 foot string into $\frac{1}{4}$ foot sections.

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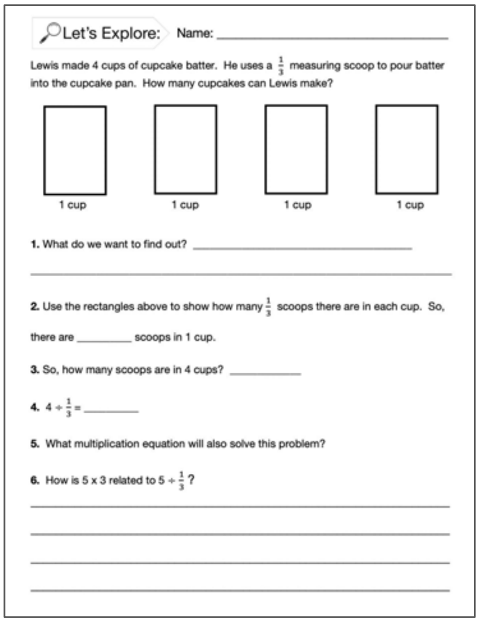
Let's Try It:

Let's explore dividing unit fractions together.



Let's Explore: Name: ____________________

Lewis made 4 cups of cupcake batter. He uses a $\frac{1}{3}$ measuring scoop to pour batter into the cupcake pan. How many cupcakes can Lewis make?

1. What do we want to find out? ____________________

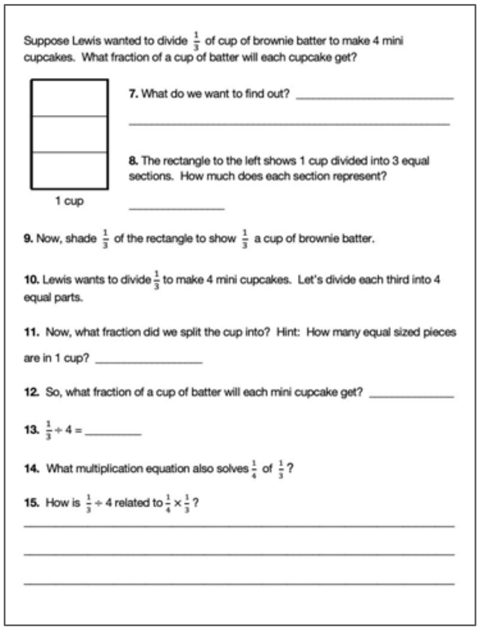
2. Use the rectangles above to show how many $\frac{1}{3}$ scoops there are in each cup. So, there are ________ scoops in 1 cup.

3. So, how many scoops are in 4 cups? __________

4. $4 \div \frac{1}{3} =$ ________

5. What multiplication equation will also solve this problem?

6. How is 5 x 3 related to $5 \div \frac{1}{3}$?



Suppose Lewis wanted to divide $\frac{1}{3}$ of cup of brownie batter to make 4 mini cupcakes. What fraction of a cup of batter will each cupcake get?

7. What do we want to find out? ____________________

8. The rectangle to the left shows 1 cup divided into 3 equal sections. How much does each section represent? __________

9. Now, shade $\frac{1}{3}$ of the rectangle to show $\frac{1}{3}$ a cup of brownie batter.

10. Lewis wants to divide $\frac{1}{3}$ to make 4 mini cupcakes. Let's divide each third into 4 equal parts.

11. Now, what fraction did we split the cup into? Hint: How many equal sized pieces are in 1 cup? __________

12. So, what fraction of a cup of batter will each mini cupcake get? __________

13. $\frac{1}{3} \div 4 =$ ________

14. What multiplication equation also solves $\frac{1}{4}$ of $\frac{1}{3}$?

15. How is $\frac{1}{3} \div 4$ related to $\frac{1}{4} \times \frac{1}{3}$?

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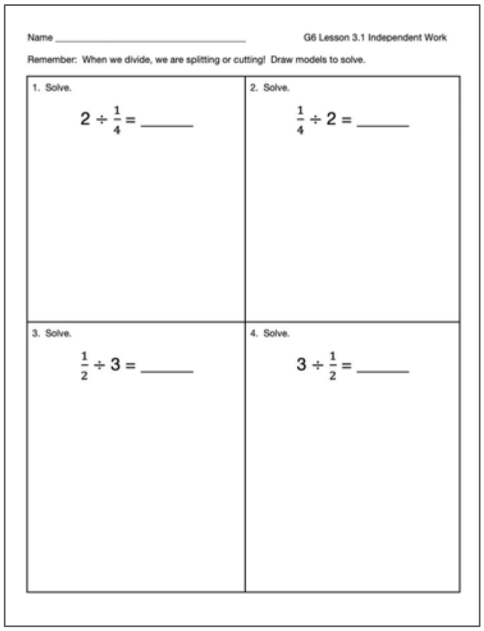
On your Own:

Now it's time to explore division with unit fractions on your own.



Name ______________________ G6 Lesson 3.1 Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve.

$2 \div \frac{1}{4} =$ ______

2. Solve.

$\frac{1}{4} \div 2 =$ ______

3. Solve.

$\frac{1}{2} \div 3 =$ ______

4. Solve.

$3 \div \frac{1}{2} =$ ______

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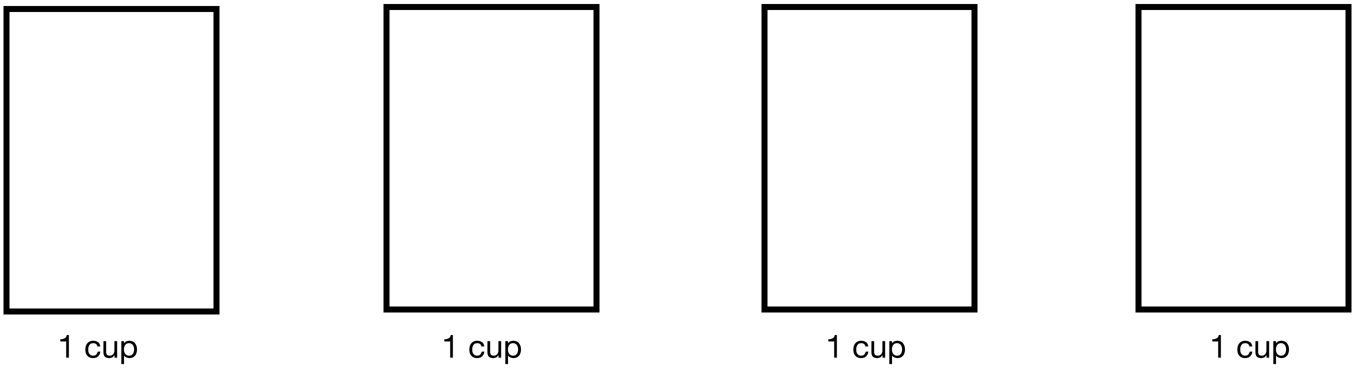
Name ____ G6 U4 Lesson 1 - Let's Try It

Lewis made 4 cups of cupcake batter. He uses a $\frac{1}{3}$ measuring scoop to pour batter into the cupcake pan. How many cupcakes can Lewis make?



1. What do we want to find out? ____

____

2. Use the rectangles above to show how many $\frac{1}{3}$ scoops there are in each cup. So, there are __________ scoops in 1 cup.

3. So, how many scoops are in 4 cups? _____________

4. $4 \div \frac{1}{3} =$ __________

5. What multiplication equation will also solve this problem?

6. How is 4 x 3 related to $4 \div \frac{1}{3}$?

____

____

____

____

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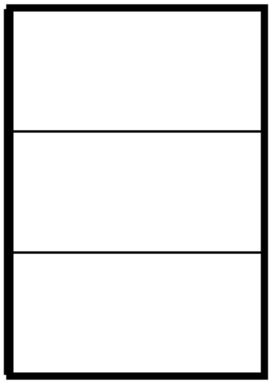
Suppose Lewis wanted to divide $\frac{1}{3}$ cup of brownie batter to make 4 mini cupcakes. What fraction of a cup of batter will each cupcake get?



7. What do we want to find out? ______________________________

____

8. The rectangle to the left shows 1 cup divided into 3 equal sections. How much does each section represent?

____

9. Now, shade $\frac{1}{3}$ of the rectangle to show $\frac{1}{3}$ a cup of brownie batter.

10. Lewis wants to divide $\frac{1}{3}$ to make 4 mini cupcakes. Let's divide each third into 4 equal parts.

11. Now, what fraction did we split the cup into? Hint: How many equal sized pieces are in 1 cup? __________________

12. So, what fraction of a cup of batter will each mini cupcake get? ______________

13. $\frac{1}{3} \div 4 =$ _________

14. What multiplication equation also solves $\frac{1}{4}$ of $\frac{1}{3}$?

15. How is $\frac{1}{3} \div 4$ related to $\frac{1}{4} \times \frac{1}{3}$?

____

____

____

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Name ____ G6 U4 Lesson 1 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve. $2 \div \frac{1}{4} =$ _______	2. Solve. $\frac{1}{4} \div 2 =$ _______
3. Solve. $\frac{1}{2} \div 3 =$ _______	4. Solve. $3 \div \frac{1}{2} =$ _______

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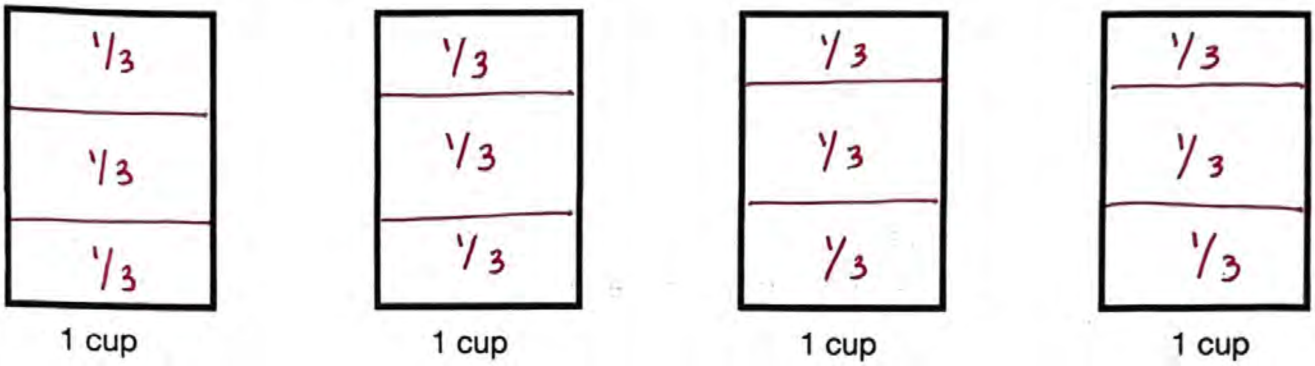
Name ANSWER KEY

G6 U4 Lesson 1 - Let's Try It

Lewis made 4 cups of cupcake batter. He uses a $\frac{1}{3}$ measuring scoop to pour batter into the cupcake pan. How many cupcakes can Lewis make?



1. What do we want to find out? How many cupcakes Lewis can make.

2. Use the rectangles above to show how many $\frac{1}{3}$ scoops there are in each cup. So, there are 3 scoops in 1 cup.

3. So, how many scoops are in 4 cups? 12

4. $4 \div \frac{1}{3} =$ 12

5. What multiplication equation will also solve this problem? $4 \times \frac{3}{1} = 12$

6. How is 4 x 3 related to $4 \div \frac{1}{3}$?

Multiplication and division are opposites so if you do the opposite operation you flip the fraction. So, $4 \div 1/3$ is the same as $4 \times 3/1$ ... I just flipped the numerator and denominator.

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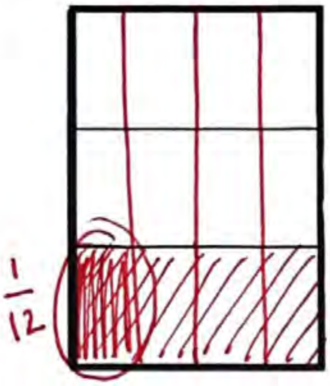
Suppose Lewis wanted to divide $\frac{1}{3}$ cup of brownie batter to make 4 mini cupcakes. What fraction of a cup of batter will each cupcake get?



7. What do we want to find out? How much batter goes into each mini cupcake

8. The rectangle to the left shows 1 cup divided into 3 equal sections. How much does each section represent?

1/3

9. Now, shade $\frac{1}{3}$ of the rectangle to show $\frac{1}{3}$ a cup of brownie batter.

10. Lewis wants to divide $\frac{1}{3}$ to make 4 mini cupcakes. Let's divide each third into 4 equal parts. ✓

11. Now, what fraction did we split the cup into? Hint: How many equal sized pieces are in 1 cup? twelfths

12. So, what fraction of a cup of batter will each mini cupcake get? 1/12

13. $\frac{1}{3} \div 4 = \frac{1}{12}$

14. What multiplication equation also solves $\frac{1}{4}$ of $\frac{1}{3}$? $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

15. How is $\frac{1}{3} \div 4$ related to $\frac{1}{4} \times \frac{1}{3}$?

They are the same dividing by 4 is the same thing as multiplying by 1/4.

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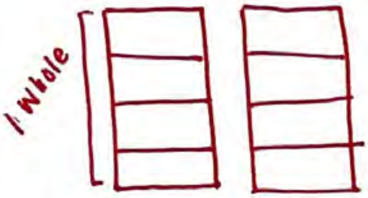
Name ANSWER KEY

G6 U4 Lesson 1 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve.

$2 \div \frac{1}{4} = $ 8



$\frac{2}{1} \times \frac{4}{1} = \frac{8}{1}$

2. Solve.

$\frac{1}{4} \div 2 = $ $\frac{1}{8}$

$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

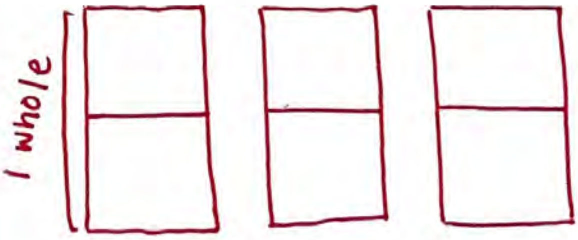
3. Solve.

$\frac{1}{2} \div 3 = $ $\frac{1}{6}$

$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

4. Solve.

$3 \div \frac{1}{2} = $ 6



$\frac{3}{1} \times \frac{2}{1} = \frac{6}{1}$

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G6 U4 Lesson 2

Divide unit fractions in word problems

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G6 U4 Lesson 2 - Student will divide unit fractions in word problems

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use what we learned yesterday to solve word problems that ask us to divide with fractions. We know that sometimes we divide a whole number by a fraction or other times we divide a fraction by a whole number. Today when we're solving problems it will be really important for us to read the problem and pause to make sure we understand. One way we can make sure we understand is to retell the problem in our own words. And then before we put our pencils to paper we should think to ourselves, "What am I trying to figure out?" That will help us make sure we really understand the question before we solve it.

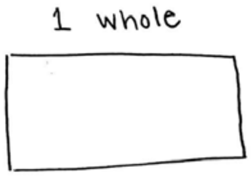
Let's Talk (Slide 3): So, let's start by collecting everything we know about dividing with fractions. Share what you know about dividing with fractions and try to give an example. I know some of us are thinking about dividing a whole number by a fraction and others are thinking about dividing a fraction into whole numbers. Those are similar and easy to get mixed up so let's quickly talk about how they're the same and how they're different. **How is dividing a fraction by a whole number the same or different from dividing a whole number by a fraction?** Possible Student Answers, Key Points:

- When I'm dividing with fractions, I am cutting or splitting.
- If we are dividing a whole number by a fraction it means we are breaking something into smaller pieces so the answer will be bigger than the whole number.
- If we are dividing a fraction by a whole number, we are breaking a piece into more, smaller pieces so the answer will be smaller than the first fraction.
- When we divide with fractions, we flip our fraction and multiply.

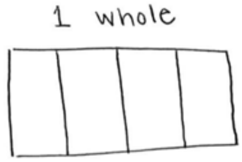
Let's Think (Slide 4): That's a lot of good information about dividing fractions. So let's apply what we know about dividing with fractions to a word problem. Today when we solve word problems we're going to make sure we read, retell, and think BEFORE we start solving. I'm going to read this question out loud and then you can reread the question on your own. "Jeni has ¼ of a pizza. She wants to share the pizza equally with a friend. How much of the original whole pizza will each of them get?" Okay now before we start to solve, let's pause and make sure we can retell the story. It's important to use our own words and understandings to retell the story.

- *Note: The actions and context of the story are more important than the actual numbers. The purpose of retelling is to make sure students understand what is happening and what they're trying to solve for. If students struggle to recall the numbers, you should tell them. You might need to cover up the story so that students use their own words. It might sound like this: "A person has a piece of a pizza and she wants to split that piece into two parts. We want to know how much of the whole pizza each person will get."*

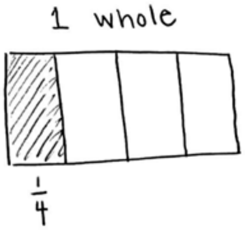
Now that we retold the story, let's pause and think about what we are trying to figure out or solve for. We want to know how much of the original pizza each person will get. Okay, now that we understand the story and know exactly what we want to figure out, we can pick up our pencils and start to solve).



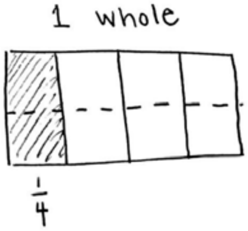
Let's start with a model, we know that Jeni has ¼ of a pizza so let's start with 1 whole. Most pizzas are circles but it's easier to draw the whole as a bar model, like this.



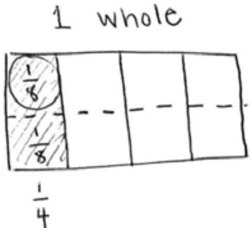
Now, we want to cut the whole into four equal pieces. There are lots of ways to cut this whole into fourths, I'm going to do it with vertical lines, like this.



Jeni has one fourth that means that she has ONE of these pieces, let's shade it in to show that's what Jeni has.



And the problem says that Jeni wants to split her piece with a friend so we want to cut each fourth into two pieces. So now, we don't have fourths anymore, we cut each fourth into two pieces so now we have eighths…1, 2, 3, 4, 5, 6, 7, 8.



So Jeni's friend gets this piece (*point*) and Jeni gets this piece (*point*). And let's go back to the original question, "How much of the original pizza will each of them get?" So they each get ⅛ of the pizza because we cut Jeni's ¼ into two pieces. Let's write that as a sentence, "*They each get ⅛ of the pizza.*"

$$\frac{1}{4} \div 2 = \_\_\_$$

$$\frac{1}{4} \times \frac{1}{2} = \boxed{\frac{1}{8}}$$

Now that we drew a bar model to help us solve, let's see if we can write an equation to help us do the math. We took ¼ and split it into 2 pieces. That means we did one fourth divided by 2.

We know that when we are solving division with fractions, we can do the opposite so we can multiply and then flip the fraction.

They each get $\frac{1}{8}$ of the pizza.

So, ¼ x ½, multiply the numerators, 1x1 is 1. Now multiply the denominators, 4x2 is 8. So ¼ divided by 2 is ⅛, the same answer!

Let's Try it (Slides 5-6): Now let's work on dividing with unit fractions in word problems together. We're going to work on this page together, step-by-step. Remember, when we are solving word problems there's a lot of work to do before we solve them. First we have to read and retell and then we have to think, "What am I trying to figure out?"

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WARM WELCOME

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Today we will divide unit fractions in word problems.

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Let's Talk:

What do you know about dividing with fractions? Give an example.

How is dividing a fraction by a whole number the same or different from dividing a whole number by a fraction?

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Let's Think:

How can we use what we know about dividing with fractions to solve this problem…

Jeni has ¼ of a pizza. She wants to share the pizza equally with a friend. How much of the original whole pizza will each of them get? Let's draw a model and write an equation to represent and solve the problem.

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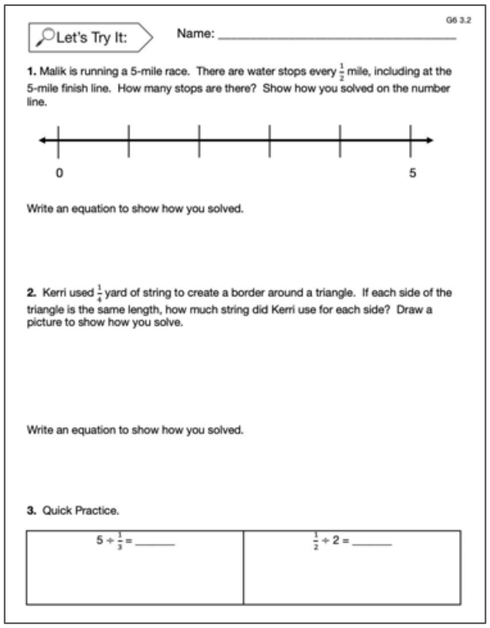
Let’s Try It:

Let’s explore how to solve word problems with dividing fractions together.



Let’s Try It: Name: ______________________ G6 3.2

1. Malik is running a 5-mile race. There are water stops every $\frac{1}{2}$ mile, including at the 5-mile finish line. How many stops are there? Show how you solved on the number line.

Write an equation to show how you solved.

2. Kerri used $\frac{1}{4}$ yard of string to create a border around a triangle. If each side of the triangle is the same length, how much string did Kerri use for each side? Draw a picture to show how you solve.

Write an equation to show how you solved.

3. Quick Practice.

$5 \div \frac{1}{3} =$ ______	$\frac{1}{2} \div 2 =$ ______

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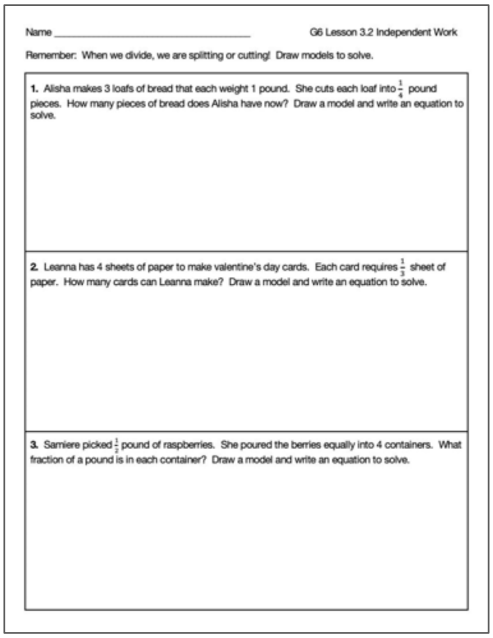
On your Own:

Now it’s time to try on your own.



Name ______________________ G6 Lesson 3.2 Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Alisha makes 3 loafs of bread that each weight 1 pound. She cuts each loaf into $\frac{1}{4}$ pound pieces. How many pieces of bread does Alisha have now? Draw a model and write an equation to solve.

2. Leanna has 4 sheets of paper to make valentine's day cards. Each card requires $\frac{1}{3}$ sheet of paper. How many cards can Leanna make? Draw a model and write an equation to solve.

3. Samiere picked $\frac{1}{2}$ pound of raspberries. She poured the berries equally into 4 containers. What fraction of a pound is in each container? Draw a model and write an equation to solve.

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Name ____ G6 U4 Lesson 2 - Let's Try It

1. Malik is running a 5-mile race. There are water stops every $\frac{1}{2}$ mile, including at the 5-mile finish line. How many stops are there? Show how you solved on the number line.

Write an equation to show how you solved.

2. Kerri used $\frac{1}{4}$ yard of string to create a border around a triangle. If each side of the triangle is the same length, how much string did Kerri use for each side? Draw a picture to show how you solved.

Write an equation to show how you solved.

3. Quick Practice.

$5 \div \frac{1}{3} =$ _______	$\frac{1}{2} \div 2 =$ _______

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Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Alisha makes 3 loaves of bread that each weigh 1 pound. She cuts each loaf into $\frac{1}{4}$ pound pieces. How many pieces of bread does Alisha have now? Draw a model and write an equation to solve.

2. Leanna has 4 sheets of paper to make valentine's day cards. Each card requires $\frac{1}{3}$ sheet of paper. How many cards can Leanna make? Draw a model and write an equation to solve.

3. Samiere picked $\frac{1}{2}$ pound of raspberries. She poured the berries equally into 4 containers. What fraction of a pound is in each container? Draw a model and write an equation to solve.

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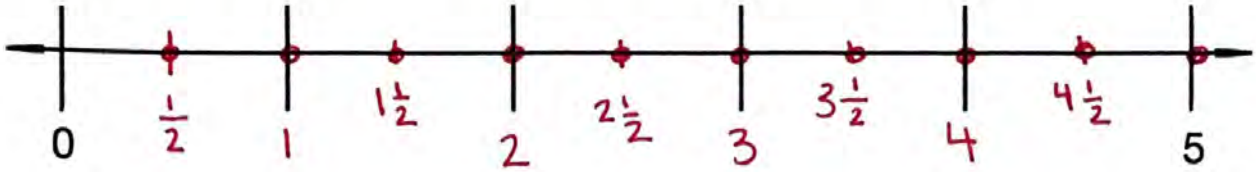
Name ANSWER KEY

G6 U4 Lesson 2 - Let's Try It

1. Malik is running a 5-mile race. There are water stops every $\frac{1}{2}$ mile, including at the 5-mile finish line. How many stops are there? Show how you solved on the number line.



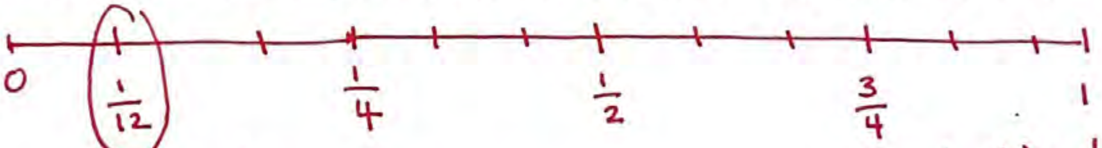
Write an equation to show how you solved.

$5 \div \frac{1}{2} = 10$

There are 10 water stops.

$\frac{5}{1} \times \frac{2}{1} = \frac{10}{1}$

2. Kerri used $\frac{1}{4}$ yard of string to create a border around a triangle. If each side of the triangle is the same length, how much string did Kerri use for each side? Draw a picture to show how you solved.

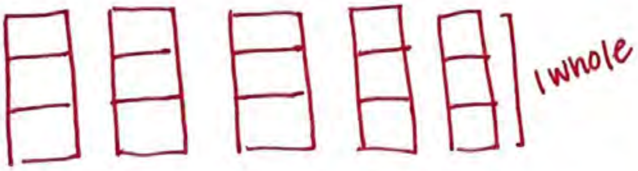


$\frac{1}{4} \div 3 = \frac{1}{12}$ $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

Write an equation to show how you solved.

$\frac{1}{4} \div 3 = \frac{1}{12}$ or $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

3. Quick Practice.

$5 \div \frac{1}{3} =$ 15  	$\frac{1}{2} \div 2 =$ 1/4  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$\frac{5}{1} \times \frac{3}{1} = \frac{15}{1}$

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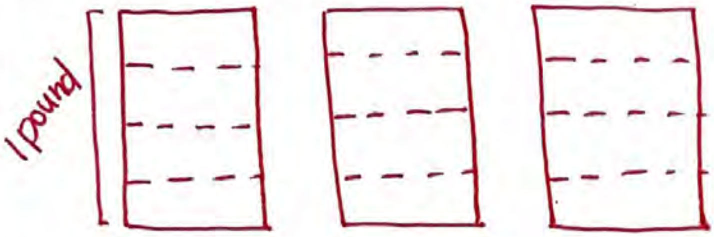
Name ANSWER KEY

G6 U4 Lesson 2 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

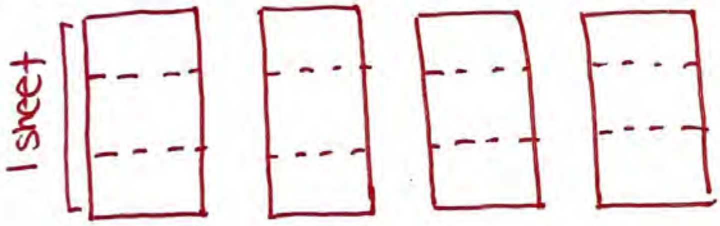
1. Alisha makes 3 loaves of bread that each weigh 1 pound. She cuts each loaf into $\frac{1}{4}$ pound pieces. How many pieces of bread does Alisha have now? Draw a model and write an equation to solve.



Alisha has 12 pieces of bread.

$3 \div \frac{1}{4} = 12$ or $\frac{3}{1} \times \frac{4}{1} = \frac{12}{1}$

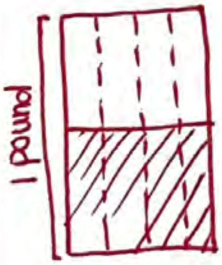
2. Leanna has 4 sheets of paper to make valentine's day cards. Each card requires $\frac{1}{3}$ sheet of paper. How many cards can Leanna make? Draw a model and write an equation to solve.



Leanna can make 12 cards.

$4 \div \frac{1}{3} = 12$ or $\frac{4}{1} \times \frac{3}{1} = \frac{12}{1}$

3. Samiere picked $\frac{1}{2}$ pound of raspberries. She poured the berries equally into 4 containers. What fraction of a pound is in each container? Draw a model and write an equation to solve.



There are $\frac{1}{8}$ pound of berries in each container.

$\frac{1}{2} \div 4 = \frac{1}{8}$ or $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

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G6 U4 Lesson 3

Explore division with fractions

CITYTUTOR DC

G6 U4 Lesson 3 - Students will explore division with fractions

Warm Welcome (Slide 1): Tutor choice.

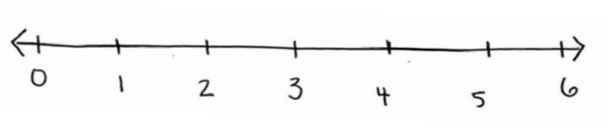
Frame the Learning/Connect to Prior Learning (Slide 2): Today we are going to explore division with non-unit fractions. We already practiced dividing with unit fractions, where the numerator is 1 for example ½ or ⅓. Today, we are going to use non-unit fractions, non-unit fractions are fractions where the numerator is greater than one. So, an example of a unit fraction is ⅓. An example of a non-unit fraction is ⅔. So, we'll use what we already know about dividing whole numbers by unit fractions or unit fractions by whole numbers except we'll have to extend it to non-unit fractions.

Let's Talk (Slide 3): So, let's open with a brainstorm. How might this be different and the same as dividing with unit fractions? **In other words, today when we divide by ⅔ instead of ⅓ or ¾ instead of ¼, how might it be different or the same?** Possible Student Answers, Key Points:

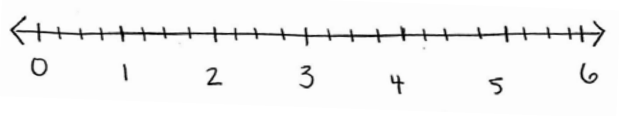
- We are still dividing, so we are still cutting.
- Well if we divide 2 by ¾ we're still cutting each whole into fourths but we're seeing how many groups of three-fourths we can make.
- It's likely still multiplying by the inverse but it'll be different because the numerator isn't 1 anymore.

Let's Think (Slide 4): Interesting ideas, let's do some more exploring of how we can divide with non-unit fractions. I want to start with this problem, listen as I read it, "I have 6 yards of ribbon. I cut the ribbon into pieces that are ¾ yard long. How many pieces of ribbon do I have?" Now, let me pause to make sure I understand this, I have 6 yards of ribbon so a yard and then another yard and another yard. And I want to cut this long ribbon (stretch your arms out to exaggerate) that's 6 yards long into smaller pieces that are ¾ of a yard long. And once I cut this big long piece of ribbon into smaller pieces, I want to see how many pieces of ribbon I have. Interesting, let's pause and think, **after I cut the ribbon into ¾ yard long pieces, do you think I'll have more or less than 6 pieces of yarn?** Possible Student Answers, Key Points:

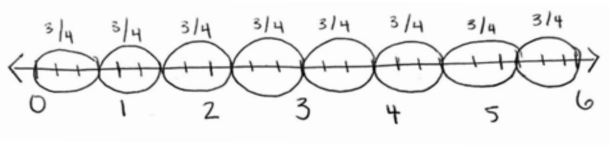
- You'll have more than 6 because each piece isn't a full yard.
- You'll have more than 6 because if you cut the piece of ribbon into 1 yard pieces, you'd have exactly 6 pieces of ribbon. But instead, you're cutting it into pieces that are smaller than 1 yard so you can cut more than 6 pieces.



Let's find out whether our predictions are right. So let's draw a model to see how we can solve this problem. I know that I could use bar models but I'm going to use a number line to help me since a number line is kind of like this long piece of ribbon in the story problem. I know that this piece of ribbon is 6 yards long, so I am going to show 0 to 6 on a number line, like this:



Now I know that I am cutting this ribbon into ¾ yard pieces so I need to cut each whole into fourths. So, this yard is cut into fourths, this yard is cut into fourths, etc. Oh, and don't forget, I only need to make 3 cuts to get fourths.



Okay, now here's where we need to stretch our thinking. When we were doing unit fractions, we were done here. But we aren't dividing 6 by ¼, we're dividing 6 by ¾. So we want to see how many ¾s there are in 6. So I am going to make groups of three fourths, like this (*circle*). So here are ¾ and 1, 2, 3 and another three fourths. And another.

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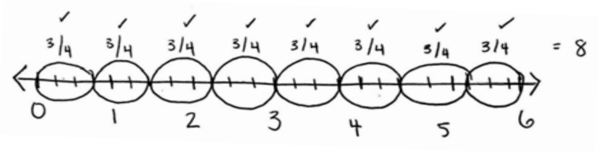
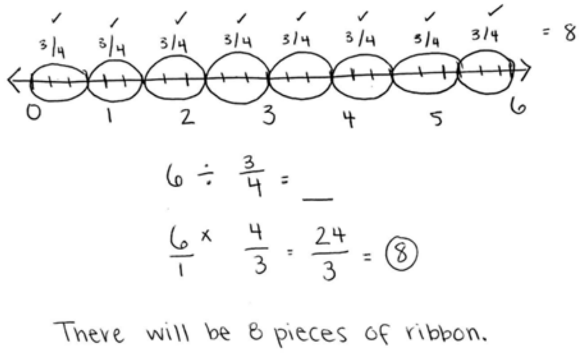


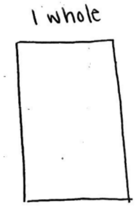
So we make groups of three fourths. Let's go back and see how many three fourths there are in 6, remember we are counting these groups (point to the groups of ¾), to keep track, I'm going to check off each group as I count it (Note: this can be difficult for students so be sure to slow down here and narrate what you're doing). So, 6 divided by ¾ is 8. When we cut the 6 yard ribbon in pieces that were ¾ yard long, we got 8 pieces of ribbon–our predictions were right, there were more than 6 pieces!



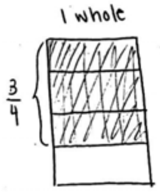
Now let's think about how we write this as an equation. We know that we were solving 6 ÷ ¾. And when we were solving division with unit fractions we discovered that we could flip the fraction and multiply. So now, we have 6 x $\frac{4}{3}$. Now let's multiply across. 6x4 is 24. and 1x3 is 3. So we have $\frac{24}{3}$ but that's an improper fraction so let's fix it. $\frac{24}{3}$ is the same as 8! So, when we did it with the equation, we got the same answer.

Let's Think (Slide 5): Okay, now let's think about a problem with similar numbers but it's a different situation. Listen to me read it, "I want to pour ¾ quart of juice equally into 6 glasses. How much juice is in each glass?" This sounds kind of like the 6 yards of ribbon except it's a little bit different. This time we have ¾ quart of juice. I'm imagining a big bottle of juice. And I want to pour the same amount into 6 different cups. So instead of dividing 6 by ¾, I'm diving ¾ by 6. **Hmm, so if I divide ¾ quart of juice into 6 cups, do you think I will have more or less than ¾ quart of juice in each cup? Why?** Possible Student Answers, Key Points:

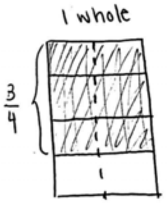
- You'll have less than ¾ quart because you're splitting that amount into 6 different cups.
- You'll have less because you'll pour a little bit of the whole amount into each cup.



Let's draw a picture to help us think about this problem. I know that I have ¾ quart of juice. That's less than 1 whole so I am going to start with 1 whole, I'll just draw it as a bar since that's how I represent fractions.



Now, I know that I have ¾ quart so I am going to split the whole into fourths and I'll shade in the three-fourths that I have.



There, this shaded part, is the ¾ quart juice that I have. And, I want to make these three pieces into six pieces. Hmm, what should I do to each fourth so that I can split this into 6 parts? That's right, I should cut each fourth into two pieces. Now, I don't call these fourths anymore because there aren't 4 equal parts in this whole, there are 1, 2, 3…8 (count them all) equal pieces.

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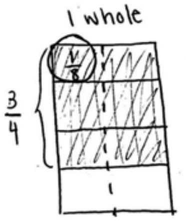

So each cup has this amount in it (*point to one of the new shaded pieces*). So, since each piece is an eighth, this is ⅛. That means that each person gets ⅛ quart of juice.

$\frac{3}{4} \div 6 = \_$

$\frac{3}{4} \times \frac{1}{6} = \frac{3}{24} = \frac{1}{8}$

Each person gets $\frac{1}{8}$ quart of juice.

Now let's think about how we write this as an equation. We know that we were solving ¾ ÷ 6. And when we were solving division with unit fractions we discovered that we could flip the fraction and multiply. So, now we have ¾ x ⅙. Let's multiply the numerator, 3x1 is 3 and then let's multiply the denominator, 4/6 is 24. So, now we have $\frac{3}{24}$ which we can simplify to ⅛. So, when we did it with the equation, we got the same answer.

So, we just solved two different problems and they both had 6 and ¾ in them. **But they weren't the same so let's talk about how they were the same and how they were different.** Possible Student Answers, Key Points:

- What we were starting with, or the whole, changed in each problem. In the purple problem, 6 was the whole that we were dividing. In the green problem, ¾ was the whole that we were dividing.
- In the purple problem, the answer was bigger than the starting number. In the green problem, the answer was smaller than the starting number.
- They're sort of like opposites. Instead of dividing 6 by ¾, in the second one we are dividing ¾ by 6.

Let's Try it (Slides 6-7): Now let's work on dividing non-unit fractions together. We're going to work on this page together, step-by-step. Remember, when we are dividing, we are splitting or cutting and we can ALWAYS draw a fraction model to help us solve.

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WARM WELCOME

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Today we will explore division with non-unit fractions.

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Let’s Talk:

Today we will divide with non unit fractions. How might this be different and the same as dividing with unit fractions?

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Let’s Think:

I want to pour ¾ quart of juice equally into 6 glasses. How much juice is in each glass?

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Let's Think:

I have 6 yards of ribbon. I cut the ribbon into pieces that are ¾ yard long. How many pieces of ribbon do I have?

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Let's Think:

I have 6 yards of ribbon. I cut the ribbon into pieces that are ¾ yard long. How many pieces of ribbon do I have?

I want to pour ¾ quart of juice equally into 6 glasses. How much juice is in each glass?

We just solved two different problems. How were they the same? How were they different?

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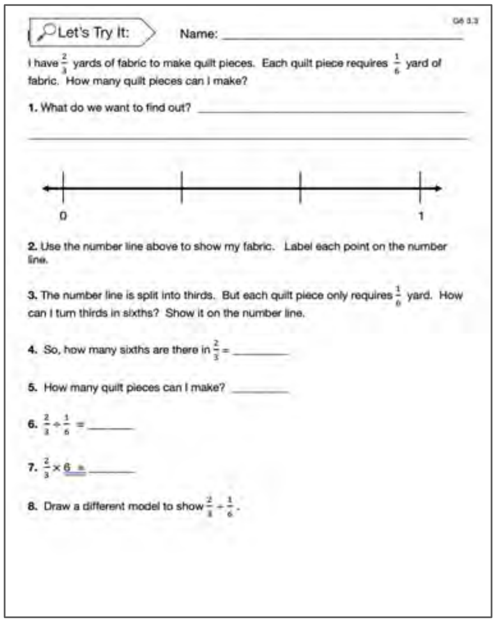
Let's Try It:

Let's explore together.



Let's Try It: Name: ______________________________ G6 3.3

I have $\frac{2}{3}$ yards of fabric to make quilt pieces. Each quilt piece requires $\frac{1}{6}$ yard of fabric. How many quilt pieces can I make?

1. What do we want to find out? ______________________________

2. Use the number line above to show my fabric. Label each point on the number line.

3. The number line is split into thirds. But each quilt piece only requires $\frac{1}{6}$ yard. How can I turn thirds in sixths? Show it on the number line.

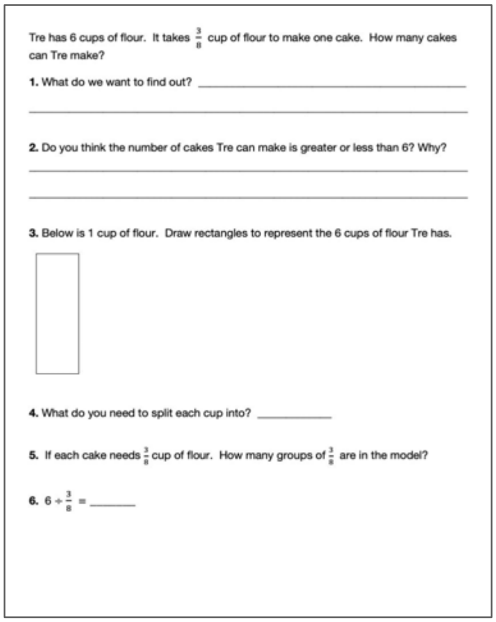
4. So, how many sixths are there in $\frac{2}{3}$ = ________

5. How many quilt pieces can I make? ________

6. $\frac{2}{3} \div \frac{1}{6}$ = ________

7. $\frac{2}{3} \times 6$ = ________

8. Draw a different model to show $\frac{2}{3} \div \frac{1}{6}$.



Tre has 6 cups of flour. It takes $\frac{3}{8}$ cup of flour to make one cake. How many cakes can Tre make?

1. What do we want to find out? ______________________________

2. Do you think the number of cakes Tre can make is greater or less than 6? Why?

3. Below is 1 cup of flour. Draw rectangles to represent the 6 cups of flour Tre has.

4. What do you need to split each cup into? __________

5. If each cake needs $\frac{3}{8}$ cup of flour. How many groups of $\frac{3}{8}$ are in the model?

6. $6 \div \frac{3}{8}$ = ________

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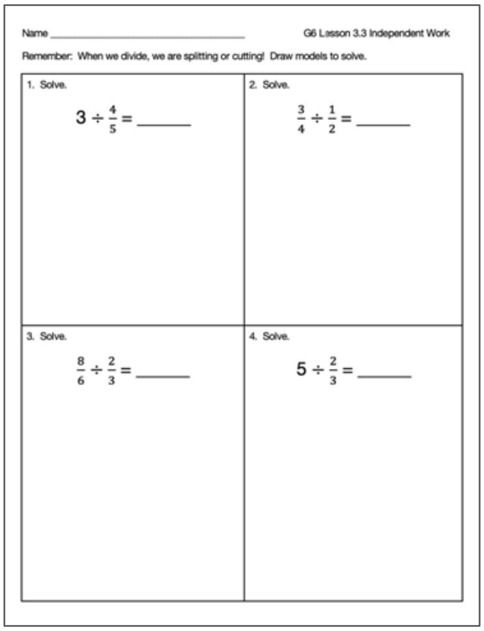
On your Own:

Now it's time to try on our own.



Name ______________________________ G6 Lasson 3.3 Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve. $3 \div \frac{4}{5} =$ ______	2. Solve. $\frac{3}{4} \div \frac{1}{2} =$ ______
3. Solve. $\frac{8}{6} \div \frac{2}{3} =$ ______	4. Solve. $5 \div \frac{2}{3} =$ ______

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Name ____ G6 U4 Lesson 3 - Let’s Try It

I have $\frac{2}{3}$ yards of fabric to make quilt pieces. Each quilt piece requires $\frac{1}{6}$ yard of fabric. How many quilt pieces can I make?

1. What do we want to find out? ____

____

2. Use the number line above to show my fabric. Label each point on the number line.

3. The number line is split into thirds. But each quilt piece only requires $\frac{1}{6}$ yard. How can I turn thirds in sixths? Show it on the number line.

4. So, how many sixths are there in $\frac{2}{3}$ = __________

5. How many quilt pieces can I make? __________

6. $\frac{2}{3} \div \frac{1}{6}$ = _______

7. $\frac{2}{3} \times 6$ = _______

8. Draw a different model to show $\frac{2}{3} \div \frac{1}{6}$.

Tre has 6 cups of flour. It takes $\frac{3}{8}$ cup of flour to make one cake. How many cakes can Tre make?

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1. What do we want to find out? ____

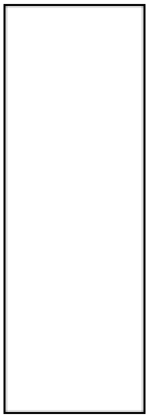
____

2. Do you think the number of cakes Tre can make is greater or less than 6? Why?

____

____

3. Below is 1 cup of flour. Draw rectangles to represent the 6 cups of flour Tre has.



4. What do you need to split each cup into? ____________

5. If each cake needs $\frac{3}{8}$ cup of flour. How many groups of $\frac{3}{8}$ are in the model?

6. $6 \div \frac{3}{8}$ = _______

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Name ____ G6 U4 Lesson 3 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve. $3 \div \frac{4}{5} = \_\_\_\_\_\_$	2. Solve. $\frac{3}{4} \div \frac{1}{2} = \_\_\_\_\_\_$
3. Solve. $2 \div \frac{2}{3} = \_\_\_\_\_\_$	4. Solve. $5 \div \frac{2}{3} = \_\_\_\_\_\_$

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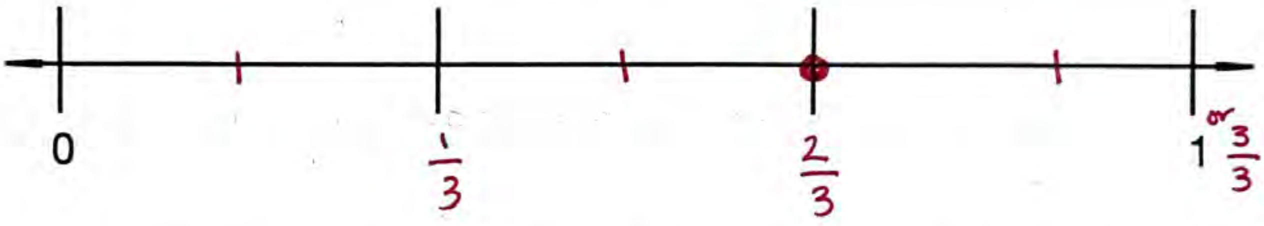
Name ______________________ G6 U4 Lesson 3 - Let's Try It

I have $\frac{2}{3}$ yards of fabric to make quilt pieces. Each quilt piece requires $\frac{1}{6}$ yard of fabric. How many quilt pieces can I make?

1. What do we want to find out? How many quilt pieces we can make



2. Use the number line above to show my fabric. Label each point on the number line.

3. The number line is split into thirds. But each quilt piece only requires $\frac{1}{6}$ yard. How can I turn thirds in sixths? Show it on the number line. Cut each third in half.

4. So, how many sixths are there in $\frac{2}{3}$ = 4

5. How many quilt pieces can I make? 4!

6. $\frac{2}{3} \div \frac{1}{6}$ = 4

7. $\frac{2}{3} \times 6$ = 4 $\frac{2}{3} \times \frac{6}{1} = \frac{12}{3} = 4$

8. Draw a different model to show $\frac{2}{3} \div \frac{1}{6}$.

= 4

Tre has 6 cups of flour. It takes $\frac{3}{8}$ cup of flour to make one cake. How many cakes can Tre make?

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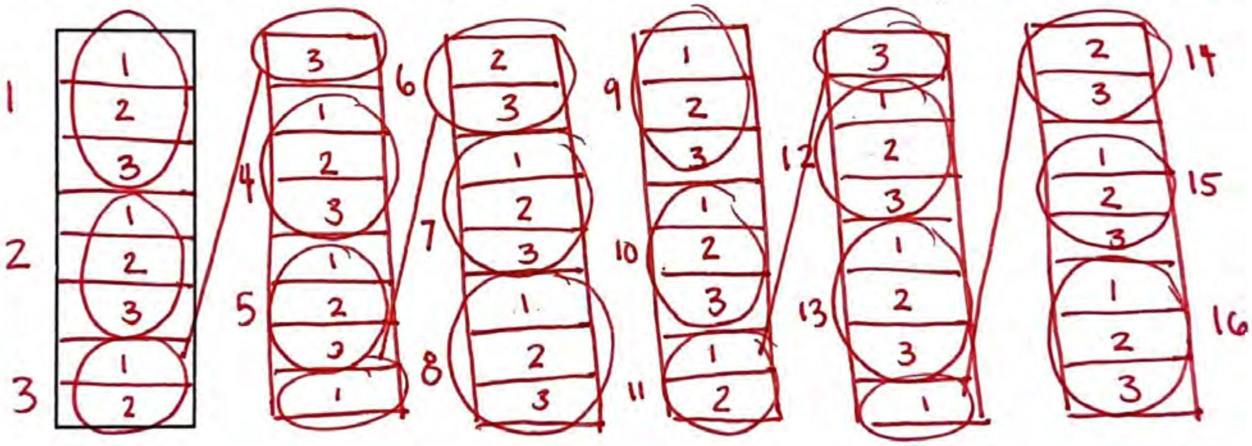
1. What do we want to find out? How many cakes Tre can make

2. Do you think the number of cakes Tre can make is greater or less than 6? Why?

More! Because it takes less than 1 cup of flour to make a cake.

3. Below is 1 cup of flour. Draw rectangles to represent the 6 cups of flour Tre has. ✓



4. What do you need to split each cup into? eighths!

5. If each cake needs $\frac{3}{8}$ cup of flour. How many groups of $\frac{3}{8}$ are in the model? 16

6. $6 \div \frac{3}{8} =$ 16

$$\frac{6}{1} \times \frac{8}{3} = \frac{48}{6} = 16$$

Tre can make 16 cakes.

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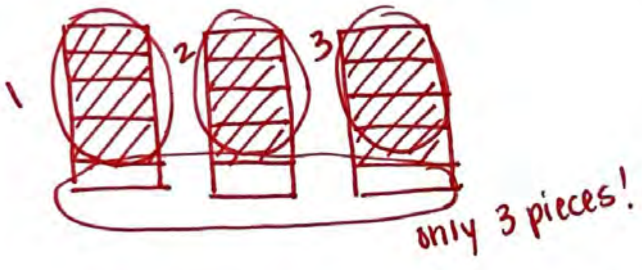
Name ______________________________

G6 U4 Lesson 3 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. Solve. "How many 4/5 are in 3?"

$3 \div \frac{4}{5} =$ <u>3 3/4</u>



$\frac{3}{1} \times \frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$

$\frac{4}{4}$ $\frac{4}{4}$ $\frac{4}{4}$ 3/4

2. Solve. "How many halves are in 3/4?"

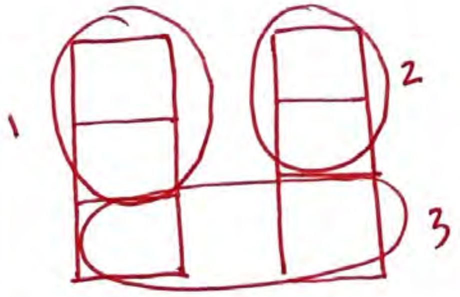
$\frac{3}{4} \div \frac{1}{2} =$ <u>$1\frac{1}{2}$</u>

$\frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = 1\frac{1}{2}$

$\frac{4}{4}$ $\frac{2}{4}$

3. Solve. "How many $\frac{2}{3}$ are in 2?"

$2 \div \frac{2}{3} =$ <u>3</u>

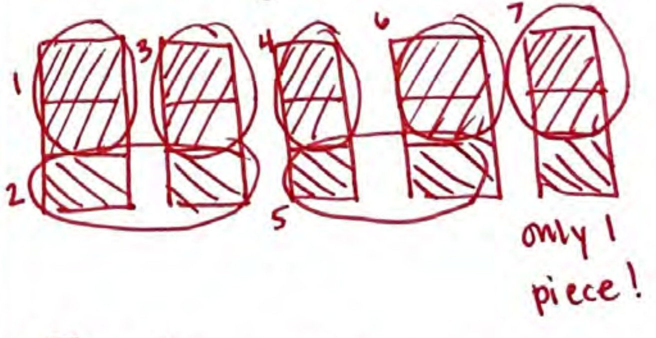


$\frac{2}{1} \times \frac{3}{2} = \frac{6}{2} = 3$

$\frac{2}{2}$ $\frac{2}{2}$ $\frac{2}{2}$

4. Solve. "How many 2/3 are in 5?"

$5 \div \frac{2}{3} =$ <u>$7\frac{1}{2}$</u>



$\frac{5}{1} \times \frac{3}{2} = \frac{15}{2} = 7\frac{1}{2}$

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G6 U4 Lesson 4

Divide fractions in word problems

G6 U4 Lesson 4 - Students will divide fractions in word problems

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use everything we know about division with fractions to help us solve word problems. Just like we did a few days ago, today it's going to be really important to read, retell and think BEFORE we start solving.

Let's Talk (Slide 3): So, let's start by using what we know to compare these two problems. The purple problem, on the left, is 4 divided by ⅔. The green problem on the right is ⅔ divided by 4. **Let's think, how are these two problems related and how are they similar or different?** Possible Student Answers, Key Points:

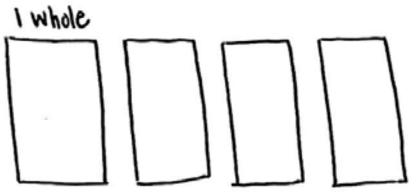
- They have the same two numbers in them, 4 and ⅔.
- They both are division.
- When you solve 4 divided by ⅔ you get 6 and when you solve ⅔ divided by 4, you get ⅙.
- When you do 4 divided by ⅔, your answer will be bigger than 4. When you do ⅔ divided by 4, your answer will be smaller than ⅔.

Note: Students should discuss how they are the same and different before they solve and then you should cue them to solve as extra practice.

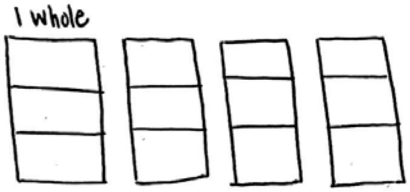
Let's Think (Slide 4): You all know a lot about division with fractions! Let's work together to solve a problem. Listen as I read it out loud, "Charlie is growing vegetables in planters. He has 4 bags of soil and uses ⅔ of a bag of soil to fill each planter. How many planters can he fill?" Now let's read it one more time together to make sure we really understand what the story is saying. Okay, now let's cover the story and retell it in our own words.

- Note: The actions and context of the story are more important than the actual numbers. The purpose of retelling is to make sure students understand what is happening and what they're trying to solve for. If students struggle to recall the numbers, you can tell them. You might need to cover up the story so that students use their own words. It might sound like this: "A person has 4 big bags of soil that he's using to fill planters. He uses some of each bag to fill one planter and we want to know how many planters he can fill using those 4 bags."

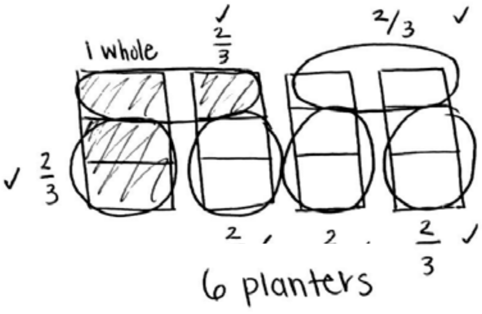
Now that we retold the story, let's pause to think about what we're trying to figure out or solve for. We want to know how many planters, or little pots, Charlie can fill if each one takes ⅔ of a bag. Now that we read, retold, and thought about the story, we're ready to solve it.



Let's start with a model. I know that Charlie has 4 whole bags of soil so I am going to draw 4 bars for the 4 whole bags of soil. There, we have 4 bags of soil.



Now we know that it takes ⅔ of a bag to fill a planter. So I am going to split each bag into thirds, I only need to make 2 cuts to make thirds. So I need to split this bag into thirds (model doing so) and this bag (continue narrating what you're doing until you split all 4 bags).



Okay now I know that it takes ⅔ of a bag to fill a planter so let me see how many groups of ⅔ I can make. So here's ⅔ (circle or shade), here's ⅓ from this bag and I can take ⅓ from this bag, that makes ⅔. (Note: This idea of combining thirds from separate whole bags might be confusing for students. If they struggle, talk it through. Example: "Well there's ⅓ left from this bag and I can dump another ⅓ from this bag and ⅓ and ⅓ makes ⅔!"). So let's
see how many groups of ⅔ I could make, or how many planters I could fill. Here's ⅔ and another ⅔. So, I can fill 6 planters.

$$4 \div \frac{2}{3} = \_\_\_$$

$$\frac{4}{1} \times \frac{3}{2} = \frac{12}{2} = 6$$

He can fill 6 planters.

Now that we drew a bar model to help us solve, let's see if we can write an equation to help us do the math. We took 4 and we tried to figure out how many ⅔ there were across all 4 bags. That means we did (4 divided by ⅔). Now we know that we can multiply and flip so now we are doing $\frac{4}{1}$ x $\frac{3}{2}$ and when we multiply our numerators, 4x3 we get 12 and then when we multiply the denominators, 1x2 we get 2. So we have $\frac{12}{2}$ which is the same as 6. So he can fill 6 planters.

Let's Try it (Slides 5-6): Now let's work on dividing with unit fractions together. We're going to work on this page together, step-by-step. Remember, when we are solving word problems there's a lot of work to do before we solve them. First we have to read and retell and then we have to think, "What am I trying to figure out?"

WARM WELCOME

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Today we will divide with fractions in word problems.

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Let's Talk:

How are these two problems related?

$4 \div \frac{2}{3}$ $\frac{2}{3} \div 4$

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Let's Think:

Charlie is growing vegetables in planters. He has 4 bags of soil and uses ⅔ of a bag of soil to fill each planter. How many planters can he fill?

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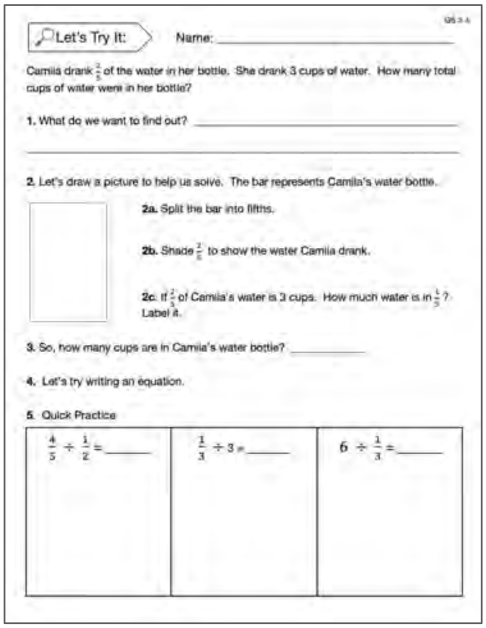
Let's Try It:

Let's explore together.



G6 3.4

Let's Try It: Name: ____________________

Camila drank $\frac{2}{5}$ of the water in her bottle. She drank 3 cups of water. How many total cups of water were in her bottle?

1. What do we want to find out? ____________________

2. Let's draw a picture to help us solve. The bar represents Camila's water bottle.

2a. Split the bar into fifths.

2b. Shade $\frac{2}{5}$ to show the water Camila drank.

2c. If $\frac{2}{5}$ of Camila's water is 3 cups. How much water is in $\frac{1}{5}$? Label it.

3. So, how many cups are in Camila's water bottle? __________

4. Let's try writing an equation.

5. Quick Practice

$\frac{4}{5} \div \frac{1}{2} =$ ______	$\frac{1}{3} \div 3 =$ ______	$6 \div \frac{1}{3} =$ ______

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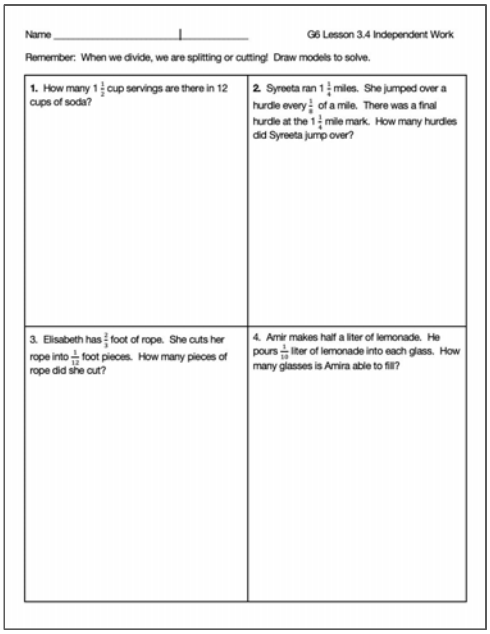
On your Own:

Now it's time to try on your own.



Name ____________________ G6 Lesson 3.4 Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. How many $1\frac{1}{2}$ cup servings are there in 12 cups of soda?	2. Syreeta ran $1\frac{1}{4}$ miles. She jumped over a hurdle every $\frac{1}{8}$ of a mile. There was a final hurdle at the $1\frac{1}{4}$ mile mark. How many hurdles did Syreeta jump over?
3. Elisabeth has $\frac{2}{3}$ foot of rope. She cuts her rope into $\frac{1}{12}$ foot pieces. How many pieces of rope did she cut?	4. Amir makes half a liter of lemonade. He pours $\frac{1}{10}$ liter of lemonade into each glass. How many glasses is Amira able to fill?

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Name ______________________________________ G6 U4 Lesson 4 - Let's Try It

Camila drank $\frac{2}{5}$ of the water in her bottle. She drank 3 cups of water. How many total cups of water were in her bottle?

1. What do we want to find out? ____

____

2. Let's draw a picture to help us solve. The bar represents Camila's water bottle.

2a. Split the bar into fifths.

2b. Shade $\frac{2}{5}$ to show the water Camila drank.

2c. If $\frac{2}{5}$ of Camila's water is 3 cups. How much water is in $\frac{1}{5}$? Label it.

3. So, how many cups are in Camila's water bottle? ____________

4. Let's try writing an equation.

5. Quick Practice.

$\frac{4}{5} \div \frac{1}{2} =$ ______	$\frac{1}{3} \div 3 =$ ______	$6 \div \frac{1}{3} =$ ______

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Name ____ G6 U4 Lesson 4 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. How many 1 $\frac{1}{2}$ cup servings are there in 12 cups of soda?

2. Syreeta ran 1 $\frac{1}{4}$ miles. She jumped over a hurdle every $\frac{1}{8}$ of a mile. There was a final hurdle at the 1 $\frac{1}{4}$ mile mark. How many hurdles did Syreeta jump over?

3. Elisabeth has $\frac{2}{3}$ foot of rope. She cuts her rope into $\frac{1}{12}$ foot pieces. How many pieces of rope did she cut?

4. Amir makes half a liter of lemonade. He pours $\frac{1}{10}$ liter of lemonade into each glass. How many glasses is Amira able to fill?

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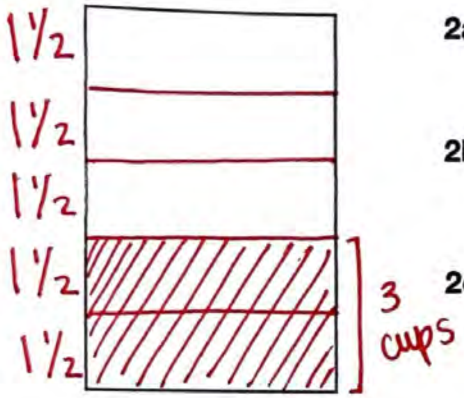
Name ANSWER KEY G6 U4 Lesson 4 - Let's Try It

Camila drank $\frac{2}{5}$ of the water in her bottle. She drank 3 cups of water. How many total cups of water were in her bottle?

1. What do we want to find out? The total amount of cups that fit in Camila's bottle

2. Let's draw a picture to help us solve. The bar represents Camila's water bottle.



2a. Split the bar into fifths. ✓

2b. Shade $\frac{2}{5}$ to show the water Camila drank. ✓

2c. If $\frac{2}{5}$ of Camila's water is 3 cups. How much water is in $\frac{1}{5}$? Label it.

$3 \div 2 = 1\frac{1}{2}$

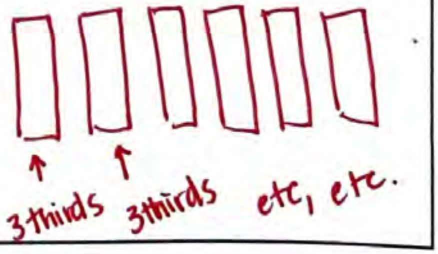
3. So, how many cups are in Camila's water bottle? $4\frac{1}{2}$ cups

$1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} = 7\frac{1}{2}$

4. Let's try writing an equation.

$\cancel{\left(\frac{5}{2}\right)\frac{2}{5}} \cdot x = \frac{3}{1}\left(\frac{5}{2}\right) \rightarrow x = \frac{15}{2} = 7\frac{1}{2}$

5. Quick Practice.

$\frac{4}{5} \div \frac{1}{2} =$ ______ $\frac{4}{5} \times \frac{2}{1} = \frac{8}{5} = 1\frac{3}{5}$ 	$\frac{1}{3} \div 3 = \frac{1}{9}$  $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$	$6 \div \frac{1}{3} = 18$ $\frac{6}{1} \times \frac{3}{1} = \frac{18}{1}$  3thirds 3thirds etc, etc.

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Name ANSWER KEY

G6 U4 Lesson 4 - Independent Work

Remember: When we divide, we are splitting or cutting! Draw models to solve.

1. How many $1\frac{1}{2}$ cup servings are there in 12 cups of soda?

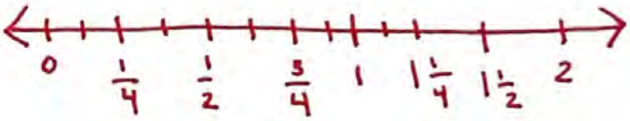
$$12 \div \frac{3}{2} = 8$$

$$\frac{12}{1} \times \frac{2}{3} = \frac{24}{3} = 8$$

8 servings

Hint:
"How many times can $1\frac{1}{2}$ fit into 12?"

2. Syreeta ran $1\frac{1}{4}$ miles. She jumped over a hurdle every $\frac{1}{8}$ of a mile. There was a final hurdle at the $1\frac{1}{4}$ mile mark. How many hurdles did Syreeta jump over?



Syreeta jumped over 10 hurdles.

$$\frac{5}{4} \div \frac{1}{8} = \frac{5}{4} \times \frac{8}{1} = \frac{40}{4} = 10$$

3. Elisabeth has $\frac{2}{3}$ foot of rope. She cuts her rope into $\frac{1}{12}$ foot pieces. How many pieces of rope did she cut?

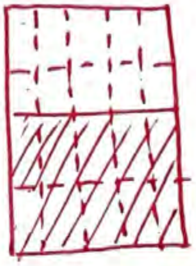
$$\frac{2}{3} \div \frac{1}{12} = \frac{2}{3} \times \frac{12}{1} = \frac{24}{3} = 8$$

She cut 8 pieces of rope.

Hint: "How many twelfths are there in 2/3?"

4. Amir makes half a liter of lemonade. He pours $\frac{1}{10}$ liter of lemonade into each glass. How many glasses is Amira able to fill?

$$\frac{1}{2} \div \frac{1}{10} = \frac{1}{2} \times \frac{10}{1} = \frac{20}{2} = 10$$



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G6 U4 Lesson 5

Calculate sums, differences, and products of decimals in the context of money

G6 U4 Lesson 5 - Students will calculate sums, differences, and products of decimals in the context of money

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2-3): Before we launch into learning, take a look at this table. I'm curious. **What do you notice or wonder about what you see?** Possible Student Answers, Key Points:

- I notice some of the numbers are decimals but another is just a whole number.
- I notice some of these look like money. I notice some boxes are blank.
- I wonder what this chart is about. I wonder what numbers go in the missing blanks. I wonder if these are amounts of money.

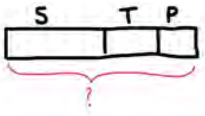
I think you're onto something with those ideas! Today we will explore decimals in the context of money. You've been learning about money in math since you were in 1st or 2nd grade, and in 5th grade you learned a variety of strategies to add, subtract, multiply, and divide with decimal numbers. Today, we're going to get a chance to revisit many of these skills as a way to launch us into learning even more about decimal operations in 6th grade.

Let's Talk (Slide 4): Now I'm going to show you a bit more about this chart we looked at. Oh I see we have labels in the table now, the first column says ITEM and the second column says COST and shows the dollar sign. So, the numbers represent the costs of some items. It looks like sunglasses cost $4.15, t-shirts cost $7, and postcards cost $0.89. Based on our new information, **What questions could somebody ask us about what is presented here?** Possible Student Answers, Key Points:

- How much does it cost to buy _____?
- I have $____. How much change would I get back if I bought ____?
- Do I have enough to buy ______ if I have $______.
- How many ______ can I buy with $_______.

There are so many different types of questions we can ask about money, and depending on what we're being asked, we'll have to use a different strategy and/or operation to answer the question. As we look at different problems today, we'll draw models and make estimates to help us make sense of the question, and then we'll use addition, subtraction, or multiplication to help us answer the questions!

Let's Think (Slide 5): Here's one question we can ask about the information in the table. Listen as I read the first question, how much do the items cost in all? Before we jump straight into the math, let's pause and visualize what we're being asked.



The question says, How much do the items cost in all. That means that we want to buy sunglasses, a t-shirt, and a postcard. I'm going to draw a bar that represents the sunglasses and label it with an S so I don't forget what it represents. Then I'll connect that to a bar for the t-shirt labeled T and a bar for the postcard labeled P. I'll put a question mark around the whole model, since we are finding the total amount for the sunglasses, the t-shirt, and the postcard. Note: Either model matches.

So how can we find the total? Add! That's right, we can join the three parts. We can add everything up. We can combine the three values.

So we want to add a pair of sunglasses, a t-shirt, and a postcard. We can use estimation to help us make a smart guess. So, the sunglasses cost ***about*** how much? $4! The t-shirt costs $7, and about how much does a postcard cost? $1! So if I'm estimating, I know our answer should be about $4 + $7 + $1. Our answer should be about $12.

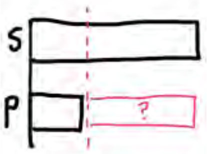
Let's do that! Anytime we add or subtract with money, we have to be extra careful about our place value. We have to add/subtract dollars with dollars and cents with cents. *(Show non-example)* **Did I rewrite this vertical equation correctly? Why or why not?** Possible Student Answers, Key Points:

- We didn't write 7 as $7.00. We're adding 7 dollars to pennies.
- Our place values aren't lined up.
- You have to line up the decimals, 7 i s the same as 7.00.
- You have to add dollars with dollars and cents with cents.

Great. Let's rewrite our vertical addition so our dollars are lined up with our dollars and our cents are lined up with our cents. Aligning the decimals is a quick way to make sure we're adding or subtracting like units. Now that we're lined up, let's add.

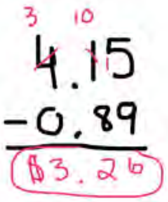
Finally, let's stop and look at our answer and think about whether it's reasonable. Well, we estimated that our answer would be about $12. And look, $12.04 is really close to our estimate.

Let's Think (Slide 6): Now, let's look at the next question, listen as I read. How much more do sunglasses cost than a postcard? Before we start, let's visualize what we're being asked. We know that the sunglasses cost more than the postcard–we'd have to pay moer money for them! And this question is asking us EXACTLY how much more the sunglasses cost than the postcard. That makes sense because when I look at the table, I see that sunglasses cost ***about*** $4 and the postcard costs ***about*** $1.



Let me draw a model, I see that the sunglasses cost the most, so I'll draw a big bar labeled S. The postcard costs less, so I'll draw a smaller bar labeled P. We're trying to find the difference, so I'll label the empty space between the postcard and sunglasses with a question mark. This is the part of the sunglasses that cost MORE than the postcard (*point to the red*). We know the sunglasses cost more than the postcard, and we're trying to find the difference between the costs. We can use subtraction to find the difference.

Before we do the math, can we estimate how much we think our answer will be? Well, let's look. The sunglasses cost about $4. The postcard costs about $1. So, 4 - 1 = 3, so the sunglasses cost about $3 more than the postcard.



Let's see if your estimate is correct. Line up each place value so we can subtract cents from cents and dollars from dollars, and let's carefully subtract. (*Vertically stack each digit and subtract. Slow down while regrouping as this can be the trickiest spot for students when subtracting.)* Great! Did the exact difference in prices match your earlier estimate? Yes!

Let's Think (Slide 7): And finally, let's look at one more. This question says, how much would 3 postcards cost? Hm, I can think of this one a few ways. Let's visualize it.We know that one postcards costs $0.89 and we want to know the total cost of THREE postcards.

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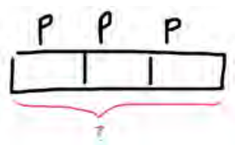
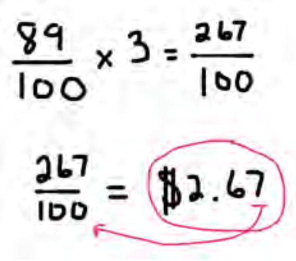


Let’s draw a model to show this. We want to show three postcards so let me draw a bar that shows 3 postcards and label each part with P for postcard. Now, I’ll put a question mark over the whole model because that’s what I don’t know! **So, what are you thinking we could do to find the total?** Possible Student Answers, Key Points:

- *We can add $0.89 three times.*
- *We can multiply $0.89 times three.*

That’s right, we could add the price of the postcard, $0.89, three times, OR we can multiply since we have three equal groups of 89 cents. Before we do the math, let’s estimate what you think the answer might be? Well, we know each postcard is about $1, so 1 + 1 + 1 = 3. Or 3 x 1 = 3. Our answer should be about $3. Great. Let’s try multiplying this time. In 5th grade, when we multiplied with decimals we learned we can write our decimals as fractions to help us multiply.



What would 0.89 be as a decimal? 89/100! It’s 89/100. An easy way to think of that is to read the decimal. We would say 0.89 is 89 hundredths. Now we can multiply 89/100 x 3. Let’s do that. 89 x 3 gets us to 267. So 89/100 x 3 is 267/100. That fraction looks funny if we’re talking about money, so let’s write it as a decimal. 267 hundredths is 2.67 or $2.67. Does that match our estimate? Yes!

We just solved a variety of money problems using what we know about decimal operations. As we see problems, let’s commit to first visualizing with a drawing or model AND thinking of an estimate for our answer. After we do that, we can use an appropriate operation. Remember to add/subtract dollars with dollars and cents with cents. And if we have to multiply, we can write our decimal in fraction form to help us multiply.

Let’s Try it (Slides 8-9): Now let’s work together on calculating sums, differences, and products of decimals in the context of money. We’re going to work on this page together, step-by-step. Remember we want to pay close attention to the place value of dollars and cents as we work, and we can always use a drawing and estimation to help make sure our answer makes sense and is reasonable.

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WARM WELCOME

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Today we will calculate sums, differences, and products of decimals in the context of money.

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Let's Talk:

What do you notice? What do you wonder?

	3.15
	7
	0.89

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Let's Talk:

Emma is at a gift shop. What questions could we ask about the items at the gift shop?

ITEM	COST ($)
sunglasses	4.15
t-shirt	7
postcard	0.89

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Let's Think:

How much do the items cost in all?

ITEM	COST ($)
sunglasses	4.15
t-shirt	7
postcard	0.89

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Let's Think:

How much more do sunglasses cost than a postcard?

ITEM	COST ($)
sunglasses	4.15
t-shirt	7
postcard	0.89

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Let’s Think:

How much would 3 postcards cost?

ITEM	COST ($)
sunglasses	4.15
t-shirt	7
postcard	0.89

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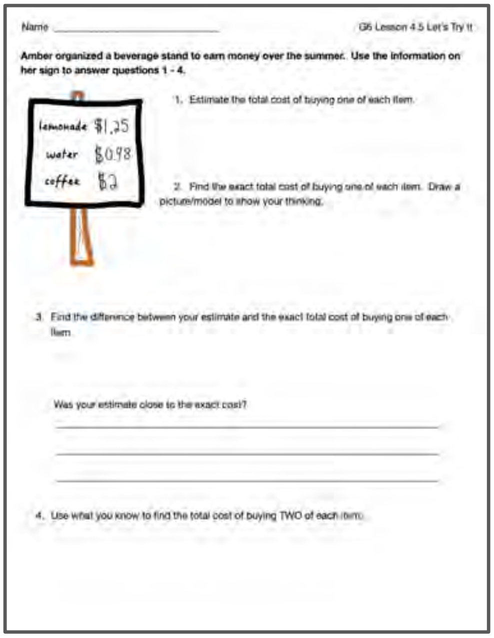
Let’s Try It:

Let’s add, subtract, and multiply with money!



Name ______________________ G5 Lesson 4.5 Let's Try It

Amber organized a beverage stand to earn money over the summer. Use the information on her sign to answer questions 1 - 4.

lemonade $1.25
water $0.98
coffee $2

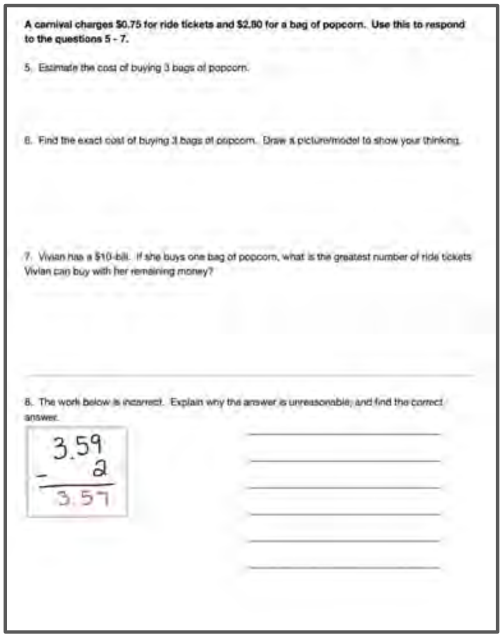
1. Estimate the total cost of buying one of each item.

2. Find the exact total cost of buying one of each item. Draw a picture/model to show your thinking.

3. Find the difference between your estimate and the exact total cost of buying one of each item.

Was your estimate close to the exact cost?

4. Use what you know to find the total cost of buying TWO of each item.



A carnival charges $0.75 for ride tickets and $2.80 for a bag of popcorn. Use this to respond to the questions 5 - 7.

5. Estimate the cost of buying 3 bags of popcorn.

6. Find the exact cost of buying 3 bags of popcorn. Draw a picture/model to show your thinking.

7. Vivian has a $10-bill. If she buys one bag of popcorn, what is the greatest number of ride tickets Vivian can buy with her remaining money?

8. The work below is incorrect. Explain why the answer is unreasonable, and find the correct answer.

$$\begin{array}{r} 3.59 \\ -\quad 2 \\ \hline 3.57 \end{array}$$

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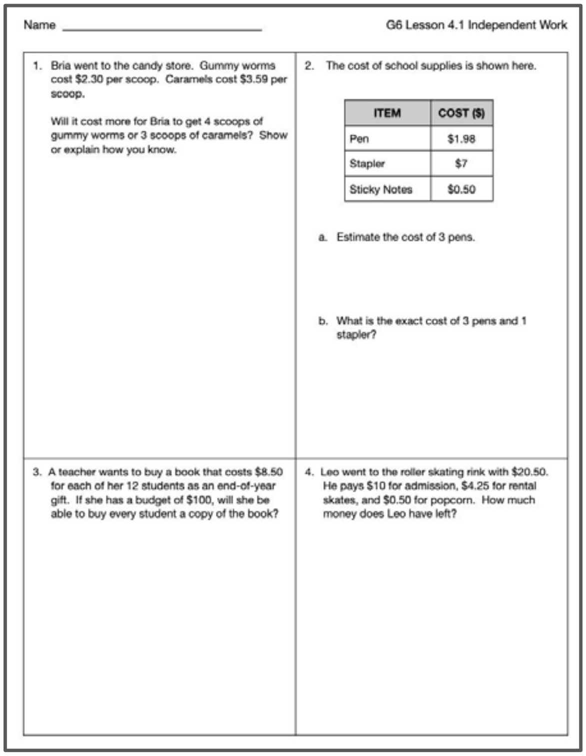
On your Own:



Name ______________________________ G6 Lesson 4.1 Independent Work

1. Bria went to the candy store. Gummy worms cost $2.30 per scoop. Caramels cost $3.59 per scoop.

   Will it cost more for Bria to get 4 scoops of gummy worms or 3 scoops of caramels? Show or explain how you know.

2. The cost of school supplies is shown here.

ITEM	COST ($)
Pen	$1.98
Stapler	$7
Sticky Notes	$0.50

   a. Estimate the cost of 3 pens.

   b. What is the exact cost of 3 pens and 1 stapler?

3. A teacher wants to buy a book that costs $8.50 for each of her 12 students as an end-of-year gift. If she has a budget of $100, will she be able to buy every student a copy of the book?

4. Leo went to the roller skating rink with $20.50. He pays $10 for admission, $4.25 for rental skates, and $0.50 for popcorn. How much money does Leo have left?

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Name ________________________________ G6 U4 Lesson 5 - Let’s Try It

Amber organized a beverage stand to earn money over the summer. Use the information on her sign to answer questions 1 - 4.

1. Estimate the total cost of buying one of each item.

2. Find the exact total cost of buying one of each item. Draw a picture/model to show your thinking.

3. Find the difference between your estimate and the exact total cost of buying one of each item.

Was your estimate close to the exact cost?

____

____

____

4. Use what you know to find the total cost of buying TWO of each item.

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A carnival charges $0.75 for ride tickets and $2.80 for a bag of popcorn. Use this to respond to the questions 5 - 7.

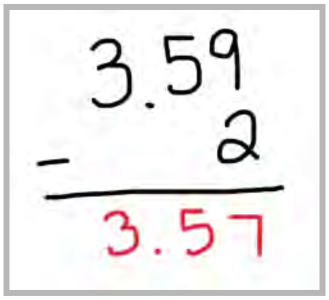
5. Estimate the cost of buying 3 bags of popcorn.

6. Find the exact cost of buying 3 bags of popcorn. Draw a picture/model to show your thinking.

7. Vivian has a $10-bill. If she buys one bag of popcorn, what is the greatest number of ride tickets Vivian can buy with her remaining money?

---

8. Carl had $3.59 and spent $2 on a sports drink. He wanted to figure out how much money he had left, but noticed his work was incorrect. Explain why the answer is unreasonable, and find the correct answer.



$$\begin{array}{r} 3.59 \\ -\quad 2 \\ \hline 3.57 \end{array}$$

____

____

____

____

____

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1. **Bria went to the candy store. Gummy worms cost $2.30 per scoop. Caramels cost $3.59 per scoop.**

   Will it cost more for Bria to get 4 scoops of gummy worms or 3 scoops of caramels? Show or explain how you know.

2. **The cost of school supplies is shown here.**

ITEM	COST ($)
Pen	$1.98
Stapler	$7
Sticky Notes	$0.50

   a. Estimate the cost of 3 pens.

   b. What is the exact cost of 3 pens and 1 stapler?

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3. **A teacher wants to buy a book that costs $8.50 for each of her 12 students as an end-of-year gift.** If she has a budget of $100, will she be able to buy every student a copy of the book?

4. **Leo went to the roller skating rink with $20.50. He pays $10 for admission, $4.25 for rental skates, and $0.50 for popcorn.** How much money does Leo have left?

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Name KEY

Amber organized a beverage stand to earn money over the summer. Use the information on her sign to answer questions 1 - 4.

1. Estimate the total cost of buying one of each item.

1 + 1 + 2 = 4

1.25 ≈ 1
0.98 ≈ 1
2 → 2

$4

2. Find the exact total cost of buying one of each item. Draw a picture/model to show your thinking.

```
   1 1
   2.00
   1.25
 + 0.98
 ------
  $4.23
```

3. Find the difference between your estimate and the exact total cost of buying one of each item.

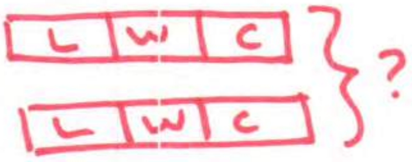
```
  4.23
 -4.00
 -----
  0.23
```

$0.23

Was your estimate close to the exact cost?

My estimate was close, yes! I was less than a quarter away from the actual cost.

4. Use what you know to find the total cost of buying TWO of each item.



```
  4.23
 +4.23
 -----
 $8.46
```

OR

$\frac{423}{100} \times \frac{2}{1} = \frac{846}{100}$

$8.46

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A carnival charges $0.75 for ride tickets and $2.80 for a bag of popcorn. Use this to respond to the questions 5 - 7.

5. Estimate the cost of buying 3 bags of popcorn.

$\$2.80 \approx \$3$

$\underbrace{\boxed{P}\boxed{P}\boxed{P}}_{?}$

$3 \times 3 = 9$

$\boxed{\approx \$9}$

6. Find the exact cost of buying 3 bags of popcorn. Draw a picture/model to show your thinking.

$\underbrace{\boxed{2.80}\boxed{2.80}\boxed{2.80}}_{?}$

$$\begin{array}{r} \overset{2}{2}.80 \\ 2.80 \\ +2.80 \\ \hline \boxed{\$8.40} \end{array}$$

OR

$\frac{280}{100} \times \frac{3}{1} = \frac{840}{100}$

$\boxed{\$8.40}$

$$\begin{array}{r} \overset{2}{2}80 \\ \times 3 \\ \hline 840 \end{array}$$

7. Vivian has a $10-bill. If she buys one bag of popcorn, what is the greatest number of ride tickets Vivian can buy with her remaining money?

$$\begin{array}{r} \overset{9\ 9\ 10}{\cancel{10}.\cancel{0}0} \\ -2.80 \\ \hline 7.20 \end{array}$$

$7.20

$\frac{75}{100} \times \frac{10}{1} = \frac{750}{100} = 7.50 \leftarrow$ 10 tickets

$\frac{75}{100} \times \frac{9}{1} = \frac{675}{100} = 6.75 \leftarrow$ 9 tickets

$$\begin{array}{r} \overset{4}{7}5 \\ \times 9 \\ \hline 675 \end{array}$$

$\boxed{\text{9 tickets}}$

8. Carl had $3.59 and spent $2 on a sports drink. He wanted to figure out how much money he had left, but noticed his work was incorrect. Explain why the answer is unreasonable, and find the correct answer.

$$\boxed{\begin{array}{r} 3.59 \\ -\quad 2 \\ \hline 3.57 \end{array}}$$

$3.59 \approx 4$

$$\begin{array}{r} 3.59 \\ -2.00 \\ \hline 1.59 \end{array}$$

His answer is too big.
It should be closer to $2.
The correct answer is
$1.59.

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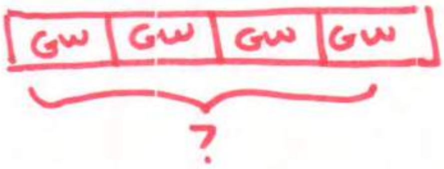
Name KEY

G6 Lesson 4.5 Independent Work

1. Bria went to the candy store. Gummy worms cost $2.30 per scoop. Caramels cost $3.59 per scoop.

Will it cost more for Bria to get 4 scoops of gummy worms or 3 scoops of caramels? Show or explain how you know.

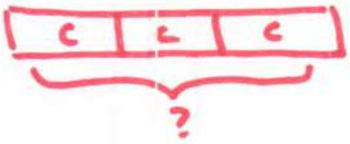


$4 \times 2.30 = ?$

$\frac{4}{1} \times \frac{230}{100} = ?$

$\frac{920}{100} = \$9.20$

$$\begin{array}{r} 230 \\ \times\ 4 \\ \hline 920 \end{array}$$



$3 \times 3.59 = ?$

$\frac{3}{1} \times \frac{359}{100} = ?$

$\frac{1077}{100} = \$10.77$

$$\begin{array}{r} {}^{1}\,{}^{2} \\ 359 \\ \times\ 3 \\ \hline 10.77 \end{array}$$

It costs more to buy 3 scoops of caramels.

2. The cost of school supplies is shown here.

ITEM	COST ($)
Pen	$1.98
Stapler	$7
Sticky Notes	$0.50

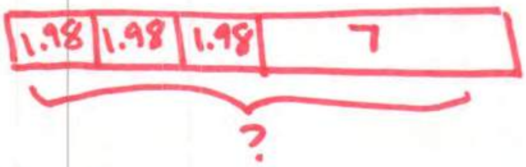
a. Estimate the cost of 3 pens.

$1.98 \approx 2$

$2 \times 3 = 6$

$6

b. What is the exact cost of 3 pens and 1 stapler?



$$\begin{array}{r} {}^{2}\ \ {}^{2}\ \\ 7.00 \\ 1.98 \\ 1.98 \\ +\ 1.98 \\ \hline 12.94 \end{array}$$

$12.94

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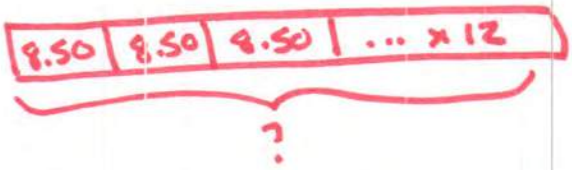
3. **A teacher wants to buy a book that costs $8.50 for each of her 12 students as an end-of-year gift.** If she has a budget of $100, will she be able to buy every student a copy of the book?



8.50 × 12 = ?

$\frac{850}{100} \times \frac{12}{1} = ?$

$\frac{10200}{100}$

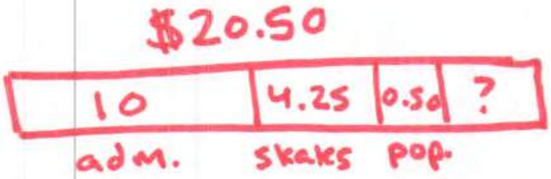
↓

$102.00

$$\begin{array}{r} 850 \\ \times\ 12 \\ \hline 1700 \\ +\ 8500 \\ \hline 10200 \end{array}$$

No, she will not be able to buy all 12 books.

4. **Leo went to the roller skating rink with $20.50. He pays $10 for admission, $4.25 for rental skates, and $0.50 for popcorn.** How much money does Leo have left?



$$\begin{array}{r} 10.00 \\ 4.25 \\ +\ 0.50 \\ \hline 14.75 \end{array}$$

$$\begin{array}{r} 20.50 \\ -\ 14.75 \\ \hline 5.75 \end{array}$$

$5.75

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G6 U4 Lesson 6

Add and subtract decimals

G6 U4 Lesson 6 - Students will add and subtract decimals

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson, we explored how we can add, subtract, and multiply with money. Today we're going to think about how we can use what we know about money to add and subtract decimals.

Let's Talk (Slide 3): In terms of addition and subtraction, **what was important to keep in mind when we worked with dollars and cents?** Possible Student Answers, Key Points:

- We had to combine or take away dollars with dollars and cents with cents.
- We had to line our decimals up.
- Note: If students say they have to "line up decimals" be sure to ask WHY that is important so students understand it helps us add/subtract like units and isn't simply a "trick."

Today, we're going to continue using that thinking to help us add and subtract decimals that don't represent money. The good thing is, all the same big ideas apply to non-money decimals.

Let's Talk (Slide 4): As we work with decimals today, I want to refresh us on a few handy math tools. First, it can be helpful to use a place value chart like this one on the slide. Not only can this help us keep our digits or models organized, but it also helps us think carefully about place value, which we know is important from when we worked with money.

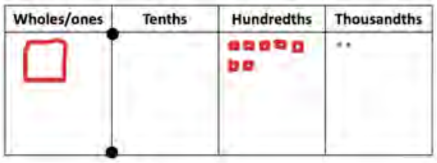
We will also draw models today for some problems to help us add and subtract. You've probably seen models that look like this starting in 4th grade. Let's refresh our brains. We can use a big square like this one to represent a one or a whole (*point to whole*). Now. if we break one whole into ten pieces, we make tenths which look like a rod (*point to tenths*). And if we keep cutting or breaking and we break a tenths rod into ten pieces, we make a small hundredths square like you see here (*point to hundredths*). And finally, if we break a hundredths square up into ten pieces, we make a tiny thousandths dot. Let's go back and review these places together. *(Start from smallest to largest, repeating the questioning below.)* How many thousandths make a hundredth? *Ten!* How many hundredths make a tenth? *Ten!* How many tenths make a whole? *Ten!*

Using these models will help us visualize our subtraction and addition today. Sometimes when we're adding and subtracting we have to regroup–we either have to take a larger group and break it up into small pieces. Like taking one whole and breaking it up into 10 tenths. Or sometimes we have to regroup by making a new group, so taking 10 tenths and making 1 whole. So, knowing that each place value is composed of ten of the place to the right of it will help us if we have to regroup. Let's dive in!

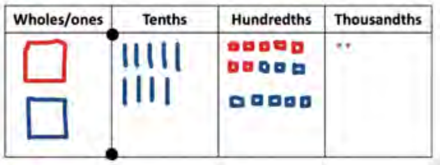
Let's Think (Slide 5): Here we see an addition and a subtraction problem involving decimals. Let's read the addition problem together, 1.072 plus 1.98. **Now, look closely at this addition problem, what do you notice?** Possible Student Answers, Key Points:

- I see a place value chart.
- Each addend has 1 one.
- One addend goes the hundredths, and one goes to the thousandths.
- It's written horizontally.

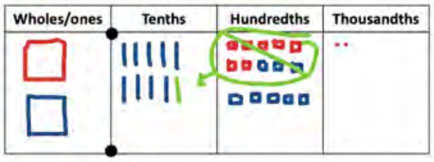
Awesome! You may know other ways to tackle this addition problem, but let's start with a visual model. We want to join 1.072 and 1.98.



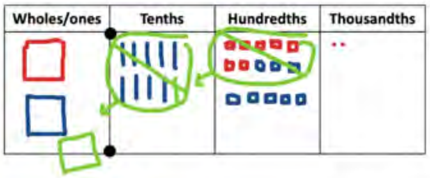
Let's start by drawing 1 whole, 0 tenths, 7 hundredths, and 2 thousandths.



Now, we want to add 1.98 to that amount. So, I need to add 1 whole/one, 9 tenths, 8 hundredths, and 0 thousandths. Now our model shows the total amount, and all we have left to do is add it altogether.



Let's go place value by place value, starting in the smallest place, the thousandths. *(Write each digit under the place value chart as you go.)* I see we have two thousandths. I see we have 15 hundredths. We can't write 15 in the hundredths place, so we have to regroup 10 hundredths and make a tenth.Now we have 5 hundredths.

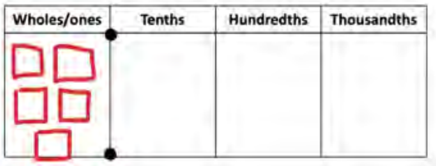


Now look at our tenths, what do you notice about our tenths? We need to regroup. We have 10 tenths. That's right, we have ten tenths, which regroups to make a whole. *(Draw that on your model)* Now we have 0 tenths and 2 wholes. Our answer is 3.052.

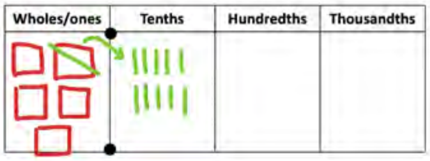
Now that model was helpful but we can also do this without a model and just solve it with the digits. If we want to add with the digits, we aligning our numbers vertically like we did with some of our money examples from last lesson. We have to be careful of how we line up each place value. We can't write it like this because the place values are not stacked. We're adding hundredths and tenths or wholes and tenths.

Let's look at a correctly aligned vertical number sentence. *(Walk through adding each place value starting in the thousandths. Some students may like drawing a place-holder zero to make 1.98 into 1.980; this makes sure every number has a "buddy" to pair with.)* Look, what we did with the digits is the same as what we did with the models. The regrouped in our number sentence show the same thing as when we regrouped ten of a unit and moved it to the next place value in our place value chart. Whether we use a model or a number sentence, we carefully add each place value and regroup when we have more than 10 of a unit.

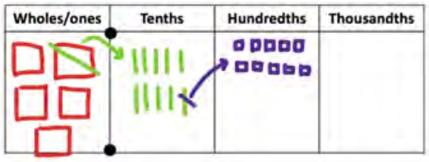
Let's Think (Slide 6): Let's look at a subtraction example, before we practice. Here we have 5 minus 2.471. We'll write this vertically in a moment, but let's think about the model first.



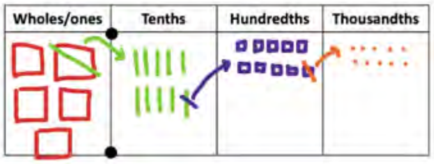
I'll start by drawing 5 wholes. Now, I am not going to draw 4.271 because I want to take that away from 5! But, I have a problem, when I start to take away the 1 thousandth from 2.471, I realize I don't have any in my place value chart. Where can I get more thousandths? The 5. You'll need to regroup from the one's place.



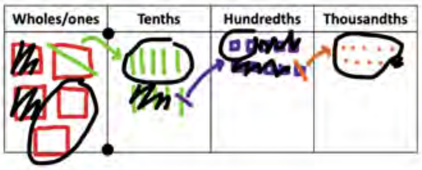
So I'm going to regroup 1 whole, which will make what? Ten tenths! Let's draw that. *(Cross out 1 whole, draw an arrow to the tenths place, then draw 10 tenths)* But I still don't have any thousandths, so let's keep regrouping.



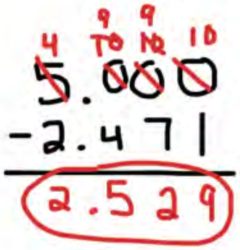
I'll regroup 1 tenth to make what? Ten hundredths! Let's draw that. *(Cross out 1 tenth, draw an arrow to the hundredths place, then draw 10 hundredths).*



We're closer, but we still don't have any thousandths to take away! So, let's regroup 1 hundredth to make what? Ten thousandths! Let's draw that. *(Cross out 1 hundredth, draw an arrow to the thousandths place, then draw 10 thousandths).* Now, let's check what we see in each place. We see, 4 wholes/ones, 9 tenths (because we regrouped 1 of them), 9 hundredths (because we regrouped 1 of them), and 10 thousandths.



Now we finally have enough to subtract. Let's take away 1 thousandth, 7 hundredths, 4 tenths, and 2 wholes.. What are we left with? 2 wholes, 5 tenths, 2 hundredths, and 9 thousandths. 2.529 is our final answer.



We know that another way we can subtract is with the vertical number sentence, let's try it. So, let's line up our place values carefully. Since 5 is a whole number, it is easiest to think of it as 5.000 so that we have a corresponding digit in each place value. We regroup from the 5, which makes 4 wholes and 10 tenths. Just like in the model, we regrouped one of those 10 tenths to make 10 hundredths. So we had 9 tenths and 10 hundredths. Then just like in the model, we regrouped one of those 10 hundredths to make 10 thousandths. This left us with 4 wholes, 9 tenths, 9 hundredths, and 10 thousandths before we subtracted.

A model is helpful because we can carefully think about what is happening with our units. The vertical number sentence is helpful because it can be more efficient. Either way, if we add or subtract like units and carefully regroup when necessary, we should arrive at our correct sum or difference.

Let's Try it (Slide 7-8): Now let's work together on adding and subtract decimals. We're going to work on this page together, step-by-step. Remember we want to pay close attention to make sure we are adding and subtracting like units. When we're adding, if we have 10 or more, we have to regroup! If we're subtracting and we don't have enough, we have to regroup! Remember, we can use models or make sure our place values are aligned to help us out!

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WARM WELCOME

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Today we will add and subtract decimals.

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Let's Talk:

In the last lesson we added and subtracted with money. What was important to keep in mind?

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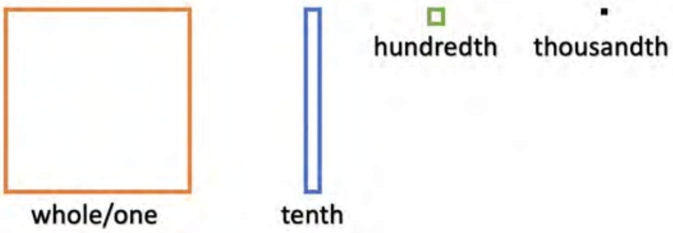
Let's Talk:

Wholes/ones	Tenths	Hundredths	Thousandths



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Let's Think:

1.072 + 1.98

Wholes/ones	Tenths	Hundredths	Thousandths

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Let's Think:

5 - 2.471

Wholes/ones	Tenths	Hundredths	Thousandths

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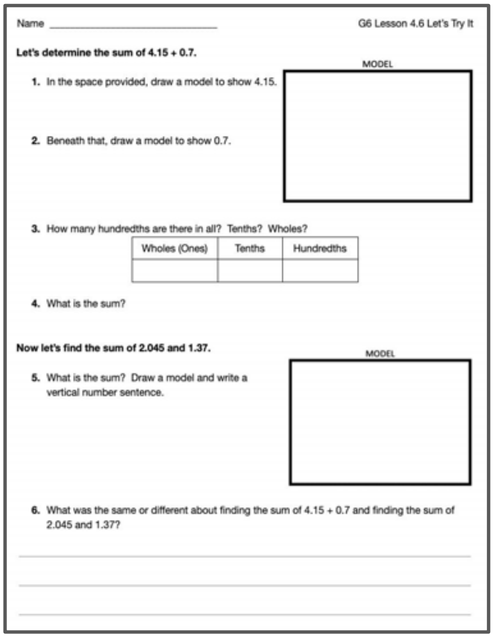
Let's Try It:



Name ____________________ G6 Lesson 4.6 Let's Try It

Let's determine the sum of 4.15 + 0.7.

MODEL

1. In the space provided, draw a model to show 4.15.
2. Beneath that, draw a model to show 0.7.
3. How many hundredths are there in all? Tenths? Wholes?

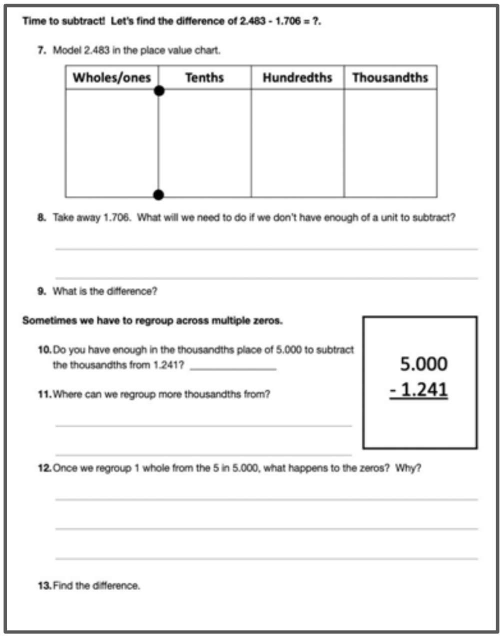
Wholes (Ones)	Tenths	Hundredths

4. What is the sum?

Now let's find the sum of 2.045 and 1.37.

MODEL

5. What is the sum? Draw a model and write a vertical number sentence.
6. What was the same or different about finding the sum of 4.15 + 0.7 and finding the sum of 2.045 and 1.37?



Time to subtract! Let's find the difference of 2.483 - 1.706 = ?.

7. Model 2.483 in the place value chart.

Wholes/ones	Tenths	Hundredths	Thousandths

8. Take away 1.706. What will we need to do if we don't have enough of a unit to subtract?
9. What is the difference?

Sometimes we have to regroup across multiple zeros.

10. Do you have enough in the thousandths place of 5.000 to subtract the thousandths from 1.241? __________
11. Where can we regroup more thousandths from?

$$\begin{array}{r} 5.000 \\ \underline{-\ 1.241} \end{array}$$

12. Once we regroup 1 whole from the 5 in 5.000, what happens to the zeros? Why?
13. Find the difference.

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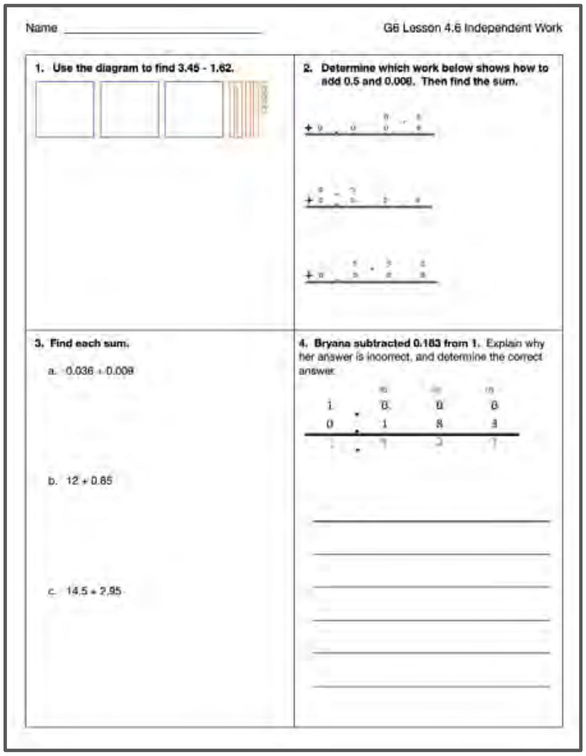
On your Own:



Name ____________________ G6 Lesson 4.6 Independent Work

1. **Use the diagram to find 3.45 - 1.62.**
2. **Determine which work below shows how to add 0.5 and 0.008. Then find the sum.**
3. **Find each sum.**
   a. 0.036 + 0.009
   b. 12 + 0.85
   c. 14.5 + 2.95
4. **Bryana subtracted 0.183 from 1.** Explain why her answer is incorrect, and determine the correct answer.

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Name ______________________________

Let's determine the sum of 4.15 + 0.7.

MODEL

1. In the space provided, draw a model to show 4.15.

2. Beneath that, draw a model to show 0.7.

3. How many hundredths are there in all? Tenths? Wholes?

Wholes (Ones)	Tenths	Hundredths

4. What is the sum?

Now let's find the sum of 2.045 and 1.37.

MODEL

5. What is the sum? Draw a model and write a vertical number sentence.

6. What was the same or different about finding the sum of 4.15 + 0.7 and finding the sum of 2.045 and 1.37?

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Time to subtract! Let's find the difference of 2.483 - 1.706 = ?.

7. Model 2.483 in the place value chart.

Wholes/ones	Tenths	Hundredths	Thousandths

8. Take away 1.706. What will we need to do if we don't have enough of a unit to subtract?

9. What is the difference?

Sometimes we have to regroup across multiple zeros.

10. Do you have enough in the thousandths place of 5.000 to subtract the thousandths from 1.241? ________________

11. Where can we regroup more thousandths from?

$$\begin{array}{r} 5.000 \\ \underline{-\ 1.241} \end{array}$$

12. Once we regroup 1 whole from the 5 in 5.000, what happens to the zeros? Why?

13. Find the difference.

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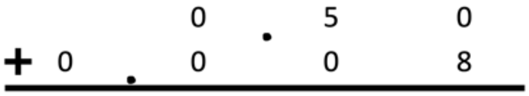
Name ________________________________

1. Use the diagram to find 3.45 - 1.62.

2. Determine which work below shows how to add 0.5 and 0.008. Then find the sum.



3. Subtract. Draw a model and show your work with digits.

1 - 0.04 = ?

Wholes/ones	Tenths	Hundredths	Thousandths

4. Add. Draw a model and show your work with digits.

1.5 + 0.947

Wholes/ones	Tenths	Hundredths	Thousandths

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5. Find each sum.

a. 0.036 + 0.009

b. 12 + 0.85

c. 14.5 + 2.95

6. Bryana subtracted 0.183 from 1. Explain why her answer is incorrect, and determine the correct answer.

$$\begin{array}{ccccc} 1 & . & \overset{10}{\cancel{0}} & \overset{10}{\cancel{0}} & \overset{10}{\cancel{0}} \\ 0 & . & 1 & 8 & 3 \\ \hline 1 & . & 9 & 2 & 7 \end{array}$$

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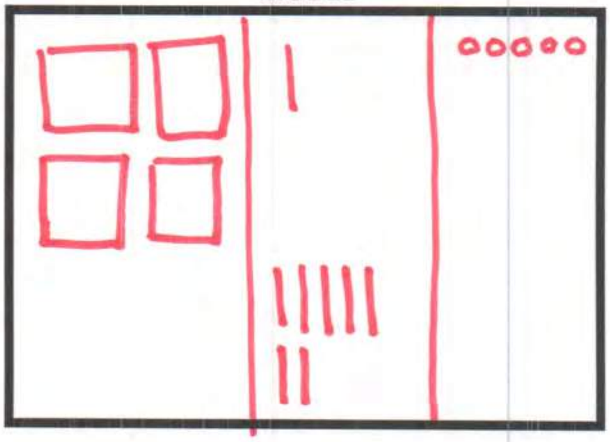
Name KEY

Let's determine the sum of 4.15 + 0.7.

1. In the space provided, draw a model to show 4.15. →

2. Beneath that, draw a model to show 0.7. →

MODEL



3. How many hundredths are there in all? Tenths? Wholes?

Wholes (Ones)	Tenths	Hundredths
4	8	5

4. What is the sum?

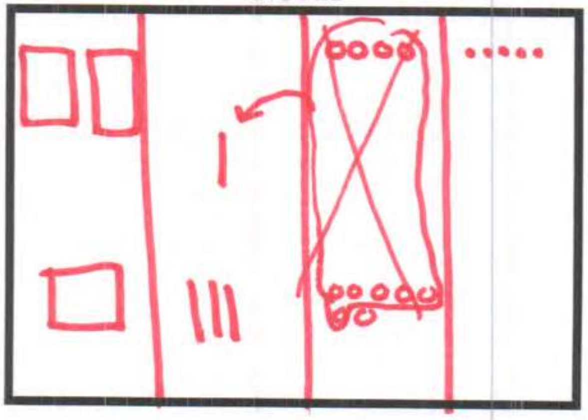
4.85

Now let's find the sum of 2.045 and 1.37.

5. What is the sum? Draw a model and write a vertical number sentence.

$$\begin{array}{r} 2.\overset{1}{0}45 \\ +\ 1.37 \\ \hline \boxed{3.415} \end{array}$$

MODEL

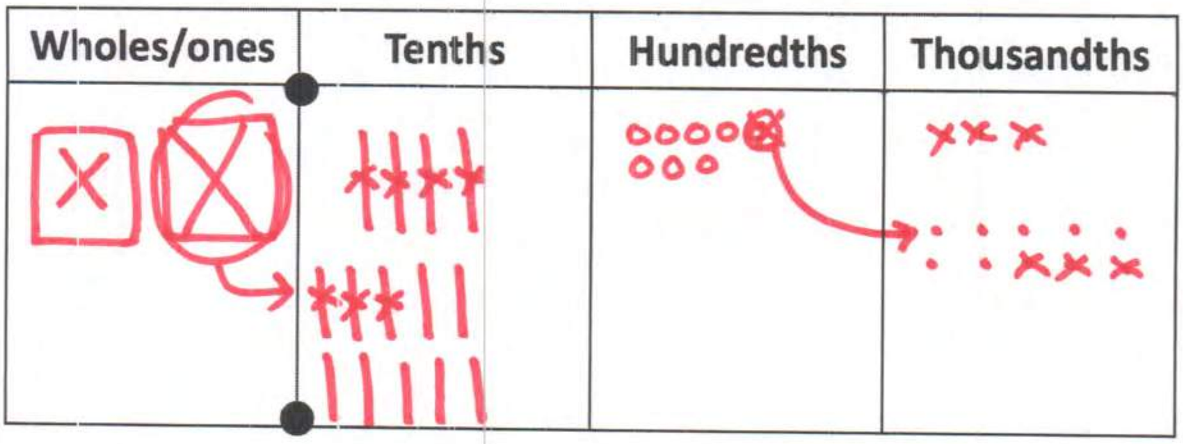


6. What was the same or different about finding the sum of 4.15 + 0.7 and finding the sum of 2.045 and 1.37?

We added like place values in both. The second expression had more place values to work with and required us to regroup.

Time to subtract! Let's find the difference of 2.483 - 1.706 = ?.

7. Model 2.483 in the place value chart.



8. Take away 1.706. What will we need to do if we don't have enough of a unit to subtract?

We will regroup 1 from the next place value to make 10 of our unit.

9. What is the difference?

0.777

Sometimes we have to regroup across multiple zeros.

10. Do you have enough in the thousandths place of 5.000 to subtract the thousandths from 1.241? NO

11. Where can we regroup more thousandths from?

We'll need to look all the way left to the 5 ones.

$$\begin{array}{r} \overset{4}{\cancel{5}}.\overset{9}{\cancel{\overset{10}{0}}}\overset{9}{\cancel{\overset{10}{0}}}\overset{10}{\cancel{0}} \\ -\,1.241 \\ \hline 3.759 \end{array}$$

12. Once we regroup 1 whole from the 5 in 5.000, what happens to the zeros? Why?

The 0 tenths is now 10 tenths. We borrow one tenth to make 9 tenths and 10 hundredths. Then we regroup 1 hundredth to make 10 thousandths and 9 hundredths.

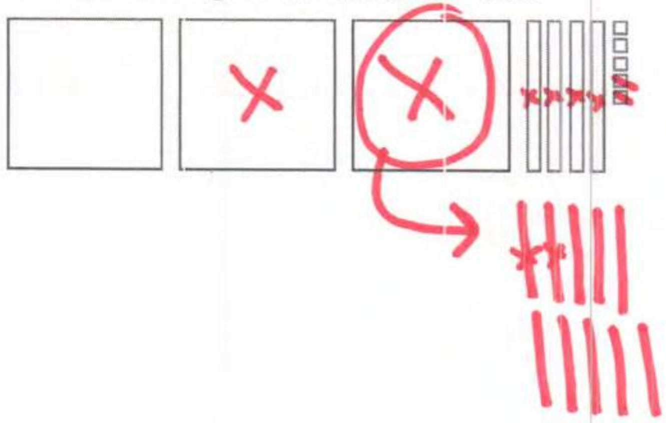
13. Find the difference.

3.759

Name KEY

G6 Lesson 4.6 Independent Work

1. **Use the diagram to find 3.45 - 1.62.**



1.83

2. **Determine which work below shows how to add 0.5 and 0.008. Then find the sum.**

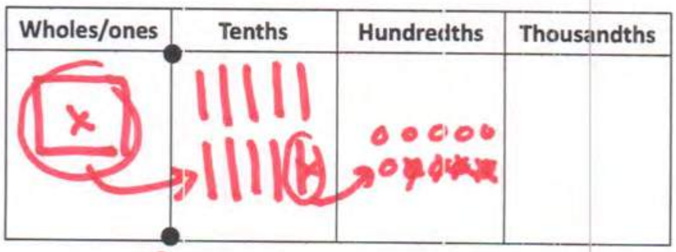
$$\begin{array}{ccccccc} & & & & 0 & . & 5 \\ + & 0 & . & 0 & 0 & & 8 \\ \hline \end{array}$$

$$\begin{array}{ccccc} & 0 & . & 5 & & \\ + & 0 & . & 0 & 0 & 8 \\ \hline & 0 & . & 5 & 0 & 8 \end{array}$$

$$\begin{array}{cccccccc} & & & 0 & . & 5 & 0 \\ + & 0 & . & 0 & & 0 & 8 \\ \hline \end{array}$$

3. **Subtract. Draw a model and show your work with digits.**

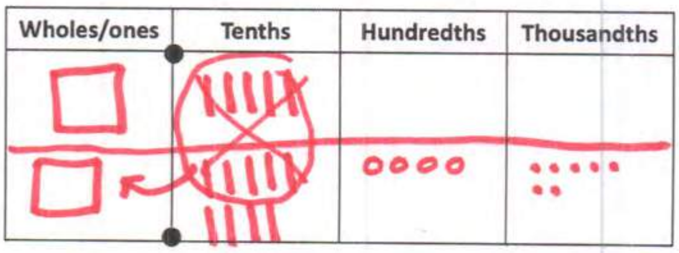
1 - ~~2~~0.04 = ?



$$\begin{array}{r} \overset{0}{\cancel{1}}.\overset{9}{\cancel{\overset{10}{0}}}\overset{10}{\cancel{0}} \\ -0.04 \\ \hline 0.96 \end{array}$$

4. **Add. Draw a model and show your work with digits.**

1.5 + 0.947



$$\begin{array}{r} 1.500 \\ +0.947 \\ \hline 1.447 \end{array}$$

5. Find each sum.

a. 0.036 + 0.009

$$\begin{array}{r@{}c@{}c@{}c@{}c@{}c} & & & & 1 & \\ & 0 & . & 0 & 3 & 6 \\ + & 0 & . & 0 & 0 & 9 \\ \hline & \boxed{0} & . & 0 & 4 & 5 \end{array}$$

b. 12 + 0.85

$$\begin{array}{r@{}c@{}c@{}c@{}c@{}c} & 1 & 2 & . & 0 & 0 \\ + & & 0 & . & 8 & 5 \\ \hline & \boxed{1} & 2 & . & 8 & 5 \end{array}$$

c. 14.5 + 2.95

$$\begin{array}{r@{}c@{}c@{}c@{}c@{}c} & & 1 & & & \\ & 1 & 4 & . & 5 & 0 \\ + & & 2 & . & 9 & 5 \\ \hline & \boxed{1} & 7 & . & 4 & 5 \end{array}$$

6. Bryana subtracted 0.183 from 1. Explain why her answer is incorrect, and determine the correct answer.

$$\begin{array}{cccccc} & & 10 & 10 & 10 \\ 1 & . & \cancel{0} & \cancel{0} & \cancel{0} \\ 0 & . & 1 & 8 & 3 \\ \hline 1 & . & 9 & 2 & 7 \end{array}$$

$$\begin{array}{r@{}c@{}c@{}c@{}c@{}c} & & & 9 & 9 & \\ & 0 & & \cancel{10} & \cancel{10} & 10 \\ & \cancel{1} & . & \cancel{0} & \cancel{0} & \cancel{0} \\ - & 0 & . & 1 & 8 & 3 \\ \hline & \boxed{0} & . & 8 & 1 & 7 \end{array}$$

The correct answer is 0.817. She just made each 0 in 1.000 into 10 without regrouping from the 1 whole, then the 10 tenths and 10 hundredths.

G6 U4 Lesson 7

Solve problems involving decimals

CITYTUTOR DC

G6 U4 Lesson 7 - Students will solve problems involving decimals

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working with decimals for a few lessons now. We added, subtracted, and multiplied within the context of money, and we also had some practice with decimals that weren't within the context of money. Today we're going to bring some of that work together and work with decimals in a variety of ways.

Let's Talk (Slide 3): Based on our previous lessons, **what's important to keep in mind when we add, subtract, or multiply with decimals?** Feel free to use any of the numbers shown here as an example, if that helps. Possible Student Answers, Key Points:

- We have to add or subtract like units. Ones with ones, tenths with tenths, hundredths with hundredths.
- We can stack each place value vertically to help us add/subtract like units.
- When we multiply, we have to keep track of the place value of our factors. We can write our decimal factors as fractions out of 10, 100, or 1000 to help us.
- We can fill in (or annex) zeros to decimals to help us see each necessary place value. Doing this helps us line up each place value. We need to be careful not to change the place value of any other digit when annexing zeros.

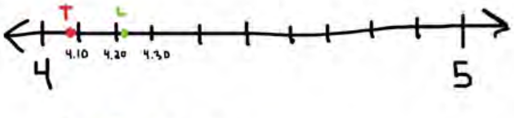
Those are all really important! As we work today, keep all this in mind. And since we're going to see a mixture of problem types today, if we're ever not sure how to solve a problem, we can use a model and/or estimation to help us make sense of the story. Let's jump right in!

Let's Think (Slide 4): Let's read this together, "Three friends measured how far they could throw their paper airplanes." And now it looks like there is a lot of information in the table. **Before we answer some questions, what do you notice or wonder about this story and the table?** Possible Student Answers, Key Points:

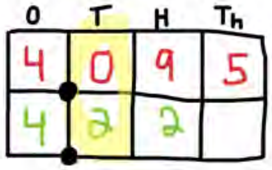
- Jada's plan flew a whole number of meters. It flew the farthest. I wonder how she designed it.
- Terrell and Lucy's planes flew about the same amount. I wonder if their designs looked similar.

We're going to use this information to answer a few different questions using our decimal operation strategies we just reviewed. Let's read this together, "Did Terrell or Lucy's plane fly the greatest distance? By how much?" Okay well, this question is asking us to compare Terrell's distance and Lucy's distance. **Who do you think went farther, and why?** Possible Student Answers, Key Points:

- Lucy's plane went farther, because 4.22 is a bigger number. They're both 4 meters, but Lucy's distance shows 2 tenths while Terrell's shows 0 tenths.
- POSSIBLE INCORRECT ANSWER: Terrell's plane went farther because 95 is bigger than 22.



Lucy's plane went farther. We can think of this a couple ways. If we picture a number line between 4 and 5 *(sketch number line)* and estimate where each plane landed, I can see that Terrell's plane landed a bit before 4.10 and Lucy's was a bit past 4.22.



We could also just think about the value of the digits in each distance *(draw place value chart)*. Lucy's distance is greater because 2 tenths is greater than 0 tenths.

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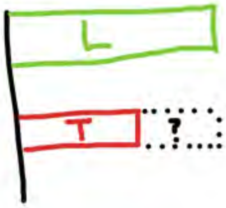
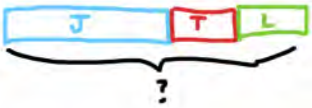


But look, the question also wants to know **exactly** how much farther Lucy's plane went than Terrell's plane. Let's work together to sketch a bar model or tape diagram to picture what is being asked. So, we know that Lucy's plane went 4.22 meters and Terrell's went 4.095, so Lucy's bar is going to be longer than Terrells–since her plane went further! Hmm, so if we want to find exactly how much longer Lucy's plane flew than Terrell's, we can subtract to find the difference.

$$\begin{array}{r} 4.\overset{1}{\cancel{2}}\overset{11}{\cancel{2}}\overset{10}{\cancel{0}} \\ -4.095 \\ \hline \boxed{0.125\text{m}} \end{array}$$

We could draw a model to show place value or use a vertical number sentence. Let's try a vertical number sentence, since they tend to be more efficient. Line up each digit so we are subtracting like place values. We've done this before, so you talk me through what you would do, and I'll scribe *(write while student shares)*. And if we were estimating, our answer makes sense. Each plane flew about 4 meters, so 4 - 4 means our answer should be close to 0, and it is!

Let's Think (Slide 5): Let's look at the next question. It says, "What was the combined distance of all three planes?" Let's stop and think, what is this question asking us? It's asking about the TOTAL distance.

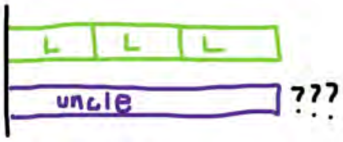


So we have to combine all three. We want to know the distance of Jada's plane AND Terrell's plane AND Lucy's plane. So, wow, let's draw a model to represent it. We're going to put Jada's distance together with Terrell's distance together with Lucy's distance. I'm labeling all of their distances with the first letter of their names.

$$\begin{array}{r} 8.\overset{1}{0}00 \\ 4.095 \\ +4.220 \\ \hline \boxed{16.315\text{m}} \end{array}$$

I see that this question is definitely different than the last one even though we're using a lot of the same information. Let's think of a reasonable estimate for the total…Lucy and Terrell each have a distance of about 4 and 4 and 4 makes 8 and then 8 more for Jada's distance, so 8 + 4 + 4…our answer should be about 16 meters. Let's add and see. Again, you talk me through the math, and I'll be your scribe. Awesome! And that sum is close to our estimate from earlier.

Let's Think (Slide 6): Okay and we have one more question, let's read it, "Lucy's uncle made a plane that flew three times as far as Lucy's plane. How far did Lucy's uncle's plan fly?" This one tells us that Lucy's uncle, who is not in the chart, flew a plane three times as far as Lucy.



Here's one way to picture what is happening in the story. Looking at this model, I see we could either add 4.22 three times OR use multiplication. Let's practice multiplying. What is a reasonable estimate? If we estimate, we're thinking the answer should be about 12 meters. Because 4 x 3 = 12.

$$4.22 \times 3 = ?$$

$$\frac{422}{100} \times \frac{3}{1} = \frac{1266}{100}$$

$$12.66\text{ m}$$

Now, when we calculate the exact answer, 4.22 x 3 can be written as 422/100 x 3/1. When I multiply 422 x 3, I get 1266 in my numerator. That answer is not reasonable; I have to think about my place value. 100 x 1 gives me a denominator of 100. So 1266/100 can be written as 12.66 meters.

Nice work! You just used the same set of information to answer lots of different types of questions.

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Let's Try it (Slide 7-8): Now let's work together to solve problems involving decimals. We're going to work on this page together, step-by-step. Remember we want to pay close attention to the place value of each digit as we work, and we can always use a drawing and estimation to help make sure our answers make sense.

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WARM WELCOME

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Today we will solve problems involving decimals.

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Let's Talk:

What's important to keep in mind when we add, subtract, or multiply with decimals?

7.2

$4.59

9.09

6.000

$0.50

.001

1

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Let's Think:

Three friends measured how far they could throw their paper airplanes.

STUDENT	DISTANCE (m)
Jada	8
Terrell	4.095
Lucy	4.22

Did Terrell or Lucy's plane fly the greatest distance? By how much?

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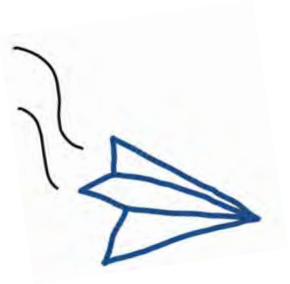
Let's Think:

Three friends measured how far they could throw their paper airplanes.

STUDENT	DISTANCE (m)
Jada	8
Terrell	4.095
Lucy	4.22

What was the combined distance of all three planes?



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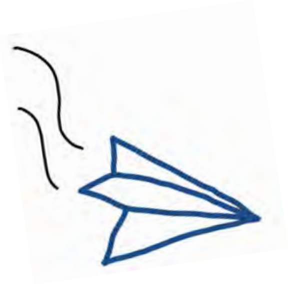
Let's Think:

Three friends measured how far they could throw their paper airplanes.

STUDENT	DISTANCE (m)
Jada	8
Terrell	4.095
Lucy	4.22

Lucy's uncle made a plane that flew *three times* as far as Lucy's plane. How far did Lucy's uncle's plane fly?



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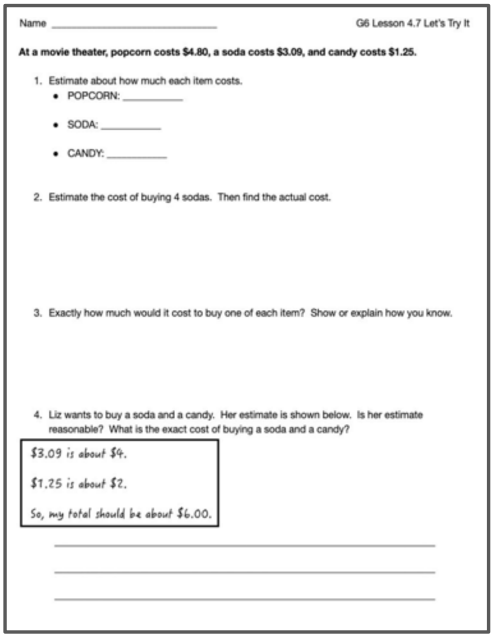
Let's Try It:

Let's solve problems involving decimals!



Name ______________________________

G6 Lesson 4.7 Let's Try It

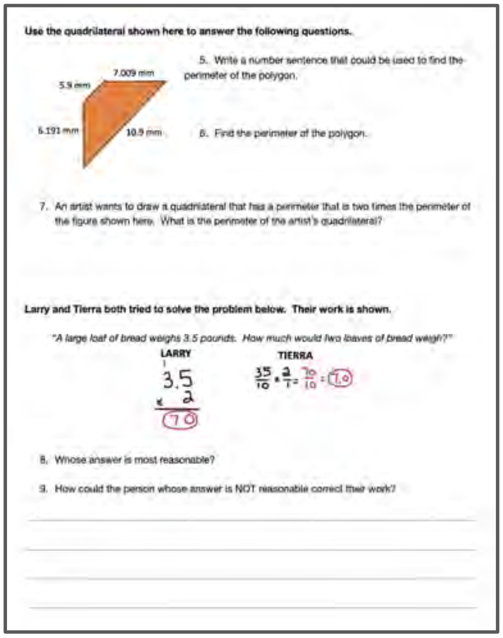
At a movie theater, popcorn costs $4.80, a soda costs $3.09, and candy costs $1.25.

1. Estimate about how much each item costs.
   - POPCORN: __________
   - SODA: __________
   - CANDY: __________
2. Estimate the cost of buying 4 sodas. Then find the actual cost.
3. Exactly how much would it cost to buy one of each item? Show or explain how you know.
4. Liz wants to buy a soda and a candy. Her estimate is shown below. Is her estimate reasonable? What is the exact cost of buying a soda and a candy?

$3.09 is about $4.

$1.25 is about $2.

So, my total should be about $6.00.



Use the quadrilateral shown here to answer the following questions.

5. Write a number sentence that could be used to find the perimeter of the polygon.
6. Find the perimeter of the polygon.
7. An artist wants to draw a quadrilateral that has a perimeter that is two times the perimeter of the figure shown here. What is the perimeter of the artist's quadrilateral?

Larry and Tierra both tried to solve the problem below. Their work is shown.

"A large loaf of bread weighs 3.5 pounds. How much would two loaves of bread weigh?"

LARRY

$$\begin{array}{r} 3.5 \\ \times\ 2 \\ \hline \boxed{70} \end{array}$$

TIERRA

$$\frac{35}{10} \cdot \frac{2}{1} = \frac{70}{10} = \boxed{7.0}$$

8. Whose answer is most reasonable?
9. How could the person whose answer is NOT reasonable correct their work?

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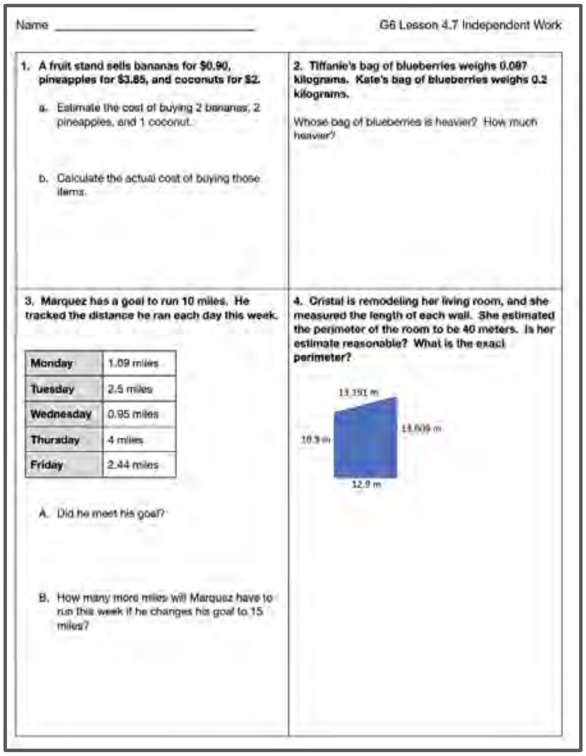
On your Own:



Name ______________________________

G6 Lesson 4.7 Independent Work

1. A fruit stand sells bananas for $0.90, pineapples for $3.85, and coconuts for $2.

a. Estimate the cost of buying 2 bananas, 2 pineapples, and 1 coconut.

b. Calculate the actual cost of buying those items.

2. Tiffanie's bag of blueberries weighs 0.097 kilograms. Kate's bag of blueberries weighs 0.2 kilograms.

Whose bag of blueberries is heavier? How much heavier?

3. Marquez has a goal to run 10 miles. He tracked the distance he ran each day this week.

Monday	1.09 miles
Tuesday	2.5 miles
Wednesday	0.95 miles
Thursday	4 miles
Friday	2.44 miles

A. Did he meet his goal?

B. How many more miles will Marquez have to run this week if he changes his goal to 15 miles?

4. Cristal is remodeling her living room, and she measured the length of each wall. She estimated the perimeter of the room to be 40 meters. Is her estimate reasonable? What is the exact perimeter?

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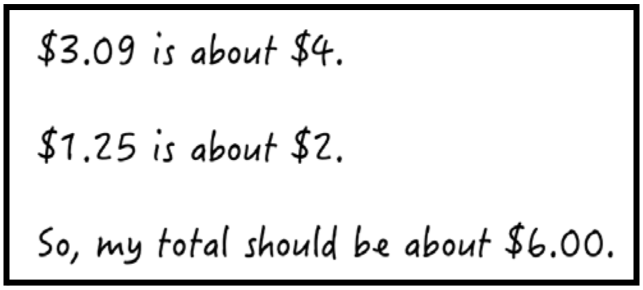
Name ______________________________ G6 U4 Lesson 7- Let's Try It

At a movie theater, popcorn costs $4.80, a soda costs $3.09, and candy costs $1.25.

1. Estimate about how much each item costs.
   - POPCORN: ___________
   - SODA: ___________
   - CANDY: ___________
2. Estimate the cost of buying 4 sodas. Then find the actual cost.
3. Exactly how much would it cost to buy one of each item? Show or explain how you know.
4. Liz wants to buy a soda and a candy. Her estimate is shown below. Is her estimate reasonable? What is the exact cost of buying a soda and a candy?



$3.09 is about $4.

$1.25 is about $2.

So, my total should be about $6.00.

____

____

____

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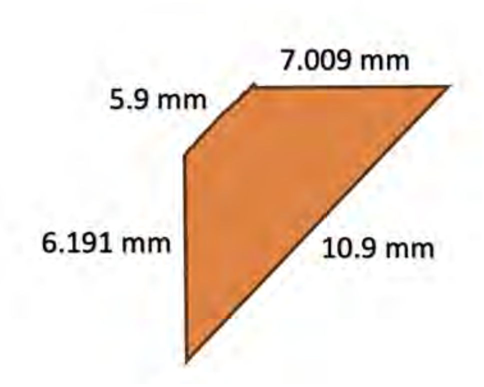
Use the quadrilateral shown here to answer the following questions.



5. Write a number sentence that could be used to find the perimeter of the polygon.

6. Find the perimeter of the polygon.

7. An artist wants to draw a quadrilateral that has a perimeter that is two times the perimeter of the figure shown here. What is the perimeter of the artist's quadrilateral?

Larry and Tierra both tried to solve the problem below. Their work is shown.

"A large loaf of bread weighs 3.5 pounds. How much would two loaves of bread weigh?"

LARRY

$$\begin{array}{r} {}^{1} \\ 3.5 \\ \times\quad 2 \\ \hline \boxed{70} \end{array}$$

TIERRA

$$\frac{35}{10} \times \frac{2}{1} = \frac{70}{10} = \boxed{7.0}$$

8. Whose answer is most reasonable?

9. How could the person whose answer is NOT reasonable correct their work?

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1. A fruit stand sells bananas for $0.90, pineapples for $3.85, and coconuts for $2. a. Estimate the cost of buying 2 bananas, 2 pineapples, and 1 coconut. b. Calculate the actual cost of buying those items.	**2. Tiffanie's bag of blueberries weighs 0.087 kilograms. Kate's bag of blueberries weighs 0.2 kilograms.** Whose bag of blueberries is heavier? How much heavier?

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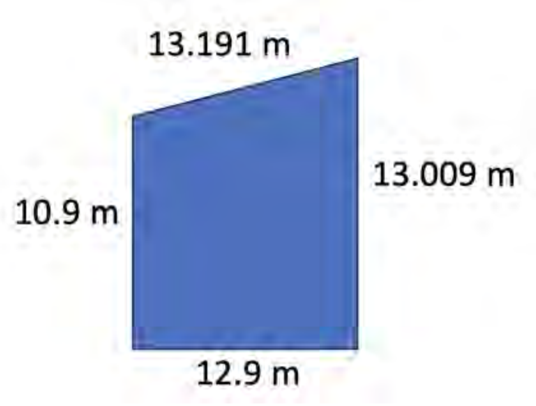
3. Marquez has a goal to run 10 miles. He tracked the distance he ran each day this week.

Monday	1.09 miles
Tuesday	2.5 miles
Wednesday	0.95 miles
Thursday	4 miles
Friday	2.44 miles

A. Did he meet his goal?

B. How many more miles will Marquez have to run this week if he changes his goal to 15 miles?

4. Cristal is remodeling her living room, and she measured the length of each wall. She estimated the perimeter of the room to be 40 meters. Is her estimate reasonable? What is the exact perimeter?



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Name KEY

At a movie theater, popcorn costs $4.80, a soda costs $3.09, and candy costs $1.25.

1. Estimate about how much each item costs.

- POPCORN: $5
- SODA: $3
- CANDY: $1

$4.80 \approx 5$

$3.09 \approx 3$

$1.25 \approx 1$

2. Estimate the cost of buying 4 sodas. Then find the actual cost.

ESTIMATE

$\underbrace{3+3+3+3}_{\$12}$ OR 3×4 $\boxed{\$12}$

ACTUAL

$$\begin{array}{r} \overset{3}{3}.09 \\ 3.09 \\ 3.09 \\ +\ 3.09 \\ \hline 12.36 \end{array}$$

OR $\frac{309}{100} \times 3 = \frac{1236}{100}$ $\boxed{\$12.36}$

3. Exactly how much would it cost to buy one of each item? Show or explain how you know.

$\underbrace{\boxed{4.80}\boxed{3.09}\boxed{1.25}}_{?}$

$$\begin{array}{r} \overset{1}{4}.\overset{1}{8}0 \\ 3.09 \\ +\ 1.25 \\ \hline 9.14 \end{array}$$

$\boxed{\$9.14}$

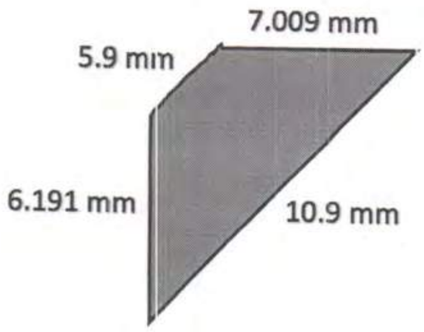
4. Liz wants to buy a soda and a candy. Her estimate is shown below. Is her estimate reasonable? What is the exact cost of buying a soda and a candy?

> $3.09 is about $4.
>
> $1.25 is about $2.
>
> So, my total should be about $6.00.

$$\begin{array}{r} 3.\overset{1}{0}9 \\ +\ 1.25 \\ \hline \boxed{\$4.34} \end{array}$$ ← exact

Her estimate is too high. $3.09 is closer to 3, and $1.25 is closer to 1. A better estimate would be about $4.

Use the quadrilateral shown here to answer the following questions.



5. Write a number sentence that could be used to find the perimeter of the polygon.

7.009 + 10.9 + 5.9 + 6.191 = ?

6. Find the perimeter of the polygon.

$$\begin{array}{r} {}^{2\,2\;\,1\,1} \\ 10.900 \\ 7.009 \\ 6.191 \\ +\;\; 5.900 \\ \hline 30.000 \end{array}$$

30 mm

7. An artist wants to draw a quadrilateral that has a perimeter that is two times the perimeter of the figure shown here. What is the perimeter of the artist's quadrilateral?

30.000 × 2 = ?

30 × 2 = 60 mm

Larry and Tierra both tried to solve the problem below. Their work is shown.

"A large loaf of bread weighs 3.5 pounds. How much would two loaves of bread weigh?"

LARRY

$$\begin{array}{r} {}^{1}\;\;\;\; \\ 3.5 \\ \times\;\;\; 2 \\ \hline 70 \end{array}$$

way too heavy! →

TIERRA

$$\frac{35}{10} \times \frac{2}{1} = \frac{70}{10} = 7.0$$

8. Whose answer is most reasonable? TIERRA

9. How could the person whose answer is NOT reasonable correct their work?

Larry forgot about his decimal in his answer.
35 × 2 is 70, but 35 tenths × 2 would
be 70 tenths or 7.0.

Name KEY

1. A fruit stand sells bananas for \$0.90, pineapples for \$3.85, and coconuts for \$2.

a. Estimate the cost of buying 2 bananas, 2 pineapples, and 1 coconut.

0.90 + 0.90 + 3.85 + 3.85 + 2

↓

1 + 1 + 4 + 4 + 2

$\bigcirc$ \$12

b. Calculate the actual cost of buying those items.

$$\begin{array}{r} {}^{3}\;\;{}^{1}\;\; \\ 0.90 \\ 0.90 \\ 3.85 \\ 3.85 \\ +\,2.00 \\ \hline 11.50 \end{array}$$

$\boxed{\$11.50}$

2. Tiffanie's bag of blueberries weighs 0.087 kilograms. Kate's bag of blueberries weighs 0.2 kilograms.

Whose bag of blueberries is heavier? How much heavier?

		0	.	0	8	7	T
		0	.	2			K

Kate's bag is heavier.

$$\begin{array}{r} {}^{1}\;{}^{\overset{9}{\cancel{10}}}\;{}^{10} \\ 0.\cancel{2}\cancel{0}\cancel{0} \\ -\,0.087 \\ \hline 0.113 \end{array}$$

It is 0.113 kg heavier.

3. Marquez has a goal to run 10 miles. He tracked the distance he ran each day this week.

Monday	1.09 miles
Tuesday	2.5 miles
Wednesday	0.95 miles
Thursday	4 miles
Friday	2.44 miles

?

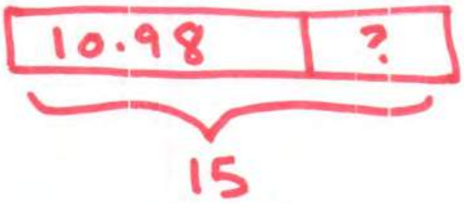
A. Did he meet his goal?

$$\begin{array}{r} 1.09 \\ 2.50 \\ 0.95 \\ 4.00 \\ +2.44 \\ \hline 10.98 \end{array}$$

miles

Yes, he did!

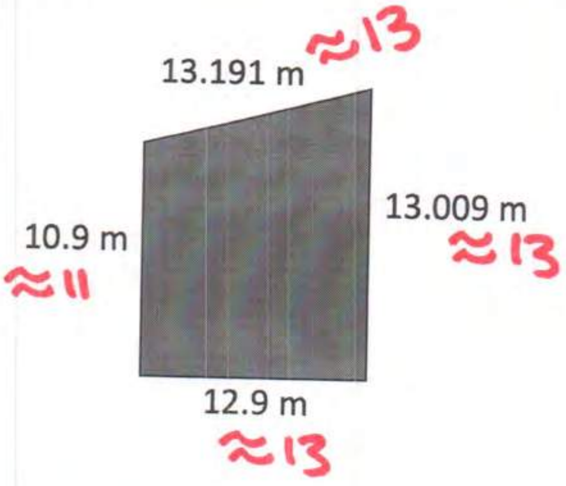
B. How many more miles will Marquez have to run this week if he changes his goal to 15 miles?



$$\begin{array}{r} 15.00 \\ -10.98 \\ \hline 4.02 \end{array}$$

4.02 miles

4. Cristal is remodeling her living room, and she measured the length of each wall. She estimated the perimeter of the room to be 40 meters. Is her estimate reasonable? What is the exact perimeter?



$$\begin{array}{r} 13 \\ 13 \\ 13 \\ +\ 11 \\ \hline 50 \end{array}$$

← my estimate

Her estimate is too low.

$$\begin{array}{r} 13.191 \\ 13.009 \\ 12.900 \\ +10.900 \\ \hline 50.000 \end{array}$$

50 m

G6 U4 Lesson 8

Use different methods to find the product of decimals

CITYTUTOR DC

G6 U4 Lesson 8 - Students will use different methods to find the product of decimals.

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working with decimals for several lessons. Today, our focus is going to be specifically on multiplying decimals. We're going to explore all the different strategies we can use to arrive at a product of two decimal numbers. By the end of our time together, you'll be able to look at a multiplication problem and decide for yourself what method makes the most sense for you.

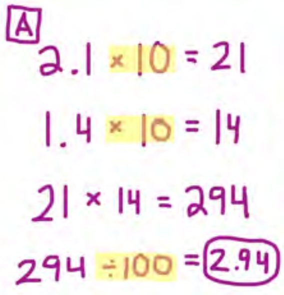
Let's Talk (Slide 3): Before we jump in ourselves, we'll take a moment to compare and contrast some methods. There are a lot of ways to think about multiplying decimals. Let's look at how three students multiplied 2.1 x 1.4. Look at these three examples. Every student showed correct work in a different way. **Do any of these strategies look familiar to you?** Possible Student Answers, Key Points:

- I multiplied by changing my decimals into fractions in 5th grade. (NOTE: This is often how students first explore decimal multiplication in 5th grade)
- Student C's work kind of looks like the multiplication algorithm.

Take a moment and look at each work sample. **What do you notice is the same? What is different?** Possible Student Answers, Key Points:

- They all use the same digits. I see 21 and 14 and 294 in all of them.
- They all have the same final answer.
- Student B used fractions.
- Student C wrote the multiplication vertically.
- Student A used friendly, or easier, numbers.
- Students A and C changed their factors so they were not decimals.

Let's Think (Slide 4): Great things to notice. I want us to look closer at each one to make sense of why every student's thinking works.

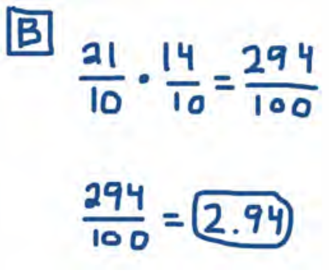


Let's start with Student A. I notice she started by changing 2.1 and 1.4 into whole numbers by multiplying each by a power of ten. 2.1 x 10 shifts each digit to make 21, and 1.4 x 10 shifts each digit to make 14. Then all she had to do was multiply 21 x 14 any way she wanted, and that got her to 294. But 294 is way too big of a product if we're only multiplying 2.1 by 1.4. If I'm estimating, 2.1 is close to 2 and 1.4 is close to 1, so our answer should be about 2 x 1. So as their last step, they divided by 100 *(highlight)* to put their answer back in decimal form. That makes sense because they multiplied one factor x10 *(highlight)* and another factor x10 *(highlight)*, so they needed to "undo" that to put their answer back in the right place value. To undo x10 and x10, they divided by 100, since 10x10 is 100. Kind of cool!

So, how would you describe Student A's strategy in your own words? Possible Student Answers, Key Points:

- They changed their factors into whole numbers by multiplying by a power of 10. Then they multiplied the whole numbers, but they had to divide by a power of 10 to put their answer back in the proper place value.
- They used a power of ten to make the numbers easier to multiply, then they turned the numbers back into decimals.

Let's Think (Slide 5): Now, let's check out Student B. This strategy might look familiar from 5th grade. It looks like they used fractions.

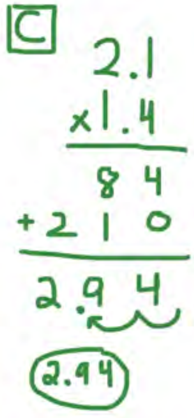


Student B wrote 2.1 as 21/10, because 2.1 is 21 in the tenths place . They then wrote 1.4 as 14/10, because 1.4 is 14 in the tenths place. Then they multiplied across their numerator and denominator to make 294/100. Lastly, they wrote 294/100 back in decimal form. 294/100 is the number 294 ending in the hundredths place, which is 2.94.

How would you describe Student B's work in your own words? Possible Student Answers, Key Points:

- They changed their factors into fractions to make them easy to multiply. They multiplied across their fractions, and then put their fraction answer back in decimal form.
- They made their numbers easier to work with by converting them to fractions.

Let's Think (Slide 5): Last but not least, check out Student C.

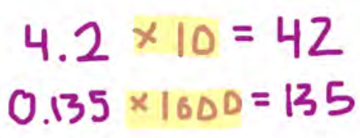


They stacked their numbers like people do when using the standard multiplication algorithm. They multiplied, remembering to annex the zero before multiplying by the second digit, and then added their partial products. **Look closely at what they did last. Why do you think they did that?** Possible Student Answers, Key Points:

- It looks like they scooped or hopped their decimal two place values in, because their first factor had 1 decimal place value and their second factor had 1 decimal place value.
- It's kind of like how Student A multiplied 21 by 14, but then had to divide by 100 to make sure the product's digits were in the proper place value.

Nice. So we saw a strategy involving converting factors to whole numbers, a strategy involving converting factors into fractions, and a strategy that looks similar to the standard algorithm with special attention to the decimal placement. Let's try out all three of these strategies for ourselves and see what methods we find most helpful.

Let's Think (Slide 7): We're going to multiply 4.2 x 0.135 using each method. Be ready to help me out.



Let's try Strategy A, where we change our decimals into whole numbers. I can start by changing 4.2 into 42. I can multiply by 10, because I only have to shift each digit one place value. I can change 0.135 into 135 by multiplying by 1,000, because I have to shift each digit three place values. I want to remember what I multiplied, or how many place values I shifted, because at the end I will need to put my answer BACK into the proper place value.

Now, let's multiply 135 x 42. We 5670.

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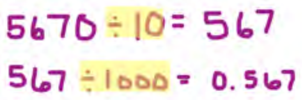
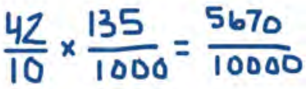
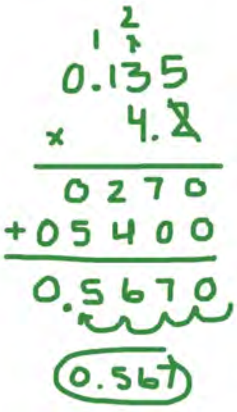


That is way too big; we were only multiplying 4.2 x 0.135, so our answer should be much smaller. So we have to divide by the powers of 10 we multiplied by earlier. If we multiplied by 10 and then by 1,000 to get friendlier numbers, we can divide by 10 and then by 1000 or we can just divide by 10,000 all at once. If we divide by 10 and then by 1000 *(write as you narrate)*, our digits shift back into place and our product is 0.567. Nicely done.



Now let's try Strategy B, where we change our decimals into fractions. What would 4.2 be as a fraction? 42/10! What would 0.135 be as a fraction? 135/1000! Cool, let's multiply across. Do we *really* need to multiply 42 by 135? No, we already did it with Strategy A. It's 5670! So multiplying across our fractions gives us 5,670 over 10,000. All we have left to do is write this in decimal form. I can think of 5670/10000 as the digits 5670 ending in the ten thousandths place, which is four place values to the right of the decimal (tenths, hundredths, thousandths, ten thousandths). Our final product is 0.5670 which is the same as what we got in Strategy A.

Ready for our final strategy? Strategy C was the one where we write our multiplication vertically. Let's set that up, even though we already know the final product *(write vertical multiplication similar to example here)*.



We're going to multiply and, in a way, kind of ignore the decimal for now. We're just multiplying the digits as if we were multiplying whole numbers *(multiply with the student's help)*. Our product looks like 05670, but we need to remember to place the decimal in our answer. I know we had three decimal place values in 0.135 and one decimal place value in 4.2, so we can shift our decimal in 4 place values *(show with arrow)*. **Why does shifting the decimal four times make sense in this problem?** Possible Student Answers, Key Points:

- It's like in Strategy A when we ended up with 5670, but divided by 100 and by 10 to put our answer back in the correct place value.
- It's like in Strategy B when we had 5670/10000, but needed to write it in decimal form.
- If I multiply thousandths by tenths, my answer should be in the ten-thousandths place.

We just practiced each strategy and saw that a lot of the multiplication of digits feels similar, but how we represent our factors in each method varies somewhat. What strategies do you most connect with and why?

Let's Try it (Slide 8-9): Now let's work together to use different methods to find the product of decimals. Whether we rewrite our decimals as fractions, rewrite our decimals as whole numbers, or multiply our numbers vertically similar to the standard algorithm, we want to keep a close eye on the place value of our products. Estimation can come in handy before and after multiplying to help make sure our products are reasonable.

WARM WELCOME

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Today we will use different methods to find the product of decimals.

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Let's Talk:

There are a lot of ways to think about multiplying decimals. Let's look at how three students multiplied 2.1 x 1.4.

A

$2.1 \times 10 = 21$

$1.4 \times 10 = 14$

$21 \times 14 = 294$

$294 \div 100 = \boxed{2.94}$

B

$\frac{21}{10} \cdot \frac{14}{10} = \frac{294}{100}$

$\frac{294}{100} = \boxed{2.94}$

C

$$\begin{array}{r} 2.1 \\ \times 1.4 \\ \hline 84 \\ +210 \\ \hline 2.\underbrace{94} \end{array}$$

$\boxed{2.94}$

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Let's Think:

Let's look closely at how this student solved.

A

$2.1 \times 10 = 21$

$1.4 \times 10 = 14$

$21 \times 14 = 294$

$294 \div 100 = \boxed{2.94}$

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Let's Think:

Let's look closely at how this student solved.

B

$$\frac{21}{10} \cdot \frac{14}{10} = \frac{294}{100}$$

$$\frac{294}{100} = \boxed{2.94}$$

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Let's Think:

Let's look closely at how this student solved.

C

$$\begin{array}{r} 2.1 \\ \times 1.4 \\ \hline 84 \\ +210 \\ \hline 2.94 \end{array}$$

$$\boxed{2.94}$$

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Let’s Think:

Let’s try each strategy!

Let’s try Strategy A…

(4.2)(0.135)

Let’s try Strategy B…

(4.2)(0.135)

Let’s try Strategy C…

(4.2)(0.135)

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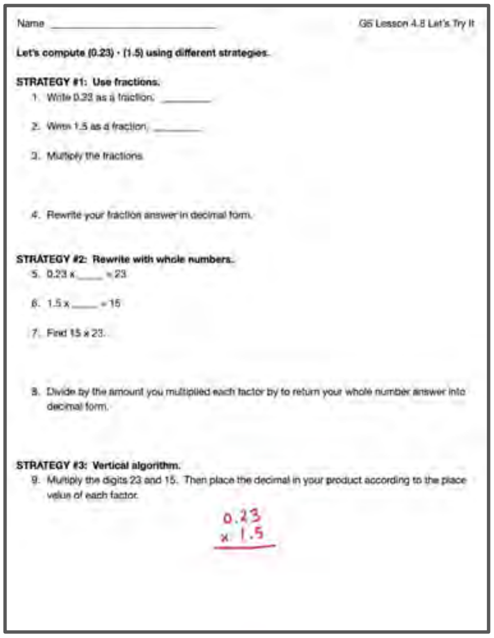
Let’s Try It:

Let’s use different methods to find the product of decimals!



Name ______________________________ G5 Lesson 4.8 Let's Try It

Let's compute (0.23) · (1.5) using different strategies.

STRATEGY #1: Use fractions.

1. Write 0.23 as a fraction. ________
2. Write 1.5 as a fraction. ________
3. Multiply the fractions.
4. Rewrite your fraction answer in decimal form.

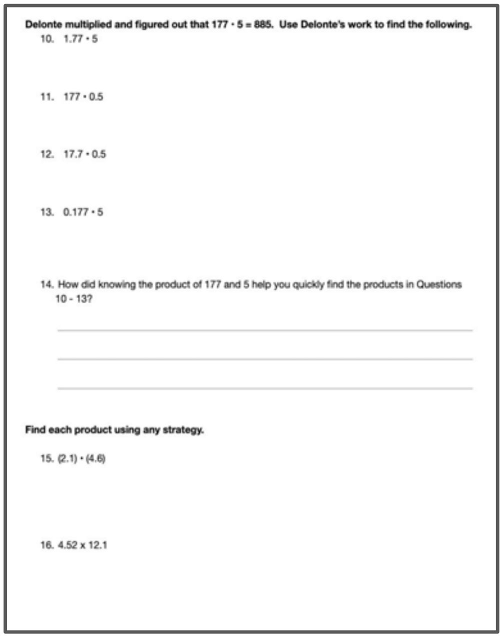
STRATEGY #2: Rewrite with whole numbers.

5. 0.23 x _____ = 23
6. 1.5 x _____ = 15
7. Find 15 x 23.
8. Divide by the amount you multiplied each factor by to return your whole number answer into decimal form.

STRATEGY #3: Vertical algorithm.

9. Multiply the digits 23 and 15. Then place the decimal in your product according to the place value of each factor.

$$\begin{array}{r} 0.23 \\ \times\ 1.5 \\ \hline \end{array}$$



Delonte multiplied and figured out that 177 · 5 = 885. Use Delonte's work to find the following.

10. 1.77 · 5
11. 177 · 0.5
12. 17.7 · 0.5
13. 0.177 · 5
14. How did knowing the product of 177 and 5 help you quickly find the products in Questions 10 - 13?

Find each product using any strategy.

15. (2.1) · (4.6)
16. 4.52 x 12.1

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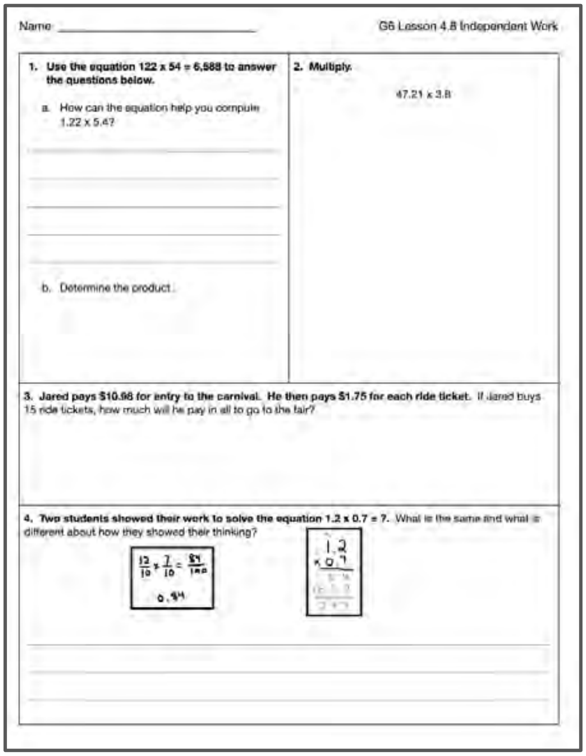
On your Own:



Name: ____________________

G6 Lesson 4.8 Independent Work

1. Use the equation 122 x 54 = 6,588 to answer the questions below.

a. How can the equation help you compute 1.22 x 5.4?

b. Determine the product.

2. Multiply.

47.21 x 3.8

3. Jared pays $10.98 for entry to the carnival. He then pays $1.75 for each ride ticket. If Jared buys 15 ride tickets, how much will he pay in all to go to the fair?

4. Two students showed their work to solve the equation 1.2 x 0.7 = ?. What is the same and what is different about how they showed their thinking?

$\frac{12}{10} \times \frac{7}{10} = \frac{84}{100}$

0.84

1.2
x 0.7

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Name ________________________________ G6 U4 Lesson 8 - Let's Try It

Let's compute (0.23) • (1.5) using different strategies.

STRATEGY #1: Use fractions.

1. Write 0.23 as a fraction. __________
2. Write 1.5 as a fraction. __________
3. Multiply the fractions.
4. Rewrite your fraction answer in decimal form.

STRATEGY #2: Rewrite with whole numbers.

5. 0.23 x _____ = 23
6. 1.5 x _____ = 15
7. Find 15 x 23.
8. Divide by the amount you multiplied each factor by to return your whole number answer into decimal form.

STRATEGY #3: Vertical algorithm.

9. Multiply the digits 23 and 15. Then place the decimal in your product according to the place value of each factor.

$$\begin{array}{r} 0.23 \\ \times\ 1.5 \\ \hline \end{array}$$

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Delonte multiplied and figured out that 177 • 5 = 885. Use Delonte's work to find the following.

10. 1.77 • 5

11. 177 • 0.5

12. 17.7 • 0.5

13. 0.177 • 5

14. How did knowing the product of 177 and 5 help you quickly find the products in Questions 10 - 13?

____

____

____

Find each product using any strategy.

15. (2.1) • (4.6)

16. 4.52 x 12.1

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Name ______________________________

1. **Use the equation 122 x 54 = 6,588 to answer the questions below.**

   a. How can the equation help you compute 1.22 x 5.4?

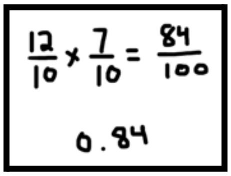
   b. Determine the product.

2. **Multiply.**

   47.21 x 3.8

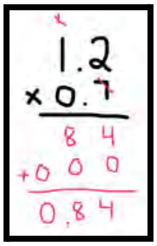
3. **Jared pays $10.98 for entry to the carnival. He then pays $1.75 for each ride ticket.** If Jared buys 15 ride tickets, how much will he pay in all to go to the fair?

4. **Two students showed their work to solve the equation 1.2 x 0.7 = ?.** What is the same and what is different about how they showed their thinking?



$$\frac{12}{10} \times \frac{7}{10} = \frac{84}{100}$$

0.84



$$\begin{array}{r} 1.2 \\ \times\ 0.7 \\ \hline 84 \\ +000 \\ \hline 0.84 \end{array}$$

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Name KEY

Let's compute (0.23) · (1.5) using different strategies.

STRATEGY #1: Use fractions.

1. Write 0.23 as a fraction. $\frac{23}{100}$

2. Write 1.5 as a fraction. $\frac{15}{10}$

3. Multiply the fractions.

$$\frac{23}{100} \times \frac{15}{10} = \frac{345}{1000}$$

$$\begin{array}{r} {}^{1}23 \\ \times 15 \\ \hline 115 \\ 230 \\ \hline 345 \end{array}$$

4. Rewrite your fraction answer in decimal form.

$\boxed{0.345}$

STRATEGY #2: Rewrite with whole numbers.

5. 0.23 x 100 = 23

6. 1.5 x 10 = 15

7. Find 15 x 23.

345

8. Divide by the amount you multiplied each factor by to return your whole number answer into decimal form.

$345 \div 1000 = 0.345$

↖ digits shift 3 place values

STRATEGY #3: Vertical algorithm.

9. Multiply the digits 23 and 15. Then place the decimal in your product according to the place value of each factor.

$$\begin{array}{r} 0.23 \\ \times\ 1.5 \\ \hline 115 \\ 0230 \\ \hline 0.345 \end{array}$$

$\boxed{0.345}$

Delonte multiplied and figured out that 177 • 5 = 885. Use Delonte's work to find the following.

10. 1.77 • 5

$$\begin{array}{r} 177 \\ \times\ 5 \\ \hline 885 \end{array}$$

$\boxed{8.85}$

11. 177 • 0.5

885 $\boxed{88.5}$

12. 17.7 • 0.5

885 $\boxed{8.85}$

13. 0.177 • 5

885 $\boxed{0.885}$

14. How did knowing the product of 177 and 5 help you quickly find the products in Questions 10 - 13?

The digits in each product were 885. I just had to keep track of each factors decimal place values to know where to put the decimal in the product.

Find each product using any strategy.

15. (2.1) • (4.6)

$$\frac{21}{10} \times \frac{46}{10} = \frac{966}{100}$$

$\boxed{9.66}$

$$\begin{array}{r} 21 \\ \times\ 46 \\ \hline 126 \\ +\ 840 \\ \hline 966 \end{array}$$

16. 4.52 x 12.1

$$\begin{array}{r} 4.52 \\ \times\ 12.1 \\ \hline 502 \\ 9040 \\ +\ 45200 \\ \hline 54742 \end{array}$$

$\boxed{54.742}$

Name KEY

1. Use the equation 122 x 54 = 6,588 to answer the questions below.

a. How can the equation help you compute 1.22 x 5.4?

I'll use the digits in the product (6588) and shift the decimal in 3 place values.

b. Determine the product.

6588

$\boxed{6.588}$

2. Multiply.

47.21 x 3.8

$$\begin{array}{r} \cancel{2}^{2} \quad \\ 47.21 \\ \times \quad 3.\cancel{8} \\ \hline 37568 \\ +141630 \\ \hline 179198 \end{array}$$

$\boxed{179.198}$

3. Jared pays $10.98 for entry to the carnival. He then pays $1.75 for each ride ticket. If Jared buys 15 ride tickets, how much will he pay in all to go to the fair?

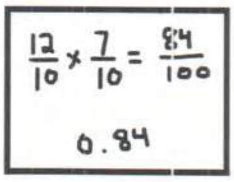
10.98 + (1.75 × 15)
entry tickets

$$\begin{array}{r} 175 \\ \times\ 15 \\ \hline 875 \\ 1750 \\ \hline 26.25 \end{array}$$

$$\begin{array}{r} 10.98 \\ +26.25 \\ \hline \end{array}$$

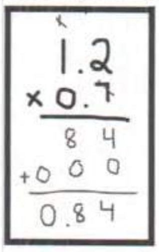
$\boxed{\$37.23}$

4. Two students showed their work to solve the equation 1.2 x 0.7 = ?. What is the same and what is different about how they showed their thinking?



$\frac{12}{10} \times \frac{7}{10} = \frac{84}{100}$

0.84



$$\begin{array}{r} 1.2 \\ \times 0.7 \\ \hline 84 \\ +000 \\ \hline 0.84 \end{array}$$

One student rewrote each factor as fractions, and the other used the algorithm. They each ended up with the same product.

G6 U4 Lesson 9

Use area diagrams to represent and justify how to find the product of two decimals

G6 U4 Lesson 9 - Students will use area diagrams to represent and justify how to find the product of two decimals

Warm Welcome (Slide 1): Tutor choice.

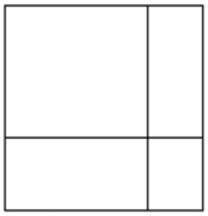
Frame the Learning/Connect to Prior Learning (Slide 2): Think back to our previous lesson. We looked at a variety of strategies to help us multiply decimals. Today, we're going to keep thinking about multiplying with decimals, but we're going to focus on a strategy you've probably seen before with whole numbers: The area model or area diagram!

Let's Talk (Slide 3): Before we dive into decimals, let's look at this fourth grader's work. **They were multiplying 36 x 25. How did this student find the product of 36 x 25?** Possible Student Answers, Key Points:

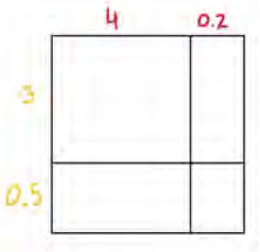
- They broke their numbers up into easier pieces and multiplied the parts. Then they added those parts together to find their answer.
- They used an area model and expanded form. They wrote 36 as 30 + 6 and 25 as 20 + 5, so they could find partial products.

This is an example of an area model or area diagram. We can use them to break apart numbers into expanded form so that we have "friendlier" parts to multiply with. I can't multiply 36 x 25 all at once in my head very quickly, but I can definitely multiply 30 x 20, and 6 x 20, and 30 x 5, and 6 x 5. That's a snap! We can do the same method to help us multiply decimals in parts. Let's explore!

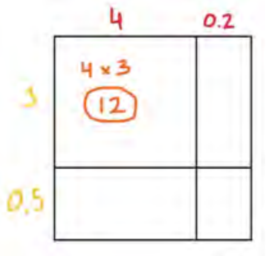
Let's Think (Slide 4): This problem is asking us to use an area diagram to find the product of 4.2 x 3.5. Just like we saw with the whole numbers, we can break these decimal numbers apart and multiply those parts carefully in an area model.



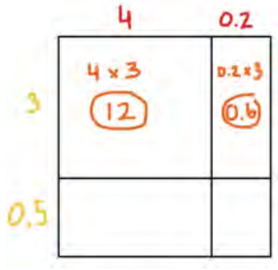
I notice each factor has TWO digits, so I'm going to draw a 2 by 2 area model to start with *(sketch an area model similar to example)*.



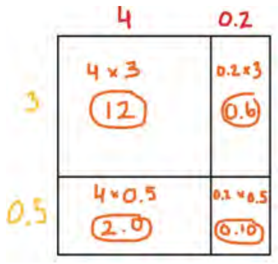
Now I need to break my numbers into expanded form. I know 4.2 has 4 ones and 2 tenths. So I could write it as 4 + 0.2 in expanded form. How could we write 3.5 in expanded form? It has 3 ones and 5 tenths, so we could write it as 3 + 0.5. Excellent. Let's label our area diagram with our expanded factors. Now we have friendly numbers that we can use to multiply efficiently.



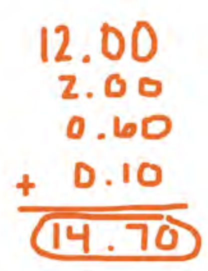
Let's start with the upper left box. *(Point our outline as you talk)* I see 4 and 3 are labeled on the sides of that part, so 4 x 3 is 12. I'll put a 12 in that box *(write 12)*.



Look at the upper right box. I see it is labeled with 0.2, and if I look across the area model, the other side would be 3. Hm, what is 0.2 x 3? *I know 3 groups of 2 tenths would make 6 tenths. So we can put 0.6 in that box.*



Nice. Now let's look at the bottom boxes. On the bottom left I see 4 and 0.5 are being multiplied. I know 4 x 0.5 is 4 groups of 5 tenths, so that's 20 tenths or 2.0. Or I could picture fractions in my head. 4/1 x 5/10 would make 20/10 if I multiply across. 20/10 is 2.0 or 2 wholes. What do we need to multiply in the last box? What would the product be? We need to multiply 0.2 x 0.5. So, 2/10 x 5/10 = 10/100 or 0.10, or I can think of it as 2 x 5 = 10, and 10ths x 10ths = 100ths. 10 hundredths is 0.10.



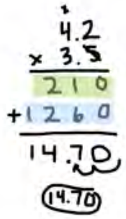
The area model made it so that our multiplication could mostly be done in our heads. Writing each factor in expanded form, made it so that we were multiplying easier parts of each number rather than the entire decimal number all at once. We just had to slow down a little bit when we were multiplying decimal parts to make sure our place value was accurate. Now all we have left to do is add. Let's go ahead and add our partial products, making sure you are adding like units like we've practiced in previous lessons. We can check our answers when you're finished. *(wait and then check/correct as needed)* Adding all four partial products together gives us a sum of 14.70 or 14.7. Nice work!

Let's Think (Slide 5): Before we jump into practicing, take a look at how another student solved the same problem. **What is the same and what is different about our strategies?** Possible Student Answers, Key Points:

- We both used an area model.
- We both multiplied parts together and then added.
- This student multiplied everything all at once using the algorithm.
- We both got the same answer.

Look closely at our partial products and the numbers the other student added. **Do you see any evidence of our partial product strategy in what this student did?** Possible Student Answers, Key Points:

- The student added 210 and 1260. The 210 is similar to our 2.10 from multiplying 4.2 x 0.5, and the 1260 is similar to our 12.60 from multiplying 4.2 x 3.



Good observations! The student multiplied 42 x 5 to make 210, and then 42 x 30 to make 1260. We kept our decimals in place for the area model, but we also see similar partial products from when we multiplied 4.2 x 0.5 across the bottom and 4.2 x 3 across the top row of our area diagram.

That's interesting. Even though the strategies can appear quite different, both strategies still involve multiplying in parts and adding those parts together.

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Let’s Try it (Slide 6-7): Now let’s work together to use area diagrams to represent and justify how to find the product of two decimals. We’ve explored lots of ways to think about decimal multiplication. When we use an area diagram, we break out decimal numbers up into more manageable pieces to multiply similar to how we first learned to multiply whole numbers in 3rd and 4th grade. Let’s practice how this looks on some more problems.

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WARM WELCOME

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Today we will use area diagrams to represent and justify how to find the product of two decimals.

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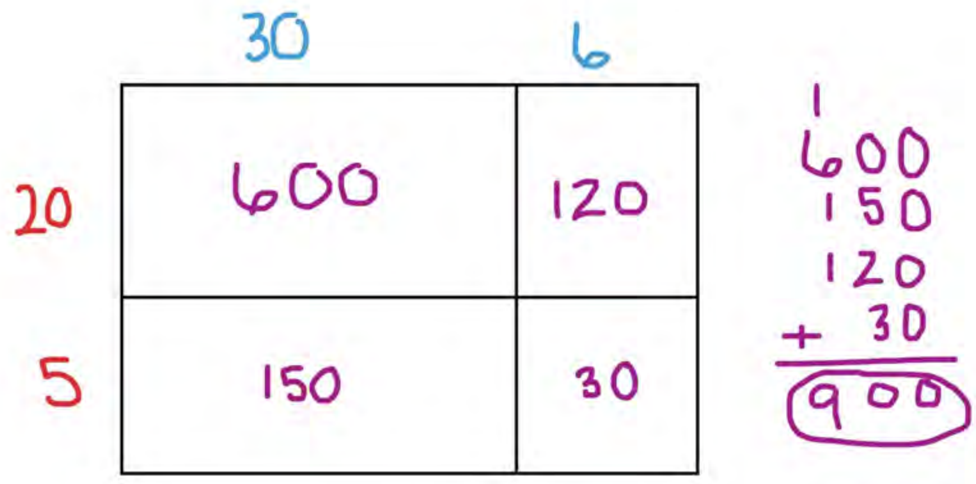
Let's Talk:

How did this student find the product of 36 x 25?



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Let's Think:

Use an area diagram to find the product of 4.2 x 3.5.

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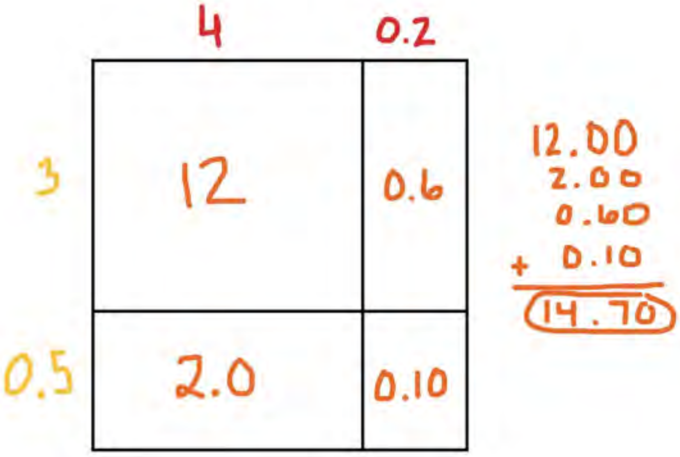
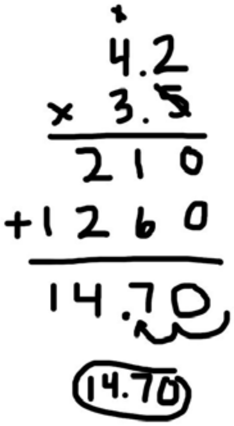
Let's Think:

Use an area diagram to find the product of 4.2 x 3.5.





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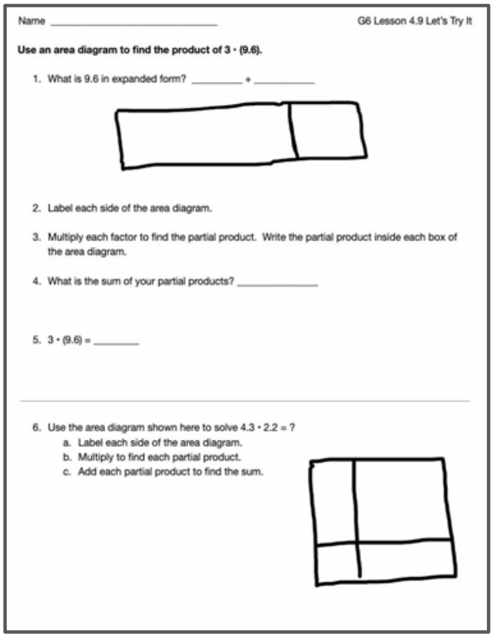
Let's Try It:

Let's use area diagrams to represent and justify how to find the product of two decimals!

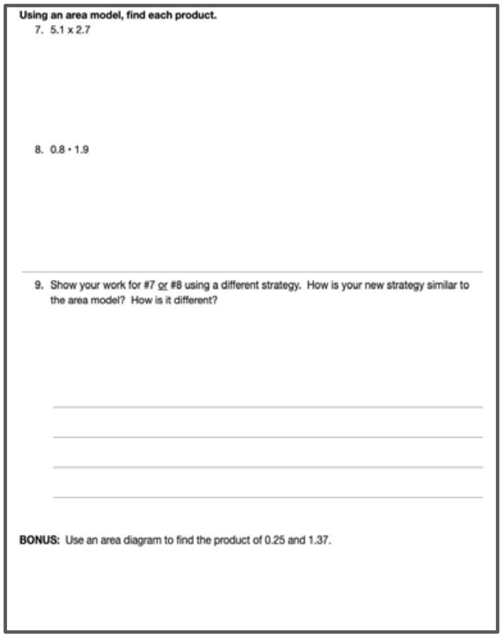


Name ______________________ G6 Lesson 4.9 Let's Try It

Use an area diagram to find the product of 3 • (9.6).

1. What is 9.6 in expanded form? ________ + ________
2. Label each side of the area diagram.
3. Multiply each factor to find the partial product. Write the partial product inside each box of the area diagram.
4. What is the sum of your partial products? ____________
5. 3 • (9.6) = _______

6. Use the area diagram shown here to solve 4.3 • 2.2 = ?
   a. Label each side of the area diagram.
   b. Multiply to find each partial product.
   c. Add each partial product to find the sum.



Using an area model, find each product.

7. 5.1 x 2.7
8. 0.8 • 1.9

9. Show your work for #7 or #8 using a different strategy. How is your new strategy similar to the area model? How is it different?

BONUS: Use an area diagram to find the product of 0.25 and 1.37.

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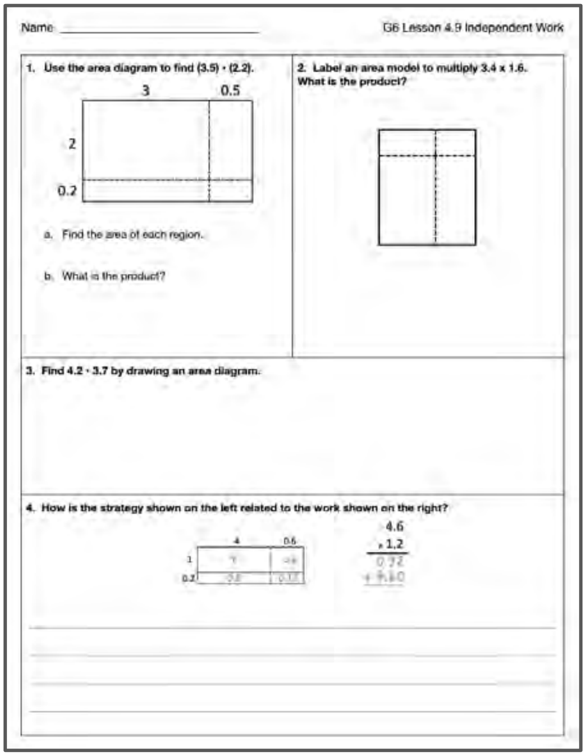
On your Own:



Name ______________________

G6 Lesson 4.9 Independent Work

1. Use the area diagram to find (3.5) · (2.2).

    a. Find the area of each region.

    b. What is the product?

2. Label an area model to multiply 3.4 x 1.6. What is the product?

3. Find 4.2 · 3.7 by drawing an area diagram.

4. How is the strategy shown on the left related to the work shown on the right?

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Name ______________________________

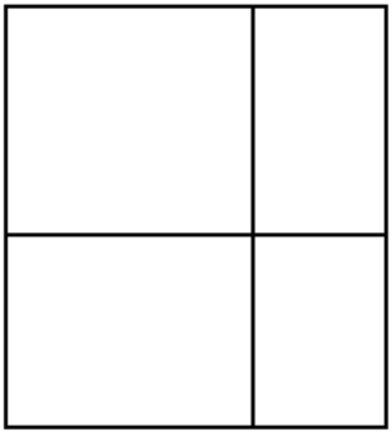
Use an area diagram to find the product of 3 • (9.6).

1. What is 9.6 in expanded form? _________ + ___________

2. Label each side of the area diagram.
3. Multiply each factor to find the partial product. Write the partial product inside each box of the area diagram.
4. What is the sum of your partial products? _______________
5. 3 • (9.6) = _________

---

6. Use the area diagram shown here to solve 4.3 • 2.2 = ?
    a. Label each side of the area diagram.
    b. Multiply to find each partial product.
    c. Add each partial product to find the sum.



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Using an area model, find each product.

7. 5.1 x 2.7

8. 0.8 • 1.9

9. Show your work for #7 or #8 using a different strategy. How is your new strategy similar to the area model? How is it different?

BONUS: Use an area diagram to find the product of 0.25 and 1.37.

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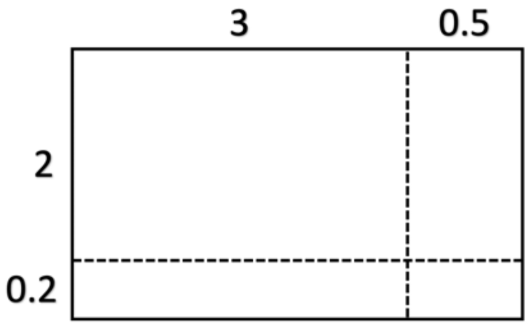
Name ______________________________

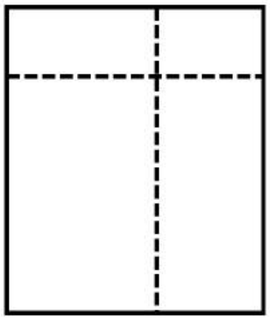
1. Use the area diagram to find (3.5) • (2.2).



a. Find the area of each region.

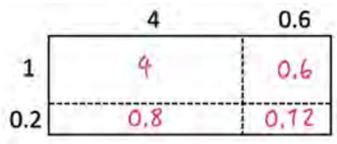
b. What is the product?

2. Label an area model to multiply 3.4 x 1.6. What is the product?



3. Find 4.2 • 3.7 by drawing an area diagram.

4. How is the strategy shown on the left related to the work shown on the right?



$$\begin{array}{r} 4.6 \\ \times\ 1.2 \\ \hline 0.92 \\ +\ 4.60 \\ \hline \end{array}$$

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Name KEY

Use an area diagram to find the product of 3 • (9.6).

1. What is 9.6 in expanded form? 9 + 0.5

	9	0.5
3	27 (3×9)	1.5 (3×0.5)

2. Label each side of the area diagram. ✓

3. Multiply each factor to find the partial product. Write the partial product inside each box of the area diagram.

4. What is the sum of your partial products? 28.5

$$\begin{array}{r} 27.0 \\ +\ 1.5 \\ \hline 28.5 \end{array}$$

5. 3 • (9.6) = 28.5

---

6. Use the area diagram shown here to solve 4.3 • 2.2 = ?
   - a. Label each side of the area diagram. ✓
   - b. Multiply to find each partial product.
   - c. Add each partial product to find the sum.

	4	0.3
2	8	0.6
0.2	0.8	0.06

$$\begin{array}{r} \overset{1}{8}.00 \\ 0.80 \\ 0.60 \\ +\ 0.06 \\ \hline 9.46 \end{array}$$

Using an area model, find each product.

7. 5.1 x 2.7

5	10	3.5
0.1	0.2	0.07
	2	0.7

10.00
3.50
0.20
+ 0.07

13.77

8. 0.8 • 1.9

	1	0.9
0.8	0.8	0.72

1
0.80
+0.72

1.52

---

9. Show your work for #7 <u>or</u> #8 using a different strategy. How is your new strategy similar to the area model? How is it different?

7
1.9
x .8

152

1.52

I used the algorithm. I got the same final product, but I multiplied each factor at once rather than in parts.

BONUS: Use an area diagram to find the product of 0.25 and 1.37.

	1	0.3	0.07
0.2	0.2	0.06	0.014
0.05	0.05	0.015	0.0035

1 1
0.2000
0.0500
0.0600
0.0150
0.0140
+ 0.0035

0.3425

0.3425

Name KEY

1. **Use the area diagram to find (3.5) · (2.2).**

	3	0.5
2	6	1
0.2	0.6	0.1

a. Find the area of each region.

b. What is the product?

6 + 1 + 0.6 + 0.1

7 + 0.7

7.7

2. **Label an area model to multiply 3.4 x 1.6. What is the product?**

	1	0.6
0.4	0.4	0.24
3	3	1.8

$$\begin{array}{r} \overset{1}{3}.00 \\ 1.80 \\ 0.40 \\ +\ 0.24 \\ \hline 5.44 \end{array}$$

5.44

3. **Find 4.2 · 3.7 by drawing an area diagram.**

	4	0.2
3	12	0.6
0.7	2.8	0.14

$$\begin{array}{r} \overset{1}{1}2.00 \\ 2.80 \\ 0.60 \\ +\ 0.14 \\ \hline 15.54 \end{array}$$

15.54

4. **How is the strategy shown on the left related to the work shown on the right?**

	4	0.6
1	4	0.6
0.2	0.8	0.12

$$\begin{array}{r} 4.6 \\ \times\ 1.2 \\ \hline 0.92 \\ +\ 4.60 \\ \hline \end{array}$$

Both show the same factors and product. The area model breaks each factor into expanded form to multiply in parts. The algorithm keeps each factor intact and multiplies one place value at a time.

G6 U4 Lesson 10

Use the partial quotients method and the place value chart to divide

G6 U4 Lesson 10 - Students will use the partial quotients method and the place value chart to divide

Warm Welcome (Slide 1): Tutor choice.

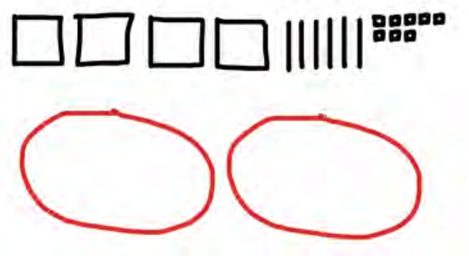
Frame the Learning/Connect to Prior Learning (Slide 2): In the next few lessons, we're going to pivot from talking about decimal multiplication to learning lots about decimal division. Before we get to decimals, today is going to refresh us on a couple ways we can think about whole number division. It's likely you've seen a lot of this in 4th and 5th grade, so today is a great chance to refresh and build our skills.

Let's Talk (Slide 3): In your own words, **what would you say is the same or different about multiplication and division?** You don't need to evaluate the expressions on the slide, but you're welcome to use them to help you explain your thinking. Possible Student Answers, Key Points:

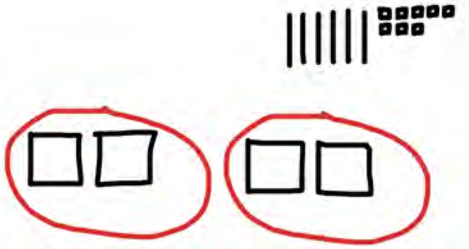
- They're opposites.
- Multiplication is like repeated addition. The bigger the number we're multiplying by, the more equal groups we have. Division is like taking away equal groups; we want to know how many of a number goes into another number.
- 36 times 12 we could think of as 36 groups of 12. Whereas 36 divided by 12 we could think of as how many groups of 12 fit into 36, or 12 groups of what number fit into 36.
- If we multiply 36 times 12, we'll get a bigger number than 36. If we divide 36 by 12, we'll get a smaller number than 36.

You named some great ideas. Let's now refresh ourselves on how we can represent division using place value models and the partial quotients method.

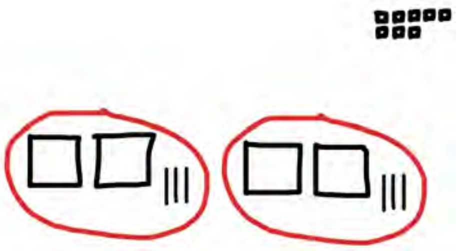
Let's Think (Slide 4): This question wants us to divide 468 by 2 using a place value model and partial quotients. As a reminder, the number we're dividing is called our DIVIDEND (468). The number we're dividing by is our divisor (2). The answer we get is our QUOTIENT.



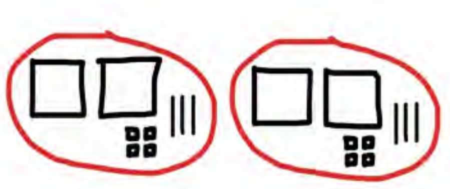
We can think of this problem as wanting us to split 468 into 2 equal groups. Let's start by modeling the dividend, since that's what we're going to have to split up. I'll model 4 hundreds with large squares, 6 tens with rods, and 8 ones with small squares. Then I'll draw two circles/ovals as my groups. Now all we have to do is share everything evenly.



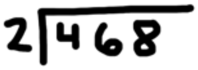
Let's start in the biggest place value. I have 4 hundreds. If I share them between 2 groups, how many should I put in each group? 2! Let's do that.



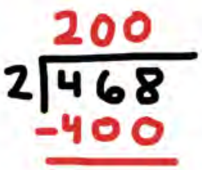
Great, now let's move onto the tens. I have 6 tens. If I split them between 2 groups, how many should I put in each group? 3! Let's show that.



And then what do you think I'm going to do last? We can split the 8 ones into 2 groups. So there should be 4 in each group. Let's show that. So now I can see we have 2 hundreds, 3 tens, and 4 ones in each group. So 468 divided by 2 is 234. We did it!

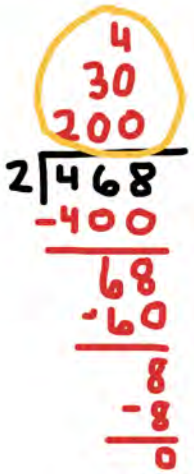


We can show what we did using partial quotients, too. To do that, we set up our division using a fancy thing called a vinculum. You might call it a division bar, and that's okay. Our divisor goes outside the bar and our dividend goes inside.



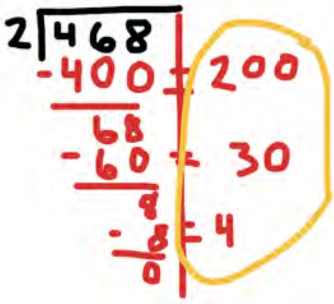
What did we do first in our model? We took the 4 hundred and put 2 hundred in each group. We show that in our partial quotients method like this *(write it out like example shown here))*. We use the top of the division bar to show what went into each group, and then we subtract beneath our dividend to keep track of what was leftover in our model/dividend.

468 take away the 400 that we shared evenly leaves us with 68 left to put into groups. We then took our 6 tens or 60, and split it into 2 groups. That meant we had 30 in each group, so I'll write 30 up above and take away the 60 that we split into groups. We're left with 8 ones in our dividend. What did we do next? *We split the 8 ones into the 2 groups, so we put 4 in each group!*



Correct, so I'll take away the 8 we shared and put 4 up top to show that 4 ones went into each group. Our quotient appears up top above the division bar in parts. That's why this method is called partial quotients. So, 200 + 30 + 4, means our quotient is 234.

Depending on how you've learned this previously, you may have also seen your quotient written to the side like this *(show or write out an example).* Either way of showing the partial quotients is accurate, so do what you feel most comfortable with.



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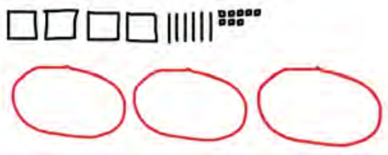
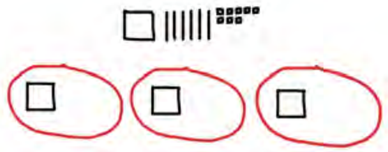
Let's Think (Slide 5): We just used a model and partial quotients to solve a whole number division problem. Let's look at one more example together that has a unique twist.



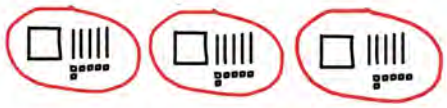
This wants us to take 468 and divide it into THREE groups. Let's start with a model, since we already modeled 468. We can use the same model, but we'll need 3 groups this time. Once again, we'll start with the greatest place value. But wait…what is the issue we run into if we try to split 4 hundred into 3 groups? Possible Student Answers, Key Points:

- 4 hundreds can't be split neatly into 3 groups.
- We will have a leftover or extra hundred



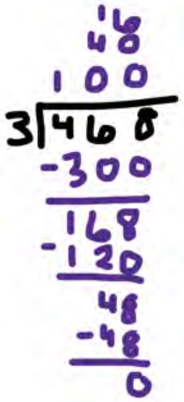
You're right. Let's split up what we can *(put 1 hundred in each group)*. We're left with 1 hundred. I can't split this evenly between 3 groups, so I'm going to break this hundred into tens. How many tens can I make with 1 hundred? 10 tens!

Great, let's cross out this hundred and rewrite it as ten tens rods. Now, how many tens do we have in all? 16! Let's share the tens three ways. Hm, this means we'll have 5 tens in each group, but I have 1 ten left over.



What do you think I'll need to do, since I can't split this ten into a group evenly/fairly? Break it into 10 ones, so it can be split up fairly. Good idea. Let's show that. Now we have 18 ones. Can we split 18 ones up evenly? I think we can! I can put 6 into each group. Let me show that in my model. How much do we have in each group now? 1 hundred, 5 tens, and 6 ones. 156! We have 156 in each group. So 468 divided into 3 groups is 156.

Let's think about what this can look like using a partial quotients method. We write 468 inside our division bar, and 3 outside. We first took 300 and split 100 into each group. I'll write 100 in our partial quotients, and take away the 300 that we split up. That leaves us with 168. Then we had 15 tens, so we put 5 tens or 50 in each group. I'll write 50 in our partial quotients, and take away the 150 that we split up. That left us with 18. I'll write 6 in our partial quotients, and if I take away 18 from our dividend, we are left with nothing to split up. Our quotient is 156, which matches what we showed in our model.



Before we jump into practicing, I want to point out that there are MANY ways to divide using partial quotients. Just because you divide out in certain parts, doesn't mean everyone will. For example, maybe I'm splitting 468 into 3 groups and I start by putting 100 in each group. That leaves me with 168 in my dividend. But I think, hm, I know 3 x 40 is 120, so I could put 40 in each group and take away 120 from my dividend. That leaves me with 48, and I know 3 x 16 is 48. I can put 16 as a partial quotient, and I take away 48 from my dividend. You'll notice I still ended up with 156 as my quotient, but I worked with different partial quotients.

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Use the relationships you know and what stands out to you to make your partial quotients as efficient as possible. As a general rule, the bigger the partial quotients you're able to pull out, the more efficiently you'll be able to solve any division problem.

Let's Try it (Slide 6-7): Now let's work together to use the partial quotients method and place value charts to divide. Similar to how we can break apart numbers to help us multiply, we can also break apart our dividends to help us divide in easier parts. We'll break our dividends up into parts that make sense to use, and then bring those parts together to arrive at our final quotient. Let's go!

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WARM WELCOME

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Today we will use the partial quotients method and the place value chart to divide.

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Let's Talk:

What's the same or different about multiplication and division?

$36 \bullet 12$

$36 \div 12$

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Let's Think:

Divide using a place value model and using partial quotients.

$468 \div 2$

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Let's Think:

Divide using a place value model and using partial quotients.

$$468 \div 3$$

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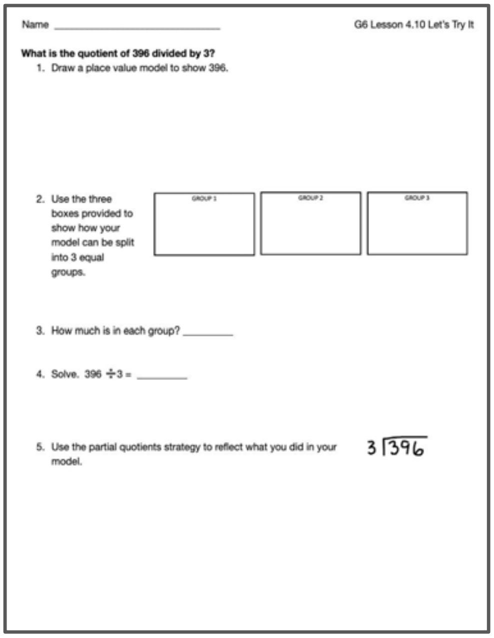
Let's Try It:

Let's use the partial quotients method and the place value chart to divide!



Name ____________________ G6 Lesson 4.10 Let's Try It

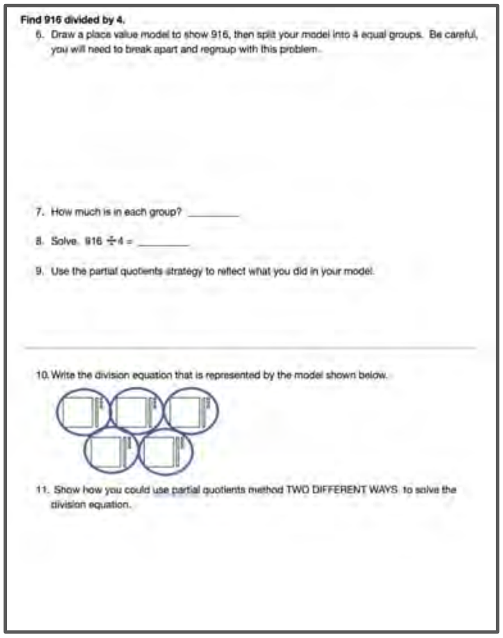
What is the quotient of 396 divided by 3?

1. Draw a place value model to show 396.
2. Use the three boxes provided to show how your model can be split into 3 equal groups.

GROUP 1 | GROUP 2 | GROUP 3

3. How much is in each group? ________
4. Solve. 396 ÷ 3 = ________
5. Use the partial quotients strategy to reflect what you did in your model.

3⟌396



Find 916 divided by 4.

6. Draw a place value model to show 916, then split your model into 4 equal groups. Be careful, you will need to break apart and regroup with this problem.
7. How much is in each group? ________
8. Solve. 916 ÷ 4 = ________
9. Use the partial quotients strategy to reflect what you did in your model.

10. Write the division equation that is represented by the model shown below.

11. Show how you could use partial quotients method TWO DIFFERENT WAYS to solve the division equation.

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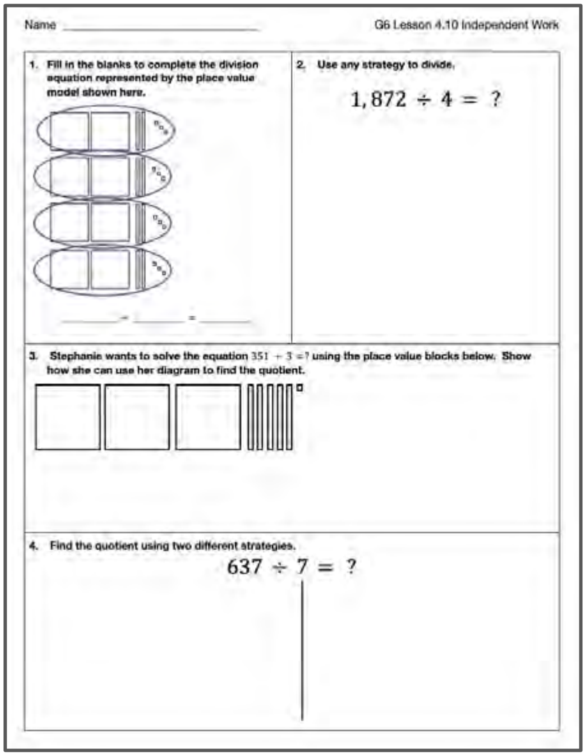
On your Own:



Name ______________________

G6 Lesson 4.10 Independent Work

1. Fill in the blanks to complete the division equation represented by the place value model shown here.

   _______ ÷ _______ = _______

2. Use any strategy to divide.

   $1,872 \div 4 = ?$

3. Stephanie wants to solve the equation $351 \div 3 = ?$ using the place value blocks below. Show how she can use her diagram to find the quotient.

4. Find the quotient using two different strategies.

   $637 \div 7 = ?$

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Name ______________________________

G6 U4 Lesson 10 - Let’s Try It

What is the quotient of 396 divided by 3?

1. Draw a place value model to show 396.

2. Use the three boxes provided to show how your model can be split into 3 equal groups.

GROUP 1	GROUP 2	GROUP 3

3. How much is in each group? _________

4. Solve. 396 ÷ 3 = _________

5. Use the partial quotients strategy to reflect what you did in your model.

$3\overline{)396}$

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Find 916 divided by 4.

6. Draw a place value model to show 916, then split your model into 4 equal groups. Be careful, you will need to break apart and regroup with this problem.

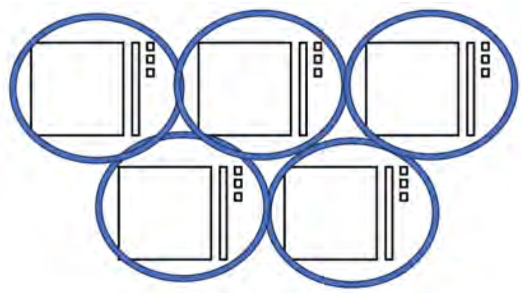
7. How much is in each group? __________

8. Solve. 916 ÷ 4 = __________

9. Use the partial quotients strategy to reflect what you did in your model.

---

10. Write the division equation that is represented by the model shown below.



11. Show how you could use partial quotients method TWO DIFFERENT WAYS to solve the division equation.

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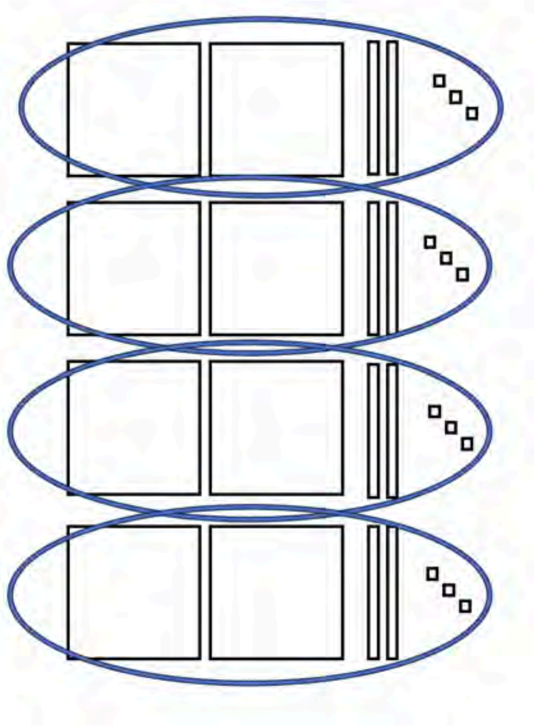
1. **Fill in the blanks to complete the division equation represented by the place value model shown here.**



__________ ÷ __________ = __________

2. **Use any strategy to divide.**

$$1,872 \div 4 = ?$$

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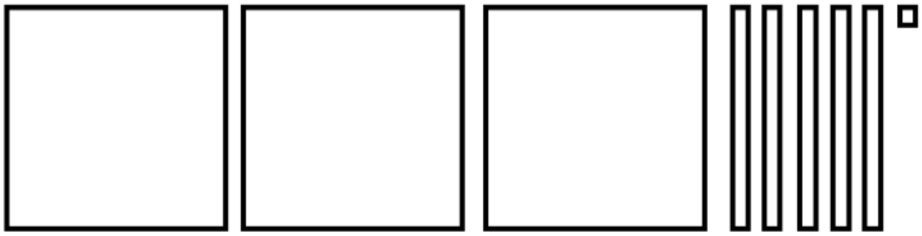
3. Stephanie wants to solve the equation $351 \div 3 = ?$ **using the place value blocks below. Show how she can use her diagram to find the quotient.**



4. Find the quotient using two different strategies.

$$637 \div 7 = ?$$

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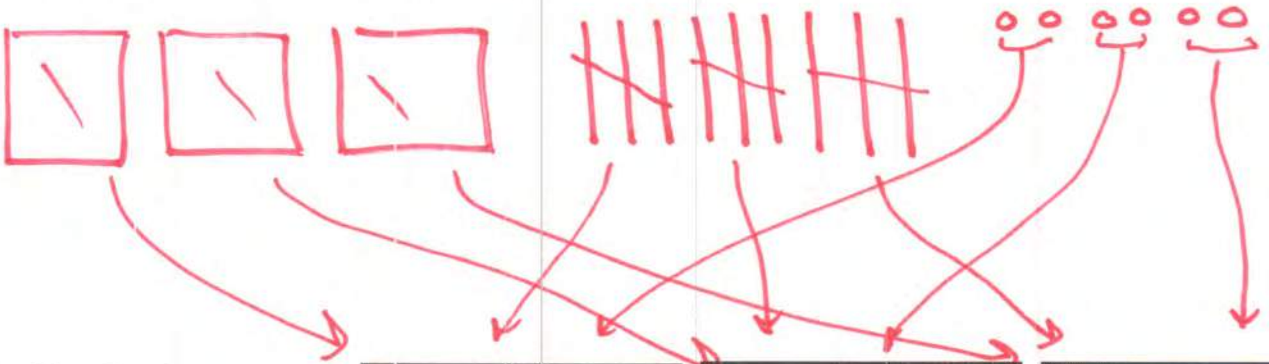
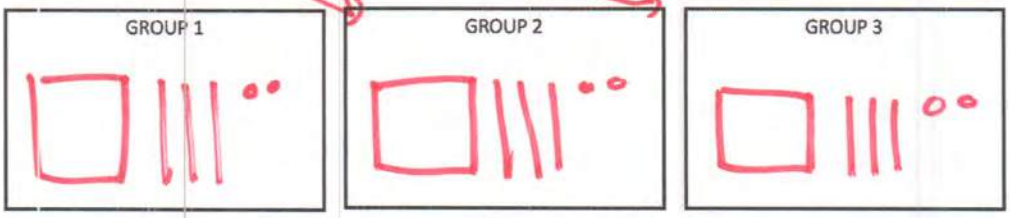
Name KEY

What is the quotient of 396 divided by 3?

1. Draw a place value model to show 396.



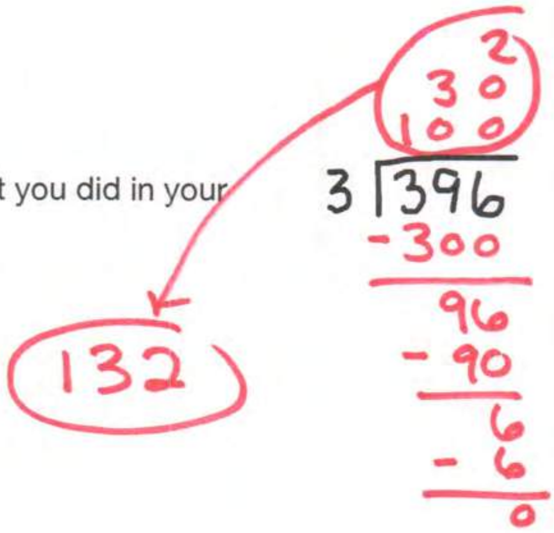
2. Use the three boxes provided to show how your model can be split into 3 equal groups.



3. How much is in each group? 132

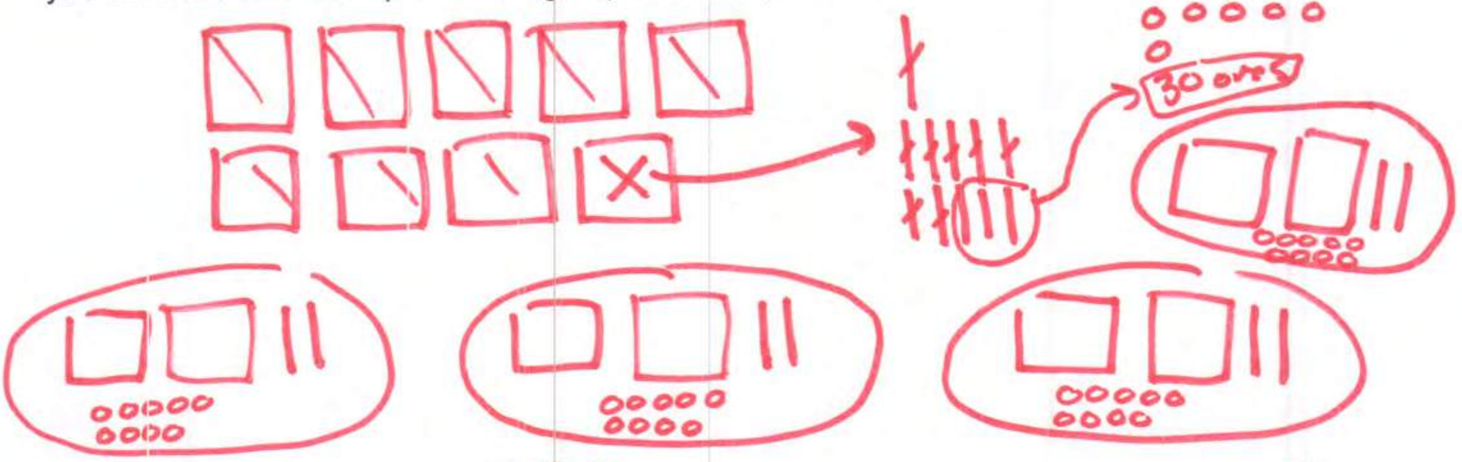
4. Solve. 396 ÷ 3 = 132

5. Use the partial quotients strategy to reflect what you did in your model.



Find 916 divided by 4.

6. Draw a place value model to show 916, then split your model into 4 equal groups. Be careful, you will need to break apart and regroup with this problem.



7. How much is in each group? 229

8. Solve. 916 ÷ 4 = 229

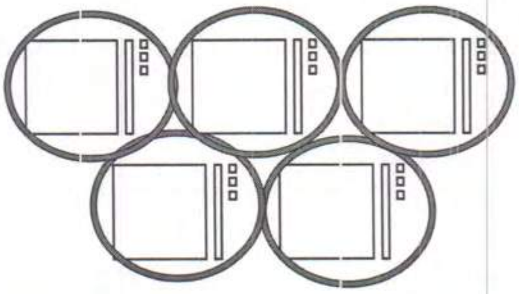
9. Use the partial quotients strategy to reflect what you did in your model.

9
20
200
4 | 916
-800
116
-80
36
-36
0

229

---

10. Write the division equation that is represented by the model shown below.



500
+ 50
+ 15
565

565 ÷ 5 = 113
total groups in each group

565÷5=113

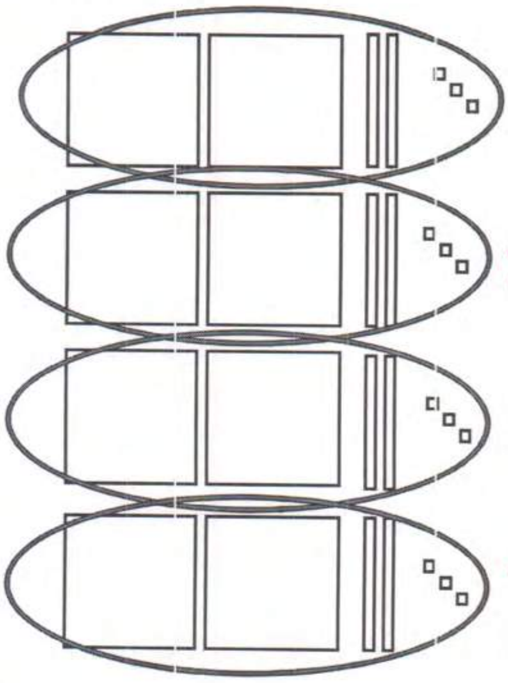
11. Show how you could use partial quotients method TWO DIFFERENT WAYS to solve the division equation.

3
10
100 = 113
5 | 565
-500
65
-50
15
-15
0

5 | 565
-500 = 100
65
-65 = 13
0
113

Name KEY

1. Fill in the blanks to complete the division equation represented by the place value model shown here.



223

223

223

223

892 ÷ 4 = 223

total groups

2. Use any strategy to divide.

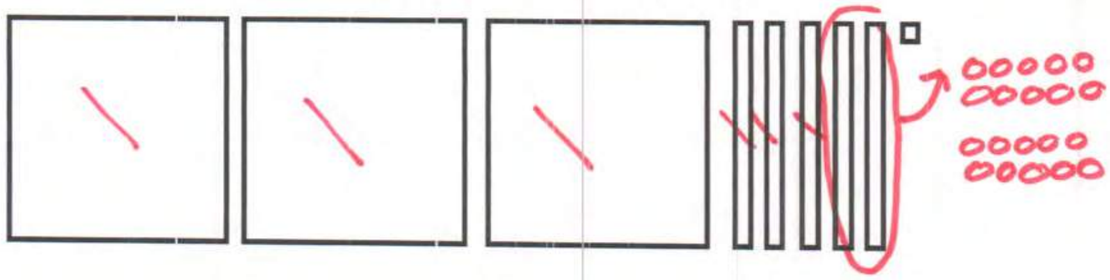
$1,872 \div 4 = ?$

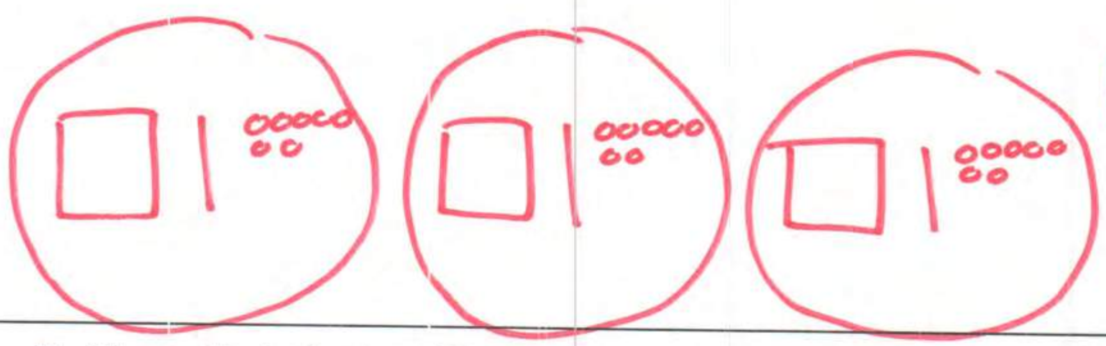
8
60
400

4) 1872
-1600
272
-240
32
-32
0

468

3. **Stephanie wants to solve the equation $351 \div 3 = ?$ using the place value blocks below. Show how she can use her diagram to find the quotient.**





117

4. **Find the quotient using two different strategies.**

$637 \div 7 = ?$

1
90

$7 \overline{)637}$
-630
7
-7
0

91

1
80
10

$7 \overline{)637}$
- 70
567
-560
7
-7
0

91

G6 U4 Lesson 11

Use the long division method to divide

CITYTUTOR DC

G6 U4 Lesson 11 - Students will use the long division method to divide

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Last time we were together, we refreshed on how we can use place value models and partial quotients to solve division problems. Today, we're going to look at one more common strategy people use to divide. You may have heard of it before; it's called long division. Today we'll see how it is an efficient way to divide, and we'll explore how it connects to other strategies we're familiar with.

Let's Talk (Slide 3): Take a look at this problem that we solved using partial quotients during our previous lesson. **In your own words, can you walk me through how we used partial quotients to arrive at our answer?** Possible Student Answers, Key Points:

- We thought about splitting 468 into 3 groups. We knew we could take 300 and put 100 in each group, so we wrote 100 as one partial quotient and subtracted the 300 we split up from our dividend. That left us with 168. We knew we could take 150 and put 50 in each group. 50 went in our partial quotients, and we took away the 150 from our dividend. That left us with 18, and 18 split into 3 groups is 6.
- Then we added our partial quotients to get our full quotient. 100 + 50 + 6 is 156.
- We could do it differently but this was the fastest way!

Great explanation. Keep that in the back of your mind as we look at the same problem using LONG DIVISION.

Let's Think (Slide 4): Here we see our partial quotients on the left in orange. We're going to look at the work in blue that shows long division, step-by-step. As I clarify what this person did, I want you thinking about any similarities or differences you notice between our partial quotients method and this person's long division method. To start with, the student set up the division so he could perform vertical, up/down, calculations. Notice any connections between the strategies so far? Long division starts the same way as partial quotients.

Let's Think (Slide 5): Now let's look at what the student did next. Next, the student knew that there are 3 groups of 1 that can go into 4. The student wrote 1 above the 4 and subtracted 3 from the 4, leaving 1. Then he brought down the 6 tens from 468 which leaves 16 (*point as you narrate*). **What connections do you see now?** Possible Student Answers, Key Points:

- We both have 1 in the hundreds place of our quotients.
- The 3 he subtracted from the 4 represents 3 hundred. In the partial quotients method we did the same thing, but we wrote it out as 300.
- The thinking is similar. In partial quotients, it seems like we're thinking of the full numbers (300, 100, etc) but with long division, we're working more with digits and intentionally putting them in their corresponding place value as we work (ex. the 1 really means 100, so I put it in the hundreds place of my quotient)

Let's Think (Slide 6): Now we have the next thing that this student did. Let's look closely to understand what's happening here. So, there were 16 left (*point to 16*) and it looks like this student knew that there are 3 groups of 5 in 16, so he wrote 5 at the top and subtracted 15 from 16, which left us with a remainder of 1.

Let's Think (Slide 7): And now, the very last step that the student took! Let's look closely, he brought down the 8 ones from 468 and wrote it next to the 1. This made 18. There are 3 groups of 6 in 18, so he wrote 6 at the top and subtracted 18, leaving 0. **Now that we've seen each step of his long division, what do you notice is the same/different?** Possible Student Answers, Key Points:

- He got the same answer, but he wrote it all at once instead of in parts. It's like he was building it step by step.

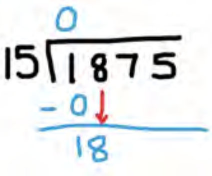
- We both started by thinking about the biggest place value first.
- Both show the quotient up top and the dividend on the bottom. As we worked through both methods, we kept subtracting out the parts we'd already divided so we could keep track of what's left in our dividend.

Those are all great things to notice. In partial quotients, we can divide out any "chunks" that make sense to us until we're left with nothing in our dividend to split up. And remember in partial quotient we can do it lots of different ways–smaller chunks or bigger chunks. But in long division, we work systematically left to right from digit to digit. We subtract out as large a group as possible in each step. We also don't write out the full numbers we're using, instead relying on the precise place value of each digit to show its value.

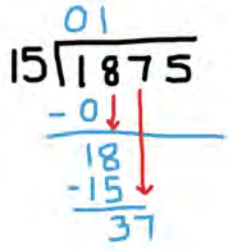
Let's Think (Slide 8): Let's try this out together. We're dividing 1875 by 15. This divisor is 2-digits. Let's start by looking at what we already know how to do, the partial quotients method! Take a close look at what this student did with the partial quotients method in green. **How did that student get their quotient?** Possible Student Answers, Key Points:

- They thought of splitting 1875 into 15 groups. 15 groups of 100 makes 1500, so they put 100 in their partial quotients and took away 1500 from the dividend. Then they took out 15 groups of 10 and then 15 groups of 10 again, subtracting 150 from the dividend each time. Then they were left with 75. 15 groups of 5 is 75, so they added 5 to the quotient. Their answer would be 125.

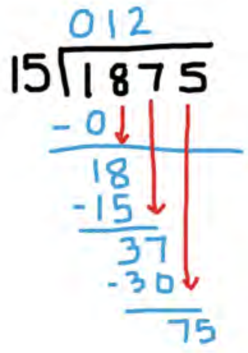
That's right, in the partial quotient method, they pulled out quotients they knew in a way that made sense to them. With long division, we're going to work systematically from left to right. Let's start.



Our first digit in the dividend is 1. I can't fit 15 into 1, so I'm going to start by writing a 0 in my quotient. I'm going to make sure I write it above the 1 so that it represents 0 thousands, since the 1 represents 1 thousand in this problem. I'll subtract 0 from 1, which remains 1. And then I'll bring down my next digit, 8, so it's next to the 1. Now we'll think about 18.



So I have 18 now, let me think…15 groups of what would get me close to 18, or how many 15s can I fit into 18? 15 groups of 1! That's right, I can fit 15 into 18 one time! Let's write 1 in my quotient directly next to the 0, so that it is neatly in the hundreds place. 15 groups of 1 would be 15, so I'm going to subtract that from the 18 in our dividend. 18 - 15 leaves us with 3, and then we'll pull down the next digit. We'll place the 7 next to the 3. Now we'll think about 37.



Okay, so we're at 27 and we want to think about how we can use 15 to get close to 37, it might not fit exactly though! So, 15 groups of what would get me close to 37? 15 groups of 2! That's right, 15 groups of 1 would be too small and 15 groups of 3 would be too big, because that would be 45. 15 groups of 2 gets us as close as possible to 37. Let's put 2 in our quotient, directly next to the 0 and the 1. So, 15 groups of 2 or 15x2 is 30, so we'll take that out of our dividend. And, 37 - 30 leaves us with 7. And we'll pull down our final digit, 5. So now we're looking at 75.

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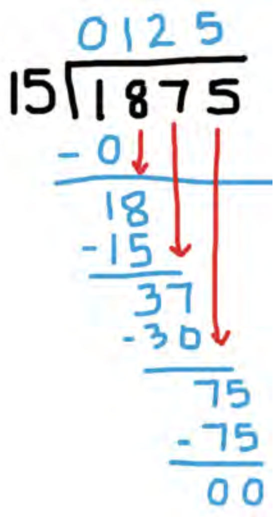

So, we've got 75 left. Let's think about 15 groups of what gets us to 75 OR how many times can 15 go into 75, it might not be exact though? 15 groups of 5! Nice! Let's slide 5 next to the rest of our quotient, and take out the 75 from our dividend. We're left with 0, so we don't have any remainder. What's our final quotient? 125! That's right, we see that from the 0 thousands, 1 hundred, 2 tens, and 5 ones.

Excellent! We just used long division to find our quotient. We didn't work in whatever pieces we wanted to, like the partial quotients example did. Instead, we worked one digit at a time from left to right, placing our digits carefully in our quotient, and then subtracting from our dividend before moving to the next digit.

Let's keep practicing so that this new method becomes more familiar over time. Practice makes perfect.

Let's Try it (Slide 6-7): Now let's work together to use the long division method to divide. Remember, when we use the long division method, we go digit by digit from left to right thinking about how many times our divisor can go into that digit based on its place value. We want to be extra careful about making sure each digit we write is in the correct place value. As we get used to this method, we can continue to use models and partial quotients to double-check our thinking. Let's go for it!

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WARM WELCOME

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Today we will use the long division method to divide.

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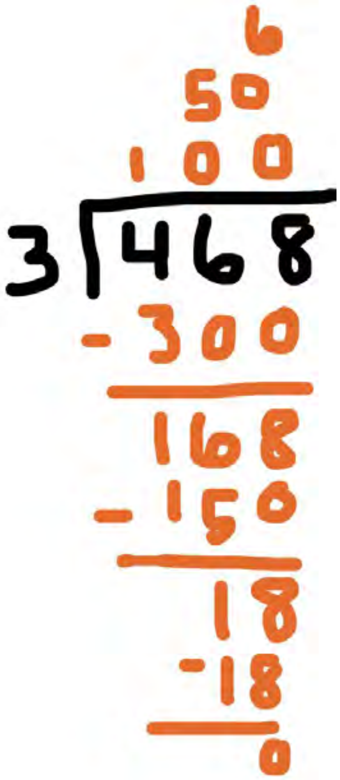
Let's Talk:

In your own words, explain how we used the partial quotients method to divide 468 by 3 in our previous lesson.



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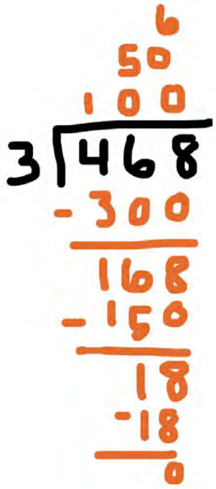
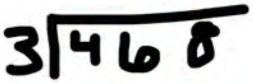
Let's Think:

Let's look at the same problem solved using what is called "long division."

PARTIAL QUOTIENTS METHOD



LONG DIVISION METHOD



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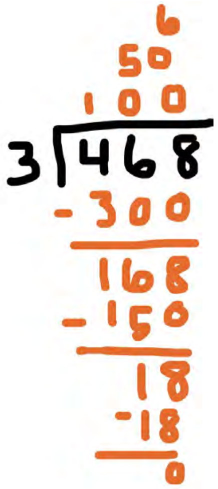
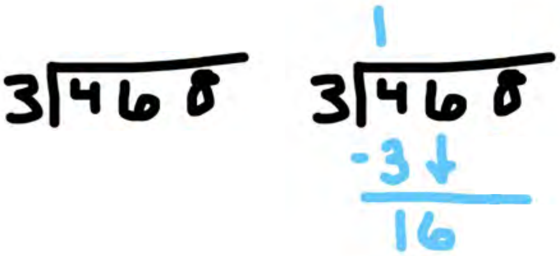
Let's Think:

Let's look at the same problem solved using what is called "long division."

PARTIAL QUOTIENTS METHOD



LONG DIVISION METHOD



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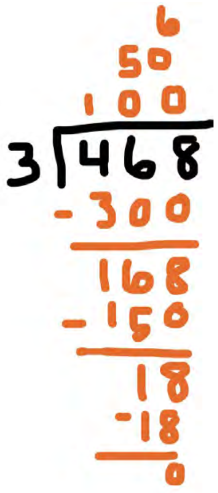
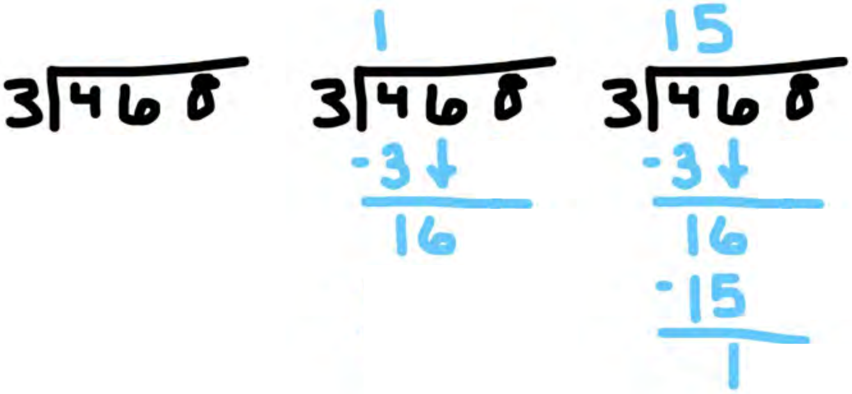
Let's Think:

Let's look at the same problem solved using what is called "long division."

PARTIAL QUOTIENTS METHOD



LONG DIVISION METHOD



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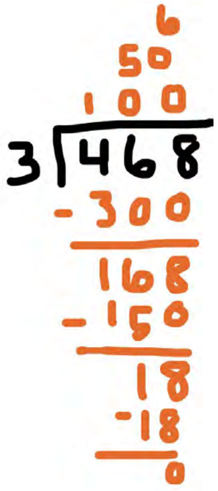
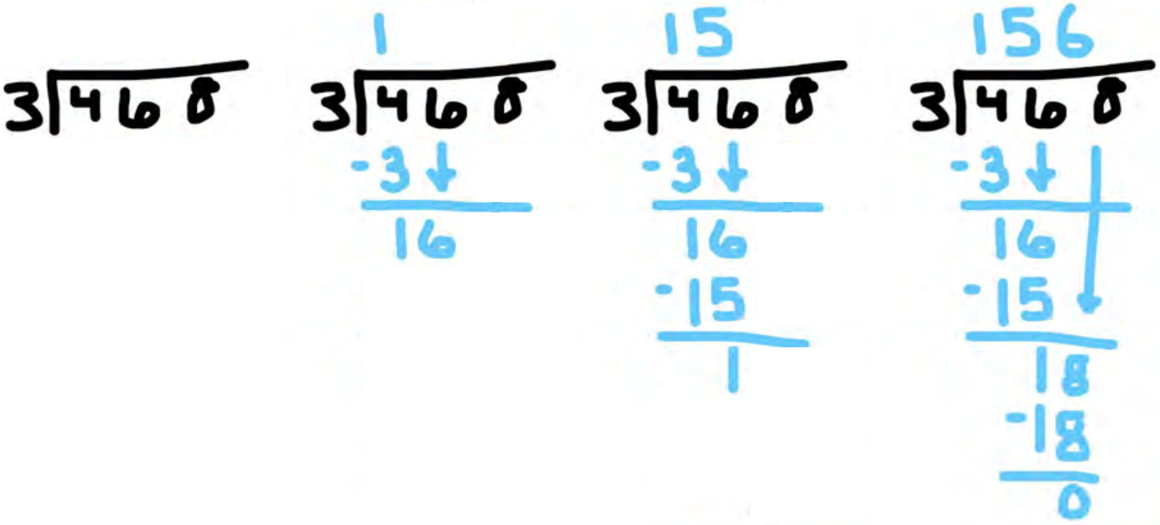
Let's Think:

Let's look at the same problem solved using what is called "long division."

PARTIAL QUOTIENTS METHOD



LONG DIVISION METHOD



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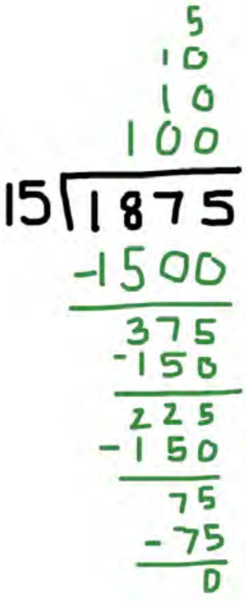
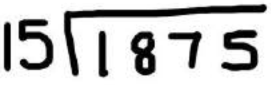
Let's Think:

Let's try long division together.

1875 ÷ 15





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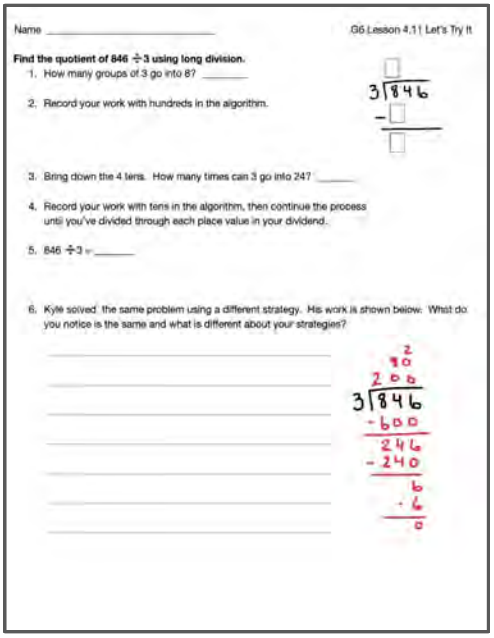
Let's Try It:

Let's use the long division method to divide!

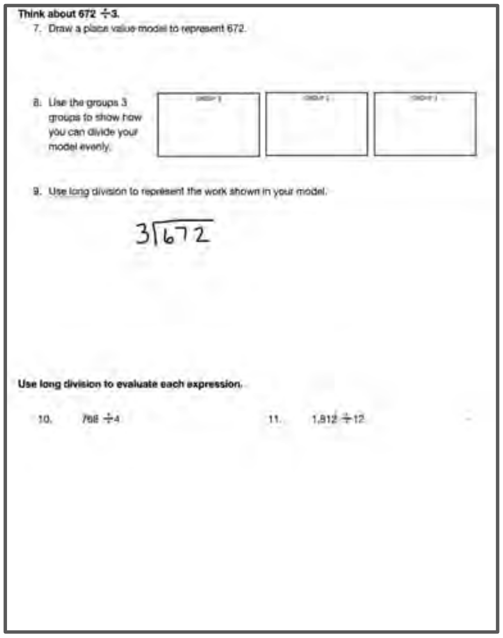


Name ____________________ G6 Lesson 4.11 Let's Try It

Find the quotient of 846 ÷3 using long division.

1. How many groups of 3 go into 8? ______
2. Record your work with hundreds in the algorithm.
3. Bring down the 4 tens. How many times can 3 go into 24? ______
4. Record your work with tens in the algorithm, then continue the process until you've divided through each place value in your dividend.
5. 846 ÷3 = ______
6. Kyle solved the same problem using a different strategy. His work is shown below. What do you notice is the same and what is different about your strategies?

2
80
200
3⟌846
-600
246
-240
6
-6
0



Think about 672 ÷3.

7. Draw a place value model to represent 672.
8. Use the groups 3 groups to show how you can divide your model evenly.
9. Use long division to represent the work shown in your model.

3⟌672

Use long division to evaluate each expression.

10. 768 ÷4
11. 1,812 ÷12

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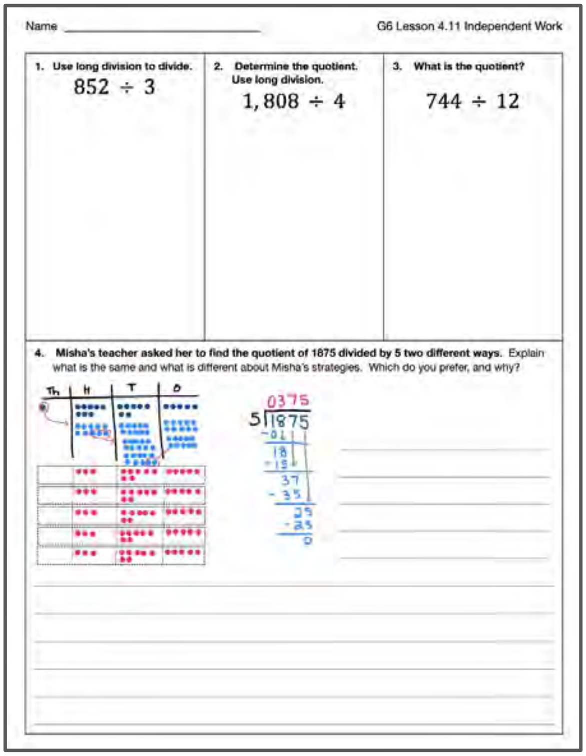
On your Own:



Name ____________________ G6 Lesson 4.11 Independent Work

1. Use long division to divide.

$852 \div 3$

2. Determine the quotient. Use long division.

$1,808 \div 4$

3. What is the quotient?

$744 \div 12$

4. Misha's teacher asked her to find the quotient of 1875 divided by 5 two different ways. Explain what is the same and what is different about Misha's strategies. Which do you prefer, and why?

0375
5⟌1875
-0↓
18
-15
37
-35
25
-25
0

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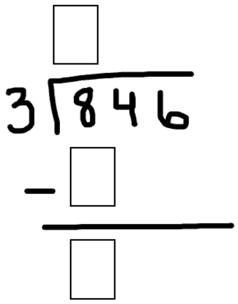
Name ______________________________ G6 U4 Lesson 11 - Let's Try It

Find the quotient of 846 ÷ 3 using long division.



1. How many groups of 3 go into 8? ________

2. Record your work with hundreds in the algorithm.

3. Bring down the 4 tens. How many times can 3 go into 24? _______

4. Record your work with tens in the algorithm, then continue the process until you've divided through each place value in your dividend.

5. 846 ÷ 3 = ________

6. Kyle solved the same problem using a different strategy. His work is shown below. What do you notice is the same and what is different about your strategies?

____

____

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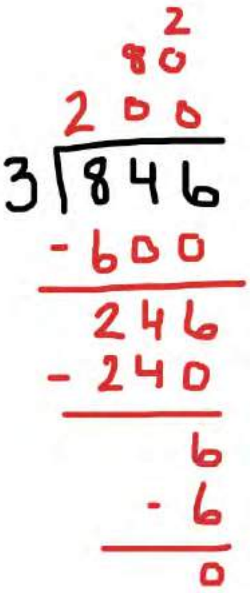

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Think about 672 ÷ 3.

7. Draw a place value model to represent 672.

8. Use the groups 3 groups to show how you can divide your model evenly.

GROUP 1 | GROUP 2 | GROUP 3

9. Use long division to represent the work shown in your model.

$3\overline{)672}$

Use long division to evaluate each expression.

10. 768 ÷ 4

11. 1,812 ÷ 12

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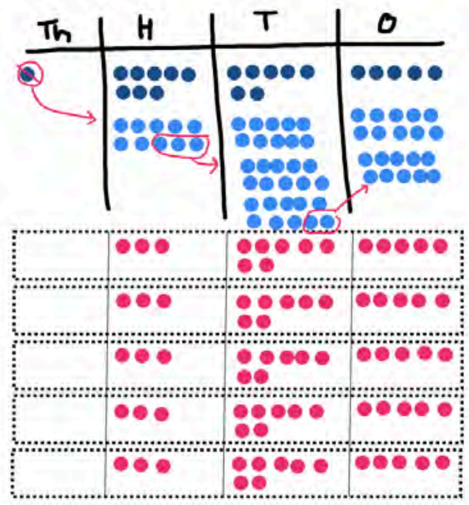
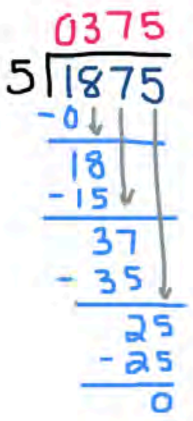
Name ______________________________

1. Use long division to divide. $852 \div 3$	**2. Determine the quotient. Use long division.** $1,808 \div 4$	**3. What is the quotient?** $744 \div 12$

4. Misha's teacher asked her to find the quotient of 1875 divided by 5 two different ways. Explain what is the same and what is different about Misha's strategies. Which do you prefer, and why?





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Name KEY

Find the quotient of 846 ÷ 3 using long division.

$$\begin{array}{r} \boxed{2}82 \\ 3\overline{)846} \\ -\boxed{6}\downarrow \\ \hline \boxed{2}4 \\ -24\downarrow \\ \hline 06 \end{array}$$

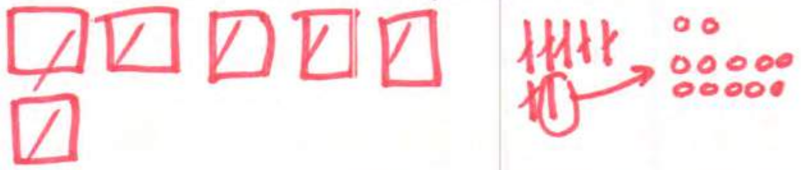
1. How many groups of 3 go into 8? 2
2. Record your work with hundreds in the algorithm. ✓
3. Bring down the 4 tens. How many times can 3 go into 24? 8
4. Record your work with tens in the algorithm, then continue the process until you've divided through each place value in your dividend. ✓
5. 846 ÷ 3 = 282
6. Kyle solved the same problem using a different strategy. His work is shown below. What do you notice is the same and what is different about your strategies?

Kyle used vertical calculations and arrived at the same quotient. Instead of using long division, Kyle used partial quotients and divided in pieces that made sense to him.

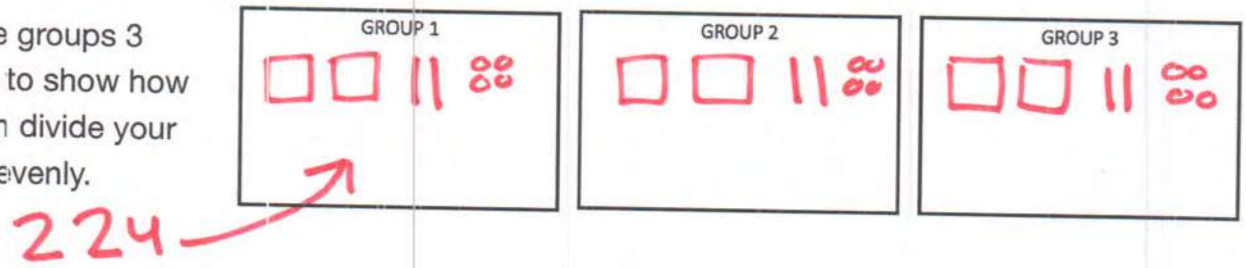
$$\begin{array}{r} 2 \\ 80 \\ 200 \\ 3\overline{)846} \\ -600 \\ \hline 246 \\ -240 \\ \hline 6 \\ -6 \\ \hline 0 \end{array}$$

Think about 672 ÷ 3.

7. Draw a place value model to represent 672.



8. Use the groups 3 groups to show how you can divide your model evenly.



9. Use long division to represent the work shown in your model.

224
3⟌672
-6↓
07
-06↓
12
-12
0

Use long division to evaluate each expression.

10. 768 ÷ 4

192
4⟌768
-4↓
36
-36↓
08
-08
0

11. 1,812 ÷ 12

151
12⟌1812
-12↓
61
-60↓
12
-12
0

Name KEY

G6 Lesson 4.11 Independent Work

1. **Use long division to divide.**

$852 \div 3$

284

3) 852

-6

25

-24

12

-12

0

2. **Determine the quotient. Use long division.**

$1,808 \div 4$

452

4) 1808

-16

20

-20

08

-8

0

3. **What is the quotient?**

$744 \div 12$

62

12) 744

-72

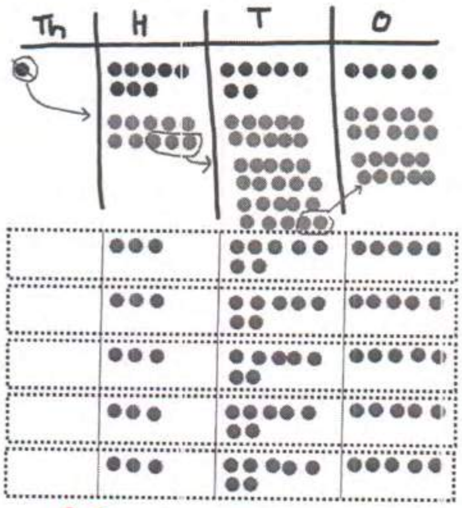
24

-24

0

62

4. **Misha's teacher asked her to find the quotient of 1875 divided by 5 two different ways.** Explain what is the same and what is different about Misha's strategies. Which do you prefer, and why?



0375

5) 1875

-0

18

-15

37

-35

25

-25

0

They both show the same dividend, divisor, and quotient. I like the algorithm because it is more efficient than a place value model. Both show we could not share any thousands, and that we can make 3 groups of 5 hundreds out of 18 hundred. In both cases we see 7 groups 5 tens can be made with 37 tens, and then 5 groups of 5 can be made of 25.

G6 U4 Lesson 12

Use long division to divide whole numbers that result in a quotient with a decimal

G6 U4 Lesson 12 - Students will use long division to divide whole numbers that result in a quotient with a decimal

Warm Welcome (Slide 1): Tutor choice.

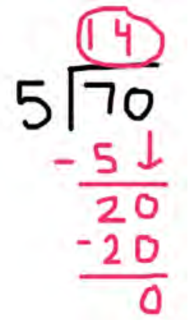
Frame the Learning/Connect to Prior Learning (Slide 2): Last lesson, we were introduced to the long division algorithm, where we went digit by digit to find our quotient. Today, we'll continue practicing this important skill, but we're going to see problems where we have a remainder that we'll write as a decimal in our quotient. We'll see what that looks like in a moment…

Let's Talk (Slide 3): **Look at the numbers shown here. What do you notice about them?** Possible Student Answers, Key Points:

- Some are whole numbers and some are decimals.
- The second number in each pair just adds on some zeros.
- Even though some have decimals, they are equivalent, for example 72 is the same as 72.0.

Yes, each of these pairs shows two equivalent numbers. Putting a zero after the decimal on a number does not change the value of that number. This is going to come in handy a bit later today. You'll see why in a moment!

Let's Think (Slide 4): Look here, we're being asked to use long division for two problems. Since we practiced this yesterday, help me with the first one (*write as students explain or walk students through it if they need extra help*).

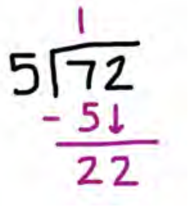


So, we're starting on the left. We see that 5 groups of 1 go into 7, or we can make 5 go into 7 1 time. We can write a 1 in our quotient, then we'll subtract 5 in the dividend. 7 - 5 is 2. We bring down our last digit, 0. 5 groups of 4 go into 20. 4 will go in our quotient, and we subtract 20. We end up with 0 in our dividend. The answer is 14. Great. 70 divided by 5 is 14. And, how did we know we were finished solving? We didn't have a remainder. We were left with 0! That's right, we knew that we were done dividing because we were left with 0, we didn't have anything leftover, in other words there was no remainder!

Let's look at the next problem, it says 72 divided by 5. **What do you notice/wonder?** Possible Student Answers, Key Points:

- I notice it looks similar to our last one, but with 72 instead of 70.
- I wonder if 5 goes into 72.
- I notice 5 doesn't go into 72 evenly.

Good noticings. I agree, I noticed that we're dividing 72, which is close to 70 by 5 and we're thinking that 5 isn't going to go into 72 evenly. That's okay, we're going to see this happen a lot today. Let me show you the easy way we will approach this issue when we see it.



I'm going to start the same way we just did. We're starting on the left side, 5 groups of 1 go into 7. I put 1 in my quotient, and subtract 5 in my dividend. That leaves me with 2, and then I'll pull down my next digit, 2.

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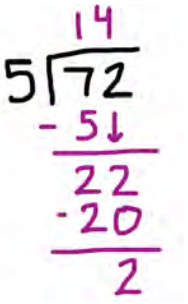
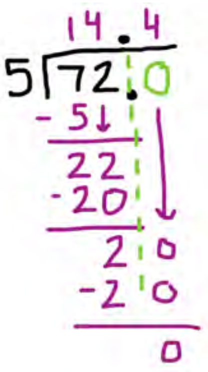


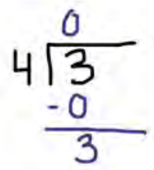
Now we’re working with 22, so 5 groups of 4 go into 22, so I’ll write 4 in the quotient and subtract 20 in the dividend. I’m left with 2. We *could* say the answer is 14 remainder 2 (14 R2), but in 6th grade we want to be able to write our answers in decimal form. So let’s think…



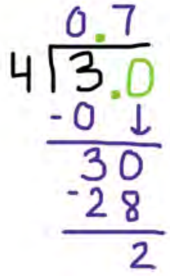
We talked earlier about how we can write 72 as 72.0 and it won’t change the value. So if I add a decimal and a 0 to my quotient like this, I can keep doing long division. I can now bring down that 0, so we have 20 in our dividend. 5 groups of 4 make 20. When I annexed my zero, you’ll notice I also put a decimal in my quotient so I know that last 4 is 4 TENTHS, not 4 ones.

Today, if we end up with a remainder, all we need to do is think of an equivalent form of our dividend. We can put a decimal on it, annex a zero and keep dividing. It’s as simple as that. Let’s look at one more.

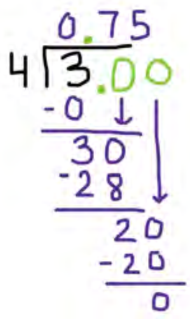
Let’s Think (Slide 5): This question says 3 divided by 4. Hmm, can we even do that? Let’s try. Usually my bigger number is my dividend, but in this case 4 is my divisor and 3 is my dividend. I’ll set up my long division algorithm accordingly.



I already feel kind of stuck, because 4 cannot go into 3. 3 is smaller than 4. *(Write 0 in quotient, subtract 0 to show a remainder of 3)* But I know I can rewrite my dividend as an equivalent number. That’s right, 3 is the same as 3.0, so let me put a decimal in my dividend and annex a zero. Don’t forget to put a decimal in your quotient too. Can I keep dividing now? Yes! Okay, follow along with me.



Let’s bring the 0 down. We have 30 in the dividend. 4 groups of 7 go into 30. So write 7 in your quotient and subtract 28 from 30. We have a remainder of 2.



Uh-oh. Another remainder? That’s okay! I can annex another 0. 3 is the same as 3.0 or 3.00. Let’s annex and see if we can keep going. Bring the 0 down. We have 20 in the dividend. 4 groups of 5 go into 20. So write 5 in your quotient and subtract 20 from 20. I think we’re done! So, 3 divided by 4 is 0.75. In that problem we had to annex zeros a couple times in order to continue dividing.

And you know what? That makes sense because I know that ¾ is the same as 0.75!

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Let's Try it (Slide 6-7): Now let's work together to divide whole numbers that result in a quotient with a decimal. In previous years when we have divided, we've thought of any leftovers as a remainder. Today we saw that we can continue dividing even if our whole numbers don't divide neatly by thinking of our remainder as a decimal. Today when we see that we're "stuck" in our division, we'll put in a decimal and continue dividing into the tenths, hundredths, and thousandths places if need be. Are you ready?

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WARM WELCOME

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Today we will use long division to divide whole numbers that result in a quotient with a decimal.

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Let's Talk:

What do you notice about the numbers shown here?

72	5	899	1.2
72.0	5.00	899.000	1.20

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Let's Think:

Use long division to find each quotient.

$5\overline{)70}$

$5\overline{)72}$

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Let's Think:

Let's think about one more example.

$3 \div 4$

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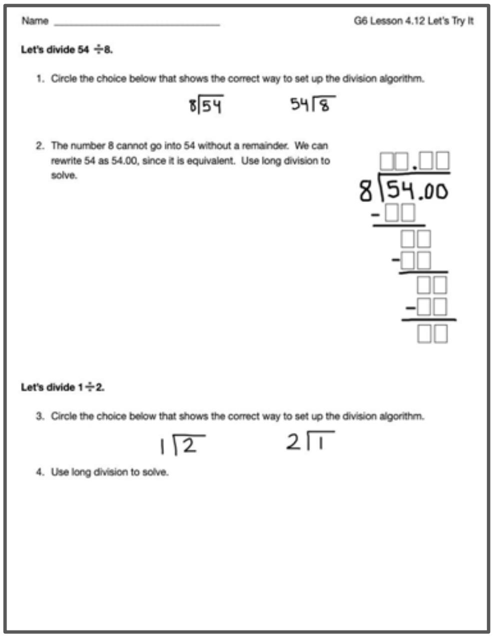
Let's Try It:

Let's use long division to divide whole numbers that result in a quotient with a decimal!



Name ______________________ G6 Lesson 4.12 Let's Try It

Let's divide 54 ÷8.

1. Circle the choice below that shows the correct way to set up the division algorithm.

$8\overline{)54}$ $54\overline{)8}$

2. The number 8 cannot go into 54 without a remainder. We can rewrite 54 as 54.00, since it is equivalent. Use long division to solve.

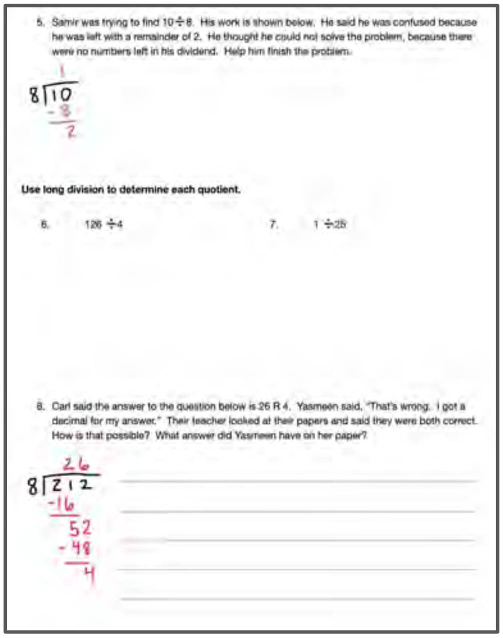
$8\overline{)54.00}$

Let's divide 1÷2.

3. Circle the choice below that shows the correct way to set up the division algorithm.

$1\overline{)2}$ $2\overline{)1}$

4. Use long division to solve.



5. Samir was trying to find 10÷8. His work is shown below. He said he was confused because he was left with a remainder of 2. He thought he could not solve the problem, because there were no numbers left in his dividend. Help him finish the problem.

Use long division to determine each quotient.

6. 126 ÷4

7. 1 ÷25

8. Carl said the answer to the question below is 26 R 4. Yasmeen said, "That's wrong. I got a decimal for my answer." Their teacher looked at their papers and said they were both correct. How is that possible? What answer did Yasmeen have on her paper?

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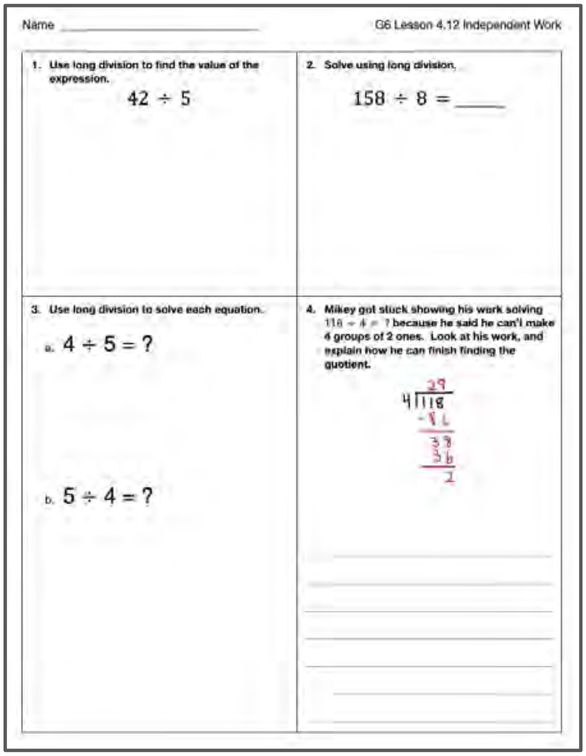
On your Own:



Name ____________________

G6 Lesson 4.12 Independent Work

1. **Use long division to find the value of the expression.**

   42 ÷ 5

2. **Solve using long division.**

   158 ÷ 8 = _____

3. **Use long division to solve each equation.**

   a. 4 ÷ 5 = ?

   b. 5 ÷ 4 = ?

4. **Mikey got stuck showing his work solving 118 ÷ 4 = ? because he said he can't make 4 groups of 2 ones. Look at his work, and explain how he can finish finding the quotient.**

   29

   4⟌118

   -8

   38

   36

   2

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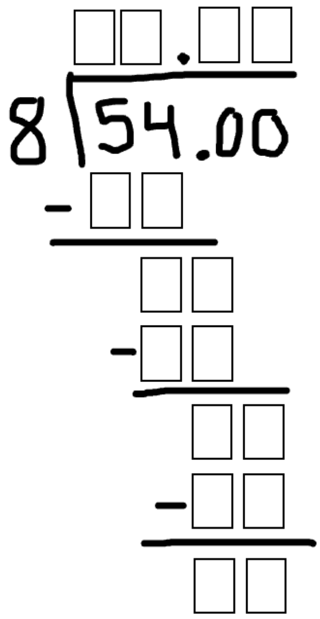
Let’s divide 54 ÷ 8.

1. Circle the choice below that shows the correct way to set up the division algorithm.

$8\overline{)54}$ $54\overline{)8}$

2. The number 8 cannot go into 54 without a remainder. We can rewrite 54 as 54.00, since it is equivalent. Use long division to solve.



Let’s divide 1 ÷ 2.

3. Circle the choice below that shows the correct way to set up the division algorithm.

$1\overline{)2}$ $2\overline{)1}$

4. Use long division to solve.

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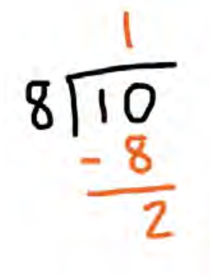
5. Samir was trying to find 10 ÷ 8. His work is shown below. He said he was confused because he was left with a remainder of 2. He thought he could not solve the problem, because there were no numbers left in his dividend. Help him finish the problem.

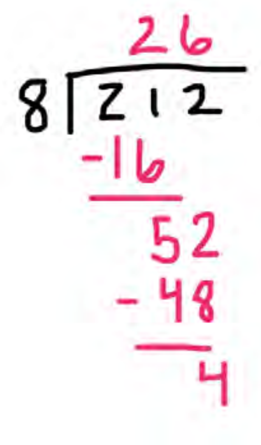


Use long division to determine each quotient.

6. 126 ÷ 4

7. 1 ÷ 25

8. Carl said the answer to the question below is 26 R 4. Yasmeen said, "That's wrong. I got a decimal for my answer." Their teacher looked at their papers and said they were both correct. How is that possible? What answer did Yasmeen have on her paper?



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Name ______________________________

1. Use long division to find the value of the expression. $42 \div 5$	**2. Solve using long division.** $158 \div 8 =$ _____

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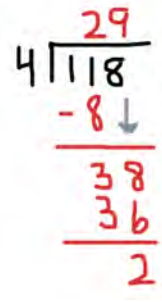
3. Use long division to solve each equation.

a. $4 \div 5 = ?$

b. $5 \div 4 = ?$

4. Mikey got stuck showing his work solving $118 \div 4 = ?$ because he said he can't make 4 groups of 2 ones. Look at his work, and explain how he can finish finding the quotient.



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Name KEY

Let's divide 54 ÷ 8.

1. Circle the choice below that shows the correct way to set up the division algorithm.

[✓ $8\overline{)54}$] $54\overline{)8}$

2. The number 8 cannot go into 54 without a remainder. We can rewrite 54 as 54.00, since it is equivalent. Use long division to solve.

$$\begin{array}{r} \boxed{0}\boxed{6}.\boxed{7}\boxed{5} \\ 8\overline{)54.00} \\ -\boxed{4}\boxed{8} \\ \hline \boxed{6}\boxed{0} \\ -\boxed{5}\boxed{6} \\ \hline \boxed{4}\boxed{0} \\ -\boxed{4}\boxed{0} \\ \hline \boxed{0}\boxed{0} \end{array}$$

Let's divide 1 ÷ 2.

3. Circle the choice below that shows the correct way to set up the division algorithm.

$1\overline{)2}$ [✓ $2\overline{)1}$]

4. Use long division to solve.

$$\begin{array}{r} 0.5 \\ 2\overline{)1.0} \\ -1\,0 \\ \hline 0 \end{array}$$

[✓ 0.5]

5. Samir was trying to find 10 ÷ 8. His work is shown below. He said he was confused because he was left with a remainder of 2. He thought he could not solve the problem, because there were no numbers left in his dividend. Help him finish the problem.

1.25
8 ⟌ 10.00
-8 ↓
20
-16 ↓
40
-40
0

$\boxed{1.25}$

Use long division to determine each quotient.

6. 126 ÷ 4

31.5
4 ⟌ 126.0
-12 ↓
06
04 ↓
20
-20
0

$\boxed{31.5}$

7. 1 ÷ 25

0.04
25 ⟌ 1.00
-1 00
0

$\boxed{0.04}$

8. Carl said the answer to the question below is 26 R 4. Yasmeen said, "That's wrong. I got a decimal for my answer." Their teacher looked at their papers and said they were both correct. How is that possible? What answer did Yasmeen have on her paper?

26.5
8 ⟌ 212.0
-16
52
-48 ↓
40
-40
0

Carl wrote his answer as 26 R 4, but Yasmeen annexed a zero to continue dividing (see my example). She got 26.5 as her quotient.

Name KEY

G6 Lesson 4.12 Independent Work

1. **Use long division to find the value of the expression.**

$$42 \div 5$$

$$\begin{array}{r} 8.4 \\ 5\overline{)42.0} \\ -40\downarrow \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

$\boxed{8.4}$

2. **Solve using long division.**

$$158 \div 8 = \_\_\_\_\_$$

$$\begin{array}{r} 19.75 \\ 8\overline{)158.00} \\ -8\downarrow \\ \hline 78 \\ 72\downarrow \\ \hline 60 \\ -56\downarrow \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

$\boxed{19.75}$

3. **Use long division to solve each equation.**

a. $4 \div 5 = ?$

$$\begin{array}{r} 0.8 \\ 5\overline{)4.0} \\ -40 \\ \hline 0 \end{array}$$

$\boxed{0.8}$

b. $5 \div 4 = ?$

$$\begin{array}{r} 1.25 \\ 4\overline{)5.00} \\ -4\downarrow \\ \hline 10 \\ -8 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

$\boxed{1.25}$

4. **Mikey got stuck showing his work solving** $118 \div 4 = ?$ **because he said he can't make 4 groups of 2 ones. Look at his work, and explain how he can finish finding the quotient.**

$$\begin{array}{r} 29.5 \\ 4\overline{)118.0} \\ -8\downarrow \\ \hline 38 \\ 36 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

He can think of 118 as 118.0, so he can continue dividing his quotient up into groups of 4. If he does that, the 2 can be thaught of as 20, which can be divided neatly by 4.

G6 U4 Lesson 13

Divide decimals by whole numbers

G6 U4 Lesson 13 - Students will divide decimals by whole numbers

Warm Welcome (Slide 1): Tutor choice.

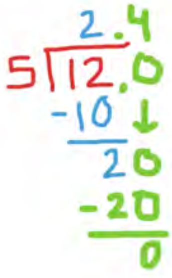
Frame the Learning/Connect to Prior Learning (Slide 2): Over the past several lessons, we've been honing our division skills. Today's aim is to divide decimals by whole numbers. This sounds like a new objective, but think back to our previous lesson. In many of our problems, we had to rewrite our dividend as a decimal, for example we converted 5 to 5.00 to help us divide. So, in a way, we've already seen how we can divide with decimals and today is an opportunity to dig a little deeper and finetune our decimal division.

Let's Talk (Slide 3): Speaking of our last lesson, this slide shows a division problem. The person who was trying to solve it claims they got stuck and they want our help. **Take a look at what they've done so far. Describe what you see.** Possible Student Answers, Key Points:

- It looks like long division. They know 5 groups of 2 go into 12.
- They wrote the 2 in their quotient, and took away 10 from their dividend.
- They were left with a remainder of 2, and then they got stuck.

Based on what we did in our last lesson, can you think of what they could do next to finish solving and get a decimal answer? Possible Student Answers, Key Points:

- They could add a decimal to make it 12.0 and 2.0.
- They could write 12 as 12.0, so they can continue dividing.
- 12.0 means the same thing as 12, but it helps us because we can now think about the tenths place.

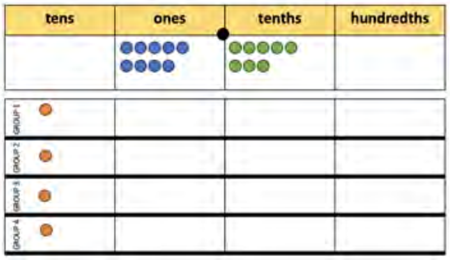


Excellent. Let's finish this for them. We annex a zero and put our decimal in to make 12.0. Bring the 0 down in our dividend, so now we're thinking of 20. 5 groups of 4 go into 20, so our 4 goes in the quotient and we subtract 20 in the dividend. Our quotient is 2.4! Let's pause here. When turned 12 into 12.0 to help us finish this problem, we made a decimal number. Did our process change? Did we have to change how we approached our long division? Possible Student Answers, Key Points:

- No, it's the same steps, just with a new place value!
- When we made 12 into the decimal 12.0, we just kept doing the long division steps we're used to. The math didn't change; we just thought of our dividend a bit differently.

Aha! So dividing a decimal by a whole number, really isn't any different than dividing with all whole numbers. We just have to keep a slightly closer eye on our place value and the placement of our decimal. Let's look at a problem together so I can prove it to you.

Let's Think (Slide 4): This slide wants us to divide 49.8 by 4 using a model and then long division. Let's start with the model. This model doesn't use squares and rods like we've seen. It just uses different colored discs or circles in each place value. It's just a little simpler to look at.



tens	ones	tenths	hundredths
	●●●●● ●●●●	●●●●● ●●●	
GROUP 1 ●			
GROUP 2 ●			
GROUP 3 ●			
GROUP 4 ●			

The model shows 4 tens, 9 ones, and 8 tenths. That's 49.8. They want us to split this up evenly into 4 groups, which they show here in rows. Let's start in the biggest place value. Can I split 4 tens up evenly? *Yes, put 1 in each group!* *(Model as you narrate. If you have colored chips or counters, that would work even better than drawing a model, because you can physically manipulate the counters.)* Okay, we have 4 tens in each group.

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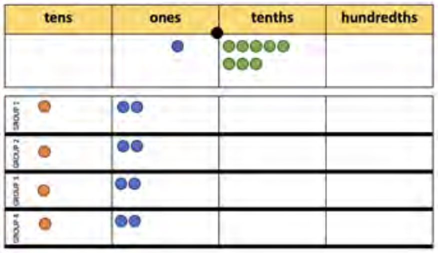
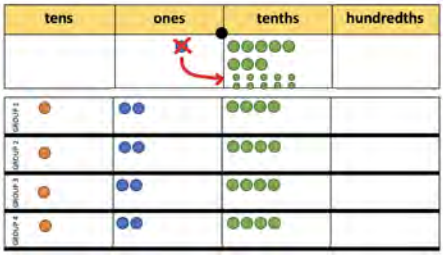
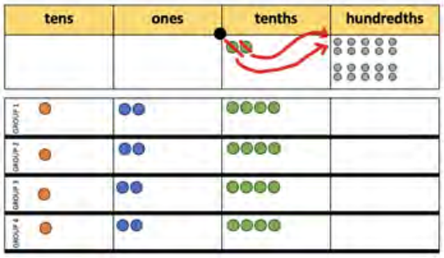


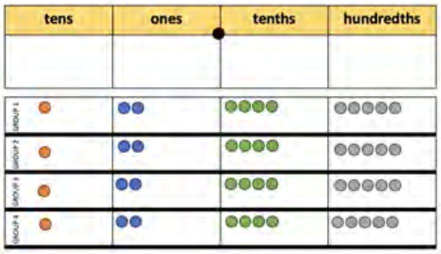
Now let's look at the tens. How could I split up 9 tens? *Put 2 in each group!* When I put 2 in each group, I will have 1 left over. I can't share that evenly into 4 groups. I'll need to break it apart or regroup it into 10 tenths. Let's show that.



Now how many tenths do we have in all? 18! Sharing those evenly means that each group gets 4 (*put 4 in each group*). Now I have 2 tenths left over, because I can't split them into 4 groups. What do you think I'll need to do with those 2 tenths? Regroup them or break them apart! That's right, we have to take our two tenths and break them into hundredths.

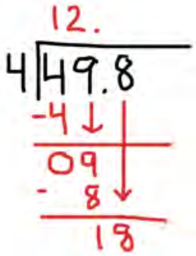


Let's break up 2 tenths. Each tenth can be broken up into 10 hundredths. So 2 tenths can be regrouped into 20 hundredths. Now we we can split those into our 4 groups. How many can I put in each group? 4 groups of 5 makes 20.



So how much was in each group? I see 1 ten, 2 ones, 4 tenths, and 5 hundredths. That's 12.45. We just divided decimals using a model.

Now let's think about how we can use the same ideas to solve the same problem with long division. Do you think we'll get the same answer if we use long division? Let's give it a shot. I'll get us started. Be ready to help me along. 4 groups of 1 go into 4, so I'll put a 1 in our quotient and subtract 4 in the dividend. We saw this step in our model when we put 1 in each group and were left with no more hundreds. Now, we dropped down the 9 and we have 9 left.



I know I can make 4 groups of 2 with 9. We saw this in our model when we put 2 ones in each group and had 1 one left over in our chart. I'll put a 2 in our quotient, then take away 8 from our dividend. We have 1 left, just like when we modeled. Bring down the 8, so that we can keep going. Okay now we have 18.

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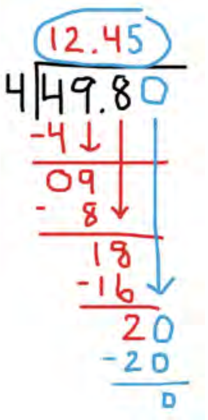
So, 4 groups of 4 can go into 18. Let's put a 4 in our quotient and subtract 16 in our dividend. And look, we saw this in our model when we regrouped the extra 1 to make 1 tenth. That left us with the 18 tenths that we split into 4 groups. After we put 4 in each group, we were left with 2 extra tenths. So since we're left with just 2, it can feel like we're done or we're stuck.



But we know that we can annex a zero to keep going. This is like when we regrouped those 2 leftover tenths to make 20 hundredths. Look, when we annexed the zero in our long division and dropped it down, we make a 20. And, 4 groups of 5 make 20, so our 5 goes into the hundredths place in our quotient. We have zero left so we're done! So 49.8 divided by 4 is 12.45.

We just used long division and arrived at the same answer!

How were our two strategies to divide decimals the same or different? Possible Student Answers, Key Points:

- We got the same answer. They both show splitting 49.8 into 4 equal groups.
- The model involved us having to physically regroup. We could actually see the splitting. It took a little longer.
- The long division is more efficient, but requires us to be extra careful with our decimal placement and place value.

Those are all wonderful reflections on our two strategies! You might prefer one strategy more than the other. You also might find that you prefer a different strategy depending on the problem you're given. As we work more, you're welcome to use the strategy that works best for you at the moment.

Let's Try it (Slide 5-6): Now let's work together to divide decimals by whole numbers. Our work will look just the same as when we divide with whole numbers, we just need to pay close attention to the decimal in our dividend and quotient. We can use models or long division to show our thinking today. We'll work carefully to ensure that the digits in our quotient are in the correct place value when all is said and done. You can do this!

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WARM WELCOME

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Today we will divide decimals by whole numbers.

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Let's Talk:

Help! I'm stuck! How can I finish my work?

$$\begin{array}{r} 2 \\ 5\overline{)12} \\ -10 \\ \hline 2 \end{array}$$

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Let's Think:

Divide 49.8 by 4. Use a model and use long division.

tens	ones	tenths	hundredths
●●●●	●●●●● ●●●●	●●●●● ●●●	

GROUP 1			
GROUP 2			
GROUP 3			
GROUP 4			

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Let's Try It:

Let's divide decimals by whole numbers!

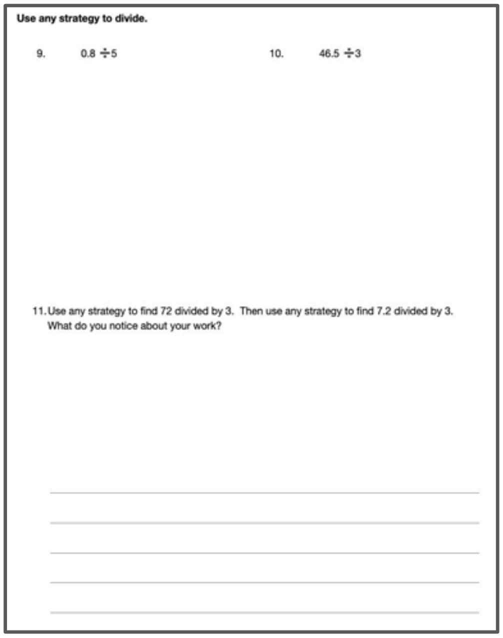
Name ____________________ G6 Lesson 4.13 Let's Try It

Consider the equation 72.4 ÷ 5 = ?

1. Draw a place value model to show 72.4.
2. Split the tens evenly into the 5 groups. Regroup any remaining tens into the ones place.
3. Split the ones evenly into the 5 groups. Regroup any remaining ones into the tenths place.
4. Split the tenths evenly into the 5 groups. Regroup any remaining tenths into the hundredths place.
5. Split the hundredths evenly into 5 groups.
6. How much is in each group?
   ______ tens
   ______ ones
   ______ tenths
   ______ hundredths
7. Solve. 72.4 ÷ 5 = __________
8. Use long division to show how you can arrive at the same quotient.

tens	ones	tenths	hundredths

$5\overline{)72.4}$



Use any strategy to divide.

9. 0.8 ÷ 5

10. 46.5 ÷ 3

11. Use any strategy to find 72 divided by 3. Then use any strategy to find 7.2 divided by 3. What do you notice about your work?

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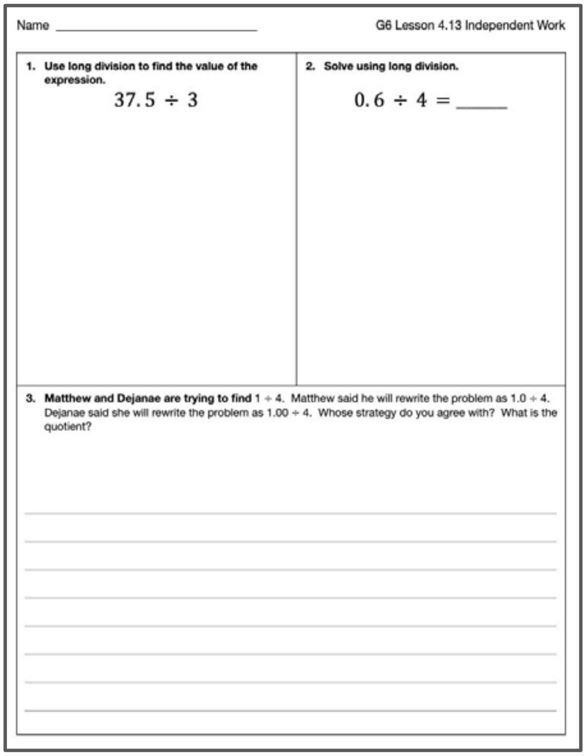
On your Own:



Name ____________________ G6 Lesson 4.13 Independent Work

1. **Use long division to find the value of the expression.**

   $37.5 \div 3$

2. **Solve using long division.**

   $0.6 \div 4 =$ _____

3. **Matthew and Dejanae are trying to find** 1 ÷ 4. Matthew said he will rewrite the problem as 1.0 ÷ 4. Dejanae said she will rewrite the problem as 1.00 ÷ 4. Whose strategy do you agree with? What is the quotient?

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Name ______________________________ G6 U4 Lesson 13 - Let's Try It

Consider the equation 72.4 ÷ 5 = ?

tens	ones	tenths	hundredths

GROUP 1			
GROUP 2			
GROUP 3			
GROUP 4			
GROUP 5			

1. Draw a place value model to show 72.4.
2. Split the tens evenly into the 5 groups. Regroup any remaining tens into the ones place.
3. Split the ones evenly into the 5 groups. Regroup any remaining ones into the tenths place.
4. Split the tenths evenly into the 5 groups. Regroup any remaining tenths into the hundredths place.
5. Split the hundredths evenly into 5 groups.
6. How much is in each group?
   ______ tens
   ______ ones
   ______ tenths
   ______ hundredths
7. Solve. 72.4 ÷ 5 = ___________
8. Use long division to show how you can arrive at the same quotient.

$5\overline{)72.4}$

Use any strategy to divide.

9. $0.8 \div 5$

10. $46.5 \div 3$

11. Use any strategy to find 72 divided by 3. Then use any strategy to find 7.2 divided by 3. What do you notice about your work?

1. **Use long division to find the value of the expression.**

$$37.5 \div 3$$

2. **Solve using long division.**

$$0.6 \div 4 = \_\_\_\_\_$$

3. **Matthew and Dejanae are trying to find** 1 ÷ 4. Matthew said he will rewrite the problem as 1.0 ÷ 4. Dejanae said she will rewrite the problem as 1.00 ÷ 4. Whose strategy do you agree with? What is the quotient?

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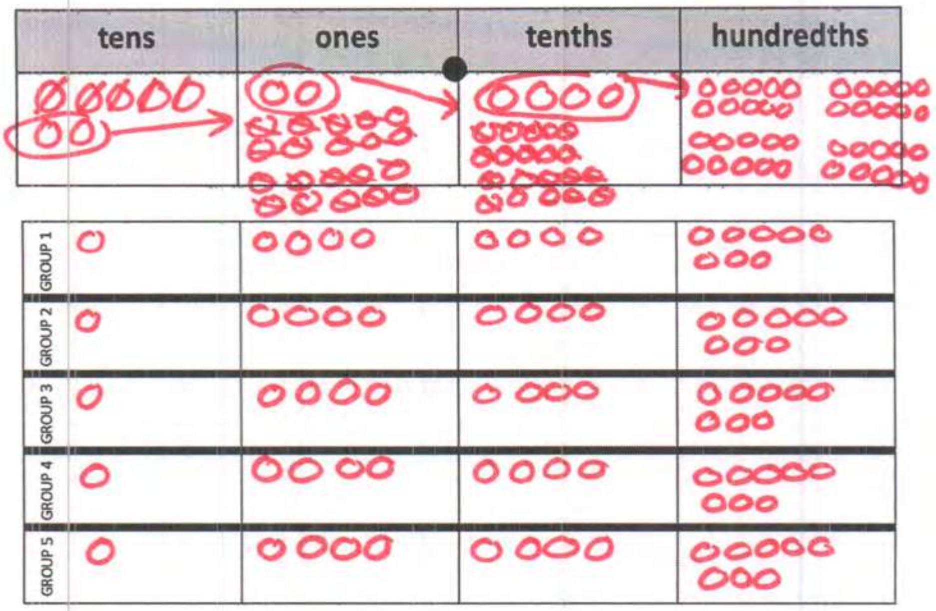
Name KEY

Consider the equation 72.4 ÷ 5 = ?

1. Draw a place value model to show 72.4. ✓



2. Split the tens evenly into the 5 groups. Regroup any remaining tens into the ones place.
3. Split the ones evenly into the 5 groups. Regroup any remaining ones into the tenths place.
4. Split the tenths evenly into the 5 groups. Regroup any remaining tenths into the hundredths place.
5. Split the hundredths evenly into 5 groups.
6. How much is in each group?

   1 tens

   4 ones

   4 tenths

   8 hundredths

7. Solve. 72.4 ÷ 5 = 14.48
8. Use long division to show how you can arrive at the same quotient.

14.48

14.48

5)72.40

-5

22

-20

24

-20

40

-40

0

Use any strategy to divide.

9. 0.8 ÷ 5

$$\begin{array}{r} 0.16 \\ 5\overline{)0.80} \\ -0\ 5\downarrow \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

$\boxed{0.16}$

10. 46.5 ÷ 3

$$\begin{array}{r} 15.5 \\ 3\overline{)46.5} \\ -3\downarrow \\ \hline 16 \\ -15\downarrow \\ \hline 15 \\ -15 \\ \hline 0 \end{array}$$

$\boxed{15.5}$

11. Use any strategy to find 72 divided by 3. Then use any strategy to find 7.2 divided by 3. What do you notice about your work?

$$\begin{array}{r} \boxed{24} \\ 3\overline{)72} \\ -6\downarrow \\ \hline 12 \\ -12 \\ \hline 0 \end{array} \qquad \begin{array}{r} \boxed{2.4} \\ 3\overline{)7.2} \\ -6 \\ \hline 12 \\ -12 \\ \hline 0 \end{array}$$

It is the same work in every way except the place value in our dividend and quotient. The second problem is just 72 tenths split 3 ways, so the quotient isn't 24... it's 24 tenths.

Name KEY

1. Use long division to find the value of the expression.

$$37.5 \div 3$$

$$\begin{array}{r} 12.5 \\ 3\overline{)37.5} \\ -3 \\ \hline 07 \\ -06 \\ \hline 15 \\ -15 \\ \hline 0 \end{array}$$

$\boxed{12.5}$

2. Solve using long division.

$$0.6 \div 4 = \underline{\qquad}$$

$$\begin{array}{r} 0.15 \\ 4\overline{)0.60} \\ -4 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

$\boxed{0.15}$

3. **Matthew and Dejanae are trying to find** 1 ÷ 4. Matthew said he will rewrite the problem as 1.0 ÷ 4. Dejanae said she will rewrite the problem as 1.00 ÷ 4. Whose strategy do you agree with? What is the quotient?

$$\begin{array}{r} 0.25 \\ 4\overline{)1.00} \\ -08 \\ \hline 20 \\ -20 \\ \hline 0 \end{array} \qquad 4\overline{)1.0}$$

I would use Dejanae's Strategy. Both students Know they can annex zeroes, but in this case, Matthew's dividend would need to annex an additional zero. 4 could not go into 1.0 (10 tenths) as is; it'd be easier to think of 1 as 1.00 (100 hundredths), since 4 goes into 100.

G6 U4 Lesson 14

Divide decimals by decimal divisors

G6 U4 Lesson 14 - Students will divide with decimal divisors

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working on division with decimals for the past several days, and we've arrived at our final lesson. We've already learned how to divide whole numbers, we saw what happens when we have decimal quotients, we explored dividing a decimal by a whole number, and today we will see how to tackle problems that involve a decimal divisor. Let's begin.

Let's Talk (Slide 3): Take a peek at the two division problems on this slide. **Without trying to solve them, what do you notice? What do you wonder?** Possible Student Answers, Key Points:

- I notice they involve the same digits. I notice they're set up as if we'd use long division. I notice some decimal numbers and some whole numbers.
- I wonder if they're the same problem. I wonder what the quotient would be.

Those are all great ideas. I want you to picture in your mind for a moment. Can you picture a model of 24.8? I'm picturing 2 tens, 4 ones, 8 hundredths, right? Now, can you picture dividing that or splitting it into 4 equal groups? Sure! We've been doing that for the past couple lessons. We could take our pieces and split them evenly into 4 groups, regrouping if necessary.

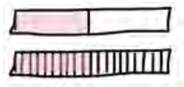
Now. Picture the problem on the right. Can you picture a model of 2.48 in your mind? I'm picturing 2 wholes, 4 tenths, 8 hundredths. See it? Now, what if I told you to split it into…0.4 groups. Can you picture that? Not really right? It's hard to think about 4 tenths of a group. What would that look like? How would I share things in 0.4 of a group–that's not even a whole group? It's difficult to think about divisors as decimals because it's hard to imagine groups that aren't whole numbers.

Well don't worry! Today, when we see divisors that are decimals, we're going to REWRITE our division to make it easier to think about and solve. Let me show you what I mean.

Let's Think (Slide 4): Think back to 3rd, 4th, and 5th grade for a second. If I gave you a fraction, like ½ *(write ½)*, and I multiplied the numerator and denominator by the same number…let's say 10 *(show that like in example)*. What happens? We'd get 10/20! We'd get an equivalent fraction!

$$\frac{1}{2} \times \frac{10}{10} = \frac{10}{20}$$

(NOTE: If students don't mention that the fractions are equivalent, consider drawing a picture of ½ and of 10/20 using the same-sized bar to emphasize that the pieces look different, but they are still equivalent values.)



We can use this thinking to help make tricky-seeming division problems, much more manageable. Let's look at a few division problems and rewrite them to make them easier to solve..

$$\frac{48.84}{0.4}$$

Read this problem with me, 48.84 divided by 0.4. A problem like 48.84 divided by 0.4 can seem hard to grasp at first. 48.84…split into 0.4 groups…hmm, not the simplest problem to think about because the divisor is not a whole number of groups. But, we can fix that. If I think of 48.84 divided by 0.4 as a fraction, it would look like this *(write it)*.

$$\frac{48.84}{0.4} \times \frac{10}{10} = \frac{488.4}{4}$$

If I multiply both numbers by 10, each digit in my numerator and each digit in my denominator will shift over to the next place value up *(show this)*. Look! This division expression is equivalent just like ½ and 2/10, but now I can think of my problem as 488.4 divided by 4, or 488.4 divided into 4 groups. That's much

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easier to wrap my head around. Notice, I chose to multiply by 10, because I saw that if the 4 in my divisor shifted up one place value, it'd be a nice easy whole number.

Look at the next example. It wants us to divide 52.7 by 0.63. Once again, this is not the easiest division problem to think about as is. If I can make the denominator, 0.63, into a whole number like 63, then we can much more efficiently tackle this problem.

$$\frac{52.7}{0.63} \times \frac{100}{100} = \frac{5270}{63}$$

$$5270 \div 63$$

Let's write our division as a fraction (write 52.7/0.63). If I multiplied both numbers by 10, I get 527 over 6.3. That's not helpful because my divisor is still a decimal, 6.3, which means it's still hard to imagine our groups. I need to shift each digit TWO place values in this problem. So I need to actually multiply each number by 100 *(cross out the x10 example, write out the x100 example as shown)*. Now we have a whole number for our divisor. We could simply divide 5270 by 63.

$$\frac{9}{0.005} \times \frac{1000}{1000} = \frac{9000}{5}$$

$$9000 \div 5$$

Look at the next example. Yikes! The divisor is a decimal, 0.005. Let's rewrite this as an easier problem. What does this equation look like as a fraction? 9/0.005! Nice. If we want to make that divisor a whole number, we're going to have to shift everything over 3 place values. What do you think I can multiply by to shift our digits 3 place values? 1000/1000! Let's do it! Now our equivalent division expression reads 9,000 divided by 5. Much easier!

$$\frac{2.4}{1.2} \times \frac{10}{10} = \frac{24}{12}$$

$$24 \div 12$$

Try the last one here. Don't evaluate it, just rewrite it as an easier, equivalent division expression. *(Give student time to work).* Great. We multiplied both numbers by 10. Each digit shifted up one place value, and we ended up with an equivalent division expression of 24 divided by 12.

Now, in your own words, how could you describe what we just did in each expression and why we did it? Possible Student Answers, Key Points:

- We wanted to make easier division expressions that were equivalent to the original ones. To do that, we wanted to get a whole number divisor.
- We used powers of 10 (10, 100, 1000) to help us. We multiplied each number by the same power of 10 so that the divisor became a whole number.
- Then we wrote an equivalent division expression that would be simpler to solve.

Let's Think (Slide 5): Let's try one more together. This time, we'll actually do the division.

This question wants us to divide 9.248 by 3.4. Our divisor is not a whole number, so we'll want to rewrite this to make our lives easier. How can I rewrite this? We can multiply by 10/10 so that our divisor becomes 34. Our dividend's digits would shift up to become 92.48.

$$\frac{9.248}{3.4} \times \frac{10}{10} = \frac{92.48}{34}$$

$$92.48 \div 34 = ?$$

So our rewritten division equation is now 92.48 divided by 34 equals something. Let's set up our division algorithm so we can do our vertical calculations.

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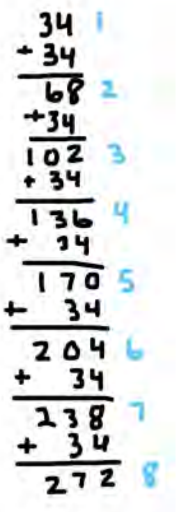
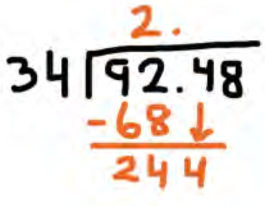
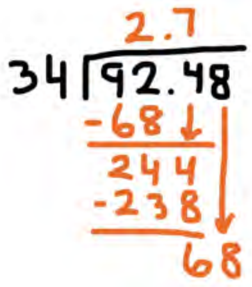


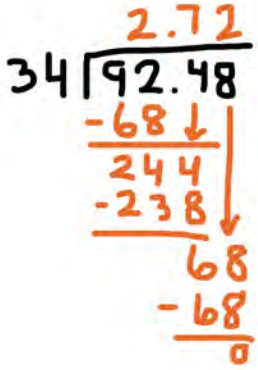
Now wait, one thing I notice is that this divisor is not a number that I know in my head super well. So, let's list out some multiples of 34 using repeated addition so that we can use them as we go through our long division. *(Write out a list repeatedly adding 34. As you go, label each new multiple with how many 34s it represents. See example.)* This feels a little tedious, but when we have a divisor that we don't know multiples of by heart, it will save us time in the long run.



Okay, so I need to think…34 groups of what goes into 92? Or how many 34s can go into 92. Look at our list. I see 2 groups of 34 can go into 92 without going over. *So, we*'ll write 2 in our quotient, and take away 68 in our dividend. Now remember, we have to make sure that we write the decimal up in our quotient to make sure we don't lose track.



We can now think about 244. 34 groups of what goes into 244? Or, another way to think of that is, how many 34s can go into 244? 7! This is why doing our multiples of 24 can be helpful! Yeah, 7! We'll put 7 in our quotient, and subtract 238 in our dividend.



Once we bring down our 8, all we have left to worry about dividing from is 68. Can you help me finish? So, 34 goes into 68 two times. I can see that from our list. So we write 2 in the quotient and when we subtract 68 in the dividend, we have nothing left. Our quotient is 2.72! Great work! As you can probably tell, the long division today is no different than we've been doing the past several lessons. Our main job today will be to carefully rewrite any tricky division expressions that have decimal divisors into equivalent division expressions with whole number divisors. Once that's handled, we can start on our long division steps easily.

Let's Try it (Slide 6-7): Now let's work together to divide with decimal divisors. When we have a decimal divisor, we will write an equivalent division expression by adjusting the place value of the digits in the dividend and the divisor to make a whole-number divisor. We will multiply by powers of 10 to do this in a snap. This makes thinking about splitting into groups much easier. Let's carefully rewrite our division problems to make our math more manageable. Let's keep at it!

WARM WELCOME

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Today we will divide with decimal divisors.

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Let's Talk:

What do you notice? What do you wonder?

$4\overline{)24.8}$ $0.4\overline{)2.48}$

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Let's Think:

Let's rewrite some division equations to make them easier to think about.

$48.84 \div 0.4$

$52.7 \div 0.63$

$9 \div 0.005$

$2.4 \div 1.2$

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Let's Think:

Let's try dividing now!

$$9.248 \div 3.4$$

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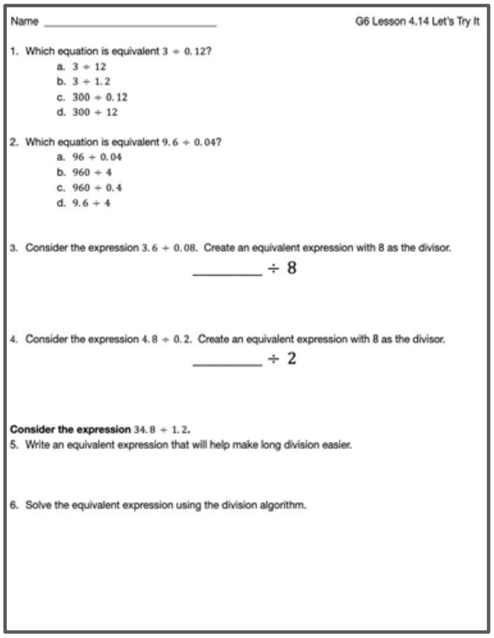
Let's Try It:

Let's divide with decimal divisors!



Name ______________________ G6 Lesson 4.14 Let's Try It

1. Which equation is equivalent $3 \div 0.12$?
    - a. $3 \div 12$
    - b. $3 \div 1.2$
    - c. $300 \div 0.12$
    - d. $300 \div 12$

2. Which equation is equivalent $9.6 \div 0.04$?
    - a. $96 \div 0.04$
    - b. $960 \div 4$
    - c. $960 \div 0.4$
    - d. $9.6 \div 4$

3. Consider the expression $3.6 \div 0.08$. Create an equivalent expression with 8 as the divisor.

_________ $\div\ 8$

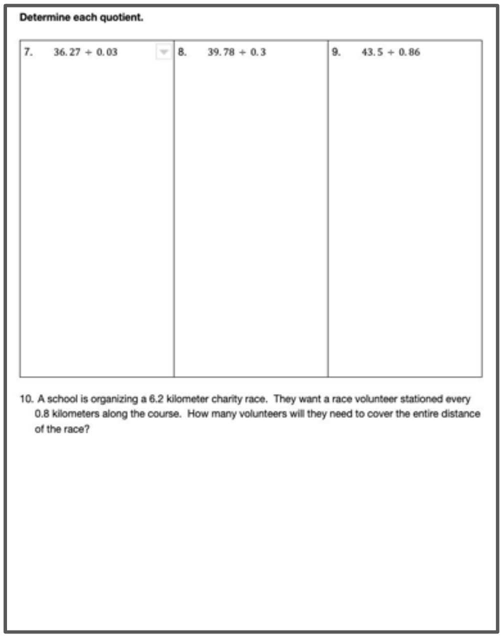
4. Consider the expression $4.8 \div 0.2$. Create an equivalent expression with 8 as the divisor.

_________ $\div\ 2$

Consider the expression $34.8 \div 1.2$.

5. Write an equivalent expression that will help make long division easier.

6. Solve the equivalent expression using the division algorithm.



Determine each quotient.

7. $36.27 \div 0.03$	8. $39.78 \div 0.3$	9. $43.5 \div 0.86$

10. A school is organizing a 6.2 kilometer charity race. They want a race volunteer stationed every 0.8 kilometers along the course. How many volunteers will they need to cover the entire distance of the race?

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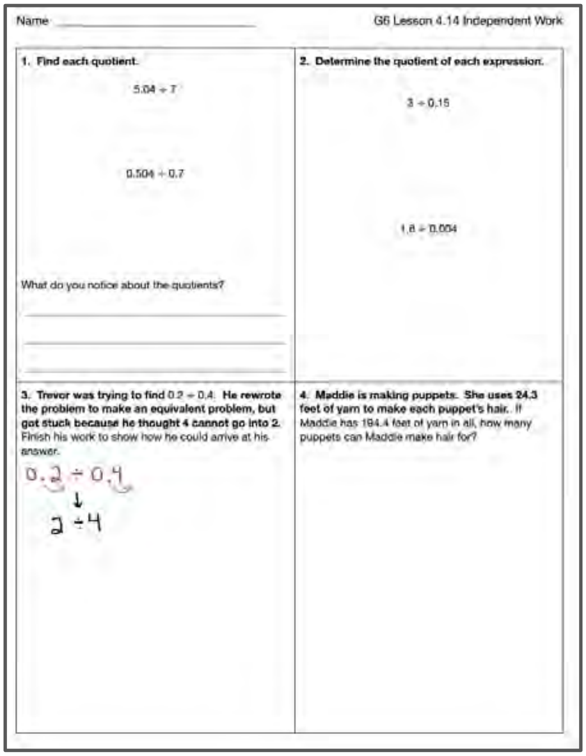
On your Own:



Name ____________________ G6 Lesson 4.14 Independent Work

1. Find each quotient.

$5.04 \div 7$

$0.504 \div 0.7$

What do you notice about the quotients?

2. Determine the quotient of each expression.

$3 \div 0.15$

$1.8 \div 0.004$

3. Trevor was trying to find $0.2 \div 0.4$. **He rewrote the problem to make an equivalent problem, but got stuck because he thought 4 cannot go into 2.** Finish his work to show how he could arrive at his answer.

$$0.2 \div 0.4 \downarrow 2 \div 4$$

4. Maddie is making puppets. She uses 24.3 feet of yarn to make each puppet's hair. If Maddie has 194.4 feet of yarn in all, how many puppets can Maddie make hair for?

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1. Which equation is equivalent $3 \div 0.12$?
    - a. $3 \div 12$
    - b. $3 \div 1.2$
    - c. $300 \div 0.12$
    - d. $300 \div 12$

2. Which equation is equivalent $9.6 \div 0.04$?
    - a. $96 \div 0.04$
    - b. $960 \div 4$
    - c. $960 \div 0.4$
    - d. $9.6 \div 4$

3. Consider the expression $3.6 \div 0.08$. Create an equivalent expression with 8 as the divisor.

__________ $\div\ 8$

4. Consider the expression $4.8 \div 0.2$. Create an equivalent expression with 8 as the divisor.

__________ $\div\ 2$

Consider the expression $34.8 \div 1.2$.

5. Write an equivalent expression that will help make long division easier.

6. Solve the equivalent expression using the division algorithm.

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Determine each quotient.

7. $36.27 \div 0.03$	8. $39.78 \div 0.3$	9. $12 \div 0.004$

10. A school is organizing a 6.2 kilometer charity race. They want a race volunteer stationed every 0.8 kilometers along the course. How many volunteers will they need to cover the entire distance of the race?

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Name ______________________________

G6 U4 Lesson 14 - Independent Work

1. Find each quotient.

5.04 ÷ 7

0.504 ÷ 0.7

What do you notice about the quotients?

____

____

____

____

____

____

2. Determine the quotient of each expression.

3 ÷ 0.15

1.8 ÷ 0.004

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3. Trevor was trying to find 0.2 ÷ 0.4. **He rewrote the problem to make an equivalent problem, but got stuck because he thought 4 cannot go into 2.** Finish his work to show how he could arrive at his answer.

$$0.\underset{\curvearrowright}{2} \div 0.\underset{\curvearrowright}{4}$$

$$\downarrow$$

$$2 \div 4$$

4. Maddie is making puppets. She uses 24.3 feet of yarn to make each puppet's hair. If Maddie has 194.4 feet of yarn in all, how many puppets can Maddie make hair for?

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Name KEY

1. Which equation is equivalent $3 \div 0.12$?
   - a. $3 \div 12$
   - b. $3 \div 1.2$
   - c. $300 \div 0.12$
   - [✓ d. $300 \div 12$]

$$\frac{3}{0.12} \times \frac{100}{100} = \frac{300}{12}$$

2. Which equation is equivalent $9.6 \div 0.04$?
   - a. $96 \div 0.04$
   - [✓ b. $960 \div 4$]
   - c. $960 \div 0.4$
   - d. $9.6 \div 4$

$$\frac{9.6}{0.04} \times \frac{100}{100} = \frac{960}{4}$$

3. Consider the expression $3.6 \div 0.08$. Create an equivalent expression with 8 as the divisor.

$$\frac{3.6}{0.08} \times \frac{100}{100} = \frac{360}{8}$$

360 ÷ 8

4. Consider the expression $4.8 \div 0.2$. Create an equivalent expression with 8 as the divisor.

$$\frac{4.8}{0.2} \times \frac{10}{10} = \frac{48}{2}$$

48 ÷ 2

Consider the expression $34.8 \div 1.2$.

5. Write an equivalent expression that will help make long division easier.

$$\frac{34.8}{1.2} \times \frac{10}{10} = \frac{348}{12}$$

348 ÷ 12

6. Solve the equivalent expression using the division algorithm.

$$\begin{array}{r} 29 \\ 12\overline{)348} \\ -24\downarrow \\ \hline 108 \\ -108 \\ \hline 0 \end{array}$$

29

Determine each quotient.

7. $36.27 \div 0.03$

$\frac{36.27}{0.03} \times \frac{100}{100} = \frac{3627}{3}$

$$\begin{array}{r} 1209 \\ 3\overline{)3627} \\ -3 \\ \hline 06 \\ -06 \\ \hline 02 \\ -00 \\ \hline 27 \\ -27 \\ \hline 0 \end{array}$$

1,209

8. $39.78 \div 0.3$

$\frac{39.78}{0.3} \times \frac{10}{10} = \frac{397.8}{3}$

$$\begin{array}{r} 132.6 \\ 3\overline{)397.8} \\ -3 \\ \hline 09 \\ -09 \\ \hline 07 \\ -06 \\ \hline 18 \\ -18 \\ \hline 0 \end{array}$$

132.6

9. $12 \div 0.004$

$\frac{12}{0.004} \times \frac{1000}{1000} = \frac{12000}{4}$

$12000 \div 4$

12 thousand $\div 4 = 3$ thousand

3000

10. A school is organizing a 6.2 kilometer charity race. They want a race volunteer stationed every 0.8 kilometers along the course. How many volunteers will they need to cover the entire distance of the race?

$6.2 \div 0.8$

$\frac{6.2}{0.8} \times \frac{10}{10} = \frac{62}{8}$

$$\begin{array}{r} 7.75 \\ 8\overline{)62.00} \\ -56 \\ \hline 60 \\ -56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

They need 7.75 volunteers, which means they will need 8 volunteers to be safe.

Name KEY

G6 Lesson 4.14 Independent Work

1. Find each quotient.

5.04 ÷ 7

$$\begin{array}{r} 7.2 \\ 7\overline{)50.4} \\ -49\downarrow \\ \hline 14 \\ -14 \\ \hline 0 \end{array} \qquad \boxed{7.2}$$

0.504 ÷ 0.7

$$\frac{0.504}{0.7} \times \frac{10}{10} = \frac{5.04}{7}$$

$$\begin{array}{r} 0.72 \\ 7\overline{)5.04} \\ -49\downarrow \\ \hline 14 \\ -14 \\ \hline 0 \end{array} \qquad \boxed{0.72}$$

What do you notice about the quotients?

The digits are the same, but their place values are different.

2. Determine the quotient of each expression.

3 ÷ 0.15

$$\frac{3}{0.15} \times \frac{100}{100} = \frac{300}{15}$$

$$\begin{array}{r} 20 \\ 15\overline{)300} \\ -30\downarrow \\ \hline 00 \\ -00 \\ \hline 0 \end{array} \qquad \boxed{20}$$

1.8 ÷ 0.004

$$\frac{1.8}{0.004} \times \frac{1000}{1000} = \frac{1800}{4}$$

$$\begin{array}{r} 450 \\ 4\overline{)1800} \\ -16\downarrow \\ \hline 20 \\ -20\downarrow \\ \hline 00 \\ -00 \\ \hline 0 \end{array} \qquad \boxed{450}$$

3. Trevor was trying to find 0.2 ÷ 0.4. **He rewrote the problem to make an equivalent problem, but got stuck because he thought 4 cannot go into 2.** Finish his work to show how he could arrive at his answer.

$$0.2 \div 0.4$$

$$\downarrow$$

$$2 \div 4 \leftarrow \text{he is correct so far}$$

$$\frac{2}{4} \rightarrow \begin{array}{r} 0.5 \\ 4\overline{)2.0} \\ -2.0 \\ \hline 0 \end{array}$$

$$\boxed{0.5}$$

4. Maddie is making puppets. She uses 24.3 feet of yarn to make each puppet's hair. If Maddie has 194.4 feet of yarn in all, how many puppets can Maddie make hair for?

$$\underset{\text{total}}{194.4} \div \underset{\text{per piece}}{24.3}$$

$$\frac{194.4}{24.3} \times \frac{10}{10} = \frac{1944}{243}$$

$$\begin{array}{r} 8 \\ 243\overline{)1944} \\ -1944 \\ \hline 0 \end{array}$$

Guess and check...

$$\begin{array}{r} {}^{2}\,{}^{1} \\ 243 \\ \times\ 5 \\ \hline 1015 \end{array} \qquad \begin{array}{r} {}^{3}\,{}^{2} \\ 243 \\ \times\ 7 \\ \hline 1701 \end{array} \qquad \begin{array}{r} {}^{3}\,{}^{2} \\ 243 \\ \times\ 8 \\ \hline 1944 \end{array}$$

$$\boxed{8 \text{ puppets}}$$

G6 U4 Lesson 15

Find the greatest common factor of two numbers

G6 U4 Lesson 15 - Students will find the greatest common factor of two numbers.

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working with decimals for the past several lessons. Today we're switching gears to start thinking about factors and multiples, specifically greatest common factors and least common multiples. Today, we'll focus on finding the greatest common factor of two numbers. Before we do that…

Let's Talk (Slide 3): Take a look at the fraction pairs you see here. **Take a second and then tell me: Do you notice anything? What stands out to you?** Possible Student Answers, Key Points:

- The fractions all look different.
- The fractions all have different numerators and denominators.
- Each color shows equivalent fractions.
- The colors show a fraction and then another fraction in simplest form.

Great noticings! Although we won't be working directly with fractions today, you've likely already thought about common factors when you simplified fractions in 5th grade. For example, if I gave you the fraction 4/6 and asked for it in simplest form, you would probably pause and think "Hmm, is there a number or FACTOR that goes into both 4 and 6 that I can divide or FACTOR out of each?" Can you think of one? 2! Yeah, 2 is a factor that goes into 4 and 6. In fact, it's the greatest common factor! If we simplify 4/6 by dividing both the numerator and denominator by 2, we end up with an equivalent fraction of ⅔.

And we do the same thing with simplifying 3/30. We can look for a common factor. So, is there a number or FACTOR that goes into both 3 and 30? Yes, 3! Very good so when we divide both the numerator and denominator by 3, we get 1/10!

And finally, let's look at 6/12. There are a few common factors here but we want to greatest common factor. We know that 2 and 3 both go into 6 and 12 but 6 is also a common factor. So if we divide the numerator and the denominator by 6 we get ½!

Nice! It looks like you've already experienced finding the greatest common factor without even knowing it. We'll use similar thinking as we tackle today's problems. Let's dive in.

Let's Think (Slide 4): Today, our goal will be to look at two numbers and determine what their greatest common factor is. Be aware, sometimes mathematicians abbreviate "greatest common factor" and just say GCF. Our first pair of numbers is 36 and 48. The question asks what is the greatest common factor. **Hmm…do you know any factors of 36 and 48 off the top of your head?** Possible Student Answers, Key Points:

- 2, 12, 4…
- They both have 12 in common.
- Note: Often students own certain factor relationships fluently. This is helpful in the long run, but we want to make sure they have a systematic way to find the GCF for number pairs that might not automatically come to them. If the student jumps quickly to the correct GCF, do not confirm the answer and instead say something like "Hm, you think it's 12. Let's see if we can be 100% certain by showing all our thinking…"

We know that mathematicians are systematic, they do this carefully and efficiently. So, in order to find the GREATEST common factor, we have to first find all the COMMON factors. In order to find the COMMON factors, we have to find all the factors of each number. It is helpful to do this in an organized list or a table so that we don't accidentally forget factors.

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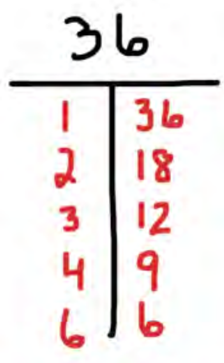
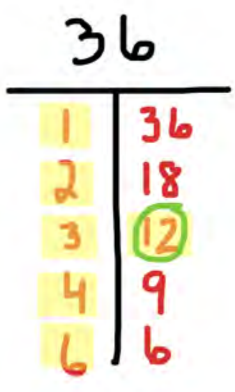


36	
1	36
2	18
3	12
4	9
6	6

Let’s make a t-chart to show the factors for 36 *(complete table as you narrate)*. I know 1 x 36 is 36, so I can start by putting 1 and 36 in my organized chart. I know 2 goes into 36 because 36 is an even number. Hm, 2 times what gives me 36? How could I figure that out if it’s not a fact I know by heart? You could divide 36 by 2 on your paper! You could skip count by 2s until you get to 36. Yes! We have several strategies to find missing factors, so do what works best for you in the moment. So 2 and 18 are factors. 3 and 12 are factors, because 3 x 12 is 36. I know 4 x 9 is 36, so 4 and 9 are factors. Is 5 a factor of 36? No, nothing times 5 will make 36. So then I think our last factor pair is 6 x 6, so let’s add those factors to our chart.

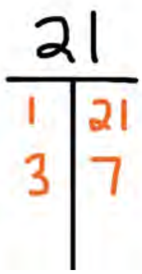
We now have all the factors of 36. Now let’s do the same thing for 48. Let’s go number by number systematically to make sure we’re catching all of our factors. *(Complete t-chart with help from students starting with 1 and 48).*



36	
1	36
2	18
3	12
4	9
6	6

48	
1	48
2	24
3	16
4	12
6	8

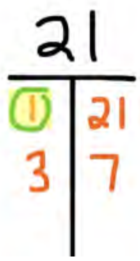
Now that we have all the factors listed out, we just have to look carefully for all the factors they have in common to help us find the GREATEST COMMON FACTOR. Let’s be systematic again, so we don’t miss anything. Let’s go factor-by-factor and highlight or circle any that they have in common. Do they both 1 as a factor? Yes! Do they both have 2 as a factor? Yes! Do they both have 3 as a factor? Yes! Do they both have 4 as a factor? Yes! Do they both have 6 as a factor? Yes! I don’t see 7 on either list, so that’s not a factor of either number. What about 8? Hm, that’s a factor of 48 but not 36. *(Keep going until you’ve checked every factor with the student)*. So our common factors are 1, 2, 3, 4, 6, and 12. Based on that, what do you think the GREATEST common factor is? 36! Nice! We found all the factors of each number, highlighted each COMMON factor, and then we were able to quickly spot the greatest common factor or GCF.



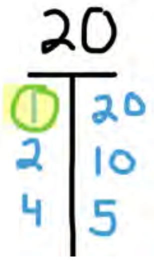
21	
1	21
3	7

20	
1	20
2	10
4	5

Let’s try another one *(create t-chart while narrating)*. The next one wants us to find the GCF of 21 and 20. Let’s start by finding all the factors. I know 1 x 21 makes 21, so 1 and 21 are easy first factors. Can you think of any other factors that make 21? 3 and 7! Yeah, 3 and 7. And that’s it for factors of 21. 2 would not work, 4 doesn’t go into 21, 5 doesn’t go into 21…there are no more factors. Make a t-chart and see if you can find all the factors of 20 and then we can check our factor list. Now we see all our factors.



21	
1	21
3	7



20	
1	20
2	10
4	5

Okay, we listed all of our factors, now let’s look carefully to find which factors do they have in common. It looks like only 1 *(highlight or circle)*. So if the only factor they have in common is 1, what do you think the GREATEST common factor is? 1! Correct! Sometimes the greatest common factor of two numbers will just be 1, and that’s totally fine. This happens when the two numbers have no other common factors.

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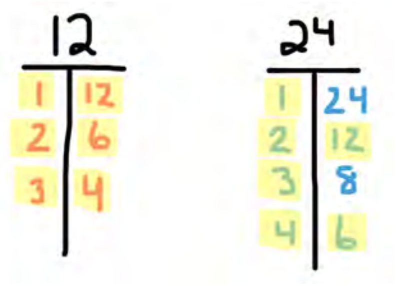
Let’s try our last one. We’re going to find the GCF of 12 and 24. If you feel comfortable, go ahead and make your list of factors for 12 and another list of factors for 24. We’ll check our t-charts when you’re ready. *(Let student work on t-charts, supporting as necessary, then compare with correct work)*



These are all the possible factors of 12 and 24. What are the COMMON factors you see? 1, 2, 3, 4, 6, 12. So based on that list, what would you say the GREATEST common factor is? 12. Correct! The biggest number that can go into 12 and 24 is 12. Sometimes our GCF is actually one of our numbers. This happens when one of the two numbers is a factor of the other. What would you say to somebody who said 24 was the GCF because it’s the biggest factor in our t-charts? Possible Student Answers, Key Points:

- 24 is a factor, but it’s not a common factor of 12 and 24.
- 24 does not go into 12. It is only a factor of 24.

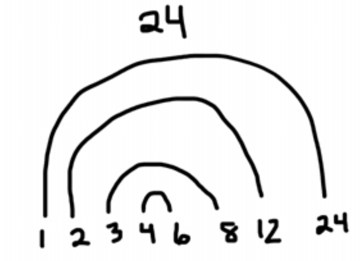
So today when we were asked to find the GCF what did we do each time? Possible Student Answers, Key Points:

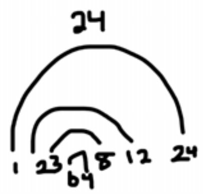
- We made an organized list/chart of every factor for each number. Then we identified which factors the numbers had in common. From there, we selected the greatest of those common factors. That’s the greatest common factor, or GCF.

And we saw that a GCF is sometimes just a regular old factor, but sometimes can be 1 if the numbers have nothing else in common AND it can be one of the numbers if one of the numbers is a factor of the other. We’ll want to keep a careful eye out for similar examples as we work more.

Let’s Try it (Slide 4): Now let’s work together to find the greatest common factor of two numbers. We’ll want to make sure we are finding all the factors of each number in an organized way, identifying which factors our numbers have in common, and then carefully identifying the *greatest* common factor.

NOTE: Some students may be familiar with “factor rainbows” from earlier grades (see first example below). This is a valid way to find factors, but is limiting. It can quickly get messy (see second example) if students don’t have enough space and requires students to predict how many factors they’re going to have in a given number. The t-chart is a more flexible way to build out factor pairs, so encourage students to use them rather than rainbows.





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WARM WELCOME

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Today we will find the greatest common factor of two numbers.

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Let’s Talk:

What do you notice about the fractions?

$$\frac{4}{6} \quad \frac{2}{3} \qquad\qquad \frac{3}{30} \quad \frac{1}{10}$$

$$\frac{6}{12} \quad \frac{1}{2}$$

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Let’s Think:

What is the greatest common factor of each number pair?

36 and 48

21 and 20

12 and 24

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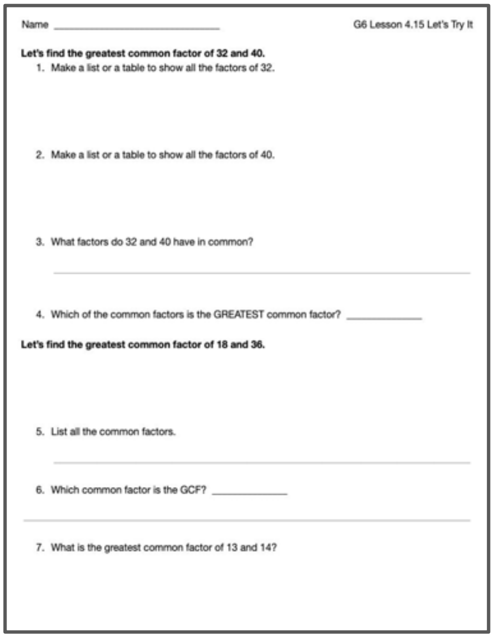
Let's Try It:

Let's find the greatest common factor of two numbers!



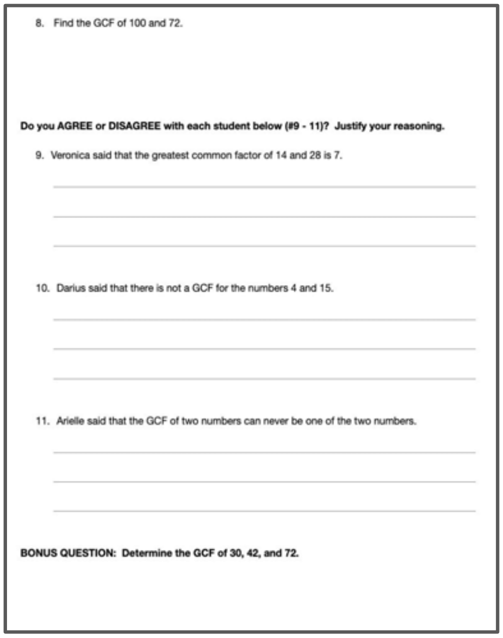
Name ______________________ G6 Lesson 4.15 Let's Try It

Let's find the greatest common factor of 32 and 40.

1. Make a list or a table to show all the factors of 32.
2. Make a list or a table to show all the factors of 40.
3. What factors do 32 and 40 have in common?
4. Which of the common factors is the GREATEST common factor? __________

Let's find the greatest common factor of 18 and 36.

5. List all the common factors.
6. Which common factor is the GCF? __________
7. What is the greatest common factor of 13 and 14?



8. Find the GCF of 100 and 72.

Do you AGREE or DISAGREE with each student below (#9 - 11)? Justify your reasoning.

9. Veronica said that the greatest common factor of 14 and 28 is 7.
10. Darius said that there is not a GCF for the numbers 4 and 15.
11. Arielle said that the GCF of two numbers can never be one of the two numbers.

BONUS QUESTION: Determine the GCF of 30, 42, and 72.

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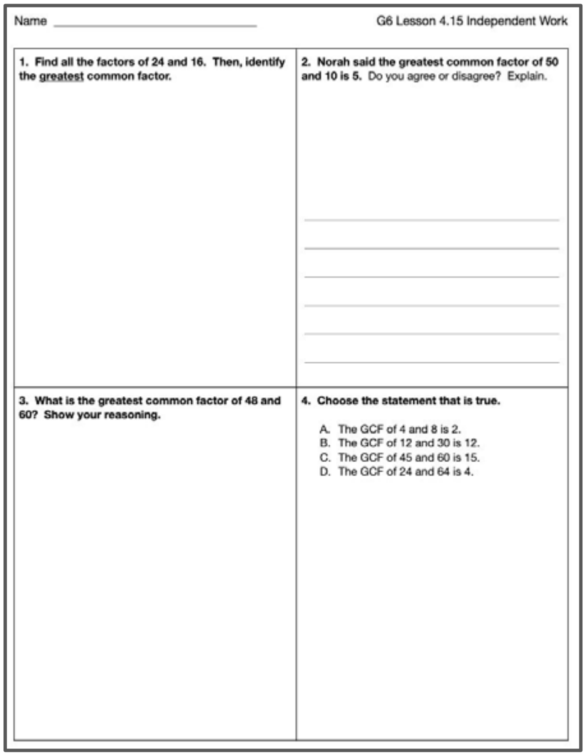
On your Own:



Name ______________________ G6 Lesson 4.15 Independent Work

1. Find all the factors of 24 and 16. Then, identify the greatest common factor.	**2. Norah said the greatest common factor of 50 and 10 is 5.** Do you agree or disagree? Explain.
3. What is the greatest common factor of 48 and 60? Show your reasoning.	**4. Choose the statement that is true.** A. The GCF of 4 and 8 is 2. B. The GCF of 12 and 30 is 12. C. The GCF of 45 and 60 is 15. D. The GCF of 24 and 64 is 4.

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Let's find the greatest common factor of 32 and 40.

1. Make a list or a table to show all the factors of 32.

2. Make a list or a table to show all the factors of 40.

3. What factors do 32 and 40 have in common?

   ____

4. Which of the common factors is the GREATEST common factor? ______________

Let's find the greatest common factor of 18 and 36.

5. List all the common factors.

   ____

6. Which common factor is the GCF? ______________

---

7. What is the greatest common factor of 13 and 14?

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8. Find the GCF of 100 and 72.

Do you AGREE or DISAGREE with each student below (#9 - 11)? Justify your reasoning.

9. Veronica said that the greatest common factor of 14 and 28 is 7.

10. Darius said that there is not a GCF for the numbers 4 and 15.

11. Arielle said that the GCF of two numbers can never be one of the two numbers.

BONUS QUESTION: Determine the GCF of 30, 42, and 72.

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Name ________________________________

1. Find all the factors of 24 and 16. Then, identify the greatest common factor.	**2. Norah said the greatest common factor of 50 and 10 is 5.** Do you agree or disagree? Explain. ______________________________ ______________________________ ______________________________ ______________________________ ______________________________ ______________________________ ______________________________ ______________________________

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3. Find the GCF of each pair of numbers.

15 and 17

9 and 27

3. What is the greatest common factor of 48 and 60? Show your reasoning.

4. Choose the statement that is true.

A. The GCF of 4 and 8 is 2.
B. The GCF of 12 and 30 is 12.
C. The GCF of 45 and 60 is 15.
D. The GCF of 24 and 64 is 4.

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Name KEY

G6 Lesson 4.15 Let's Try It

Let's find the greatest common factor of 32 and 40.

1. Make a list or a table to show all the factors of 32.

32	
1	32
2	16
4	8

2. Make a list or a table to show all the factors of 40.

40	
1	40
2	20
4	10
5	8

3. What factors do 32 and 40 have in common?

1, 2, 4, 8

4. Which of the common factors is the GREATEST common factor? 8

Let's find the greatest common factor of 18 and 36.

18	
1	18
2	9
3	6

36	
1	36
2	18
3	12
4	9
6	6

5. List all the common factors.

1, 2, 3, 6, 9, 18

6. Which common factor is the GCF? 18

7. What is the greatest common factor of 13 and 14?

13	
1	13

14	
1	14
2	7

1

8. Find the GCF of 100 and 72.

④

100

1	100
2	50
④	25
5	10

72

1	72
2	36
3	24
④	18
6	12
8	9

Do you AGREE or DISAGREE with each student below (#9 - 11)? Justify your reasoning.

9. Veronica said that the greatest common factor of 14 and 28 is 7.

I disagree. 7 is a common factor, but 14 is the GCF.

10. Darius said that there is not a GCF for the numbers 4 and 15.

I disagree. 4 and 15 share a common factor of 1.

11. Arielle said that the GCF of two numbers can never be one of the two numbers.

I disagree. The GCF of 14 and 28 is 14, for example.

BONUS QUESTION: Determine the GCF of 30, 42, and 72.

30

①	30
②	15
3	10
5	6

40

①	40
②	20
4	10
5	8

72

①	72
②	36
3	24
4	18
6	12
8	9

②

Name KEY

1. Find all the factors of 24 and 16. Then, identify the greatest common factor.

24	
①	24
②	12
3	⑧
④	6

16	
①	16
②	⑧
④	4

GCF: ⑧

2. Norah said the greatest common factor of 50 and 10 is 5. Do you agree or disagree? Explain.

10	
①	⑩
②	⑤

50	
①	50
②	25
⑤	⑩

I disagree. 5 is <u>a</u> common factor, but it's not the greatest. The GCF is 10.

3. Find the GCF of each pair of numbers.

15 and 17

15

①	15
3	5

17

①	17

①

9 and 27

9

①	⑨
③	3

27

①	27
③	⑨

⑨

3. What is the greatest common factor of 48 and 60? Show your reasoning.

48

①	48
②	24
③	16
④	⑫
⑥	8

60

①	60
②	30
③	20
④	15
5	⑫
⑥	10

⑫

4. Choose the statement that is true.

~~A.~~ The GCF of 4 and 8 is 2.
~~B.~~ The GCF of 12 and 30 is 12.
[✓ C.] The GCF of 45 and 60 is 15.
D. The GCF of 24 and 64 is 4.

A

4

1	④
2	2

8

1	8
2	④

B

12

1	12
2	⑥
3	4

30

1	30
2	15
3	10
5	⑥

C

45

1	45
3	⑮
5	9

60

1	60
2	30
3	20
4	⑮
5	12
6	10

G6 U4 Lesson 16

Find the least common multiple of two numbers

CITYTUTOR DC

G6 U4 Lesson 16 - Students will find the least common multiple of two numbers.

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson, we explored how to find the greatest common factor (GCF) of two numbers. We'll see a little of that in today's work, but we're shifting our focus to think about the LEAST COMMON MULTIPLE (LCM) of two numbers. Ready to get started?

Let's Talk (Slide 3): Take a look at the list of numbers you see in front of you. **Think for a moment, and then tell me: What do you notice? What do you wonder about these lists?** Possible Student Answers, Key Points:

- The numbers get bigger. It looks like skip counting.
- It reminds me of multiplication. Like 2 x 1 = 2, and 2 x 2 = 4, and 2 x 3 = 6, and so on…
- Unlike yesterday when we were finding factors, these lists never end…they could keep going and going and going!

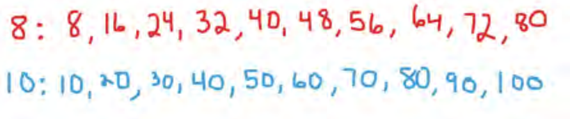
Nice work! Each of these is a list of multiples. A multiple is the product of one number multiplied by another number. So multiples of 2 would be 2 x 1, 2 x 2, 2 x 3, and so on. Multiples of 5 would be 5 x 1, 5 x 2, 5 x 3, and so on. Multiple…multiplied…they kind of sound the same. What multiples of 9 do we see here? 9, 18, 27, 36, 45, 54!

So yesterday we found factors of our numbers and looked for the GREATEST common factor. Today, our goal will be to find multiples of our numbers and look for the LEAST common multiple. Just like yesterday, we'll want to work systematically and carefully to make sure we don't miss any multiples. Let's give it a shot.

Let's Think (Slide 4): We're going to find the least common multiple, or LCM, of a few number pairs. Let's start by finding the LCM of 8 and 10. In order to find the LEAST common multiple, we have to find the common multiples. In order to find the COMMON multiples, we have to find the multiples of each number. Let's do that. We could keep listing multiples forever, so I like to start by listing out the first 10 multiples or so.

8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

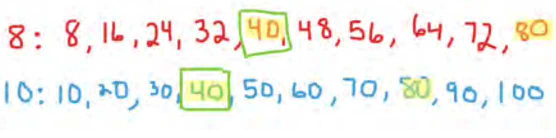
Help me list out the multiples of 8. I know 8 x 1 is 8 *(write multiples in a neat list as you go).* 8 x 2 is 16. 8 x 3 is 24. *(Continue and stop at 80)* Here are the first 10 multiples of 8.



8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

10: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Let's list the first 10 multiples of 10. Help me out. Notice that I'm writing them directly underneath, this will help me when I'm going back to find the least common multiple.



8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

10: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Multiples are different from factors, we see, but at this point we want to look for COMMON multiples just like we looked for common factors. Do you see any multiples that are in common? Yes, I notice 40 and 80! *(highlight both)* They are both common multiples. Which of these is the LEAST common multiple? 40, because it's less than 80! Correct, we would say the least common multiple, or LCM, of 8 and 10 is 40. It is the smallest multiple that both 8 and 10 share, or we can think of it as the smallest number that 8 and 10 both go into evenly.

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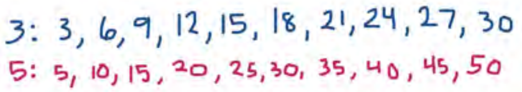
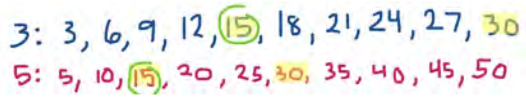
Let's take a look at the second set of numbers. We want to find the least common multiple of 3 and 5. Let's list out the first 10 multiples of 3 and the first 10 multiples of 5.

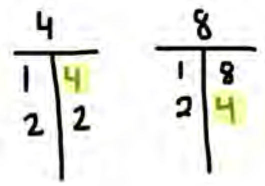


You take a minute to do that and then we can compare our multiples. *(Give time for students to list out multiples, then cross-check and correct as needed)* Great, so here are our first 10 multiples of each number.



I see some common multiples. I see 15 is a multiple of both numbers AND 30 is a multiple of both numbers. So what is our LEAST common multiple? 15! Why isn't it 30? 30 is bigger than 15, and we're looking for the smallest multiple of both numbers!

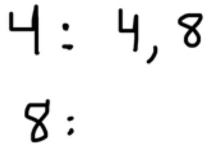
You're doing great. Let's try one more. This last one is asking us for the least common multiple of 4 and 8.



I'm going to start showing my work to you for this one, and I want you to stop me if you see me do anything incorrect. *(Start modeling t-charts as if you're finding the GCF instead of the LCM. List out the factors of each number. Find the greatest of the common factors. Wait for the student to stop you at any point in this process.)* Oh wow, my mistake! **I was finding the greatest common factor when the question wanted me to find the least common multiple. What's the difference again?**

Possible Student Answers, Key Points:

- The greatest common factor is the biggest number that goes into both numbers, so you look for all the factors and find the greatest one that both numbers share.
- The least common multiple requires you to find the smallest number that both numbers can go into, so we list out the multiples of both numbers and select the least common multiple.
- When you're thinking about multiples you're multiplying, when you're thinking about factors you're sort of dividing.



You're right. Let's do that. Go ahead and list out your multiples of 4 and 8. We'll check our work together when you finish. *(Allow student time to work, then compare and correct as needed)* Excellent, you listed out the first 10 multiples of each. I bet you already know the least common multiple. But I want to show you something really quick. *(Write out list as you narrate)* When I was listing out my multiples, I started with 4. **Then 8…then I stopped, because I realized something. What do you think I realized?**

Possible Student Answers, Key Points:

- You went 4, then 8…and realized that 8 was obviously going to be a factor of 8, so you stopped there.
- You didn't really need to list out all the factors, because you found a common factor quickly.

Yeah, sometimes the common factors show up quickly, so you might not always need to make a long list. I also want to point out here that sometimes our LCM actually is one of our numbers. In this case, the LCM of 4 and 8 was actually 8. Nice work wrapping up these three questions. **In your own words, share with me how you go about finding the LCM of two numbers.** Possible Student Answers, Key Points:

- You list out multiples of both numbers.
- Once you have your lists, look for multiples they have in common.
- The smallest of those will be your least common multiple. It's the smallest number that both of your numbers goes into or the smallest number that is a multiple of both numbers.

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We’ve been listing out 10 multiples, which is a good rule of thumb, **but can you think of a situation where listing out 10 multiples might not be as helpful?** Possible Student Answers, Key Points:

- If you notice a common multiple quickly. Like I know with 2 and 4, that 4 is going to be a common multiple. I don’t need to list out 10 multiples in that case
- Maybe you have numbers that don’t have a common multiple within the first 10 multiples. Like 17 and 30. You might have to keep going past 10 multiples.

Excellent thinking. Keep that in mind as we move into the next part of our lesson. And one other thing to consider…just like I did, sometimes people get the greatest common factor and least common multiple mixed up, and they will mistakenly look for the GREATEST common multiple. **Think about our last example. Why would finding the GREATEST common multiple not make sense?** Possible Student Answers, Key Points:

- The multiples just keep going on forever, so we’d never find the greatest one.
- We would have to keep going and going. There are an infinite number of multiples.

Let’s Try it (Slide 5-6): Now let’s work together to find the least common multiple of two numbers. As we work, let’s make sure we are carefully skip-counting or multiplying to create our list of multiples. Once we identify the multiples our numbers have in common, we’ll simply select the LEAST common multiple from that set. Let’s go!

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WARM WELCOME

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Today we will find the least common multiple of two numbers.

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Let's Talk:

What do you notice or wonder about the lists below?

2: 2, 4, 6, 8, 10, 12…

5: 5, 10, 15, 20, 25, 30…

9: 9, 18, 27, 36, 45, 54…

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Let's Think:

What is the least common multiple of each number pair?

8 and 10	3 and 5	4 and 8

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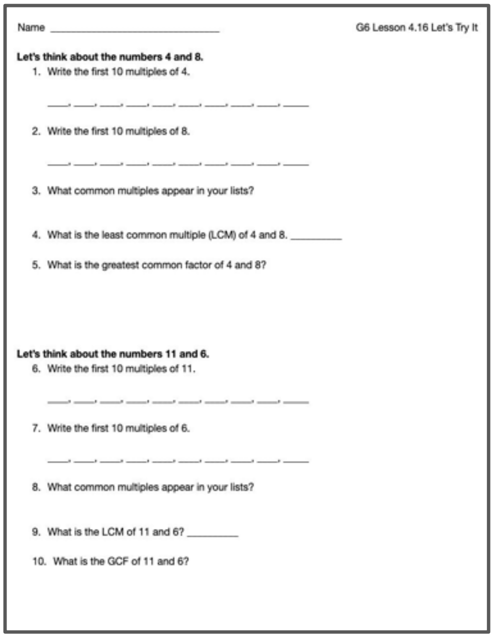
Let’s Try It:

Let’s find the least common multiple of two numbers!



Name ____________________ G6 Lesson 4.16 Let’s Try It

Let’s think about the numbers 4 and 8.

1. Write the first 10 multiples of 4.

____, ____, ____, ____, ____, ____, ____, ____, ____, ____

2. Write the first 10 multiples of 8.

____, ____, ____, ____, ____, ____, ____, ____, ____, ____

3. What common multiples appear in your lists?
4. What is the least common multiple (LCM) of 4 and 8. ________
5. What is the greatest common factor of 4 and 8?

Let’s think about the numbers 11 and 6.

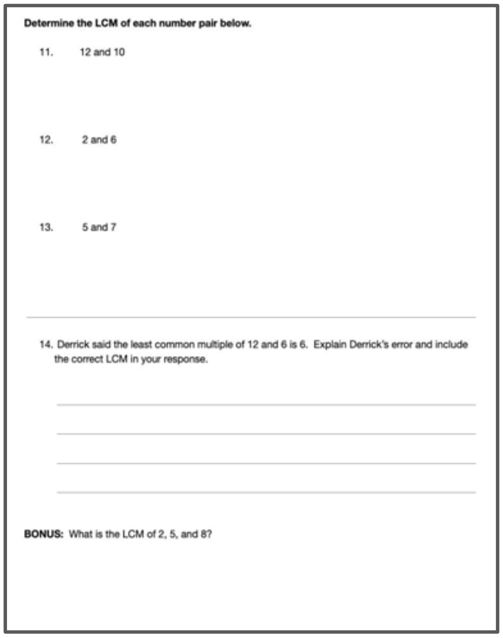
6. Write the first 10 multiples of 11.

____, ____, ____, ____, ____, ____, ____, ____, ____, ____

7. Write the first 10 multiples of 6.

____, ____, ____, ____, ____, ____, ____, ____, ____, ____

8. What common multiples appear in your lists?
9. What is the LCM of 11 and 6? ________
10. What is the GCF of 11 and 6?



Determine the LCM of each number pair below.

11. 12 and 10
12. 2 and 6
13. 5 and 7
14. Derrick said the least common multiple of 12 and 6 is 6. Explain Derrick’s error and include the correct LCM in your response.

BONUS: What is the LCM of 2, 5, and 8?

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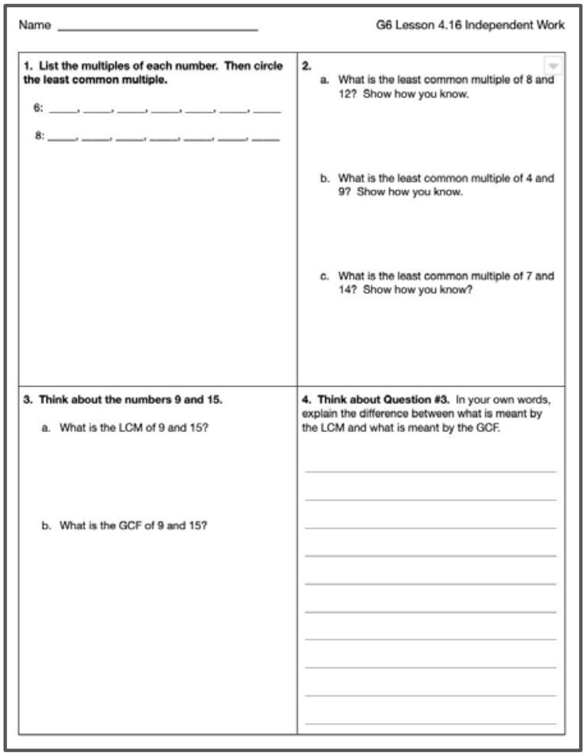
On your Own:



Name ____________________ G6 Lesson 4.16 Independent Work

1. List the multiples of each number. Then circle the least common multiple.

6: ____, ____, ____, ____, ____, ____, ____

8: ____, ____, ____, ____, ____, ____, ____

2.

a. What is the least common multiple of 8 and 12? Show how you know.

b. What is the least common multiple of 4 and 9? Show how you know.

c. What is the least common multiple of 7 and 14? Show how you know?

3. Think about the numbers 9 and 15.

a. What is the LCM of 9 and 15?

b. What is the GCF of 9 and 15?

4. Think about Question #3. In your own words, explain the difference between what is meant by the LCM and what is meant by the GCF.

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Let’s think about the numbers 4 and 8.

1. Write the first 10 multiples of 4.

____, ____, ____, ____, ____, ____, ____, ____, ____, _____

2. Write the first 10 multiples of 8.

____, ____, ____, ____, ____, ____, ____, ____, ____, _____

3. What common multiples appear in your lists?

4. What is the least common multiple (LCM) of 4 and 8. _________

5. What is the greatest common factor of 4 and 8?

Let’s think about the numbers 11 and 6.

6. Write the first 10 multiples of 11.

____, ____, ____, ____, ____, ____, ____, ____, ____, _____

7. Write the first 10 multiples of 6.

____, ____, ____, ____, ____, ____, ____, ____, ____, _____

8. What common multiples appear in your lists?

9. What is the LCM of 11 and 6? _________

10. What is the GCF of 11 and 6?

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Determine the LCM of each number pair below.

11. 12 and 10

12. 2 and 6

13. 5 and 7

---

14. Derrick said the least common multiple of 12 and 6 is 6. Explain Derrick's error and include the correct LCM in your response.

BONUS: What is the LCM of 2, 5, and 8?

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1. List the multiples of each number. Circle the common multiples and then put a box around the least common multiple.

6: _____, _____, _____, _____, _____, _____, _____

8: _____, _____, _____, _____, _____, _____, _____

2.

a. What is the least common multiple of 8 and 12? Show how you know.

b. What is the least common multiple of 4 and 9? Show how you know.

c. What is the least common multiple of 7 and 14? Show how you know?

3. Think about the numbers 9 and 15.

a. What is the LCM of 9 and 15?

b. What is the GCF of 9 and 15?

4. Think about Question #3. In your own words, explain the difference between what is meant by the LCM and what is meant by the GCF.

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Name KEY

Let's think about the numbers 4 and 8.

1. Write the first 10 multiples of 4.

4, 8, 12, 16, 20, 24, 28, 32, 36, 40

2. Write the first 10 multiples of 8.

8, 16, 24, 32, 40, 48, 56, 64, 72, 80

3. What common multiples appear in your lists?

8, 16, 24, 32, 40

4. What is the least common multiple (LCM) of 4 and 8. 8

5. What is the greatest common factor of 4 and 8?

4	
1	4
2	2

8	
1	8
2	4

4

Let's think about the numbers 11 and 6.

6. Write the first 10 multiples of 11.

11, 22, 33, 44, 55, 66, 77, 88, 99, 110

7. Write the first 10 multiples of 6.

6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72

8. What common multiples appear in your lists?

None! I have to extend each count.

9. What is the LCM of 11 and 6? 66

10. What is the GCF of 11 and 6?

11	
1	11

6	
1	6
2	3

1

Determine the LCM of each number pair below.

11. 12 and 10

10, 20, 30, 40, 50, 60

12, 24, 36, 48, 60

60

12. 2 and 6

6, 12, 18

2, 4, 6, 8, 10

6

13. 5 and 7

5, 10, 15, 20, 25, 30, 35

7, 14, 21, 28, 35

35

14. Derrick said the least common multiple of 12 and 6 is 6. Explain Derrick's error and include the correct LCM in your response.

I think Derrick was finding the GCF by accident. The LCM is 12 because it's the smallest multiple of both 6 and 12.

BONUS: What is the LCM of 2, 5, and 8?

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

5, 10, 15, 20, 25, 30, 35, 40

8, 16, 24, 32, 40

Name KEY

1. List the multiples of each number. Circle the common multiples and then put a box around the least common multiple.

6: 6, 12, 18, 24, 30, 36, 42, 48

8: 8, 16, 24, 32, 40, 48, 56, 64

2.

a. What is the least common multiple of 8 and 12? Show how you know.

8, 16, 24, 32

12, 24, 36, 48

24

b. What is the least common multiple of 4 and 9? Show how you know.

4, 8, 12, 16, 20, 24, 28, 32, 36

9, 18, 27, 36

36

c. What is the least common multiple of 7 and 14? Show how you know?

7, 14

14

14

3. Think about the numbers 9 and 15.

a. What is the LCM of 9 and 15?

9, 18, 27, 36, 45

15, 30, 45

45

b. What is the GCF of 9 and 15?

9	
1	9
3	3

15	
1	15
3	5

3

4. Think about Question #3. In your own words, explain the difference between what is meant by the LCM and what is meant by the GCF.

The LCM is the smallest number that two numbers can both go into evenly.

The GCF is the biggest number that can go into both numbers evenly.

G6 U4 Lesson 17

Solve word problems using common multiples and common factors

G6 U4 Lesson 17 - Students will solve word problems using common multiples and common factors.

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In previous lessons, we've been exploring finding the greatest common factor and the least common multiple of two numbers. Today we're going to see how thinking about factors and multiples can help us solve real-life problems.

Let's Talk (Slide 3): Let's start by considering what we already know. **In your own words, what is the same or different about finding the LCM and the GCF of, say, the numbers 8 and 6.** Possible Student Answers, Key Points:

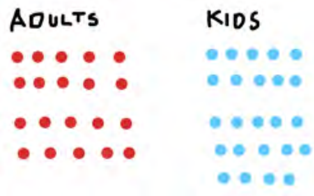
- They're similar in that we want to be organized. They're similar in that we look for what our numbers have in common.
- They're different because when we find common multiples, we're looking for a number that both of our numbers can multiply to get or that both of our numbers go into evenly. We can use skip-counting to list them out.
- They're different because when we find common factors, we're looking for numbers that we can multiply to make our numbers. We can list our factors in a t-chart to help us organize our thinking.

Great, so as we look at story problems today, keep these differences in mind. The story problem won't always tell us if it's a GCF or an LCM problem. We're going to have to think about what we know. If we have a story that involves splitting things into equal groups, that will likely involve common factors. Whereas if we have a problem that involves extending a pattern or thinking about multiple groups, that will likely involve common multiples.

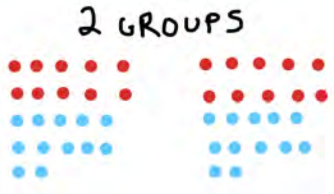
Let's Think (Slide 4): Let's see what this looks like in action. Listen while I read the first problem. It says "There are 20 adults and 24 children going to the amusement park. They want to form identical groups." Let's picture that *(If possible, have objects like counters or cubes to represent the adults and the children. This will be better than a drawing because it will be easier to form and reform groups.)*

The first part of the question says, "Each group must be made up of the same number of adults and children. What is the greatest number of groups that can be made?" **In your own words, what is this problem about?** Possible Student Answers, Key Points:

- It's like a field trip and they want to put the people into chaperone groups that are the same size with same number of adults and kids. They want to have the most groups possible; they don't want like one big group, maybe so that they can spread out.



Yeah. So one option that probably won't work would be to stay in one big group like we see here with 20 adults and 24 kids. *(Move objects or redraw image as you narrate)* I wonder if we could split them into 2 equal groups?



We have 20 adults, so 2 groups would mean 10 adults in each group. We have 24 children, so 2 groups would mean 12 children in each group. That worked! Which option is better for them right now? 2 groups, because they want the most groups possible!

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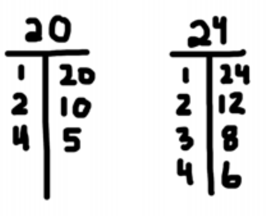
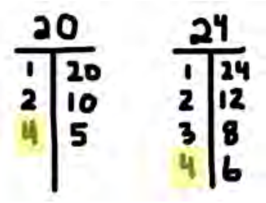
Great. So what if we kept going, do you think 3 groups would work? *(Give students a minute to reorganize the objects/drawing)* Hm, that didn't work, because we couldn't split 20 adults into 3 groups evenly. We'd have some adults left over. Before we keep going, do you see any connections between GCF or LCM in the thinking we're doing? We're trying to split 24 and 20 into equal groups, so it kind of feels like we're factoring.



20	
1	20
2	10
4	5

24	
1	24
2	12
3	8
4	6

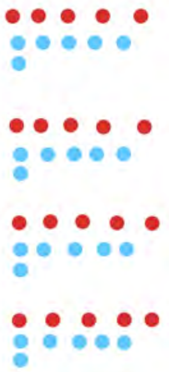
We are factoring! We're thinking of all the ways we can break 24 into equal groups, and we're thinking of all the ways we can split 20 up into equal groups. Let's see if making t-charts to think about all of our factors can help us arrive at a solution to this problem. Take a second to make an organized list of factors of 24 adults and an organized list of factors of 20 children. Then we can compare our factors. *(Let student make t-chart and correct/support as needed)*



20	
1	20
2	10
4	5

24	
1	24
2	12
3	8
4	6

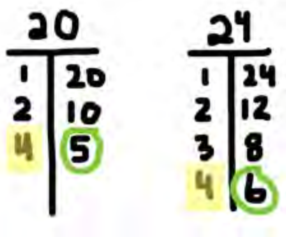
Great, so our list of factors show us that we could group the adults in 1 group of 20 or 20 groups of 1. We could group them in 2 groups of 10 or 10 groups of 2. We could group them in 4 groups of 5 or 5 groups of 4. How could we group the children, based on your factors? 1 group of 24 or 24 groups of 1, 2 groups of 12 or 12 groups of 2, 3 groups of 8 or 8 groups of 3, 4 groups of 6 or 6 groups of 4.



Given that information, the biggest number of groups we could form both numbers into is 4. I figured that out based on the GCF! *(Reorganize objects or drawing to demonstrate the groupings)*

The greatest number of identical groups we could form would be 4. It can't be something more than that, because think about 5 groups. I could split the adults up into 5 groups, but not the children because 5 is not a factor of 24. The GCF showed us that we can make 4 identical groups.

Can you use the work we have shown to answer the second part of the question? How many adults does each group have? How many children? I see 5 adults and 6 children in each group!



20	
1	20
2	10
4	5

24	
1	24
2	12
3	8
4	6

Excellent. We could also see that without the objects/drawings by looking at our factors. In our charts. 4 groups of adults means 5 in each group (*Circle 5)*. 4 groups of children, means 6 in each group *(Circle 6)*.

Let's Think (Slide 5): Since we just worked on a story problem where we used common factors to help get to our answer, you can probably guess our last problem will be about common multiples. You're correct, but I'm going to read it, and I want you to think about *why* using multiples might help us in this context. This question says: "Patrick's house needs some repairs. The smoke detector beeps every 3 minutes, and the dishwasher clanks every 4 minutes. If Patrick hears both sounds at 9:00AM, what is the next time he will hear both sounds at once?" **Why might multiples help us think through this problem?** Possible Student Answers, Key Points:

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- If the smoke detector beeps every 3 minutes, we know it will beep on minute 3, minute 6, minute 9, and so on. Same with the dishwasher, but we'd be thinking about multiples of 4.
- Listing out the multiples will help us see when the sounds sync up.

3, 6, 9, 12, 15, 18, 21, 24, 27, 30

4, 8, 12, 16, 20, 24, 28, 32, 36, 40

Great thinking. We're going to have to extend the pattern of sounds, which might feel like repeated addition or finding multiples. Let's do it. Go ahead and list out multiples, not factors, of 3 and 4. Check with me when you're ready. *(Wait and support/correct as needed)*

3, 6, 9, 12, 15, 18, 21, 24, 27, 30

4, 8, 12, 16, 20, 24, 28, 32, 36, 40

Do we see times where both machines make a sound? Yes, at 12 minutes and 24 minutes. So if Patrick hears both sounds at 9:00AM, when is the next time he'd hear them together? 12 minutes later, which would be 9:12AM.

Now let's look at the second part of this question and see if we can use what we have done so far to help us. The second part asks how many times he will hear both sounds in an hour. How many times did they sound-off together so far based on our work? *Two times, 9:12 and 9:24!* Great, but the question is asking for the next hour, and I don't think we've gone that far in our thinking. What might we do to figure this out? Keep finding multiples. We can extend both lists until we reach an hour or 60 minutes.

3, 6, 9, 12, 15, 18, 21, 24, 27, 30
33, 36, 39, 42, 45, 48, 51, 54, 57, 60

4, 8, 12, 16, 20, 24, 28, 32, 36, 40
44, 48, 52, 56, 60

Let's do just that *(list out the remaining numbers)*. What multiples show us that the machines beeped together? *12, 24, 36, 48, 60!* So over the course of the next hour, how many times do the sounds happen at once? 5!

Great! We spent the past two slides using factors and multiples to help us solve real-world problems. **As we look at our different story problems moving forward, what clues can we listen/look for that can help us know whether common factors or common multiples will be most helpful?** Possible Student Answers, Key Points:

- If we're making equal groups or reorganizing numbers, like in the amusement park problem, common factors will come in handy.
- If we're extending a pattern, like in the problem about Patrick and the noises, common multiples are helpful.

Let's Try it (Slide 6-7): Now let's work together to solve word problems involving common multiples and common factors. As we dig into each word problem, we'll first think whether multiples or factors will help us in the given context. From there, we'll use t-charts or organized lists to help us identify common multiples/factors. Those lists will be the key to unlock the answer to practically any questions that might be thrown our way. Here we go!

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WARM WELCOME

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Today we will solve word problems using common multiple and common factors.

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Let's Talk:

What's the same or different about the LCM and the GCF?

8 and 6

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Let's Think:

There are 20 adults and 24 children going to the amusement park. They want to form identical groups.

a. Each group must be made up of the same number of adults and children. What is the greatest number of groups that can be made?

b. How many adults does each group have? How many children?

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Let's Think:

Patrick's house needs some repairs. The smoke detector beeps every 3 minutes, and the dishwasher clanks every 4 minutes.

a. If Patrick hears both sounds at 9:00am, what is the next time he will hear both sounds at once?

b. How many times will Patrick hear both sounds within that hour?

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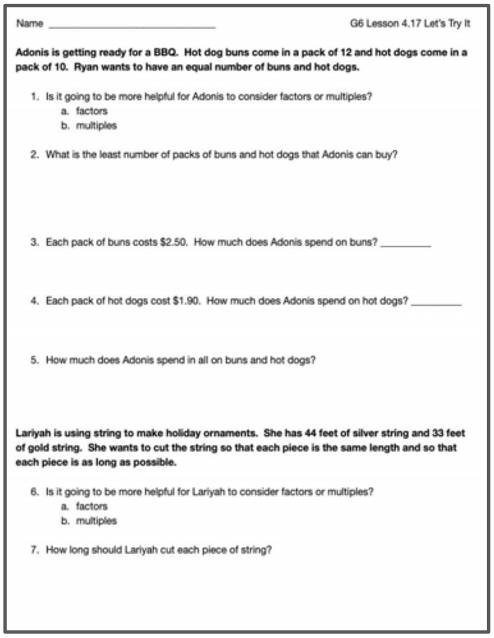
Let's Try It:

Let's solve word problems using common multiples and common factors!



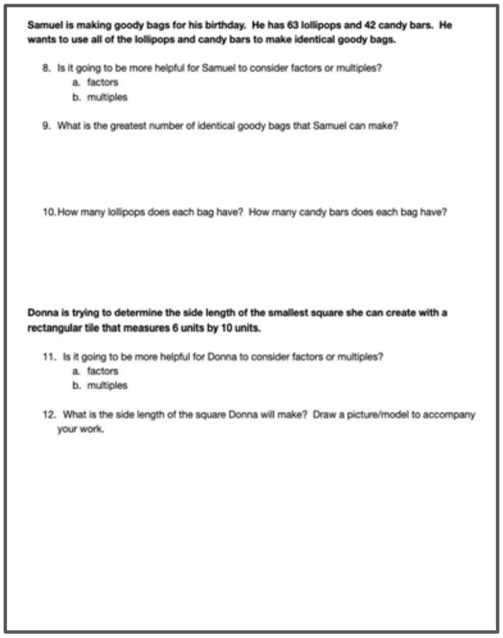
Name ___________________________ G6 Lesson 4.17 Let's Try It

Adonis is getting ready for a BBQ. Hot dog buns come in a pack of 12 and hot dogs come in a pack of 10. Ryan wants to have an equal number of buns and hot dogs.

1. Is it going to be more helpful for Adonis to consider factors or multiples?
   a. factors
   b. multiples
2. What is the least number of packs of buns and hot dogs that Adonis can buy?
3. Each pack of buns costs $2.50. How much does Adonis spend on buns? _________
4. Each pack of hot dogs cost $1.90. How much does Adonis spend on hot dogs? _________
5. How much does Adonis spend in all on buns and hot dogs?

Lariyah is using string to make holiday ornaments. She has 44 feet of silver string and 33 feet of gold string. She wants to cut the string so that each piece is the same length and so that each piece is as long as possible.

6. Is it going to be more helpful for Lariyah to consider factors or multiples?
   a. factors
   b. multiples
7. How long should Lariyah cut each piece of string?



Samuel is making goody bags for his birthday. He has 63 lollipops and 42 candy bars. He wants to use all of the lollipops and candy bars to make identical goody bags.

8. Is it going to be more helpful for Samuel to consider factors or multiples?
   a. factors
   b. multiples
9. What is the greatest number of identical goody bags that Samuel can make?
10. How many lollipops does each bag have? How many candy bars does each bag have?

Donna is trying to determine the side length of the smallest square she can create with a rectangular tile that measures 6 units by 10 units.

11. Is it going to be more helpful for Donna to consider factors or multiples?
   a. factors
   b. multiples
12. What is the side length of the square Donna will make? Draw a picture/model to accompany your work.

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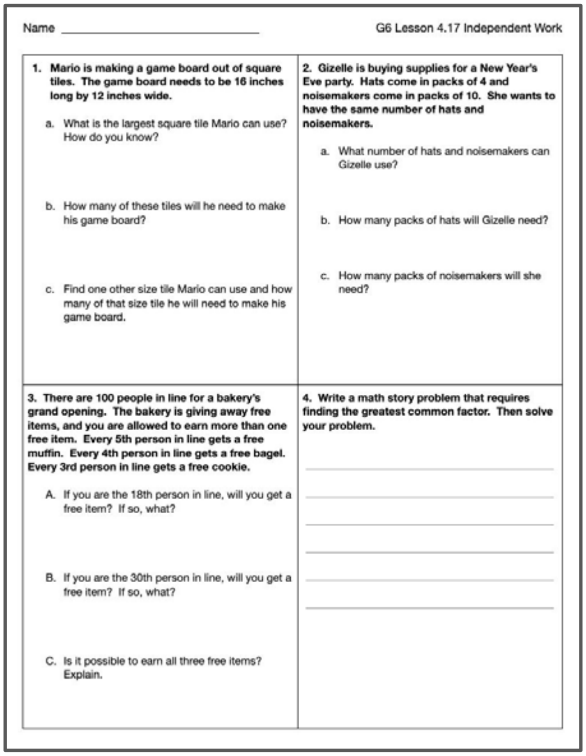
On your Own:



Name ____________________

G6 Lesson 4.17 Independent Work

1. Mario is making a game board out of square tiles. The game board needs to be 16 inches long by 12 inches wide.

a. What is the largest square tile Mario can use? How do you know?

b. How many of these tiles will he need to make his game board?

c. Find one other size tile Mario can use and how many of that size tile he will need to make his game board.

2. Gizelle is buying supplies for a New Year's Eve party. Hats come in packs of 4 and noisemakers come in packs of 10. She wants to have the same number of hats and noisemakers.

a. What number of hats and noisemakers can Gizelle use?

b. How many packs of hats will Gizelle need?

c. How many packs of noisemakers will she need?

3. There are 100 people in line for a bakery's grand opening. The bakery is giving away free items, and you are allowed to earn more than one free item. Every 5th person in line gets a free muffin. Every 4th person in line gets a free bagel. Every 3rd person in line gets a free cookie.

A. If you are the 18th person in line, will you get a free item? If so, what?

B. If you are the 30th person in line, will you get a free item? If so, what?

C. Is it possible to earn all three free items? Explain.

4. Write a math story problem that requires finding the greatest common factor. Then solve your problem.

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Adonis is getting ready for a BBQ. Hot dog buns come in a pack of 12 and hot dogs come in a pack of 10. Adonis wants to have an equal number of buns and hot dogs.

1. Is it going to be more helpful for Adonis to consider factors or multiples?
    a. factors
    b. multiples

2. What is the least number of packs of buns and hot dogs that Adonis can buy?

3. Each pack of buns costs $2.50. How much does Adonis spend on buns? _________

4. Each pack of hot dogs cost $1.90. How much does Adonis spend on hot dogs? _________

5. How much does Adonis spend in all on buns and hot dogs?

Lariyah is using string to make holiday ornaments. She has 44 feet of silver string and 33 feet of gold string. She wants to cut the string so that each piece is the same length and so that each piece is as long as possible.

6. Is it going to be more helpful for Lariyah to consider factors or multiples?
    a. factors
    b. multiples

7. How long should Lariyah cut each piece of string?

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Samuel is making goody bags for his birthday. He has 63 lollipops and 42 candy bars. He wants to use all of the lollipops and candy bars to make identical goody bags.

8. Is it going to be more helpful for Samuel to consider factors or multiples?
   a. factors
   b. multiples

9. What is the greatest number of identical goody bags that Samuel can make?

10. How many lollipops does each bag have? How many candy bars does each bag have?

Donna is trying to determine the side length of the smallest square she can create with a rectangular tile that measures 6 units by 10 units.

11. Is it going to be more helpful for Donna to consider factors or multiples?
   a. factors
   b. multiples

12. What is the side length of the square Donna will make? Draw a picture/model to accompany your work.

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Name ______________________________

G6 U4 Lesson 17 - Independent Work

1. **Mario is making a game board out of square tiles. The game board needs to be 16 inches long by 12 inches wide.**

   a. What is the largest square tile Mario can use? How do you know?

   b. How many of these tiles will he need to make his game board?

   c. Find one other size tile Mario can use and how many of that size tile he will need to make his game board.

2. **Gizelle is buying supplies for a New Year's Eve party. Hats come in packs of 4 and noisemakers come in packs of 10. She wants to have the same number of hats and noisemakers.**

   a. What number of hats and noisemakers can Gizelle use?

   b. How many packs of hats will Gizelle need?

   c. How many packs of noisemakers will she need?

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3. There are 100 people in line for a bakery's grand opening. The bakery is giving away free items, and you are allowed to earn more than one free item. Every 5th person in line gets a free muffin. Every 4th person in line gets a free bagel. Every 3rd person in line gets a free cookie.

A. If you are the 18th person in line, will you get a free item? If so, what?

B. If you are the 30th person in line, will you get a free item? If so, what?

C. Is it possible to earn all three free items? Explain.

4. Write a math story problem that requires finding the greatest common factor. Then solve your problem.

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Name KEY

G6 Lesson 4.17 Let's Try It

Adonis is getting ready for a BBQ. Hot dog buns come in a pack of 12 and hot dogs come in a pack of 10. ~~Ryan~~ Adonis wants to have an equal number of buns and hot dogs.

1. Is it going to be more helpful for Adonis to consider factors or multiples?
   - a. factors
   - [✓ b.] multiples

2. What is the least number of packs of buns and hot dogs that Adonis can buy?

12: 12, 24, 36, 48, 60
1 2 3 4 5

⑤ packs of buns.

10: 10, 20, 30, 40, 50, 60
1 2 3 4 5 6

⑥ packs of hot dogs.

3. Each pack of buns costs $2.50. How much does Adonis spend on buns? $12.50

2.50 × 5

$$\begin{array}{r} \overset{2}{2}50 \\ \times\ 5 \\ \hline 12.50 \end{array}$$

4. Each pack of hot dogs cost $1.90. How much does Adonis spend on hot dogs? $11.40

1.90 × 6

$$\begin{array}{r} \overset{5}{1}90 \\ \times\ 6 \\ \hline 11.40 \end{array}$$

5. How much does Adonis spend in all on buns and hot dogs?

$$\begin{array}{r} 12.50 \\ +\ 11.40 \\ \hline 23.90 \end{array}$$

$23.90

Lariyah is using string to make holiday ornaments. She has 44 feet of silver string and 33 feet of gold string. She wants to cut the string so that each piece is the same length and so that each piece is as long as possible.

6. Is it going to be more helpful for Lariyah to consider factors or multiples?
   - [✓ a.] factors
   - b. multiples

7. How long should Lariyah cut each piece of string?

44

①|44
2|22
4|⑪

33

①|33
3|⑪

11 feet

Samuel is making goody bags for his birthday. He has 63 lollipops and 42 candy bars. He wants to use all of the lollipops and candy bars to make identical goody bags.

8. Is it going to be more helpful for Samuel to consider factors or multiples?
   - [✓ a. factors]
   - b. multiples

9. What is the greatest number of identical goody bags that Samuel can make?

63

1	63
3	21
7	9

42

1	42
2	21
3	14
6	7

21 bags

10. How many lollipops does each bag have? How many candy bars does each bag have?

63 ÷ 21 bags = 3 lollipops per bag

42 ÷ 21 bags = 2 candy bars per bag

Donna is trying to determine the side length of the smallest square she can create with a rectangular tile that measures 6 units by 10 units. ↖ equal sides

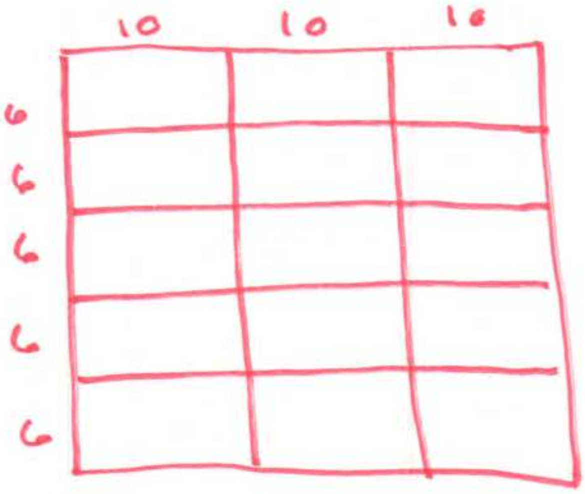
11. Is it going to be more helpful for Donna to consider factors or multiples?
   - a. factors
   - [✓ b. multiples]

12. What is the side length of the square Donna will make? Draw a picture/model to accompany your work.

6: 6, 12, 18, 24, 30

10: 10, 20, 30

30 units



Name KEY

1. **Mario is making a game board out of square tiles. The game board needs to be 16 inches long by 12 inches wide.**

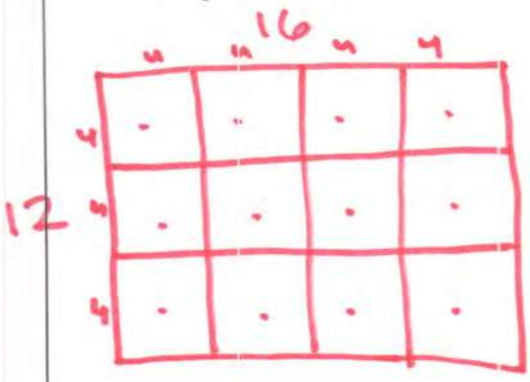
   a. What is the largest square tile Mario can use? How do you know?

12	
①	12
②	6
3	④

16	
①	16
②	8
4	④

4 in × 4 in

   b. How many of these tiles will he need to make his game board?



$\boxed{12}$

   c. Find one other size tile Mario can use and how many of that size tile he will need to make his game board.

He could use 1in × 1in OR 2in × 2 in.

He would need 192 or 48 tiles, respectively.

2. **Gizelle is buying supplies for a New Year's Eve party. Hats come in packs of 4 and noisemakers come in packs of 10. She wants to have the same number of hats and noisemakers.**

   a. What number of hats and noisemakers can Gizelle use?

4: 4, 8, 12, 16, ⑳

10: 10, ⑳

⑳

   b. How many packs of hats will Gizelle need?

4	8	12	16	20
①	②	③	④	⑤

↑ 5 packs

   c. How many packs of noisemakers will she need?

10	20
①	②

↑ 2 packs

3. There are 100 people in line for a bakery's grand opening. The bakery is giving away free items, and you are allowed to earn more than one free item. Every 5th person in line gets a free muffin. Every 4th person in line gets a free bagel. Every 3rd person in line gets a free cookie.

A. If you are the 18th person in line, will you get a free item? If so, what?

$\boxed{M}$ 5, 10, 15, 20, 25, 30, 35

$\boxed{B}$ 4, 8, 12, 16, 20, 24

$\boxed{C}$ 3, 6, 9, 12, 15, 18 ← a cookie

B. If you are the 30th person in line, will you get a free item? If so, what?

You'd get a muffin and a cookie, since 30 is a multiple of 5 + 3.

C. Is it possible to earn all three free items? Explain.

Yes! The 60th person in line wauld win all three. 60 is a multiple of 3, 4, and 5.

4. Write a math story problem that requires finding the greatest common factor. Then solve your problem.

Juice boxes come in packs of 10. Cookie packs come in a case of 25. If Sean has 1 pack of juice and 1 case of cookies, how many picnic boxes can he make if he wants to make identical boxes for his friends and wants as many as possible?

10	
1	10
2	5

25	
1	25
5	5

He can make 5 picnic boxes.

Each will have 2 juices and 5 cookie packs.

CITYTUTOR DC

G6 Unit 5:

Expressions and Equations

G6 U5 Lesson 1

Use models to write equations and solve for unknown values

CITYTUTOR DC

G6 U5 Lesson 1 - Students will use tape diagrams and equations to solve for unknown values in an equation

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore tape diagrams and equations. In previous grades, you used tape diagrams or bar models to represent equations. By the end of this session, you will be able to use tape diagrams to represent and solve equations. Let's begin by understanding what a tape diagram is. A tape diagram, also known as a bar model, is a visual representation that helps us solve and understand mathematical problems. It uses bars to represent quantities or parts of a whole.

Let's Talk (Slide 3): Have you ever used tape diagrams/bar models before? How did you use them and how were they useful for modeling or solving a problem? Possible Answer Answers, Key Points:

- I used them to represent equations, to show the parts and the whole.
- I used them to represent story problems that join or take away or have equal groups.
- They can be helpful because they help show what's happening in a story and they can help give us hints on how to solve to find the unknown.

That's right! Bar models, or tape diagrams, can be really helpful because they are a visual representation of equations or story problems. They are a great tool to help us solve problems.

Let's Talk (Slide 4): Today, we are going to use tape diagrams to help us represent equations with unknowns. Let's start by looking at this picture/tape diagram/bar model. **What do you notice and wonder about this image?** Possible Answer Answers, Key Points:

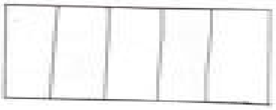
- There are two parts, 5 and 3, and they join together to make the whole, 8.
- This tape diagram shows addition AND it shows subtraction, since they're opposites.

Yes, this tape diagram represents a whole (8) split into two parts (5 and 3). **What are some real life scenarios or situations that this bar model can represent?** Possible Answer Answers, Key Points:

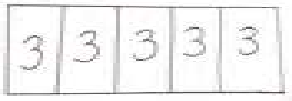
- I have \$5 and got \$3 more and now altogether I have \$8.
- I have 5 pink slimes and 3 blue slimes and altogether I have 8 slimes
- I have 8 pieces of candy and ate 5, now I have 3 left.

Very good thinking! This tape diagram can represent lots of different scenarios and many different equations. It could show addition, where we're joining two parts 5 and 3 or it could show subtraction where we're starting with the whole and taking away a part to be left with the other part.

Let's Think (Slide 5): That tape diagram showed addition and subtraction, now let's make a tape diagram that represents the multiplication equation 5 x 3 = 15. We know that multiplication is the same as "groups of," so another way to say 5 times 3 is 5 groups of 3.So, we need to make a tape diagram that has 5 groups with 3 items in each group.



First, I am going to draw a big rectangle to show 1 whole. Then, I'm going to split my whole into five equal groups because I know we have 5 groups in this equation.



I know that I have five groups OF three, which means there are three in each group. So, I'm going to put 3 in each group–3 in this group, 3 in this group (*narrate as you write*).

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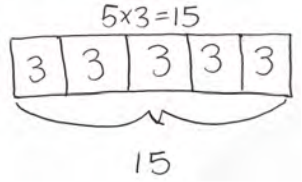
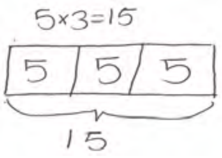


Finally, let's figure out what 5 times 3 is. We see 3 and 3 and 3 and 3 and 3...five groups of three. Since we know both the number of groups, 5, and how many items are in each group, 3, I can multiply them together to get my whole, 15!



Note: Some students may think to create a tape diagram that represents 3 groups of 5 (shown to the right), while the answer is the same, that model does not represent the given equation.

Let's Think (Slide 6): Now we are going to add variables to our equations and tape diagrams. Variables are letters that represent an unknown amount. You've probably also seen a question mark or letters as placeholders or "substitutes" for unknown values. Basically, anytime we see something in an equation or tape diagram that isn't a number, it's a substitute for the unknown, it's what we're trying to solve for. Look at the tape diagram on this slide. **What do you notice?** Possible Answer Answers, Key Points:

- There are two parts that make up the whole.
- Six is one part, the other part is X, or unknown, and the total is 8.
- I see that 6 and X together make 8.
- James has cookies, Ashley has some cookies and together they have 8 cookies.

That's right! It represents the number of cookies that James and Ashley have. James has 6 cookies, and Ashley has an unknown number of cookies...X! An **unknown number** is some amount of cookie that we do not know. Here, there is the letter "x" as a substitute for Ashley's quantity because we do not know the value.

Let's think of some equations that represent the situation in the tape diagram. We know that 6 represents James' 6 cookies, plus the "x",which represents the unknown amount of Ashley's cookies, is equal to 8.

$$6 + X = 8$$

$$X + 6 = 8$$

One equation we can write is James' cookies and Ashley's cookies makes 8 cookies, so 6 plus X equals 8.

We also know that addition is commutative, we can switch the order. So, we can start with Ashley cookies and add James' cookie and that still gives us 8, so X plus 6 equals 8.

And finally, we can also write subtraction number sentences for the same tape diagram.

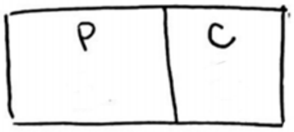
$$8 - 6 = X$$

$$8 - X = 6$$

So, we start with all 8 cookies, take away James' 6 cookies and we're left with Ashley's cookies. So, 8 minus 8 equals X.

Or, we can switch the parts. We can still start with all 8 cookies and take away Ashley's cookies and we'll be left with James' cookies. So, 8 minus X equals 6.

Let's Think (Slide 7): We drew a tape diagram from an equation then we wrote equations from a tape diagram, now we'll do one more problem where we'll create a tape diagram from a story problem. Listen as I read it, "Jasmine spent some amount of money at the store. She bought a pizza for $5 and chips for $3."Let's think about how we can represent this situation with a tape diagram.



First, I will draw a whole rectangle to show that I spent all of this money. Let's split it into two parts to show that we spent some money on pizza and some on chips, I'll label each piece with a "P" for pizza and a "C" for chips.

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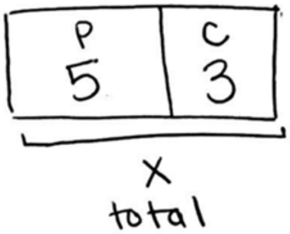
So, we know from the story that we spent $5 on pizza and $3 on chips, so I'll go back and label the exact amount for each part.



And finally, the last part of the story says, "How much money did Jasmine spend at the store?" That's what we're trying to solve. We know that Jasmine spent money on pizza AND cookies, so we need to count that money together. So let's draw a bracket to show that we're counting both parts. I'm going to label that with X as the unknown, that's what we're solving for.

Finally, let's think of some equations that represent this tape diagram. Everyone, on your paper or white board, write down some equations that we can use to represent this tape diagram. Possible Answer Answers, Key Points:

- 5 + 3 = X so I know that x, the total/whole represents the number 8.
- 3 + 5 = X because we can add our parts in any order.
- X - 5 = 3 because we can start with the whole and take away a part to find the other part, but that's hard to solve.
- X - 3 = 5 because we can start with the whole amount and take away the other part but that's also hard to solve.

Nice thinking! When we use tape diagrams to represent equations and stories, we can use what we know about operations to help us solve for unknowns!

Let's Try it (Slides 8-9): Now let's practice using tape diagrams to represent equations and making equations that represent tape diagram diagrams. Remember tape diagram, also known as a bar model, is a visual representation that helps us solve and understand mathematical problems. It uses bars to represent quantities or parts of a wholeWe will practice equations. We will work on this first page with partners.

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WARM WELCOME

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Today we will use tape diagrams and equations to solve for unknown values in an equation.

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Let’s Talk:

Have you ever used tape diagrams/bar models before?

How did you use them and how were they useful for modeling or solving a problem?

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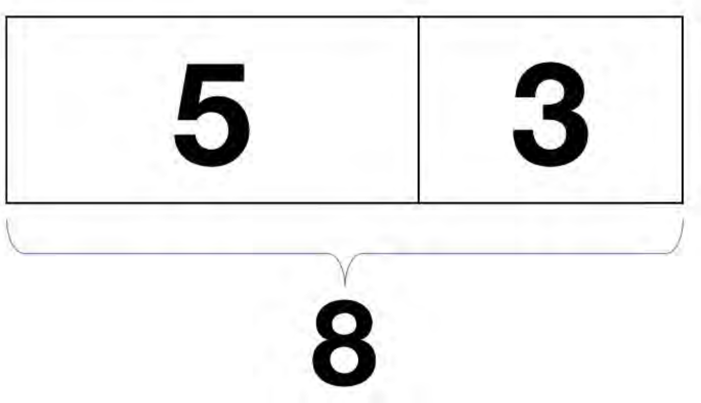
Let’s Talk:

What do you notice and wonder about this tape diagram/ bar model? What is a story we can tell about this model?



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Let’s Think:

Let’s make a tape diagram to represent the equation.

$$5 \times 3 = 15$$

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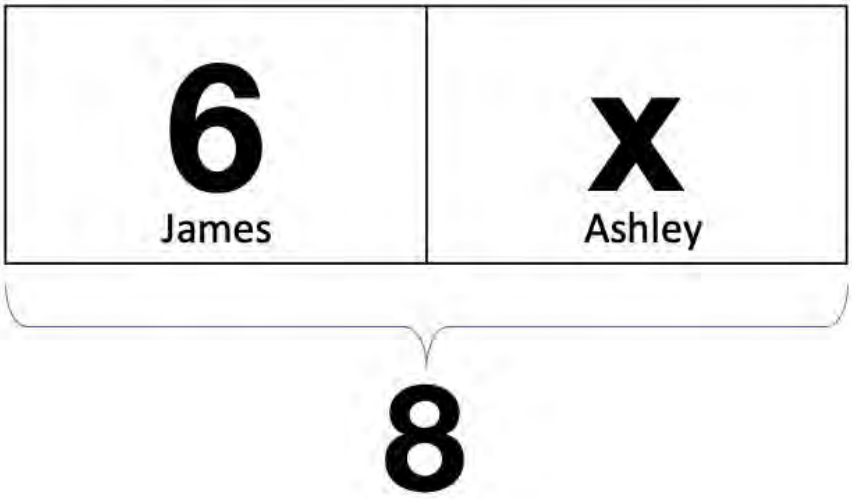
Let’s Think:

What are some equations can we write to represent this tape diagram?



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Let's Think:

Let's draw a tape diagram to represent this situation.

Jasmine spent some amount of money at the store. She bought a pizza for $5 and chips for $3. How much money did Jasmine spend at the store?

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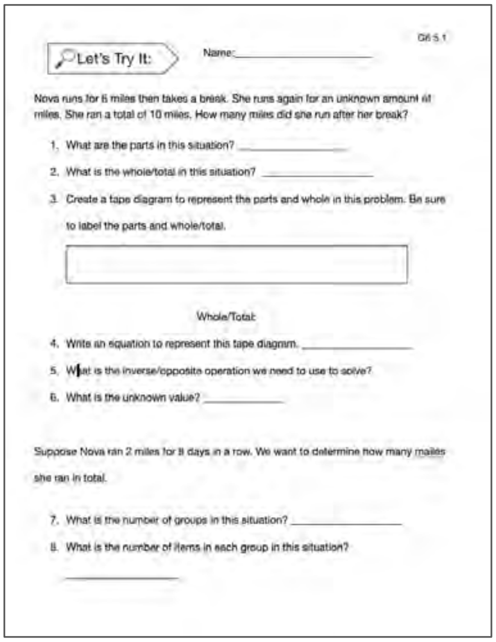
Let's Try It:

Let's try using tape diagrams and equations to solve for unknown values together.



G6 5.1

Let's Try It: Name:__________________

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

1. What are the parts in this situation? _______________
2. What is the whole/total in this situation? _______________
3. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.

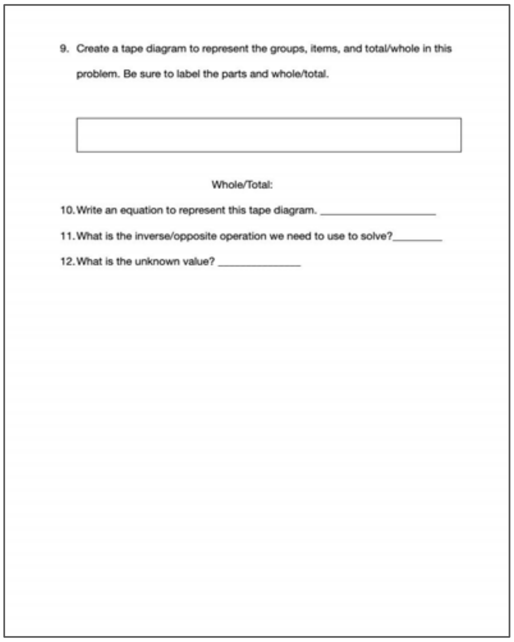
Whole/Total:

4. Write an equation to represent this tape diagram. _______________
5. What is the inverse/opposite operation we need to use to solve?
6. What is the unknown value? __________

Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many miles she ran in total.

7. What is the number of groups in this situation? _______________
8. What is the number of items in each group in this situation?

____



9. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

10. Write an equation to represent this tape diagram. _______________
11. What is the inverse/opposite operation we need to use to solve?________
12. What is the unknown value? __________

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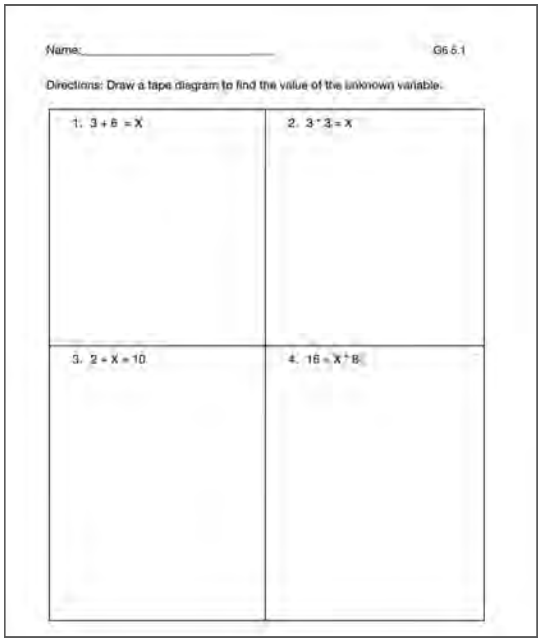
On your Own:

Now it’s your turn to use tape diagrams and equations to solve for unknown values.



Name:__________________________ G6 5.1

Directions: Draw a tape diagram to find the value of the unknown variable.

1. $3 + 6 = X$
2. $3 * 3 = X$
3. $2 + X = 10$
4. $16 = X * 8$

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Name: ____

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

1. What operation does the problem represent? ______________________
2. What are the parts in this situation? _____________________
3. What is the whole/total in this situation? _____________________
4. What is our unknown in this situation? _____________________
5. What can we use to represent our unknown value?____________
6. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

7. Write an equation to represent this tape diagram. _____________________

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Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many miles she ran in total.

8. What operation does the problem represent? ____________________
9. What is the number of groups in this situation? ___________________
10. What is the number of items in each group in this situation? ___________________
11. What is our unknown in this situation? ___________________
12. What can we use to represent our unknown value? ______________
13. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

14. Write an equation to represent this tape diagram. ___________________

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Name:________________________________

Directions: Create a tape diagram to match the given equations.

1. $3 + 6 = X$
2. $3 * 3 = X$
3. $2 + X = 10$
4. $16 = X * 8$

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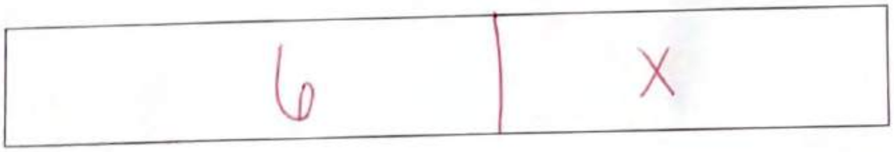
Name: Answer key ? G6 U5 Lesson 1 - Let's Try It

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

1. What operation does the problem represent? Subtraction
2. What are the parts in this situation? 6, Unknown
3. What is the whole/total in this situation? 10
4. What is our unknown in this situation? miles after break
5. What can we use to represent our unknown value? X (any variable)
6. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.



Whole/Total: 10

7. Write an equation to represent this tape diagram. $10 - 6 = X$ $6 + X = 10$

Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many miles she ran in total.

8. What operation does the problem represent? multiplication

9. What is the number of groups in this situation? 8

10. What is the number of items in each group in this situation? 2

11. What is our unknown in this situation? total

12. What can we use to represent our unknown value? t (any variable)

13. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

2	2	2	2	2	2	2	2

Whole/Total: 16

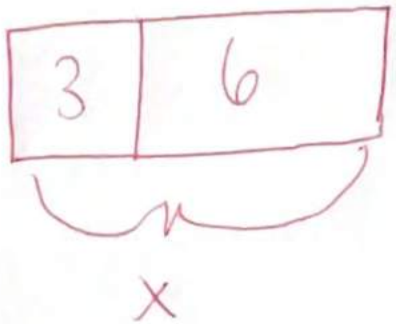
14. Write an equation to represent this tape diagram. $2 \times 8 = 16$

ame: Answer key

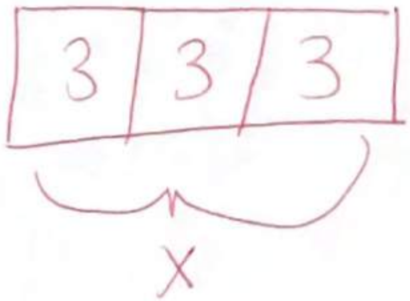
G6 U5 Lesson 1 Independent Work

Directions: Create a tape diagram to match the given equations.

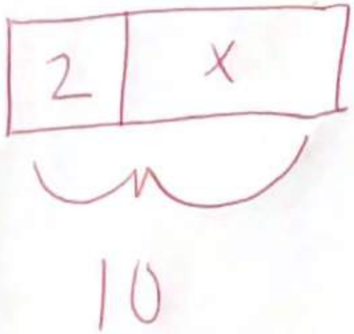
1. 3 + 6 = X



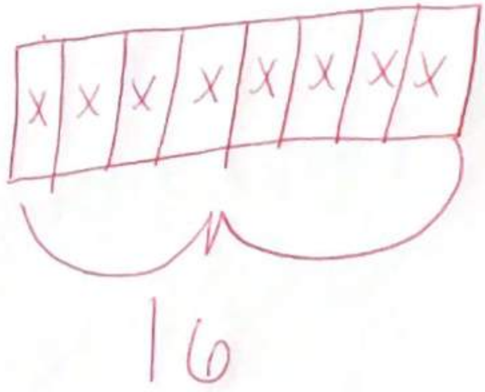
2. 3 * 3 = X



3. 2 + X = 10



4. 16 = X * 8



G6 U5 Lesson 2

Use given values to see if an equation is true or false

G6 U5 Lesson 2 - Students will replace variables with given values to see if an equation is true or false

Warm Welcome (Slide 1): Tutor choice

Let's Review (Slide 2): Before we start today's lesson let's review two important ideas. First, **what does an equal sign mean in an equation?** Possible Answer Answers, Key Points:

- An equal sign means that the value on both sides are the same value/equal to each other.
- An equal sign means that whatever value is on the left side is the exact same value on the right side
- An equal sign means that both sides are balanced/ the same
- For example, if we have 3 + 2 = 5, it means that adding 3 + 2 has the same value or is equal to 5. Both sides are balanced.

That's right, an equal sign means that the two sides of the equation are equal or balanced. An equal sign is a symbol in an equation that goes in between the left side and right side of the equation. The symbol represents that both sides have the same exact value. If the value on the left side of the equal sign is 10 then the value on the right side must be 10 for the equation to be true. That's going to be important today.

Second, let's discuss…**what is a variable?** Possible Answer Answers, Key Points:

- A variable is a letter that substitutes for a number when we do no know the value
- A variable is like a mystery number that we do not know so we label it with a letter

That is correct! A variable is a placeholder for a number we don't know yet. The letter is taking the place of the unknown number until you figure out its value.

Frame the Learning/Connect to Prior Learning (Slide 3): Today we will explore equations with variables and determine whether they are true or false. Previously we explored modeling equations with variables using tape diagrams/bar models. Remember, variables are letters that serve as placeholders or substitutes for some unknown value in an equation. By the end of this lesson you will be able to replace a variable with a given number and determine if that equation is true or false.

Let's Talk (Slide 4): Let's start by discussing some important points that will be useful for today's lesson. What does it mean if something is true or false? Give me an example of something you know is true or false.
Possible Answer Answers, Key Points:

- If something is true that means that it is correct or real.
- For example I know that if I say the grass is green it is true because I can see the grass is the color green.
- If something is false then it is incorrect or not real.
- For example, I know that if I say the grass is blue that is false because I can see that grass is green.

That's right! If something is true, if it is real or correct. When something is true it can be proven as a fact. However, something is false if it is not real or incorrect or cannot be proven true.

Let's Think (Slide 5): Those are some great big ideas that will help us with our objective today. Today we will determine if an equation is true or false. An equation is true if both sides have the same value and are equal or balanced. One way you can think of this is like a seesaw, for an equation to be true, both sides have to have the same value so the seesaw is balanced. Now, let's practice replacing variables with given values and determining if an equation is true or false. I will model the process for you.

$2y + 4 = 14$

Considering the equation 2y + 4 = 14, I am going to write this equation. In this equation, 'y' is the variable. You can use any letter as a variable. To determine if the equation is true or false, we need to substitute a given value for 'y'.

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$$2(5)+4=14$$

✓

Let's say we are given the value y = 5. That means that every time we see the variable y, we can replace or substitute it with the number 5. Let’s look at the equation 2(y) + 4 = 14. I am going to rewrite this equation but instead of y I will write the number 5 in its place.

$$10+4=14$$

✓

After I substitute the given value into the equation, I will solve the equation. I know that 2 times 5 is 10. So, now our equation simplifies to 10 plus 4.

$$14=14$$

✓

I know 10 plus 4 is 14. By performing the calculations, we find that 14 equals 14. I know this is true because 14 is the same exact number and value as 14. Since both sides of the equation are equal or the same, the equation is true.

Let’s Think (Slide 7): Let’s look at the equation 3x - 7 = 16. This time we are given the value x = 7.

$$3x-7=16$$

First, let’s write our original equation 3x - 7 = 16. In this equation, 'x' is the variable. You can use any letter as a variable. To determine if the equation is true or false, we need to substitute a given value for 'x'.

$$3(7)-7=16$$

✓

Let's say we are given the value x = 7. That means that every time we see the variable x, we can replace or substitute it with the number 7. Let’s look at the equation 3x - 7 = 16. I am going to rewrite this equation but instead of x I will write the number 7 in its place.

$$21-7=16$$

✓

After I substitute the value into the equation, I will begin to simplify or solve it. I know that 3 times 7 is 21. Now my equation simplifies to 21 minus 7 equals 16.

$$14\neq16$$

When we do 21 minus 7 we get 14. By performing the calculations, we see that the left side of the equation is 14 while the right is 16. So, this equation is not true because 14 is a different number and value than 16. Since both sides of the equation are not equal, the equation is false or not true.

Let’s Try it (Slides 8): Now let’s work on replacing variables with given values to see if the value makes the equation true or false. Remember if both sides are equal once you substitute the given value and solve then the equation is true. And, if one side is a different value than the other side (bigger or smaller), then the equation is false!

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WARM WELCOME

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Let's Review:

What does an equal sign mean in an equation?

What is a variable?

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Today we will replace variables with given values to see if an equation is true.

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Let’s Talk:

What does it mean if something is true or false? Give an example of something you know is true or false.

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Let's Think:

Is this equation true or false?

$$2y + 4 = 14$$

Given Value: $y = 5$

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Let's Think:

Is this equation true or false?

$$3x - 7 = 16$$

Given Value: $x = 7$

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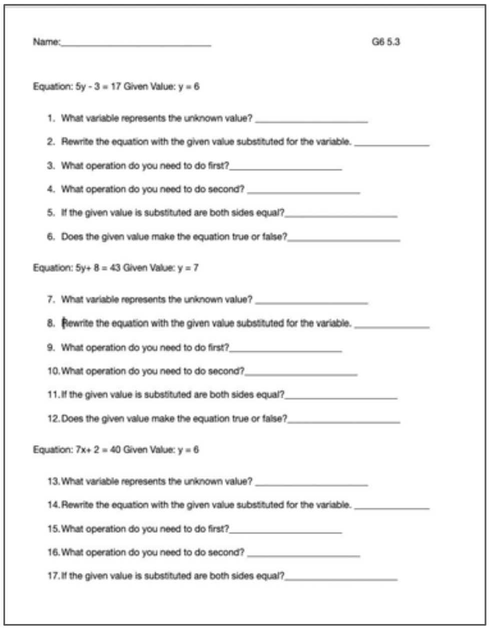
Let’s Try It:

Let’s determine if the given value makes an equation true together.



Name:____________________ G6 5.3

Equation: 5y - 3 = 17 Given Value: y = 6

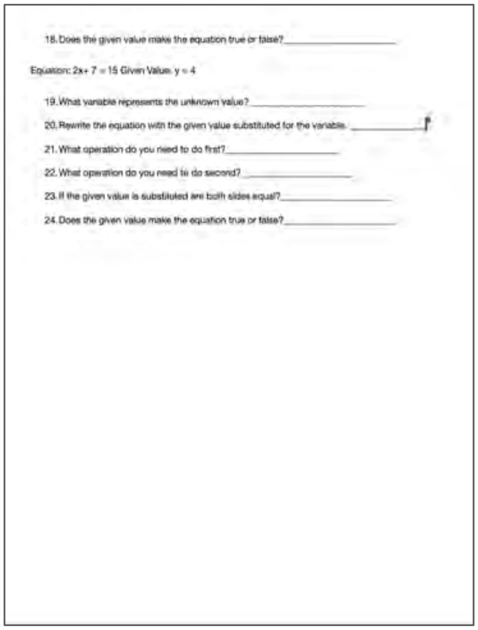
1. What variable represents the unknown value? ________________
2. Rewrite the equation with the given value substituted for the variable. __________
3. What operation do you need to do first?________________
4. What operation do you need to do second? ________________
5. If the given value is substituted are both sides equal?________________
6. Does the given value make the equation true or false?________________

Equation: 5y+ 8 = 43 Given Value: y = 7

7. What variable represents the unknown value? ________________
8. Rewrite the equation with the given value substituted for the variable. __________
9. What operation do you need to do first?________________
10. What operation do you need to do second?________________
11. If the given value is substituted are both sides equal?________________
12. Does the given value make the equation true or false?________________

Equation: 7x+ 2 = 40 Given Value: y = 6

13. What variable represents the unknown value? ________________
14. Rewrite the equation with the given value substituted for the variable. __________
15. What operation do you need to do first?________________
16. What operation do you need to do second? ________________
17. If the given value is substituted are both sides equal?________________



18. Does the given value make the equation true or false?________________

Equation: 2x+ 7 = 15 Given Value: y = 4

19. What variable represents the unknown value? ________________
20. Rewrite the equation with the given value substituted for the variable. __________
21. What operation do you need to do first?________________
22. What operation do you need to do second?________________
23. If the given value is substituted are both sides equal?________________
24. Does the given value make the equation true or false?________________

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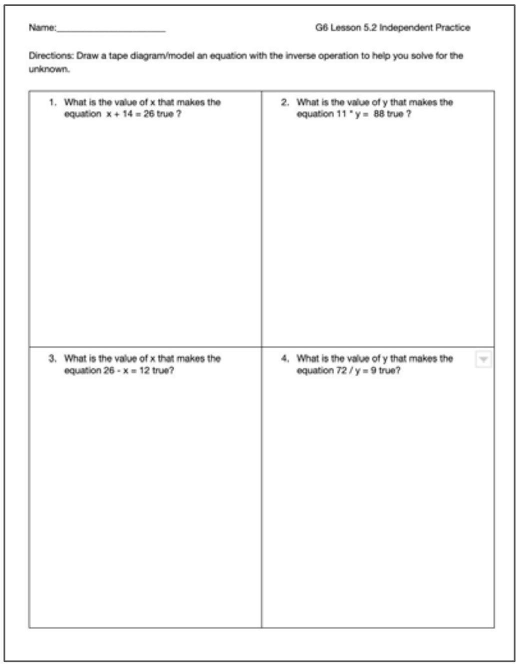
On your Own:

Now it’s time for you to determine if the given value makes an equation true on your own.



Name:________________ G6 Lesson 5.2 Independent Practice

Directions: Draw a tape diagram/model an equation with the inverse operation to help you solve for the unknown.

1. What is the value of x that makes the equation x + 14 = 26 true ?
2. What is the value of y that makes the equation 11 * y = 88 true ?
3. What is the value of x that makes the equation 26 - x = 12 true?
4. What is the value of y that makes the equation 72 / y = 9 true?

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Equation: $5y - 3 = 17$ Given Value: $y = 6$

1. What variable represents the unknown value? _______________________
2. Rewrite the equation with the given value substituted for the variable. _______________
3. What operation do you need to do first?_______________________
4. What operation do you need to do second? _______________________
5. If the given value is substituted are both sides equal?_______________________
6. Does the given value make the equation true or false?_______________________

Equation: $5x + 8 = 43$ Given Value: $x = 7$

7. What variable represents the unknown value? _______________________
8. Rewrite the equation with the given value substituted for the variable. _______________
9. What operation do you need to do first?_______________________
10. What operation do you need to do second?_______________________
11. If the given value is substituted are both sides equal?_______________________
12. Does the given value make the equation true or false?_______________________

Equation: $7y+ 2 = 40$ Given Value: $y = 6$

13. What variable represents the unknown value? _______________________
14. Rewrite the equation with the given value substituted for the variable. _______________
15. What operation do you need to do first?_______________________
16. What operation do you need to do second? _______________________
17. If the given value is substituted are both sides equal?_______________________
18. Does the given value make the equation true or false?_______________________

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Equation: 2y+ 7 = 15 Given Value: y = 4

19. What variable represents the unknown value? _______________________
20. Rewrite the equation with the given value substituted for the variable. _______________
21. What operation do you need to do first?_______________________
22. What operation do you need to do second?_______________________
23. If the given value is substituted are both sides equal?_______________________
24. Does the given value make the equation true or false?_______________________

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Name: ____________________________________ G6 U5 Lesson 2 - Independent Practice

Directions: Substitute the variables for the given values to determine if both sides of the equation are equal. If they are equal then the equation is true. If not, the equation is false.

1. Determine if the equation $8x + 3 = 35$ true or false with the given values? Given value: $x= 4$

2. Determine if the equation $3y + 4 = 25$ is true or false with the given values? Given value: $y = 4$

3. Determine if $9c - 4 = 40$ is true or false with the given values? Given value: $c = 6$

4. Determine if the equation $4a + 5 = 31$ is true or false with the given values? Given value: $a = 4$

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Name: Answer Key

G6 U5 Lesson 2 - Let's Try It!

Equation: $5y - 3 = 17$ Given Value: $y = 6$

1. What variable represents the unknown value? y
2. Rewrite the equation with the given value substituted for the variable. $5(6) - 3 = 17$
3. What operation do you need to do first? multiplication
4. What operation do you need to do second? Subtraction
5. If the given value is substituted are both sides equal? no
6. Does the given value make the equation true or false? false

$5(6) - 3 = 17$

$30 - 3 = 17$

$27 \neq 17$

Equation: $5x + 8 = 43$ Given Value: $x = 7$

7. What variable represents the unknown value? x
8. Rewrite the equation with the given value substituted for the variable. $5(7)+8=43$
9. What operation do you need to do first? multiplication
10. What operation do you need to do second? addition
11. If the given value is substituted are both sides equal? yes
12. Does the given value make the equation true or false? true

$5(7) + 8 = 43$

$35 + 8 = 43$

$43 = 43$

Equation: $7x+ 2 = 40$ Given Value: $y = 6$

13. What variable represents the unknown value? y
14. Rewrite the equation with the given value substituted for the variable. $7(6)+2=40$
15. What operation do you need to do first? multiplication
16. What operation do you need to do second? addition
17. If the given value is substituted are both sides equal? no
18. Does the given value make the equation true or false? false

$7(6)+2=40$ $44 \neq 40$

$3\ 42+2 \neq 40$

Equation: $2x + 7 = 15$ Given Value: $y = 4$

19. What variable represents the unknown value? y

20. Rewrite the equation with the given value substituted for the variable. $2(4)+7=15$

21. What operation do you need to do first? multiply

22. What operation do you need to do second? add

23. If the given value is substituted are both sides equal? yes

24. Does the given value make the equation true or false? true

$$2(4)+7=15$$

✓

$$8+7=15$$

✓

$$15 \overset{\checkmark}{=} 15$$

Name: Answer Key

G6 U5 Lesson 2 - Independent Practice

Directions: Substitute the variables for the given values to determine if both sides of the equation are equal. If they are equal then the equation is true. If not, the equation is false.

1. Determine if the equation 8x + 3 = 35 true or false with the given values? Given value: x= 4

$8(4)+3=35$

∨

$32+3=35$

∨

$35=35$

✓

True

2. Determine if the equation 3y + 4 = 25 is true or false with the given values? Given value: y = 4

$3(4)+4=25$

∨

$12+4=25$

∨

$16\neq 25$

False

3. Determine if 9c - 4 = 40 is true or false with the given values? Given value: c = 6

$9(6)-4=40$

∨

$54-4=40$

∨

$50\neq 40$

False

4. Determine if the equation 4a + 9 = 31 is true or false with the given values? Given value: a = 31

$4(31)+9=31$

∨

$124+9=31$

∨

$132\neq 31$

False

G6 U5 Lesson 3

Interpret and solve equations that represent the same situation

G6 U5 Lesson 3 - Students will interpret and solve equations that represent the same situation

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we're going to work on interpreting and solving equations that represent real life scenarios. By the end of this lesson, you'll be able to interpret and solve equations representing the same situation. Let's get started.

Let's Talk (Slide 3): Let's start off by discussing what we already know about equations. **What do you know about equations?** Possible Answer Answers, Key Points:

- An equation is a mathematical statement that shows two expressions are equal.
- An equation is when the value of the left of the equal sign is the exact same value on the right of the equal sign.
- Equations use the equal sign and other symbols.
- Equations can be used to represent lots of different situations–joining, taking apart, making equation groups, dividing!

Yes, that is correct. An equation is a math statement that shows two values or expressions that are equal to each other. It is like having a scale and both sides have to be exactly the same value for it to be even or balanced. When both sides of the equal sign are the exact same, like 10 and 10, the equation is true. We also know that equations use symbols. Every equation has the equal sign, which shows that both sides are the same. But equations also use other symbols like the plus sign to show that you're joining two things or the minus sign to show that you're taking away. We also sometimes see the multiplication sign to show groups or the division sign to show splitting a whole into groups.

So now that we know that equations show two values or expressions that are equal to each other, let's think about how we can use equations to represent real life. **Give an example of an equation that represents a real life situation.** Possible Answer Answers, Key Points:

- Any real life example that represents an equation.
- If I have 2 brothers and 5 sisters, I have 7 siblings in all. An equation is 5+2=7.
- There are 3 people with long hair and 5 people with short hair at the table. That means there are 8 people in all. So. an equation that represents that is 3+5=8.

Let's Think (Slide 5): Great job brainstorming equations in real life, they're all around us and they're really helpful if we're figuring out something we don't know! Let's pretend we're planning a class field trip to an amusement park. Each student has to pay an entrance fee of $5. I'm going to write an equation on the board, and I'll explain what each variable represents as we go.

$$S \times C = t$$

In this equation, s represents the number of students attending the field trip, c represents the cost of entry for each student, and t is the total cost you will spend all together. We have to multiply the cost of entry by the number of students because we will pay that price per student.

$$\begin{array}{ccccc} S & \times & C & = & t \\ \downarrow & & \downarrow & & \\ 10 & \times & 5 & = & t \end{array}$$

Now, let's substitute the known values into the variables of this equation to find the total cost of the trip. Let's say we have 10 students and the cost is $5 for each student to enter. We need to think about the total cost. We can substitute 10 for s because s represents students. Then, we can substitute 5 for c because c represents the cost. So, to find the total cost we need to multiply 10x5.

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$$\begin{array}{c} s \times c = t \\ \downarrow \quad \downarrow \\ 10 \times 5 = t \\ \vee \\ 50 = t \end{array}$$

Now, let’s simplify or solve the equation to find the total cost. I know that 10 times 5 is equal to 50. So t, or the total cost, is equal to 50.

The total cost of the field trip is $50 dollars.

And finally, let’s write our answer as a sentence. The total cost for the field trip is 50 dollars.

Let’s Think (Slide 6): Now, let's change the scenario slightly. Let’s use the same equation s * c = t. But, this time there are 20 students and the cost is still $5 to enter the park. I need to think about how I can determine the total cost of the trip.

$$\begin{array}{c} s \times c = t \\ \downarrow \quad \downarrow \\ 20 \times 5 = t \\ \vee \\ 100 = t \end{array}$$

Let’s start with the equation, we multiply the number of students by the cost for each student to find the total cost of the trip. Just like before, in this equation, s represents the number of students attending the field trip, c represents the cost of entry for each student, and t is the total cost you will spend all together. We have to multiply the cost of entry by the number of students because we will pay that price per student.

So, now, let’s substitute the known values into the variables of this equation to find the total cost of the trip. I will replace the variable s with the value 20 because 20 students are going on the trip. Now, let’s replace the variable c with the value 5 because it represents the cost per person. Now I have the equation 20 * 5 = 100.

Finally, let’s simplify or solve the equation. We know that 20 times 5 is equal to 100. So the total cost of the trip is 100.

The total Cost of the field trip is $100 dollars.

Now, let’s write our answer as a sentence. The total cost for the field trip is 100 dollars.

Now, this is why equations are helpful. They help us find unknowns in the same situation, even when the variables change–we used the same equation to find the total cost even when the number of students changed and we could use the same equation if the price goes up or down. The structure of the equation remains the same; it's just the values that change based on different scenarios. So, regardless of the specific values, as long as we have s * c = t we can find the total cost for any given scenario.

Let’s Try It (Slide 6-7) Now let’s try interpreting and solving equations that represent real-world situations together. Remember, pay attention to the units (students, tickets, cost!) and make sure you understand what each variable represents in each case.

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WARM WELCOME

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Today we will interpret and solve equations that represent the same situation.

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Let's Talk:

What do you know about equations?

Give an example of an equation that represents a real life situation.

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Let's Think:

Let's create an equation to match a trip to an amusement park

- Equation: $s * c = t$
    - There are 10 students going to the park
    - Each student must pay $5 to enter the park
    - What is the total cost?

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Let's Think:

Let's create an equation to match a trip to an amusement park

- Equation: s * c = t
- There are 20 students going to the park
- Each student must pay $5 to enter the park
- What is the total cost?

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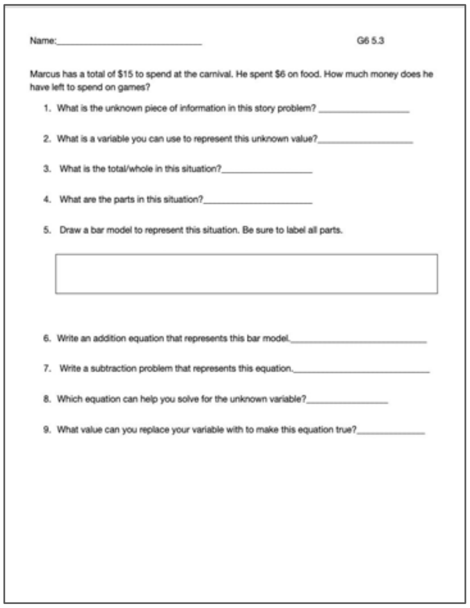
Let's Try It:

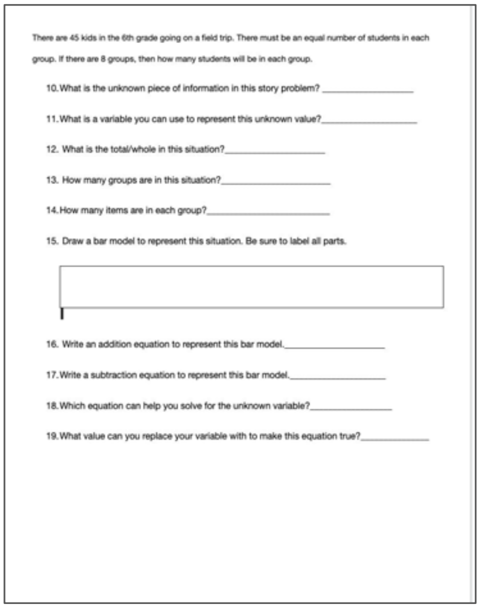
Now let's try interpreting and solving equations that represent the same situation together.



Name:______________________ G6 5.3

Marcus has a total of $15 to spend at the carnival. He spent $6 on food. How much money does he have left to spend on games?

1. What is the unknown piece of information in this story problem? ______________
2. What is a variable you can use to represent this unknown value?______________
3. What is the total/whole in this situation?______________
4. What are the parts in this situation?______________
5. Draw a bar model to represent this situation. Be sure to label all parts.
6. Write an addition equation that represents this bar model.______________
7. Write a subtraction problem that represents this equation.______________
8. Which equation can help you solve for the unknown variable?______________
9. What value can you replace your variable with to make this equation true?______________



There are 45 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

10. What is the unknown piece of information in this story problem? ______________
11. What is a variable you can use to represent this unknown value?______________
12. What is the total/whole in this situation?______________
13. How many groups are in this situation?______________
14. How many items are in each group?______________
15. Draw a bar model to represent this situation. Be sure to label all parts.
16. Write an addition equation to represent this bar model.______________
17. Write a subtraction equation to represent this bar model.______________
18. Which equation can help you solve for the unknown variable?______________
19. What value can you replace your variable with to make this equation true?______________

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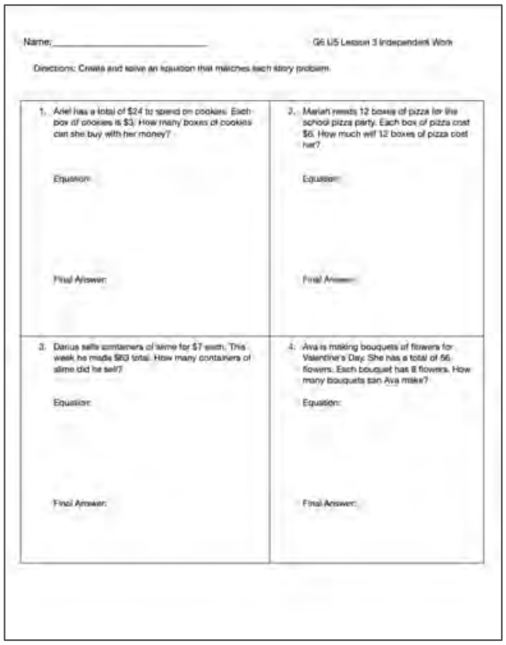
On your Own:

Now let’s try interpreting and solving equations that represent the same situation on your own.



Name:________________________ G6 U5 Lesson 3 Independent Work

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money?

   Equation:

   Final Answer:

2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her?

   Equation:

   Final Answer:

3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell?

   Equation:

   Final Answer:

4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make?

   Equation:

   Final Answer:

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Name:______________________________________ G6 U5 Lesson 3 - Let's Try It!

Marcus went to the carnival. He has spent $20 on rides and $8 on food. How much money did he spend in total?

1. What is the unknown piece of information in this story problem? ___________________
2. What is a variable you can use to represent this unknown value?____________________
3. What variable can you use to represent the rides?___________________
4. What variable can you use to represent the food?_______________________
5. Draw a bar model to represent this situation. Be sure to label all parts.
6. Write an equation with variables that represents this situation.____________________________
7. Substitute the variables and rewrite the equation.____________________________
8. Solve the equation._________________

There are 48 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

9. What is the unknown piece of information in this story problem? ___________________
10. What is a variable you can use to represent this unknown value?____________________
11. What variable can you use to represent the rides?___________________
12. What variable can you use to represent the food?_______________________
13. Draw a bar model to represent this situation. Be sure to label all parts.

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14. Write an division equation to represent this bar model.____________________

15. Write a multiplication equation to represent this bar model.___________________

16. Which equation can help you solve for the unknown variable?________________

17. What value can you replace your variable with to make this equation true?_____________

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Name:______________________________________ G6 U5 Lesson 3 - Independent Practice

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money?

   Equation:

   Final Answer:

2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her?

   Equation:

   Final Answer:

3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell?

   Equation:

   Final Answer:

4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make?

   Equation:

   Final Answer:

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Name: Answer Key

G6 U5 Lesson 3 - Let's Try It!

Marcus went to the carnival. He has spent \$20 on rides and \$8 on food. How much money did he spend in total?

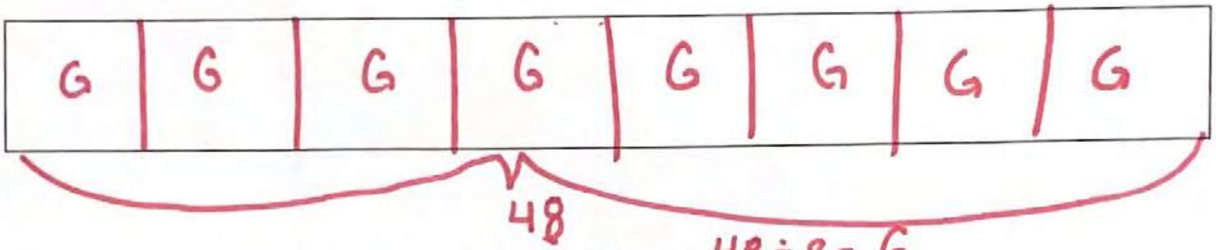
1. What is the unknown piece of information in this story problem? Total
2. What is a variable you can use to represent this unknown value? M (any variable)
3. What variable can you use to represent the rides? r (any variable)
4. What variable can you use to represent the food? f (any variable)
5. Draw a bar model to represent this situation. Be sure to label all parts.

6. Write an equation with variables that represents this situation. $8+20=x$
7. Substitute the variables and rewrite the equation. $8+20=28$
8. Solve the equation. 28

There are 48 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

9. What is the unknown piece of information in this story problem? Number in each group
10. What is a variable you can use to represent this unknown value? G (any)
11. What variable can you use to represent the rides? r (any)
12. What variable can you use to represent the food? f (any)

13. Draw a bar model to represent this situation. Be sure to label all parts.



14. Write an division equation to represent this bar model. $48 \div 8 = G$

15. Write a multiplication equation to represent this bar model. $8 \cdot G = 48$

16. Which equation can help you solve for the unknown variable? $48 \div 8 = G$

17. What value can you replace your variable with to make this equation true? 6

$48 \div 8 = 6$

Name: Answer Key

G6 U5 Lesson 3 - Independent Practice

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money?

Equation:

$$\frac{24}{3} = \frac{\cancel{3} \cdot x}{\cancel{3}}$$

$$8 = x$$

Final Answer: 8 boxes of cookies

2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her?

Equation:

$$12 \cdot 6 = x$$

$$72 = x$$

Final Answer: $72

3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell?

Equation:

$$\frac{x \cdot \cancel{7}}{\cancel{7}} = \frac{63}{7}$$

$$x = 9$$

Final Answer: 9 containers

4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make?

Equation:

$$\frac{56}{8} = \frac{\cancel{8}x}{\cancel{8}}$$

$$7 = x$$

Final Answer: 7 bouquets

G6 U5 Lesson 4

Divide using fractions when solving equations in the form of px= q

CITYTUTOR DC

G6 U5 Lesson 4 - Students will divide using fractions when solving equations in the form of px= q

Warm Welcome (Slide 1): Tutor choice

Let's Review (Slide 2): What is a reciprocal? Possible Answer Answers, Key Points:

- Reciprocal is a flipped or inverted version of a fraction or a number.
- It is when the numerator and denominator switch spots
- For example, if you have the fraction 2/3, its reciprocal would be 3/2.
- The reciprocal of 3 is ⅓. The reciprocal of ⅓ is 3.

That is correct! A reciprocal is a flipped version of a fraction or a number. For example in the fraction ⅔ the numerator is 2 and the denominator is 3. In the reciprocal equations the numerator and denominator switch spots. So, the numerator would be 3 and the denominator would be 2…three halves (*write fractions to show*).

Frame the Learning/Connect to Prior Learning (Slide 3): Today, we're going to practice dividing using fractions when solving equations in the form of px = q. By the end of this lesson, you'll be able to confidently apply this skill to solve various equations. Are you ready? Let's get started!

Let's Talk (Slide 4): Let's open with a brainstorm, **who can remind us of what it means to divide two numbers?** Possible Answer Answers, Key Points:

- Dividing is the process of finding out how many times one number fits into another number.
- Dividing is splitting a total into equal groups.

That's right! Dividing is when you split a total into equal groups! It's like when you have a big bag of skittles and you want to give it to pass them out to your friends so that everyone gets the same amount. Dividing is all about making things fair and even. When you know your total but are missing either your groups or items then you can divide by the number that the variable is being multiplied by. Division works because it is the inverse of multiplication.

Let's Think (Slide 4): Now, let's move on to dividing using fractions. Let's consider the equation 1/4x = 3. Remember, we want to isolate or get x by itself in order to determine the unknown value.

$$\frac{1}{4}x = 3$$

Let's start by rewriting the original equation.

$$\cancel{\frac{4}{1}} \cdot \cancel{\frac{1}{4}}x = 3 \cdot \frac{4}{1}$$

Since we have a fraction, we need to multiply by the reciprocal of the fraction on the left side to isolate the variable or get it by itself. In this case, we multiply both sides by the reciprocal of 1/4, which is 4/1. Whenever you have a fraction that is being multiplied by a variable you will have to multiply by the reciprocal to get the variable alone or isolated. We'll multiply both sides of the equation by 4/1.

$$X = \frac{3}{1} \cdot \frac{4}{1}$$

The left side simplifies to x because the two fractions cancel each other out. On the right side, we have to multiply these two numbers. Since one is a fraction, I am going to turn my whole number 3 into a fraction by putting a 1 under my whole number. Now I have 3/1, this does not change my value because it is saying I have 3 ones, which is 3. Simplifying, on the right we have 4 times 3 which equals 12.

$$X = 12$$

Finally, let's write an equation that represents what my variable x is equal to. So, I will write x = 12.

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$$\frac{1}{4}x = 3$$

Now let’s double check our work by plugging the value back in for the variable and seeing if it is correct. First I will write my original equation ¼ x equals 3.

$$\frac{1}{4}(12) = 3$$

We just solved for x and found that it was 12. Let’s plug 12 in to make sure that we get the same answer. So, ¼ times 12 equals 3. Let’s solve.

$$\frac{1}{4} \times \frac{12}{1} = \frac{12}{4}$$

Since one is a fraction, I am going to turn my whole number into a fraction by putting a 1 as the denominator. Let’s multiply across the top and bottom. On the top 1 times 12 is 12 and on the bottom 4 times 1 is 4.This simplifies to the equation 12/4 equals 3

$$\frac{12}{4} = 3$$

Looking at the equation 12/4 equals 3. I need to think to myself, “ Is this true?” So, I need to simplify 12/4 to determine if it is actually equal to 3. I can skip count by 4 until I get to 12. Skip count: 4 , 8, 12. That means 12/4 or 12 divided by 4 equals 3.

$$3 = 3$$

So, our equation is correct because 3 does equal 3, they are the exact same number and have the same value.

Let’s Think (Slide 4): Great job walking through all of those steps with me. Now we are going to try another example. Be sure to pay attention and ask questions while I model each step. Let’s think about how we can solve the equation 3/4x = 6.

$$\frac{3}{4}x = 6$$

Let’s start off by writing the original equation.

$$\cancel{\frac{4}{3}} \cdot \cancel{\frac{3}{4}} X = \frac{6}{1} \cdot \frac{4}{3}$$

Since we have a fraction, we need to multiply by the reciprocal of the fraction on the left side to isolate the variable or get it by itself. We will multiply both sides by the reciprocal of 3/4, which is 4/3. Since one is a fraction, I am going to turn my whole number in a fraction by putting a 1 as the denominator. We'll multiply both sides of the equation by 4/3.

$$X = \frac{24}{3}$$

The left side simplifies to x because the two fractions cancel each other out. We have to do some math on the right. Now we multiply our numbers 6 times 4 is 24 and 3 times 1 is 3. So , we have x = 24/3, which is 24 divided by 3. I can skip count by 3’s to solve and x = 4.

$$X = 8$$

I know that x = 24/3, and 24 divided by 3 is 8. I can skip count by 3’s to solve and x = 8. Finally, I will write an equation that represents what my variable x is equal to. So, I will write x = 8.

$$\frac{3}{4} \cdot 8 = 6$$

Now let’s double check our work by plugging the value back in for my variable and seeing if it is correct. First let’s rewrite the original equation and plug the variable back in, so instead of x, I’m going to write 78.

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$$\frac{3}{4} \cdot \frac{8}{1} = 6$$

Since one is a fraction, I am going to turn my whole number into a fraction by putting a 1 as the denominator under 8. Now that I substituted my value for my variable I need to solve my equation. I know that 3 times 8 is equal to 24 and 4 times 1 equals 4. So my equation simplifies to 24/4 or 24 divided by 4

$$\frac{24}{4} = 6$$

Looking at the equation 24/4 equals 6. I need to think to myself, “ Is this true?” So, I need to simplify 24/4 to determine if it is actually equal to 6. I can skip count by 4 until I get to 24. Skip count: 4 , 8, 12, 16, 20, 24. That means 24/4 or 24 divided by 4 equals 6.

$$6 = 6$$

So, our equation is correct because 6 does equal 6, they are the exact same number and have the same value.

Let’s Try it (Slides 7-8): Great job, everyone! You all demonstrated excellent understanding of dividing using fractions when solving equations in the form of px = q. Remember we want to isolate or get x alone by multiplying both sides of the equation by the reciprocal. Be sure to double check your answers by substituting them back into the original equations. Simplify the fractions to their simplest form and ensure you have found the correct value of x. Keep practicing this skill, and you'll become even more proficient.

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WARM WELCOME

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Let's Review:

What is a reciprocal? Give an example.

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We will divide using fractions when solving equations in the form of px= q.

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Let’s Talk:

What does it mean to divide two numbers? Give an example.

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Let's Think: Let's work together to solve.

$$\frac{1}{4}x = 3.$$

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Let's Think: Let's work together to solve.

$$\frac{3}{4}x = 6$$

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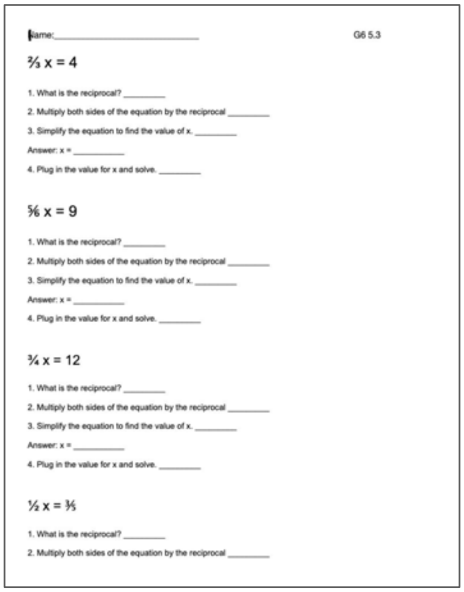
Let's Try It:

Let's try to divide using fractions when solving equations in the form of px= q together.



Name:______________________ G6 5.3

⅔ x = 4

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = __________

4. Plug in the value for x and solve. ________

⅚ x = 9

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = __________

4. Plug in the value for x and solve. ________

¾ x = 12

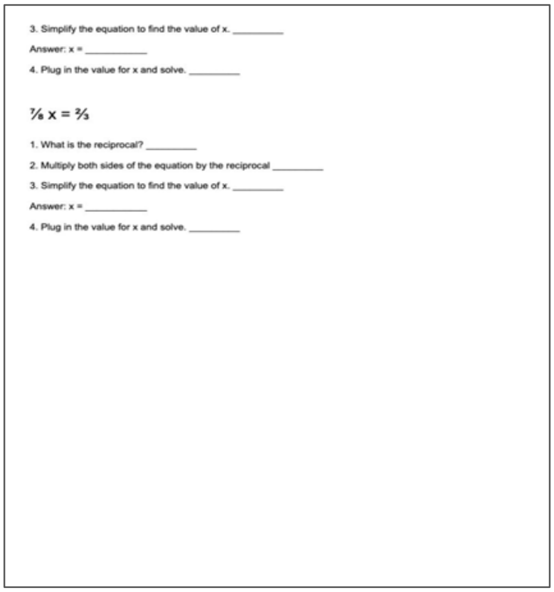
1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = __________

4. Plug in the value for x and solve. ________

½ x = ⅗

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________



3. Simplify the equation to find the value of x. ________

Answer: x = __________

4. Plug in the value for x and solve. ________

⅞ x = ⅔

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = __________

4. Plug in the value for x and solve. ________

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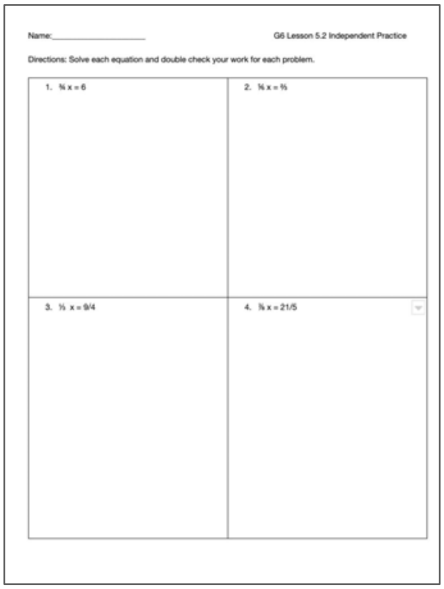
On your Own:

Now it is your turn to divide using fractions when solving equations in the form of px= q together.



Name:__________________ G6 Lesson 5.2 Independent Practice

Directions: Solve each equation and double check your work for each problem.

1. ¾ x = 6	2. ⅙ x = ⅘
3. ⅓ x = 9/4	4. ⅜ x = 21/5

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Name:_____________________________________ G6 U5 Lesson 4 - Let’s Try It

$\frac{2}{3}x = 4$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{5}{6}x = 9$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{3}{4}x = 12$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

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$\frac{1}{2} x = \frac{3}{5}$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{7}{8} x = \frac{2}{3}$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

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Name:____________________________________

Directions: Solve each equation and double check your work for each problem.

1. Solve.

$$\frac{3}{4} x = 6$$

2. Solve

$$\frac{5}{6} x = \frac{2}{3}$$

3. Solve

$$\frac{1}{3} x = 9/4$$

4. Solve

$$\frac{7}{8} x = 21/5$$

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Name: Answer Key

G6 U5 Lesson 4 - Let's Try It!

$\frac{2}{3}x = 4$

1. What is the reciprocal? 3/2

2. Multiply both sides of the equation by the reciprocal $\cancel{\frac{3}{2}}\cancel{\frac{2}{3}}x = \frac{4}{1} \cdot \frac{3}{2} = \frac{12}{12}$

3. Simplify the equation to find the value of x. 12/2 $\quad x = \frac{12}{2}$

Answer: x = 6

4. Plug in the value for x and solve. $\frac{2}{3} \cdot \frac{6}{1} = 4$

$\frac{12}{3} = 4$

$4 = 4$

$\frac{5}{6}x = 9$

1. What is the reciprocal? 6/5

2. Multiply both sides of the equation by the reciprocal $\cancel{\frac{6}{5}} \cdot \cancel{\frac{5}{6}} x = \frac{9}{1} \cdot \frac{6}{5}$

3. Simplify the equation to find the value of x. 10 4/5 $\quad x = \frac{54}{5}$

Answer: x = 10 4/5 or 54/5 $\quad x = 10\ 4/5$

4. Plug in the value for x and solve.

$\frac{5}{6} \cdot \frac{54}{5} = 9$

$\frac{270}{30} = 9 \quad 9 = 9$

$\frac{3}{4}x = 12$

1. What is the reciprocal? 4/3

2. Multiply both sides of the equation by the reciprocal → $\cancel{\frac{4}{3}} \cdot \cancel{\frac{3}{4}} x = \frac{12}{1} \cdot \frac{4}{3} = \frac{48}{3}$

3. Simplify the equation to find the value of x. → $x = \frac{48}{3}$

Answer: x = 48/3

4. Plug in the value for x and solve. → $\frac{3}{4} \cdot \frac{48}{3} = 12$

$\frac{144}{12} = 12$

$12 = 12$

$\frac{1}{2}x = \frac{3}{5}$

1. What is the reciprocal? 2/1

2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x. _________

Answer: x = 6/5 1 1/5

4. Plug in the value for x and solve. _________

$$\cancel{\frac{2}{1}}\cancel{\frac{1}{2}}x = \frac{3}{5}\cdot\frac{2}{1}$$

$$x = \frac{6}{5}$$

$$x = 1\frac{1}{5}$$

$$\frac{1}{2}\cdot\frac{6}{5} = \frac{3}{5}$$

$$\frac{6}{10} = \frac{3}{5}$$

$$3/5 = 3/5$$

⅞ x = ⅔

1. What is the reciprocal? 8/7

2. Multiply both sides of the equation by the reciprocal _________

3. Simplify the equation to find the value of x. _________

Answer: x = 16/21

4. Plug in the value for x and solve. _________

$$\cancel{\frac{8}{7}}\cancel{\frac{7}{8}}x = \frac{2}{3}\cdot\frac{8}{7}$$

$$x = \frac{16}{21}$$

$$\frac{7}{8}\cdot\frac{16}{21} = \frac{2}{3}$$

$$\frac{112}{168} = \frac{2}{3}$$

$$\frac{2}{3} = \frac{2}{3}$$

Name: Answer Key

G6 U5 Lesson 4 - Independent Practice

Directions: Solve each equation and double check your work for each problem.

1. ¾ x = 6

$\cancel{\frac{4}{3}}\,\cancel{\frac{3}{4}}x = \frac{6}{1}\cdot\frac{4}{3} = \frac{24}{3}$

$x = \frac{24}{3}$

$x = 8$

2. ⅚ x = ⅔

$\cancel{\frac{6}{5}}\,\cancel{\frac{5}{6}}x = \frac{2}{3}\cdot\frac{6}{5} = \frac{12}{15}$

$x = 12/15$

3. ⅓ x = 9/4

$\cancel{\frac{3}{1}}\cdot\cancel{\frac{1}{3}}x = \frac{9}{4}\cdot\frac{3}{1} = \frac{27}{4}$

$x = \frac{27}{4}$

$x = 6\,3/4$

4. ⅞ x = 21/5

$\cancel{\frac{8}{7}}\,\cancel{\frac{7}{8}}x = \frac{21}{5}\cdot\frac{7}{8} = \frac{147}{40}$

$x = 3\frac{27}{40}$

G6 U5 Lesson 5

Create and solve an equation that represents a situation with an unknown amount by writing equations with variables

G6 U5 Lesson 5 - Students will write an equation that represents a situation with an unknown amount by writing equations with variables

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will create and solve equations that represent situations with unknown amounts using variables. It will help us better understand variables and how or why they are used in equations. In previous lessons we made sense of and solved equations with variables. Now we will make our own equations that relate to the real world.

Let's Talk (Slide 3): Let's begin by talking about what we already know about equations and variables. **What is a variable? Give an example.** Possible Student Answers, Key Points:

- It's like a placeholder for a value or values.
- Variables in math to represent unknown numbers or quantities.
- For example 5 + x = 8.

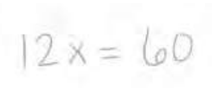
That is correct. Variables are letters that allow us to create equations and solve puzzles by figuring out what values can replace the letter and make the equation true. So, think of a variable as a placeholder that can hold different numbers and help us solve math problems. **Think of a real-life situation where you have encountered or come across unknown quantities or used variables.** Possible Student Answers, Key Points:

- Any real life example that represents an equation with an unknown.
- I had 8 dollars and I need X more dollars to have 20 dollars in all.

That is correct! There are many different situations in which we have used variables or unknown quantities or numbers in the real world. This could be ordering a certain amount of food for an unknown total. Another example is collecting money for an unknown amount of time until we reach a set goal. We can always use variables to show the unknown, or what we're trying to solve…it's just like leaving something blank!There are so many different scenarios that this will help us solve in our real life.

Let's Think (Slide 4): Today you will create and solve equations that represent situations with unknown amounts. This will be helpful for you in the real world in various aspects of planning. Look at the question on this slide, let's imagine a girl named Janay goes to a toy store that sells action figures for $12 each. Janay bought some action figures and spent a total of $60.

Let's use variables to determine the number of action figures Janay bought. I am going to use the variable x to represent the number of action figures Janay bought. Let me think of an equation that matches this situation. Well the price is $12 per action figure so I can multiply 12 by X or the number of action figures to help me determine the total cost. So that would look like 12x because 12 is next to the variable, I know that means multiplication. Now I know she spent a total of $60 so that would go on the right of my equal sign because 12 times "x" is equal to my total of 60.



The equation would be 12x = 60. Look, 12 represents the cost per action figures, times x represents that amount of action figures, and 60 is my total money spent on action figures.

Now I need to solve my equation for X to determine the total amount of action figures she bought with her $60. So let's look at this equation. I know I need to isolate "X" or get "X" alone. First, I need to draw a straight line down the equal sign to separate the values on my left and right side.

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$$\frac{12x}{12} = \frac{60}{12}$$

Next, I need to start on the side of the equal sign that my variable is on. I see my variable “X” is on the left side of my equal sign. So let me see I have 12x or 12 times X but I want to isolate “X” or get “X” alone or by itself. I know that division is the inverse or opposite of multiplication so If I divide 12x by 12 then I will get 1 X or just “X”. If I divide by 12 on the left of the equal sign then I must divide by 12 on the right side as well, in order to keep the equation balanced.

$$\frac{\cancel{12}x}{\cancel{12}} = \frac{60}{12}$$
$$x = 5$$

So I know that 60 divided by 12 means I am splitting 60 into 12 equal groups, so I can skip count by 12 until I get to 60 to see my total number of groups or action figures. Skip count with me…12, 24, 36, 48, 60. That is 5 groups , therefore x = 5. This means that Janay bought 5 action figures for $12 each with a total of $60 spent.

$$12x = 60$$
$$12(5) = 60$$
$$\checkmark$$
$$60 = 60$$

Finally, I need to check my work! I can plug the value for the variable into the original equation and solve it to see if it is correct. So I have 12x = 60, I plug in my variable and get 12(5) = 60. I know that 12 times 5 is equal to 60 so this is correct. That means that Janay bought 5 action figures! I’m going to go back to the story problem and write that as a sentence to make sure it makes sense, “Janay bought 5 action figures.”

Let’s Try it (Slide 5): Now let’s practice creating or writing equations with variables to represent the unknown value and solve for the value. Remember, a variable is like a placeholder for an unknown amount or value. It is just a letter “substituting” for a certain value. Once you determine the value, you can replace the variable with the number. We will work on the first page together and the second page independently.

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WARM WELCOME

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We will create and solve an equation that represents a situation with an unknown amount by writing equations with variables.

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↺ Let's Review:

What is a variable in an equation? Give an example.

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Let's Talk:

Think of a real-life situation where you have encountered or come across unknown quantities or used variables.

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Let's Think:

Janay goes to a toy store that sells action figures for $12 each. Janay bought some action figures and spent a total of $60. Let's use variables to determine the number of action figures Janay bought.

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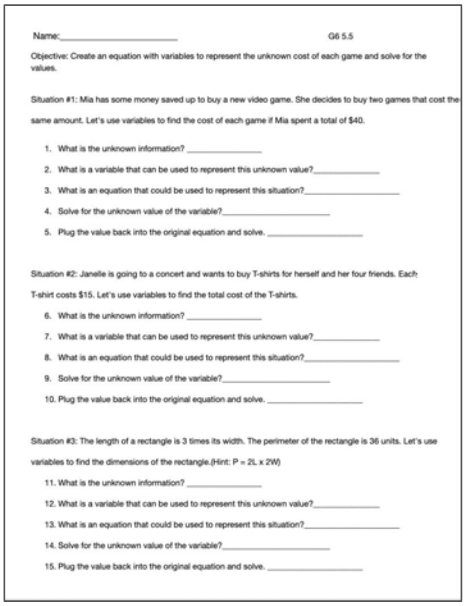
Let's Try It:



Name:____________________ G6 5.5

Objective: Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost the same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? _______________
2. What is a variable that can be used to represent this unknown value?______________
3. What is an equation that could be used to represent this situation?__________________
4. Solve for the unknown value of the variable?____________________
5. Plug the value back into the original equation and solve. ___________________

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? _______________
7. What is a variable that can be used to represent this unknown value?______________
8. What is an equation that could be used to represent this situation?__________________
9. Solve for the unknown value of the variable?____________________
10. Plug the value back into the original equation and solve. ___________________

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: $P = 2L \times 2W$)

11. What is the unknown information? _______________
12. What is a variable that can be used to represent this unknown value?______________
13. What is an equation that could be used to represent this situation?__________________
14. Solve for the unknown value of the variable?____________________
15. Plug the value back into the original equation and solve. ___________________

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On your Own:

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Name:____________________________________ G6 U5 Lesson 5 - Let’s Try It

Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost the same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? ________________
2. What is a variable that can be used to represent this unknown value?______________
3. What is an equation that could be used to represent this situation?____________________
4. Solve for the unknown value of the variable?_______________________
5. Plug the value back into the original equation and solve. ____________________

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? ________________
7. What is a variable that can be used to represent this unknown value?______________
8. What is an equation that could be used to represent this situation?____________________
9. Solve for the unknown value of the variable?_______________________
10. Plug the value back into the original equation and solve. ____________________

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: P = 2L x 2W).

11. What is the unknown information? ________________
12. What is a variable that can be used to represent this unknown value?______________
13. What is an equation that could be used to represent this situation?____________________
14. Solve for the unknown value of the variable?_______________________
15. Plug the value back into the original equation and solve. ____________________

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Name:____________________________________

G6 U5 Lesson 5 - Independent Practice

Directions: Create equations with variables to represent the unknown value and solve for the values. Be sure to plug the value back into the original equation to double check your work.

1. A farmer has 21 cows and sheep on the farm. The number of cows is twice the number of sheep. Let's use variables to find the number of cows and sheep.
2. The total cost of buying some items is \$80. Each item costs \$8. Let's use variables to find the number of items.
3. Alexis is twice as old as her brother. The sum of their ages is 30. Let's use variables to find their ages.
4. The sum of two consecutive numbers is 35. Let's use variables to find the unknown numbers.

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Name: Answer Key

G6 U5 Lesson 5 - Let's Try It!

Objective: Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost th

same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? Cost of each game
2. What is a variable that can be used to represent this unknown value? C (any)
3. What is an equation that could be used to represent this situation? $\frac{2C}{2} = \frac{40}{2}$
   $C = 20$
4. Solve for the unknown value of the variable? 20
5. Plug the value back into the original equation and solve.
   $2 \cdot 20 = 46$
   $40 = 40$

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? total Cost
7. What is a variable that can be used to represent this unknown value? t (any)
8. What is an equation that could be used to represent this situation? $5(15) = t$ ✓
9. Solve for the unknown value of the variable? $75 = t$
10. Plug the value back into the original equation and solve.
    $5(15) = 75$
    $75 = 75$

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: P = 2L x 2W)

11. What is the unknown information? L, W
12. What is a variable that can be used to represent this unknown value? L, W
13. What is an equation that could be used to represent this situation? $2(3w+w) = 36$
    $6w + 2w = 36$
    $\frac{8W}{8} = \frac{36}{8}$
    $w = 4.5$
14. Solve for the unknown value of the variable? $W = 4.5$

Name: Answer Key

G6 U5 Lesson 5 - Independent Practice

Directions: Create equations with variables to represent the unknown value and solve for the values. Be sure to plug the value back into the original equation to double check your work.

1. A farmer has 2 cows and sheep on the farm. The number of cows is twice the number of sheep. Let's use variables to find the number of cows and sheep.

$C=2S$

$C+S=21$

$2S+S=21$

$\frac{3S}{3}=\frac{21}{3}$

$\boxed{S=7}$

$21-7=\boxed{14}$

7 Sheep 14 cows

2. The total cost of buying some items is $80. Each item costs $8. Let's use variables to find the number of items.

$\frac{\cancel{8}I}{\cancel{8}} = \frac{80}{8}$

$I = 10$

10 items

3. Alexis is twice as old as her brother. The sum of their ages is 30. Let's use variables to find their ages.

$A=2B$

$A+B=30$

$2B+B=30$

$\frac{\cancel{3}B}{\cancel{3}}=\frac{30}{3}$

$B=10$ Brother is 10

$A=2B$

$A=2(10)$

$A=20$

Alexis is 20

4. The sum of two consecutive numbers is 35. Let's use variables to find the unknown numbers.

$N+(N+1)=35$

$2n+\cancel{1} = 35$

$\cancel{-1} \quad -1$

$\frac{\cancel{2}n}{\cancel{2}} = \frac{34}{2}$

$n = 17$

17, 18

G6 U5 Lesson 6

Use equations to solve problems with percentages

G6 U5 Lesson 6 - Students will use equations to solve problems with percentages

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use equations to help us solve problems with percentages. It is important that we understand percentages because percentages are everywhere in our everyday lives! We already have created and solved equations with variables, today we'll use percentages.

Let's Talk (Slide 3): You all spent a lot of time in earlier units working with percentages. So, let's warm our brains out by discussing, **what is a percentage?** Possible Answer Answers, Key Points:

- A percentage is a certain amount out of 100.
- A percentage is like a ratio but it's always out of 100.
- Percentages are similar to fractions, like 50% is the same as one-half.

Yes, that is correct. A percent is an amount out of one hundred. Percentages are used in people's everyday lives and are all around us. It is important to think about how we might use this in the real world. **Can you think of real-life situations where percentages are used?** Possible Answer Answers, Key Points:

- When something is on sale for a certain percent off, like 20% off all jackets.
- On a test when you get a grade, like 80%.
- When you leave a tip or a service fee, like 15%.

Yes that is correct! Percentages are used to compare numbers all around us in our daily lives. We see percentages on test scores, goals, tips, service fee, sales, and so many other places. This is why it is so important to learn today's lessons because you will use this in your daily lives.

Let's Think (Slide 4): Great job discussing percentages and how they apply to our lives. Learning about percentages will help us navigate daily life because percentages are all around us. When we're solving problems about percentages, we have to think carefully about what we know and what we don't know. Let's imagine our favorite store is having a 20% off sale on all items. You want to buy a shirt that originally costs $25. How much will the shirt cost after the discount?

So, we know that the original short costs 25 dollars and we know that the discount is going to be 20% of $25. So we need to figure out the discount, or how much we'll save on the sale, and take that away from the original price. In other words, we could use an equation to help us solve.

$$\begin{matrix}\text{original} \\ \text{price}\end{matrix} - \left[\begin{matrix}\text{original} \\ \text{price}\end{matrix} \cdot \begin{matrix}\text{discount} \\ \%\end{matrix}\right] = X$$

First we need to calculate the discount, which we do by multiplying the original price by the percentage discount. And then we start with the original price and take away that discount to find the total of the shirt. So, original price minus (original price times the discount percentage).

$$25-(.20\times25)=X$$
$$\vee$$
$$25-(5)=X$$
$$\vee$$
$$20=X$$

Now that we have our equation. We can plug in our numbers to help us find the total. First, let's identify the information given to me. We know the original cost of the shirt…$25 and the discount percentage…20%.

So, .20 times 25, I can move the decimal over one and think of it as 2 times 25, which is easy…50! And then I need to move the decimal back over one time. So, that's 5.

This means that I get a $5 discount off of my shirt.

If I get $5 of the shirt that means that the original price, 25, minus 5 is 20. This means that after the 20% off sale, I will pay $20 for the shirt.

That was one example of how a story might ask us about percentages, where we're finding a percentage of an original and taking that amount away. But, we also might also have problems where we're finding a percentage and adding it back to the original price or amount. Let me show you.

Let's Think (Slide 5): Let's imagine you spent $25 on dinner. You want to leave a 20% tip. How much will you spend on dinner? This sounds really similar, I see the same two pieces of information, let's read a little bit closer to think about what's happening here. So, I went to dinner and I spent $25 on dinner. Now, I want to leave a tip, or something extra for the server who helped me..20% to be exact…so I need to figure out how much I spent on dinner…the $25 for dinner and the extra tip for the server. So, this problem is different because I'm not taking the percentage away, I'm adding it.

$$\begin{array}{c}\text{original}\\\text{price}\end{array} + \left[\begin{array}{c}\text{original}\\\text{price}\end{array} \cdot \begin{array}{c}\text{discount}\\\%\end{array}\right] = X$$

In order to solve this problem, I need to find the amount I'm going to tip, 20% of $25 and add that back to the original amount. Here, the percent equation I can use is the original price PLUS the original price times the percentage, and that will give me the total cost of my dinner.

$$25 + (25 \times .2) = X$$
$$\vee$$

So, let me plug my values in. I know that the original price of dinner was $25. And, to find how much I'm going to tip, I need to multiply $25 times 20%, or 0.2.

$$25 + 5 = X$$
$$\vee$$
$$30 = X$$

We just did the same math in my previous problem. We know that 25 times 0.2 is 5. But, instead of taking that 5 away, I need to ADD it to the original price because that's the tip, or extra money, that I'm adding for my server.

So, I will end up paying $30 for my dinner. I'll pay $25 for food plus the $5 tip (20% of $25!), which is $30 in all.

Let's Try it (Slides 6-7): Now let's try solving equations with percentages. Remember to think carefully about what you're trying to figure out and use a percent formula to help you solve. Be sure to plug in the correct value in for the correct spot in the equation. We will work on the first worksheet step by step together.

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WARM WELCOME

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We will use equations to solve problems with percentages

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Let's Talk:

What is a percentage? Think of real-life situations where percentages are used.

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Let's Think:

Let's imagine our favorite store is having a 20% off sale on all items. You want to buy a shirt that originally costs $25. How much will the shirt cost after the discount?

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Let's Think:

Let's imagine you spent $25 on dinner. You want to leave a 20% tip. How much will you spend on dinner?

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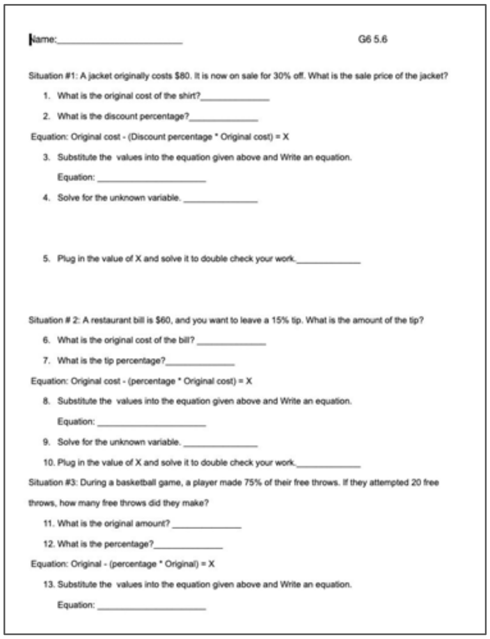
Let's Try It:



Name:_______________________ G6 5.6

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt?_____________
2. What is the discount percentage?_____________

Equation: Original cost - (Discount percentage * Original cost) = X

3. Substitute the values into the equation given above and Write an equation.
   Equation: ____________________
4. Solve for the unknown variable. _____________
5. Plug in the value of X and solve it to double check your work.____________

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? _____________
7. What is the tip percentage?_____________

Equation: Original cost - (percentage * Original cost) = X

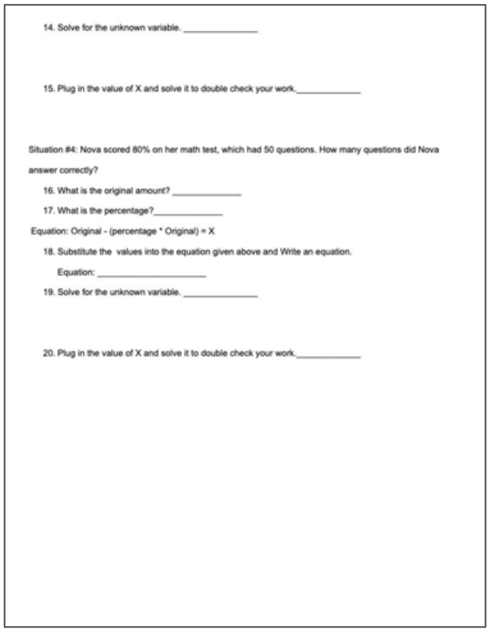
8. Substitute the values into the equation given above and Write an equation.
   Equation: ____________________
9. Solve for the unknown variable. _____________
10. Plug in the value of X and solve it to double check your work.____________

Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they make?

11. What is the original amount? _____________
12. What is the percentage?_____________

Equation: Original - (percentage * Original) = X

13. Substitute the values into the equation given above and Write an equation.
    Equation: ____________________



14. Solve for the unknown variable. _____________
15. Plug in the value of X and solve it to double check your work.____________

Situation #4: Nova scored 80% on her math test, which had 50 questions. How many questions did Nova answer correctly?

16. What is the original amount? _____________
17. What is the percentage?_____________

Equation: Original - (percentage * Original) = X

18. Substitute the values into the equation given above and Write an equation.
    Equation: ____________________
19. Solve for the unknown variable. _____________
20. Plug in the value of X and solve it to double check your work.____________

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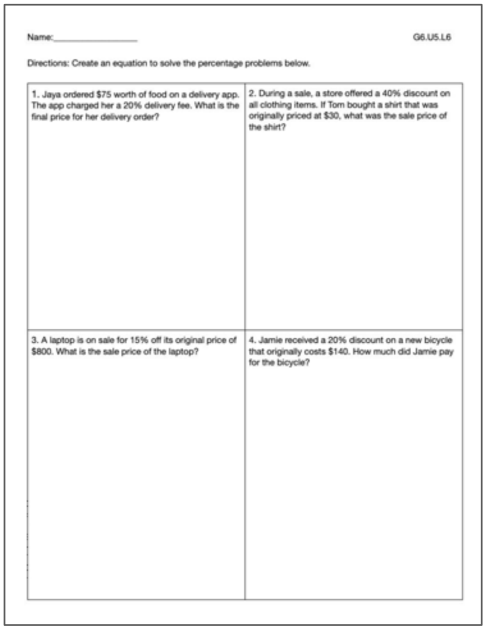
On your Own:



Name:________________ G6.U5.L6

Directions: Create an equation to solve the percentage problems below.

1. Jaya ordered $75 worth of food on a delivery app. The app charged her a 20% delivery fee. What is the final price for her delivery order?	2. During a sale, a store offered a 40% discount on all clothing items. If Tom bought a shirt that was originally priced at $30, what was the sale price of the shirt?
3. A laptop is on sale for 15% off its original price of $800. What is the sale price of the laptop?	4. Jamie received a 20% discount on a new bicycle that originally costs $140. How much did Jamie pay for the bicycle?

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Name:____________________________________ G6 U5 Lesson 6 - Let’s Try It

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt?______________
2. What is the discount percentage?______________

Equation: original cost - (discount percentage * original cost) = X

3. Substitute the values into the equation given above and write an equation.

   Equation: ______________________

4. Solve for the unknown variable. _______________
5. Plug in the value of X and solve it to double check your work._____________

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? ______________
7. What is the tip percentage?______________

Equation: original cost - (percentage * original cost) = X

8. Substitute the values into the equation given above and Write an equation.

   Equation: ______________________

9. Solve for the unknown variable. _______________
10. Plug in the value of X and solve it to double check your work._____________

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Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they miss?

11. What is the original amount? ______________

12. What is the percentage?______________

Equation: original - (percentage * original) = X

13. Substitute the values into the equation given above and Write an equation.

Equation: ______________________

14. Solve for the unknown variable. _______________

15. Plug in the value of X and solve it to double check your work._____________

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Name ____ G6 U5 Lesson 6 - Independent Work

Directions: Create an equation to solve the percentage problems below.

1. A store is offering a 25% discount on a toy that originally costs $40. How much will the toy cost after the discount?

2. At a bakery, the donuts are 30% off the original price of $20 a dozen. How much are the donuts after the sale price?

3. Thomas ordered food from a delivery food service. His food cost a total of $55. He was charged a 15% service fee. How much did he spend in total on the food delivery?

4. Jane spent $125 at a restaurant on her dinner. She plans on leaving a 25% tip for her waitress. How much money will she spend in total with the bill and tip combined?

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Name: Answer Key

G6 U5 Lesson 6 - Let's Try It!

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt? $80
2. What is the discount percentage? 30% .30

Equation: Original cost - (Discount percentage * Original cost) = X

3. Substitute the values into the equation given above and Write an equation.

   Equation: $80-(.30\cdot 80)=x$

4. Solve for the unknown variable. 56

   $80-(.3\cdot 80)=x$

   $80-24=x$

   $56=x$

5. Plug in the value of X and solve it to double check your work.

   $80-(.3\cdot 80)=56$

   $80-24=56$

   $56=56$

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? 60
7. What is the tip percentage? 15% .15

Equation: Original cost - (percentage * Original cost) = X

8. Substitute the values into the equation given above and Write an equation.

   Equation: $60-(.15\cdot 60)$

9. Solve for the unknown variable. 51
10. Plug in the value of X and solve it to double check your work.

   $60-(.15\cdot 60)=51$

   $60-9=51$

   $51=51$

Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they miss?

11. What is the original amount? 20
12. What is the percentage? .75

Equation: Original - (percentage * Original) = X

13. Substitute the values into the equation given above and Write an equation.

   Equation: $20-(.75\cdot 20)=x$

   $20-15=x$

   $\boxed{x=5}$

Name: Answer Key

G6 U5 Lesson 6 - Independent Practice

Directions: Create an equation to solve the percentage problems below.

1. A store is offering a 25% discount on a toy that originally costs $40. How much will the toy cost after the discount?

$$40-(.25\cdot 40)=x$$

$$\downarrow$$

$$40-10=x$$

$$\boxed{30=x}$$

2. At a bakery, the donuts are 30% off the original price of $20 a dozen. How much are the donuts after the sale price?

$$20-(.3\cdot 20)=x$$

$$\downarrow$$

$$20-6=x$$

$$\boxed{14=x}$$

3. Thomas ordered food from a delivery food service. His food cost a total of $55. He was charged a 15% service fee. How much did he spend in total on the food delivery?

$$55+(.15\cdot 55)=x$$

$$\downarrow$$

$$55+8.25=x$$

$$\downarrow$$

$$\boxed{\$63.25=x}$$

4. Jane spent $125 at a restaurant on her dinner. She plans on leaving a 25% tip for her waitress. How much money will she spend in total with the bill and tip combined?

$$125+(.25\cdot 125)=x$$

$$\downarrow$$

$$125+31.25=x$$

$$\boxed{\$156.25=x}$$

G6 U5 Lesson 7

Use diagrams to differentiate between equal and equivalent expressions

CITYTUTOR DC

G6 U5 Lesson 7 - Students will use diagrams to differentiate between equal and equivalent expressions

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will build on our knowledge of the distributive property, which we've been learning about since third grade. We will jog on memory on how to use the distributive property in order to create equivalent expressions. This skill will be important as we continue exploring equations.

Let's Talk (Slide 3): Today, we will talk about the similarities and differences between equal expressions and equivalent expressions. Let's start with reviewing what we already know about the distributive property. So…**what do you already know about the distributive property?** Possible Answer Answers, Key Points:

- When you have a number outside a set of parentheses and inside the parentheses.
- It says that when you have a number outside a set of parentheses and inside the parentheses, there is an addition or subtraction, you can share or distribute the number to each part inside the parentheses.

Yes, that is correct. The distributive property explains how multiplication can be distributed over addition or subtraction.The property applies to both numbers and variables.

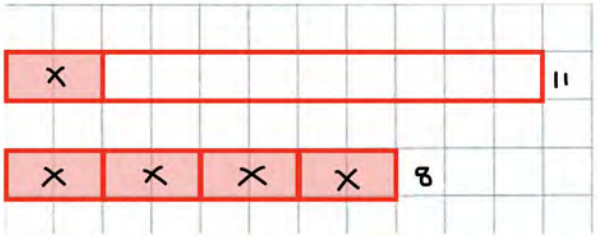
Let's Think (Slide 4): Today we'll explore how the distributive property can help us find equivalent expressions. Remember, an expression is like a math sentence with numbers, variables, and operations, but it doesn't have an equal sign. For example, 2 + 3 and 4 + 2 and X + 1 are expressions (*write*). These are all expressions because they have a combination of numbers, variables, and operations like addition or subtraction but there is no equal sign involved. Today expressions will be important to our learning.

Now let's learn how to use diagrams to figure out which expressions are equivalent and which are just sometimes equal. Let's talk about the difference between equal expressions and equivalent expressions. An equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values.

For example, the two expressions x + 9 and 4x are equal ,when x = 3. If we look at the diagram, when x-3 we have 3+9 which is 12 for the first expression. Then for the second expression, we have 4(3) which is 12. So when x=3, the two expressions are equal. But, they aren't always equal depending on what the variable is.

And, when we do the math and substitute 3 for x, we see that 3+9 is 12 and 4x2 is 12. We can see that they're equal in both the diagram (*point)* and with the equations.

Let's Think (Slide 5): Let's explore whether they're equal when x=2. Let's use diagram substitution to prove whether they are or are not equal..



Let's model x + 9 and 4x when x = 2. I would represent x + 9 by making a box around 2 units and labeling it x. Then I would connect a group of 9 more and would have a total of 11 blocks.

Next, let's represent 4x when x = 2. That would be four sets of 2 so I would make four groups of 2, which makes 8 in all.

When I look at the diagram, I see that 11 and 8 aren't equal, therefore these expressions are not equal when x = 2.

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So these expressions are equal when x = 3 but not when x=2 so that means that they aren't equivalent expressions.

Let's Think (Slide 6): That brings us to EQUIVALENT EXPRESSIONS, equivalent expressions are two expressions that will always have the same exact value no matter what value a variable is set to, whether x=2 or x=3 or any other value. They may look different but simplify to the same value each time.

So, let's look at the expression 4(x + 3). I want to think of an expression that is equivalent, this is making me think about the distributive property. We know that the distributive property creates an equivalent expression by distributing multiplication across the parentheses.

$$4(x+3)$$

Look, this 4 is outside the parentheses. So, we can distribute it to the X and the 3 (*draw arrows*).

$$\begin{array}{ccc} 4\cdot x & + & 4\cdot 3 \\ \downarrow & & \downarrow \\ 4x & + & 12 \end{array}$$

First, let's distribute the outside term, 4, to the first term…x! So, 4 times x or 4x. Then we need to distribute or multiply the outside term, 4, to the second inside term 3, which is 4 times 3.

Now my expression is 4x plus 12. So I could rewrite this expression as 4x + 12.

$$4x+12=4(x+3)$$

Therefore 4(x + 3) and 4x + 12 are equivalent because equivalent expressions have the same value for any given values of the variables, so I can set them equal to each other. Even though the expressions look different, they both give us the same value for every value x.

$$\begin{array}{ccc} 4x+12 & = & 4(x+3) \\ 4(5)+12 & = & 4(5+3) \\ \downarrow & & \downarrow \\ 20+12 & = & 4(8) \\ \downarrow & & \downarrow \\ 32 & = & 32 \end{array}$$

Let's test it to see if they're the same when x=5. We'll use the same equation and plug 5 in for the variable x on both sides.

Now, when we do the math we see that when x=5, the equations are equivalent, they both equal 32.

Now, everyone, pick your own value for X and plug it in to prove that the expressions are equivalent. (*Have students share out their value and whether the two expressions had the same value*).

Let's Try it (Slides 6): Now, we will work together. I will hand out worksheets with various expressions. Your task is to determine whether they are equal or equivalent. Remember, an equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values. However, an equivalent expression is two expressions that will always have the same exact value no matter what value a variable is set to.

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WARM WELCOME

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We will use diagrams to differentiate between equal and equivalent expressions.

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Let's Talk:

What do you already know about the distributive property?

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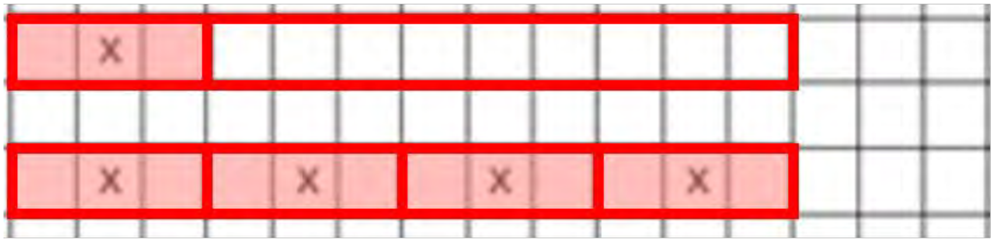
Let's Think:

Equal Expressions

An equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values.

x + 9 and 4x



x + 9 when x = 3

4x when x =3

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Let's Think:

Let's draw a diagram to determine whether the expressions are equal.

Remember, an equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values. Let's look at the same two expressions but change the given variable.

x + 9 and 4x

x + 9 when x = 2

4x when x =2

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Let's Think:

Equivalent Expressions

Equivalent expressions are two expressions that will always have the same exact value no matter what value a variable is set to. They may look different but simplify to the same value each time.

$$4\ (\ x + 3)$$

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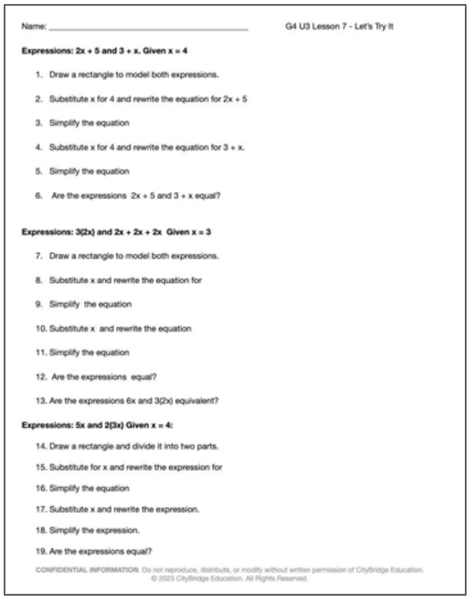
Let's Try It:

Let's try to use diagrams to differentiate between equal and equivalent expressions together



Name: ______________________ G4 U3 Lesson 7 - Let's Try It

Expressions: 2x + 5 and 3 + x. Given x = 4

1. Draw a rectangle to model both expressions.
2. Substitute x for 4 and rewrite the equation for 2x + 5
3. Simplify the equation
4. Substitute x for 4 and rewrite the equation for 3 + x.
5. Simplify the equation
6. Are the expressions 2x + 5 and 3 + x equal?

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions.
8. Substitute x and rewrite the equation for
9. Simplify the equation
10. Substitute x and rewrite the equation
11. Simplify the equation
12. Are the expressions equal?
13. Are the expressions 6x and 3(2x) equivalent?

Expressions: 5x and 2(3x) Given x = 4:

14. Draw a rectangle and divide it into two parts.
15. Substitute for x and rewrite the expression for
16. Simplify the equation
17. Substitute x and rewrite the expression.
18. Simplify the expression.
19. Are the expressions equal?

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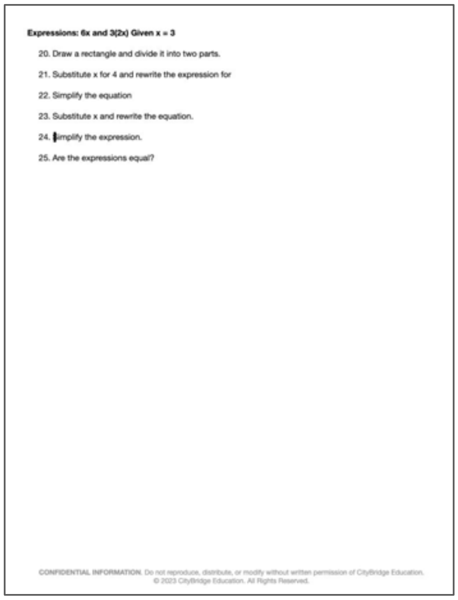

Expressions: 6x and 3(2x) Given x = 3

20. Draw a rectangle and divide it into two parts.
21. Substitute x for 4 and rewrite the expression for
22. Simplify the equation
23. Substitute x and rewrite the equation.
24. Simplify the expression.
25. Are the expressions equal?

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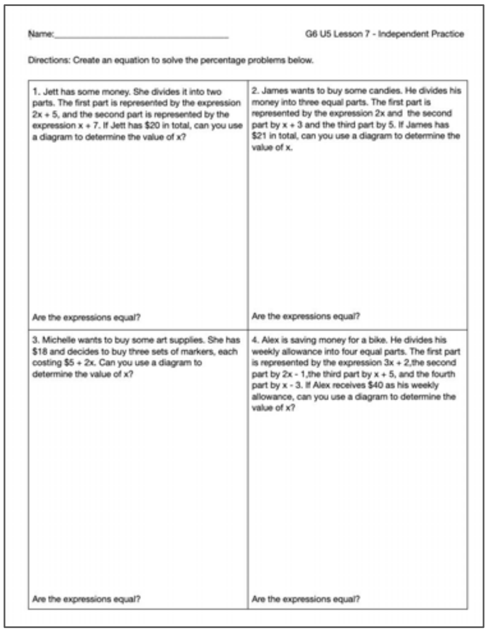
On your Own:

Try to use diagrams to differentiate between equal and equivalent expressions on your own.



Name: ______________________ G6 U5 Lesson 7 - Independent Practice

Directions: Create an equation to solve the percentage problems below.

1. Jett has some money. She divides it into two parts. The first part is represented by the expression 2x + 5, and the second part is represented by the expression x + 7. If Jett has $20 in total, can you use a diagram to determine the value of x? Are the expressions equal?	2. James wants to buy some candies. He divides his money into three equal parts. The first part is represented by the expression 2x and the second part by x + 3 and the third part by 5. If James has $21 in total, can you use a diagram to determine the value of x. Are the expressions equal?
3. Michelle wants to buy some art supplies. She has $18 and decides to buy three sets of markers, each costing $5 + 2x. Can you use a diagram to determine the value of x? Are the expressions equal?	4. Alex is saving money for a bike. He divides his weekly allowance into four equal parts. The first part is represented by the expression 3x + 2,the second part by 2x - 1,the third part by x + 5, and the fourth part by x - 3. If Alex receives $40 as his weekly allowance, can you use a diagram to determine the value of x? Are the expressions equal?

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Name: ____ G4 U3 Lesson 7 - Let's Try It

Expressions: 2x + 5 and 3 + x. Given x = 4

1. Draw a rectangle to model both expressions.
2. Substitute x for 4 and rewrite the equation for 2x + 5
3. Simplify the equation
4. Substitute x for 4 and rewrite the equation for 3 + x.
5. Simplify the equation
6. Are the expressions 2x + 5 and 3 + x equal?

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions.
8. Substitute x and rewrite the equation for
9. Simplify the equation
10. Substitute x and rewrite the equation
11. Simplify the equation
12. Are the expressions equal?
13. Are the expressions 6x and 3(2x) equivalent?

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Expressions: $5x$ and $2(3x)$ Given $x = 4$:

14. Draw a rectangle and divide it into two parts.
15. Substitute for x and rewrite the expression for
16. Simplify the equation
17. Substitute x and rewrite the expression.
18. Simplify the expression.
19. Are the expressions equal?

Expressions: $6x$ and $3(2x)$ Given $x = 3$

20. Draw a rectangle and divide it into two parts.
21. Substitute x for 4 and rewrite the expression for
22. Simplify the equation
23. Substitute x and rewrite the equation.
24. Simplify the expression.
25. Are the expressions equal?

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Name:____________________________________ G6 U5 Lesson 7 - Independent Work

Directions: Use diagrams and plug in the value of x to determine if the expressions are equivalent.

1. Draw two separate diagrams to represent the expressions 3 + 2 and 4 + 1. Are these expressions equal or equivalent? Explain your answer using the diagrams.

2. Draw two separate diagrams to represent the expressions 2 x 5 and 10. Are these expressions equal or equivalent? Explain your answer using the diagrams.

3. Draw two separate diagrams to represent the expressions 6 - 3 and 7 - 4. Are these expressions equal or equivalent? Explain your answer using the diagrams.

4. Draw two separate diagrams to represent the expressions 2 x 3 and 3 x 2. Are these expressions equal or equivalent? Explain your answer using the diagrams.

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Name: Answer Key

Expressions: 2x + 5 and 3 + x. Given x = 4

1. Draw a rectangle to model both expressions.

2x	5

3	x

2. Substitute x for 4 and rewrite the equation for 2x + 5

$2(4)+5$

3. Simplify the equation

$8+5$

13

4. Substitute x for 4 and rewrite the equation for 3 + x.

$3+4$

5. Simplify the equation

7

6. Are the expressions 2x + 5 and 3 + x equal?

No

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions.

2x	2x	2x

2x	2x	2x

8. Substitute x and rewrite the equation for $3(2\cdot3)$

9. Simplify the equation

$3(6)$

18

10. Substitute x and rewrite the equation $2\cdot3+2\cdot3+2\cdot3$

11. Simplify the equation

$6+6+6$

18

12. Are the expressions equal? Yes

13. Are the expressions 6x and 3(2x) equivalent? Yes

Expressions: 5x and 2(3x) Given x = 4:

14. Draw a rectangle and divide it into two parts.

5x

3x	3x

15. Substitute for x and rewrite the expression for

$5\cdot4$

16. Simplify the equation

20

17. Substitute x and rewrite the expression. $2(3\cdot4)$

18. Simplify the expression.

$2\cdot12$

24

19. Are the expressions equal? No

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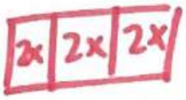
Expressions: 6x and 3(2x) Given x = 3

20. Draw a rectangle and divide it into two parts.



21. Substitute x for 4 and rewrite the expression for

$6 \cdot 3$

22. Simplify the equation

18

23. Substitute x and rewrite the equation. $3(2 \cdot 3)$

24. Simplify the expression.

$3(6)$

25. Are the expressions equal?

18

yes

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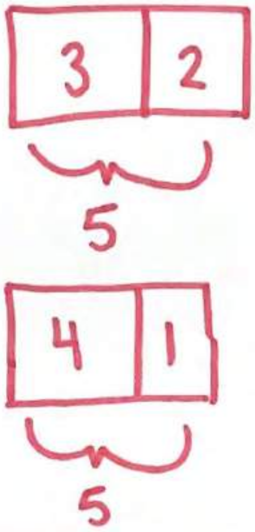
Name: Answer Key

G6 U5 Lesson 7 - Independent Practice

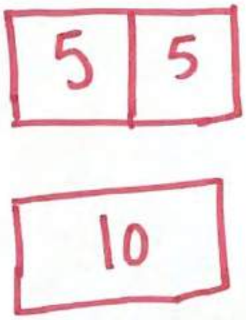
Directions: Use diagrams and plug in the value of x to determine if the expressions are equivalent.

1. Draw two separate diagrams to represent the expressions 3 + 2 and 4 + 1. Are these expressions equal or equivalent? Explain your answer using the diagrams.



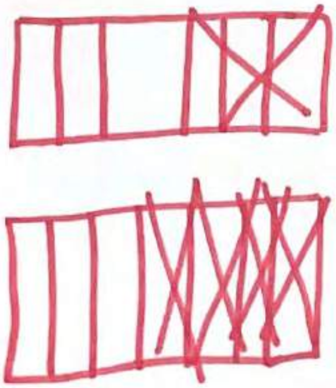
Equal but not equivalent

2. Draw two separate diagrams to represent the expressions 2 x 5 and 10. Are these expressions equal or equivalent? Explain your answer using the diagrams.



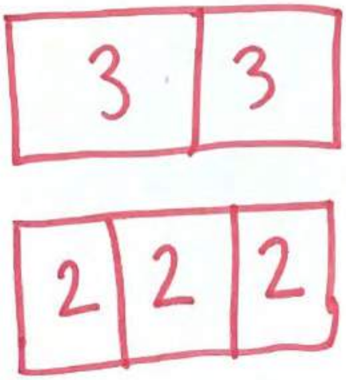
equivalent

3. Draw two separate diagrams to represent the expressions 6 - 3 and 7 - 4. Are these expressions equal or equivalent? Explain your answer using the diagrams.



equal

4. Draw two separate diagrams to represent the expressions 2 x 3 and 3 x 2. Are these expressions equal or equivalent? Explain your answer using the diagrams.



equal

G6 U5 Lesson 8

Use an area diagram to generate equivalent numerical expressions that are related by the distributive property

CITYTUTOR DC

G6 U5 Lesson 8 - Students will use an area diagram and the distributive property to write equivalent expressions with variables

Warm Welcome (Slide 1): Tutor choice

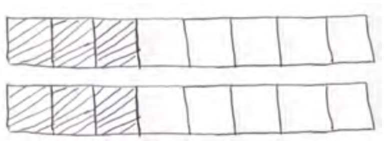
Frame the Learning/Connect to Prior Learning (Slide 2): Today's math lesson focuses on using area diagrams to generate equivalent numerical expressions related to the distributive property. By the end of this lesson, you will be able to apply the distributive property to simplify expressions and identify equivalent expressions. Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future.

Let's Talk (Slide 4): Today we'll be working with expressions. Remember expressions are a combination of numbers, operations , and variables, but there is no equal sign… 4 + 3 is an expression and x - y is also an expression. Today we will continue to talk about the distributive property and how it can help us simplify expressions. Let's start with a discussion, **what is the distributive property? Give an example**. Possible Answer Answers, Key Points:

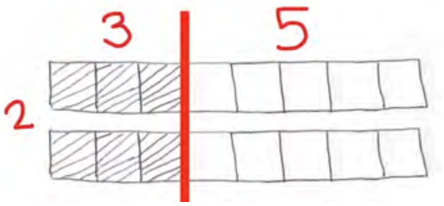
- The distributive property lets us multiply a number outside a set of parentheses with each term inside the parentheses to create an equivalent expression.
- For example 3(x+2) is the same as 3x + 6…you just distributed, or passed the 3 out to the two terms inside of the parentheses.

That's correct! The distributive property tells us how to distribute a number outside a set of parentheses to each term inside. For example, a(b + c) is the same as ab + ac because you first multiply a times b then you and then you bring down the addition sign add a times c or ac.

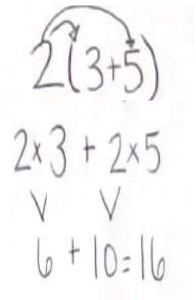
Let's Think (Slide 4): Let's think about how to use an area diagram or drawing to better understand the distributive property and generate equivalent numerical expressions. Let's look at the expression 2(3 + 5). Let's create an area diagram to model this expression.



So, we need to start with 3+5 (*point to equation*), so we'll draw 3 and 5 more, which is 8.But, look. This equation is saying that I need 3+5 two times because it says TWO times three plus five (*point to the two in the equation*). So I need to draw 3+5 again. So now I have two rectangles of 3 and 5, which is 8. I have 2 groups of 8.



But, we know that the distributive property tells us that we can think of this equation a little differently. Instead of thinking of this as 2 groups of 3 and 5…which is 8. We can think of this as 2 groups of 3 (*draw line*) AND 2 groups of 5



Let's show that with the equation, since I have two of each number, 3 and 5. I need to multiply 2 by each number inside the parentheses then add them together because the original operation in the parentheses is addition, just like the model shows. I have 2 times 3 AND 2 times 5.

When we do the math, we know that 2 times 3 is 6, so 6 is my first term. I need to bring down the plus sign. I know that 2 times 5 is 10, so 10 is my second term. Now I have the expression 6 + 10 and I know that 6 and 10 is 16. Therefore for our original equation, 2(3 + 5) is equal to 2x3 + 2x5…they both simplify to 16!

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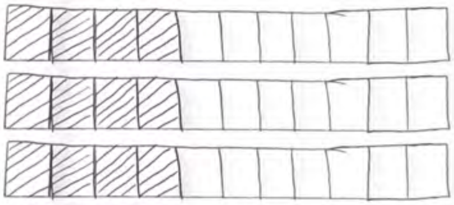
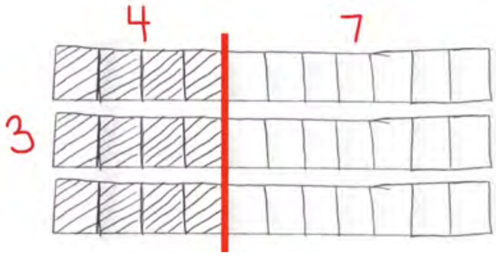
Let's Think (Slide 5): Let's look at another expression and think about how we can draw a model to show the distributive property to help us find an equivalent expression. First, read the expression with me…3 times 4 plus 7!



So, we need to do 4+7, which is 11…3 times. So, here's one set of 4+7…and another 4+7… and finally one last set of 4+7 (*narrate as you draw*).

There, we modeled 3 groups of 4+7…11 and 11 and 11, which is 33.



But, we can think of 3(4+7) in a different way. Instead of 3 groups of 4 and 7, we could distribute the 3 (*draw line*). We could think of it as 3 groups of 4 (*point*) AND 3 groups of 7 (*point*).

And, 3 groups of 4 are 12 and 3 groups of 7 are 21. Now, when we add them together 12 and 21 is 33.

$$3(4+7)$$
$$3\times4+3\times7$$
$$\vee \qquad \vee$$
$$12+21$$
$$\vee$$
$$33$$

Now, we'll apply the distributive property to the equation.

Since I have four of each number, 2 and 7. I need to multiply 4 by each number inside the parentheses then add them together because that is the original operation in the parentheses. So, 4 times 2 (*draw line*) PLUS (*point*) 4 times 7 (*draw line*).

Let's rewrite that to show how we distributed the 4 (*write*)...3x4 plus 3x7 and we know this expression, 4 x 2 + 4 x 7, is equivalent to the original expression 4(2 + 7), it's another way to write it.

So let's simplify and solve this expression. We know that 4x3 is 12 and 3x7 is 21. Now, we have 12+21, which is 33.

$$3(4+7)$$
$$\vee$$
$$3(11)$$
$$\vee$$
$$33$$

And, when we go back to the original expression, 3(4+7) and we solve it without distributing the 3. We add 4+7 and get 11. Then we need 3x11, which is also 330.

$$3(4+7)=3\times4+3\times7$$

This means that both of the expressions 4(2 + 7) and 4 x 2 + 4 x 7 are equivalent expressions and have the value of 33. We used the distributive property and a diagram to help us determine these expressions are equivalent.

Let's Try it (Slides 7-8): Now let's try simplifying different expressions using area diagrams to show the distributive property. Remember to draw the area diagrams or rectangles to model the distributive property, and use the distributive property to simplify the expressions.

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WARM WELCOME

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We will use an area diagram or rectangle to generate equivalent numerical expressions that are related by the distributive property.

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Let's Review:

What is an expression?

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Let's Talk:

What is the distributive property? Give an example.

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Let's Think:

Let's create an equivalent expression using the distributive property

$$2(3 + 5)$$

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Let's Think:

Let's create an equivalent expression using the distributive property

$$3(4 + 7)$$

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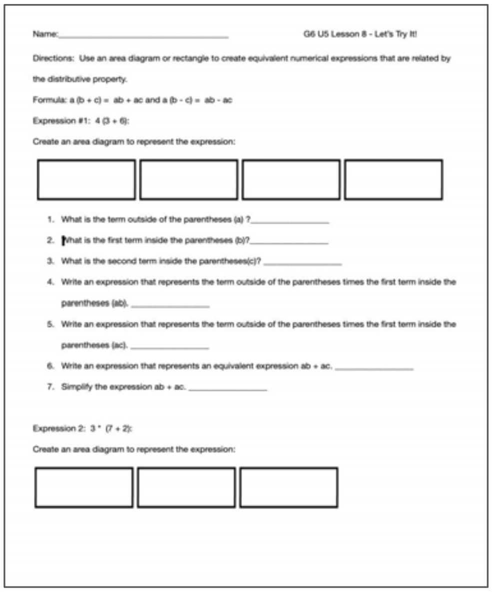
Let's Try It:

Lets try making equivalent expressions using the distributive property together.



Name:__________________________ G6 U5 Lesson 8 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

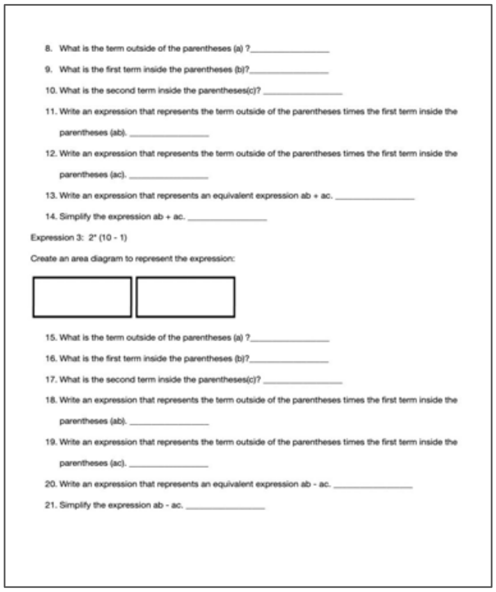
Expression #1: 4 (3 + 6):

Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?______________
2. What is the first term inside the parentheses (b)?______________
3. What is the second term inside the parentheses(c)? ______________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ______________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ______________
6. Write an expression that represents an equivalent expression ab + ac. ______________
7. Simplify the expression ab + ac. ______________

Expression 2: 3 * (7 + 2):

Create an area diagram to represent the expression:



8. What is the term outside of the parentheses (a) ?______________
9. What is the first term inside the parentheses (b)?______________
10. What is the second term inside the parentheses(c)? ______________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ______________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ______________
13. Write an expression that represents an equivalent expression ab + ac. ______________
14. Simplify the expression ab + ac. ______________

Expression 3: 2* (10 - 1)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?______________
16. What is the first term inside the parentheses (b)?______________
17. What is the second term inside the parentheses(c)? ______________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ______________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ______________
20. Write an expression that represents an equivalent expression ab - ac. ______________
21. Simplify the expression ab - ac. ______________

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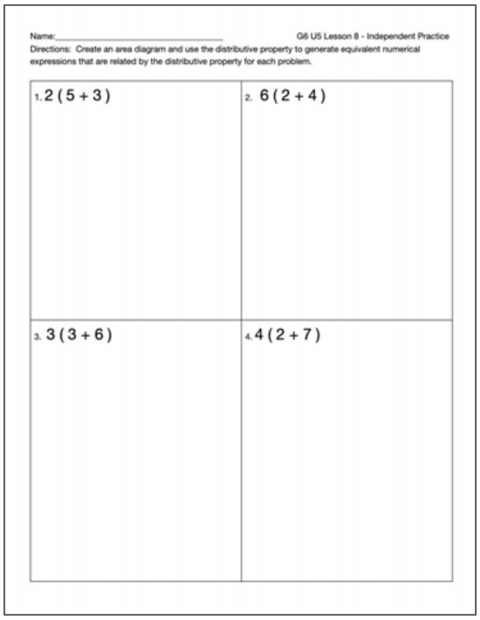
On your Own:

Try making equivalent expressions using the distributive property on your own.



Name:__________________________ G6 U5 Lesson 8 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

1. 2 (5 + 3)	2. 6 (2 + 4)
3. 3 (3 + 6)	4. 4 (2 + 7)

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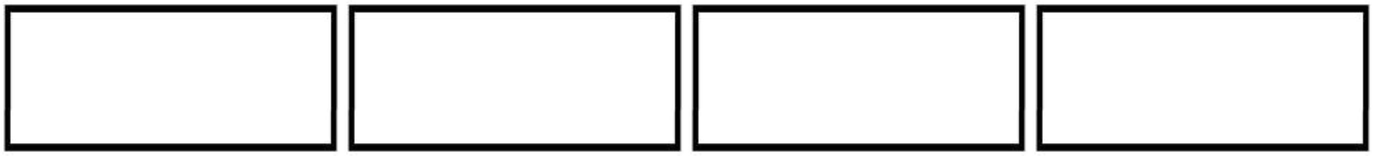
Name: ____________________________________

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property. Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4 (3 + 6):

Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ?__________________
2. What is the first term inside the parentheses (b)?__________________
3. What is the second term inside the parentheses(c)? __________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). __________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). __________________
6. Write an expression that represents an equivalent expression ab + ac. __________________
7. Simplify the expression ab + ac. __________________

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Expression #2: 3 * (7 + 2):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?_________________
9. What is the first term inside the parentheses (b)?_________________
10. What is the second term inside the parentheses(c)? _________________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
13. Write an expression that represents an equivalent expression ab + ac. _________________
14. Simplify the expression ab + ac. _________________

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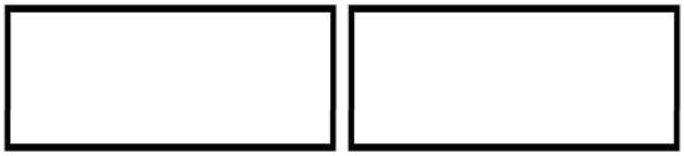
Expression #3: 2* (10 + 1)

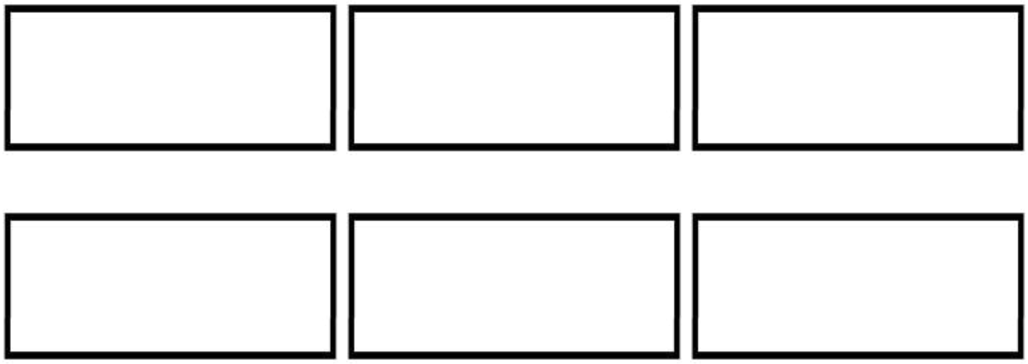
Create an area diagram to represent the expression:



15. What is the term outside of the parentheses (a) ?_________________
16. What is the first term inside the parentheses (b)?_________________
17. What is the second term inside the parentheses(c)? _________________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
20. Write an expression that represents an equivalent expression ab + ac. _________________
21. Simplify the expression ab + ac. _________________

Expression #4: 6 * (12 + 3)

Create an area diagram to represent the expression:



22. What is the term outside of the parentheses (a) ?_________________
23. What is the first term inside the parentheses (b)?_________________
24. What is the second term inside the parentheses(c)? _________________

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

27. Write an expression that represents an equivalent expression ab + ac. _________________

28. Simplify the expression ab + ac. _________________

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Name:______________________________________ G6 U5 Lesson 8 - Independent Work

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

1. Solve. 2 (5 + 3)	2. Solve. 6 (2 + 4)
3. Solve. 3 (3 + 6)	4. Solve. 4 (2 + 7)

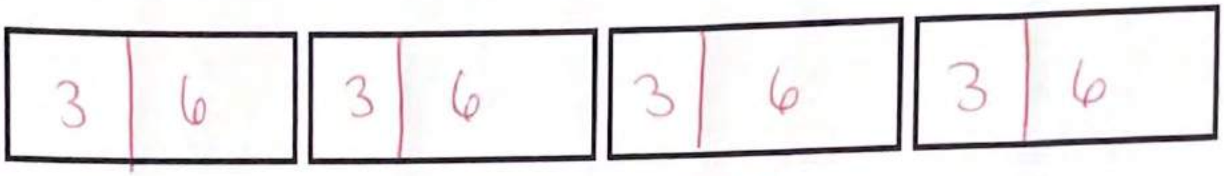
Name: Answer key

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4 (3 + 6):

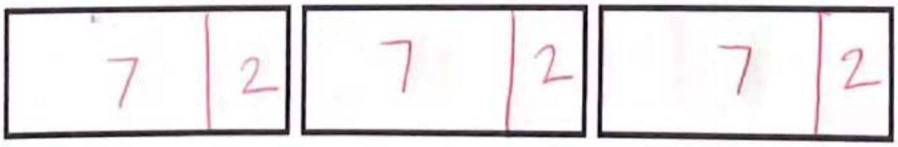
Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ? 4
2. What is the first term inside the parentheses (b)? 3
3. What is the second term inside the parentheses(c)? 6
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $4 \cdot 3 = 12$
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $4 \cdot 6 = 24$
6. Write an expression that represents an equivalent expression ab + ac. $4 \cdot 3 + 4 \cdot 6$
7. Simplify the expression ab + ac. $12+24=36$

Expression #2: 3 * (7 + 2):

Create an area diagram to represent the expression:



8. What is the term outside of the parentheses (a) ? 3

9. What is the first term inside the parentheses (b)? 7

10. What is the second term inside the parentheses(c)? 2

11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $3 \cdot 7$

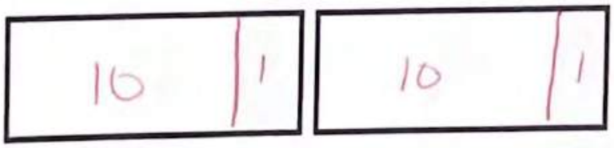
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $3 \cdot 2$

13. Write an expression that represents an equivalent expression ab + ac. $3 \cdot 7 + 3 \cdot 2$

14. Simplify the expression ab + ac. $21 + 6 = 27$

Expression #3: 2* (10 + 1)

Create an area diagram to represent the expression:



15. What is the term outside of the parentheses (a) ? 2

16. What is the first term inside the parentheses (b)? 10

17. What is the second term inside the parentheses(c)? 1

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $2 \cdot 10$

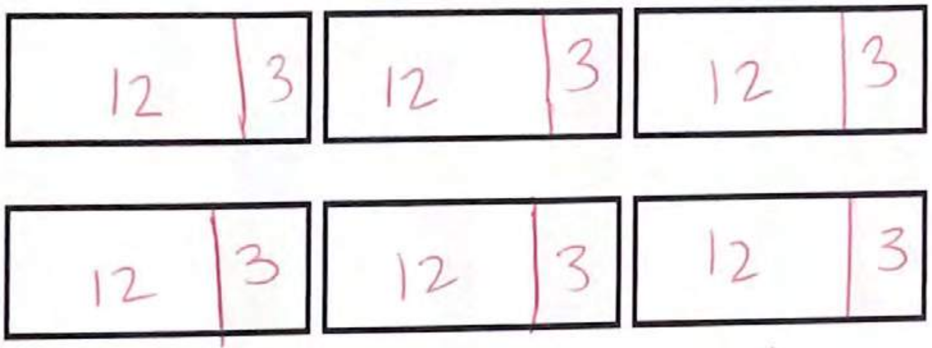
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $2 \cdot 1$

20. Write an expression that represents an equivalent expression ab + ac. $= 2 \cdot 10 + 2 \cdot 1$
$20 + 2 = 22$

21. Simplify the expression ab + ac. 20+2 =22

Expression #4: 6 * (12 + 3)

Create an area diagram to represent the expression:



22. What is the term outside of the parentheses (a) ? 6

23. What is the first term inside the parentheses (b)? 12

24. What is the second term inside the parentheses(c)? 3

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 6•12

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 6•3

27. Write an expression that represents an equivalent expression ab + ac. 6•12+6•3

28. Simplify the expression ab + ac. 72+ 9= 81

Name: Answer Key

G6 U5 Lesson 8 - Independent Practice

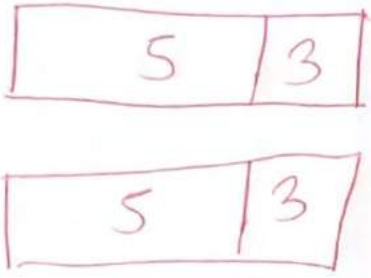
Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

1. $2(5+3)$

$2 \cdot 5 + 2 \cdot 3$

$10 + 6$

16

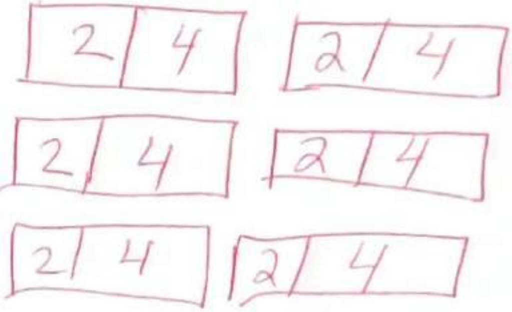


2. $6(2+4)$

$6 \cdot 2 + 6 \cdot 4$

$12 + 24$

36

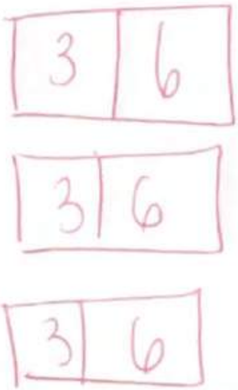


3. $3(3+6)$

$3 \cdot 3 + 3 \cdot 6$

$9 + 18$

27

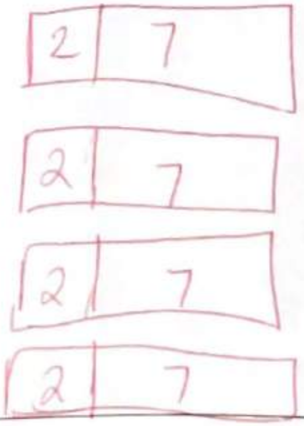


4. $4(2+7)$

$4 \cdot 2 + 4 \cdot 7$

$8 + 21$

29



G6 U5 Lesson 9

Use an area diagram and the distributive property to write equivalent expressions with variables

CITYTUTOR DC

G6 U5 Lesson 9 - Students will Use an area diagram and the distributive property to write equivalent expressions with variables.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Previously we used area diagrams and the distributive property to write equivalent expressions. Today, we'll use what we already know about diagrams and the distributive property to write equivalent expressions with variables. By the end of this lesson, you will be able to use area diagrams and the distributive property to write equivalent expressions with variables.

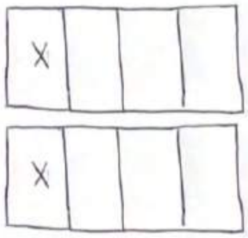
Let's Talk (Slide 3): Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future. Let's begin our math lesson by reviewing what we've learned about expressions and variables. An expression is a math sentence with numbers and operations. It is a combination of numbers, operations , and variables, but there is no equal sign.

Now that we reviewed expressions and the distributive property, let's remember what a variable is. **Everyone, think of an example of an expression with a variable.** Possible Answer Answers, Key Points:

- 3x + 5
- x - y
- 4 + x
- 10 - b

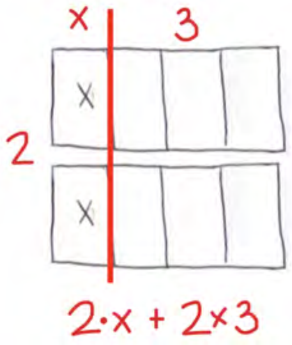
Very good! We can up with lots of examples of expressions with variables. Now, let's build on this knowledge and explore how we can use area diagrams and the distributive property to write equivalent expressions with variables. We use variables when we do not know the value of something yet, but we are still trying to figure it out. This might be like when we order food at a restaurant. We know how much each item is but we do not know the total until the server brings our bill.

Let's Think (Slide 5): Today we will write equivalent expressions with variables by using area diagrams. This will be similar steps to our previous lesson but we are replacing a value with a variable . Let's start with the example 2(x + 3).



We can represent the expression 2(x + 3) using an area diagram or model. The expression means we have 2 groups of (x + 3). So, we can draw a model of x, which we don't know, and three more.

And, we need that TWICE, because the expression says TWO groups of x+3 (*point to equation*). So, I'll draw another x+3. There, now we have two groups of x+3.



Just like yesterday, we can think of this area model a little differently. If I draw this line, instead of thinking of x+3 two times. I can distribute the two. So, 2 times x, or 2x (*point*) AND 2 times 3 (*point*).

So, another way to write this expression is 2x (*point to model*) + 2x3 (*point to model*), I just distributed, or passed out, the 2.

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$2(x+3)$

Now, we'll use an equation to represent the distributive property and expand it. The distributive property says we can distribute or multiply the number outside the parentheses to each term inside (*draw arrows*).

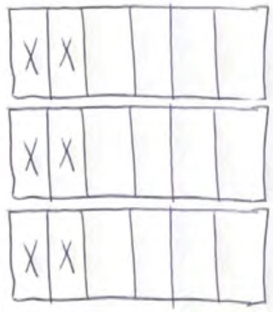
$2 \cdot x + 2 \cdot 3$

So, it becomes 2 * x + 2 * 3. I know that 2 times x equals 2x and 2 times 3 equals 6.

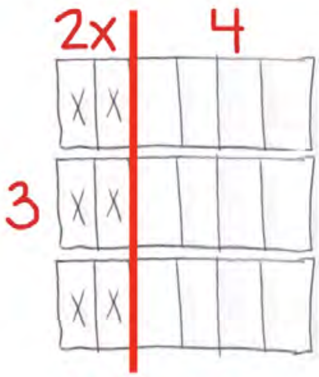
$2x + 6$

Now we have an equivalent expression, 2x + 6, which means the same thing and has the same value as 2(x + 3).

Let's Think (Slide 6): Let's try another example together. I need to write an equivalent expression for the expression 3(2x + 4).



First, let's draw a rectangle that shows 2x, which is x and x and 4 more. The expression tells me that I need THREE groups of 2x+4, so let me draw two more of the exact same thing...2x and 4 more….2x and 4 more. There, I have three groups of 2x + 4.



Now, let's apply the distributive property to our area model. The distributive property says we can distribute the number outside the parentheses to each term inside. So, when I draw this line, I see that I have 3 groups of 2x AND s groups of 4 (point).

$$3 \cdot 2x + 3 \times 4$$
$$6x + 12$$

So, when I write that as an expression, I Have 3 times 2x PLUS 3 times 4. We can simplify that even more. We know that 3x2 is 6, so 6x, and we know that 3x4 is 12. So, 6x + 12. Now we have an equivalent expression, 6x + 12 which is the same or has the same value as 3(2x + 4).

$$3(2x + 4)$$
$$3 \cdot 2x + 3 \times 4$$
$$6x + 12$$

Let's show how we did that with the expression. So, we started with 3(2x+4). We know that the distributive property tells us that we can distribute or pass out the term outside the parentheses to the terms inside the parenthesis (*draw arrows*). Now, this is where it gets a tiny bit tricky, this is one whole term…2x (*highlight*). So we can have 3 times 2x PLUS 3 times 4 (*write).*

And, we can simplify this…3x2 is 6 so now we have 6x plus…3x4 is 12. So, 6x+ 12 is equivalent to 3(2x+4).

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Let’s Try it (Slides 6-7): Today, we learned how to use area diagrams and the distributive property to write equivalent expressions with variables. Remember, area diagrams help us visualize expressions, and the distributive property allows us to simplify them. Now, let’s try to use area diagrams and the distributive property to write equivalent expressions with variables.

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WARM WELCOME

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We will use an area diagram and the distributive property to write equivalent expressions with variables.

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Let’s Talk:

What is an example of example of an expression with a variable?

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Let’s Think: Let’s create an equivalent expression using the distributive property.

$$2\ (x + 3)$$

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Let's Think:

Let's create an equivalent expression using the distributive property.

$$3\ (\ 2x + 4\ )$$

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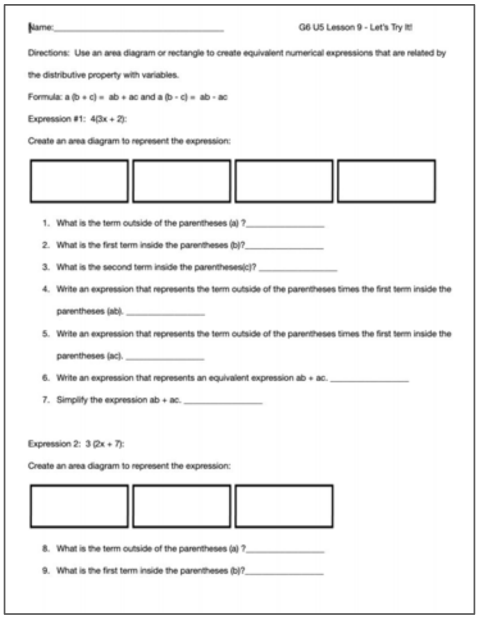
Let's Try It:

Now let's try it together.



Name:______________________________ G6 U5 Lesson 9 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4(3x + 2):

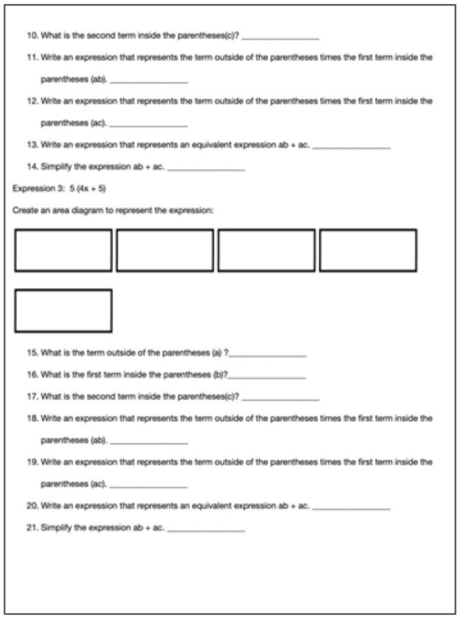
Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?_______________
2. What is the first term inside the parentheses (b)?_______________
3. What is the second term inside the parentheses(c)? _______________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
6. Write an expression that represents an equivalent expression ab + ac. _______________
7. Simplify the expression ab + ac. _______________

Expression 2: 3 (2x + 7):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?_______________
9. What is the first term inside the parentheses (b)?_______________



10. What is the second term inside the parentheses(c)? _______________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
13. Write an expression that represents an equivalent expression ab + ac. _______________
14. Simplify the expression ab + ac. _______________

Expression 3: 5 (4x + 5)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?_______________
16. What is the first term inside the parentheses (b)?_______________
17. What is the second term inside the parentheses(c)? _______________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
20. Write an expression that represents an equivalent expression ab + ac. _______________
21. Simplify the expression ab + ac. _______________

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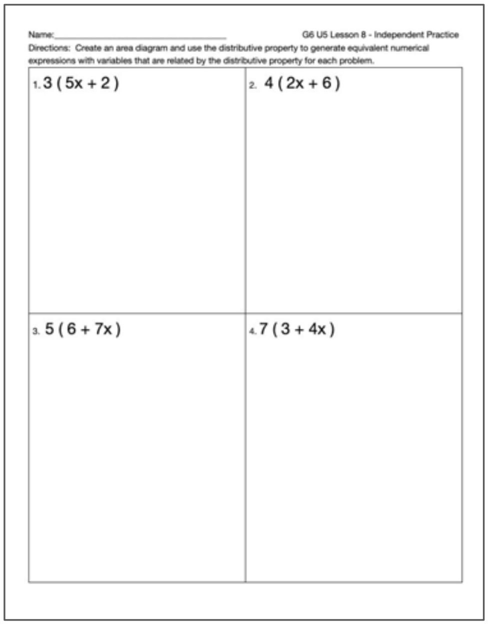
On your Own:

Now let's try it on your own



Name:______________________________ G6 U5 Lesson 8 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $3 (5x + 2)$	2. $4 (2x + 6)$
3. $5 (6 + 7x)$	4. $7 (3 + 4x)$

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Name:_________________________________

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4(3x + 2):

Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?________________
2. What is the first term inside the parentheses (b)?________________
3. What is the second term inside the parentheses(c)? ________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ________________
6. Write an expression that represents an equivalent expression ab + ac. ________________
7. Simplify the expression ab + ac. ________________

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Expression #2: 3 (2x + 7):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?_________________
9. What is the first term inside the parentheses (b)?_________________
10. What is the second term inside the parentheses(c)? _________________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
13. Write an expression that represents an equivalent expression ab + ac. _________________
14. Simplify the expression ab + ac. _________________

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Expression #3: 5 (4x + 5)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?_________________

16. What is the first term inside the parentheses (b)?_________________

17. What is the second term inside the parentheses(c)? _________________

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

20. Write an expression that represents an equivalent expression ab + ac. _________________

21. Simplify the expression ab + ac. _________________

Expression #4: 2 (4 + 3x)

Create an area diagram to represent the expression:

22. What is the term outside of the parentheses (a) ?_________________

23. What is the first term inside the parentheses (b)?_________________

24. What is the second term inside the parentheses(c)? _________________

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25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

27. Write an expression that represents an equivalent expression ab + ac. _________________

28. Simplify the expression ab + ac. _________________

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Name:____ G6 U5 Lesson 9 - Independent Work

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. Solve.

$$3(5x + 2)$$

2. Solve.

$$4(2x + 6)$$

3. Solve.

$$5(6 + 7x)$$

4. Solve.

$$7(3 + 4x)$$

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Name: Answer Key

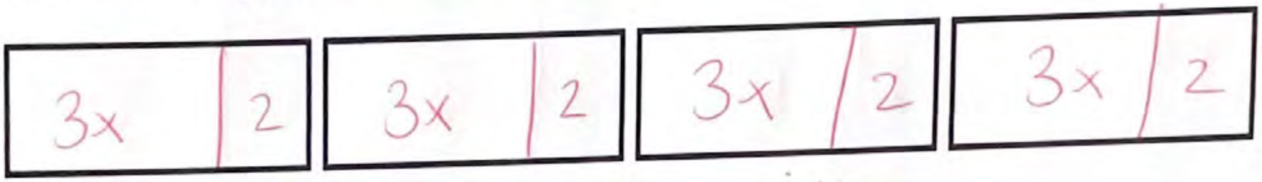
G6 U5 Lesson 9 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4(3x + 2):

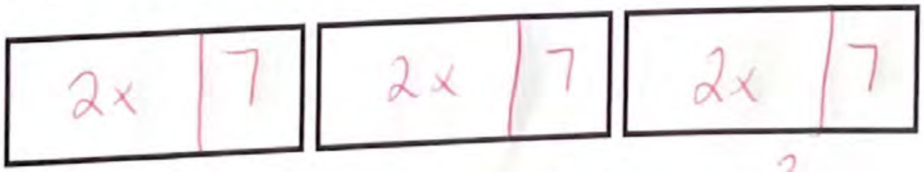
Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ? 4
2. What is the first term inside the parentheses (b)? 3x
3. What is the second term inside the parentheses(c)? 2
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 4 · 3x
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 4 · 2
6. Write an expression that represents an equivalent expression ab + ac. 4 · 3x + 4 · 2
7. Simplify the expression ab + ac. 12x + 8

Expression #2: 3 (2x + 7):

Create an area diagram to represent the expression:



8. What is the term outside of the parentheses (a) ? 3

9. What is the first term inside the parentheses (b)? $2x$

10. What is the second term inside the parentheses(c)? 7

11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $3 \cdot 2x$

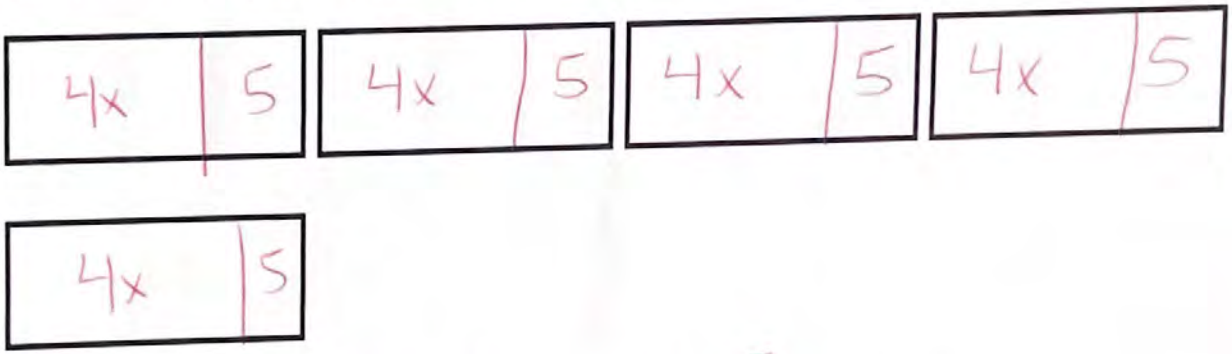
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $3 \cdot 7$

13. Write an expression that represents an equivalent expression ab + ac. $3 \cdot 2x + 3 \cdot 7$

14. Simplify the expression ab + ac. $6x + 21$

Expression #3: 5 (4x + 5)

Create an area diagram to represent the expression:



15. What is the term outside of the parentheses (a) ? 5

16. What is the first term inside the parentheses (b)? $4x$

17. What is the second term inside the parentheses(c)? 5

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $5 \cdot 4x$

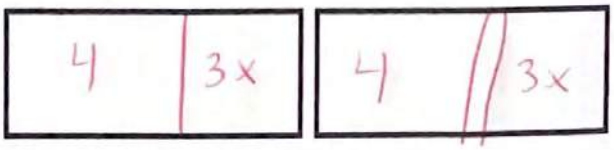
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $5 \cdot 5$

20. Write an expression that represents an equivalent expression ab + ac. $5 \cdot 4x + 5 \cdot 5$

21. Simplify the expression ab + ac. $20x + 25$

Expression #4: 2 (4 + 3x)

Create an area diagram to represent the expression:



22. What is the term outside of the parentheses (a) ? 2

23. What is the first term inside the parentheses (b)? 4

24. What is the second term inside the parentheses(c)? 3x

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 2 · 4

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 2 · 3x

27. Write an expression that represents an equivalent expression ab + ac. 2 · 4 + 2 · 3x

28. Simplify the expression ab + ac. 8 + 6x

Name: Answer Key

G6 U5 Lesson 9 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $3(5x+2)$

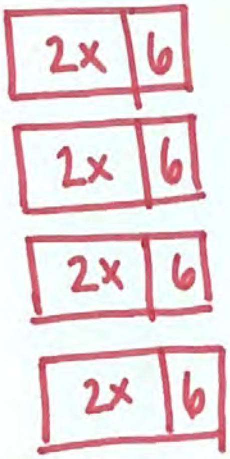
$3 \cdot 5x + 3 \cdot 2$

$15x + 6$

2. $4(2x+6)$

$4 \cdot 2x + 4 \cdot 6$

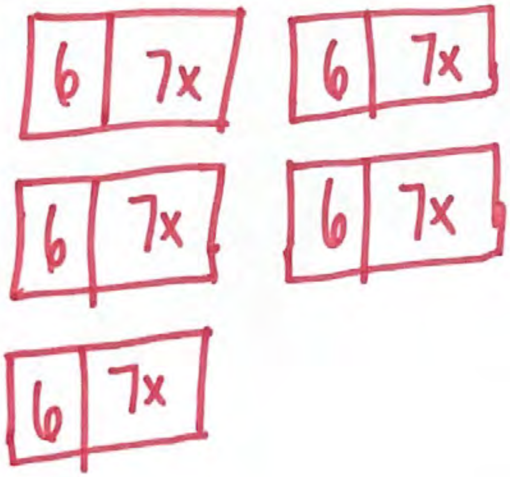
$8x + 24$



3. $5(6+7x)$

$5 \cdot 6 + 5 \cdot 7x$

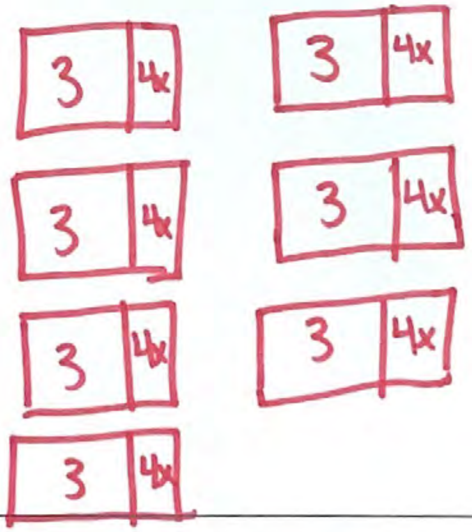
$30 + 35x$



4. $7(3+4x)$

$7 \cdot 3 + 7 \cdot 4x$

$21 + 28x$



G6 U5 Lesson 10

Use the distributive property to write equivalent expressions with variables

G6 U5 Lesson 10 - We will use the distributive property to write equivalent expressions with variables.

Warm Welcome (Slide 1): Tutor choice

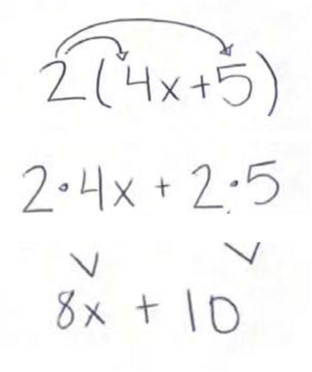
Frame the Learning/Connect to Prior Learning (Slide 2): We've become experts on the distributive property! We've been using models and expressions to show how the distributive property works and why it makes sense. Today, we'll continue that work but we'll just work with expressions, we're leaving the models and drawings behind! So, by the end of this lesson, you will be able to use the distributive property to write equivalent expressions with variables. Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future.

Let's Talk (Slide 3): Let's take a look at another student's work with the distributive property. This says, Amar used the Distributive Property to write an equivalent expression for 3(x+2y). Let's take a minute to look at how Amar solved it. Do you agree with what he did? Why or why not? Possible Answer Answers, Key Points:

- Amar used the distributive property but did it wrong.
- He passed the 3 to the y to get 3y but when he distributed it to the 2x, he added the two terms, 3 and 2, instead of multiplying them.
- He should've gotten 3y + 6x instead of 3x + 5x.

That's right! Amar was right in that he knew to distribute the 3 to both of the terms inside of the parenthesis but he got mixed up with his math. He needed to multiply 3x2, not add 3+2. So he should've gotten 3y + 6x instead.

Let's Think (Slide 4): Let's make sure we remember Amar's mistake today as we continue to practice the distributive property. Let's start with the example 2(4x + 5). We will use the distributive property to expand the expression. The distributive property says we can distribute the number outside the parentheses to each term inside.

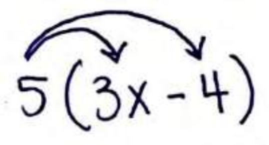


First let's distribute 2 to the first term 4x, this creates 2 times 4x. Next, I need to distribute 2 to the second term,5. This is 2 times 5.

So, our expression is 2 times 4x plus 2 times 5.Now, I need to continue solving or simplifying this expression

Remember, what Amar did? we're not adding 2 and 4, we're multiplying them. So we have 8x and then we need to multiply 2x5, which is 10. So, 8x+10 is the new expression.

Let's Think (Slide 5): Let's try another example together. Let's use the distributive property to write an equivalent expression. Before we start, notice the operation in the parentheses is subtraction. So instead of adding the two terms we will subtract. The distributive property says we can distribute the number outside the parentheses to each term inside, we use the same process…we just have to be careful of the signs and operations.



First, we need to distribute the 5 to each term in the parentheses. So, 5 times 3x MINUS 5 times 4 (*point and draw arrow as you say it*).

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$$\begin{array}{ccc} 5\cdot 3x & - & 5\cdot 4 \\ \vee & & \vee \\ 15x & - & 20 \end{array}$$

Now let’s write that out. We have 5 times 3x MINUS 5 times 4.

Now we can simplify that, 5x3 is 15 so we have 15x. And then we have to take away 5x4, which is 20. So, we have 15x - 20.

Let’s Try it (Slides 6-7): Now, you have a strong understanding of using the distributive property to write equivalent expressions with variables. Remember to pay careful attention to the operations inside of the parenthesis.

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WARM WELCOME

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We will use the distributive property to write equivalent expressions with variables.

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Let's Talk:

Amar used the distributive property to write an equivalent expression for 3(x+2y). Do you agree with what he did? Why or why not?

$$3(y+2x)$$

$$3y + 5x$$

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Let's Think:

Let's create an equivalent expression using the distributive property.

$$2(4x + 5)$$

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Let's Think:

Let's create an equivalent expression using the distributive property.

5 (3x - 4)

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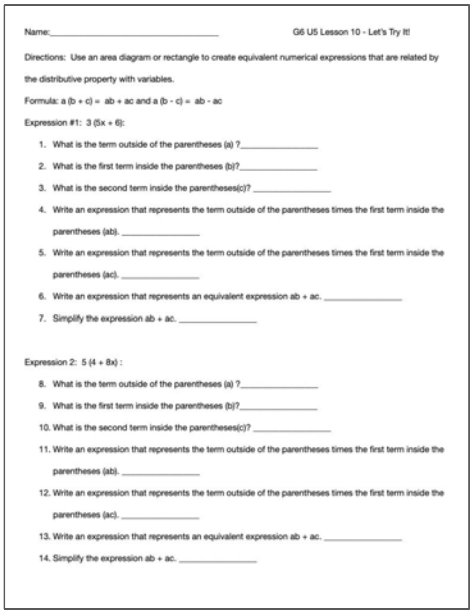
Let's Try It:

Now let's try it together.



Name:________________________________ G6 U5 Lesson 10 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

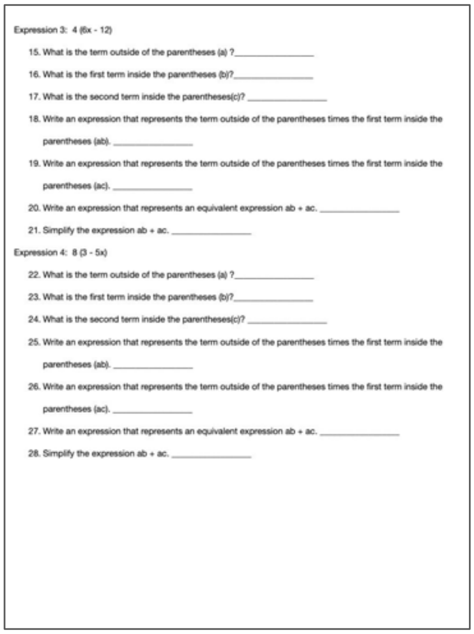
Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 3 (5x + 6):

1. What is the term outside of the parentheses (a) ?_______________
2. What is the first term inside the parentheses (b)?_______________
3. What is the second term inside the parentheses(c)? _______________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
6. Write an expression that represents an equivalent expression ab + ac. _______________
7. Simplify the expression ab + ac. _______________

Expression 2: 5 (4 + 8x) :

8. What is the term outside of the parentheses (a) ?_______________
9. What is the first term inside the parentheses (b)?_______________
10. What is the second term inside the parentheses(c)? _______________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
13. Write an expression that represents an equivalent expression ab + ac. _______________
14. Simplify the expression ab + ac. _______________



Expression 3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ?_______________
16. What is the first term inside the parentheses (b)?_______________
17. What is the second term inside the parentheses(c)? _______________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
20. Write an expression that represents an equivalent expression ab + ac. _______________
21. Simplify the expression ab + ac. _______________

Expression 4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ?_______________
23. What is the first term inside the parentheses (b)?_______________
24. What is the second term inside the parentheses(c)? _______________
25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
27. Write an expression that represents an equivalent expression ab + ac. _______________
28. Simplify the expression ab + ac. _______________

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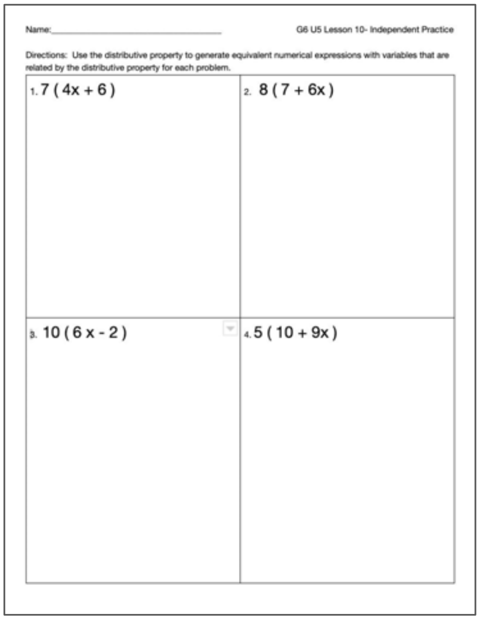
On your Own: **Now let's try it on your own.**



Name:______________________________ G6 U5 Lesson 10- Independent Practice

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $7 (4x + 6)$
2. $8 (7 + 6x)$
3. $10 (6 x - 2)$
4. $5 (10 + 9x)$

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Name:_______________________________________ G6 U5 Lesson 10 - Let's Try It

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a(b - c) = ab - ac

Expression #1: 3(5x + 6):

1. What is the term outside of the parentheses (a) ?_________________
2. What is the first term inside the parentheses (b)?_________________
3. What is the second term inside the parentheses(c)? _________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
6. Write an expression that represents an equivalent expression ab + ac. _________________
7. Simplify the expression ab + ac. _________________

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Expression #2: 5(4 + 8x) :

8. What is the term outside of the parentheses (a) ?_________________
9. What is the first term inside the parentheses (b)?_________________
10. What is the second term inside the parentheses(c)? _________________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
13. Write an expression that represents an equivalent expression ab + ac. _________________
14. Simplify the expression ab + ac. _________________

Expression #3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ?_________________
16. What is the first term inside the parentheses (b)?_________________
17. What is the second term inside the parentheses(c)? _________________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
20. Write an expression that represents an equivalent expression ab + ac. _________________
21. Simplify the expression ab + ac. _________________

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Expression #4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ?_________________

23. What is the first term inside the parentheses (b)?_________________

24. What is the second term inside the parentheses(c)? _________________

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

27. Write an expression that represents an equivalent expression ab + ac. _________________

28. Simplify the expression ab + ac. _________________

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Name:______________________________________ G6 U5 Lesson 10- Independent Work

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. Solve.

$$7 (4x + 6)$$

2. Solve.

$$8 (7 + 6x)$$

3. Solve.

$$10 (6 x - 2)$$

4. Solve.

$$5 (10 + 9x)$$

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Name: Answer key

G6 U5 Lesson 10 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 3 (5x + 6):

1. What is the term outside of the parentheses (a) ? 3
2. What is the first term inside the parentheses (b)? 5x
3. What is the second term inside the parentheses(c)? 6
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $3 \cdot 5x$
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $3 \cdot 6$
6. Write an expression that represents an equivalent expression ab + ac. $3 \cdot 5x + 3 \cdot 6$
7. Simplify the expression ab + ac. $15x + 18$

Expression #2: 5 (4 + 8x) :

8. What is the term outside of the parentheses (a) ? 5
9. What is the first term inside the parentheses (b)? 4
10. What is the second term inside the parentheses(c)? 8x
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $5 \cdot 4$
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $5 \cdot 8x$
13. Write an expression that represents an equivalent expression ab + ac. $5 \cdot 4 + 5 \cdot 8x$

14. Simplify the expression ab + ac. 20 + 40x

Expression #3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ? 4

16. What is the first term inside the parentheses (b)? 6x

17. What is the second term inside the parentheses(c)? 12

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 4 • 6x

19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 4 • 12

20. Write an expression that represents an equivalent expression ab + ac. 4 • 6x + 4 • 12

21. Simplify the expression ab + ac. 24x + 48

Expression 4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ? 8

23. What is the first term inside the parentheses (b)? 3

24. What is the second term inside the parentheses(c)? 5x

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 8 • 3

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 8 • 5x

27. Write an expression that represents an equivalent expression ab + ac. 8 • 3 + 8 • 5x

28. Simplify the expression ab + ac. 24 + 40x

Name: Answer Key

G6 U5 Lesson 10- Independent Practice

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $7(4x + 6)$

$7 \cdot 4x + 7 \cdot 6$

$28x + 42$

2. $8(7 + 6x)$

$8 \cdot 7 + 8 \cdot 6x$

$56 + 48x$

3. $10(6x - 2)$

$10 \cdot 6x - 10 \cdot 2$

$60x - 20$

4. $5(10 + 9x)$

$5 \cdot 10 + 5 \cdot 9x$

V

$50 + 45x$

G6 U5 Lesson 11

Evaluate and write expressions with exponents that are equal to a given number

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G6 U5 Lesson 11 - Students will evaluate and write expressions with exponents that are equal to a given number

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will learn how to evaluate and write expressions with exponents that are equal to a given number. We will use our strong knowledge of expressions and operations and apply it to today's lesson.

Let's Talk (Slide 3): **Have you ever heard the term or phrase, "That is growing at an exponential rate"? What do you think that means?** Possible Student Answers, Key Points:

- Something grows or changes very quickly and keeps getting bigger and bigger at a faster and faster rate.
- Bacteria grows at an exponential rate because it grows very quickly.

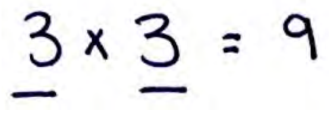
That is correct! Imagine you have a tiny plant, and every day it doubles in size, and then the next day, it doubles again, and it keeps doubling every day. That's exponential growth. Exponents involve numbers repeatedly multiplying at a fast rate, they're a new notation but how we figure out the total won't be new. Let me show you.

Let's Talk (Slide 4): So, Now let's look at this expression 3^2…we read this as three-squared. **Based on our discussion, what are you noticing and wondering about this expression?** Possible Student Answers/Key Points:

- I notice there is one big number and one small number
- I notice there is an exponent
- I wonder how you solve this expression or what is represents
- I wonder what you do with the two numbers.

That is correct, there are two different numbers, there is a big number, the base, and a little number, the exponent.

The big number is the base (*label*) and that is the number we repeatedly multiply. The small number is the exponent (*label)* and that's how many times we repeatedly multiply the base by itself. An exponent tells us how many times to multiply a number by itself. So, the base tells us what number we're multiplying again and again, and the exponent tells us how many times to do it.



So, to solve three-squared, or 3 to the power of two. We take the base and multiply it as many times as the exponent tells us to. So, we're going to multiply the base by the base. So, 3…that's the base times itself. So, 3x3 and that's 9...you see I multiplied the base…two times (*underline*) and that's 9. So, three-squared is 9!

Let's Think (Slide 4): Let's look at another one. Notice that this expression also has a 2 and a 3 but they're in different places.

This time, 2 is the base (*underline*) and 3 is the exponent (*circle*). Remember, the exponent is a little number written as a superscript that tells us how many times to multiply a base number by itself.

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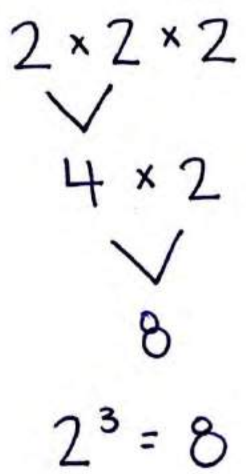
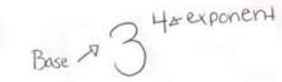


In order to evaluate this expression, we need to multiply the base, 2, three times because the exponent is 3. So, 2 times itself…2…times itself again 2! Now, we have to be careful here…it looks kind of like repeated addition 2 and 2 and 2 but it's different. We need to multiply 2x2 and then multiply that BY 2!

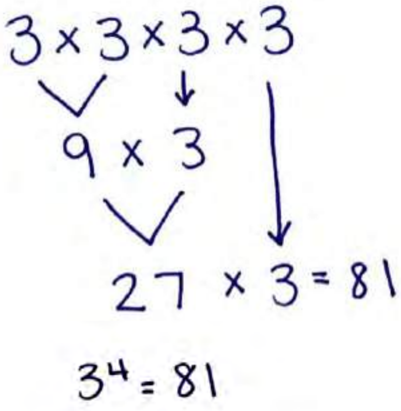
So, 2x2 is 4, that's quick. Now, I need to multiply 4 times 2 again. So, 4x2 is 8, that's also quick.

So 2x2x2 is 8, and that is the same as 2 to the power of 3 or 2 cubed.

Let's Think (Slide 6): Now, let's try writing an expression with an exponent that is equal to a given number, this is telling me to write an expression where the exponent is 4. We can pick any number for the base but the exponent has to be 4. So, let's choose 3 as our base.



So, 3 is the base and 4 is the exponent. That means that we're trying to solve the expression 3 to the power of 4.



So, in order to solve this expression. What's the number we're going to multiply again and again? 3! That's right, 3 is the base. And how many times should we multiply 3? Four times! Right, we need to do 3 times itself times itself times itself. So, 3x3x3x3..

First I have do 3 times 3, which is 9. Now we have another 3 to multiply so 9x3, that's still pretty easy…27! And finally, we have one more 3, so 27x3…that's a little harder. We can stack and add if we need to. Everybody do it, what's 27x3? 81!

Nice work, so 3 to the power of 4 is…81! We multiplied the base, 3, by itself four times. Notice we did not multiply 3 times 4 that would be adding 3 and 3 and 3 and 3, instead we're multiplying 3 and 3 and 3 and 3 and the number is MUCH bigger.

I want to point out how exponents make numbers get larger by an extremely fast rate. The expression 3^4 has small numbers but once you evaluate , you get a large number 81.

Let's Try it (Slides 7-8): Today, we learned how to evaluate and write expressions with exponents. Remember evaluating an expression with an exponent means multiplying the base, the big number, by itself repeatedly the number of times indicated by the exponent. Writing an expression with an exponent equal to a given number allows us to choose any base and set the exponent to the desired value. We will now have a chance to practice together.

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WARM WELCOME

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We will evaluate and write expressions with exponents that are equal to a given number.

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Let's Talk:

What do you think that means when something is “growing at an exponential rate”?

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Let's Talk:

What do you notice and wonder about this expression?

$$3^2$$

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Let's Think:

Let's evaluate this expression together.

$$2^3$$

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Let's Think:

Let's write an expression that has an exponent as 4.

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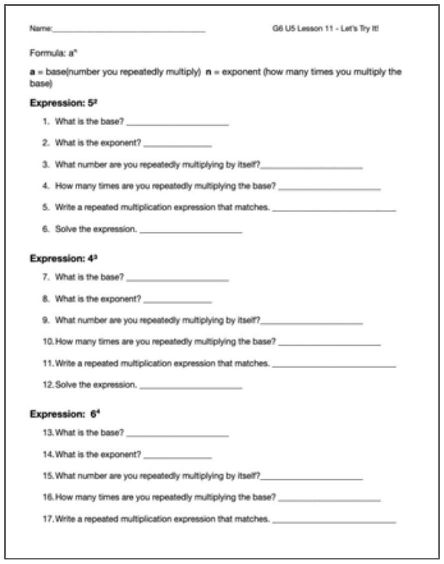
Let's Try It:

Let's evaluate and write expressions with exponents together



Name:____________________ G6 U5 Lesson 11 - Let's Try It!

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

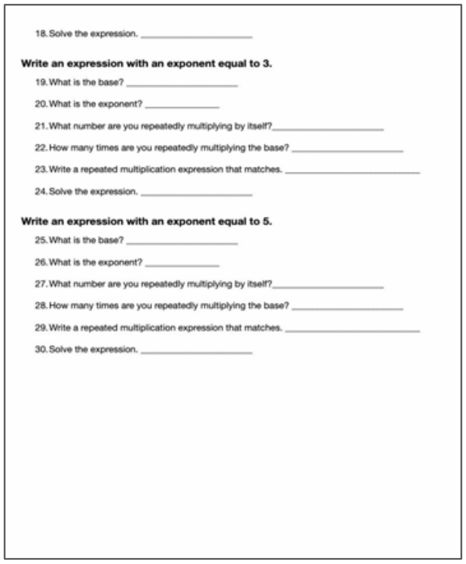
1. What is the base? ____________
2. What is the exponent? __________
3. What number are you repeatedly multiplying by itself?____________
4. How many times are you repeatedly multiplying the base? ____________
5. Write a repeated multiplication expression that matches. ____________
6. Solve the expression. ____________

Expression: 4^3

7. What is the base? ____________
8. What is the exponent? __________
9. What number are you repeatedly multiplying by itself?____________
10. How many times are you repeatedly multiplying the base? ____________
11. Write a repeated multiplication expression that matches. ____________
12. Solve the expression. ____________

Expression: 6^4

13. What is the base? ____________
14. What is the exponent? __________
15. What number are you repeatedly multiplying by itself?____________
16. How many times are you repeatedly multiplying the base? ____________
17. Write a repeated multiplication expression that matches. ____________



18. Solve the expression. ____________

Write an expression with an exponent equal to 3.

19. What is the base? ____________
20. What is the exponent? __________
21. What number are you repeatedly multiplying by itself?____________
22. How many times are you repeatedly multiplying the base? ____________
23. Write a repeated multiplication expression that matches. ____________
24. Solve the expression. ____________

Write an expression with an exponent equal to 5.

25. What is the base? ____________
26. What is the exponent? __________
27. What number are you repeatedly multiplying by itself?____________
28. How many times are you repeatedly multiplying the base? ____________
29. Write a repeated multiplication expression that matches. ____________
30. Solve the expression. ____________

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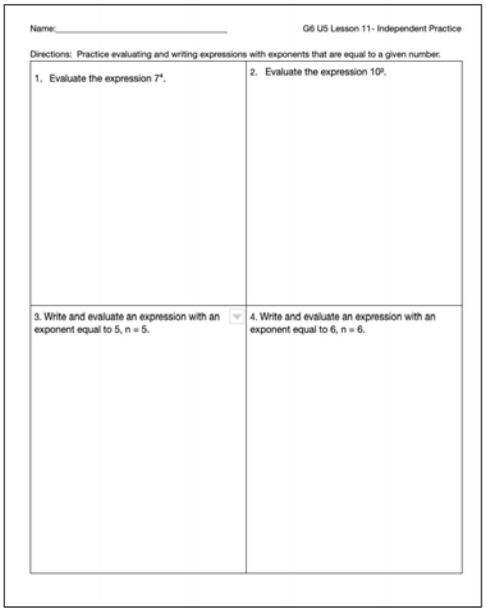
On your Own:

Let's try to evaluate and write expressions with exponents on your own.



Name:____________________ G6 U5 Lesson 11- Independent Practice

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4.	2. Evaluate the expression 10^3.
3. Write and evaluate an expression with an exponent equal to 5, n = 5.	4. Write and evaluate an expression with an exponent equal to 6, n = 6.

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Name:___________________________________ G6 U5 Lesson 11 - Let's Try It

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

1. What is the base? ________________________
2. What is the exponent? ________________
3. What number are you repeatedly multiplying by itself?________________________
4. How many times are you repeatedly multiplying the base? ________________________
5. Write a repeated multiplication expression that matches. _____________________________
6. Solve the expression. ________________________

Expression: 4^3

7. What is the base? ________________________
8. What is the exponent? ________________
9. What number are you repeatedly multiplying by itself?________________________
10. How many times are you repeatedly multiplying the base? ________________________
11. Write a repeated multiplication expression that matches. _____________________________
12. Solve the expression. ________________________

Expression: 6^4

13. What is the base? ________________________
14. What is the exponent? ________________
15. What number are you repeatedly multiplying by itself?________________________
16. How many times are you repeatedly multiplying the base? ________________________
17. Write a repeated multiplication expression that matches. _____________________________
18. Solve the expression. ________________________

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Write an expression with an exponent equal to 3.

19. What is the base? _______________________
20. What is the exponent? _______________
21. What number are you repeatedly multiplying by itself?_______________________
22. How many times are you repeatedly multiplying the base? _______________________
23. Write a repeated multiplication expression that matches. ____________________________
24. Solve the expression. _______________________

Write an expression with an exponent equal to 5.

25. What is the base? _______________________
26. What is the exponent? _______________
27. What number are you repeatedly multiplying by itself?_______________________
28. How many times are you repeatedly multiplying the base? _______________________
29. Write a repeated multiplication expression that matches. ____________________________
30. Solve the expression. _______________________

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Name:____________________________________ G6 U5 Lesson 11- Independent Work

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4

2. Evaluate the expression 10^3

3. Write and evaluate an expression with an exponent equal to 5, n = 5.

4. Write and evaluate an expression with an exponent equal to 6, n = 6.

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Name: Answer Key

G6 U5 Lesson 11 - Let's Try It!

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

1. What is the base? 5
2. What is the exponent? 2
3. What number are you repeatedly multiplying by itself? 5
4. How many times are you repeatedly multiplying the base? 2
5. Write a repeated multiplication expression that matches. 5·5
6. Solve the expression. 25

Expression: 4^3

7. What is the base? 4
8. What is the exponent? 3
9. What number are you repeatedly multiplying by itself? 4
10. How many times are you repeatedly multiplying the base? 3
11. Write a repeated multiplication expression that matches. 4·4·4
12. Solve the expression. 4·4·4

16·4

$\boxed{64}$

Expression: 6^4

13. What is the base? 6
14. What is the exponent? 4
15. What number are you repeatedly multiplying by itself? 6
16. How many times are you repeatedly multiplying the base? 4
17. Write a repeated multiplication expression that matches. 6·6·6·6

18. Solve the expression. 6 · 6 · 6 · 6

36 · 6 · 6

36 · 6 · 6

216 · 6

1,296

Write an expression with an exponent equal to 3.

19. What is the base? 5 (any number)

20. What is the exponent? 3

21. What number are you repeatedly multiplying by itself? 5

22. How many times are you repeatedly multiplying the base? 3

23. Write a repeated multiplication expression that matches. 5 · 5 · 5

24. Solve the expression. 5 · 5 · 5

25 · 5 = 125

Write an expression with an exponent equal to 5.

25. What is the base? 2 (any number)

26. What is the exponent? 5

27. What number are you repeatedly multiplying by itself? 2

28. How many times are you repeatedly multiplying the base? 5

29. Write a repeated multiplication expression that matches. 2 · 2 · 2 · 2 · 2

30. Solve the expression. 2 · 2 · 2 · 2 · 2

4 · 2 · 2 · 2

8 · 2 · 2

16 · 2

22

Name: Answer key

G6 U5 Lesson 11- Independent Practice

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4.

$7 \cdot 7 \cdot 7 \cdot 7$

$49 \cdot 7 \cdot 7$

$343 \cdot 7$

2,401

2. Evaluate the expression 10^3.

$10 \cdot 10 \cdot 10$

$100 \cdot 10$

1,000

3. Write and evaluate an expression with an exponent equal to 5, n = 5.

2^5

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

$4 \cdot 2 \cdot 2 \cdot 2$

$8 \cdot 2 \cdot 2$

$16 \cdot 2$

32

4. Write and evaluate an expression with an exponent equal to 6, n = 6.

4^6

$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

$16 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

$64 \cdot 4 \cdot 4 \cdot 4$

$256 \cdot 4 \cdot 4$

$1{,}024 \cdot 4$

$\boxed{4{,}096}$

G6 U5 Lesson 12

Decide if expressions are equal by evaluating expressions and understanding what exponents mean

G6 U5 Lesson 12 - Students will decide if expressions are equal by evaluating expressions and understanding what exponents mean

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we are going to continue building our knowledge and skills of exponents and expressions. The objective of today's lesson is to decide if expressions are equal by evaluating expressions and understanding what exponents mean. By the end of this lesson, you'll be able to decide if expressions are equal and understand the significance of exponents

Let's Talk (Slide 3): Yesterday we learned about exponents and how to find the total when an exponent is in an expression. So, let's look at these two expressions…three squared and two cubed. We see that they both have a 2 and a 3. **But, using what you know about exponents are they the same? Why or why not?**
Possible Student Answers,Key Points:

- They aren't the same, 3 squared is 3x3, which is 9.
- 2 cubed is 2x2x2 which is 8.
- When you're solving exponents you have to look carefully at which number is the base and which number is the exponent and that helps you find the total.

That's right! These are totally different expressions because they have different bases and different exponents. Remember, an exponent is a small number written above and to the right of a base number. It tells us how many times we need to multiply the base by itself.

Let's Talk (Slide 4): In one short day you all have become really good at exponents. So, let's dig a little deeper and determine if expressions with exponents are equivalent. For example ,$5^3 + 3$ and $4^3 + 64$ are both expressions. Let's determine if these expressions are equivalent, or equal to each other.

Let's look at the expression $5^3 + 3$. The first thing I need to do is solve the exponent and determine the value of 5^3.

$$5^3 + 3$$

$$(5 \cdot 5 \cdot 5) + 3$$

So, 5 is the base and 3 is the exponent so we have to do 5 times 5 times 5, let's put that in parenthesis since we need to solve it first.

$$\vee$$

$$(25 \cdot 5) + 3$$

We know that 5x5 is…25!

$$\vee$$

$$125 + 3$$

Then we have to multiply 25 by another 5…that's 125. And finally, we can add 3, which gets us to 128.

$$\vee$$

$$128$$

So, now we know that the expression $5^3 + 3$ is equal to 128.

But, this is asking us if they're equivalent. So now let's evaluate the expression $4^3 + 64$. The first thing we need to do is solve the exponent and determine the value of 4^3.

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$$4^3 + 64$$
$$(4 \cdot 4 \cdot 4) + 64$$
$$\vee$$
$$(16 \cdot 4) + 64$$
$$\vee$$
$$64 + 64$$
$$\vee$$
$$128$$

So, 4 is the base and 3 is the exponent so we need to do 4x4x4 and then add 64. So, I'll put 4x4x4 in parenthesis.

Now, 4x4 is easy, that's 16.

Now we have to take 16 and multiply it by 4 again. And, 16x4 is 64.

So, 4^3 is equal to 64. Now, we need to add another 64.

So, 64 + 64 is 128. So, now we know the expressions $5^3 + 3$ and $4^3 + 64$ both have the same exact value and are equal because they both equal 128.

Remember, two expressions are equivalent if they equal the same thing. These two expressions both equaled 128 so they're equivalent. In order to find whether two expressions are equivalent we have to solve both of them, like we just did.

Let's Try it (Slides 6-7): Great job everyone! We started to explore exponents and evaluate expressions. You've gained a better understanding of how to deal with expressions involving exponents. Remember, to look carefully at the base and the exponent and do careful math to help you evaluate expressions.

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WARM WELCOME

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We will decide if expressions are equal by evaluating expressions and understanding what exponents mean.

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Let's Talk:

Are these two expression the same? Why or why not?

$$3^2 \qquad 2^3$$

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Let's Think:

Let's determine if these expressions are equivalent.

$$5^3 + 3 \text{ and } 4^3 + 64$$

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Let’s Think:

Let’s determine if these expressions are equivalent.

$$4^3 - 6 \text{ and } 6^2 + 22$$

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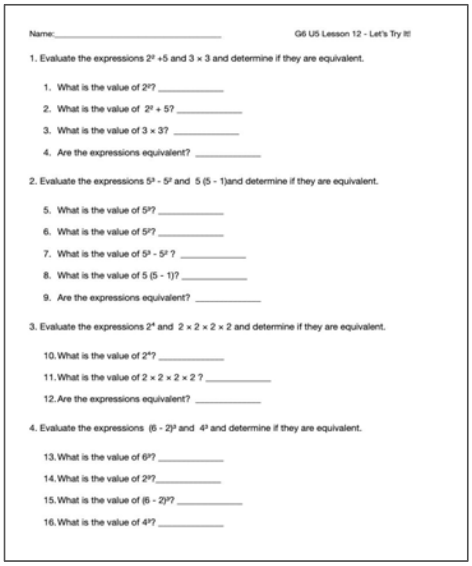
6^2

Let’s Try It:

Now let’s practice evaluating the expressions with exponents to determine if they are equivalent.



Name:__________________ G6 U5 Lesson 12 - Let's Try It!

1. Evaluate the expressions 2^2 +5 and 3 × 3 and determine if they are equivalent.

1. What is the value of 2^2? __________
2. What is the value of $2^2 + 5$? __________
3. What is the value of 3 × 3? __________
4. Are the expressions equivalent? __________

2. Evaluate the expressions $5^3 - 5^2$ and 5 (5 - 1)and determine if they are equivalent.

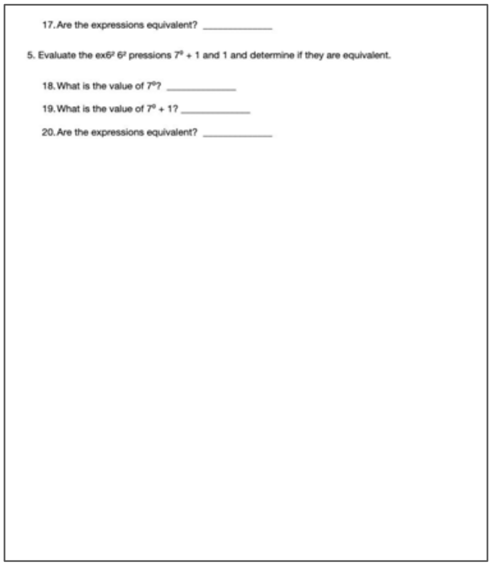
5. What is the value of 5^3? __________
6. What is the value of 5^2? __________
7. What is the value of $5^3 - 5^2$? __________
8. What is the value of 5 (5 - 1)? __________
9. Are the expressions equivalent? __________

3. Evaluate the expressions 2^4 and 2 × 2 × 2 × 2 and determine if they are equivalent.

10. What is the value of 2^4? __________
11. What is the value of 2 × 2 × 2 × 2 ? __________
12. Are the expressions equivalent? __________

4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

13. What is the value of 6^3? __________
14. What is the value of 2^3?__________
15. What is the value of $(6 - 2)^3$? __________
16. What is the value of 4^3? __________



17. Are the expressions equivalent? __________

5. Evaluate the ex6^2 6^2 pressions 7^0 + 1 and 1 and determine if they are equivalent.

18. What is the value of 7^0? __________
19. What is the value of 7^0 + 1? __________
20. Are the expressions equivalent? __________

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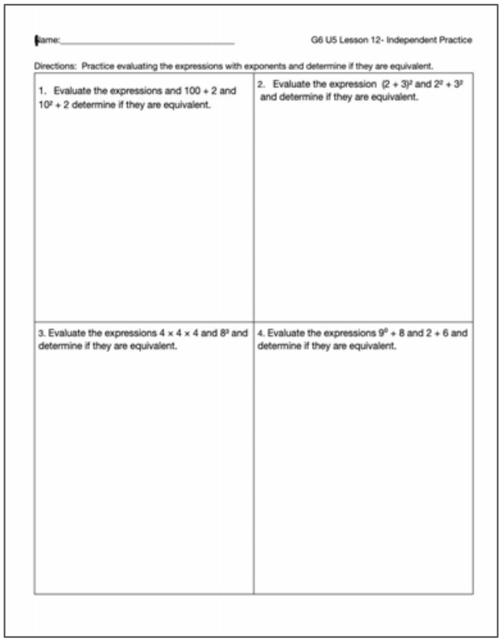
On your Own:

Now practice evaluating the expressions with exponents on your own.



Name:______________________________ G6 U5 Lesson 12- Independent Practice

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and $100 + 2$ and $10^2 + 2$ determine if they are equivalent.	2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent.
3. Evaluate the expressions $4 \times 4 \times 4$ and 8^3 and determine if they are equivalent.	4. Evaluate the expressions $9^0 + 8$ and $2 + 6$ and determine if they are equivalent.

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1. Evaluate the expressions 2^2 +5 and 3 × 3 and determine if they are equivalent.

1. What is the value of 2^2? ______________
2. What is the value of $2^2 + 5$? ______________
3. What is the value of 3 × 3? ______________
4. Are the expressions equivalent? ______________

2. Evaluate the expressions $5^3 - 5^2$ and 5 (5 - 1)and determine if they are equivalent.

5. What is the value of 5^3? ______________
6. What is the value of 5^2? ______________
7. What is the value of $5^3 - 5^2$? ______________
8. What is the value of 5 (5 - 1)? ______________
9. Are the expressions equivalent? ______________

3. Evaluate the expressions 2^4 and 2 × 2 × 2 × 2 and determine if they are equivalent.

10. What is the value of 2^4? ______________
11. What is the value of 2 × 2 × 2 × 2 ? ______________
12. Are the expressions equivalent? ______________

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4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

13. What is the value of 6^3? _____________

14. What is the value of 2^3?_____________

15. What is the value of $(6 - 2)^3$? _____________

16. What is the value of 4^3? _____________

17. Are the expressions equivalent? _____________

5. Evaluate the ex6^2 6^2 pressions $7^0 + 1$ and 1 and determine if they are equivalent.

18. What is the value of 7^0? _____________

19. What is the value of $7^0 + 1$? _____________

20. Are the expressions equivalent? _____________

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Name:____________________________________ G6 U5 Lesson 12 - Independent Work

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and 100 + 2 and $10^2 + 2$ determine if they are equivalent.

2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent.

3. Evaluate the expressions $4 \times 4 \times 4$ and 8^3 and determine if they are equivalent.

4. Evaluate the expressions $9^0 + 8$ and $2 + 6$ and determine if they are equivalent.

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Name: Answer Key G6 U5 Lesson 12 - Let's Try It!

1. Evaluate the expressions $2^2 + 5$ and 3×3 and determine if they are equivalent.

1. What is the value of 2^2? 4
2. What is the value of $2^2 + 5$? 4+5=9
3. What is the value of 3×3? 9
4. Are the expressions equivalent? yes

2. Evaluate the expressions $5^3 - 5^2$ and $5 (5 - 1)$and determine if they are equivalent.

5. What is the value of 5^3? 125
6. What is the value of 5^2? 25
7. What is the value of $5^3 - 5^2$? 125-25=100
8. What is the value of $5 (5 - 1)$? 25-5=20
9. Are the expressions equivalent? no

3. Evaluate the expressions 2^4 and $2 \times 2 \times 2 \times 2$ and determine if they are equivalent.

10. What is the value of 2^4? 16
11. What is the value of $2 \times 2 \times 2 \times 2$? 16
12. Are the expressions equivalent? yes

4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

13. What is the value of 6^3? 216
14. What is the value of 2^3? 8
15. What is the value of $(6 - 2)^3$? 64
16. What is the value of 4^3? 64

Name: Answer Key

G6 U5 Lesson 12- Independent Practice

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and 100 + 2 and $10^2 + 2$ determine if they are equivalent.

$100+2=102$

$10^2+2=$

$100+2=102$

yes

2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent.

$(2+3)^2$

$5^2=25$

2^2+3^2

$4+9=13$

no

3. Evaluate the expressions $4 \times 4 \times 4$ and 8^3 and determine if they are equivalent.

$4 \cdot 4 \cdot 4$

$16 \cdot 4$

64

$8 \cdot 8 \cdot 8$

$64 \cdot 8$

512

no

4. Evaluate the expressions $9^0 + 8$ and 2 + 6 and determine if they are equivalent.

$9^0+8=9$

$1+8=9$

$2+6=8$

no

G6 U5 Lesson 13

Use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction

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G6 U5 Lesson 13 - Students will use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we're going to build on what you already know about the order of operations and apply it to expressions involving exponents.The objective of today's lesson is to use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction.

Let's Talk (Slide 3): We will be combining our previous knowledge about order of operations and expressions involving exponents. **What have you learned so far about expressions with exponents?** Possible Student Answers/ Key Points:

- Expressions with exponents have numbers or variables raised to a certain power
- Exponents represent repeated multiplication
- Exponents have a base, that's the number we multiply by itself.

Let's Talk (Slide 4): That is correct! Exponents represent repeated multiplication. The base is the number that is repeatedly multiplied and the exponent tells you how many times it is multiplied by itself. **What do you know about order of operations?** Possible Student Answers/ Key Points:

- I know that the order of operations uses the acronym PEMDAS.
- PEMDAS stands for Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction. This is the order used to solve expressions.

That is correct! As you've mentioned, we follow PEMDAS to solve expressions step by step. Today, we'll include exponents as well. Remember that exponents show repeated multiplication. For example, 3^2 means 3 × 3, and 4^3 means 4 × 4 × 4.

Let's Think (Slide 5): Today we will use the steps of PEMDAS in order to solve expressions. Let me review these steps

1. Parentheses/Brackets: We have to perform operations inside parentheses or brackets first.
2. Exponents: Then, we evaluate any exponents or powers.
3. Multiplication and Division: Next, we do multiplication and division from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.

$$\begin{gathered} 2 + 3 \times 4^2 - 5 \\ 2 + 3 \times (4 \times 4) - 5 \\ \downarrow \\ 2 + 3 \times 16 - 5 \\ \downarrow \\ 2 + 48 - 5 \\ \downarrow \\ 50 - 5 \\ \downarrow \\ 45 \end{gathered}$$

Let's use the steps to evaluate the expression 2 + 3 × 4^2 - 5. According to PEMDAS, the first step would be the parentheses but there are none in this expression. So, after that we have to solve exponents, so I'll start by evaluating 4^2, which is time same as 4x4. We know that 4x4 equals 16.

So I will write 16 under 4^2 and bring the rest of the expressions down. Now I have the expression 2 + 3×16 - 5. After exponents…we do multiplication and division. So, we need to do 3x16. Everybody, use your paper or whiteboard to solve 3x16…what is it? 48!

Now we have 2 + 48 - 5. Now, let's continue with the addition and subtraction from left to right. So, 2+48…that's 50.

Finally, I have 50 - 5, which is 45. So the expression 2 + 3×4^2 - 5 simplifies to 45.

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Let's Think (Slides 6): Great job walking through that example with me. Now, let's try another example together. Be sure to pay attention to how I follow PEMDAS steps to solve the expression.

$$3^2 - (8 \div 2) + 5$$
$$\downarrow$$
$$3^2 - 4 + 5$$
$$\downarrow$$
$$(3 \times 3) - 4 + 5$$
$$\downarrow$$
$$9 - 4 + 5$$
$$\downarrow$$
$$5 + 5$$
$$\downarrow$$
$$10$$

Let's look at the expression: 3^2 - (8 ÷ 2) + 5. According to PEMDAS, we first handle the parentheses, which is 8 divided by 2…that's a quick fact…4!

Next, we need to solve exponents, so let's evaluate 3^2, which is 3 x 3. I know that 3 times 3 equals 9.

Now, we don't have any multiplication or division so we skip to addition and subtraction from left to right. So, 9-4…that's 5. And, 5+5 more is 10. So, we just used PEMDAS to evaluate the expression…3^2 - (8 ÷ 2) + 5 and we found that it simplifies to 10.

Let's Try it (Slides 7-8): Today, we used the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction. I'm impressed with your hard work and understanding throughout the lesson. Remember to use PEMDAS as we work together to evaluate more expressions and follow each step carefully.

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WARM WELCOME

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We will use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction.

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Let's Review:

What do you know about expressions with exponents?

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Let's Talk:

What do you know about order of operations?

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Let’s Think:

Let’s use order of operations to evaluate.

$$2 + 3 \times 4^2 - 5$$

1. Parentheses/Brackets: Perform operations inside parentheses or brackets first.
2. Exponents: Evaluate any exponents or powers.
3. Multiplication and Division: Perform these operations from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.

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Let’s Think:

Let’s use order of operations to evaluate.

$$3^2 - (8 \div 2) + 5$$

1. Parentheses/Brackets: Perform operations inside parentheses or brackets first.
2. Exponents: Evaluate any exponents or powers.
3. Multiplication and Division: Perform these operations from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.

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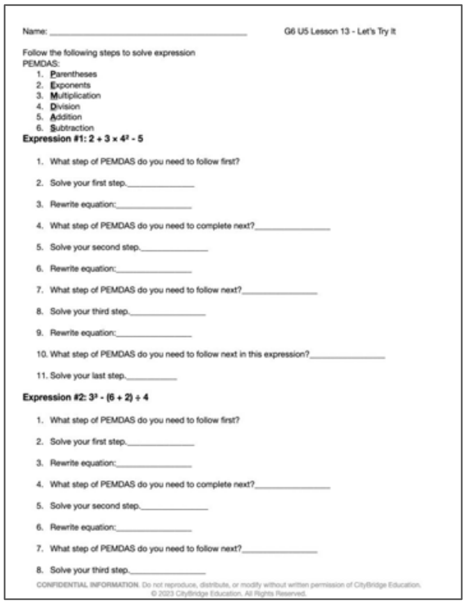
Let's Try It:

Let's use the order of operations to evaluate expressions with exponents together.



Name: ____________________ G6 U5 Lesson 13 - Let's Try It

Follow the following steps to solve expression
PEMDAS:
1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $2 + 3 \times 4^2 - 5$

1. What step of PEMDAS do you need to follow first?
2. Solve your first step.__________
3. Rewrite equation:__________
4. What step of PEMDAS do you need to complete next?__________
5. Solve your second step.__________
6. Rewrite equation:__________
7. What step of PEMDAS do you need to follow next?__________
8. Solve your third step.__________
9. Rewrite equation:__________
10. What step of PEMDAS do you need to follow next in this expression?__________
11. Solve your last step.__________

Expression #2: $3^3 - (6 + 2) \div 4$

1. What step of PEMDAS do you need to follow first?
2. Solve your first step.__________
3. Rewrite equation:__________
4. What step of PEMDAS do you need to complete next?__________
5. Solve your second step.__________
6. Rewrite equation:__________
7. What step of PEMDAS do you need to follow next?__________
8. Solve your third step.__________

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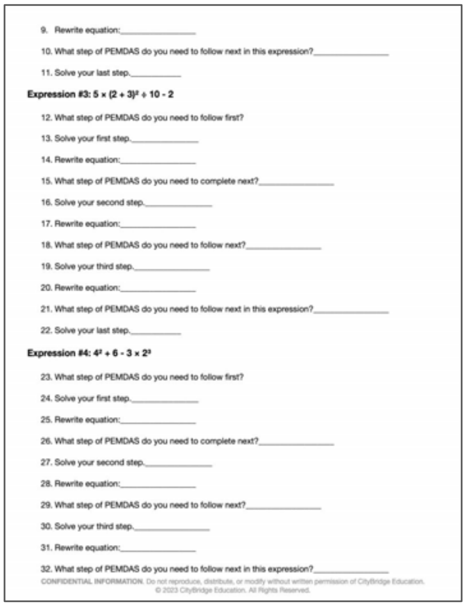

9. Rewrite equation:__________
10. What step of PEMDAS do you need to follow next in this expression?__________
11. Solve your last step.__________

Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

12. What step of PEMDAS do you need to follow first?
13. Solve your first step.__________
14. Rewrite equation:__________
15. What step of PEMDAS do you need to complete next?__________
16. Solve your second step.__________
17. Rewrite equation:__________
18. What step of PEMDAS do you need to follow next?__________
19. Solve your third step.__________
20. Rewrite equation:__________
21. What step of PEMDAS do you need to follow next in this expression?__________
22. Solve your last step.__________

Expression #4: $4^2 + 6 - 3 \times 2^3$

23. What step of PEMDAS do you need to follow first?
24. Solve your first step.__________
25. Rewrite equation:__________
26. What step of PEMDAS do you need to complete next?__________
27. Solve your second step.__________
28. Rewrite equation:__________
29. What step of PEMDAS do you need to follow next?__________
30. Solve your third step.__________
31. Rewrite equation:__________
32. What step of PEMDAS do you need to follow next in this expression?__________

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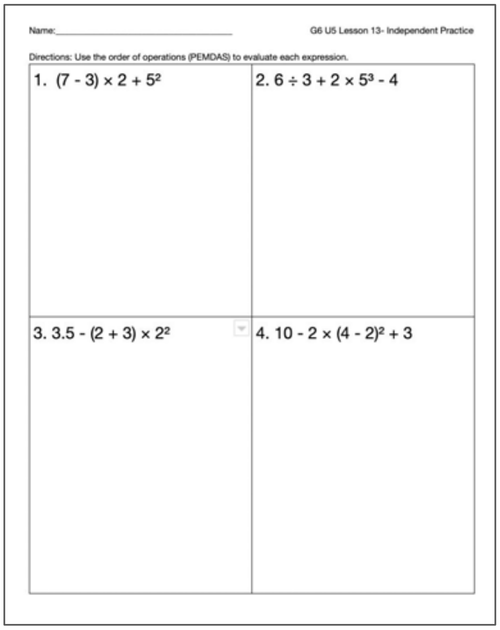
On your Own:

Now use the order of operations to evaluate expressions with exponents on your own



Name:____________________ G6 U5 Lesson 13- Independent Practice

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. $(7 - 3) \times 2 + 5^2$	2. $6 \div 3 + 2 \times 5^3 - 4$
3. $3.5 - (2 + 3) \times 2^2$	4. $10 - 2 \times (4 - 2)^2 + 3$

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Name: ____ G6 U5 Lesson 13 - Let’s Try It

PEMDAS:

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $2 + 3 \times 4^2 - 5$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Expression #2: $3^3 - (6 + 2) \div 4$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

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Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Expression #4: $4^2 + 6 - 3 \times 2^3$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

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Name:____________________________________ G6 U5 Lesson 13- Independent Work

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. Solve.

$$(7 - 3) \times 2 + 5^2$$

2. Solve.

$$6 \div 3 + 2 \times 5^3 - 4$$

3. Solve.

$$35 - (2 + 3) \times 2^2$$

1. Solve.

$$10 - 2 \times (4 - 2)^2 + 3$$

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Name: Answer Key

G6 U5 Lesson 13 - Let's Try It

Follow the following steps to solve expression
PEMDAS:

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $2 + 3 \times 4^2 - 5$

1. What step of PEMDAS do you need to follow first? Exponent
2. Solve your first step. $4^2=16$
3. Rewrite equation: $2+3\cdot16-5$
4. What step of PEMDAS do you need to complete next? multiplication
5. Solve your second step. $3\cdot16=48$
6. Rewrite equation: $2+48-5$
7. What step of PEMDAS do you need to follow next? add
8. Solve your third step. $2+48=50$
9. Rewrite equation: $50-5$
10. What step of PEMDAS do you need to follow next in this expression? subtract
11. Solve your last step. $50-5=45$

Expression #2: $3^3 - (6 + 2) \div 4$

1. What step of PEMDAS do you need to follow first? Parentheses
2. Solve your first step. $6+2=8$
3. Rewrite equation: $3^3-8\div4$
4. What step of PEMDAS do you need to complete next? Exponent
5. Solve your second step. $3^3=27$
6. Rewrite equation: $27-8\div4$
7. What step of PEMDAS do you need to follow next? Division
8. Solve your third step. $8\div4=2$

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9. Rewrite equation: 27-2

10. What step of PEMDAS do you need to follow next in this expression? Subtraction

11. Solve your last step. 25

Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

12. What step of PEMDAS do you need to follow first? Parentheses

13. Solve your first step. $2+3=5$

14. Rewrite equation: $5 \cdot 5^2 \div 10 - 2$

15. What step of PEMDAS do you need to complete next? Exponent

16. Solve your second step. $5^2 = 25$

17. Rewrite equation: $5 \cdot 25 \div 10 - 2$

18. What step of PEMDAS do you need to follow next? Division

19. Solve your third step. $25 \div 10 = 2.5$

20. Rewrite equation: $5 \cdot 2.5 - 2$

21. What step of PEMDAS do you need to follow next in this expression? 12.5 - 2

22. Solve your last step. 10.5 or $10\frac{1}{2}$

Expression #4: $4^2 + 6 - 3 \times 2^3$

23. What step of PEMDAS do you need to follow first? Exponent

24. Solve your first step. $4^2 = 16$

25. Rewrite equation: $16+6-3 \times 2^3$

26. What step of PEMDAS do you need to complete next? Exponent

27. Solve your second step. $2^3 = 8$

28. Rewrite equation: $16+6-3 \cdot 8$

29. What step of PEMDAS do you need to follow next? multiply

30. Solve your third step. $3 \cdot 8 = 24$

31. Rewrite equation: 16+6-24

32. What step of PEMDAS do you need to follow next in this expression? add

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33. Solve your fourth step. 16+6=22

34. What step of PEMDAS do you need to follow next in this expression? Subtract

35. Solve your last step. 22-24= -2

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Name: Answer Key

G6 U5 Lesson 13- Independent Practice

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. $(7 - 3) \times 2 + 5^2$

↓

$4 \cdot 2 + 5^2$

↓

$4 \cdot 2 + 25$

↓

$8 + 25$

↓

33

2. $6 \div 3 + 2 \times 5^3 - 4$

↓

$6 \div 3 + 2 \cdot 125 - 4$

↓

$2 + 2 \cdot 125 - 4$

↓

$2 + 250 - 4$

↓

$252 - 4$

↓

248

3. 3 5 - $(2 + 3) \times 2^2$

↓

$35 - 5 \cdot 2^2$

↓

$35 - 5 \cdot 4$

↓

$35 - 20$

↓

15

4. $10 - 2 \times (4 - 2)^2 + 3$

↓

$10 - 2 \cdot 2^2 + 3$

↓

$10 - 2 \cdot 4 + 3$

↓

$10 - 8 + 3$

↓

$2 + 3$

↓

5

G6 U5 Lesson 14

Evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation

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G6 U5 Lesson 14 - Students will evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use everything we have learned about expressions, exponents, variables, and order of operations and tying it altogether. We will evaluate expressions with a variable, an exponent, and order of operations. We will use substitution to determine whether a given number is a solution to an equation.

Let's Talk (Slide 3): Let's talk about the word **simplify.** What does it mean to simplify? Give an example.
Possible Student Answers/Key Points:

- Simplify means to make something simpler.
- If we simplify a plan, we make it easier or quicker.
- When we simplify an expression, we combine like terms or terms that are the same.

That is correct, to simplify something we make it simpler or easier! When we're talking about simplifying expressions, we combine like terms. When we're combining like terms, we have to make sure that we follow the order of operations, known as PEMDAS.

- Parentheses/Brackets: We always perform operations inside parentheses or brackets first.
- Exponents: Then we evaluate any exponents or powers.
- Multiplication and Division: Next, we perform these operations from left to right.
- Addition and Subtraction: And finally, carry out addition and subtraction operations from left to right.

Let's Think (Slide 4): Today, we will learn to evaluate expressions with variables, exponents, and other operations. We will also determine whether a given value is a solution to an equation. So we are layering on the components of variables. Now I need to use order of operations or PEMDAS to evaluate the expression.

$$3x^2+2x-5$$

Let's look at the expression $3x^2$+ 2x - 5=51 and the given value for x is equal to 4. If x = 4.

$$3\underset{\vee}{(4)^2}+2(4)-5$$

First, let's substitute the given value of x. We need to replace each x with the value 4 in the expression.

$$\underset{\vee}{3\cdot16}+2(4)-5$$

Next, we need to evaluate the exponents. We know that four-squared is the same as 4 times 4, which is 16. So, now we have 3x16 + 2(4) - 5. Now that we evaluated exponents, we need to multiply and divide from left to right. Let's multiply 3 times 16, which equals 48.

$$48+\underset{\vee}{2(4)}-5$$

So the equation is now 48 + 2 (4) - 5. Next, let's multiply 2 times 4, which is 8. And, since there is no division, I need to add and subtract left to right.

$$\underset{\vee}{48+8}-5$$

So my equation is now 48 + 8 - 5. Going from left to right, 48 plus 8 is equal to 56.

$$\underset{\vee}{56-5}$$

Finally, let's subtract 56 minus 5, which is 51.

$$51$$

Therefore, when x = 4, the value of the expression $3x^2$ + 2x - 5 is 51. This means that $3x^2$ + 2x - 5 = 51 is true when x =4.

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Let's Try it (Slides 5): Today we evaluated expressions with variables, exponents, and other operations. We substituted a given value into an equation and used order of operations or PEMDAS to simplify the expression. We will continue to work on this together. Remember it is important to use the correct order of operations and use PEMDAS to follow each step.

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WARM WELCOME

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We will evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation.

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Let’s Talk:

What does it mean to simplify? Give an example.

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Let’s Think:

Let’s evaluate the expression when x = 4.

$$3x^2 + 2x - 5 = 51$$

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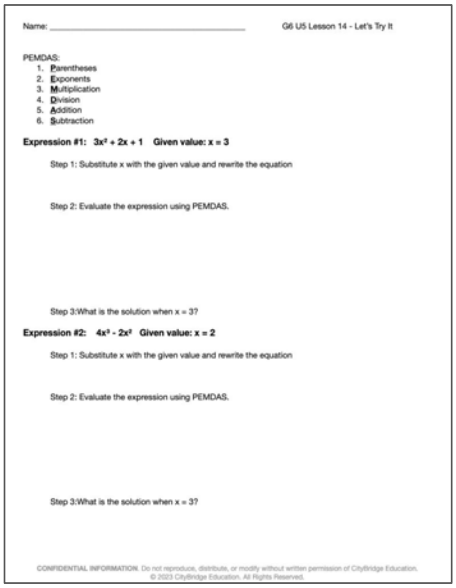
Let's Try It:

Let's evaluate expressions with a given value together.



Name: ____________________ G6 U5 Lesson 14 - Let's Try It

PEMDAS:
1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $3x^2 + 2x + 1$ Given value: $x = 3$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:What is the solution when $x = 3$?

Expression #2: $4x^3 - 2x^2$ Given value: $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:What is the solution when $x = 3$?

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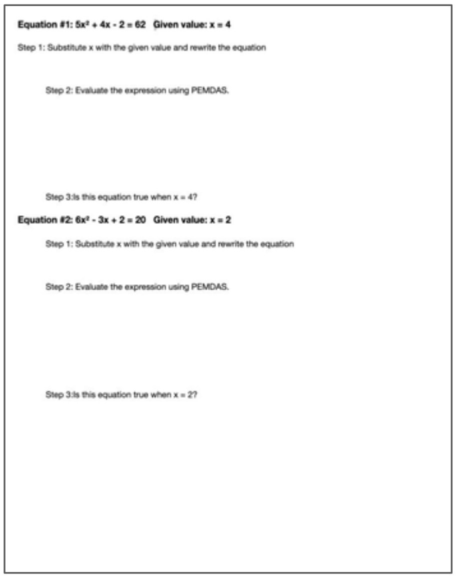

Equation #1: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:Is this equation true when $x = 4$?

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:Is this equation true when $x = 2$?

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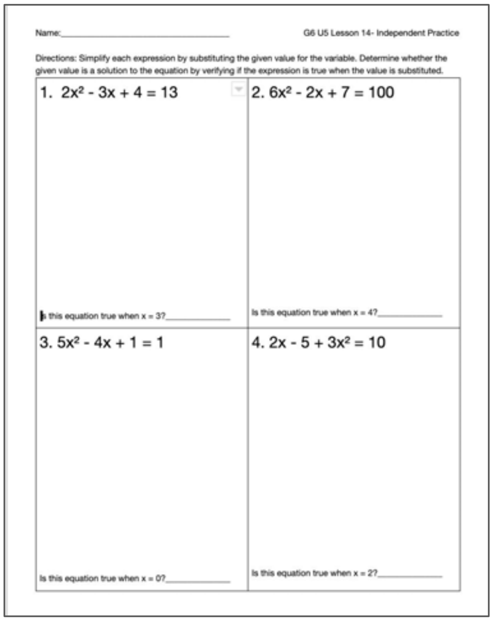
On your Own:

Now try evaluating expressions with a given value on your own.



Name:____________________ G6 U5 Lesson 14- Independent Practice

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. $2x^2 - 3x + 4 = 13$ Is this equation true when $x = 3$?__________	2. $6x^2 - 2x + 7 = 100$ Is this equation true when $x = 4$?__________
3. $5x^2 - 4x + 1 = 1$ Is this equation true when $x = 0$?__________	4. $2x - 5 + 3x^2 = 10$ Is this equation true when $x = 2$?__________

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Name: ____ G6 U5 Lesson 14 - Let’s Try It

PEMDAS:

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $3x^2 + 2x + 1$ Given value: $x = 3$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 3?	**Show your work here:**

Expression #2: $4x^3 - 2x^2$ Given value: $x = 2$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 2?	**Show your work here:**

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Equation #3: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when $x = 4$?	**Show your work here:**

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when $x = 2$?	**Show your work here:**

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Name:______________________________________ G6 U5 Lesson 14- Independent Work

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. Solve.

$$2x^2 - 3x + 4 = 13$$

Is this equation true when x = 3?_______________

2. Solve.

$$6x^2 - 2x + 7 = 100$$

Is this equation true when x = 4?_______________

3. Solve.

$$5x^2 - 4x + 1 = 1$$

Is this equation true when x = 0?_______________

4. Solve.

$$2x - 5 + 3x^2 = 10$$

Is this equation true when x = 2?_______________

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Name: Answer Key

G6 U5 Lesson 14 - Let's Try It

PEMDAS:

1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $3x^2 + 2x + 1$ **Given value:** $x = 3$

Step 1: Substitute x with the given value and rewrite the equation

$3 \cdot 3^2 + 2 \cdot 3 + 1$

Step 2: Evaluate the expression using PEMDAS.

$3 \cdot 3^2 + 2 \cdot 3 + 1$

$3 \cdot 9 + 6 + 1$

$27 + 6 + 1$

$33 + 1 = 44$

Step 3:What is the solution when x = 3? $\boxed{44}$

Expression #2: $4x^3 - 2x^2$ **Given value:** $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

$4 \cdot 2^3 - 2 \cdot 2^2$

Step 2: Evaluate the expression using PEMDAS.

$4 \cdot 2^3 - 2 \cdot 2^2$

$4 \cdot 8 - 2 \cdot 4$

$32 - 2 \cdot 4$

$32 - 8 = \boxed{24}$

Step 3:What is the solution when x = 3?

24

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Equation #1: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

Step 1: Substitute x with the given value and rewrite the equation

$5 \cdot 4^2 + 4 \cdot 4 - 2 = 62$

Step 2: Evaluate the expression using PEMDAS.

$5 \cdot 4^2 + 4 \cdot 4 \cdot 2 = 62$

$5 \cdot 16 + 16 \cdot 2 = 62$

$\vee \qquad \vee$

$80 + 32 = 62$

$112 = 62$

Step 3:Is this equation true when $x = 4$? NO

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

$6 \cdot 2^2 - 3(2) + 2 = 20$

Step 2: Evaluate the expression using PEMDAS.

$6 \cdot 2^2 - 3(2) + 2 = 20$

$6 \cdot 4 - 6 + 2 = 26$

$24 - 6 + 2 = 20$

$18 + 2 = 20$

$20 = 20$

Step 3:Is this equation true when $x = 2$?

Yes

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Name: Answer key

G6 U5 Lesson 14- Independent Practice

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. $2x^2 - 3x + 4 = 13$

$2 \cdot 3^2 - 3(3) + 4 = 13$

$2 \cdot 9 - 9 + 4 = 13$

$18 - 9 + 4 = 13$

$9 + 4 = 13$

$13 = 13$

Is this equation true when x = 3? yes

2. $6x^2 - 2x + 7 = 100$

$6 \cdot 4^2 - 2(4) + 7 = 100$

$6 \cdot 16 - 8 + 7 = 100$

$96 - 8 + 7 = 100$

$88 + 7 = 100$

$95 \neq 100$

Is this equation true when x = 4? No

3. $5x^2 - 4x + 1 = 1$

$5 \cdot 0^2 - 4(0) + 1 = 1$

$5 \cdot 0 - 0 + 1 = 1$

$0 - 0 + 1 = 1$

$0 + 1 = 1$

$1 = 1$

Is this equation true when x = 0? yes

4. $2x - 5 + 3x^2 = 10$

$2(2) - 5 + 3 \cdot 2^2 = 10$

$4 - 5 + 3 \cdot 4 = 10$

$4 - 5 + 12 = 10$

$-1 + 12$

$11 \neq 10$

Is this equation true when x = 2? no

G6 U5 Lesson 15

Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios

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G6 U5 Lesson 15 - Students will create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use what we already know about ratios to create tables, graphs, and equations to represent the relationship between quantities in a set of equivalent ratios. Ratios can be used in many everyday life situations.

Let's Review (Slide 3): Today, we will explore equivalent ratios and learn how to represent them using tables, graphs, and equations. Before we jump into our lesson let's review: **What is a ratio? Give an example.**
Possible Student Answers/Key Points:

- A ratio is a comparison between two quantities or numbers
- A ratio represents how much one quantity is in relation to another
- The three ways to write a ratio are with a colon a:b, or with the word to a to b or with a fraction a/b
- For example 1 cup of raisins for every 2 cups of peanuts.

Let's Talk (Slide 4): That is correct! Ratios compare relationships between different quantities and are often used to describe part-to part and part-to-whole relationships. W**here do we see or use ratios in everyday life?** Possible Student Answers/Key Points:

- In recipes, ratios are used to determine the correct proportion of ingredients. For instance, a cake recipe may call for a ratio of 2 cups of flour to 1 cup of sugar
- In sports, ratios are used to represent statistics and performance measurements. For instance, a basketball player's free throw success rate can be expressed as a ratio of successful shots to attempted shots.

That is correct! Ratios are encountered and used in many different aspects of everyday life. Ratios are useful for problem solving everyday problems.

Let's Think (Slide 5): Let's consider a fruit salad recipe that calls for the following ratio of fruits: 3 cups of strawberries for every 5 cups of blueberries. If we want to write a ratio comparing the amount of strawberries to the amount of blueberries, we can write it a few ways.

3:5 or 3 to 5 or 3/5

This can be written as 3:5, 3 to 5, and ⅗, those all compare the amount of strawberries to the amount of blueberries.

To find equivalent ratios, we will multiply and divide both parts of the original ratio by the same number. Let's imagine that we want to DOUBLE the recipe, which means we want to make 2 times the amount. In order to double the recipe we have to multiply both parts, the amount of strawberries and the amount of blueberries by 2.

$\frac{3 \times 2}{5 \times 2} = \frac{6}{10}$ or 6:10 or 6 to 10

6 cups of strawberries and 10 cups of blueberries

We can use any form of the ratio to find an equivalent ratio, let's use the fraction since we know how to find equivalent fractions really quickly. We originally have 3 cups of strawberries and to double it we multiply by 2, which is 6 cups of strawberries. Originally we had 5 cups of blueberries and to double it we multiply by 2, which is 10 cups of blueberries. So, our new equivalent ratio is 6/10. We can write that as 6:10 or 6 to 10.

So, if we're doubling the recipe, we need 6 cups of strawberries and 10 cups of blueberries.

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But, let’s imagine that it’s a small party and we don’t want to make the whole recipe, instead we want to only make HALF of the recipe. In order to cut the recipe in half we have to divide both parts, the amount of strawberries and blueberries by 2.

Originally we have 3 cups of strawberries and 5 cups of blueberries, let’s use the fraction form of the ratio again, ⅗.

$$\frac{3 \div 2}{5 \div 2} = \frac{1.5}{2.5}$$ or 1.5 : 2.5 or 1.5 to 2.5

1.5 cups of strawberries and
2.5 cups of blueberries

To half it we divide both parts by 2. So, 3 cups of strawberries ÷ 2 = 1.5 cups of strawberries. And, 5 cups of blueberries ÷ 2 = 2.5 cups of blueberries. Our new equivalent ratio is 1.5:2.5, in other words we need 1.5 cups of strawberries and 2.5 cups of blueberries.

Let’s Think (Slides 6): The last way that we can represent ratios is in a table. Let's create a table to represent the relationship between the quantities in the original and equivalent ratios.

	Strawberries	**Blueberries**
Original ×1	3 cups	5 cups
Double ×2	6 cups	10 cups
Half ÷2	1.5 cups	2.5 cups

We know that we’re comparing the amount of strawberries to blueberries. So, in the original recipe, which is just x1, we had 3 cups of strawberries to 5 cups of blueberries. Then, when we did the math to double it, we had 6 cups of strawberries to 10 cups of blueberries. Finally, when we halved the recipe, we had 1.5 cups of strawberries to 2.5 cups of blueberries.

Let’s Try it (Slides 5): Remember to use tables, graphs, and equations to represent the relationship between quantities in a set of equivalent ratios. We will use a variety of tools to generate equivalent ratios. This lesson will be crucial for 7th and 8th grade math as well as real-life problem solving skills. Let’s practice some more problems together.

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WARM WELCOME

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We will create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

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↺ Let's Review:

What is a ratio? Give an example.

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Let's Talk:

Where do we see or use ratios in everyday life?

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Let’s Think:

Let's consider a fruit salad recipe that calls for the following ratio of fruits: 3 cups of strawberries to 5 cups of blueberries.

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Let’s Think:

Let's create a table to represent the relationship between the quantities in the original and equivalent ratios.

	Strawberries	**Blueberries**
Original		
Double		
Half		

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Let's Try It:

Let's practice making equivalent ratios together.

Name:______________________________ G6 U5 Lesson 15 - Let's Try It

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe

Ratio:___ Multiplier: _____

Lemons	1	2	3			
Cups of Sugar	2	4		8		

Cookie Recipe

Cups of Chocolate Chips	2	4		8		
Cups of Sugar	3	6	9			

Ratio:___ Multiplier: _____

Pizza Recipe

Cups of Cheese	3					
Cups of Pepperoni	4					

Ratio:___ Multiplier: _____

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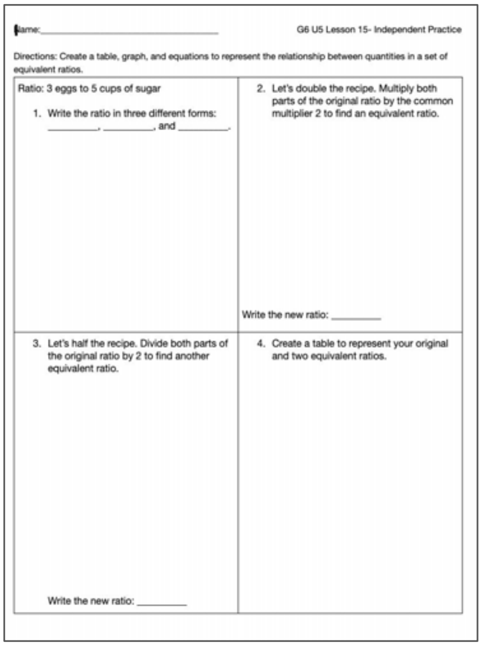
On your Own:

Practice making equivalent ratios on your own.



Name:______________________________ G6 U5 Lesson 15- Independent Practice

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: _________, _________, and _________.
2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

Write the new ratio: _________

3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

Write the new ratio: _________

4. Create a table to represent your original and two equivalent ratios.

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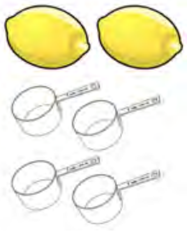
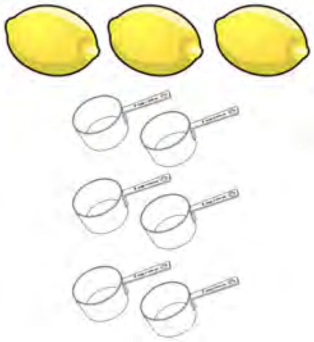
Name: ____ G6 U5 Lesson 15 - Let’s Try It

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe

Lemons:	1	2	3			
Cups of Sugar:	2	4		8		
Ratio:_______ Multiplier: _______						

Cookie Recipe

Cups of Chocolate Chips	2	4		8		
Cups of Sugar	3	6	9			
Ratio:_______ Multiplier: _______						

Pizza Recipe

Cups of Cheese	3					
Cups of Pepperoni	4					
Ratio:_______ Multiplier: _______						

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Name:____________________________________ G6 U5 Lesson 15- Independent Work

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: __________, __________, and __________.

2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

Write the new ratio: __________

3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

Write the new ratio: __________

4. Create a table to represent your original and two equivalent ratios.

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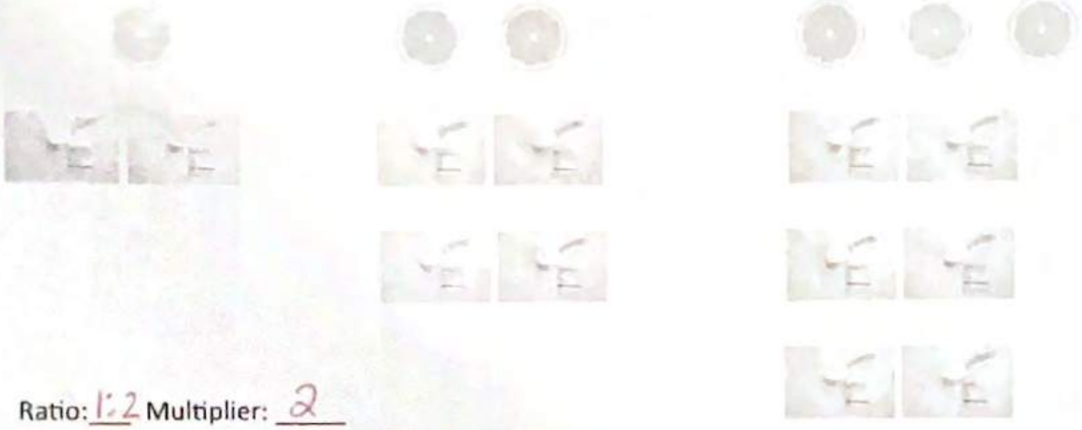
Name: Answer Key

G6 U5 Lesson 15 - Let's Try It

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe



Ratio: 1:2 Multiplier: 2

Lemons	1	2	3	4	5	6
Cups of Sugar	2	4	6	8	10	12

Cookie Recipe

Cups of Chocolate Chips	2	4	6	8	10	12
Cups of Sugar	3	6	9	12	15	18

Ratio: 2:3 Multiplier: _____

Pizza Recipe

Cups of Cheese	3	6	9	12	15	18
Cups of Pepperoni	4	8	12	16	20	24

Ratio: 3:4 Multiplier: _____

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Name: Answer Key

G6 U5 Lesson 15- Independent Practice

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: 3 to 5, 3:5, and 3/5.

2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

$$\frac{3}{5} \cdot \frac{2}{2} = \frac{6}{10}$$

Write the new ratio: 6:10

3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

$$\frac{3}{5} \div \frac{2}{2} = \frac{1.5}{2.5}$$

Write the new ratio: 1.5 to 2.5

4. Create a table to represent your original and two equivalent ratios.

Eggs	Sugar
1.5	2.5
3	5
6	10

G6 U5 Lesson 16

Use graphs and equations to show different kinds of relationships involving area, volume, and exponents

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G6 U5 Lesson 16 - Students will use graphs and equations to show different kinds of relationships involving area, volume, and exponents

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we are going to explore how graphs and equations can help us understand relationships involving area, volume, and exponents. We will use some key concepts related to ratios learned in our previous lessons.

Let's Review (Slide 3): Before we begin, let's quickly review some key concepts related to ratios and rates. **Can someone share an example of a ratio or rate?** Possible Student Answers/ Key Points:

- A ratio is a way to compare two quantities by showing how much of one thing there is compared to another thing, like the strawberry and blueberries we looked at yesterday.
- A rate is a special type of ratio that compares two different kinds of quantities with different units. It shows how fast or slow something is happening or changing.

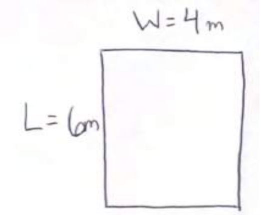
That is correct. Ratios compare two or more numbers with a colon, the word to, or a fraction. A rate compares two different kinds of quantities with different units. It shows how fast or slow something is happening or changing.

Let's Talk (Slide 4):! Now, **who can tell us what area and volume mean? Give an example, if possible!** Possible Student Answers/ Key Points:

- Area is the amount of space inside of a 2D shape, like how much space a rug takes up.
- The formula for area is a = length × width
- Volume is the amount of space inside of a 3D shape, like how much space there is inside of a toy chest.
- The formula for volume: v = length × width x height

That is correct! Area is the amount of space inside of a 2D shape, or a flat figure. The formula to determine area is a = length × width. However, volume is the amount of space inside of a 3D shape, like a cube or rectangular prism. The formula for volume is v = length × width x height.

Let's Think (Slide 5): We will use these formulas to help us to determine area and volume. We can substitute known values into the variables to solve for unknown values. Let's begin by looking at an example. Consider a rectangular garden with a length of 6 meters and a width of 4 meters. We want to find the area of this garden.



First, let's draw a model of the garden and label the dimensions. The problem tells us that it's a "rectangular" garden so we know that it's shaped like a rectangle. Now, let's label the length 6 meters and the width 4 meters.

$A = L \times W$

Now we know that the formula to find the area of a rectangle is to multiply the length times the width, let's write that down.

$A = 6m \times 4m$

So, in this case, the area is 6 meters × 4 meters.

$A = 24m^2$

When we do the math, we see that the area of the garden is 24 square meters. This means that the entire space of the garden is covered by 24 meters squared.

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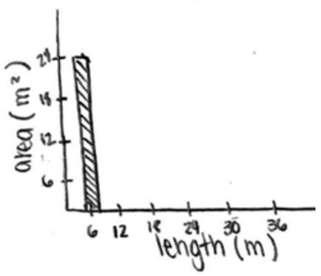
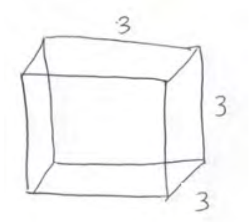


Now, let's use a graph to show the relationship between the length of the rectangle and the total area of the rectangle. We can level the x-axis with length and the units and the y-axis with total area and the units (*label*).

Then, we want to make sure that the increments of counting along both axes are the same, so let's count by 6 along each one (*label*).

Now we can make our graph. When the length was 6 meters, the total area was 24 square meters. So let's plot that on our graph. That makes sense because the total area is FOUR times as long as the length, since the rectangle has dimensions of 6 by 4.

Let's Think (Slide 6): Now, let's work on another example together. This says that a toy box, cube, has a length, width and height of 3 units. It's asking us to determine the amount of space the toy box has inside of it. Let's pause and make sure we understand what we just read. It's talking about a toy box, is that a 2D or 3D shape? 3D! That's right, it's a three-dimensional shape. We also know that because the problem tells us that the length, width, and height is 3 units. Anything that has a length, width, and height is three-dimensional. Finally, this says that the length, width, AND height are all 3 units, that means that this toy box must be a cube.



Let's draw a model of the toy box, it doesn't have to be perfect though (*draw cube*). Now we know that the length, widthI need to think how we can find the volume of this cube

$V = L \times W \times H$

In order to find the volume of a cube, we must use the formula for volume, L x W x H.

$V = 3 \times 3 \times 3$

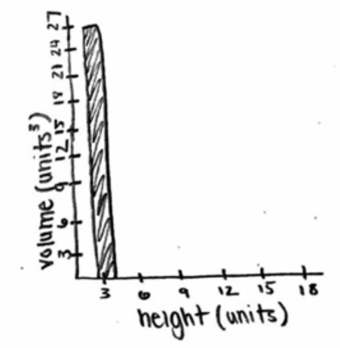
Since this is a cube the length, width, and height are the same , 3. The volume of this cube would be 3 units × 3 units × 3 units.

$V = 3 \times 3 \times 3$
✓

This is like 3 to the third power. First, I will solve 3 times 3 which is 9.

$V = 9 \times 3$

So, now my equation is 9 times 3, which equals 27 cubic units. So the volume of the cube is 27 meters cubed . This means that the entire space inside the cube is 27 square meters.



Now, let's create a graph to compare the height of the cube to the total volume of the cube. Just like before, let's start by labeling the axes with height and volume since that's what we're comparing.

Then, we can label the numbers, let's count by 3 to make it a little easier. And finally, let's graph the data. We know that the height was 3 units and then the total volume was 27 cubic meters since we had to multiply length times height times width… 3 times 3 times 3, which is 27.

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Let's Try it (Slides 7-8): Today, we explored how to use graphs and equations to represent relationships involving area, volume, and exponents. Now, we will work together through different scenarios involving area, volume, and exponents. Remember to use the correct formula and to plug the correct values in each formula and to use the correct unit. We will use graphs and equations to represent the relationships described in each scenario.

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WARM WELCOME

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We will use graphs and equations to show different kinds of relationships involving area, volume, and exponents

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↺ Let's Review:

Tell me what you know about ratios. Give some examples.

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Let's Talk:

What do you know about Area?
What do you know about Volume?

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Let’s Think:

Let’s create an equation to represent and solve for the area in this scenario.

A rectangular garden has a length of 6 meters and a width of 4 meters.

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Let’s Think:

Let’s create an equation and graph to represent and solve for the volume in this scenario.

A toy box has a length, width and height of 3 units. Determine the amount of space the toy box has inside of it.

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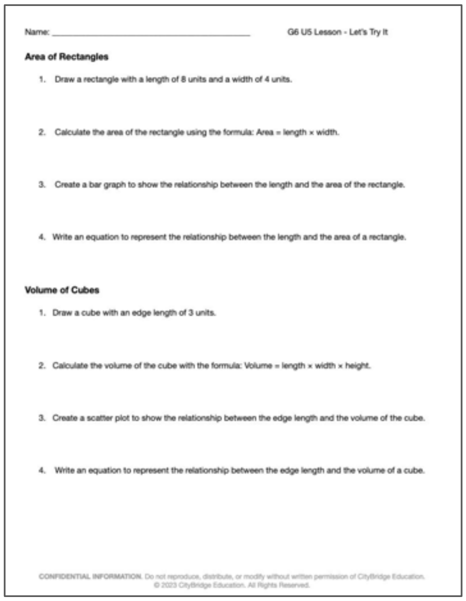
Let's Try It:

Let's practice using equations and graphs together.



Name: ______________________ G6 U5 Lesson - Let's Try It

Area of Rectangles

1. Draw a rectangle with a length of 8 units and a width of 4 units.
2. Calculate the area of the rectangle using the formula: Area = length × width.
3. Create a bar graph to show the relationship between the length and the area of the rectangle.
4. Write an equation to represent the relationship between the length and the area of a rectangle.

Volume of Cubes

1. Draw a cube with an edge length of 3 units.
2. Calculate the volume of the cube with the formula: Volume = length × width × height.
3. Create a scatter plot to show the relationship between the edge length and the volume of the cube.
4. Write an equation to represent the relationship between the edge length and the volume of a cube.

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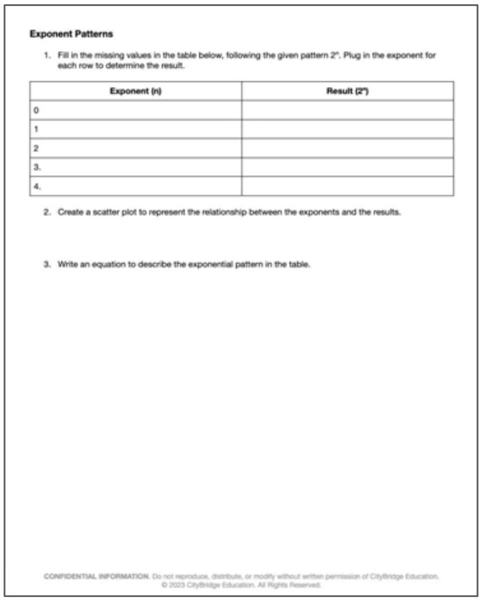

Exponent Patterns

1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	
1	
2	
3.	
4.	

2. Create a scatter plot to represent the relationship between the exponents and the results.
3. Write an equation to describe the exponential pattern in the table.

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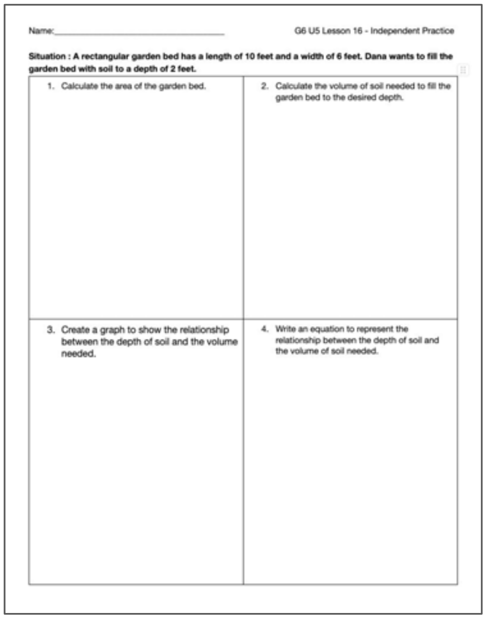
On your Own:

Now try practicing using equations and graphs on your own.



Name:______________________ G6 U5 Lesson 16 - Independent Practice

Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

1. Calculate the area of the garden bed.
2. Calculate the volume of soil needed to fill the garden bed to the desired depth.
3. Create a graph to show the relationship between the depth of soil and the volume needed.
4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

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Name: ____

1. Draw a rectangle with a length of 8 units and a width of 4 units.

2. Calculate the area of the rectangle using the formula: Area = length × width.

3. Create a graph to show the relationship between the length and the area of the rectangle.

4. Write an equation to represent the relationship between the length and the area of a rectangle.

Volume of Cubes

1. Draw a cube with an edge length of 3 units.

2. Calculate the volume of the cube with the formula: Volume = length × width × height.

3. Create a graph to show the relationship between the edge length and the volume of the cube.

4. Write an equation to represent the relationship between the edge length and the volume of a cube.

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Exponent Patterns

1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	
1	
2	
3.	
4.	

2. Create a scatter plot to represent the relationship between the exponents and the results.

3. Write an equation to describe the exponential pattern in the table.

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Name:____________________________________ G6 U5 Lesson 16 - Independent Work

Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

1. Calculate the area of the garden bed.
2. Calculate the volume of soil needed to fill the garden bed to the desired depth.
3. Create a graph to show the relationship between the depth of soil and the volume needed.
4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

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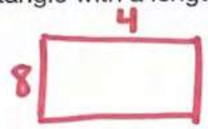
Name: Answer Key

G6 U5 Lesson 16 - Let's Try It

Area of Rectangles

1. Draw a rectangle with a length of 8 units and a width of 4 units.



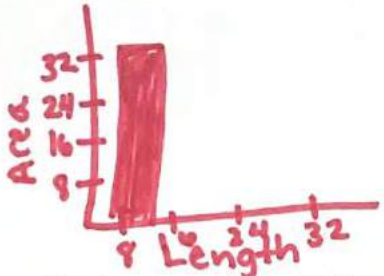
2. Calculate the area of the rectangle using the formula: Area = length × width.

$A = L \cdot W$

$A = 8 \cdot 4$

$A = 32u^2$

3. Create a graph to show the relationship between the length and the area of the rectangle.



4. Write an equation to represent the relationship between the length and the area of a rectangle.

8 : 32 $\qquad 32 = 8 \cdot 4$

Volume of Cubes

1. Draw a cube with an edge length of 3 units.

2. Calculate the volume of the cube with the formula: Volume = length × width × height.

$V = L \times W \times H$

$V = 3 \cdot 3 \cdot 3$

$V = 27$

3. Create a graph to show the relationship between the edge length and the volume of the cube.

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4. Write an equation to represent the relationship between the edge length and the volume of a cube.

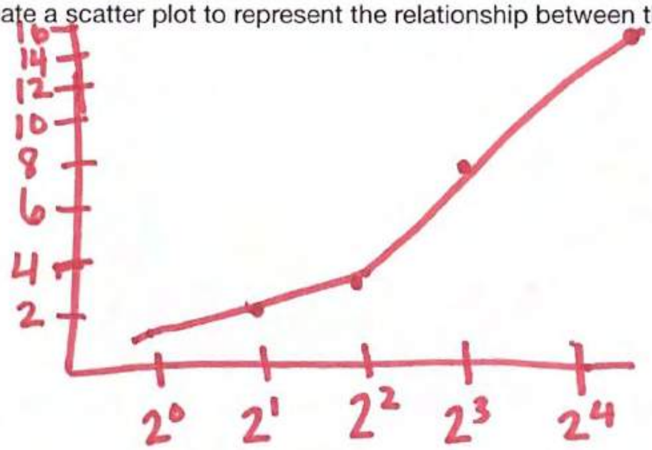
$3:27$ $27 = 3 \cdot 3$

Exponent Patterns

1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
3.	$2^3 = 8$
4.	$2^4 = 16$

2. Create a scatter plot to represent the relationship between the exponents and the results.



3. Write an equation to describe the exponential pattern in the table.

2^n

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Name: Answer Key

G6 U5 Lesson 16 - Independent Practice

Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

1. Calculate the area of the garden bed.

$A = L \cdot W$

$A = 10 \cdot 6$

$A = 60ft^2$

2. Calculate the volume of soil needed to fill the garden bed to the desired depth.

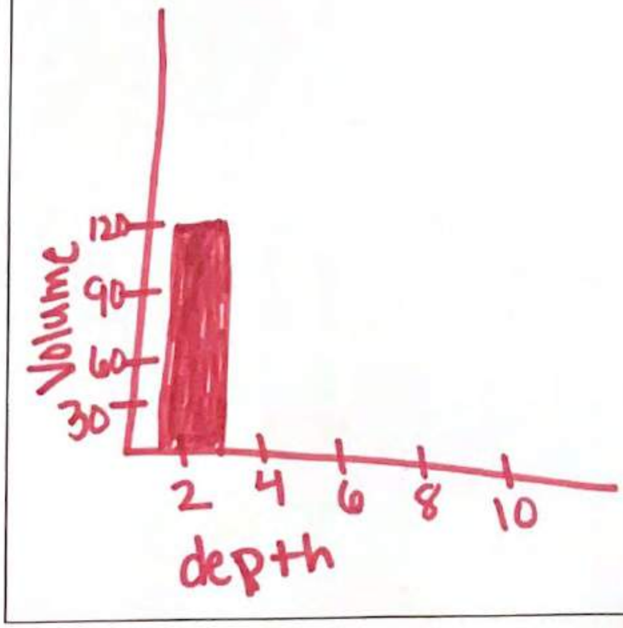
$V = L \cdot W$

$V = 10 \cdot 6 \cdot 2$

$V = 60 \cdot 2$

$V = 120ft^3$

3. Create a graph to show the relationship between the depth of soil and the volume needed.



4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

$120 = 10 \cdot 6 \cdot 2$

120:2

CITYTUTOR DC

G6 Unit 6:

Rational Numbers

G6 U6 Lesson 1

Explore positive and negative numbers

G6 U6 Lesson 1 - Students will explore positive and negative numbers

Materials:

- Number line for every student

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we are going to explore positive and negative numbers. Have you ever heard the word positive? What about negative? Tell me what you know about those words. Perhaps some of you have seen them in video games (you get +10 for something or -10 for something), perhaps some of you have heard of positive and negative in terms of feedback (you can get positive or negative feedback). Let's go to the next slide to continue to talk about positive and negative numbers.

Let's Talk (Slide 3): So, it sounds like we already know a bit about positive and negative numbers, let's open our exploration by looking at this number line. **What do you notice and wonder about this number line?**
Possible Student Answers, Key Points:

- There are numbers to the right of zero and to the left of zero.
- Some numbers are just "normal" and others have a minus sign in front of them.
- the numbers on the left go the opposite way.
- The distance between all of the numbers on the number line is the same.
- I wonder what the minus sign in front of those numbers means.
- I wonder how 1 and -1 are related.

Those are all terrific noticings and wonderings. Some of you have seen number lines like this before and others haven't.

- This is a number line just like the ones you've worked with before except this one extends past 0 into negative numbers.
- Anything to the right of zero is a positive number, we could write it as +1 or +2 but usually when we write numbers, we just write positive numbers as the number itself.
- Anything to the left of zero is a negative number, the opposite of the positive number. Sometimes it's helpful to think of negative numbers as like debts or deficits.
- Just like on number lines with only positive numbers, numbers that are further to the left on a number line are smaller. So the farther we go to the left, the smaller the numbers before and vice versa, the further we go to the right, the bigger the numbers become.

Another way we can think of this is with temperature. Thermometers have temperatures that are above zero (*point*), and the higher it gets above zero, the hotter it is like in the summer when it's 98 degrees, it's HOT! And there are also negative numbers, temperatures that are below zero (brr!) and the further below zero it gets, the colder it is like in the winter in Minnesota it can get to be -10 degrees, that's COLD! So, numbers that are to the right of, or above, zero are positive and numbers that are to the left of, or below, zero are negative.

Let's Think (Slide 4): So, let's use what we just learned about positive and negative numbers to help us complete the first number line (pass out number line printable for every student). **First, talk to a partner, what do you notice about this number line? How could we go about completing this number line?**
Possible Student Answers, Key Points:

- I see that between 1 and -1 there's only one space so I know that the number line is counting by 1.
- I could start at 1 and go up or start at -1 and go backwards.
- I could also start at -8 and count up.

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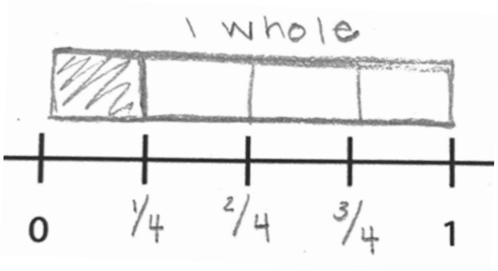
Let's Think (Slide 5): Now let's look at the second number line, it's a bit different. **Look at this number line carefully and then talk to your partner, what do you notice about *this* number line?** Possible Student Answers, Key Points:

- There are spaces between the whole numbers.
- I see 0, 1, 2 but there are also tick marks between those numbers which means it's fractions.
- Each whole number is split into fourths, or four equal parts.

Very good observations! This number line looks quite different. We have all of our whole numbers, or integers…0, 1, 2 and -1 and -2 but there are four tick marks or units between each whole number. Hmm, that means that we are talking about units that are less than 1 whole, like fractions or decimals! So if each whole number is split into four equal parts, that means that these are each fourths. Let's start by filling out the positive numbers first.

- Note: If students are struggling to understand this, draw a bar model above 0-1 and split it into fourths along the number line, like below (this should remind them of the fraction models that they're used to).
- As students progress past 1 and -1, it's most appropriate for them to write 1 ¼ not 5/4.



So we have our positive numbers filled out, now let's use that to fill out our negative numbers (students should notice and follow the pattern).

Let's Try it (Slides 6-7): Now let's work on positive and negative numbers together. We're going to work on this page together, step-by-step. Remember, numbers that are to the right of zero are positive and numbers to the left of zero are negative.

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WARM WELCOME

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Today we will explore positive and negative numbers.

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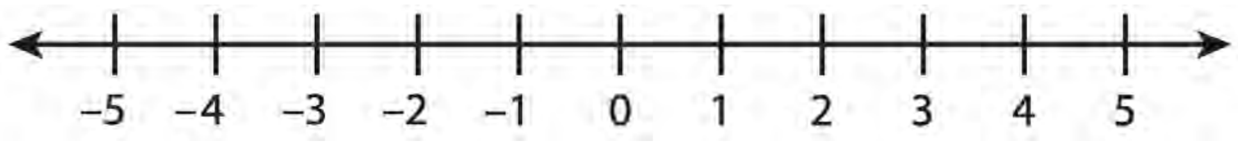
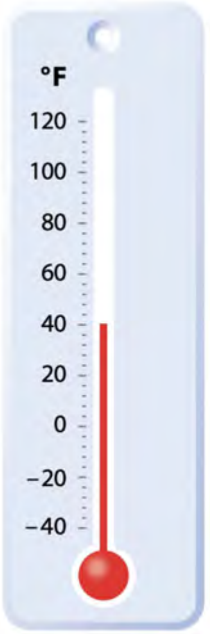
Let’s Talk:

What do you notice and wonder about this number line?





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Let’s Think:

Let’s use what we know about positive and negative numbers to finish the number line.

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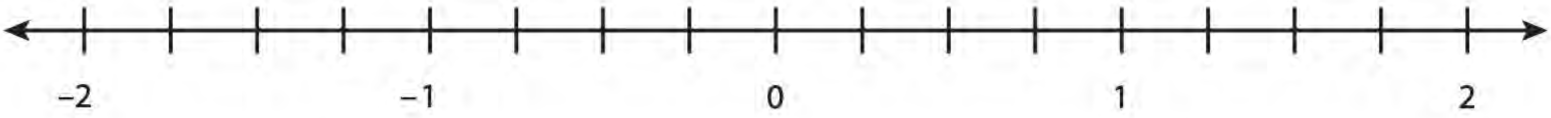
Let's Think:

Let's use what we know about positive and negative numbers to finish the number line.



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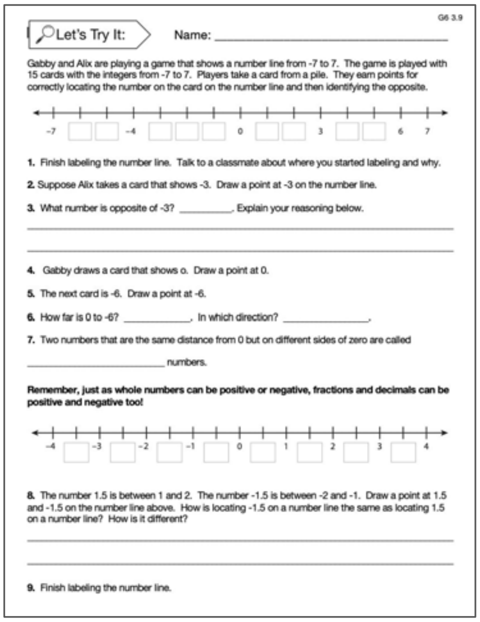
Let's Try It:

Let's explore positive and negative numbers together.


G6 3.9

Let's Try It: Name: ______________________________

Gabby and Alix are playing a game that shows a number line from -7 to 7. The game is played with 15 cards with the integers from -7 to 7. Players take a card from a pile. They earn points for correctly locating the number on the card on the number line and then identifying the opposite.

1. Finish labeling the number line. Talk to a classmate about where you started labeling and why.

2. Suppose Alix takes a card that shows -3. Draw a point at -3 on the number line.

3. What number is opposite of -3? __________. Explain your reasoning below.

4. Gabby draws a card that shows o. Draw a point at 0.

5. The next card is -6. Draw a point at -6.

6. How far is 0 to -6? ____________. In which direction? ______________.

7. Two numbers that are the same distance from 0 but on different sides of zero are called

____________________ numbers.

Remember, just as whole numbers can be positive or negative, fractions and decimals can be positive and negative too!

8. The number 1.5 is between 1 and 2. The number -1.5 is between -2 and -1. Draw a point at 1.5 and -1.5 on the number line above. How is locating -1.5 on a number line the same as locating 1.5 on a number line? How is it different?

9. Finish labeling the number line.

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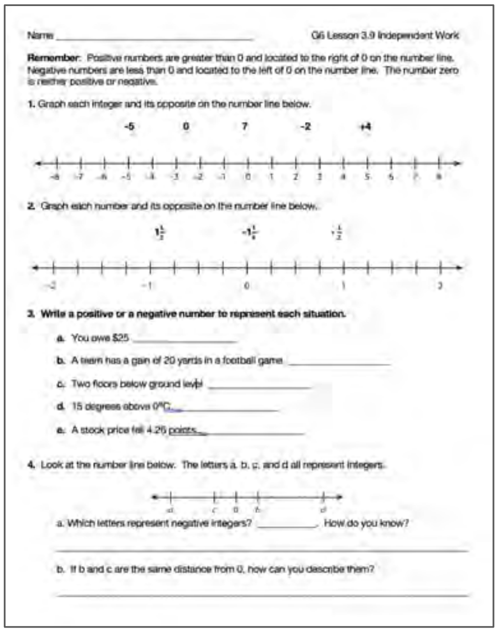
On your Own:

Now it’s time to try on your own.



Name ______________________ G6 Lesson 3.9 Independent Work

Remember: Positive numbers are greater than 0 and located to the right of 0 on the number line. Negative numbers are less than 0 and located to the left of 0 on the number line. The number zero is neither positive or negative.

1. Graph each integer and its opposite on the number line below.

-5 **0** **7** **-2** **+4**

2. Graph each number and its opposite on the number line below.

$1\frac{1}{2}$ $-1\frac{1}{4}$ $-\frac{1}{2}$

3. Write a positive or a negative number to represent each situation.

a. You owe $25 ______________

b. A team has a gain of 20 yards in a football game ______________

c. Two floors below ground level ______________

d. 15 degrees above 0°C ______________

e. A stock price fell 4.25 points ______________

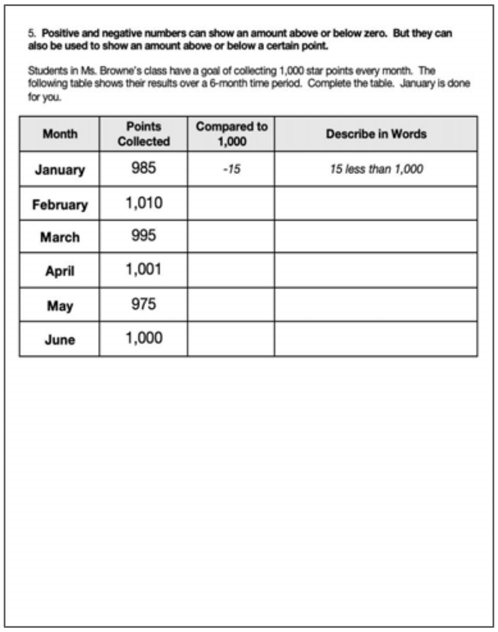
4. Look at the number line below. The letters a, b, c, and d all represent integers.

a. Which letters represent negative integers? __________. How do you know?

____

b. If b and c are the same distance from 0, how can you describe them?

____



5. **Positive and negative numbers can show an amount above or below zero. But they can also be used to show an amount above or below a certain point.**

Students in Ms. Browne’s class have a goal of collecting 1,000 star points every month. The following table shows their results over a 6-month time period. Complete the table. January is done for you.

Month	Points Collected	Compared to 1,000	Describe in Words
January	985	*-15*	*15 less than 1,000*
February	1,010		
March	995		
April	1,001		
May	975		
June	1,000		

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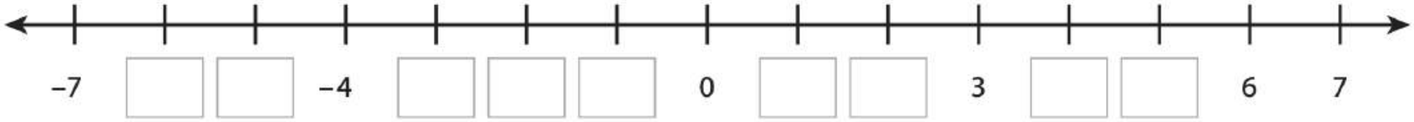
Gabby and Alix are playing a game that shows a number line from -7 to 7. The game is played with 15 cards with the integers from -7 to 7. Players take a card from a pile. They earn points for correctly locating the number on the card on the number line and then identifying the opposite.



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2. Suppose Alix takes a card that shows -3. Draw a point at -3 on the number line.

3. What number is opposite of -3? __________. Explain your reasoning below.

____

____

4. Gabby draws a card that shows o. Draw a point at 0.

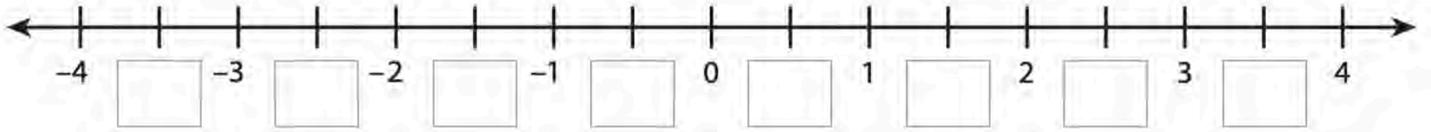
5. The next card is -6. Draw a point at -6.

6. How far is 0 to -6? _____________. In which direction? ________________.

7. Two numbers that are the same distance from 0 but on different sides of zero are called

____________________________ numbers.

Remember, just as whole numbers can be positive or negative, fractions and decimals can be positive and negative too!



8. The number 1.5 is between 1 and 2. The number -1.5 is between -2 and -1. Draw a point at 1.5 and -1.5 on the number line above. How is locating -1.5 on a number line the same as locating 1.5 on a number line? How is it different?

____

____

9. Finish labeling the number line.

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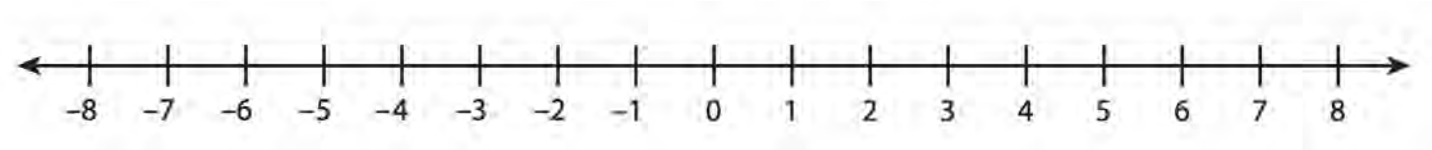
Name ____ G6 U6 Lesson 1 - Independent Work

Remember: Positive numbers are greater than 0 and located to the right of 0 on the number line. Negative numbers are less than 0 and located to the left of 0 on the number line. The number zero is neither positive or negative.

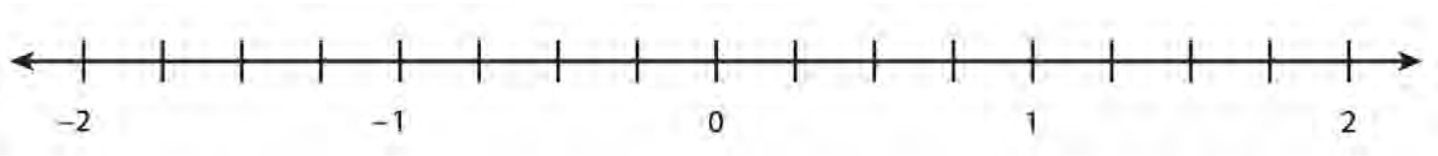
1. Graph each integer and its opposite on the number line below.

-5 **0** **7** **-2** **+4**



2. Graph each number and its opposite on the number line below.

$1\frac{1}{2}$ $-1\frac{1}{4}$ $-\frac{1}{2}$



3. Write a positive or a negative number to represent each situation.

a. You owe $25 ____________________

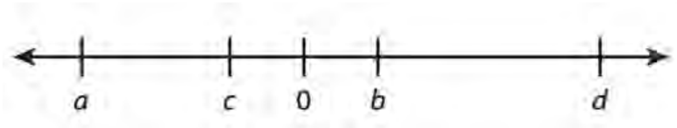
b. A team has a gain of 20 yards in a football game ____________________

c. Two floors below ground level ____________________

d. 15 degrees above 0°C ____________________

e. A stock price fell 4.26 points ____________________

4. Look at the number line below. The letters a, b, c, and d all represent integers.



a. Which letters represent negative integers? ____________. How do you know?

____

b. If b and c are the same distance from 0, how can you describe them?

____

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5. **Positive and negative numbers can show an amount above or below zero. But they can also be used to show an amount above or below a certain point.**

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May	975		
June	1,000		

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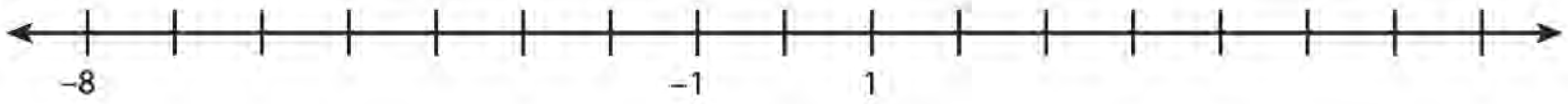
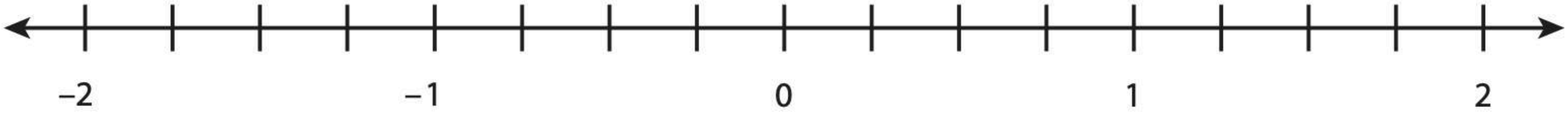
1. Let’s use what we know about positive and negative numbers to finish the number line.



2. Let’s use what we know about positive and negative numbers to finish the number line.



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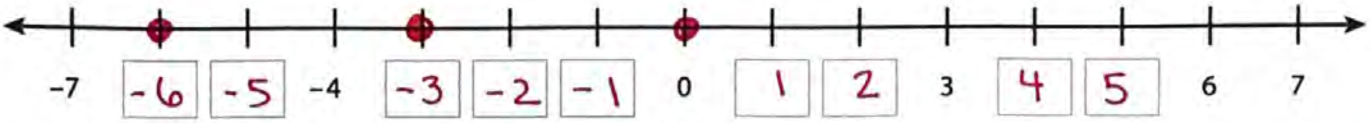
Name: ANSWER KEY

G6 U6 Lesson 1 - Let's Try It

Gabby and Alix are playing a game that shows a number line from -7 to 7. The game is played with 15 cards with the integers from -7 to 7. Players take a card from a pile. They earn points for correctly locating the number on the card on the number line and then identifying the opposite.



1. Finish labeling the number line. Talk to a classmate about where you started labeling and why. ✓

2. Suppose Alix takes a card that shows -3. Draw a point at -3 on the number line. ✓

3. What number is opposite of -3? 3!. Explain your reasoning below.

3 and -3 are opposites because they're the same distance from zero.

4. Gabby draws a card that shows o. Draw a point at 0. ✓

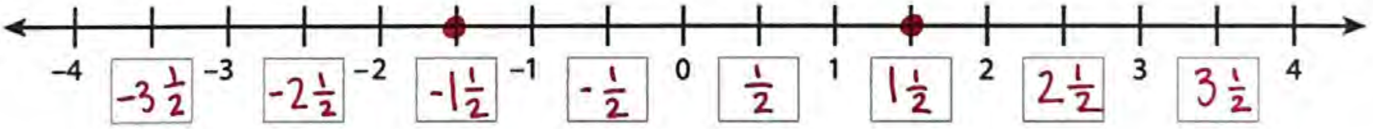
5. The next card is -6. Draw a point at -6. ✓

6. How far is 0 to -6? 6. In which direction? left.

7. Two numbers that are the same distance from 0 but on different sides of zero are called

opposite numbers.

Remember, just as whole numbers can be positive or negative, fractions and decimals can be positive and negative too!



8. The number 1.5 is between 1 and 2. The number -1.5 is between -2 and -1. Draw a point at 1.5 and -1.5 on the number line above. How is locating -1.5 on a number line the same as locating 1.5 on a number line? How is it different?

It's the same distance from zero, you pass 1/2, 1 or -12, -1 to get to it. But, you go a different direction to find positive or negative.

9. Finish labeling the number line.

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Name ANSWER KEY

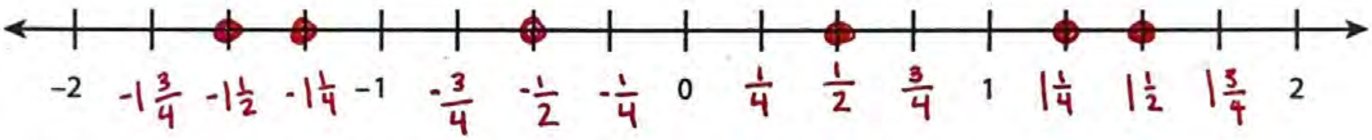
Remember: Positive numbers are greater than 0 and located to the right of 0 on the number line. Negative numbers are less than 0 and located to the left of 0 on the number line. The number zero is neither positive or negative.

1. Graph each integer and its opposite on the number line below.

-5	0	7	-2	+4
5	✓	-7	2	-4

2. Graph each number and its opposite on the number line below.

$1\frac{1}{2}$, $-1\frac{1}{2}$ $-1\frac{1}{4}$, $1\frac{1}{4}$ $-\frac{1}{2}$, $\frac{1}{2}$



3. Write a positive or a negative number to represent each situation.

a. You owe $25 -25

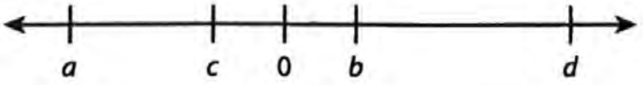
b. A team has a gain of 20 yards in a football game +20

c. Two floors below ground level -2

d. 15 degrees above 0°C +15

e. A stock price fell 4.26 points - 4.26

4. Look at the number line below. The letters a, b, c, and d all represent integers.



a. Which letters represent negative integers? a, c. How do you know?

They're to the left of zero

b. If b and c are the same distance from 0, how can you describe them?

Opposite numbers

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G6 U6 Lesson 2

Find absolute value and order rational numbers

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G6 U6 Lesson 2 - Students will find absolute value and order numbers

Warm Welcome (Slide 1): Tutor choice.

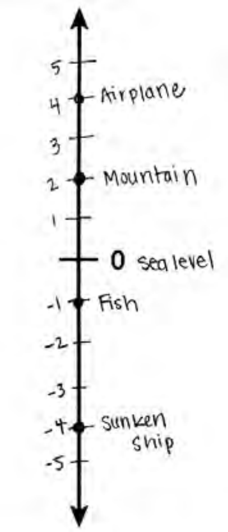
Frame the Learning/Connect to Prior Learning (Slide 2): Today we are going to use what we know about positive and negative numbers to think about absolute value, which is the distance of any number from zero. We'll also dig back into our brains to think about something we've already learned about…ordering numbers.

Let's Talk (Slide 3): So, what do you already know about comparing and ordering numbers? Possible Student Answers, Key Points:

- When we compare numbers we read from left to right.
- When we compare numbers we can say whether one number is bigger OR smaller than another number.
- When I'm comparing two things, I can write two different inequalities.
- I know that > is the greater than sign, < is the less than sign and = is the equal sign.
- When we order numbers, we can order them from least to greatest, or from greatest to least.

Let's Think (Slide 4): We have two different ideas to discuss and learn about today. First, let's talk about absolute value. Who has ever heard the word elevation? If you have, what did it mean or where did you hear it used? That's right, elevation refers to how far away from a given height something is, often sea level. When we're talking about the elevation of an object here, negative numbers represent objects that are below sea level..things that are under water like sunken shifts and coral reefs and positive numbers are used to represent objects that are above sea level, like mountains and villages.

So, this table on this slide shows the location of the mountain, a school of fish, a sunken shift, and an airplane. Based on what I just told you about elevation and the picture here, what do you notice about the location of the different objects? Some are positive and some are negative! That's right, some of the numbers are positive and some are negative, I bet that means that some are ABOVE sea level and some are BELOW sea level.



Now, let's work together to graph the location of each object on this number line on the slide. Zero is sea level, that's where we measure the distance from, I'm going to label that as SEA LEVEL. So we know that the mountain and the airplane are positive numbers, that means that they're ABOVE sea level so let's plot them as positive numbers (*plot 2 and 4, label airplane and mountain*).

We also know that the school of fish and the sunken shift are negative numbers because they're BELOW sea level (*plot -1 and -4, label fish and airplane*). So, this number line helps us see the distance each object is from sea level, whether they're above or below sea level and how far away from sea level each object is.

Now, let's answer some questions about how far each object is from sea level.

1. First, how far above sea level is the mountain? 4! That's right, we count the hops from sea level, count with me…1, 2, 3, 4.
2. How far below sea level is the school of fish? 1! It's not -1 because we're just saying the distance, it takes one hop to get from sea level to the fish.

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3. Finally, which two objects are the same distance from sea level? Think about this one and share with a partner about what you think and how you figured it out.

Let's Think (Slide 5): Guess what? We just practiced thinking about absolute value! When we are talking about the distance from 0, we're talking about absolute value! That's why both the sunken ship and airplane are the same distance to sea level.

Like you said, 4 is 4 units from 0 and -4 is 4 units from 0 (*show the hops on the number line*). When I'm counting absolute values I can count the distance forwards or backwards (*show on the number line*). And, when we write absolute value we write it like this… |-4|=4(*point*).

So, if we want to find absolute value of 4, which is written like this or |4| (*point*), we want to find the distance from 4 to zero. We can count from 0 to 4 or from 4 to 0, either way it's…4! So the absolute value of 4 is…4!

Let's Think (Slide 6): So, let's use what we know about absolute value to help us order numbers. Like you told me earlier, when we order numbers we put them in order from least to greatest or from greatest to least, you've been doing this in school (and real life!) for a while now. But, today, we're going to have to use what we know about absolute value to help us order numbers. Let's look at this set of numbers, read them with me…

- The absolute value of -2.
- -8…no absolute value there!
- 4…no absolute value there!
- The absolute value of 6.
- And finally, the absolute value of -7.

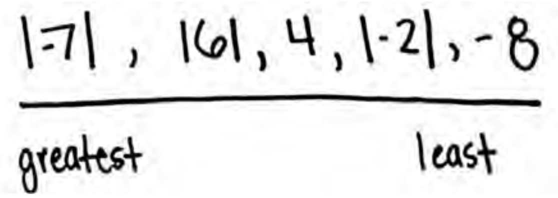
So this is a mixed set of numbers, some of them are just numbers while others have the absolute value notation. Let's interpret each number before we put them in order.

The absolute value of -2, let's find -2 on the number line and count the distance from 0 (*count forwards or backwards*). So the absolute value of -2 is 2!

Now, -8 and 4 are just regular numbers so we don't have to interpret them, let's just rewrite them so we know the value.

And finally, What's the absolute value of 6? 6! And What about the absolute value of -7? 7!

Nice work! Now, we can put them in order from greatest to least, that means from biggest to smallest. When we write them in order, we have to write them in the original form we were given to show what we were comparing but these interpretations can help us order these numbers.



Which number is the largest? 7! That's right, the absolute value of 7 is the largest number we have, let's write that first.

What's next? |6|! Nice work! And then? 4! Next? |-2|! And finally, what's the smallest number? -8!

Great job! We just put this set of numbers in order from greatest to least.

Let's Try it (Slides 7-8): Now let's work on ordering numbers together. Remember that absolute value is the distance between a number and 0!

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WARM WELCOME

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Today we will find absolute value and compare positive and negative numbers.

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Let's Talk:

What do you know about comparing numbers?

What do you know about ordering numbers?

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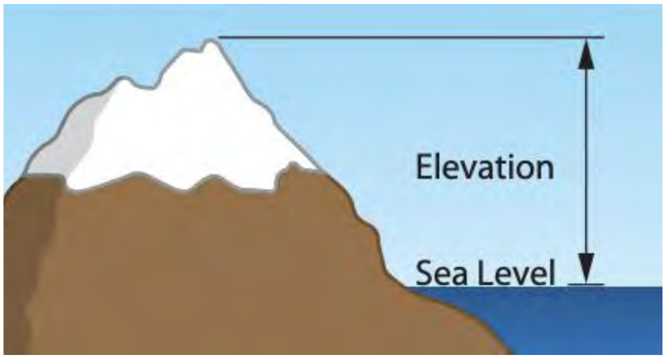
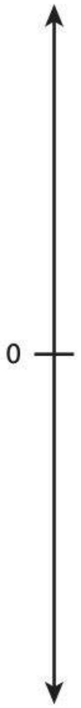
Let's Think:



Object	Mountain	Fish	Sunken Ship	Airplane
Elevation (in km)	2	−1	−4	4

The elevation of an object tells you its distance above or below sea level. Negative numbers are used to represent objects below sea level. Positive numbers are used to represent objects above sea level.

The table to the left shows the elevations of four objects. Let's graph their locations on a number line and then describe the distances.



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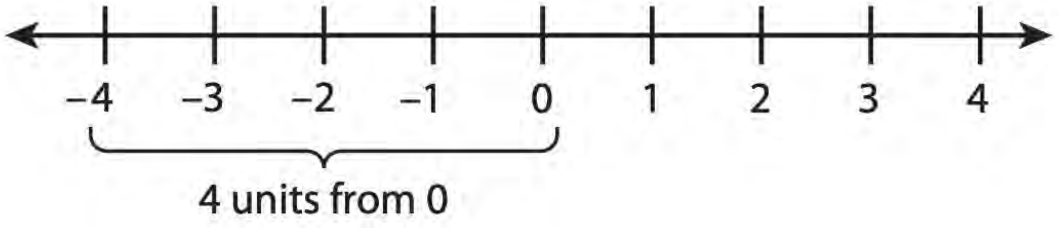
Let's Think:

The absolute value of a number is its distance from 0 on the number line |-4| means the absolute value of -4.

-4 is 4 units from 0.

|-4| = 4

|4| = ______



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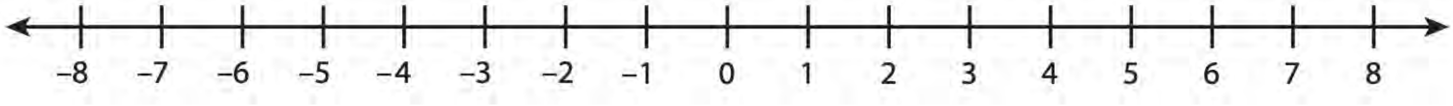
Let's Think:

We can put the numbers in order from greatest to least.

|-2| -8   4 |6| |-7|



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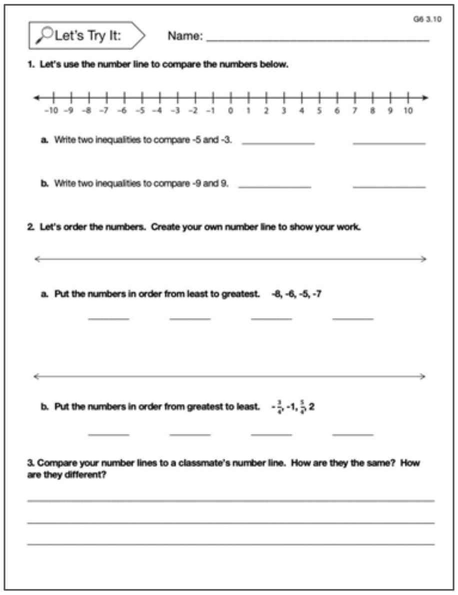
Let's Try It:

Let's explore comparing numbers and absolute together.



G6 3.10

Let's Try It: Name: ____________________

1. Let's use the number line to compare the numbers below.

a. Write two inequalities to compare -5 and -3. __________ __________

b. Write two inequalities to compare -9 and 9. __________ __________

2. Let's order the numbers. Create your own number line to show your work.

a. Put the numbers in order from least to greatest. -8, -6, -5, -7

_____ _____ _____ _____

b. Put the numbers in order from greatest to least. $-\frac{3}{4}, -1, \frac{5}{4}, 2$

_____ _____ _____ _____

3. Compare your number lines to a classmate's number line. How are they the same? How are they different?

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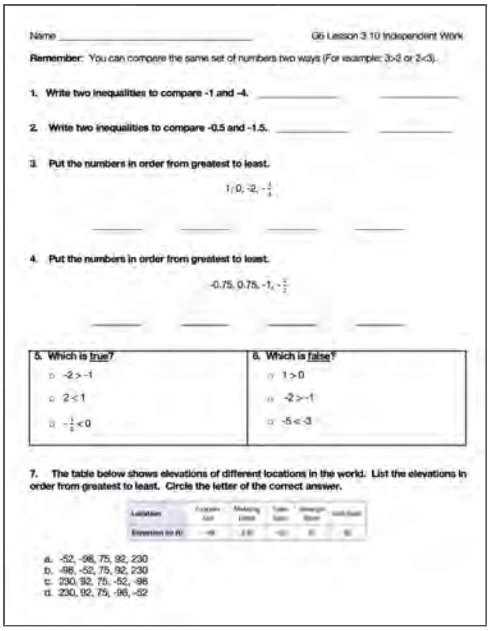
On your Own:

Now its time to try on your own.



Name ____________________ G6 Lesson 3.10 Independent Work

Remember: You can compare the same set of numbers two ways (For example: 3>2 or 2<3).

1. Write two inequalities to compare -1 and -4. __________ __________

2. Write two inequalities to compare -0.5 and -1.5. __________ __________

3. Put the numbers in order from greatest to least.

$1, 0, -2, -\frac{1}{4}$

_____ _____ _____ _____

4. Put the numbers in order from greatest to least.

$-0.75, 0.75, -1, -\frac{1}{2}$

_____ _____ _____ _____

5. Which is <u>true</u>?

○ -2 > -1

○ 2 < 1

○ $-\frac{1}{2} < 0$

6. Which is <u>false</u>?

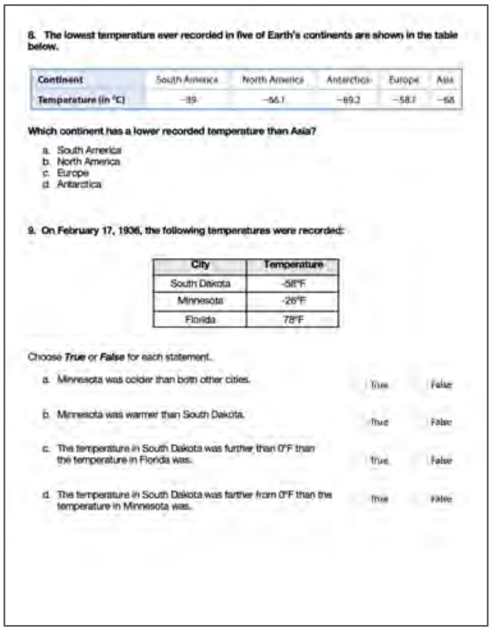
○ 1 > 0

○ -2 > -1

○ -5 < -3

7. The table below shows elevations of different locations in the world. List the elevations in order from greatest to least. Circle the letter of the correct answer.

a. -52, -98, 75, 92, 230
b. -98, -52, 75, 92, 230
c. 230, 92, 75, -52, -98
d. 230, 92, 75, -98, -52



8. The lowest temperature ever recorded in five of Earth's continents are shown in the table below.

Continent	South America	North America	Antarctica	Europe	Asia
Temperature (in °C)	−39	−66.1	−69.2	−58.1	−68

Which continent has a lower recorded temperature than Asia?

a. South America
b. North America
c. Europe
d. Antarctica

9. On February 17, 1936, the following temperatures were recorded:

City	Temperature
South Dakota	-58°F
Minnesota	-26°F
Florida	78°F

Choose ***True*** or ***False*** for each statement.

a. Minnesota was colder than both other cities. True False

b. Minnesota was warmer than South Dakota. True False

c. The temperature in South Dakota was further than 0°F than the temperature in Florida was. True False

d. The temperature in South Dakota was farther from 0°F than the temperature in Minnesota was. True False

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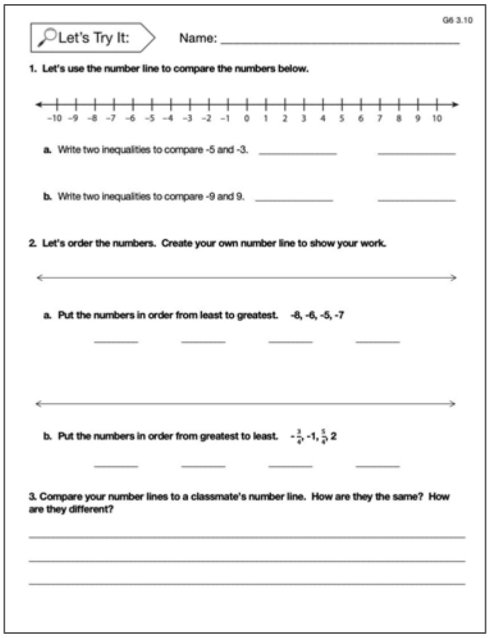
Let’s Try It:

Let’s explore together.



G6 3.10

Let’s Try It: Name: ____________________

1. Let’s use the number line to compare the numbers below.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

a. Write two inequalities to compare -5 and -3. __________ __________

b. Write two inequalities to compare -9 and 9. __________ __________

2. Let’s order the numbers. Create your own number line to show your work.

a. Put the numbers in order from least to greatest. -8, -6, -5, -7

______ ______ ______ ______

b. Put the numbers in order from greatest to least. $-\frac{3}{4}, -1, \frac{5}{4}, 2$

______ ______ ______ ______

3. Compare your number lines to a classmate’s number line. How are they the same? How are they different?

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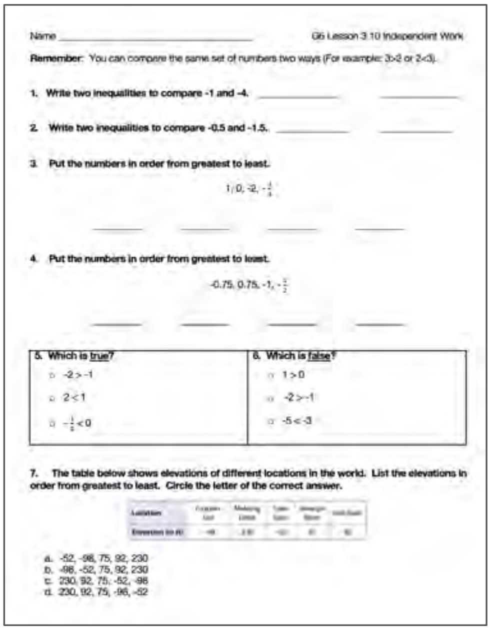
On your Own:

Now it’s time to try on your own.



Name ____________________ G6 Lesson 3.10 Independent Work

Remember: You can compare the same set of numbers two ways (For example: 3>2 or 2<3).

1. Write two inequalities to compare -1 and -4. __________ __________

2. Write two inequalities to compare -0.5 and -1.5. __________ __________

3. Put the numbers in order from greatest to least.

$1, 0, -2, -\frac{1}{4}$

______ ______ ______ ______

4. Put the numbers in order from greatest to least.

$-0.75, 0.75, -1, -\frac{1}{2}$

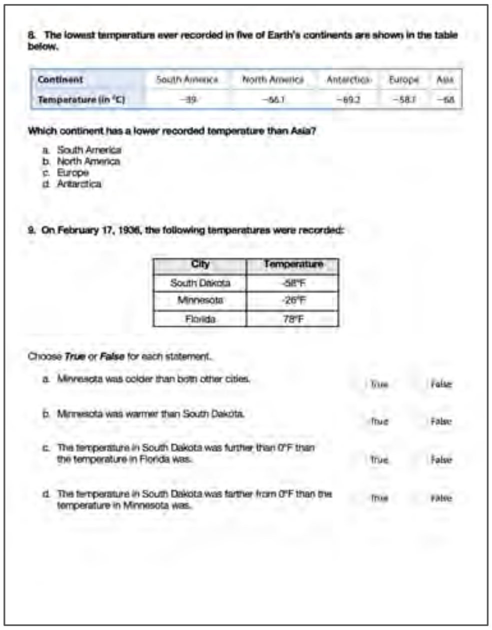
______ ______ ______ ______

5. Which is <u>true</u>?	6. Which is <u>false</u>?
○ $-2 > -1$	○ $1 > 0$
○ $2 < 1$	○ $-2 > -1$
○ $-\frac{1}{4} < 0$	○ $-5 < -3$

7. The table below shows elevations of different locations in the world. List the elevations in order from greatest to least. Circle the letter of the correct answer.

Location	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elevation (in ft)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

a. -52, -98, 75, 92, 230
b. -98, -52, 75, 92, 230
c. 230, 92, 75, -52, -98
d. 230, 92, 75, -98, -52



8. The lowest temperature ever recorded in five of Earth’s continents are shown in the table below.

Continent	South America	North America	Antarctica	Europe	Asia
Temperature (in °C)	−39	−56.1	−69.2	−58.1	−68

Which continent has a lower recorded temperature than Asia?

a. South America
b. North America
c. Europe
d. Antarctica

9. On February 17, 1936, the following temperatures were recorded:

City	Temperature
South Dakota	-58°F
Minnesota	-26°F
Florida	78°F

Choose ***True*** or ***False*** for each statement.

a. Minnesota was colder than both other cities. True False

b. Minnesota was warmer than South Dakota. True False

c. The temperature in South Dakota was further than 0°F than the temperature in Florida was. True False

d. The temperature in South Dakota was farther from 0°F than the temperature in Minnesota was. True False

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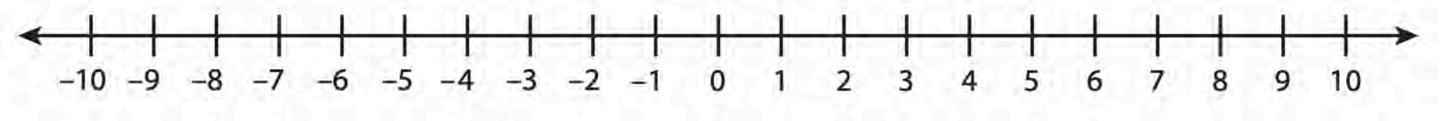
Name ____ G6 U6 Lesson 2 - Let’s Try It



1. Put the following numbers in order from least to greatest.

$|-5|$ -2 $|2|$ 0 4

↓ ↓ ↓ ↓ ↓

_____ _____ _____ _____ _____

____

1. Put the following numbers in order from greatest to least.

$|-6|$ -1 $|1|$ $|-3|$ 5

↓ ↓ ↓ ↓ ↓

_____ _____ _____ _____ _____

____

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Name ____ G6 U6 Lesson 2 - Independent Work

Remember: You find absolute value BEFORE you start ordering numbers.

1. Put the numbers in order from greatest to least.

1, |-5|, 4, -2, |-3|

__________ __________ __________ __________ __________

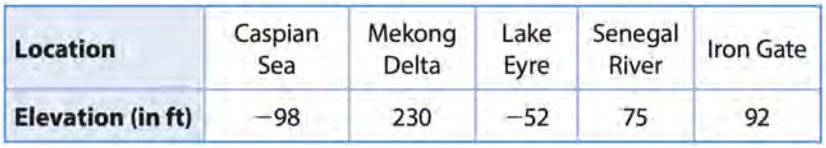
2. Put the numbers in order from least to greatest.

3, |-6|, 8, -1, |-4|

__________ __________ __________ __________ __________

3. Which shows the numbers in order from least to greatest?	**4. Which shows the numbers in order from greatest to least?**
○ |-4|, 3, 5	○ |-7|, 1, |-2|
○ 3, |-4|, 5	○ |-7|, |-2|, 1
○ 5, |-4|, 3	○ 1, |-2|, |-7|

7. The table below shows elevations of different locations in the world. List the elevations in order from greatest to least. Circle the letter of the correct answer.



Location	Caspian Sea	Mekong Delta	Lake Eyre	Senegal River	Iron Gate
Elevation (in ft)	−98	230	−52	75	92

a. -52, -98, 75, 92, 230
b. -98, -52, 75, 92, 230
c. 230, 92, 75, -52, -98
d. 230, 92, 75, -98, -52

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8. The lowest temperature ever recorded in five of Earth's continents are shown in the table below.

Continent	South America	North America	Antarctica	Europe	Asia
Temperature (in °C)	−39	−66.1	−89.2	−58.1	−68

Which continent has a lower recorded temperature than Asia?

a. South America
b. North America
c. Europe
d. Antarctica

9. On February 17, 1936, the following temperatures were recorded:

City	Temperature
South Dakota	-58°F
Minnesota	-26°F
Florida	78°F

Choose ***True*** or ***False*** for each statement.

a. Minnesota was colder than both other cities. ☐ True ☐ False

b. Minnesota was warmer than South Dakota. ☐ True ☐ False

c. The temperature in South Dakota was further than 0°F than the temperature in Florida was. ☐ True ☐ False

d. The temperature in South Dakota was farther from 0°F than the temperature in Minnesota was. ☐ True ☐ False

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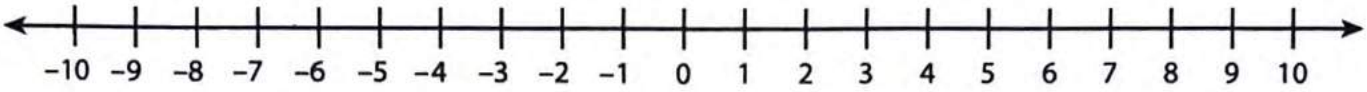
Name ANSWER KEY

G6 U6 Lesson 2 - Let's Try It



1. Put the following numbers in order from least to greatest.

|-5|	**-2**	**|2|**	**0**	**4**
↓	↓	↓	↓	↓
5	-2	2	0	4

-2, 0, |2|, 4, |-5|

least greatest

1. Put the following numbers in order from greatest to least.

|-6|	**-1**	**|1|**	**|-3|**	**5**
↓	↓	↓	↓	↓
6	-1	1	3	5

|-6|, 5, |-3|, |1|, -1

greatest least

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Name ANSWER KEY G6 U6 Lesson 2 - Independent Work

Remember: You find absolute value BEFORE you start ordering numbers.

1. **Put the numbers in order from greatest to least.**

1, |-5|, 4, -2, |-3|

1 , 5 , 4 , -2 , 3

|-5| 4 |-3| 1 -2

greatest least

2. **Put the numbers in order from least to greatest.**

3, |-6|, 8, -1, |-4|

3 , 6 , 8 , -1 , 4

-1 3 |-4| |-6| 8

least greatest

3. Which shows the numbers in order from least to greatest?	**4. Which shows the numbers in order from greatest to least?**
4, 3, 5 X |-4|, 3, 5 3, 4, 5 ✓ • 3, |-4|, 5 5, 4, 3 X 5, |-4|, 3	7, 1, 2 X |-7|, 1, |-2| 7, 2, 1 • |-7|, |-2|, 1 ✓ 1, 2, 7 X 1, |-2|, |-7|

7. **The table below shows elevations of different locations in the world. List the elevations in order from greatest to least. Circle the letter of the correct answer.**

Location	Caspian Sea	Mekong Delta	Lake Eyre	Senegal River	Iron Gate
Elevation (in ft)	−98	230	−52	75	92

~~a.~~ -52, -98, 75, 92, 230
~~b.~~ -98, -52, 75, 92, 230
[✓ c.] 230, 92, 75, -52, -98
~~d.~~ 230, 92, 75, -98, -52

230, 92, 75, -52, -98

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8. The lowest temperature ever recorded in five of Earth's continents are shown in the table below.

Continent	South America	North America	Antarctica	Europe	Asia
Temperature (in °C)	−39	−66.1	−89.2	−58.1	−68

Which continent has a lower recorded temperature than Asia?

a. South America
b. North America
c. Europe
[✓ d.] Antarctica

$-89.2 < -68$

9. On February 17, 1936, the following temperatures were recorded:

City	**Temperature**
South Dakota	-58°F
Minnesota	-26°F
Florida	78°F

Choose ***True*** or ***False*** for each statement.

a. Minnesota was colder than both other cities. ☐ True ☒ False

b. Minnesota was warmer than South Dakota. ☐ True ☒ False

c. The temperature in South Dakota was further than 0°F than the temperature in Florida was. ☐ True ☒ False

$|-58|$ and 78

d. The temperature in South Dakota was farther from 0°F than the temperature in Minnesota was. ☒ True ☐ False

$|-58|$ and $|-26|$

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G6 U6 Lesson 3

Use absolute value and inequalities to compare and interpret rational numbers

G6 U6 Lesson 3 Objective- We will compare and interpret rational numbers using absolute value and inequalities.

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect Prior Learning (Slide 2): Previously you learned about absolute value and ordering rational numbers. Today, we will explore how to use absolute value and inequalities to compare and interpret rational numbers. Absolute value and inequalities are essential tools for comparing and interpreting rational numbers in real-world situations. They help us understand the relationships and magnitudes, or sizes, of quantities, making it easier to make decisions, solve problems, and draw meaningful conclusions from data.

Let's Talk (Slide 3): Before we start today's lesson, let's review what we know about rational numbers. **Can anyone tell me what rational numbers are? Give me an example of a rational number.** Possible Answer Answers, Key Points:

- Rational numbers are numbers that can be expressed as a fraction,decimal, or whole numbers.
- Rational numbers include positive and negative numbers, as well as whole numbers and fractions.
- Rational numbers can be represented on a number line

That's correct! Rational numbers include fractions, decimals, and whole numbers. Now, let's move on to absolute value. **Does anyone remember what absolute value means?** Possible Answer Answers, Key Points:

- Absolute value is the distance or how far a number is from zero on the number line.
- Finding the absolute value will always result in a positive value.

Excellent! Absolute value is the distance of a number from zero on the number line. It tells us how far a number is from zero, regardless of its sign or whether it's positive or negative. For example, the absolute value of -5 is 5 because it's 5 units away from zero. Now, let's see how we can use absolute value and inequalities to compare rational numbers.

Let's Think (Slide 4): Now, let's talk about inequalities. Inequalities are comparisons between two numbers using symbols like < (less than), > (greater than), = (equal to), ≤ (less than or equal to), or ≥ (greater than or equal to). It's important to remember the names of each of these symbols so that we can use them to quickly compare quantities. When we compare we read from left to right and then use the appropriate symbol to compare the first number to the second number.

We can write TWO inequalities for one set of numbers. We can say that one number is bigger than another number like 2 is greater than 1. But we can also switch it around and say that the other number is smaller than another number, like 1 is less than 2.

Let's Think (Slide 5): So, let's explore how we can compare -9 and -4. Let's use the number line to help us compare these numbers. Help me out, someone please point to -4 on the number line, now point to -9 on the number line. Now comparing positive and negative numbers is the same as comparing only positive numbers. Numbers to the right are bigger, numbers to the left are smaller, in other words numbers to the left are always smaller than numbers on the right. So, if we want to write two inequalities for -9 and -4, we can say -9 is less than -4 (*Note: say this as words FIRST!*) or -9<-4 (*then write it with a symbol*) or if we wanted to start with -4 we could say -4 is greater than -9 or we could write -4>-9.

Let's Think (Slide 6): But, we can also compare absolute value, which is the same idea but just adds an extra step before we can compare. Let me show you.

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$|20|$

$\downarrow$

20

Imagine you and your friend have piggy banks, and you both saved some money. You saved $20, and your friend saved -$10, which means they owe someone $10.

We need to determine the absolute value of each number first. The two lines next to the number symbolize absolute value. I need to determine the absolute value of 20. Well, we know 20 is 20 units away from zero so the absolute value of 20 is 20.

$|-10|$

$\downarrow$

10

Now, we need to determine the absolute value of negative 10. That means that we want to determine how far -10 is away from 0. If we started at -10 and hopped to 0 on a number line, like we did yesterday, it would be 10 hops away. So the absolute value of -10 is 10!

$20 > 10$

Now that we found the absolute value we can compare the amounts using inequalities. We're comparing 20 to 10 and we have to read from the left to right. So, $20 is…greater than $10, you have more money in your piggy bank than your friend (*fill in symbol*).

Let's Think (Slide 7): Now let's try another example. Imagine you have two cities, City A and City B. City A has a temperature of 10 degrees Celsius, and City B has a temperature of -5 degrees Celsius. We can use absolute value to find how far the temperatures are from zero and then we can compare them.

$|-5|$

$\downarrow$

5

Remember, absolute value is how far away a number is from 0. So, the absolute value of -5 is 5, which means it's 5 degrees away from zero.

$|10|$

$\downarrow$

10

What's the absolute value of 10? 10! That's right because 10 is 10 units away from zero.

$|-5| \quad |10|$

$\downarrow \quad\quad \downarrow$

$5 < 10$

Now, we can compare the temperatures using inequalities. We can compare the temperature of the cities two ways, first we can compare them by saying which temperature is colder. So, colder means that the temperature is less. So 5 is less than 10 (*write 5<10*), which means that City B is colder. But we can also say which city is warmer with a different inequality, this time we're going to use greater than to compare the cities. So, 10 is greater than 5 (*write 10>5*), which means that City A is warmer than City B.

Let's Try it (Slides 8-9): Great job, everyone! Now, it's time to practice using absolute value and inequalities to compare and interpret rational numbers together. Remember that the absolute value is the distance from zero and will always result in a positive value. Be sure to show your work and think about the meaning of the rational numbers in real-life situations.

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WARM WELCOME

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Today, we will explore how to use absolute value and inequalities to compare and interpret rational numbers.

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Let's Talk:

What are rational numbers?

What is absolute value?

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Let's Think:

We can use symbols to compare quantities.

$<$	$>$	$=$	$\leq$	$\geq$
less than	greater than	equal to	less than or equal to	greater than or equal to

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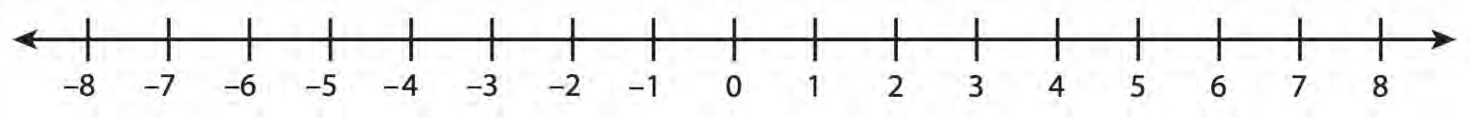
Let's Think:

We can use symbols to compare numbers. Let's write two inequalities.

-9 and -4



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Let's Think:

Let's determine the absolute value and use an inequality to compare.

Imagine you and your friend have piggy banks, and you both saved some money

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Let's Think:

Let's determine the absolute value and use an inequality to compare.

Imagine you have two cities, City A and City B. City A has a temperature of 10 degrees Celsius, and City B has a temperature of -5 degrees Celsius

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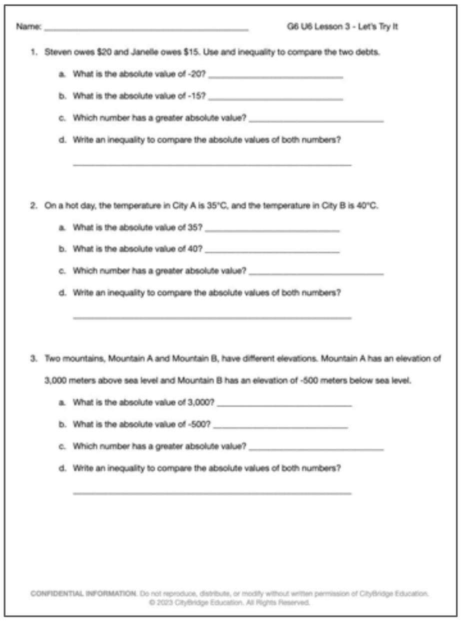
Let's Try It:

Now let's try using absolute value to compare rational numbers together.



Name: ______________________________ G6 U6 Lesson 3 - Let's Try It

1. Steven owes $20 and Janelle owes $15. Use and inequality to compare the two debts.
   a. What is the absolute value of -20? ____________________
   b. What is the absolute value of -15? ____________________
   c. Which number has a greater absolute value? ____________________
   d. Write an inequality to compare the absolute values of both numbers?

   ____

2. On a hot day, the temperature in City A is 35°C, and the temperature in City B is 40°C.
   a. What is the absolute value of 35? ____________________
   b. What is the absolute value of 40? ____________________
   c. Which number has a greater absolute value? ____________________
   d. Write an inequality to compare the absolute values of both numbers?

   ____

3. Two mountains, Mountain A and Mountain B, have different elevations. Mountain A has an elevation of 3,000 meters above sea level and Mountain B has an elevation of -500 meters below sea level.
   a. What is the absolute value of 3,000? ____________________
   b. What is the absolute value of -500? ____________________
   c. Which number has a greater absolute value? ____________________
   d. Write an inequality to compare the absolute values of both numbers?

   ____

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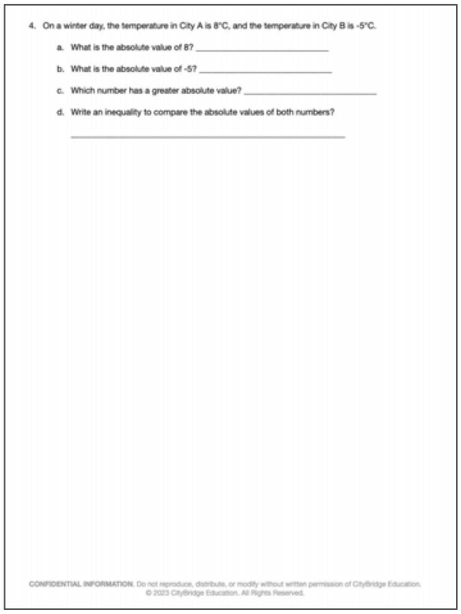

4. On a winter day, the temperature in City A is 8°C, and the temperature in City B is -5°C.
   a. What is the absolute value of 8? ____________________
   b. What is the absolute value of -5? ____________________
   c. Which number has a greater absolute value? ____________________
   d. Write an inequality to compare the absolute values of both numbers?

   ____

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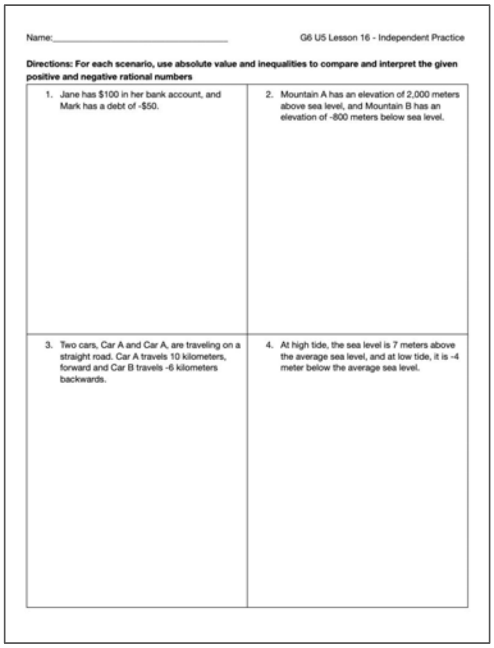
On your Own:

It's your turn to try using absolute value to compare rational numbers on your own.



Name:______________________________ G6 U5 Lesson 16 - Independent Practice

Directions: For each scenario, use absolute value and inequalities to compare and interpret the given positive and negative rational numbers

1. Jane has $100 in her bank account, and Mark has a debt of -$50.
2. Mountain A has an elevation of 2,000 meters above sea level, and Mountain B has an elevation of -800 meters below sea level.
3. Two cars, Car A and Car A, are traveling on a straight road. Car A travels 10 kilometers, forward and Car B travels -6 kilometers backwards.
4. At high tide, the sea level is 7 meters above the average sea level, and at low tide, it is -4 meter below the average sea level.

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Name: ____ G6 U6 Lesson 3 - Let’s Try It

1. Steven owes $20 and Janelle owes $15. Use and inequality to compare the two debts.
   a. What is the absolute value of -20? ______________________________
   b. What is the absolute value of -15? ______________________________
   c. Which number has a greater absolute value? ______________________________
   d. Write an inequality to compare the absolute values of both numbers?

      ____

2. On a hot day, the temperature in City A is 35°C, and the temperature in City B is 40°C.
   a. What is the absolute value of 35? ______________________________
   b. What is the absolute value of 40? ______________________________
   c. Which number has a greater absolute value? ______________________________
   d. Write an inequality to compare the absolute values of both numbers?

      ____

3. Two mountains, Mountain A and Mountain B, have different elevations. Mountain A has an elevation of 3,000 meters above sea level and Mountain B has an elevation of -500 meters below sea level.
   a. What is the absolute value of 3,000? ______________________________
   b. What is the absolute value of -500? ______________________________
   c. Which number has a greater absolute value? ______________________________
   d. Write an inequality to compare the absolute values of both numbers?

      ____

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4. On a winter day, the temperature in City A is 8°C, and the temperature in City B is -5°C.

   a. What is the absolute value of 8? ______________________________

   b. What is the absolute value of -5? ______________________________

   c. Which number has a greater absolute value? ______________________________

   d. Write an inequality to compare the absolute values of both numbers?

   ____

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Name:______________________________________ G6 U6 Lesson 3 - Independent Work

Directions: For each scenario, use absolute value and inequalities to compare and interpret the given positive and negative rational numbers

1. Jane has $100 in her bank account, and Mark has a debt of -$50.
2. Mountain A has an elevation of 2,000 meters above sea level, and Mountain B has an elevation of -800 meters below sea level.
3. Two cars, Car A and Car A, are traveling on a straight road. Car A travels 10 kilometers, forward and Car B travels -6 kilometers backwards.
4. At high tide, the sea level is 7 meters above the average sea level, and at low tide, it is -4 meter below the average sea level.

Name: Answer Key

1. Steven owes \$20 and Janelle owes \$15. Use and inequality to compare the two debts.
   a. What is the absolute value of -20? 20
   b. What is the absolute value of -15? 15
   c. Which number has a greater absolute value? 20
   d. Write an inequality to compare the absolute values of both numbers?
   20>15

2. On a hot day, the temperature in City A is 35°C, and the temperature in City B is 40°C.
   a. What is the absolute value of 35? 35
   b. What is the absolute value of 40? 40
   c. Which number has a greater absolute value? 40
   d. Write an inequality to compare the absolute values of both numbers?
   35<40

3. Two mountains, Mountain A and Mountain B, have different elevations. Mountain A has an elevation of 3,000 meters above sea level and Mountain B has an elevation of -500 meters below sea level.
   a. What is the absolute value of 3,000? 3,000
   b. What is the absolute value of -500? 500
   c. Which number has a greater absolute value? 3,000
   d. Write an inequality to compare the absolute values of both numbers?
   3,000 > 500

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4. On a winter day, the temperature in City A is 8°C, and the temperature in City B is -5°C.

   a. What is the absolute value of 8? 8

   b. What is the absolute value of -5? 5

   c. Which number has a greater absolute value? 8

   d. Write an inequality to compare the absolute values of both numbers?

      8 > 5

Name: Answer Key

G6 U6 Lesson 3 - Independent Practice

Directions: For each scenario, use absolute value and inequalities to compare and interpret the given positive and negative rational numbers

1. Jane has $100 in her bank account, and Mark has a debt of -$50.

$|100| = 100$

$|-50| = 50$

$100 > 5$

2. Mountain A has an elevation of 2,000 meters above sea level, and Mountain B has an elevation of -800 meters below sea level.

$|2{,}000| = 2{,}000$

$|{}^{-}800| = 800$

$2{,}000 > 800$

3. Two cars, Car A and Car A, are traveling on a straight road. Car A travels 10 kilometers, forward and Car B travels -6 kilometers backwards.

$|10| = 10$

$|-6| = 6$

$10 > 6$

4. At high tide, the sea level is 7 meters above the average sea level, and at low tide, it is -4 meter below the average sea level.

$|7| = 7$

$|-4| = 4$

G6 U6 Lesson 4

Find and plot pairs of rational numbers on a 4-quadrant coordinate plane

CITYTUTOR DC

G6 U6 Lesson 1 – Explore the coordinate plane

Materials/Prep:

- Copies of coordinate planes for every student

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we are going to explore the coordinate plane. We're going to take what we learned about positive and negative numbers and think about how they apply to graphing numbers on a coordinate plane.

Let's Talk (Slide 3): So, let's start with talking about what we already know. Some of you probably explored this last year, and maybe you already began to explore it this year. Let's discuss what we know about graphing points on a coordinate plane. If students are struggling, show them the coordinate plane on Slide 4. Possible Student Answers, Key Points:

- When we graph points on the coordinate, there is an x and y coordinate.
- We usually graph the x coordinate first, then the y coordinate.
- When we write the coordinate of a point, we always right the x coordinate first then the y coordinate like (1, 2).
- The x axis goes across, the y axis goes up and down.
- If I'm graphing the x coordinate, I go across. If I'm graphing the y coordinate, I go up (or down).

Let's Talk (Slide 4): Wow, you all know a lot about graphs and graphing points. I know most of you have experience graphing positive integers. So, let's look at this graph, what do you notice and wonder about this graph? Have you ever seen a graph like this before (some students likely have)? Possible Student Answers, Key Points:

- How do you plot points on this graph?
- What do the negative numbers mean?
- Do I graph points the same way on this graph? First x and then y?
- This graph has positive numbers and negative numbers.
- Different portions (quadrants) of the graph will always have positive or negative x or y coordinates.

Those are all great questions and ideas! This is called a coordinate plane and you're exactly right that this coordinate plane has positive and negative numbers. Where the x and y axes intersect is called the origin. The origin is (0,0). We know that the x axis goes across or horizontally (*model with your hands something going across*). So, anything on the x axis that is to the right of the origin will be a positive integer and anything to the left of the origin will be a negative number, just like the number lines we were looking at yesterday. The same is true for the y-axis. The y-axis goes up and down, it's vertical. So, anything above the origin is positive (*point to positive*) and anything below the origin is negative (*point to negative*).

Let's Talk (Slide 5): Each of these sections is called a quadrant.

- Here is quadrant 1 (*point*). Quadrant 1 will always be the top right corner. What can you say about the points in quadrant 1? What will always be true about the x and y axis of ANY point in quadrant 1? The x and y are both positive!
- Here is quadrant 2 (*point*). Quadrant 2 will always be to the top left corner. What can you say about the points in quadrant 2? What will always be true about the x and y axis of ANY point in quadrant 2? The y will be positive but the x will be negative.
- Here is quadrant 3 (*point*). Quadrant 3 will always be the bottom left corner. What can you say about the points in quadrant 3? What will always be true about the x and y axis of ANY point in quadrant 3? They'll both be negative!

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- Here is quadrant 4 (*point*). And finally, quadrant 4 will always be the bottom right corner. They're always counted counter clockwise. What can you say about the points in quadrant 4? What will always be true about the x and y axis of ANY point in quadrant 4? The x will be positive but the y will be negative!

Let's Think (Slide 5-9): So, let's spend some more time exploring the coordinate plane together (*pass out coordinate planes printable for every student*). Let's start at the origin, we know that the origin is where the x and y-axis intersect, it's (0,0). One really, really, really important thing to remember is that when we're plotting points, we always plot the x-axis first (across) and then the y-axis (up and down). So we always go over and then up/down. Say that with me ACROSS FIRST, then UP OR DOWN!

Let's follow the directions, with our fingers let's move to units to the left, where are we? That's right, we're at -2 because anything to the left of 0 is negative! Now it says move 3 units up. Where are we (A, B, C, D)? And what's the ordered pair for Point A? Remember, just like we go across first, we always write the x first and then the y. So we're at (-2, 3).

Repeat steps for Slides 6-9.

Let's Think (Slide 10): Whoa, you all just plotted points in all four quadrants of our coordinate plane. Let's look at Points A, B, C, and D and talk about how they're the same and how they're different. Possible Student Answers, Key Points:

- The points all have 3 and 2 in them but they switch from positive to negative and from the x-axis to the y-axis.
- One point has a positive x and a positive y, another point has a positive x and a negative y, etc.
- A and B share the same y but have different points on the x-axis.
- A and C share the same x but have different points on the y-axis.
- Follow-Up: Imagine that your friend told you that the coordinates for Point A were (3, -2), what would you say to them?

Let's Try it (Slides 11-12): Now let's work on plotting points on the coordinate plane together. We're going to work on this page together, step-by-step. Remember, we plot the x point first (horizontally) and then the y point!

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WARM WELCOME

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Today we will explore the coordinate plane.

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Let's Talk:

What do you know about graphing points on a coordinate plane?

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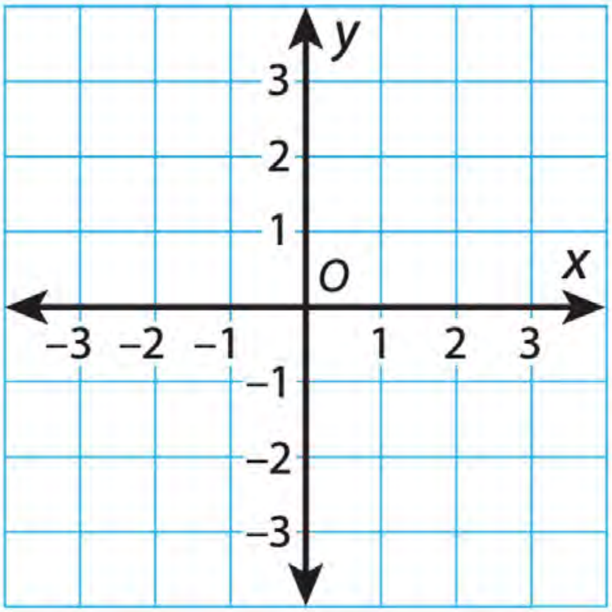
Let's Talk:

What do you notice and wonder about the graph to the right?



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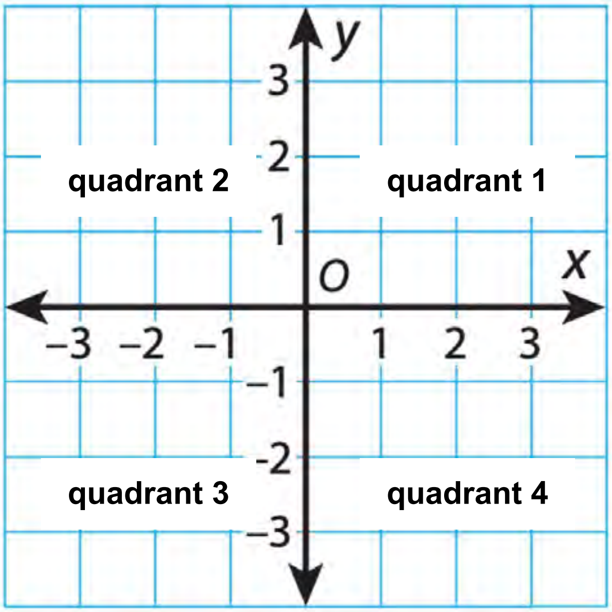
Let's Talk:

What do you notice and wonder about the graph to the right?



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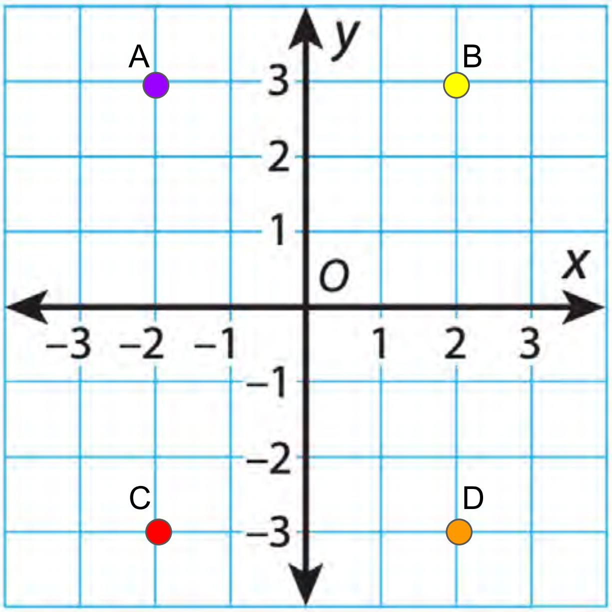
Let's Think:

Put your finger on the origin.

Move 2 units to the left and 3 units up.

Where are you? ______

What's the ordered pair? (____, ____)



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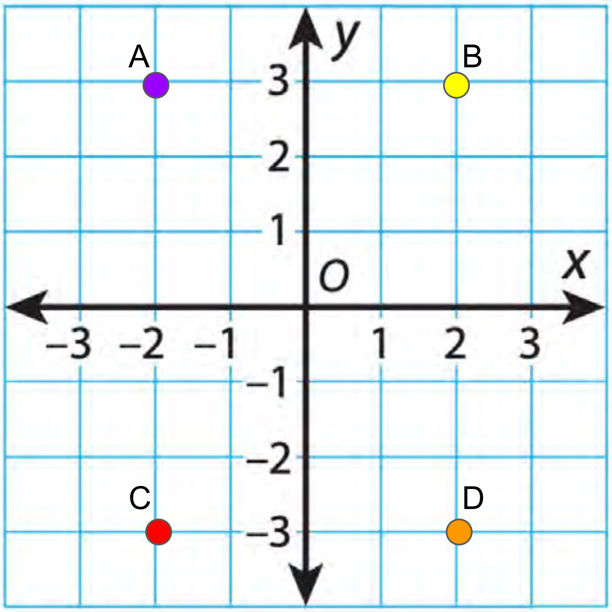
Let's Think:



Put your finger on the origin.

Move 2 units to the left and 3 units down.

Where are you? ______

What's the ordered pair? (____, ____)

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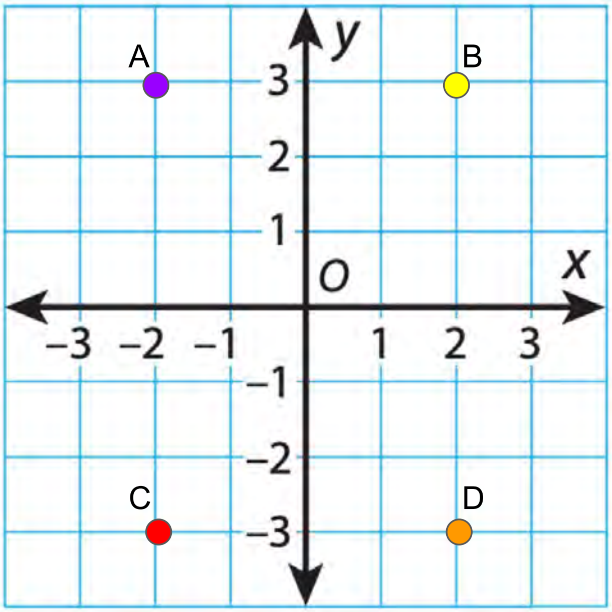
Let's Think:



Put your finger on the origin.

Move 2 units to the right and 3 units down.

Where are you? ______

What's the ordered pair? (____, ____)

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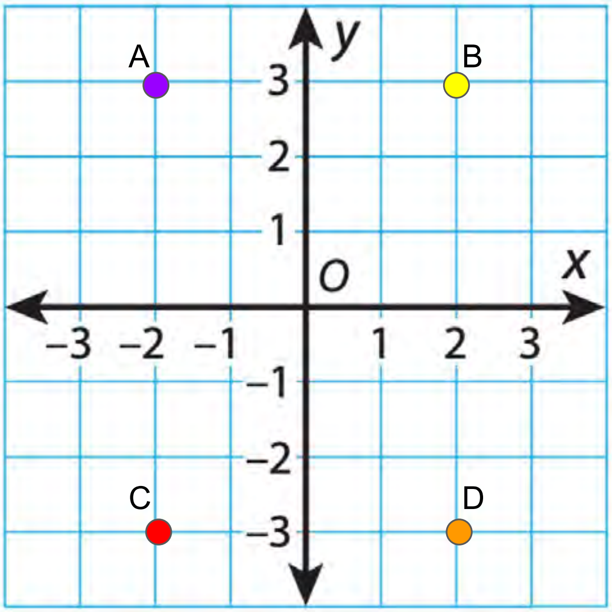
Let's Think:



Put your finger on the origin.

Move 2 units to the right and 3 units up.

Where are you? ______

What's the ordered pair? (____, ____)

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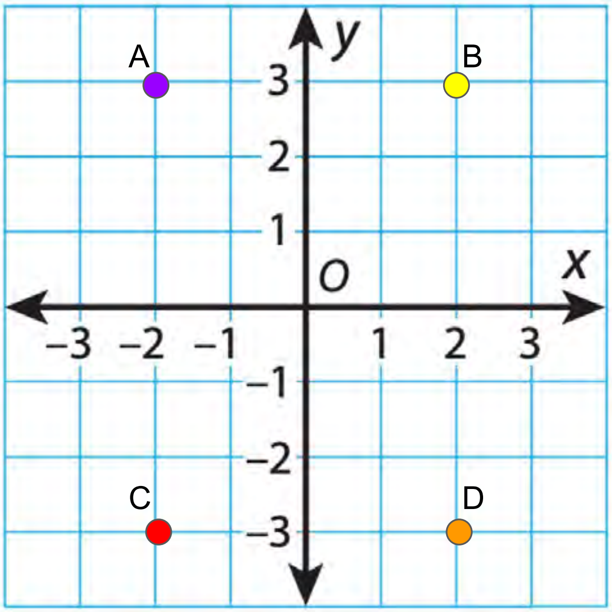
Let's Think:



Let's Talk:
How are Points A, B, C, and D similar and different?

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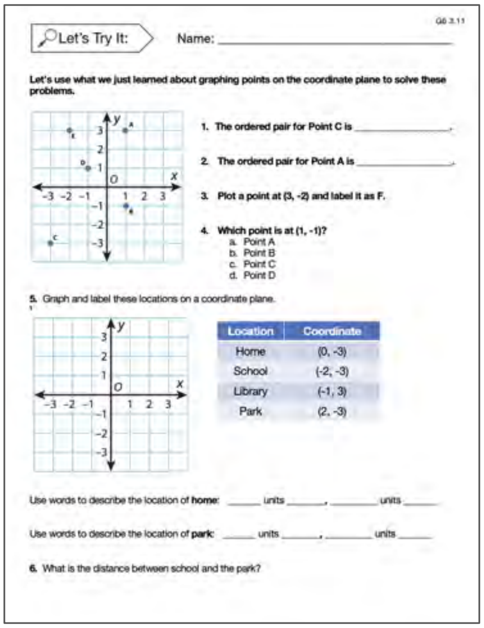
Let's Try It:

Let's explore coordinate planes together.



Let's Try It: Name: ___________________ G6 3.11

Let's use what we just learned about graphing points on the coordinate plane to solve these problems.

1. The ordered pair for Point C is ______________.

2. The ordered pair for Point A is ______________.

3. Plot a point at (3, -2) and label it as F.

4. Which point is at (1, -1)?
  a. Point A
  b. Point B
  c. Point C
  d. Point D

5. Graph and label these locations on a coordinate plane.

Location	Coordinate
Home	(0, -3)
School	(-2, -3)
Library	(-1, 3)
Park	(2, -3)

Use words to describe the location of **home**: _____ units ______, ________ units ______

Use words to describe the location of **park**: _____ units ______, ________ units ______

6. What is the distance between school and the park?

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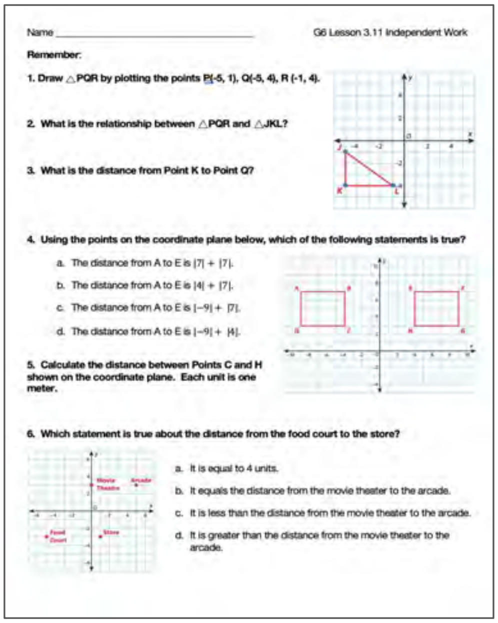
On your Own:

Now it's time to try on your own.



Name ___________________ G6 Lesson 3.11 Independent Work

Remember:

1. Draw △PQR by plotting the points P(-5, 1), Q(-5, 4), R (-1, 4).

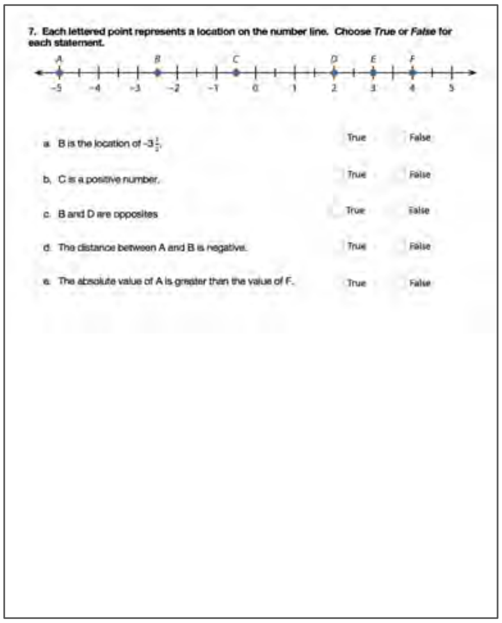
2. What is the relationship between △PQR and △JKL?

3. What is the distance from Point K to Point Q?

4. Using the points on the coordinate plane below, which of the following statements is true?
  a. The distance from A to E is |7| + |7|.
  b. The distance from A to E is |4| + |7|.
  c. The distance from A to E is |−9| + |7|.
  d. The distance from A to E is |−9| + |4|.

5. Calculate the distance between Points C and H shown on the coordinate plane. Each unit is one meter.

6. Which statement is true about the distance from the food court to the store?
  a. It is equal to 4 units.
  b. It equals the distance from the movie theater to the arcade.
  c. It is less than the distance from the movie theater to the arcade.
  d. It is greater than the distance from the movie theater to the arcade.



7. Each lettered point represents a location on the number line. Choose *True* or *False* for each statement.

a. B is the location of $-3\frac{1}{2}$. ☐ True ☐ False

b. C is a positive number. ☐ True ☐ False

c. B and D are opposites ☐ True ☐ False

d. The distance between A and B is negative. ☐ True ☐ False

e. The absolute value of A is greater than the value of F. ☐ True ☐ False

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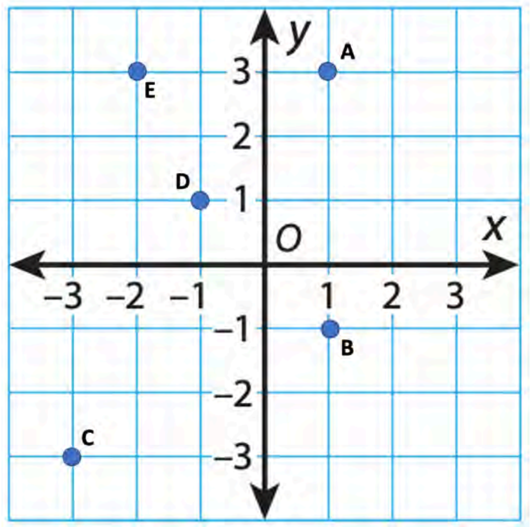
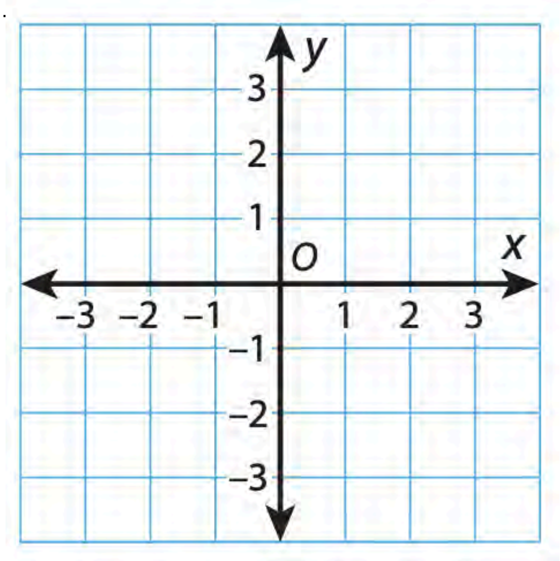
Name: ____ G6 U6 Lesson 4 - Let's Try It

Let's use what we just learned about graphing points on the coordinate plane to solve these problems.



1. **The ordered pair for Point C is ____________________.**
2. **The ordered pair for Point A is ____________________.**
3. **Plot a point at (3, -2) and label it as F.**
4. **Which point is at (1, -1)?**
   a. Point A
   b. Point B
   c. Point C
   d. Point D

5. Graph and label these locations on a coordinate plane.



Location	Coordinate
Home	(0, -3)
School	(-2, -3)
Library	(-1, 3)
Park	(2, -3)

Use words to describe the location of **home**: _______ units ________, __________ units _______

Use words to describe the location of **park**: _______ units ________, __________ units _______

6. What is the distance between school and the park?

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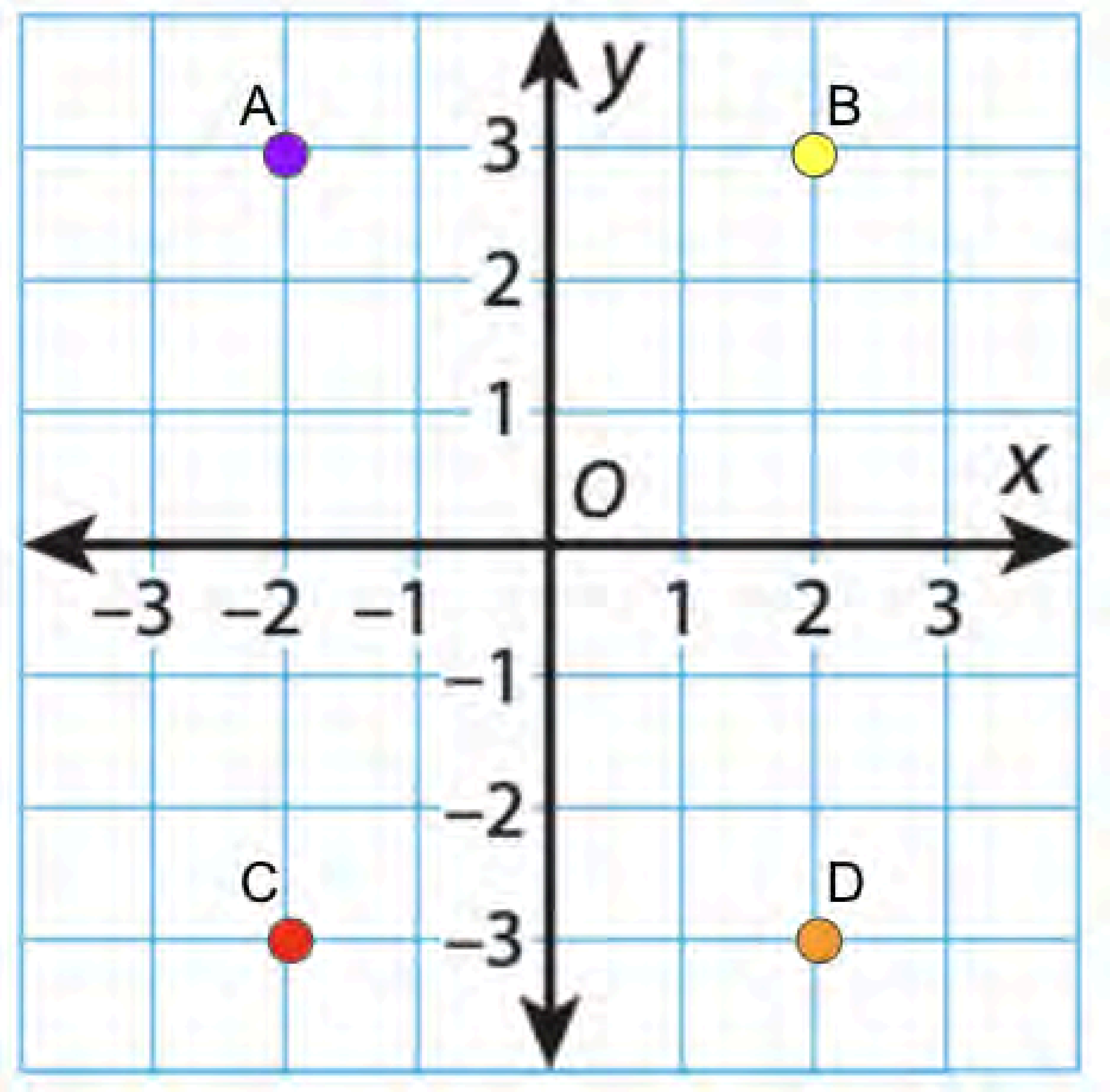

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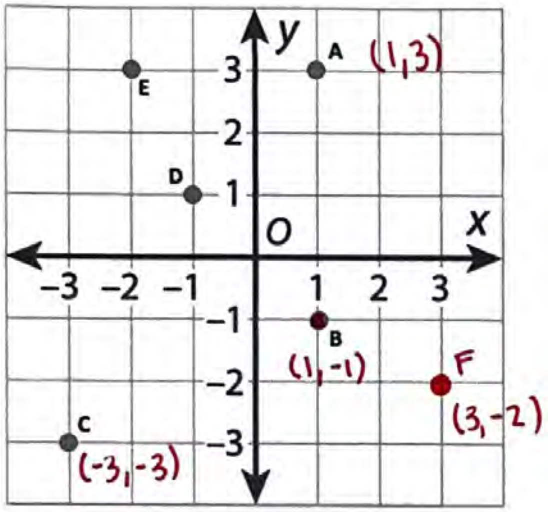
Name: ANSWER KEY

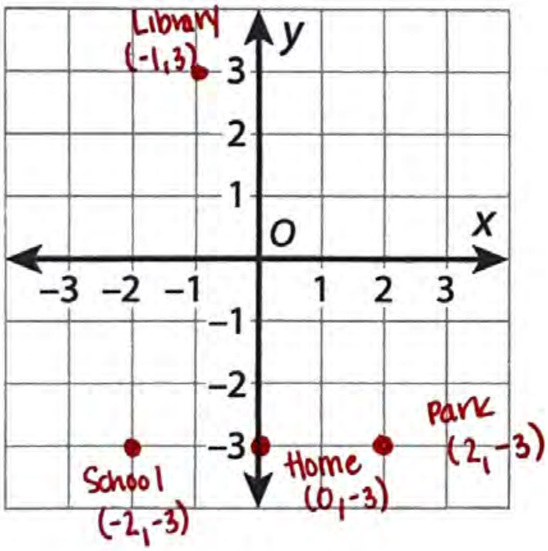
G6 U6 Lesson 4 - Let's Try It

Let's use what we just learned about graphing points on the coordinate plane to solve these problems.



1. **The ordered pair for Point C is** (-3, -3) **.**
2. **The ordered pair for Point A is** (1,3) **.**
3. **Plot a point at (3, -2) and label it as F.** ✓
4. **Which point is at (1, -1)?**
   - a. Point A
   - [✓ b.] Point B
   - c. Point C
   - d. Point D

5. Graph and label these locations on a coordinate plane.



Location	Coordinate
Home	(0, -3) ✓
School	(-2, -3) ✓
Library	(-1, 3) ✓
Park	(2, -3) ✓

Use words to describe the location of **home**: 0 units left or right, 3 units down

Use words to describe the location of **park**: 2 units right, 3 units down

6. What is the distance between school and the park? 4 units

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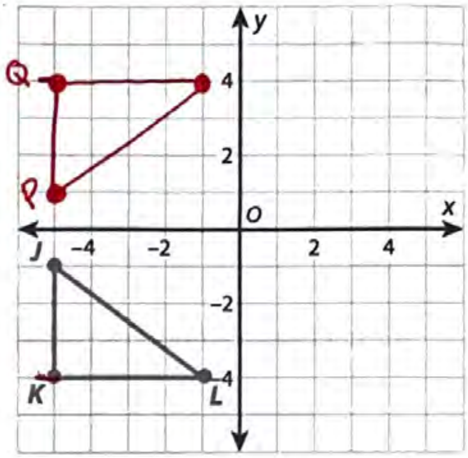
Name: ANSWER KEY

G6 U6 Lesson 4 - Independent Work



1. ✓ **Draw △PQR by plotting the points P(-5, 1), Q(-5, 4), R (-1, 4).**

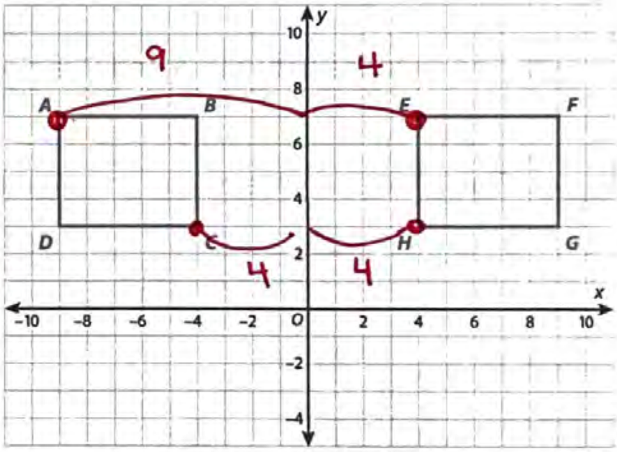
2. What is the relationship between △PQR and △JKL?

It's the same but flipped over!

3. What is the distance from Point K to Point Q?

8

4. Using the points on the coordinate plane below, which of the following statements is true?



a. The distance from A to E is |7| + |7|. = 14

b. The distance from A to E is |4| + |7|. = 11

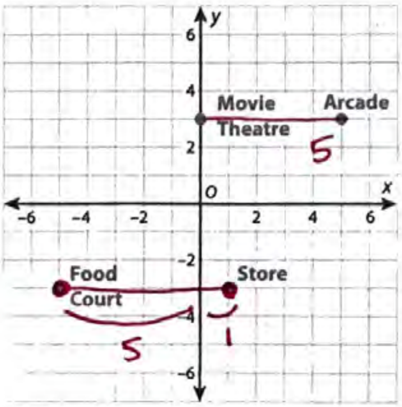
c. The distance from A to E is $\overset{9+7}{|-9| + |7|}$. = 16

[✓ d.] The distance from A to E is $\overset{9+4}{|-9| + |4|}$. = 13

5. Calculate the distance between Points C and H shown on the coordinate plane. Each unit is one meter.

4 m + 4 m = 8 m

6. Which statement is true about the distance from the food court to the store?



~~a.~~ It is equal to 4 units.

~~b.~~ It equals the distance from the movie theater to the arcade.

~~c.~~ It is less than the distance from the movie theater to the arcade.

✓ d. It is greater than the distance from the movie theater to the arcade. 6 > 5

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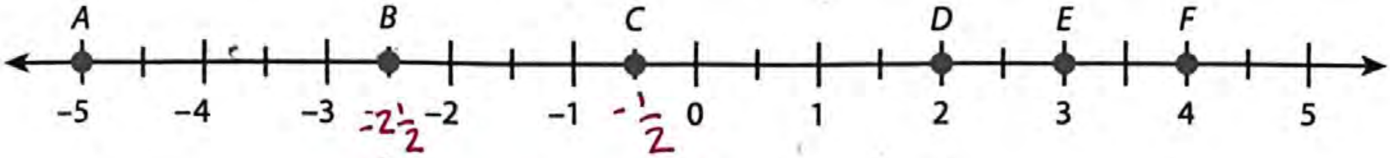
7. Each lettered point represents a location on the number line. Choose *True* or *False* for each statement.



a. B is the location of -3 $\frac{1}{2}$. ☐ True ☒ False

b. C is a positive number. ☐ True ☒ False

c. B and D are opposites ☐ True ☒ False

d. The distance between A and B is negative. ☐ True ☒ False

e. The absolute value of A is greater than the value of F. ☑ True ☐ False

$|-5| > 4$

↓

$5 > 4$

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G6 U6 Lesson 5

Use coordinates to find distances and reflections on the coordinate plane

CITYTUTOR DC

G6 U6 Lesson 5 - We will use coordinates to find distances and reflections on the coordinate plane

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use coordinates to find distances and reflections on the coordinate plane. We will take the information we already know about coordinate planes and coordinate pairs to help us access today's lesson.

Let's Talk (Slide 3): Before we start today's lesson, **let's review what we know about the coordinate plane.** Possible Answer Answers, Key Points:

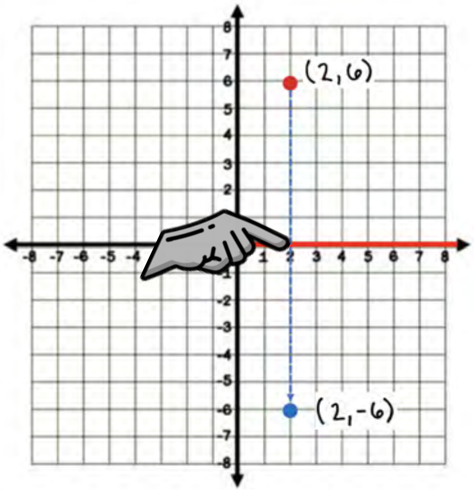
- The coordinate plane is a grid with horizontal and vertical lines intersecting at the origin (0,0)
- We use ordered pairs (x, y) to represent points on the coordinate plane.

That is correct! The coordinate plane is a grid with horizontal and vertical lines intersecting at the origin (0,0) We use ordered pairs (x, y) to represent points on the coordinate plane. You all have a good understanding of the coordinate plane. **What do you think of when you hear the word reflection?** Possible Answer Answers, Key Points:

- A reflection is like looking in a mirror.
- When you see a reflection it is flipped or inverted like when you take a selfie

That is correct! A reflection is like looking in a mirror. Let me show you what a reflection is on the coordinate plane.

Let's Think (Slide 4): On the coordinate plane we can reflect points over the x-axis (*trace with finger*) or over the y-axis (*trace with finger*). When we're reflecting a point over the access, it means we're basically taking it and flipping it over the given axis. There's a pattern that we might notice for reflecting over the two axes, let's see if we can figure it out.



Let's start by plotting Point P(2,6). We start on the x-axis, go to over 2 to the right and then up 6 (*plot point*). Let's label it with its coordinates..(2, 6).

Now it says to reflect Point P over the x-axis. That means that I want to reflect this point over this line (*trace x-axis with highlighter*). Point P is 6 spaces away from the x-axis (*count*) so when we reflect it over the x-axis it has to be 6 spaces away from the x-axis in the opposite quadrant (*count down 6 spaces*). The x coordinate isn't changing, it's like I'm walking in a straight line, crossing this big street which is the x-axis then traveling the same distance).

So, Point P reflected over the x-axis is (2, -6). How did our coordinates change when we reflected Point P over the x-axis? Possible Student Answers, Key Points:

- The x coordinate stayed the same but the y-coordinate changed to negative, or the opposite.
- They're in a straight line up and down
- It crossed over the x-axis right at 2.

And, to find the distance between the two points, just like we were working on yesterday, we can count the spaces (*point and count*). The distance is 12 units. But, we can also write an equation, we could say the distance from -6 to zero PLUS the distance from 0 to 6. This is where the idea of absolute value comes in! We can write |-6| + 6 = 12 to show how to find the distance.

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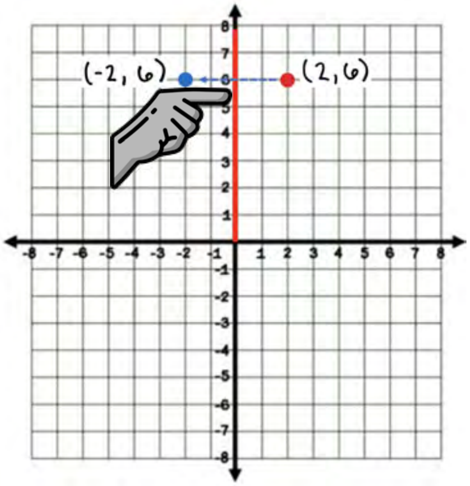
Guess what? We can also reflect points over the y-axis. Let's explore what happens when we reflect points over the y-axis (*trace with finger*).



Just like when we reflect over the x-axis, we can imagine that we're walking in a straight line and cross a big street, the y-axis. We need to travel the same distance on each side of the street.

So, in order to get from Point P to the y-axis, there were 2 spaces. That means that we need to travel 2 spaces on the other side of the y-axis as well.

There, we walked in a straight line from Point P and crossed the y-axis. We made sure that the distance between the y-axis and the reflected point were the same as the original point.

Now, let's label our new point, we're at -2 on the x-axis and we're still at 6 on the y-axis!

What do you notice happened to our coordinate points when we reflected Point P over the y-axis? Possible Student Answers, Key Points:

- It has the same numbers 2 and 6 but the x coordinate changed from positive to negative
- It's at the same point on the y-axis but the x-axis coordinates changed.

That's right, those are really good reflections! Everybody, plot a different point on your coordinate plane.

- Now, reflect it over the x-axis. What happened?
- Now, reflect it over the y-axis. What happened?
-

Those are interesting! You notice that when you reflect over the x-axis, the x-coordinate stays the same but the y-coordinate changes to the opposite (either positive or negative). And the opposite is true when you reflect over the y-axis. You notice that the y-coordinate stays the same but the x-coordinate changes to the opposite. Don't forget…

- **Reflecting over the x-axis:** If you have a point (x, y), its reflection over the x-axis will be (x, -y). The x-coordinate remains the same, but the y-coordinate changes to its opposite.
- **Reflecting over the y-axis:** If you have a point (x, y), its reflection over the y-axis will be (-x, y). The y-coordinate remains the same, but the x-coordinate changes to its opposite.

Let's Try it (Slides 6-7): In today's lesson, we explored how we can reflect points over either the x- or y-axis. Remember, if you have a point (x, y), its reflection over the x-axis will be (x, -y). The x-coordinate remains the same, but the y-coordinate changes to its opposite. And, if you have a point (x, y), its reflection over the y-axis will be (-x, y). The y-coordinate remains the same, but the x-coordinate changes to its opposite.

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WARM WELCOME

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We will use coordinates to find distances and reflections on the coordinate plane.

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Let's Review:

Let's review what we know about the coordinate plane

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Let's Talk:

What do you think of when you hear the word reflection?

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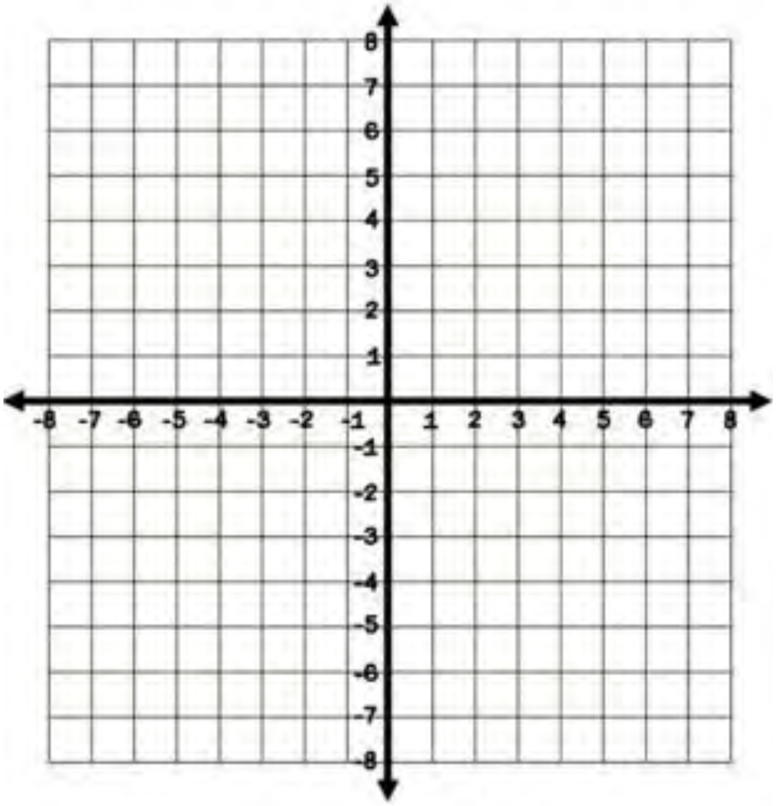
Let's Think:

Plot Point P(2,6)

Reflect P over the x-axis.

Reflect P over the y-axis.



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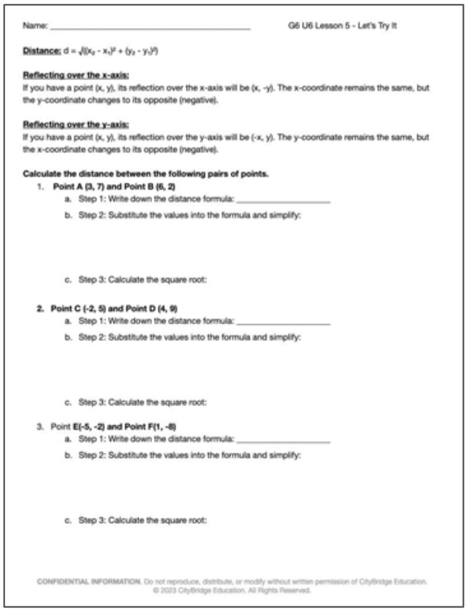
Let's Try It:

Let's practice together.



Name: ______________________ G6 U6 Lesson 5 - Let's Try It

Distance: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Reflecting over the x-axis:
If you have a point (x, y), its reflection over the x-axis will be (x, -y). The x-coordinate remains the same, but the y-coordinate changes to its opposite (negative).

Reflecting over the y-axis:
If you have a point (x, y), its reflection over the y-axis will be (-x, y). The y-coordinate remains the same, but the x-coordinate changes to its opposite (negative).

Calculate the distance between the following pairs of points.

1. **Point A (3, 7) and Point B (6, 2)**
   a. Step 1: Write down the distance formula: ______________
   b. Step 2: Substitute the values into the formula and simplify:
   c. Step 3: Calculate the square root:
2. **Point C (-2, 5) and Point D (4, 9)**
   a. Step 1: Write down the distance formula: ______________
   b. Step 2: Substitute the values into the formula and simplify:
   c. Step 3: Calculate the square root:
3. Point **E(-5, -2) and Point F(1, -8)**
   a. Step 1: Write down the distance formula: ______________
   b. Step 2: Substitute the values into the formula and simplify:
   c. Step 3: Calculate the square root:

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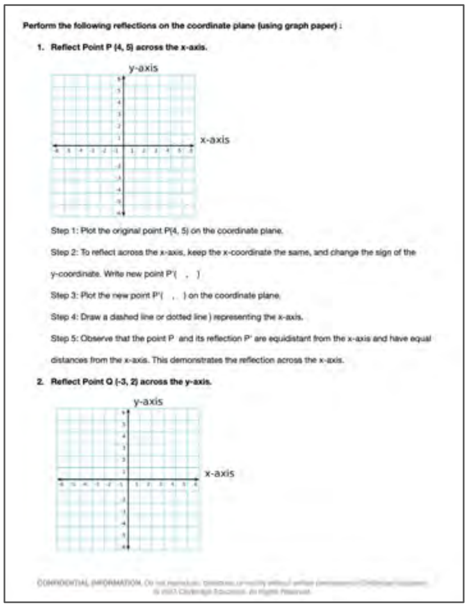

Perform the following reflections on the coordinate plane (using graph paper) :

1. **Reflect Point P (4, 5) across the x-axis.**

y-axis
x-axis

Step 1: Plot the original point P(4, 5) on the coordinate plane.

Step 2: To reflect across the x-axis, keep the x-coordinate the same, and change the sign of the y-coordinate. Write new point P'(,)

Step 3: Plot the new point P'(,) on the coordinate plane.

Step 4: Draw a dashed line or dotted line) representing the x-axis.

Step 5: Observe that the point P and its reflection P' are equidistant from the x-axis and have equal distances from the x-axis. This demonstrates the reflection across the x-axis.

2. **Reflect Point Q (-3, 2) across the y-axis.**

y-axis
x-axis

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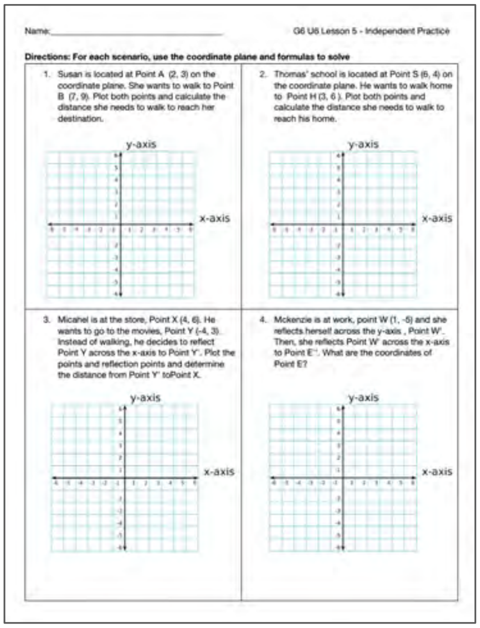
On your Own:

Let’s try on our own.



Name:______________________________ G6 U6 Lesson 5 - Independent Practice

Directions: For each scenario, use the coordinate plane and formulas to solve

1. Susan is located at Point A (2, 3) on the coordinate plane. She wants to walk to Point B (7, 9). Plot both points and calculate the distance she needs to walk to reach her destination.

2. Thomas' school is located at Point S (6, 4) on the coordinate plane. He wants to walk home to Point H (3, 6). Plot both points and calculate the distance she needs to walk to reach his home.

3. Micahel is at the store, Point X (4, 6). He wants to go to the movies, Point Y (-4, 3). Instead of walking, he decides to reflect Point Y across the x-axis to Point Y'. Plot the points and reflection points and determine the distance from Point Y' toPoint X.

4. Mckenzie is at work, point W (1, -5) and she reflects herself across the y-axis , Point W'. Then, she reflects Point W' across the x-axis to Point E''. What are the coordinates of Point E?

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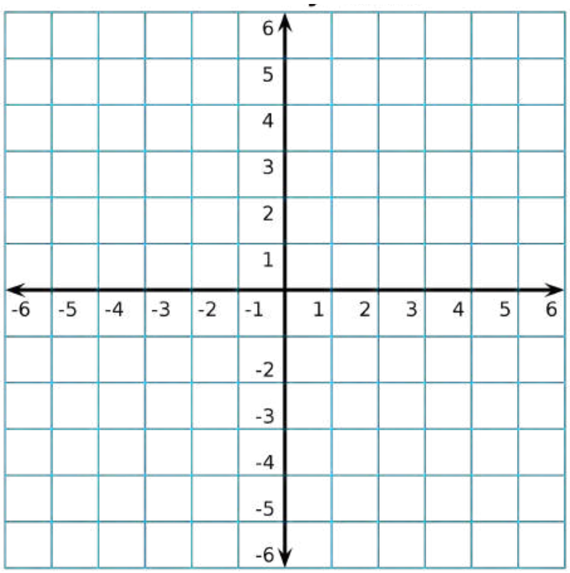
Name: ____ G6 U6 Lesson 5 - Let’s Try It

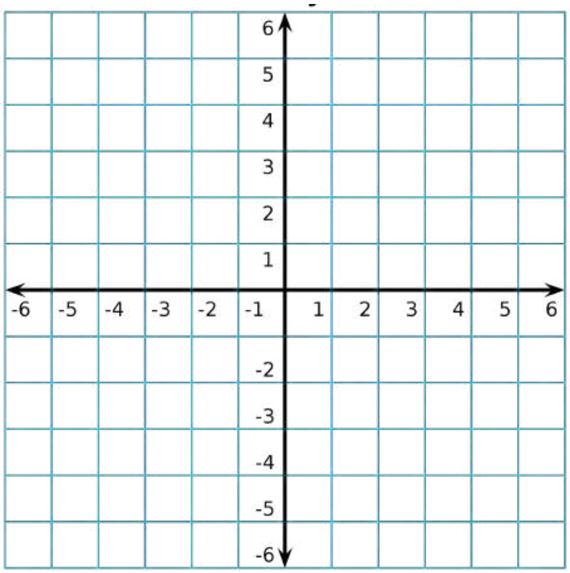
Directions: Perform the following reflections on the coordinate plane (using graph paper):

1. **Reflect Point P (4, 5) across the x-axis. Label it as Point Q.**



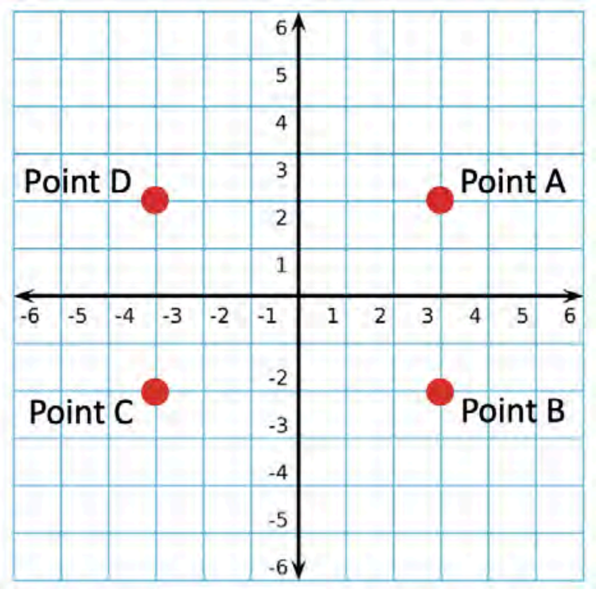
2. **What is the distance between Point P and Point Q?**

3. **Reflect Point R (-3, 2) across the y-axis. Label it as Point S.**



4. **What is the distance between Point R and Point S?**

5. **Which point shows (3, 2) reflected over the y-axis?**



a. **Point A**

b. **Point B**

c. **Point C**

d. **Point D**

e. **None of the above**

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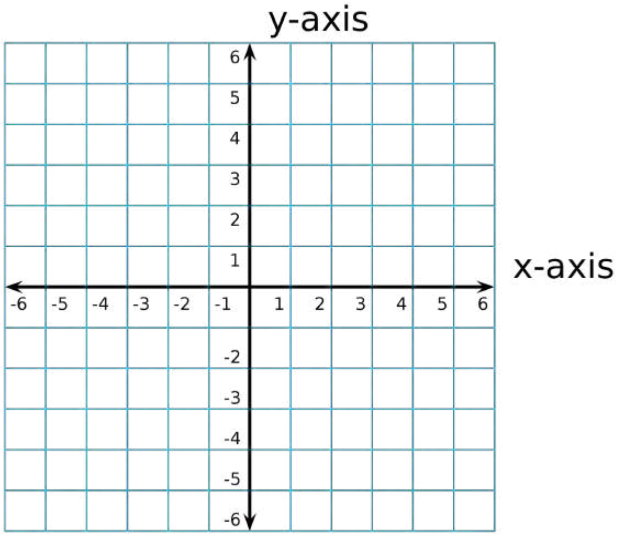
Name:______________________________________ G6 U6 Lesson 5 - Independent Work

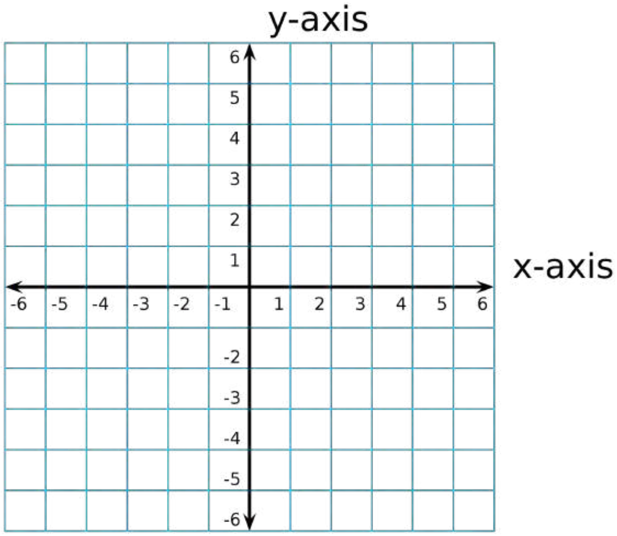
Directions: For each scenario, use the coordinate plane to solve.

1. Reflect Point A (2, 3) over the x-axis. What is the new point? Label it as Point B.



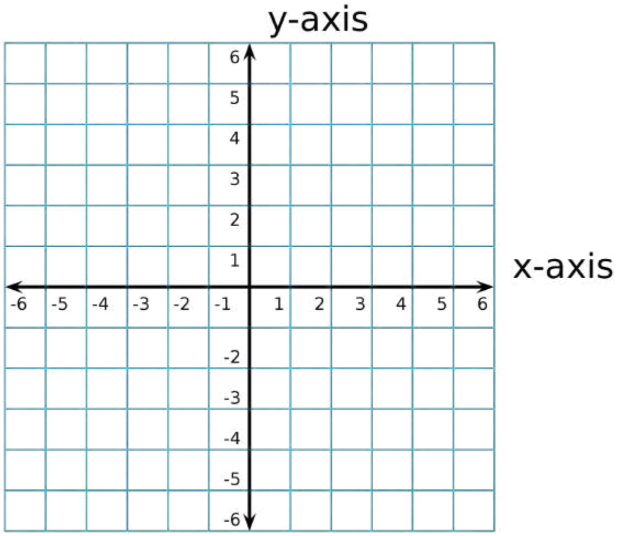
2. What is the distance between Point A and Point B?

3. Reflect Point C (-3, 3) over the y-axis. What is the new point? Label it as Point D.



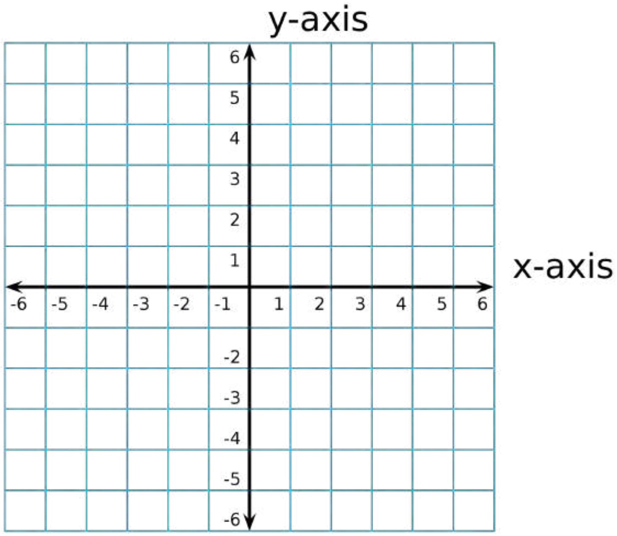
4. What is the distance between Point C and Point D?

5. Reflect Point E (3, -5) over the y-axis. What is the new point? Label it as Point F.



6. What is the distance between Point E and Point F?

7. Reflect Point G (-2, -4) over the x-axis. What is the new point? Label it as Point H.



8. What is the distance between Point G and Point H?

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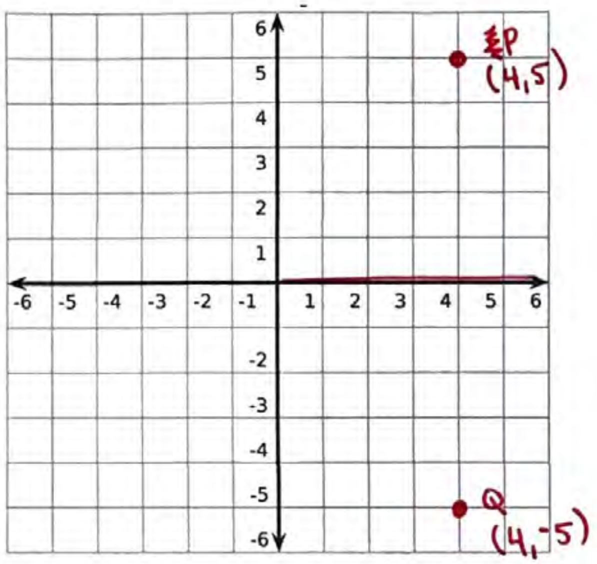
Name: ANSWER KEY

Directions: Perform the following reflections on the coordinate plane (using graph paper):

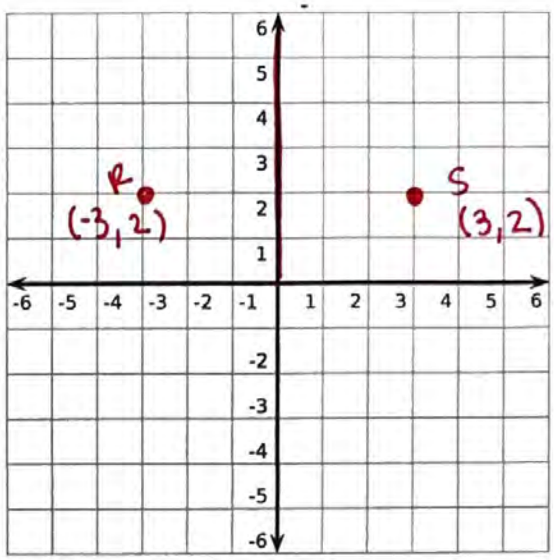
1. **Reflect Point P (4, 5) across the x-axis. Label it as Point Q.**



2. **What is the distance between Point P and Point Q?**

10 units

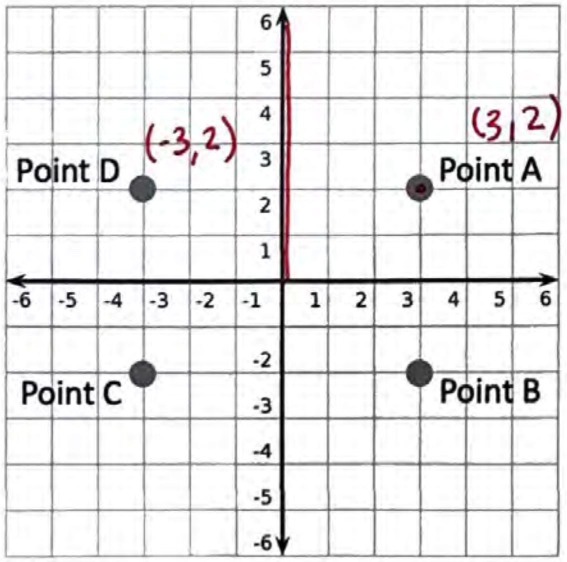
3. **Reflect Point R (-3, 2) across the y-axis. Label it as Point S.**



4. **What is the distance between Point R and Point S?**

6 units

5. **Which point shows (3, 2) reflected over the y-axis?**



a. **Point A**

b. **Point B**

c. **Point C**

[✓ d. **Point D**]

e. **None of the above**

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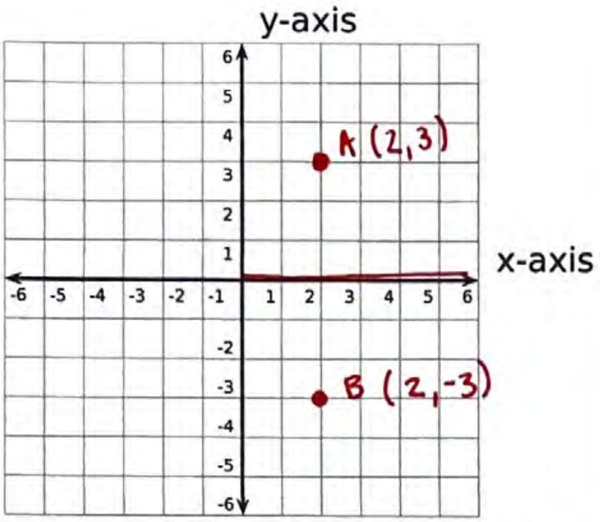
Name: ANSWER KEY

Directions: For each scenario, use the coordinate plane to solve.

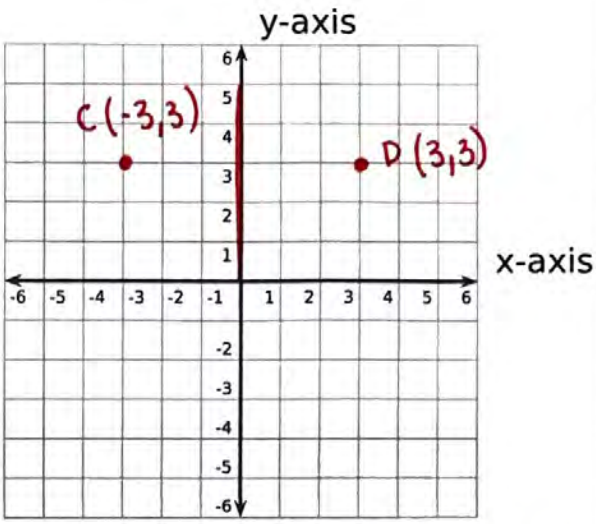
1. Reflect Point A (2, 3) over the x-axis. What is the new point? Label it as Point B.



2. What is the distance between Point A and Point B?

6 units

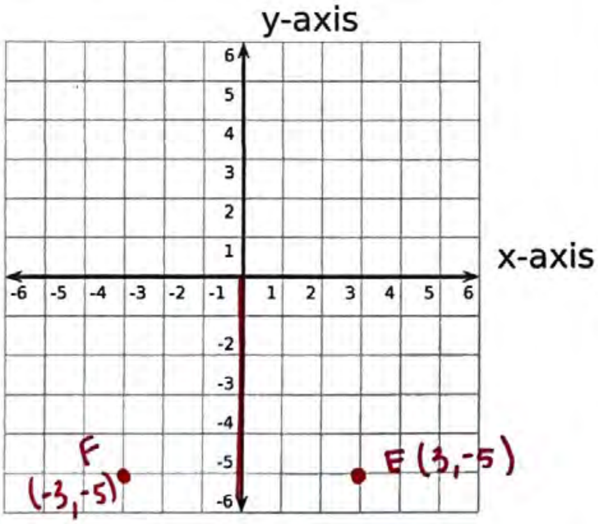
3. Reflect Point C (-3, 3) over the y-axis. What is the new point? Label it as Point D.



4. What is the distance between Point C and Point D?

6 units

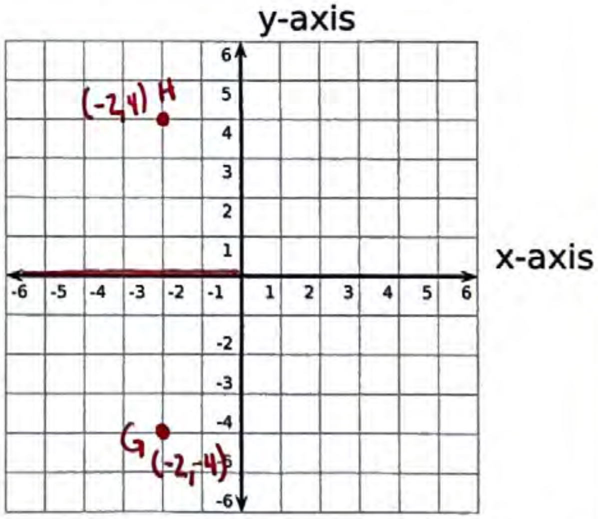
5. Reflect Point E (3, -5) over the y-axis. What is the new point? Label it as Point F.



6. What is the distance between Point E and Point F?

6 units

7. Reflect Point G (-2, -4) over the x-axis. What is the new point? Label it as Point H.



8. What is the distance between Point G and Point H?

8 units

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G6 U6 Lesson 6

Plot points on the coordinate plane to make polygons, and solve problems about vertical and horizontal distance between points

CITYTUTOR DC

G6 U6 Lesson 6 - Plot points on the coordinate plane to make polygons, and solve problems about vertical and horizontal distance between points.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will continue our exploration of the coordinate plane. By the end of this lesson, you will be able to plot points to create polygons.

Let's Talk (Slide 3): Before we begin, let's quickly review what we've learned so far about the coordinate plane. **Who can tell me what the x-coordinate and y-coordinate represent?** Possible Answer Answers, Key Points:

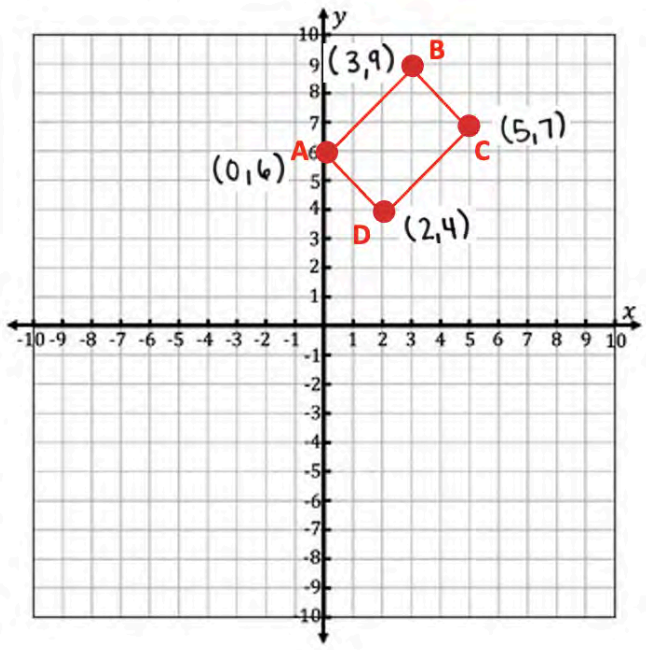
- The coordinate plane is a grid with horizontal and vertical lines intersecting at the origin (0,0)
- We use ordered pairs (x, y) to represent points on the coordinate plane.

That is correct. The coordinate plane is a grid with horizontal and vertical lines intersecting at the origin (0,0) We use ordered pairs (x, y) to represent points on the coordinate plane. **Now what do you know about polygons?** Possible Answer Answers, Key Points:

- A polygon is a two-dimensional shape made up of straight lines and closed sides.
- A shape formed by connecting multiple points called vertices with line segments called sides.
- The sides do not intersect, and the shape is fully enclosed, meaning it forms a closed figure.
- Polygons come in various shapes and sizes, and they can have different numbers of sides.
- Some examples of polygons are triangles, rectangles, and squares.

That is correct. A polygon is a two-dimensional shape made up of straight lines and closed sides. Some examples are triangles, rectangles, and squares.

Let's Think (Slide 4): Today, we will take our understanding of the coordinate plane further by plotting points to form polygons. Let's start by thinking about how to create or make polygons. In order to create a polygon on the coordinate plane, we need to plot a series of points and connect them with straight lines. The order in which we plot the points matters, as it determines the shape of the polygon.



Let's explore that. This says to plot the following points: A (0, 6), B (3, 9), C (5, 7), and D (2, 4).

Let's start with A, x is o and 7 is 6 (*plot and label point*).

Now, B…x is 3 and y is 9 (*plot and label point*).

And, C…x is 5 and y is 7 (*plot and label point*).

And finally D…X is 2 and y is 4 (*plot and label point*).

Okay, now that we've plotted our points, let's use straight lines to connect the points in order…A to B, B to C, C to D and D back to A.

Look at that…we made a polygon! **What kind of polygon is this? How do you know?** It's a rectangle because it has 4 right angles and 2 sets of parallel sides!

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Let's Try it (Slides 6-7): Today, we learned how to plot points on the coordinate plane to create polygons on the coordinate plane. Remember when plotting points, go over and then up. Also, use a rule or straight edge to connect dots if you need to!

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WARM WELCOME

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We will plot points on the coordinate plane to make polygons, and solve problems about vertical and horizontal distance between points.

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Let's Review:

What do you already know about the coordinate plane and coordinate pairs?

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Let's Talk:

What do you know about polygons?

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Let’s Think:

Let’s plot points to create polygons.

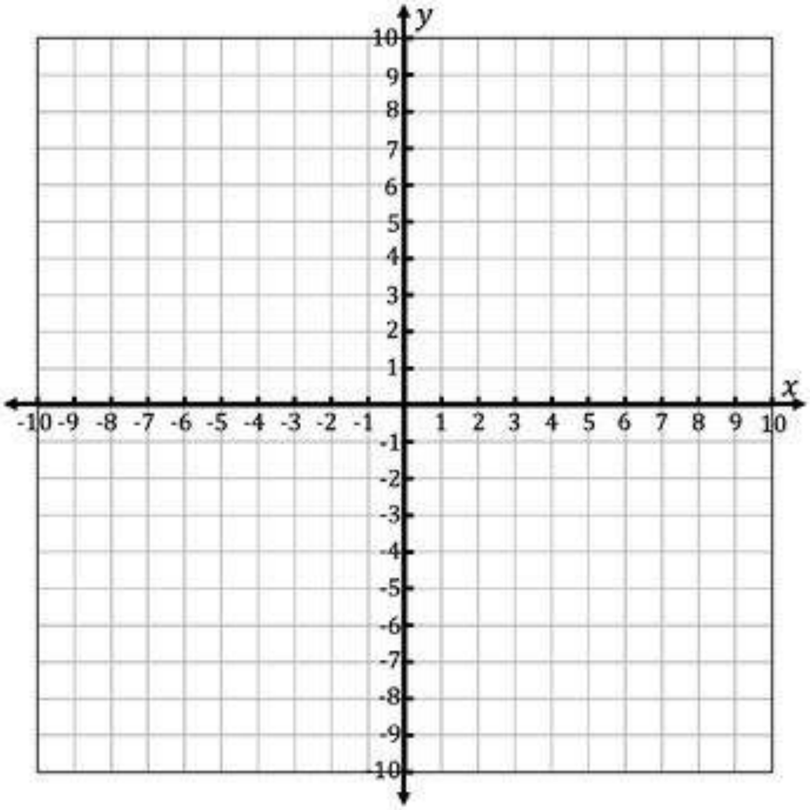
A **(0, 6)**

B **(3, 9)**

C **(5, 7)**

D **(2, 4)**

What shape did we make?



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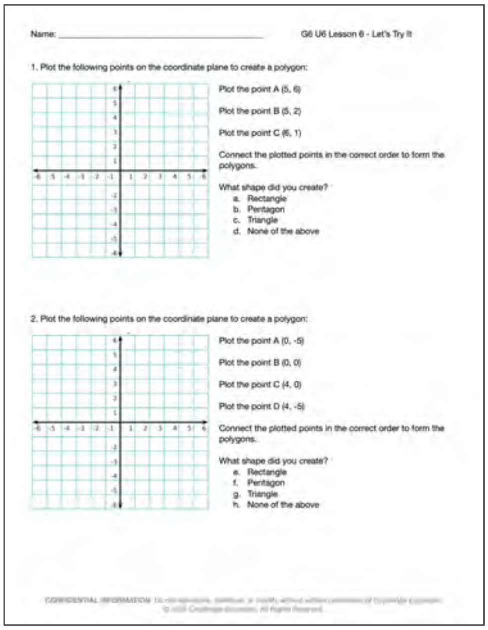
Let’s Try It:

Let’s practice creating polygons on a coordinate plane



Name: ______________________ G6 U6 Lesson 6 - Let’s Try It

1. Plot the following points on the coordinate plane to create a polygon:

Plot the point A (5, 6)

Plot the point B (5, 2)

Plot the point C (6, 1)

Connect the plotted points in the correct order to form the polygons.

What shape did you create?
   a. Rectangle
   b. Pentagon
   c. Triangle
   d. None of the above

2. Plot the following points on the coordinate plane to create a polygon:

Plot the point A (0, -5)

Plot the point B (0, 0)

Plot the point C (4, 0)

Plot the point D (4, -5)

Connect the plotted points in the correct order to form the polygons.

What shape did you create?
   e. Rectangle
   f. Pentagon
   g. Triangle
   h. None of the above

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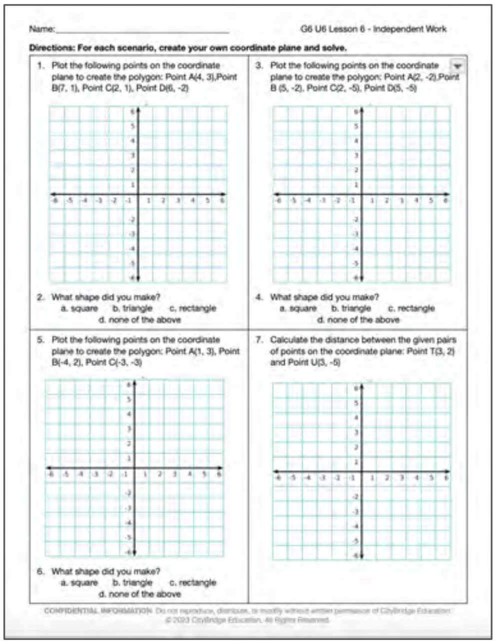
On your Own:

Now try creating polygons on a coordinate plane on your own



Name:______________________________

G6 U6 Lesson 6 - Independent Work

Directions: For each scenario, create your own coordinate plane and solve.

1. Plot the following points on the coordinate plane to create the polygon: Point A(4, 3),Point B(7, 1), Point C(2, 1), Point D(6, -2)
2. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above
3. Plot the following points on the coordinate plane to create the polygon: Point A(2, -2),Point B (5, -2), Point C(2, -5), Point D(5, -5)
4. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above
5. Plot the following points on the coordinate plane to create the polygon: Point A(1, 3), Point B(-4, 2), Point C(-3, -3)
6. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above
7. Calculate the distance between the given pairs of points on the coordinate plane: Point T(3, 2) and Point U(3, -5)

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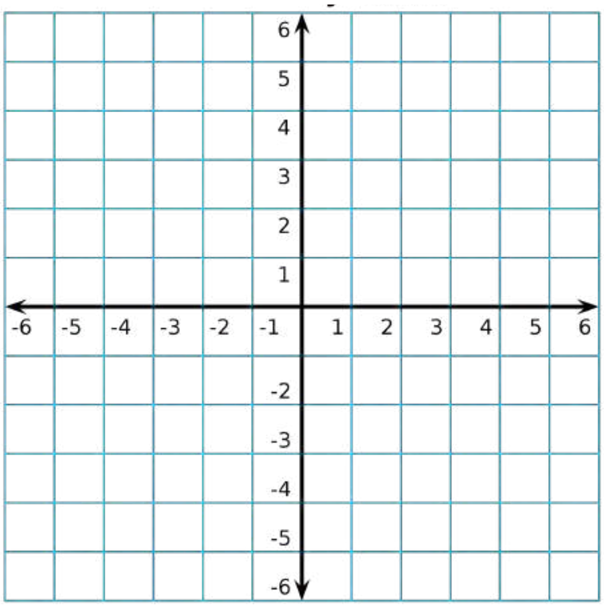
Name: ____ G6 U6 Lesson 6 - Let's Try It

1. Plot the following points on the coordinate plane to create a polygon:



Plot the point A (5, 6)

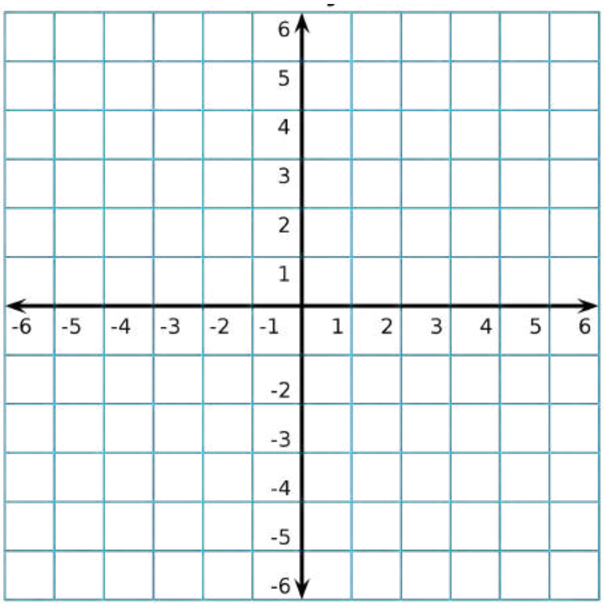
Plot the point B (5, 2)

Plot the point C (6, 1)

Connect the plotted points in the correct order to form the polygons.

What shape did you create?
   a. Rectangle
   b. Pentagon
   c. Triangle
   d. None of the above

2. Plot the following points on the coordinate plane to create a polygon:



Plot the point A (0, -5)

Plot the point B (0, 0)

Plot the point C (4, 0)

Plot the point D (4, -5)

Connect the plotted points in the correct order to form the polygons.

What shape did you create?
   e. Rectangle
   f. Pentagon
   g. Triangle
   h. None of the above

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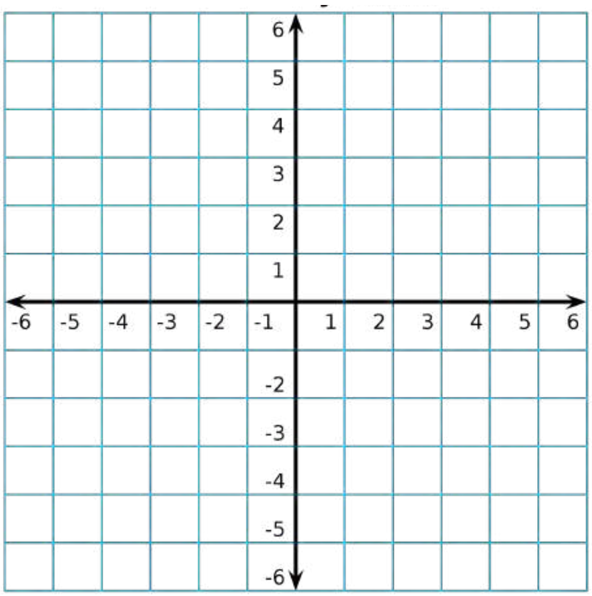
Name:______________________________________ G6 U6 Lesson 6 - Independent Work

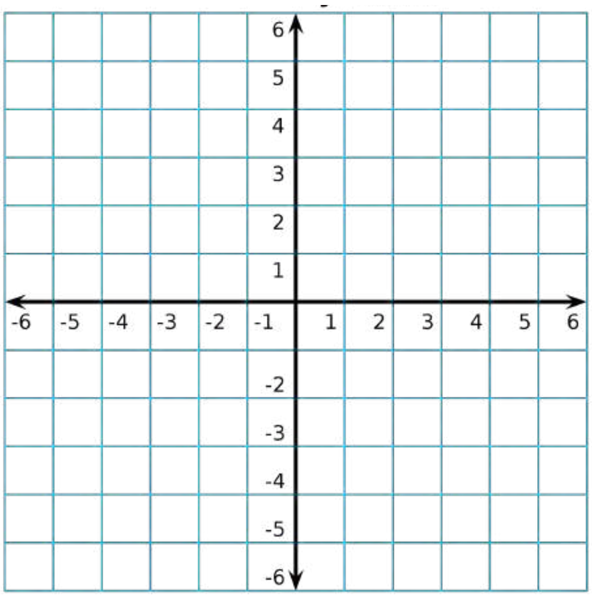
Directions: For each scenario, create your own coordinate plane and solve.

1. Plot the following points on the coordinate plane to create the polygon: Point A(4, 3),Point B(6, 1), Point C(2, 1), Point D(6, -2)



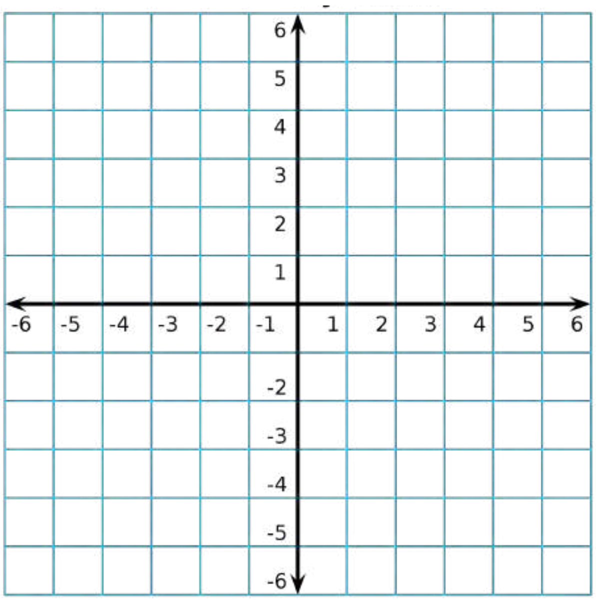
2. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above

3. Plot the following points on the coordinate plane to create the polygon: Point A(2, -2),Point B (5, -2), Point C(2, -5), Point D(5, -5)



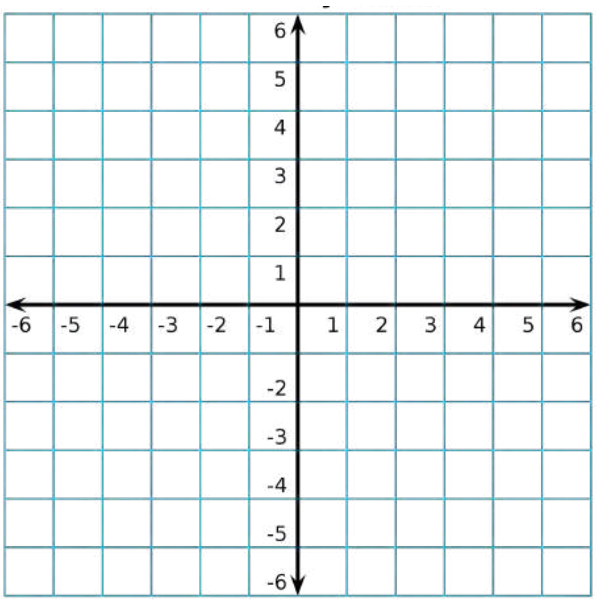
4. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above

5. Plot the following points on the coordinate plane to create the polygon: Point A(1, 3), Point B(-4, 2), Point C(-3, -3)



6. What shape did you make?
   a. square b. triangle c. rectangle
   d. none of the above

7. Calculate the distance between the given pairs of points on the coordinate plane: Point T(3, 2) and Point U(3, -5)



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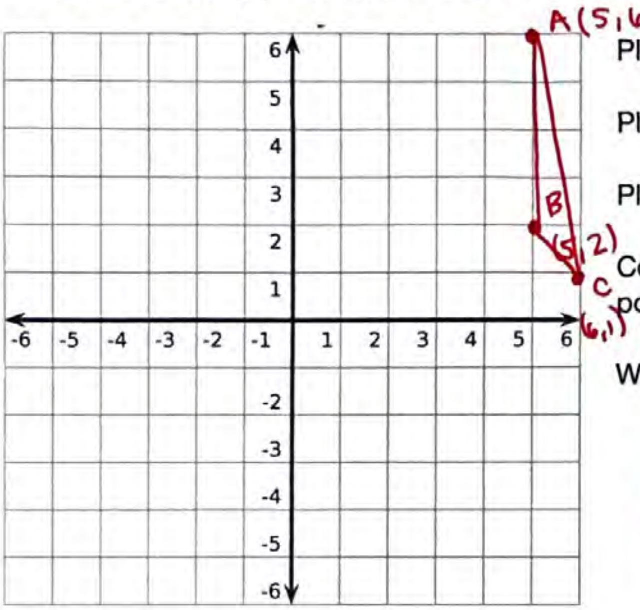
Name: ANSWER KEY

G6 U6 Lesson 6 - Let's Try It

1. Plot the following points on the coordinate plane to create a polygon:



Plot the point A (5, 6) ✓

Plot the point B (5, 2) ✓

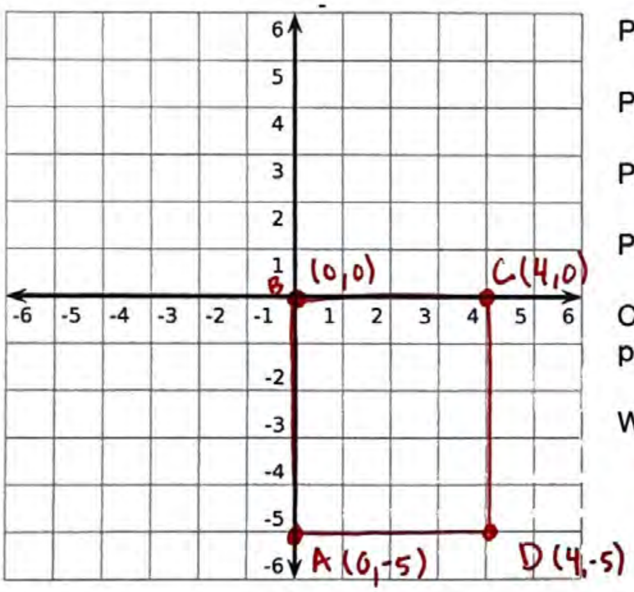
Plot the point C (6, 1) ✓

Connect the plotted points in the correct order to form the polygons. ✓

What shape did you create?

a. Rectangle
b. Pentagon
[✓ c.] Triangle
d. None of the above

2. Plot the following points on the coordinate plane to create a polygon:



Plot the point A (0, -5) ✓

Plot the point B (0, 0) ✓

Plot the point C (4, 0) ✓

Plot the point D (4, -5)

Connect the plotted points in the correct order to form the polygons. ✓

What shape did you create?

[✓ e.] Rectangle
f. Pentagon
g. Triangle
h. None of the above

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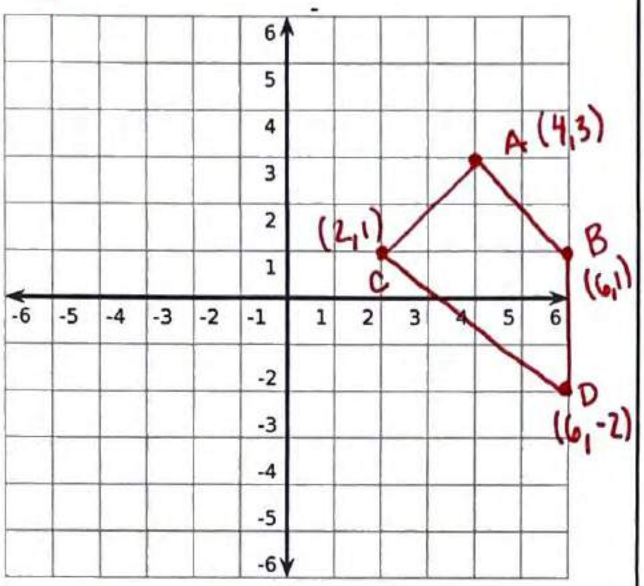
Name: ANSWER KEY

G6 U6 Lesson 6 - Independent Work

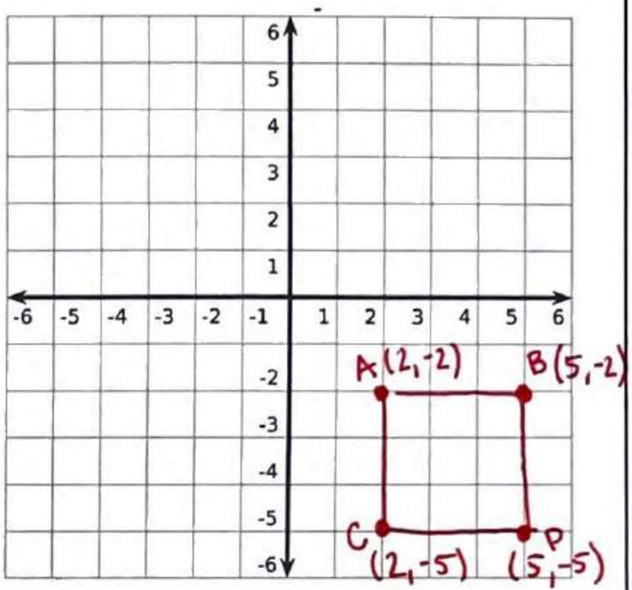
Directions: For each scenario, create your own coordinate plane and solve.

1. Plot the following points on the coordinate plane to create the polygon: Point A(4, 3), Point B([illegible], 1), Point C(2, 1), Point D(6, -2)
   6



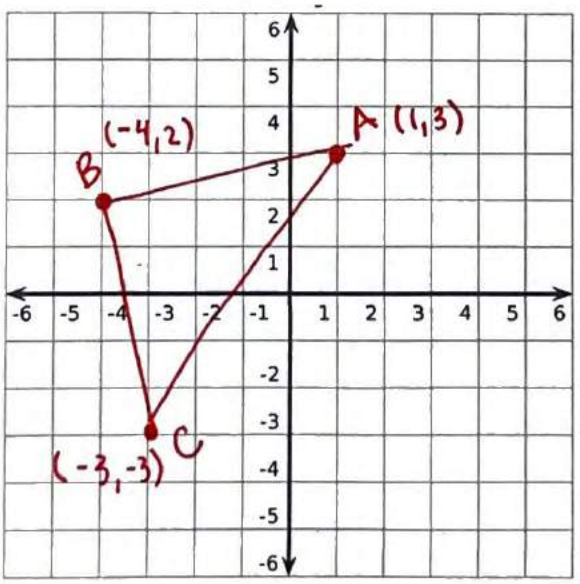
2. What shape did you make?
   a. square b. triangle c. rectangle
   [✓ d. none of the above]

3. Plot the following points on the coordinate plane to create the polygon: Point A(2, -2), Point B (5, -2), Point C(2, -5), Point D(5, -5)



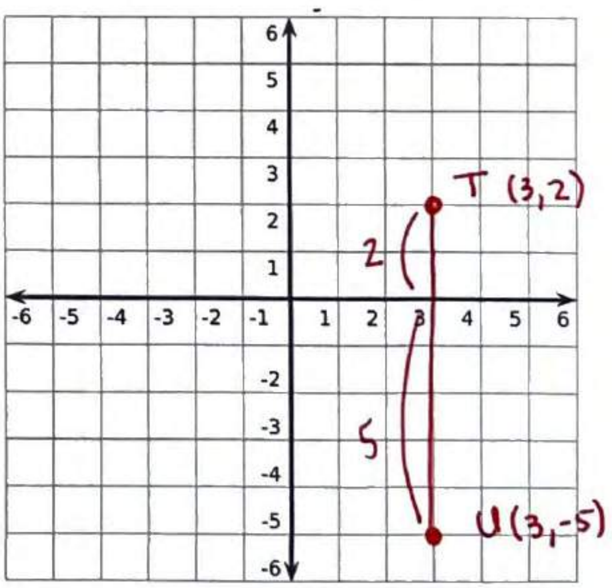
4. What shape did you make?
   [✓ a. square] b. triangle c. rectangle
   d. none of the above

5. Plot the following points on the coordinate plane to create the polygon: Point A(1, 3), Point B(-4, 2), Point C(-3, -3)



6. What shape did you make?
   a. square [✓ b. triangle] c. rectangle
   d. none of the above

7. Calculate the distance between the given pairs of points on the coordinate plane: Point T(3, 2) and Point U(3, -5)



7 units

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