CITYTUTOR DC

Sixth Grade Math Lesson Materials

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CITYTUTOR DC

G6 Unit 1:

Area and Surface Area

G6 U1 Lesson 1

Explore the meaning of area

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:

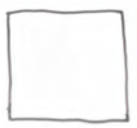
- The amount of space inside of a shape.
- We can tile to find the total area of rectangles.
- We can skip count to find the total area of rectangles.
- We can multiply the length times the width to find the area of rectangles.
- We can cut shapes into smaller shapes, like rectangles, to find the area.

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.



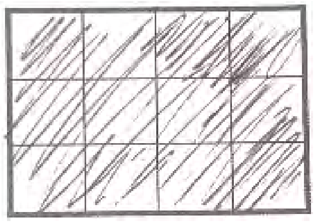
What shape is this? It's a square! That's right! This is a square because it has four equal sides that are all the same exact length. It also has 90 degree angles meaning the "L" shapes are formed in the corners. Point to the area of this square…that's right it's the INSIDE of the shape.

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…

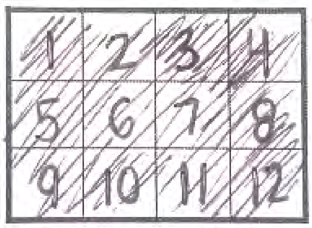
And one last one, look at this shape…what shape is this? A parallelogram! It's a parallelogram because it has four sides and the opposite sides are the same length. We see that the top and bottom are the same length and the left and right are the same length. And again, point to the area of the parallelogram…

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.

WARM WELCOME

Today we will explore the meaning of area.

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Let's Review:

What do you remember about area?

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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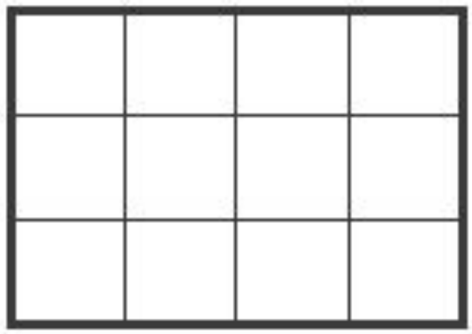
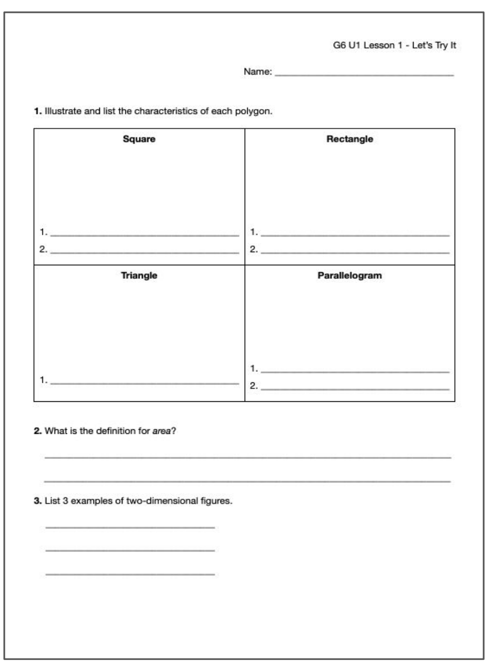
Let's Think:

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



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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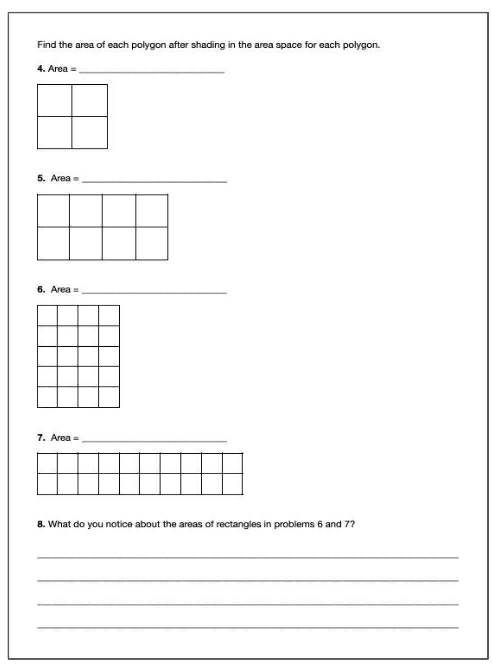

Find the area of each polygon after shading in the area space for each polygon.

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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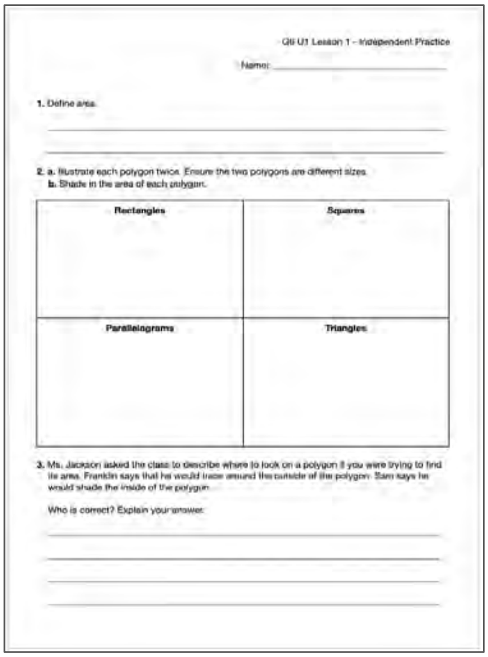
On your Own:

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



G6 U1 Lesson 1 - Independent Practice

Name: ____________________

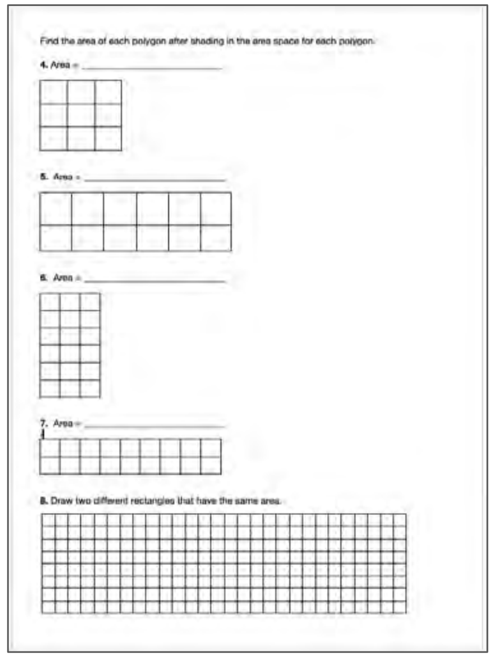
1. Define area.

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.



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.

Name: ___________________________________

1. Illustrate and list 2 characteristics of each polygon.

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

2. What is the definition for area?

____

____

3. List 3 examples of two-dimensional figures.

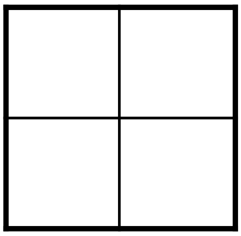
____

____

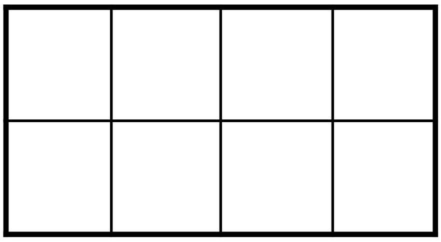
____

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

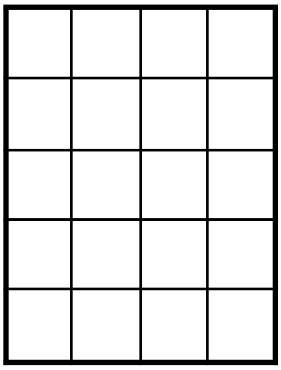
4. Area = ______________________________



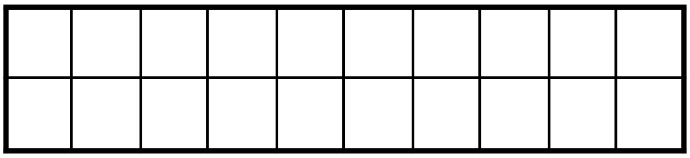
5. Area = ______________________________



6. Area = ______________________________



7. Area = ______________________________



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

____

____

____

____

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.

____

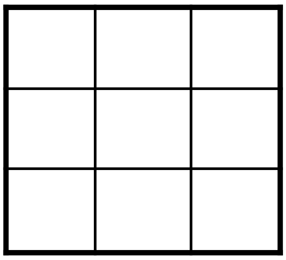
____

____

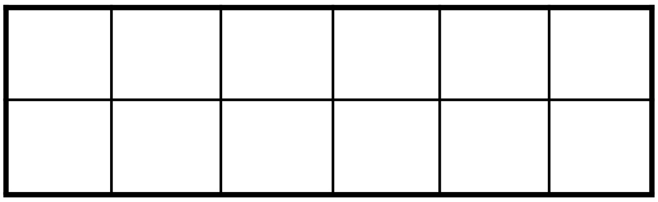
____

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

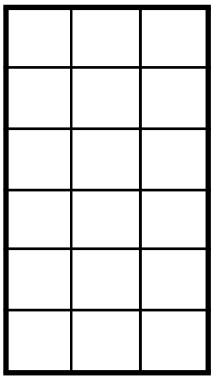
4. Area = ______________________________



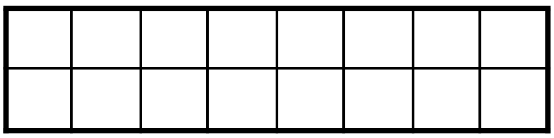
5. Area = ______________________________



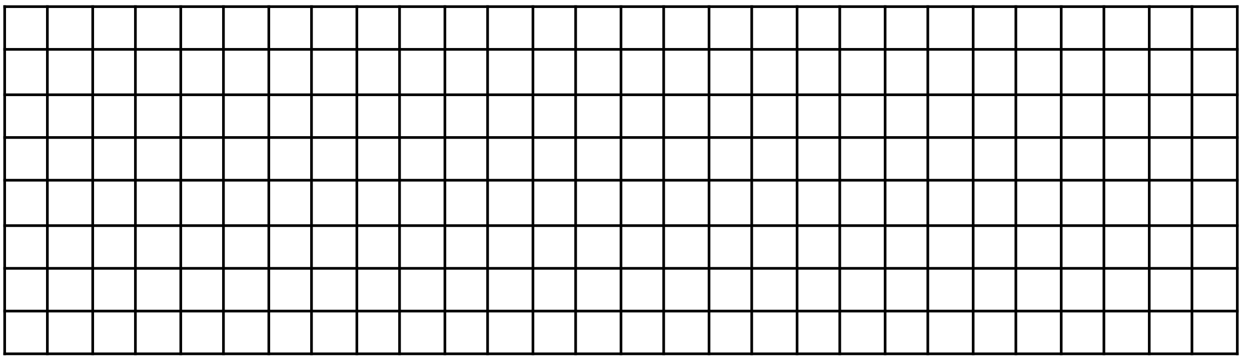
6. Area = ______________________________



7. Area = ______________________________

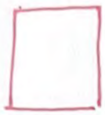


8. Draw two different rectangles that have the same area.



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.)

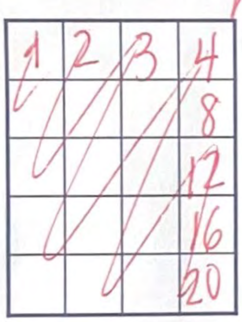
hexagon
square
rhombus
parallelogram
rectangle

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

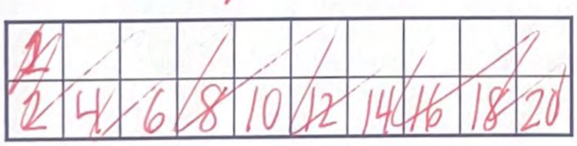
4. Area = 4 units^2 or 4 square units

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?

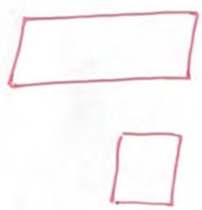
They are similar in that they both have an area of 20 square units. They are different in that the width and lengths are not the same.

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.

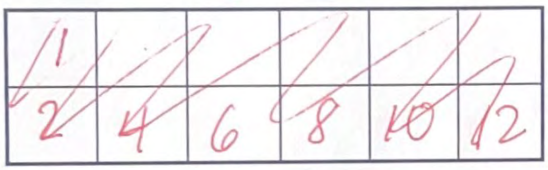
Who is correct? Explain your answer.

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.

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

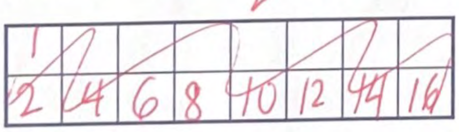
4. Area = 9 square units

5. Area = 12 square units

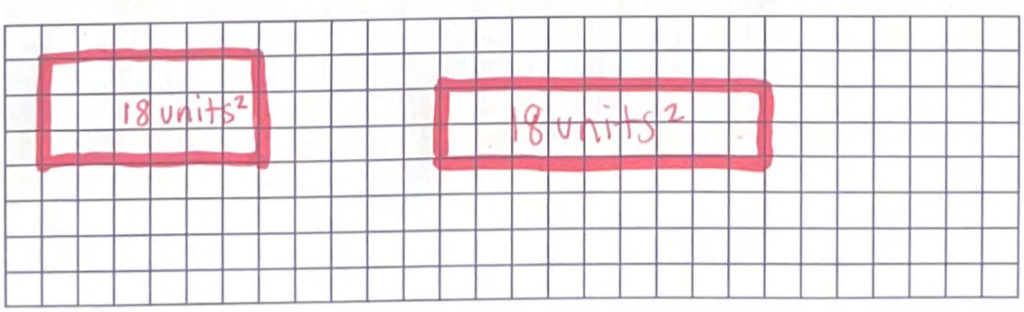


6. Area = 18 square units

7. Area = 16 square units



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



G6 U1 Lesson 2

Decompose and compose polygons to calculate area

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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."

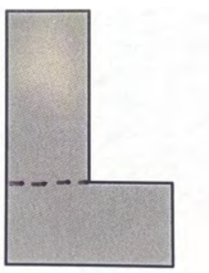
Let's Talk (Slide 3): What does it mean to decompose? What are some examples of things that decompose? Possible Student Answers, Key Points:

- 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.

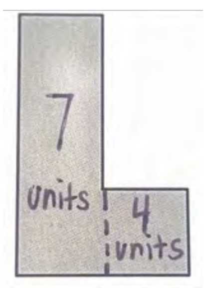
Let's Think (Slide 4): Let's start by looking at this polygon. What's the name of this polygon? How do you know? Hexagon, because it has 6 straight sides!

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.

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.

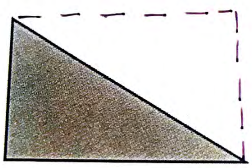
Now look, I can make another cut on the right side and now I have 2 triangles and 1 rectangle!

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.

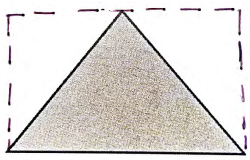
Let's Think (Slide 7): But, guess what? Another way to calculate the area of this parallelogram is to rearrange it, move around the parts.

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.

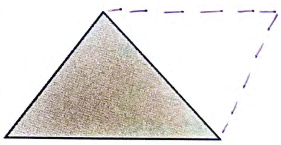
Let's Think (Slide 9): We just practiced decomposing or breaking shapes apart. But what about composing? Composing means to build or put back together. Let's work together to think about how each triangle can be composed into a parallelogram? Let's add to each triangle to see. *(Allow students to try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

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!

WARM WELCOME

Today we will decompose and compose polygons to calculate area.

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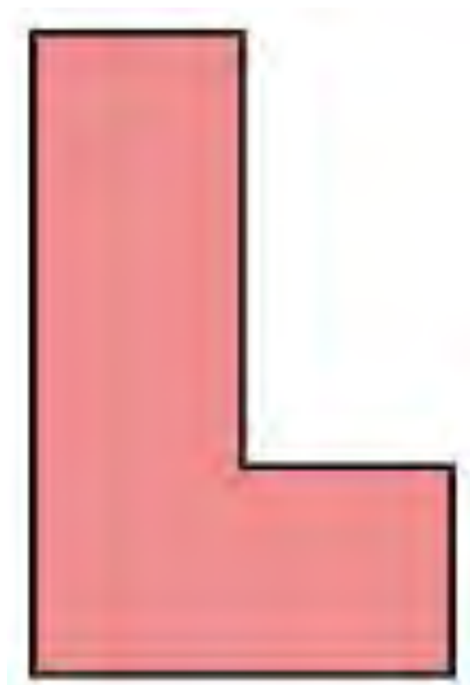
Let's Talk:

What does it mean to *decompose?*

What are some examples of things that decompose?

Let's Think:

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



Let's Think:

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

Let's Think:

We decomposed this parallelogram into 2 triangles and 1 rectangle!

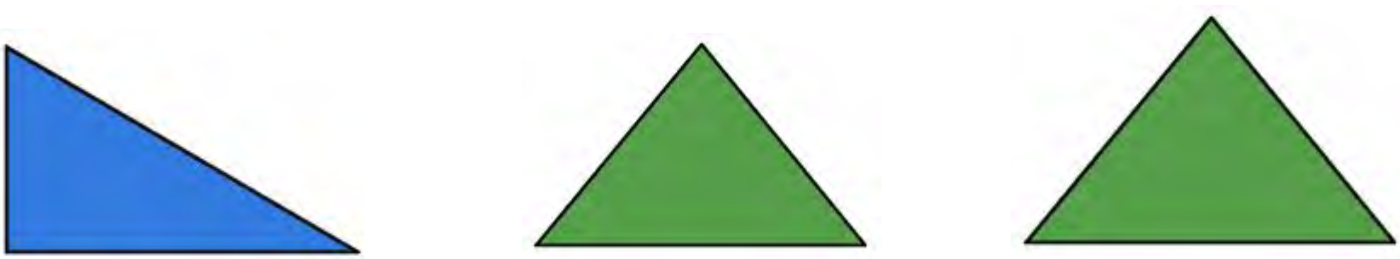
How can we find the area?

Let's Think:

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

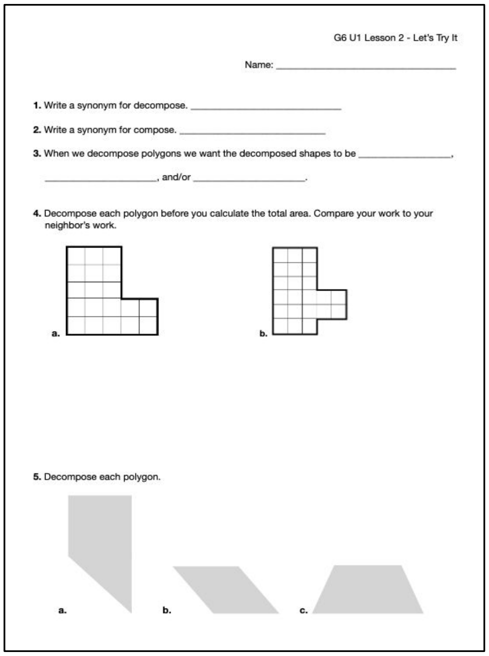
Let's Think:

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



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.

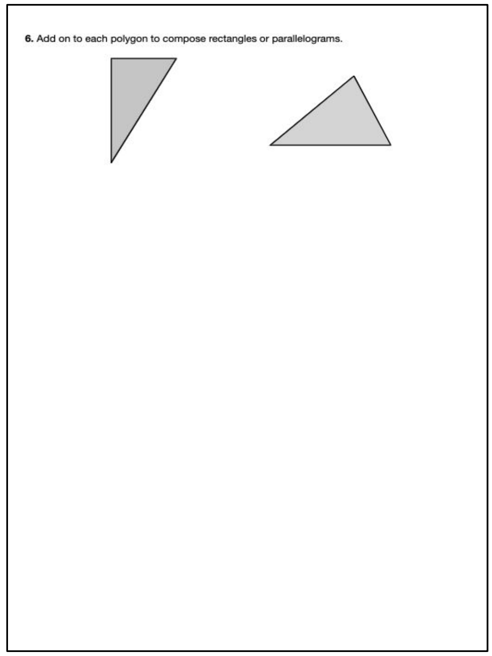
b.

5. Decompose each polygon.

a.

b.

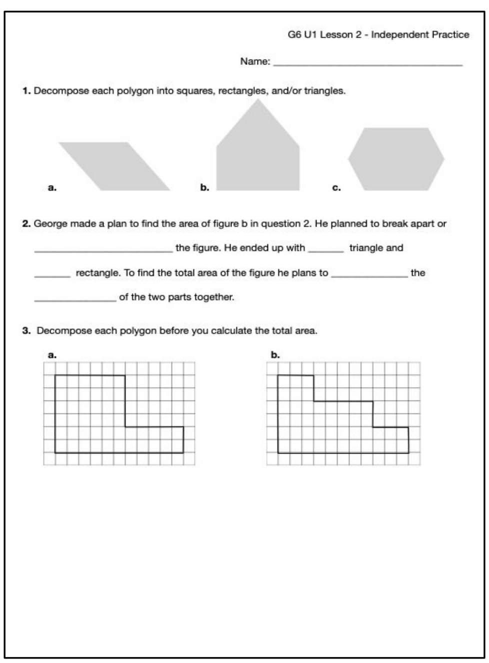
c.



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

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.

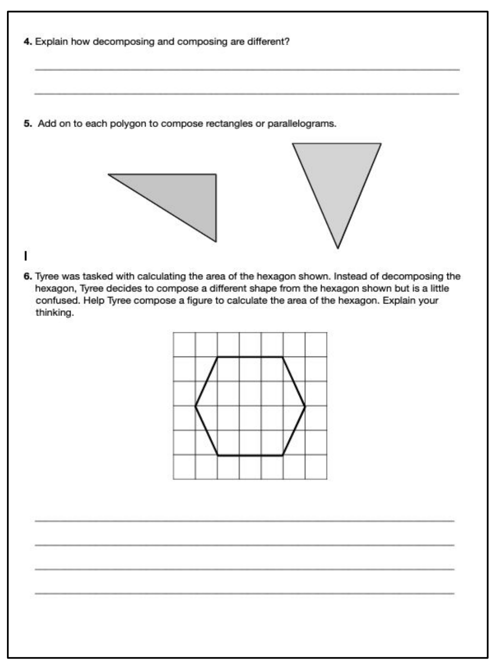
c.

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.

I

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.

Name: ______________________________

G6 U1 Lesson 2 - Let's Try It

1. Write a synonym for decompose. __________________________

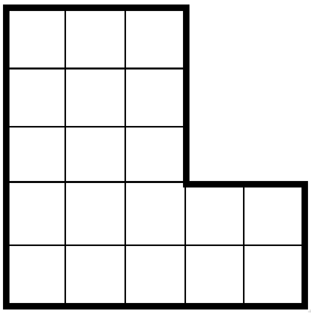
2. Write a synonym for compose. __________________________

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

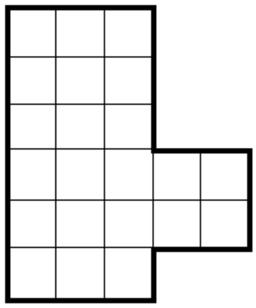
______________________, and/or ______________________.

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

a.



b.



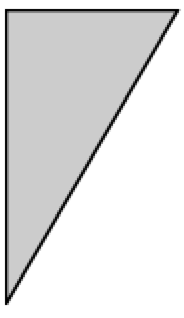
5. Decompose each polygon.

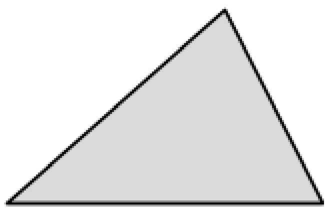
a.

b.

c.

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





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

a.

b.

c.

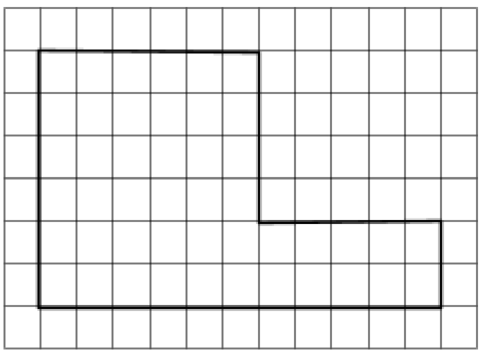
2. George made a plan to find the area of figure b in question 2. He planned to break apart or

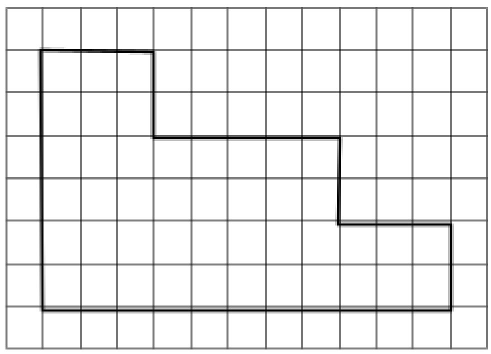
_______________________ the figure. He ended up with ______ triangle and

______ 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.


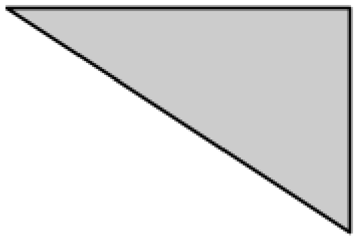
b.


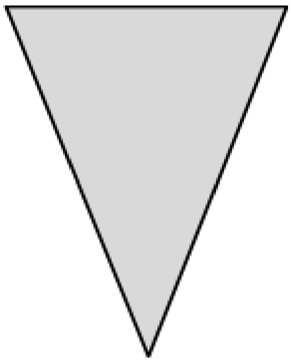
4. Explain how decomposing and composing are different?

____

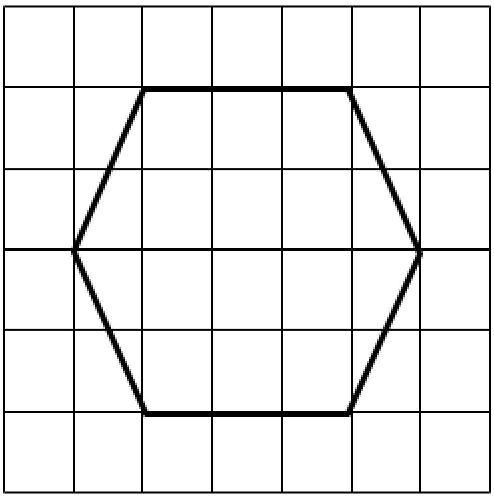
____

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.



____

____

____

____

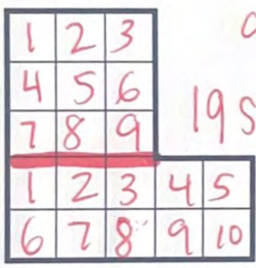
Name: ______________________________ G6 U1 Lesson 2 - Let's Try It

1. Write a synonym for decompose. break apart

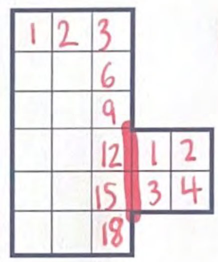
2. Write a synonym for compose. build

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

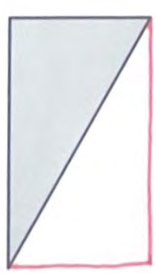
5. Decompose each polygon. (answers will vary)

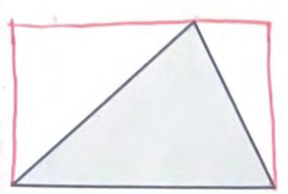
a.

b. 

c. 

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





Name: ______________________ G6 U1 Lesson 2 - Independent Practice

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

a.


b.

c.

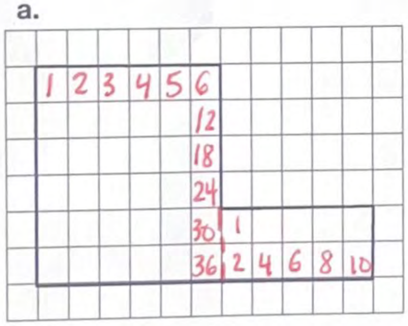

2. George made a plan to find the area of figure b in question 2. He planned to break apart or

__decompose__ the figure. He ended up with __1__ triangle and

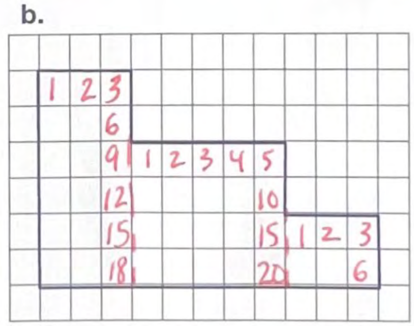
__1__ rectangle. To find the total area of the figure he plans to __add__ the

__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

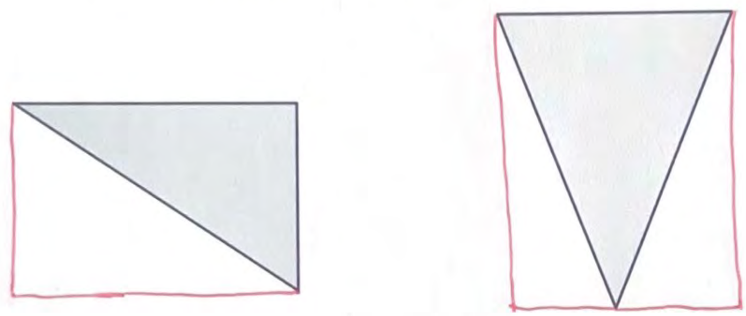
b.


18+20+6 = 44 units^2

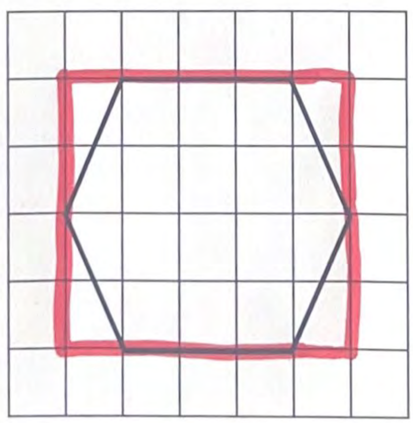
4. Explain how decomposing and composing are different?

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.

G6 U1 Lesson 3

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

CITYTUTOR DC

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

Warm Welcome (Slide 1): Tutor choice.

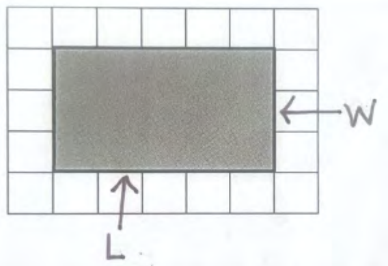
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be using what we learned in the last lesson about composing, decomposing, and rearranging polygons to determine the actual area of polygons. Instead of counting the square units, we will be using the area formula to calculate the area.

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:

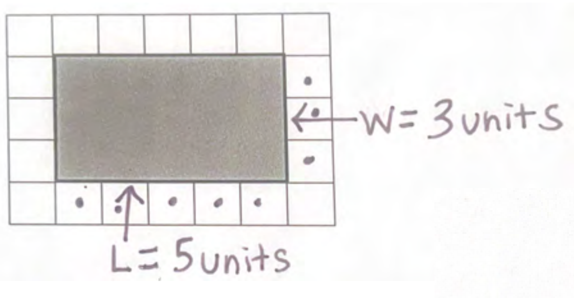
- To find the answer faster
- To make less work for us
- To understand parts of the problem
- To simplify the problem
- To help us know how to solve in a structured way

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.

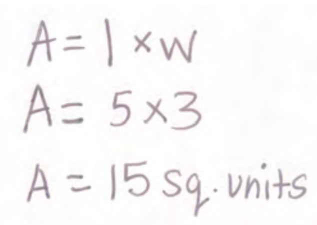
Let's Think (Slide 4): Let's use that formula to calculate the area of this rectangle without counting each square unit, individually. So we know that to find the area of this rectangle we can multiply the number of rows by the number of columns, in other words we can multiply length times the width.



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.

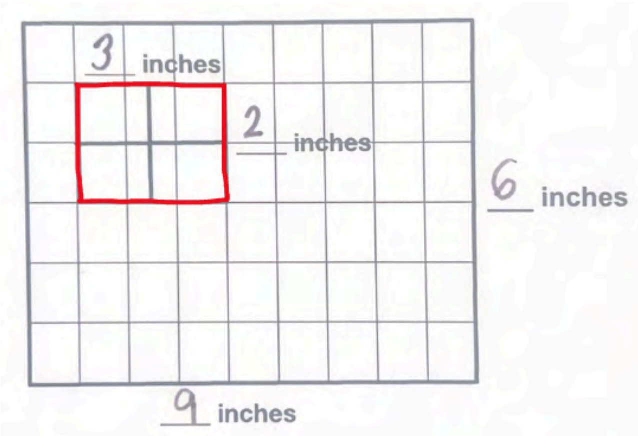


Finally, we can apply our formula by writing the formula, substituting the information we know into the formula and then solving the formula.

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."

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.



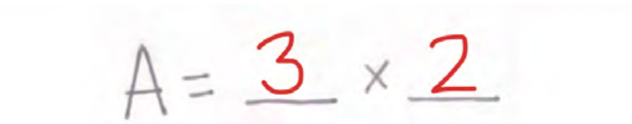
Before we answer the question, let's work together to calculate the missing measurements. The window is kind of tricky because of the window pane in the middle but we want to know the length of the whole window (*outline*). We know that it's 3 inches by 2 inches.

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

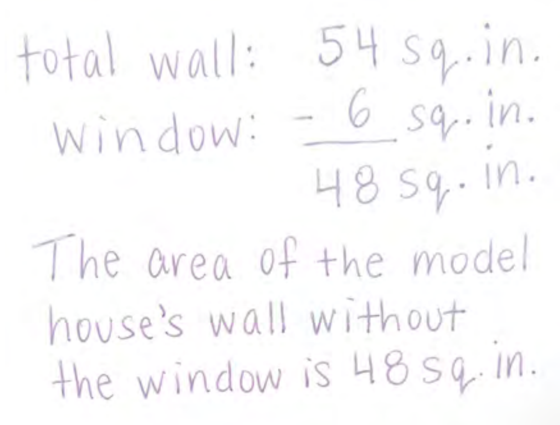
So, to calculate the area of the wall without the window we first need to calculate the area of the big wall. Let's fill in our area formula and solve for the area? A = 9 x 6; 54 square inches

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.



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.



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.

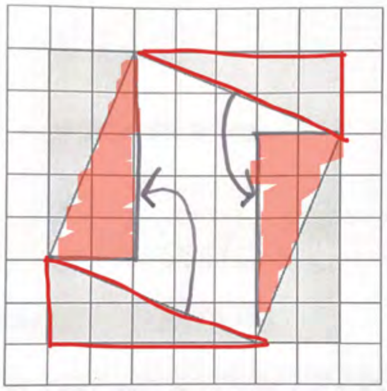
Let's Think (Slide 7): Nice work, let's look at the next slide to continue to think about how the area formula can be helpful for us. Let's think about how we calculate the area of the shaded region on the grid shown?

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:

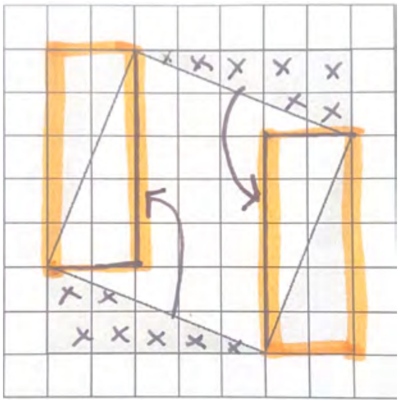
- Because some of the squares within the shaded region aren't complete squares.
- Because some of the tiles are cut off.

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

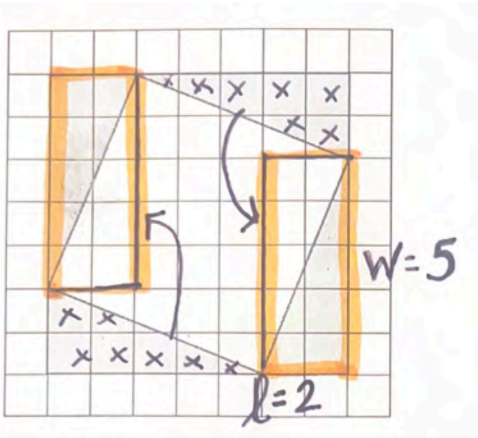
We can use the larger green triangles themselves! We know from the last lesson that triangles can come together to compose rectangles so let's apply that knowledge now to calculate the area of the shaded region.



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!

WARM WELCOME

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

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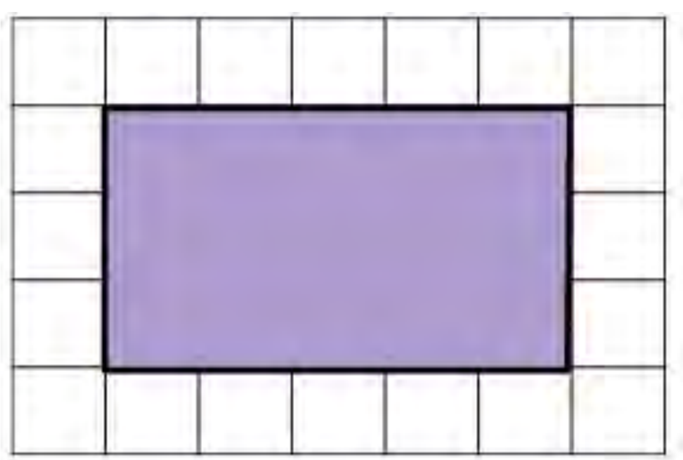
Let's Talk:

Let's brainstorm…

Why are formulas important in mathematics?

Let's Think: Let's use the area formula.



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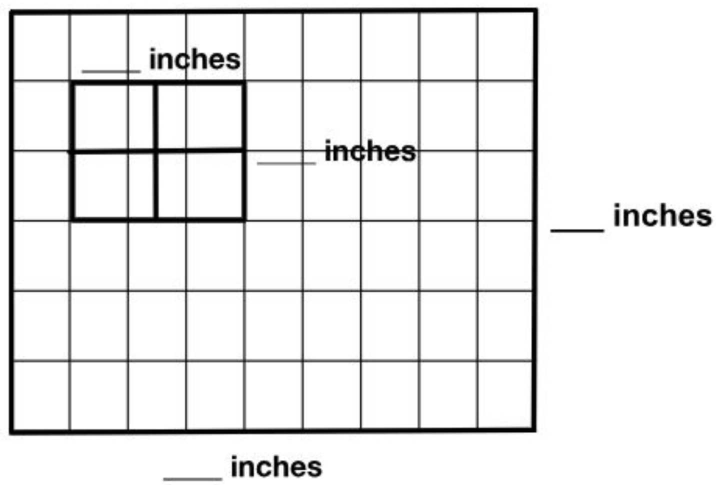
Let’s Think:

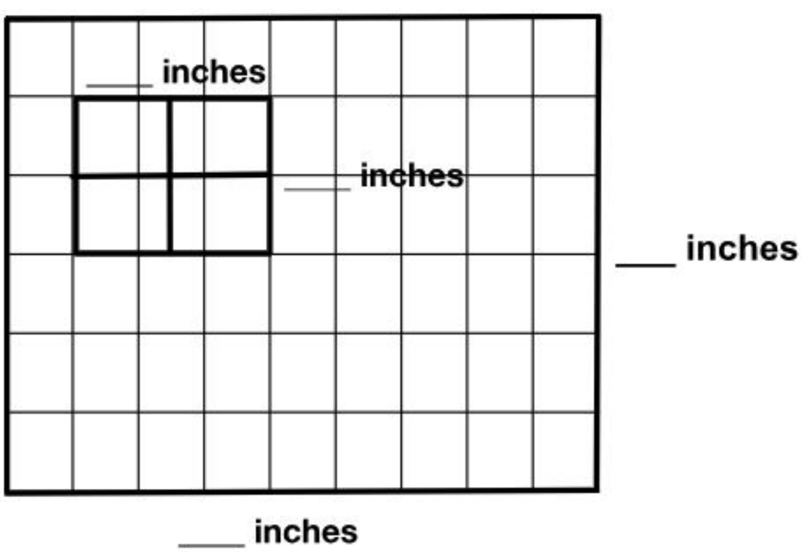
Nelson is designing a model house. Each square on the grid is 1 square unit. The figure shown represents one wall of the model house and the window on that wall.



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

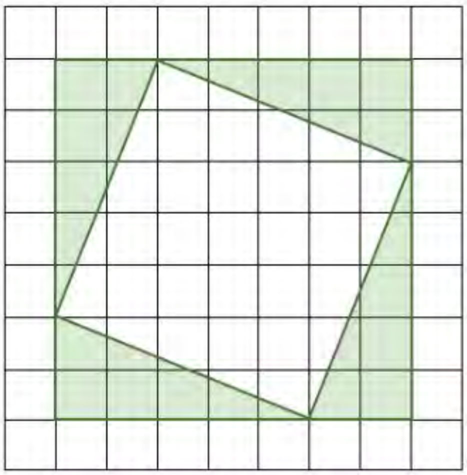
Let’s Think:

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



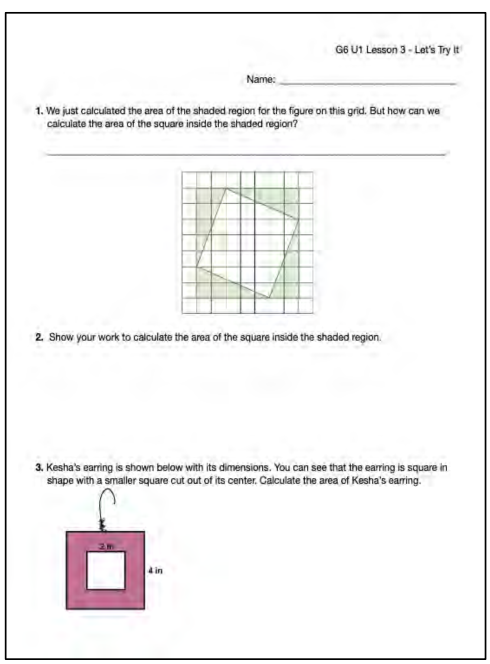
Let's Think:

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?



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?

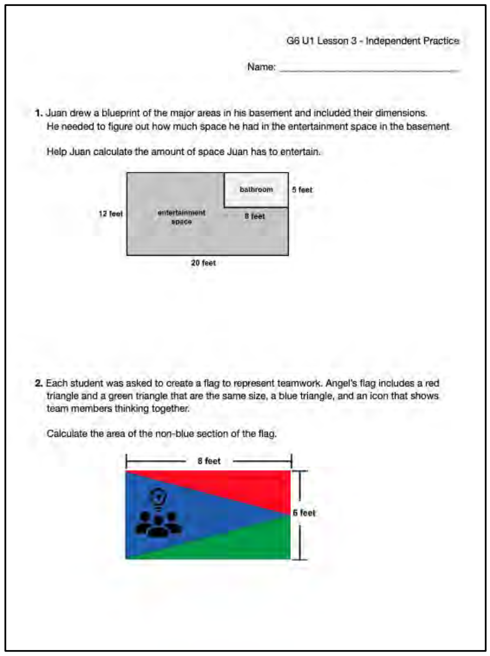
____

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.

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.

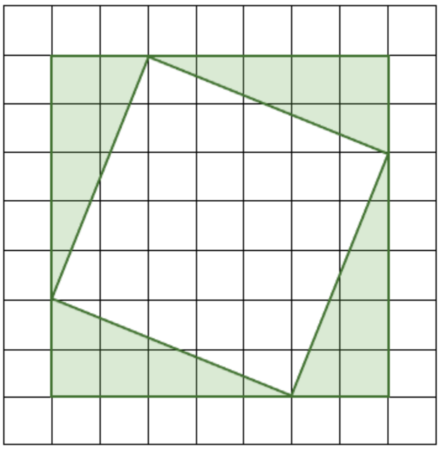
Help Juan calculate the amount of space Juan has to entertain.

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.

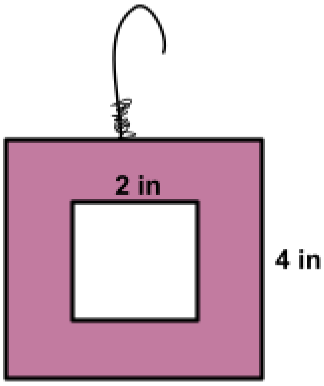
1. We just calculated the area of the shaded region for the figure on this grid. But how can we calculate the area of the square inside the shaded region?

____



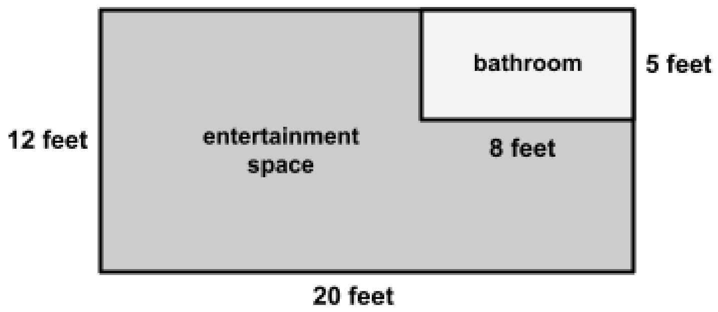
2. Show your work to calculate the area of the square inside the shaded region.

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.



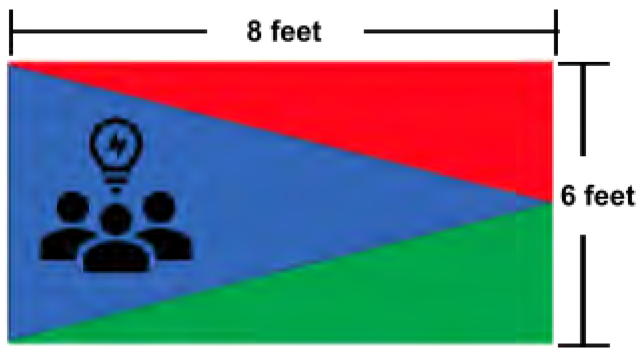
1. Juan drew a blueprint of the major areas in his basement and included their dimensions. He needed to figure out how much space he had in the entertainment portion in his basement.

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



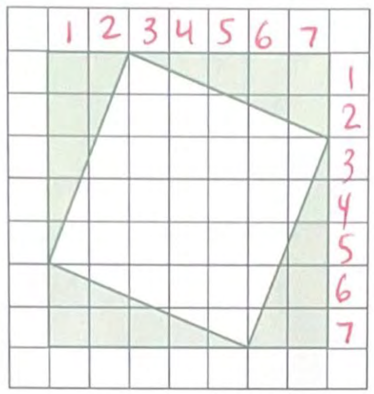
2. Each student was asked to create a flag to represent teamwork. Angel's flag includes a red triangle and a green triangle that are the same size as well as a blue triangle with an icon that shows team members thinking together.

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



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.

$A_{\text{total square}} = l \times w$

$A = 7 \times 7$

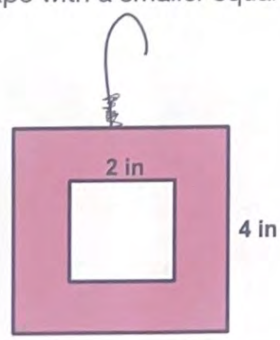
$A = 49$ sq. units

$A_{\text{total square}} = 49$

$A_{\text{shaded region}} = -20$

$A_{\text{square inside}} = 29$ 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

$A_{\text{cut out}} = l \times w$

$A = 2 \times 2$

$A = 4$ sq. units

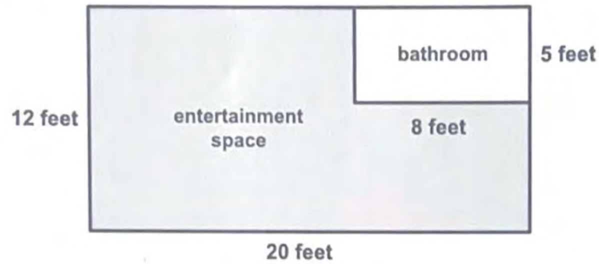
$A_{\text{total square}} = 16$

$A_{\text{cut out}} = -4$

12 sq. units

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.

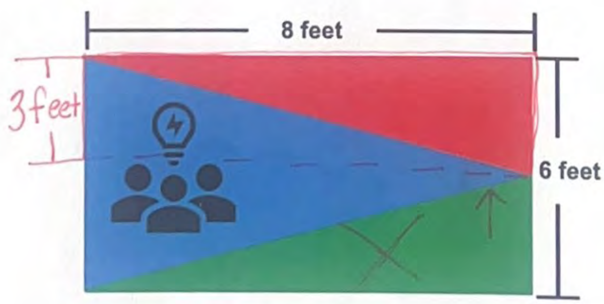
Help Juan calculate the amount of space he has to entertain.



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 24ft².

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.

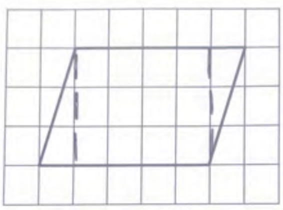
Let's Think (Slide 4): Most people think parallelograms are always slanted like some of the ones we see on the slide. But the definition for a parallelogram does not say a parallelogram must be slanted! Look at the other polygons on this slide.**Think about the attributes of a parallelogram and talk 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.

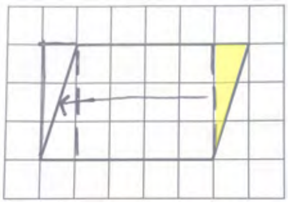
That's right! All parallelograms really aren't slanted. A square and a rectangle are also parallelograms. I'm sure you're wondering why this is so important! Well, it's important because we already know how to calculate the area of squares and rectangles AND we know that we can decompose and rearrange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

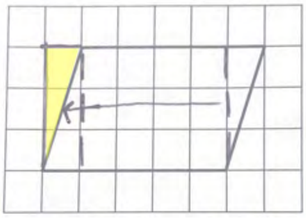
In our last lesson we explored how we can cut a slanted parallelogram into 2 triangles and 1 square or rectangle. And we can do the same thing here, watch me.



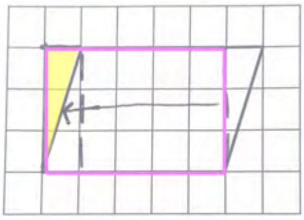
First we want to decompose the parallelogram into squares/rectangles and triangles. Let's start right at the top left corner and cut down, that helps us make sure that we're cutting a triangle with a point at the top! Now, we can go to the bottom corner and cut up. Look, now we have a triangle here,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



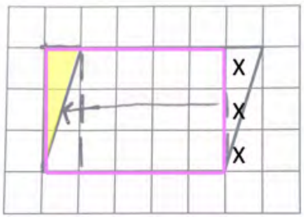
Now, let's try moving or rearranging a part of our parallelogram. We can stop the parallelogram from being slanted by moving a piece from the left to the right side of the parallelogram (or from right to left). Look at this triangle (*shade it in*), I can move it over here to make a rectangle. We want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



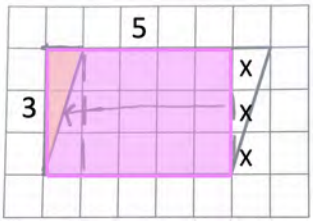
Now look, we cut the parallelogram and moved this triangle over to the other side. It looks like we composed a rectangle.



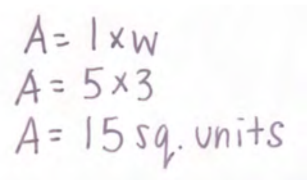
Let's highlight or trace the new composed shape. It is helpful to see the new figure we composed. Look, it's a rectangle!



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).



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!

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.

WARM WELCOME

Today we will calculate the area of parallelograms.

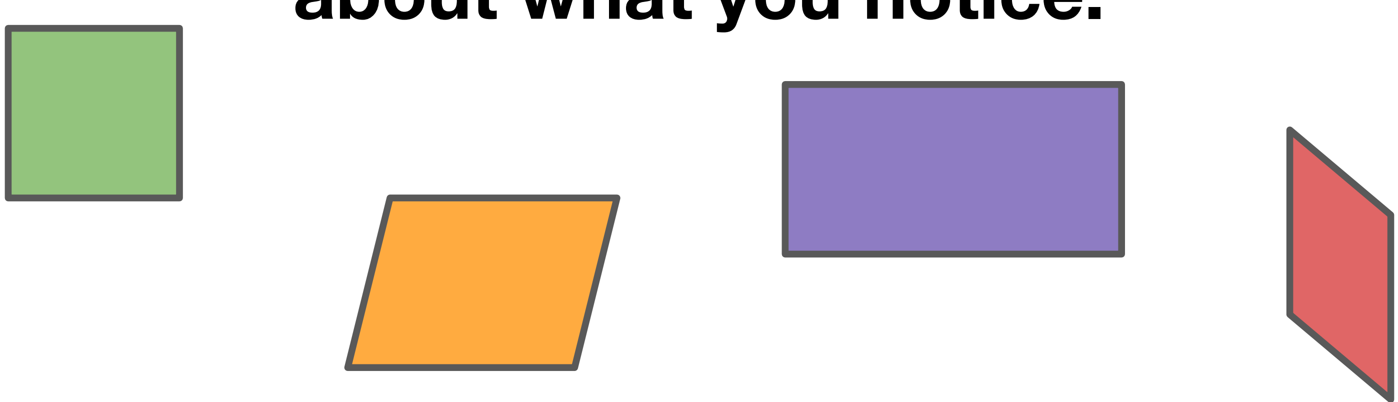
Let's Talk:

What does it mean to *rearrange*?

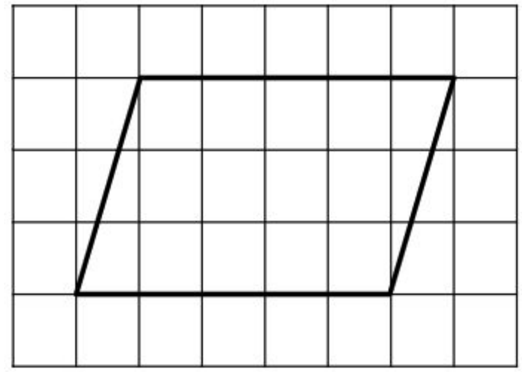
When in your life have you rearranged something?

Let's Think:

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



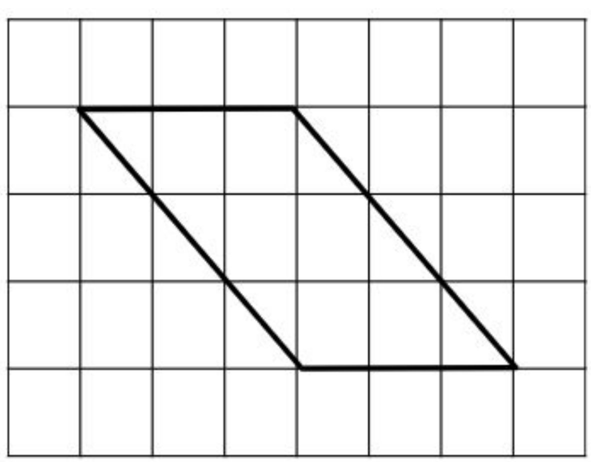
Let's Think:



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

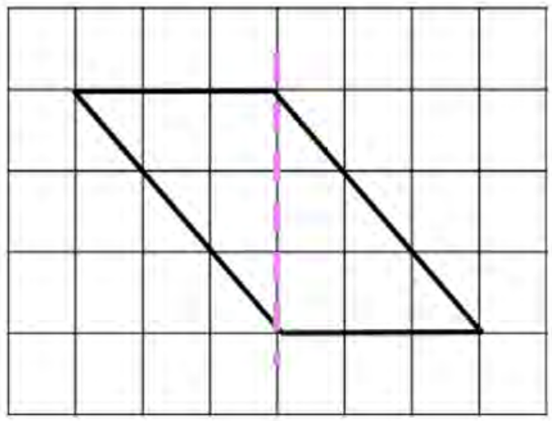
Let's Think:

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



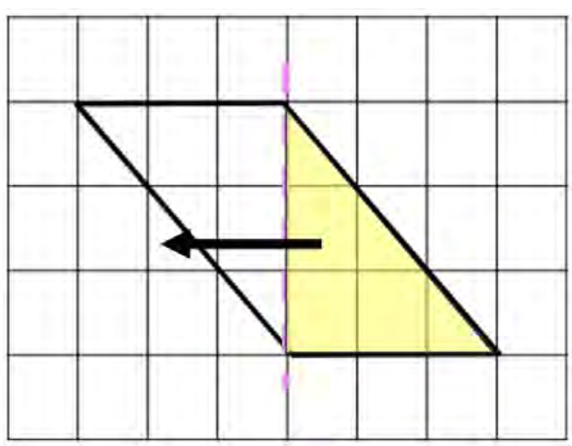
Let's Think:

Cut it! This one makes 2 triangles!



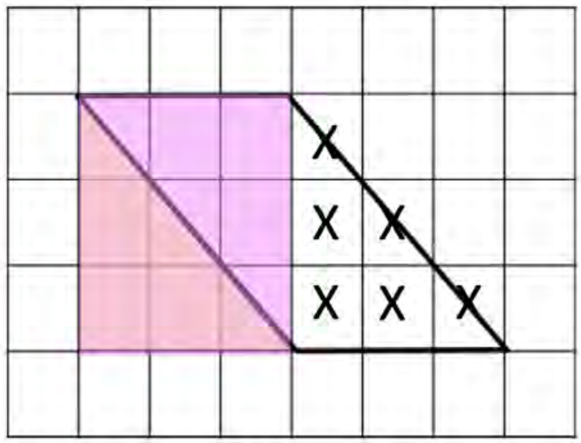
Let's Think:

Rearrange it!



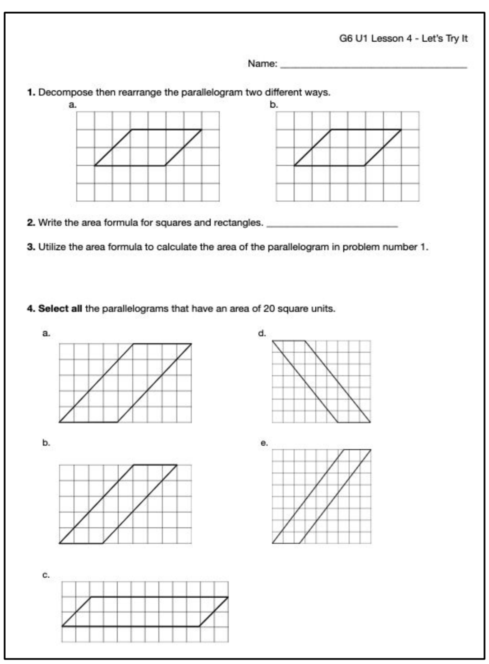
Let's Think:

Findt the new shape and calculate area!



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.

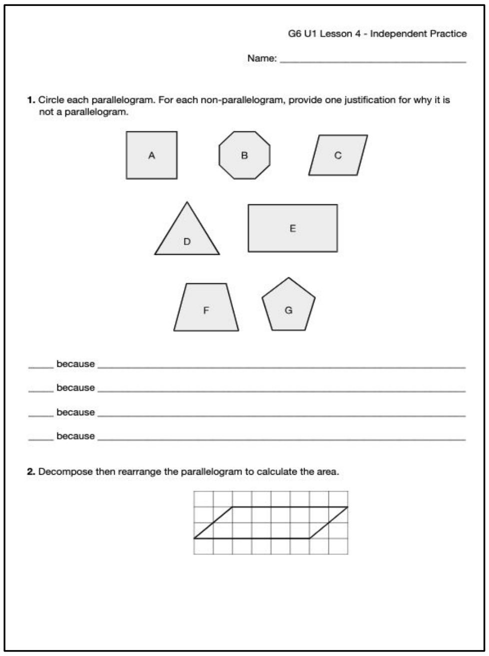
b.

e.

c.

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.

A B C D E F G

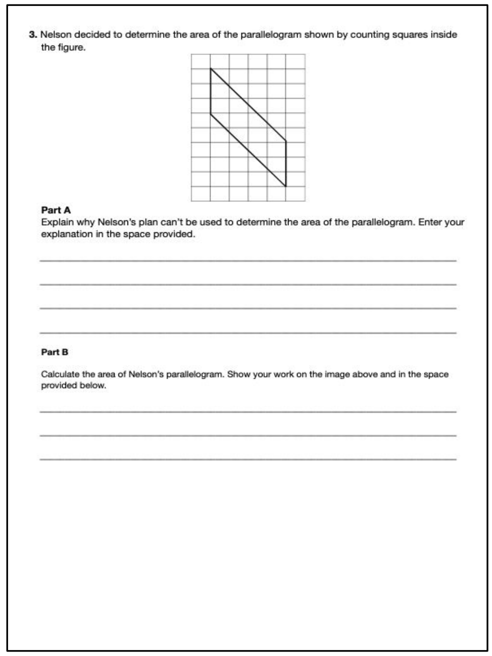
_____ because ______________________

_____ 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.

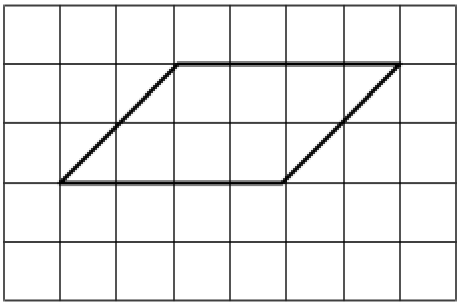
____

____

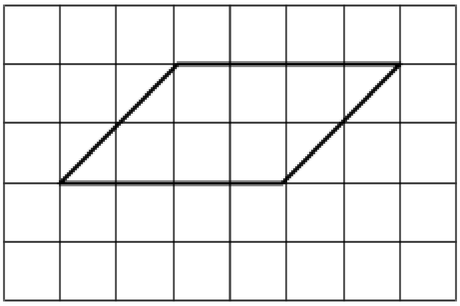
____

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.

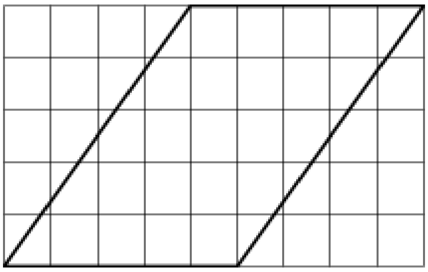


2. Write the area formula for squares and rectangles. _________________________

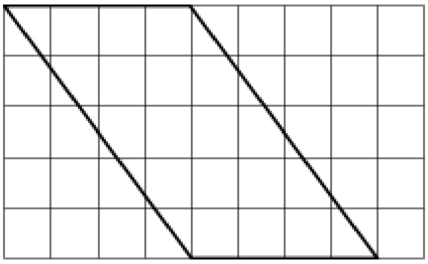
3. Utilize the area formula to calculate the area of the parallelogram in problem number 1.

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

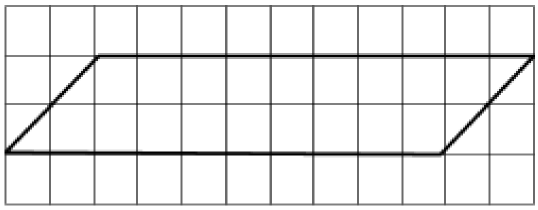
a.



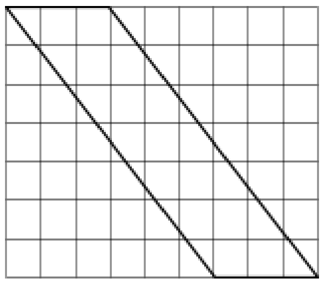
b.



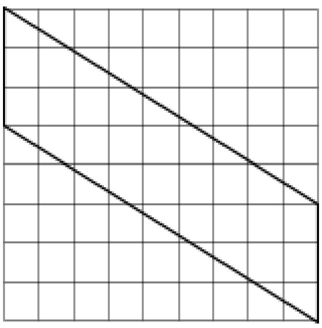
c.



d.

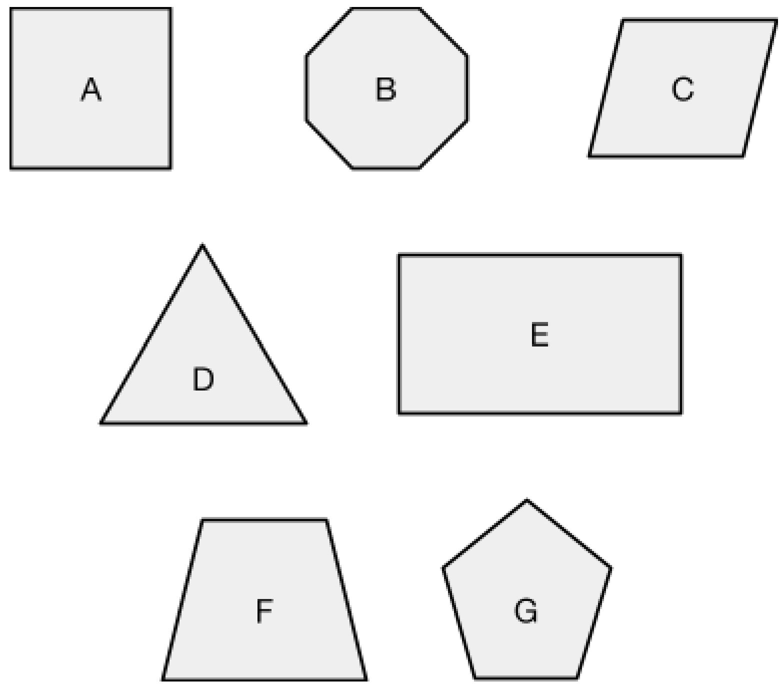


e.



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.



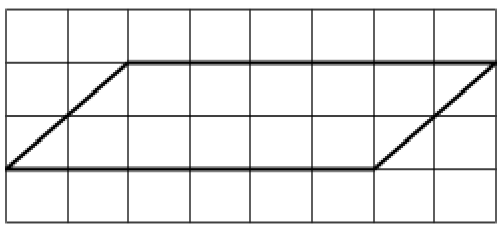
_____ because ____

_____ because ____

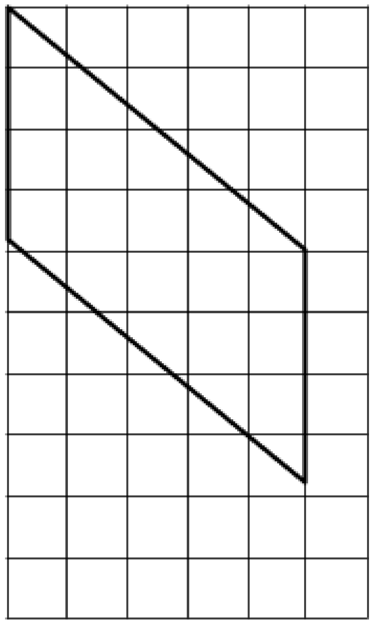
_____ because ____

_____ because ____

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



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.

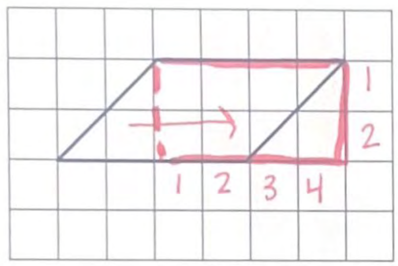
Part B

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

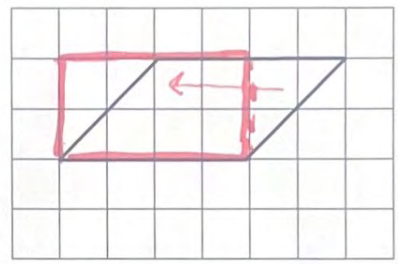
Name: ______________________ G6 U1 Lesson 4 - Let's Try It

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.



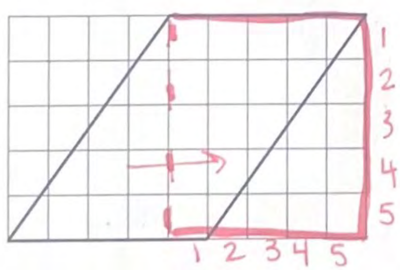
2. Write the area formula for squares and rectangles. A = length x width

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

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

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

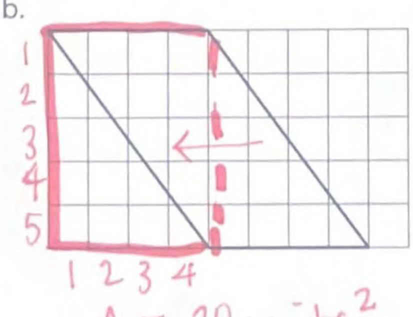
a.



A = 25 $units^2$

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

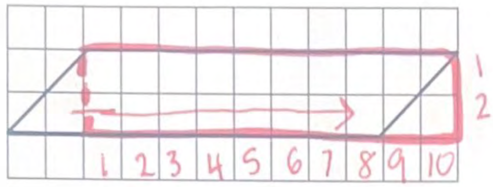
b.



A = 20 $units^2$

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

c.



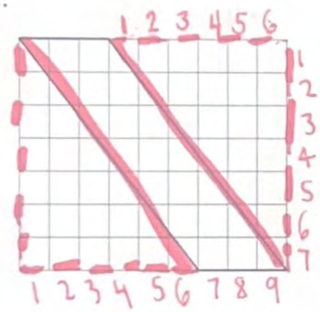
A = 20 units^2

$A = l \times w$

$A = 10 \times 2$

A = 20 sq. units or 20 units^2

d.

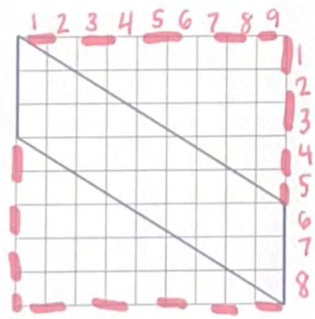


A = 21 units^2

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, $A = l \times w$ or $A = 6 \times 7$ which is 42 units^2. 63 units^2 - 42 units^2 = 21 units^2

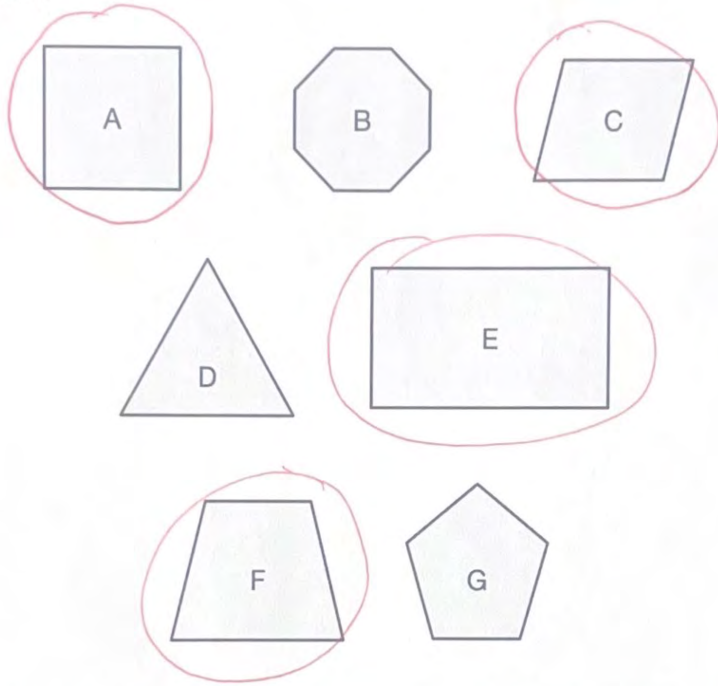
e.



Area of the entire composed rectangle is 9x8 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, $A = l \times w$ or $A = 9 \times 5$ which is 45 units^2. 72 units^2 - 45 units^2 = 27 units^2

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



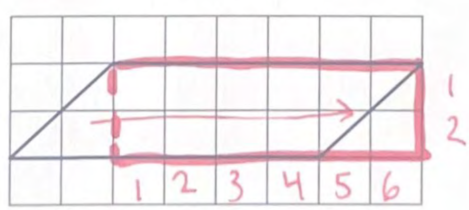
B because it does not have 4 sides (or 4 angles)

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.

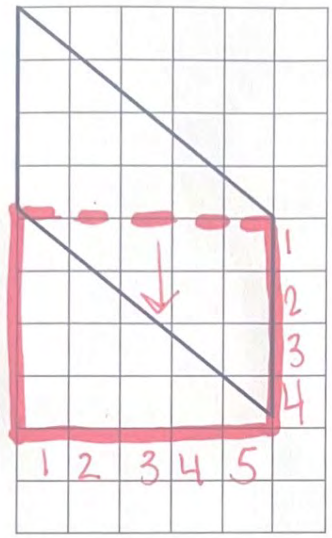


A = length × width

A = 6 × 2

A = 12 square units or 12 $units^2$

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.

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.

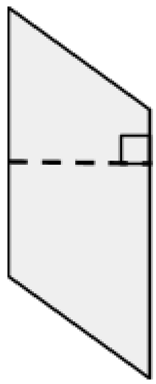
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will revisit the area of parallelograms but focus specifically on utilizing the formula for determining the area of slanted parallelograms as opposed to determining area of parallelograms only on a grid.

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:

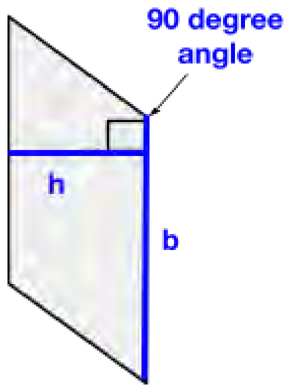
- The bottom of something, I hear the word base in basement, etc.
- Note: Some students may say they think of *bass* as in music. That is a different word and is spelled differently making "base" and "bass" homophones which are words that are pronounced the same but have different spellings and/or meanings.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

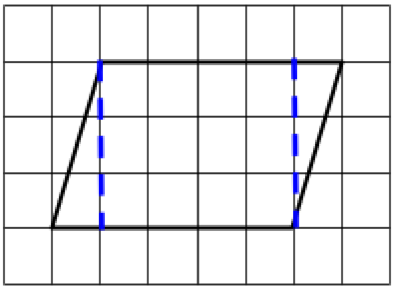


The base is always on the side or solid line where the 90 degree angle sits or touches so it's not always on the bottom. A 90 degree angle forms an "L" shape *(make an "L" with your fingers).* You can be sure an angle is 90 degrees when you see the box like we see on the figure *(point to box).* The 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.

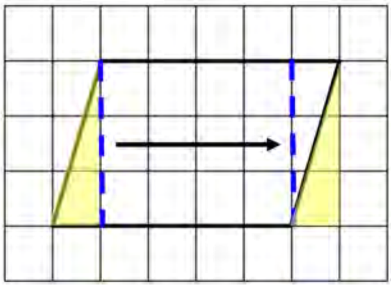


Based on the descriptions we just discussed, where do you think we should label the base, height, and 90 degree angle of this parallelogram *(point to image)*? The dotted line is the height, the base touches the angle and the angle is the box. That's right! The easiest to label is the 90 degree angle 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!

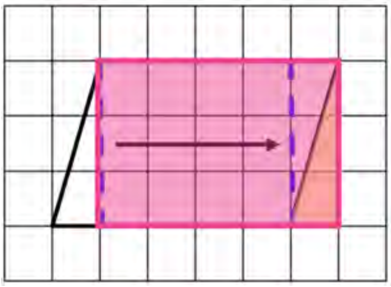
Let's Think (Slide 5): Next, let's connect the knowledge we have about parallelograms on a grid to what we are learning about parallelograms off a grid. On a grid is when we have the polygon on top of the tiles *(point).* Off the grid is when we see the polygon without the tiles *(point).*



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.

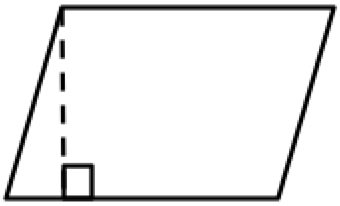


Our second step is to rearrange the polygon to create a rectangle. We recall that rearranging means to *move around*. Look at how we moved the triangle from the left to the right side.

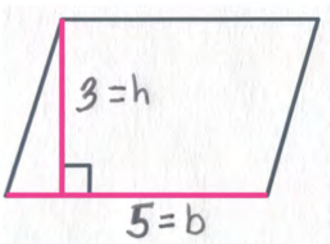


And now, we have a rectangle! I'm going to highlight to make it easy to see our new rearranged shape! Last thing is to count the squares inside the parallelogram or we can use the area formula to calculate the area of the parallelogram but we are just going to practice our skip counting skills in two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

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.

WARM WELCOME

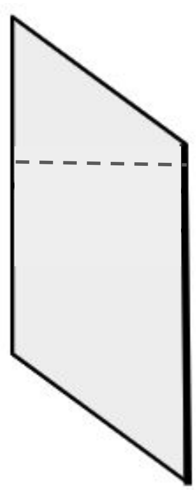
Today we will use the area formula for parallelograms to calculate the area of slanted parallelograms.

Let's Talk:

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

Let's Think:

How do we label the parts of a parallelogram?



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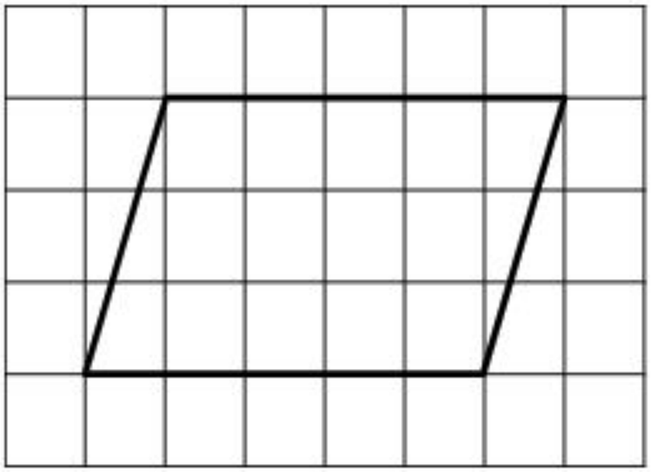
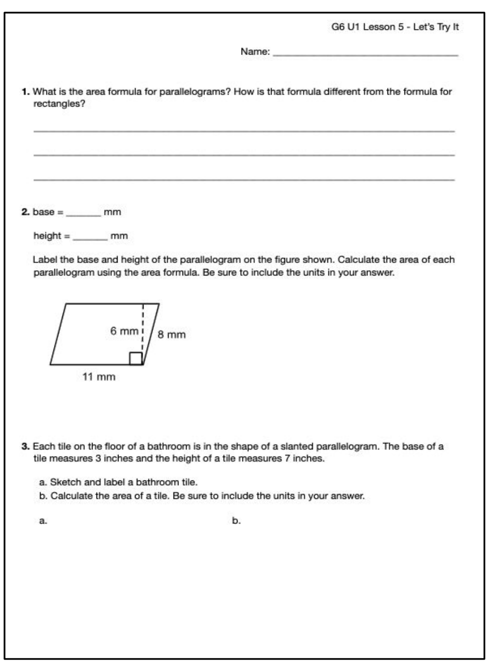
Let's Think:

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



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

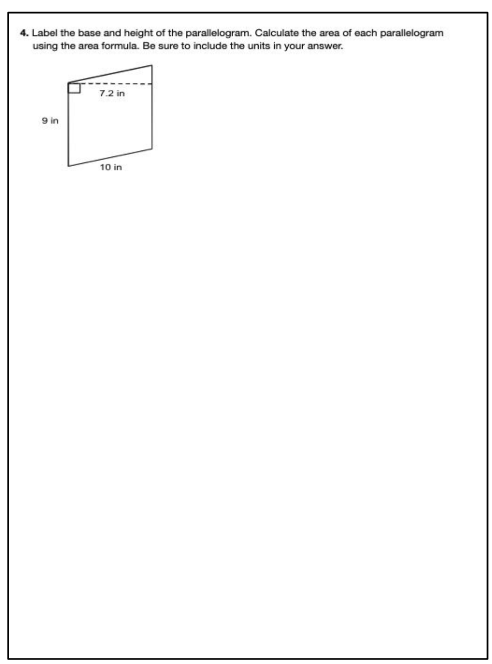
height = ______ mm

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.

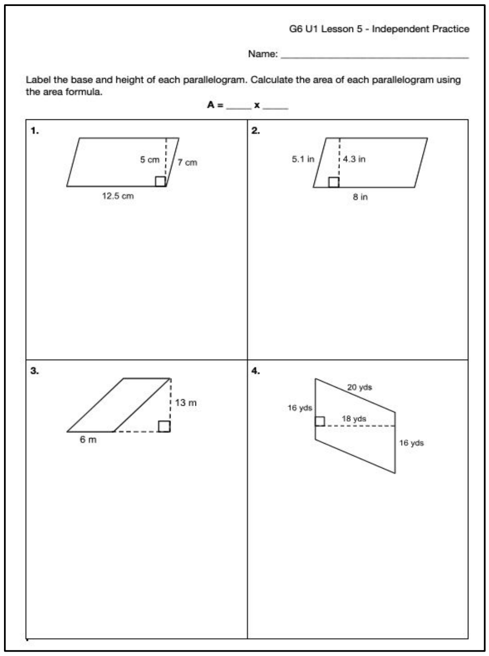
a. b.



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.

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.

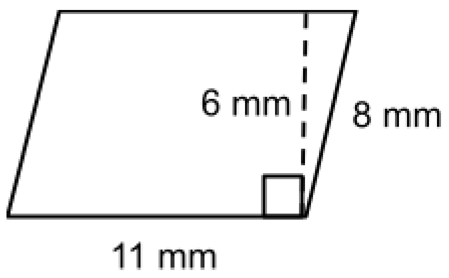
A = ____ x ____

1. 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.

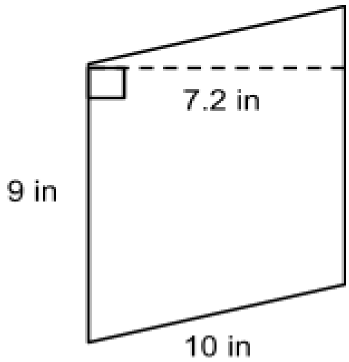
6. Write the area formula for a parallelogram. ________________________

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

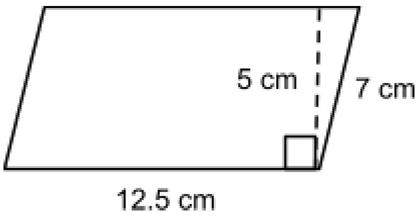


9. Calculate the area of each parallelogram using the area formula. Be sure to include the units in your answer.

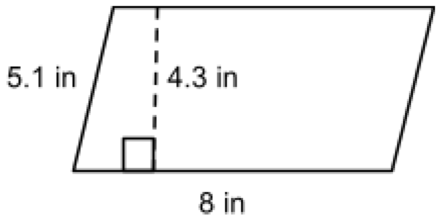
Label the base and height of each parallelogram. Calculate the area of each parallelogram using the area formula.

A = _____ x _____

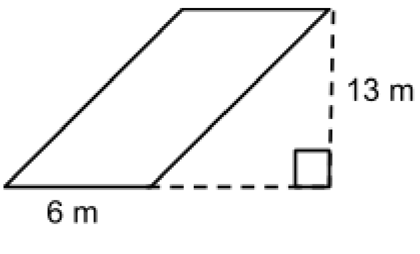
1.



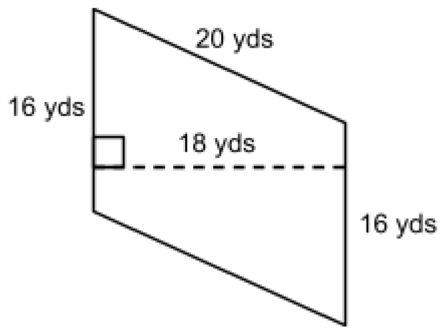
2.



3.



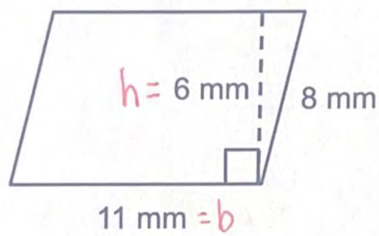
4.



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.

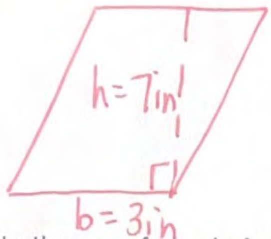
A = base × h

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.

$A = b \times h$

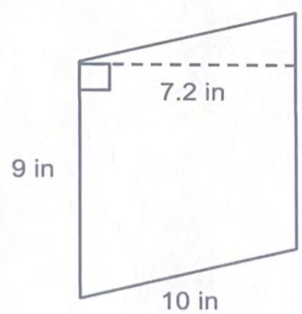
$A = 3 \times 7$

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

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.

$A = b \times h$

$A = 9 \times 7.2$

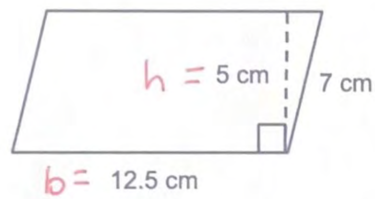
$7.2 \times 9 = 64.8$

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

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

A = b x h

1.



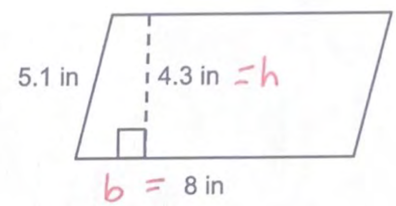
$A = b \times h$

$A = 12.5 \times 5$

$$\begin{array}{r} 12.5 \\ \times\ 5 \\ \hline 62.5 \end{array}$$

$A = 62.5\,cm^2$

2.



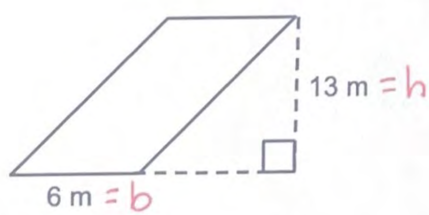
$A = b \times h$

$A = 8 \times 4.3$

$$\begin{array}{r} 4.3 \\ \times\ 8 \\ \hline 34.4 \end{array}$$

$A = 34.4\,in^2$

3.



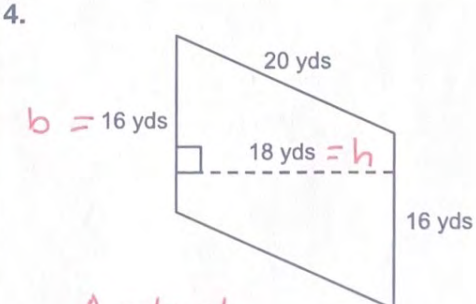
$A = b \times h$

$A = 6 \times 13$

$$\begin{array}{r} 13 \\ \times\ 6 \\ \hline 78 \end{array}$$

$A = 78\,m^2$

4.



$A = b \times h$

$A = 16 \times 18$

$$\begin{array}{r} 16 \\ \times 18 \\ \hline 128 \\ +160 \\ \hline 288 \end{array}$$

$A = 288\,yds^2$

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:

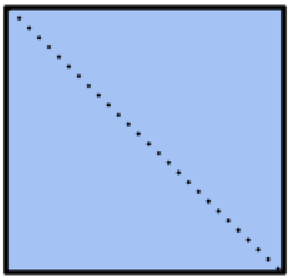
- They both have straight sides
- They both have angles
- They're both closed figures and can be small or large, etc.
- Triangles only have three sides while squares have four
- The sides of a square are always the same length but the sides of triangles can be different lengths

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!

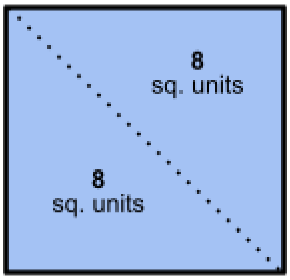


We can decompose this square many different ways, but what if we draw a diagonal from one angle to another angle on this square, **what do you notice?**

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.

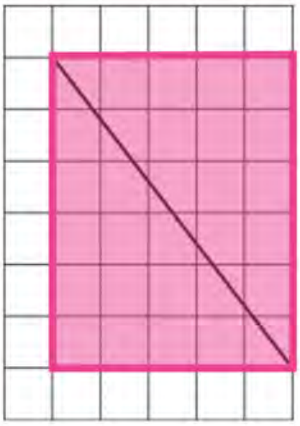
Well look at that! We can decompose or break down a square parallelogram in half to make two, equally-sized triangles. If the triangles are equally-sized that means that the areas of the two triangles will be the same. So, if we know the area of the square then we can also easily find the area of each 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.

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!



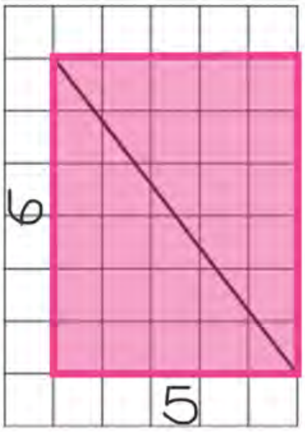
So how do we figure that out? Well, if the whole square has an area of 16 square inches and we just split that square in half to get two *(hold up two fingers)* equally-sized triangles. Let's try it. What is half of 16? 8 That's right! 16 split into two equal pieces is 8 and it is also 8 because 16 divided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

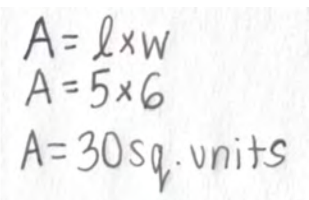


We are still working to find the area of the original triangle. But, since we have a rectangle we can use the area formula for a rectangle or Area = length x width to calculate the area of our newly composed rectangle. We need to first know our length and width and can figure this out by counting the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

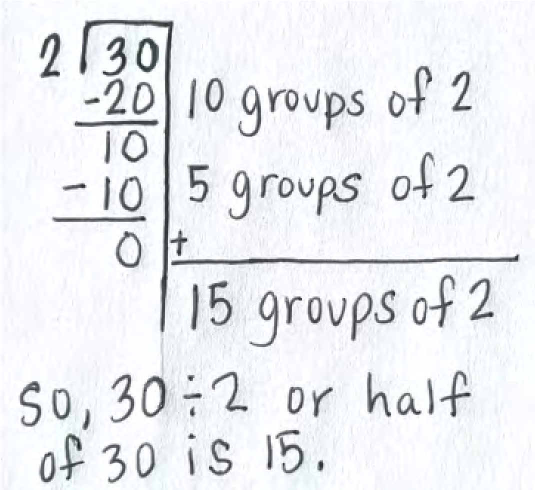


Our next step is to calculate the area of the composed rectangle. We know that we can use the area formula to find the area. So Area= 5 x 6, that's easy math! So the area of the composed rectangle equals 30 square units.

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!



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.

WARM WELCOME

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

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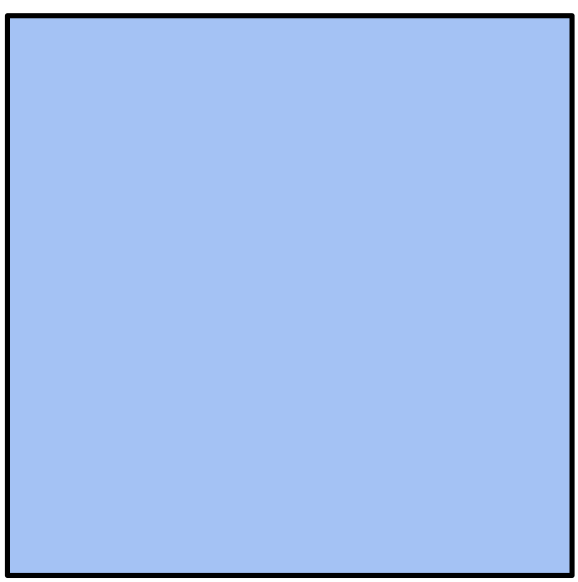
Let's Talk:

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

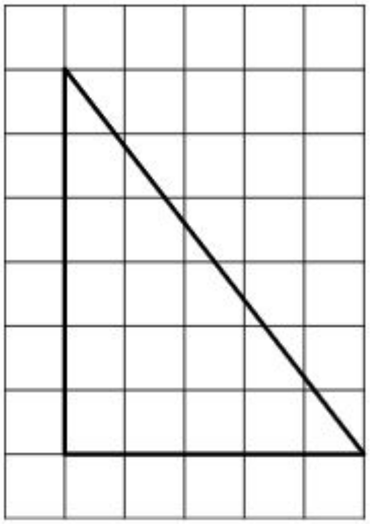
Let's Think:

Let's decompose this square.



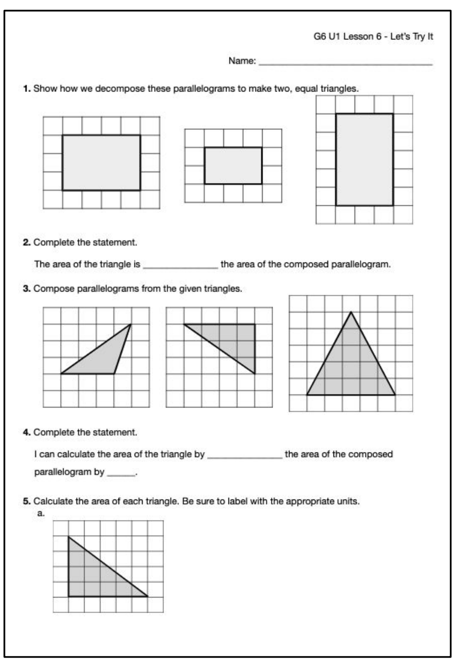
Let's Think:

How can we compose a parallelogram from this triangle?



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.

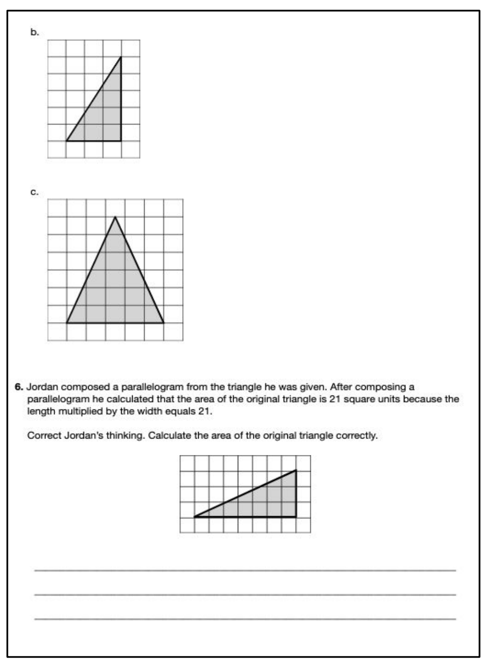
3. Compose parallelograms from the given triangles.

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.

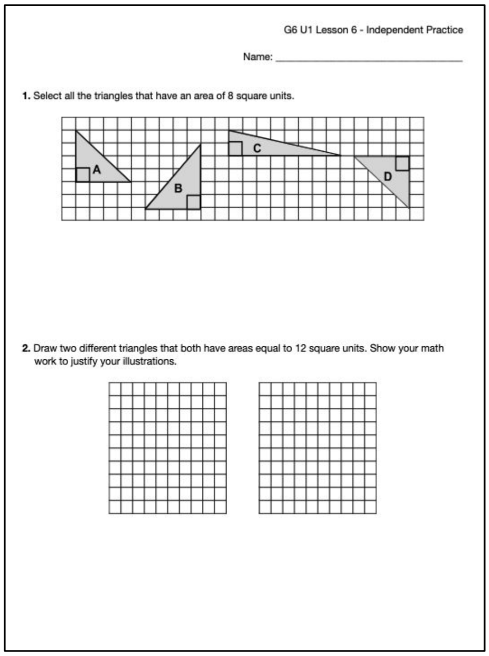
c.

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.

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

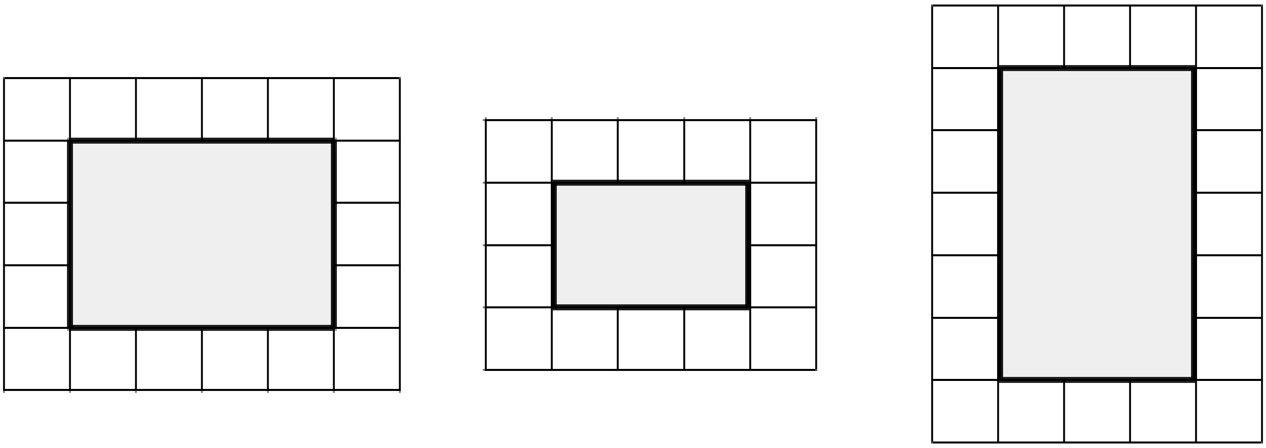
Name: ______________________________

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.

Name: ___________________________________ G6 U1 Lesson 6 - Let’s Try It

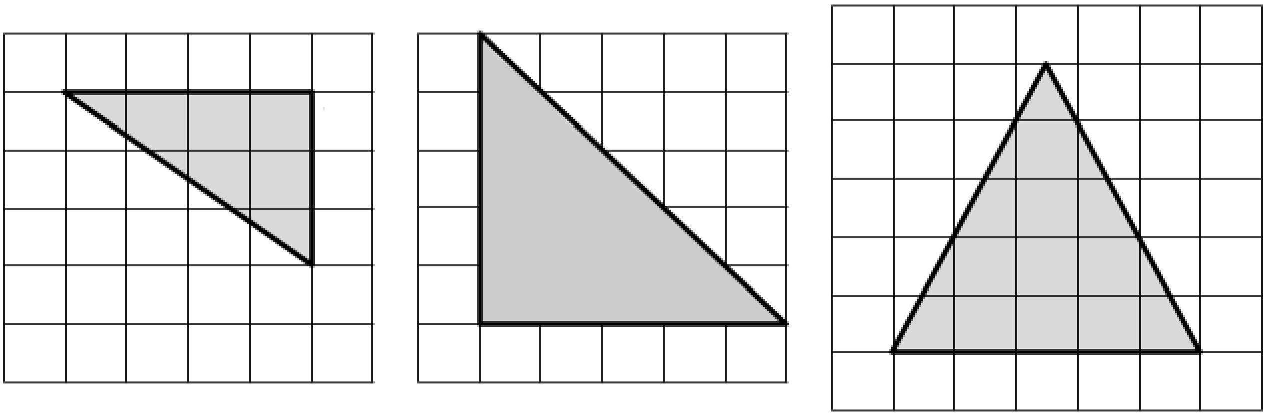
1. Show how we decompose these parallelograms to make two, equal triangles.



2. Complete the statement.

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

3. Compose parallelograms from the given triangles.

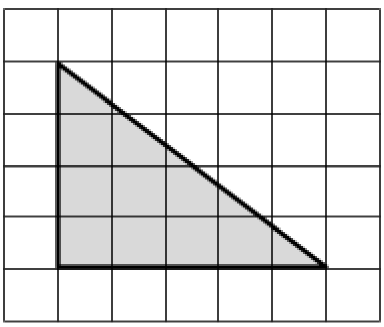


4. Complete the statement.

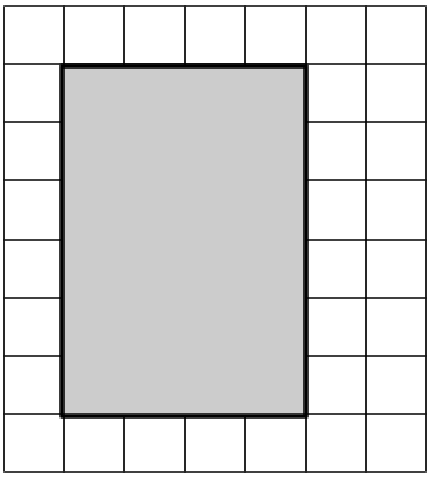
I can calculate the area of the triangle by _______________ the area of the composed parallelogram by ______.

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

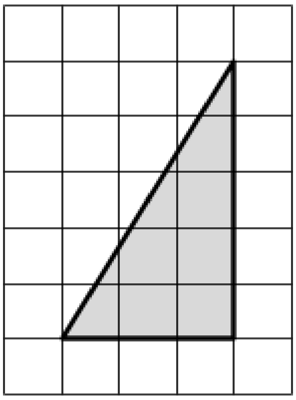
5.



6.

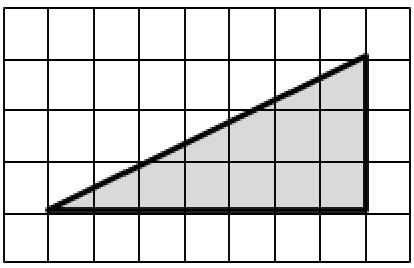


7.



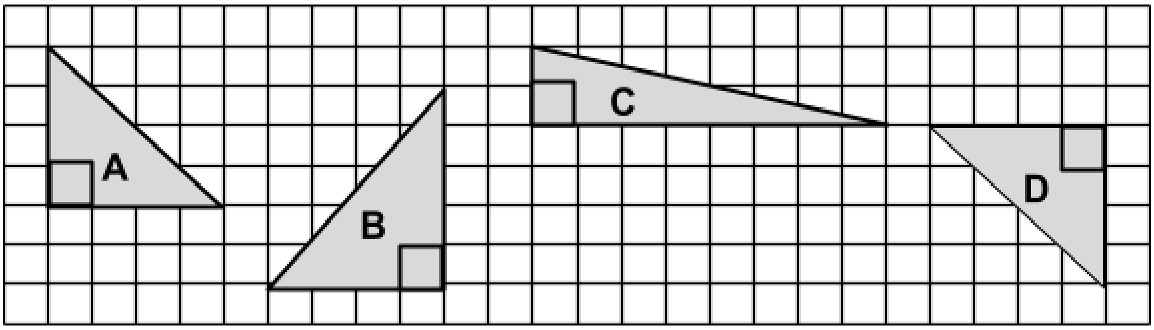
8. Jordan composed a parallelogram from the triangle he was given. After composing a parallelogram he calculated that the area of the original triangle is 21 square units because the length multiplied by the width equals 21.

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

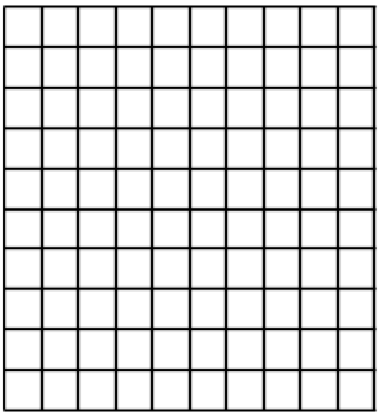


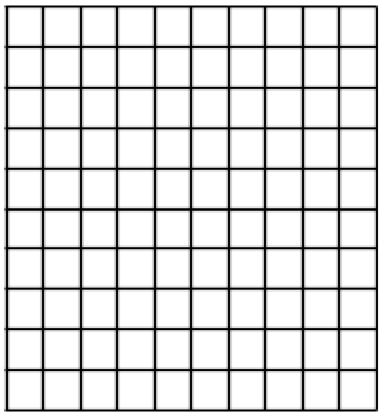
Name: ___________________________________ G6 U1 Lesson 6 - Independent Practice

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

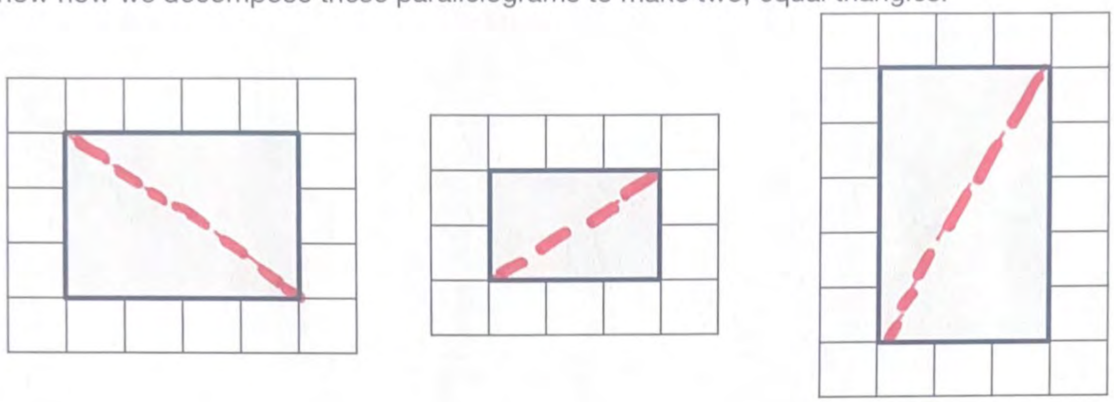


2. Draw two different triangles that both have areas equal to 12 square units. Show your math work to justify your illustrations.





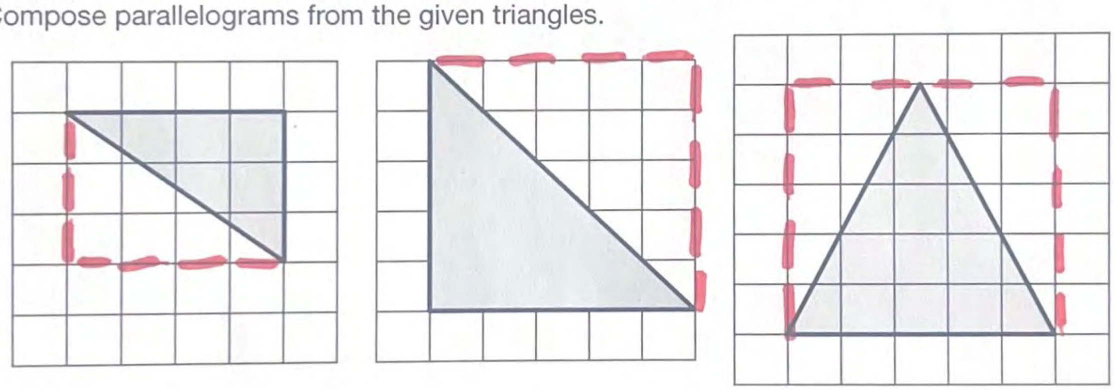
1. Show how we decompose these parallelograms to make two, equal triangles.



2. Complete the statement.

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

3. Compose parallelograms from the given triangles.

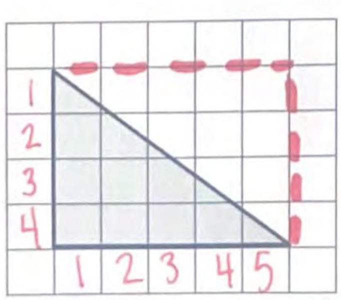


4. Complete the statement.

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.



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

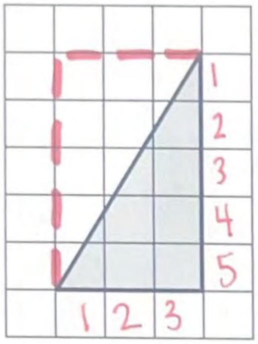
$A_{rectangle} = l \times w$

$A = 5 \times 4$

$A = 20$ sq. units

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

6.



$A = 7\frac{1}{2}$ units^2

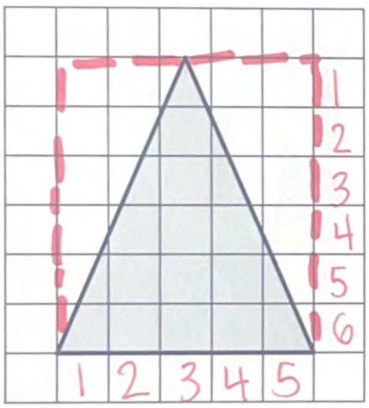
$A_{rectangle} = l \times w$

$A = 5 \times 3$

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

2 ⟌15
−12 6 groups of 2
3
−2 1 group of 2
1
7 R1 or $7\frac{1}{2}$

7.



$A = 15$ unit^2

$A_{rectangle} = l \times w$

$A = 5 \times 6$

$A = 30$ sq. units

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

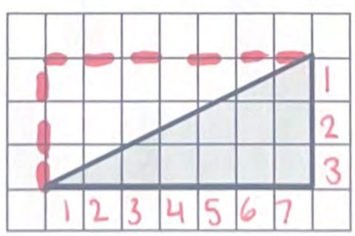
8. Jordan composed a parallelogram from the triangle he was given. After composing a parallelogram he calculated that the area of the original triangle is 21 square units because the length multiplied by the width equals 21.

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

$A_{parallelogram} = l \times w$

$A = 7 \times 3$

$A = 21$ sq. units



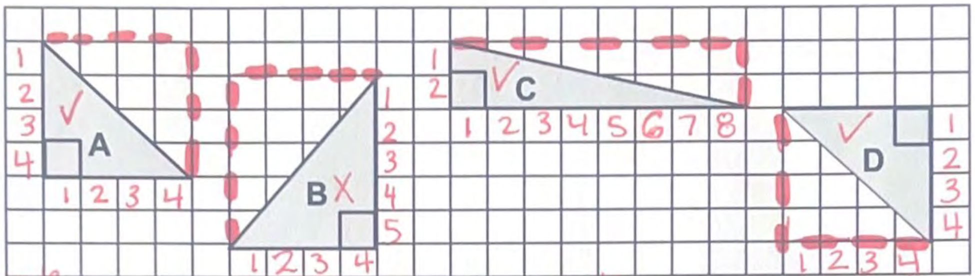
$A_{triangle} = \frac{21}{2}$

2 ⟌21
−20 10 groups of 2
10 R1 or $10\frac{1}{2}$

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 $10\frac{1}{2}$ square units.

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

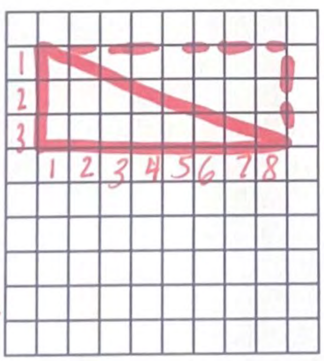
$A = 4 \times 4$

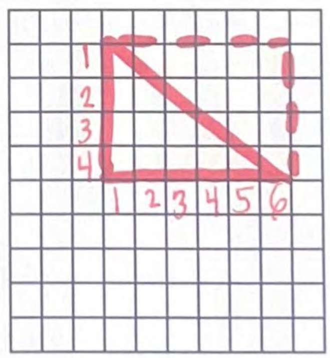
$A_{triangle} = \frac{16}{2}$

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

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 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

G6 U1 Lesson 7

Calculate the area of triangles using the area formula

CITYTUTOR DC

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.

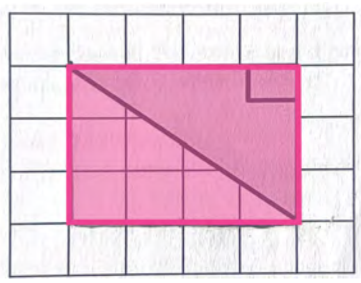
Let's Talk (Slide 3): Let's start with a brainstorm, **what does half mean? Give an example.** Possible Student Answers, Key Points:

- 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.

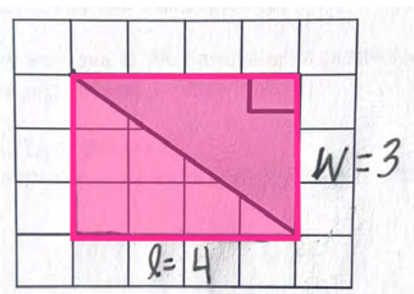
You're right, half is when we split something into two parts or two groups! That's going to be important today. Let me show you.

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.



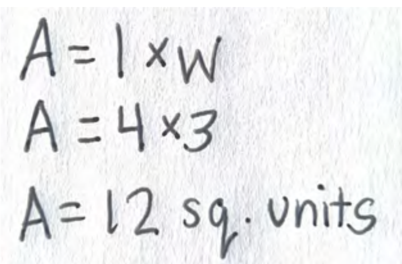
Let's revisit a problem we solved yesterday. Remember that to find the area of this triangle we first composed or built a parallelogram, in this case we composed a rectangle, like this.



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.



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.

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:

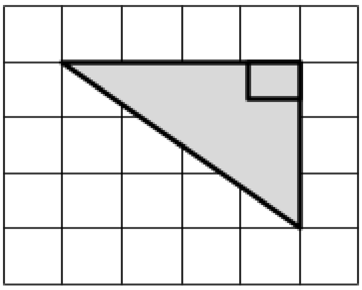
- First, we multiplied the length by the width.
- Then, we divided that answer by 2.

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.

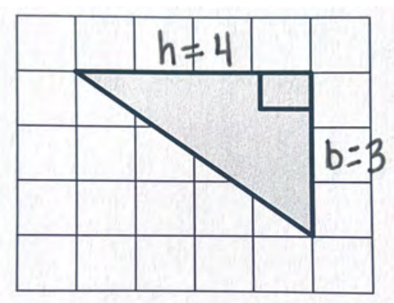
So, our calculation steps for the area of a triangle would be to multiply the base by the height, first. Then, divide that answer by 2.

- 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 $A = ½ \ x \ b \ x \ h$ *(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.

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!

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

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

$$A = 6 \text{ sq. units}$$

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.

WARM WELCOME

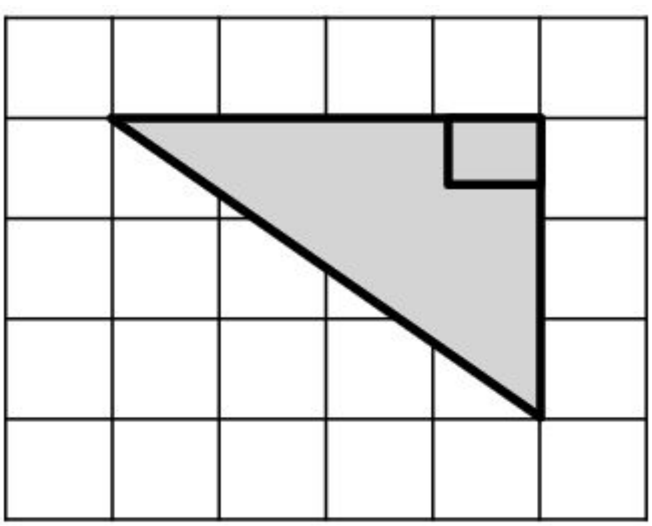
Today we will calculate the area of triangles using the area formula.

Let's Talk:

What does half mean?
Give an example.

Let's Think:

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



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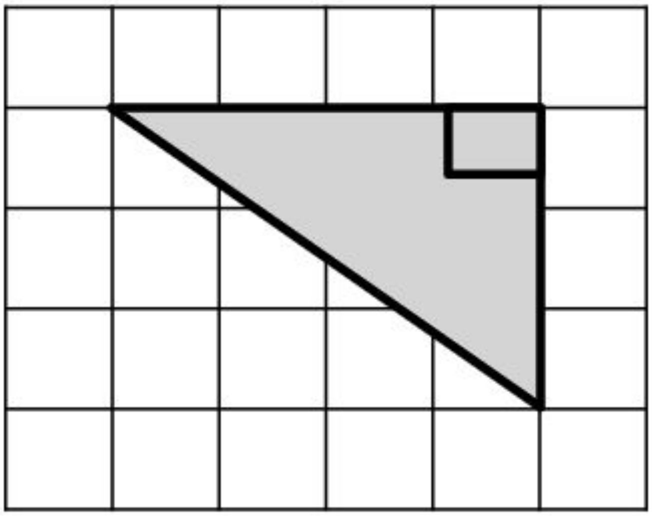
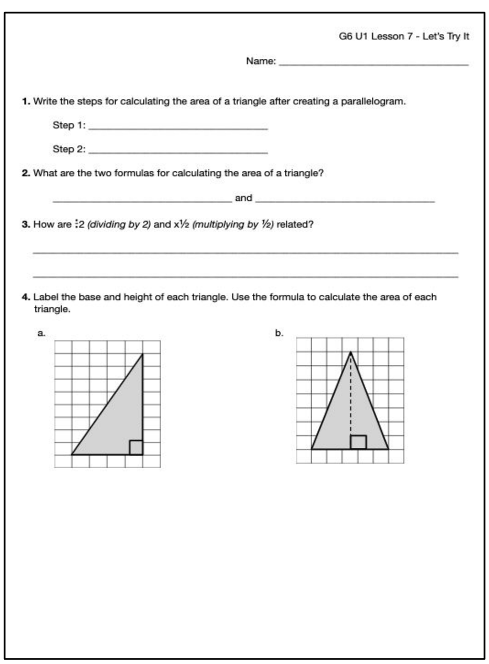
Let's Think:

Using a formula is a more efficient method for solving .



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?

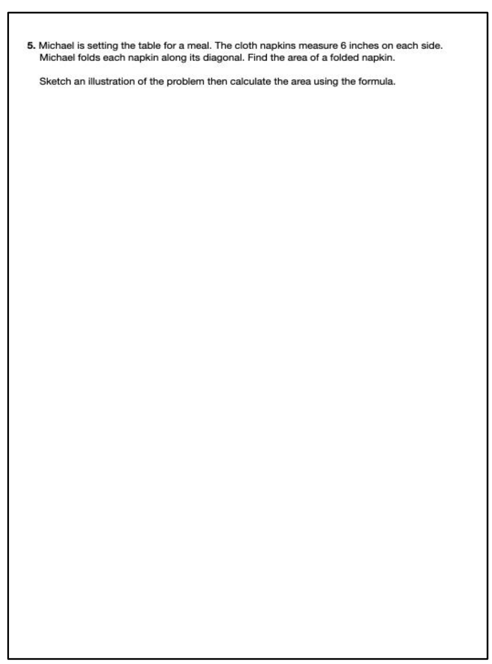
____

____

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.

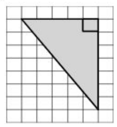
On your Own:

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

G6 U1 Lesson 7 - Independent Practice

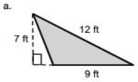
Name: ______________________________

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

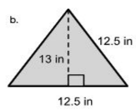


2. Label the base and height of each triangle. Use the formula to calculate the area of each triangle.

a.



b.



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?

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 ___________________________________

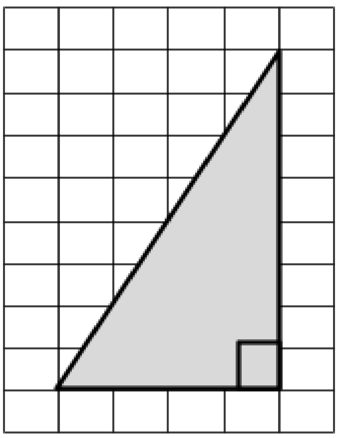
3. How are ÷2 *(dividing by 2)* and x½ *(multiplying by ½)* related?

____

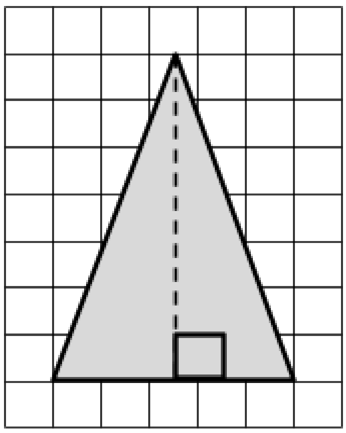
____

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

a.



b.

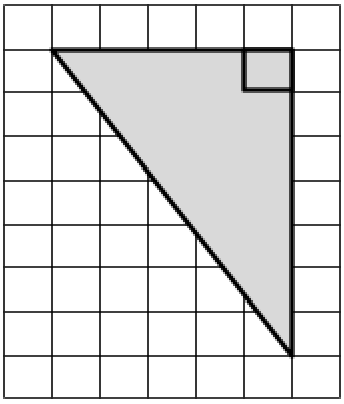


5. Michael is setting the table for a meal. The cloth napkins measure 6 inches on each side. Michael folds each napkin along its diagonal. Find the area of a folded napkin.

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

1. Label the base and height of the triangle.

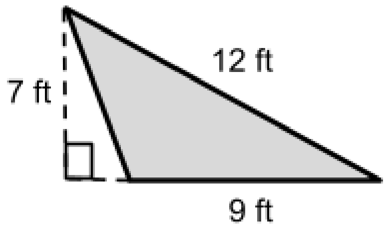
2. Use the formula to calculate the area of the triangle.



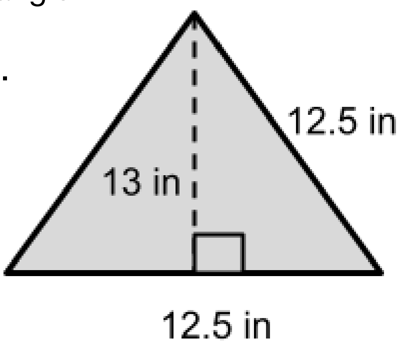
3. Label the base and height of each triangle.

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?

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?

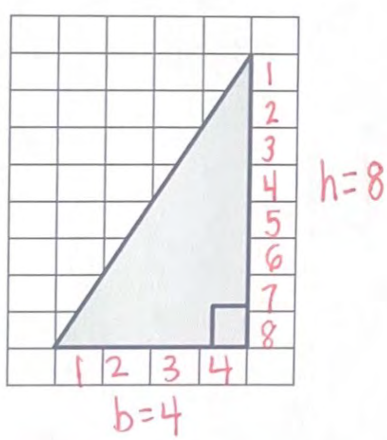
$A = \frac{1}{2} \times b \times h$ and $A = \frac{b \times h}{2}$

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.



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

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

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

$A = 16$ sq. units

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

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

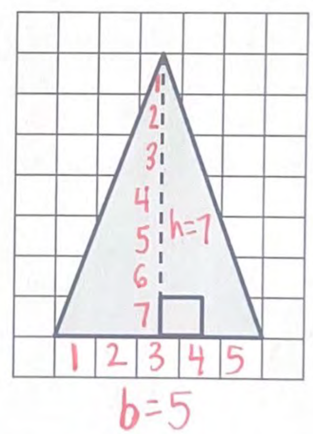
$A = \frac{1}{2} \times 4 \times 8$

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

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

$A = 16$ sq. units

b.



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

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

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

$A = 17\frac{1}{2}$ 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

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

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

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

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

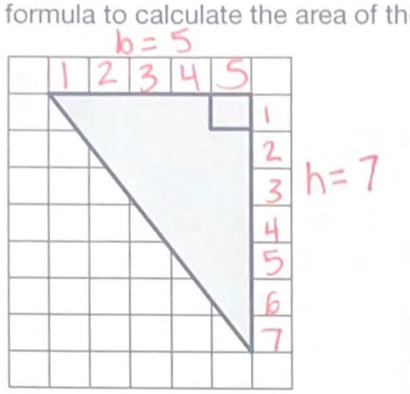
$A = \frac{36}{2}$

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

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.



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

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

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

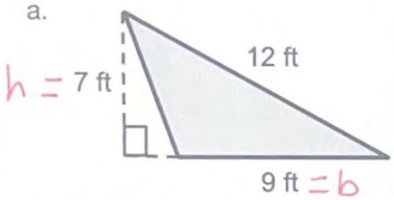
$A = 17\frac{1}{2}$ sq. units

2 ⟌35
−30 | 15 groups of 2
5
−4 | 2 groups of 2
1
+ 17

3. Label the base and height of each triangle.

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

a.



2 ⟌63
−60 | 30 groups of 2
3
−2 | 1 group of 2
1
+ 31

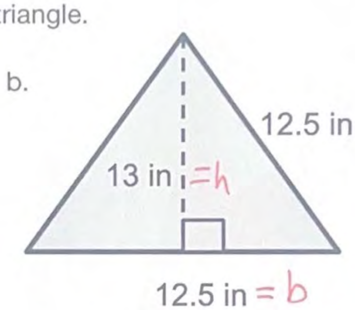
$A = \frac{b \times h}{2}$

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

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

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

b.



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

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

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

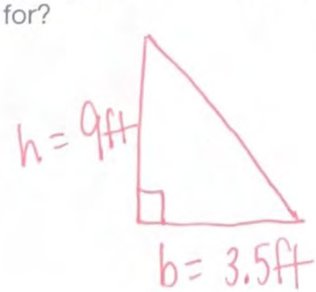
$A = \frac{162.5}{2} = 81\frac{1}{4}\,in^2$

12.5 × 13: 375 + 1250 = 162.5

2 ⟌162
−160 | 80 group of 2
2
−2 | 1 group of 2
0
+ 81

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?



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

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

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

3.5 × 9 = 31.5

2 ⟌31
−20 | 10 groups of 2
11
−10 | 5 groups of 2
1
+ $15\frac{1}{2}$

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

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

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.

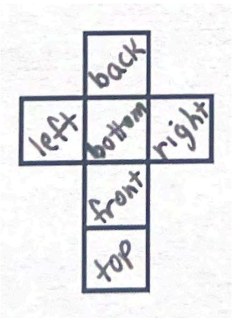
Thinking about the surface of something, surface means the outside part. Think of the surface as the outside part you touch if you are holding an object. Close your eyes and imagine holding a box of tissues. What parts are your hands touching? The outside part. Exactly! You are touching the outside or 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.

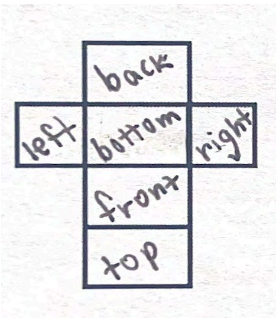
Let's Think (Slide 6): Remember all that great work we did in lessons 1-7? Well we're still going to use that knowledge in this lesson when we calculate the area of 2D figures such as squares, rectangles, and triangles on our way to calculating the total surface area of 3D figures!

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.

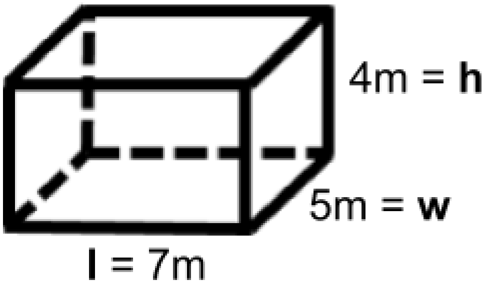


Let's do the same with our rectangular prism. Let's take a second to try and visualize folding the rectangular prism. Start by placing the bottom face directly on the ground *(mimic each motion as you say them aloud)*. Next, fold upward the right and left faces, then fold upward the back and front faces. 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.



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.

WARM WELCOME

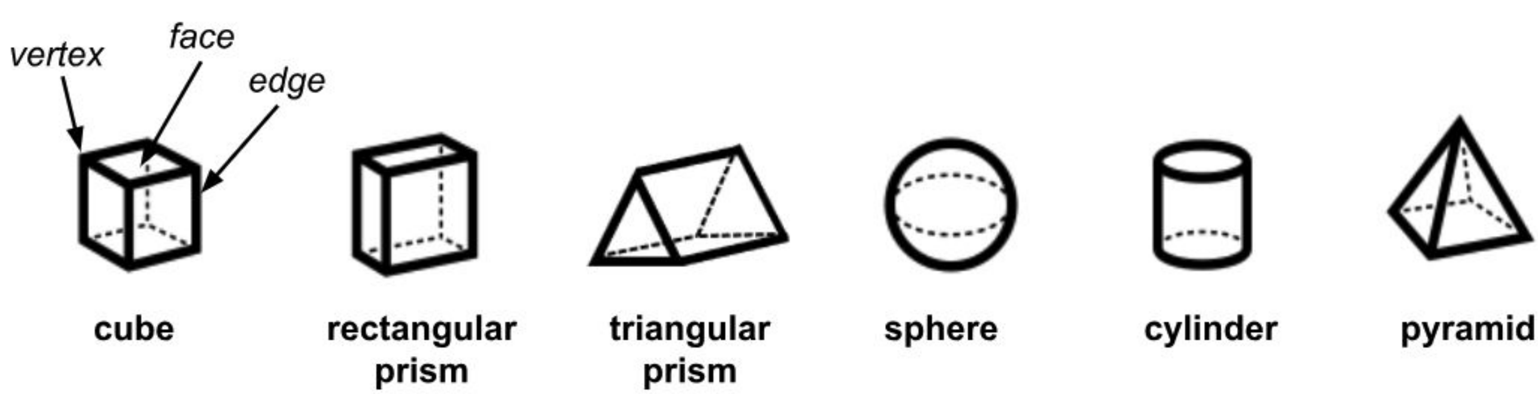
Today we will use nets to calculate surface area of rectangular prisms.

Let's Talk:

What do you know about 3-dimensional shapes?

What do you know about 2-dimensional shapes?

Let's Think:



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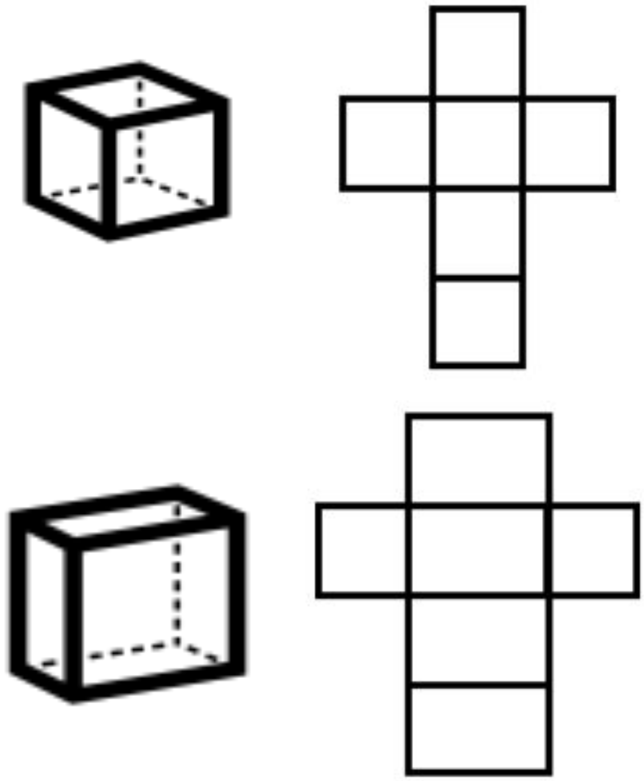
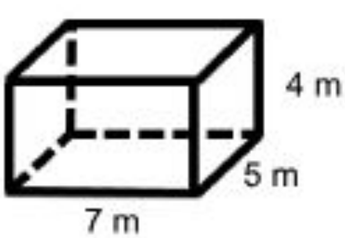
Let's Think:

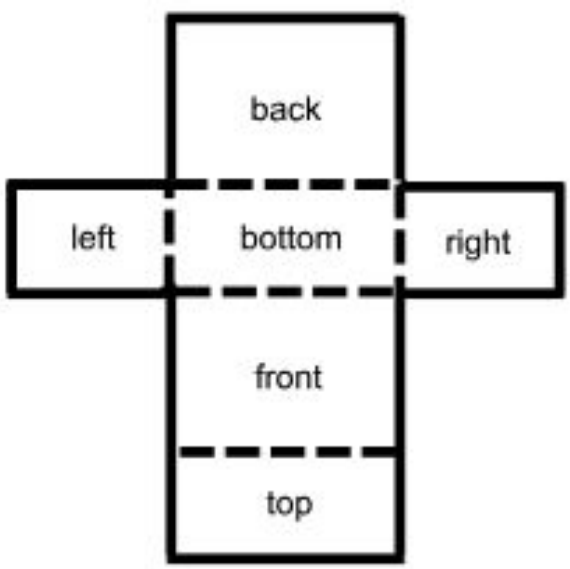
Let's label each net's face with their bottom, top, front, back, left, and right.



Let's Think:

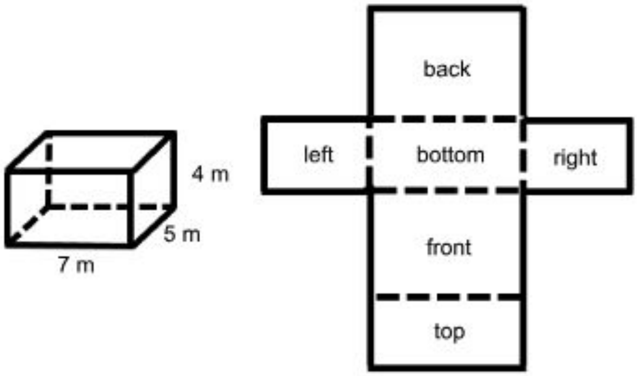
What can we tell about the size of the faces of a rectangular prism?





Let's Think:

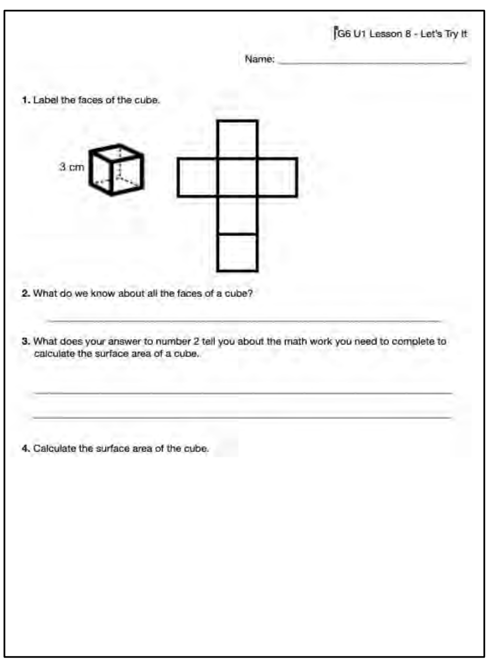
Let's calculate the area of each face.



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

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.

3 cm

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

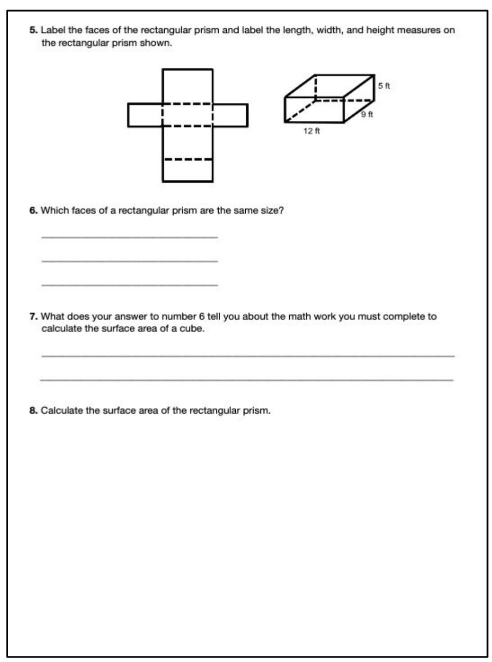
____

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.

5 ft
9 ft
12 ft

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.

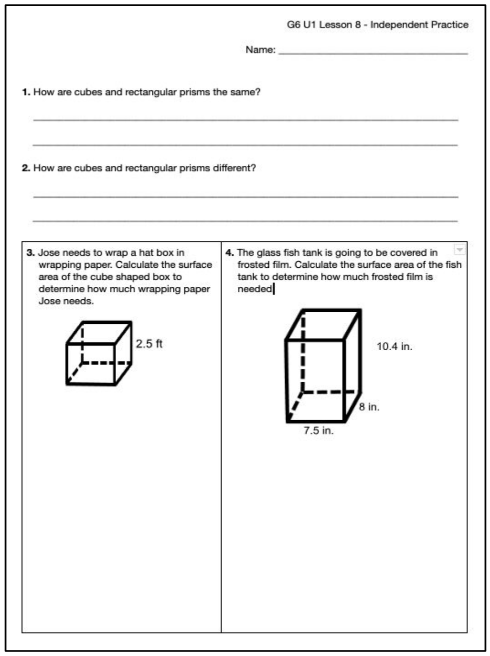
____

____

8. Calculate the surface area of the rectangular prism.

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?

____

____

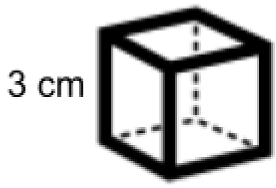
2. How are cubes and rectangular prisms different?

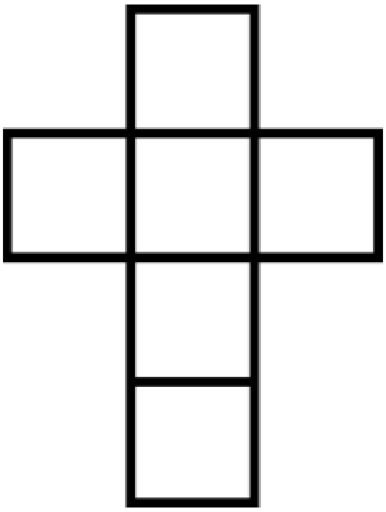
____

____

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. 2.5 ft	**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 10.4 in. 8 in. 7.5 in.

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.

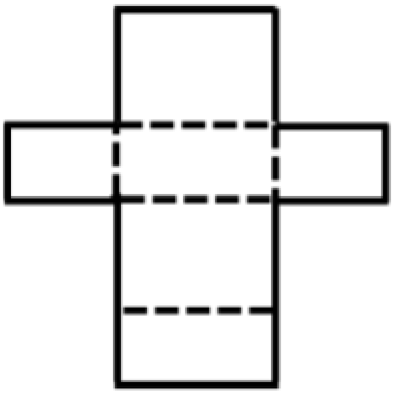
____

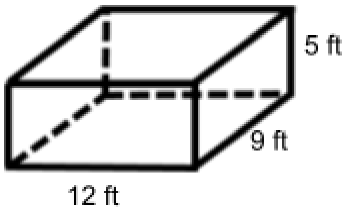
____

4. Calculate the surface area of the cube.

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.

1. How are cubes and rectangular prisms the same?

____

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2. How are cubes and rectangular prisms different?

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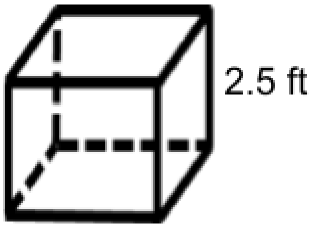
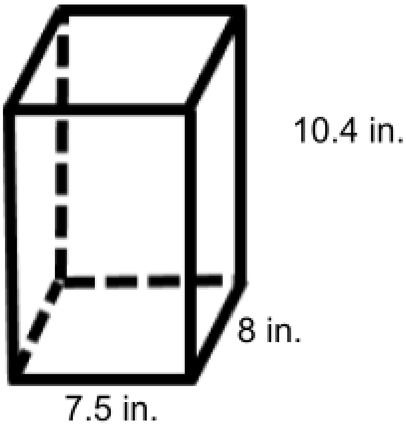
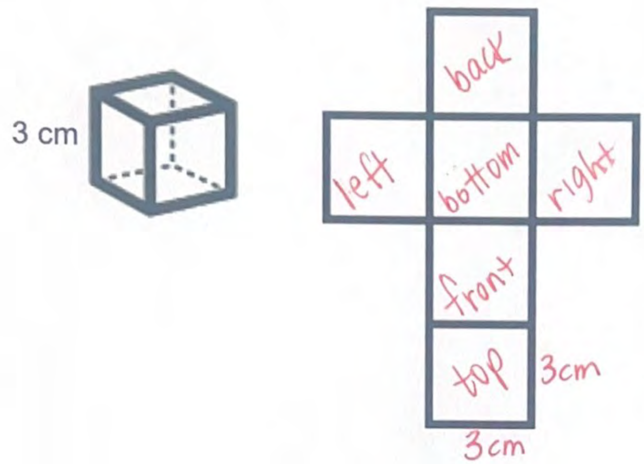
3. Jose needs to wrap a hat box in wrapping paper. Calculate the surface area of the cube shaped box to determine how much wrapping paper Jose needs. 	**4.** The glass fish tank is going to be covered in frosted film. Calculate the surface area of the fish tank to determine how much frosted film is needed. 

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.

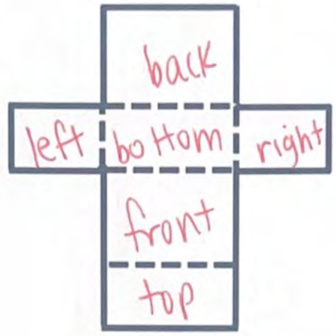
4. Calculate the surface area of the cube.

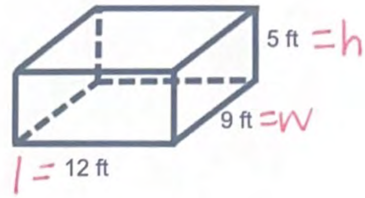
Find the area of one face $A = l \times w$ so, $A = 3 \times 3$ OR $9 cm^2$.

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

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 → $A = w \times h = 9 \times 5 = 45\ ft^2 \times 2 = 90\ ft^2$

Ba/F → $A = l \times h = 12 \times 5 = 60\ ft^2 \times 2 = 120\ ft^2$

T/Bo → $A = l \times w = 12 \times 9 = 108\ ft^2 \times 2 = 216\ ft^2$

$+$ ———

$426\ ft^2$

$45 \times 2 = 90$

$108 \times 2 = 216$

The surface area of the rectangular prism is 426 ft.

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.

2.50 × 2.50 = 125 + 5000 = 6.250

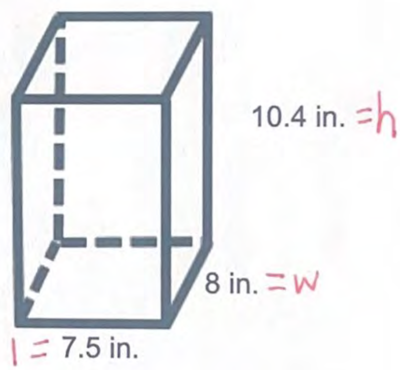
one face → A = w×h = 2.5×2.5 = 6.25 ft^2

6.25 × 6 faces

6.25 × 6 = 37.50

Surface Area = 37.5 ft^2

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 in^2 × 2 = 442.4 in^2

10.4 × 8 = 83.20

10.40 × 7.50 = 520 + 7280 = 78.000

7.50 × 8 = 60.00

The surface area is 442.4 in^2.

G6 U1 Lesson 9

Use nets to calculate surface area of triangular prisms

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

Warm Welcome (Slide 1): Tutor choice.

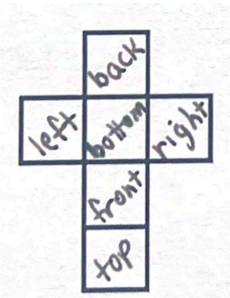
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue exploring 3D figures and surface area which is the amount of space covering the outside of a 3D figure. In the last lesson we used our knowledge of 2D, or 2-dimensional, figures like squares and rectangles to calculate the 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:

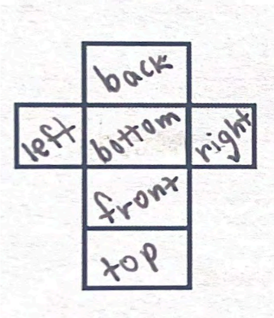
- It's like people are jumping off the screen.
- It's different from a 2D movie because it's like you can pick things up.

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.

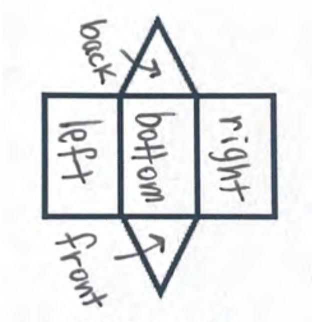


Next up are the vertical faces; front, back, and top. Again, we are using the bottom face to position the front and back faces. The face above the bottom face we label the back face and we label the front face on the other side. It is the face touching the bottom face.

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.



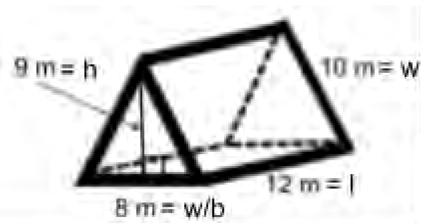
Let's label the net of the triangular prism. When we label the net we still begin with the bottom face like with the rectangular prism's net. Once we've identified the bottom face it makes it easier to identify the others because their position is based on the placement of the bottom face.

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/

- 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.

WARM WELCOME

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

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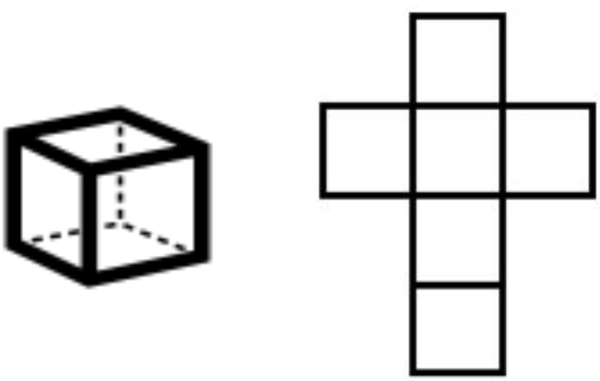
Let's Talk:

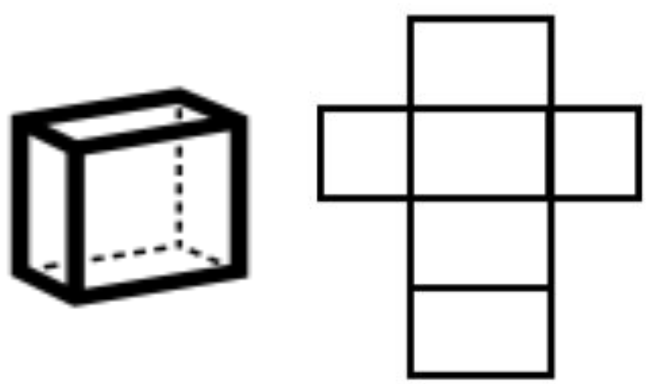
Have any of you seen a 3D movie?

Describe that experience.

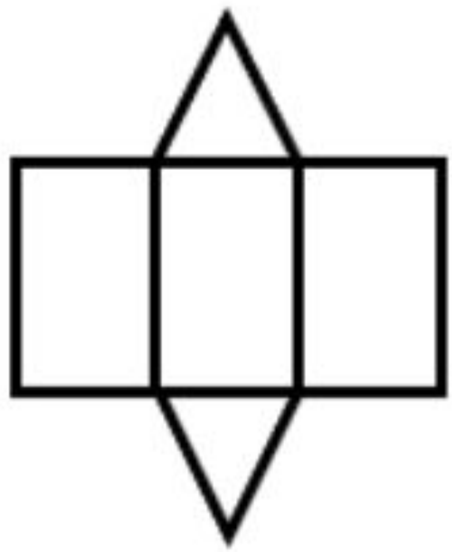
Let's Think:

Let's label each net's faces.

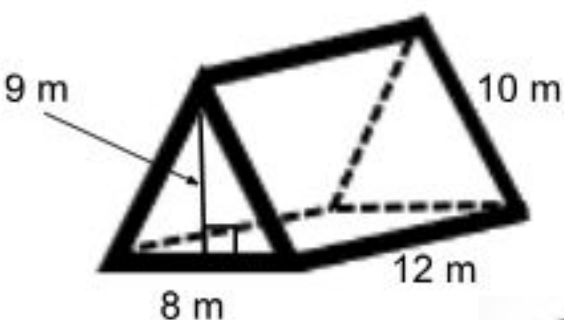


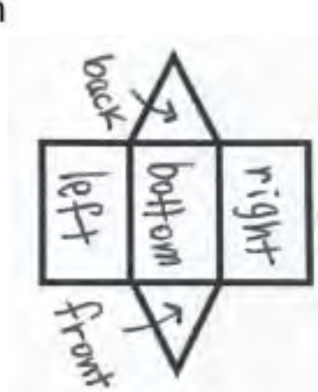


Let's Think: When you hear the name *triangular prism* what shape do you think of?



Let's Think: Let's calculate the area of each face.

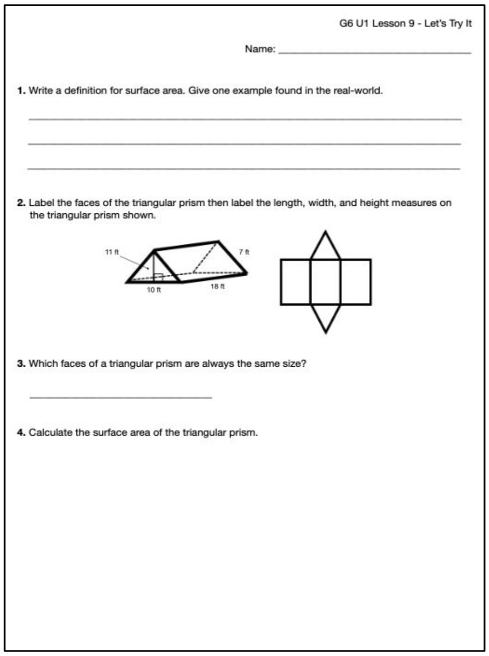




Area of front/back	**front**	**back**
Area of left/right	**left**	**right**
Area of bottom	**bottom**	

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.

____

____

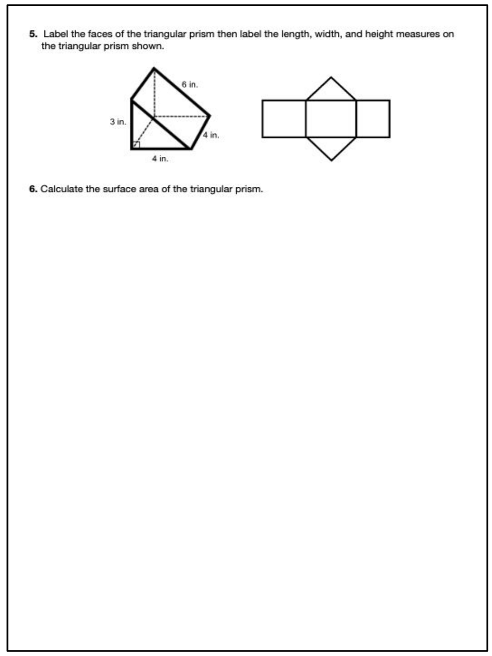
____

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?

____

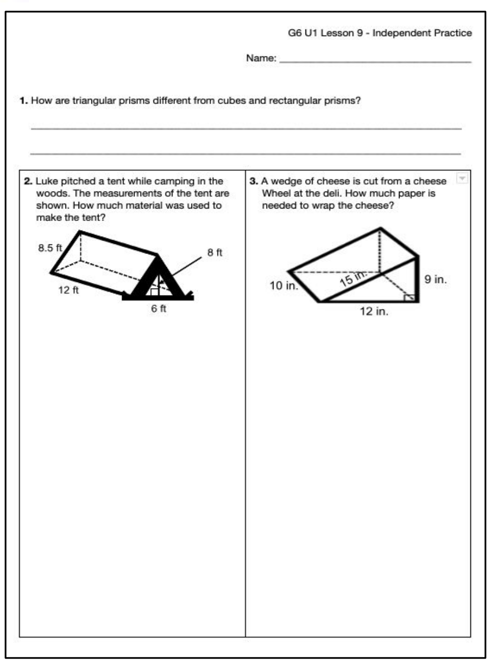
4. Calculate the surface area of the triangular prism.


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.

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?

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

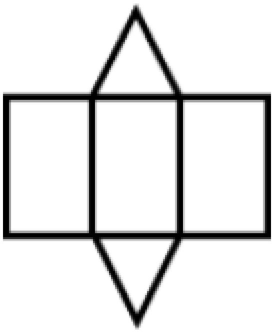
____

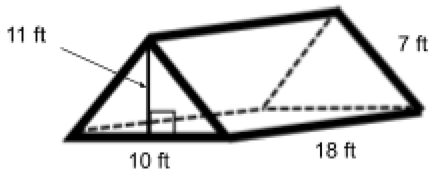
____

____

2. Label the faces of the triangular prism.

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





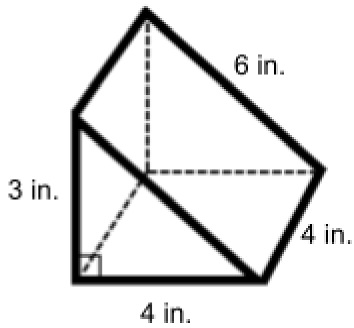
4. Which are the only faces of a triangular prism that are always the same size?

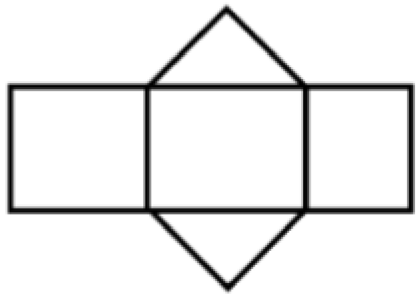
____

5. Calculate the surface area of the triangular prism.

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.

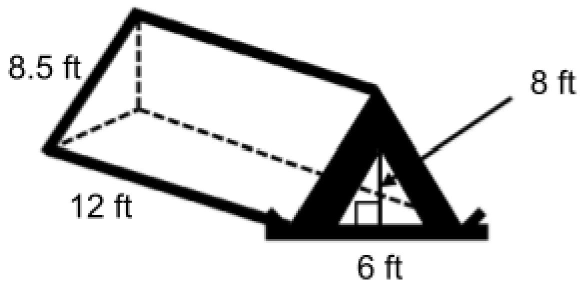
Name: ________________________________ G6 U1 Lesson 9 - Independent Practice

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

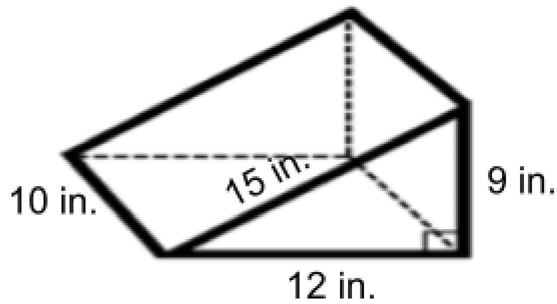
____

____

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?

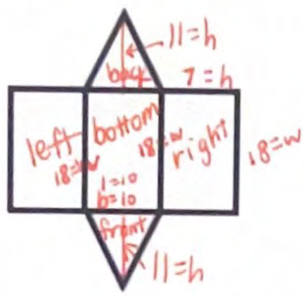


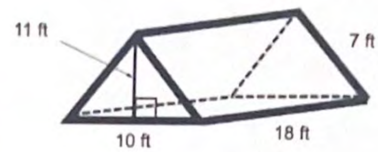
1. Write a definition for surface area. Give one example found in the real-world. (answers will vary)

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

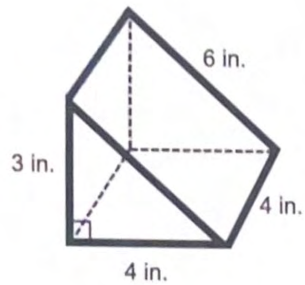
right $= h \times w = 7 \times 18 = \boxed{126}$

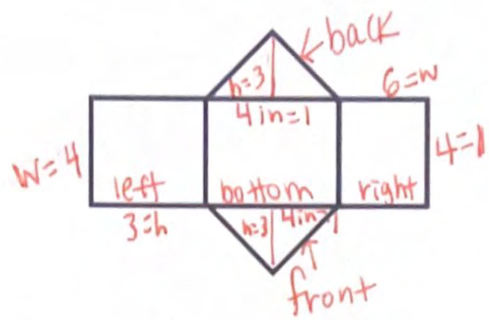
$110 + 180 + 126 + 126 = 542\ ft^2$

The surface area is $542\ ft^2$.

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.

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

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

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

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

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

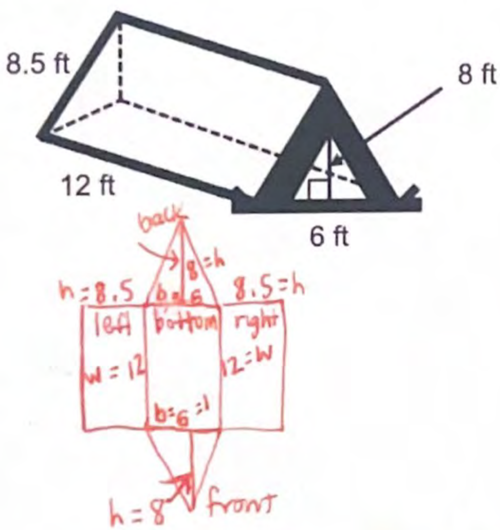
The surface area is 64 in^2.

Name: ______________________________

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

$24 \times 2 = \boxed{48}$

left/right = $h \times w = 8.5 \times 12$

```
   12
 x 8.5
   60
+ 960
 102.0
```

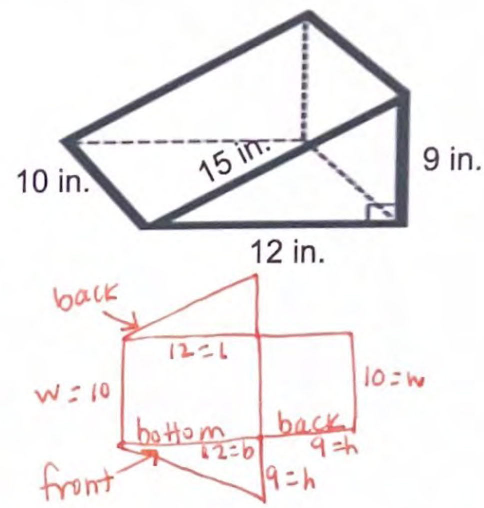
$102 \times 2 = \boxed{204}$

bottom = $l \times w = 6 \times 12 = \boxed{72}$

$48 + 204 + 72 = 324$

The surface area is 324 ft^2.

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

$54 \times 2 = \boxed{108}$

bottom = $l \times w = 12 \times 10 = \boxed{120}$

back = $h \times w = 9 \times 10 = \boxed{90}$

$108 + 120 + 90 = 318$

318 in^2 of paper is needed to wrap the cheese.

G6 U1 Lesson 10

Use nets to calculate surface area of rectangular and triangular prisms

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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.

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.

WARM WELCOME

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

Let's Talk:

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

Let's Think:

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

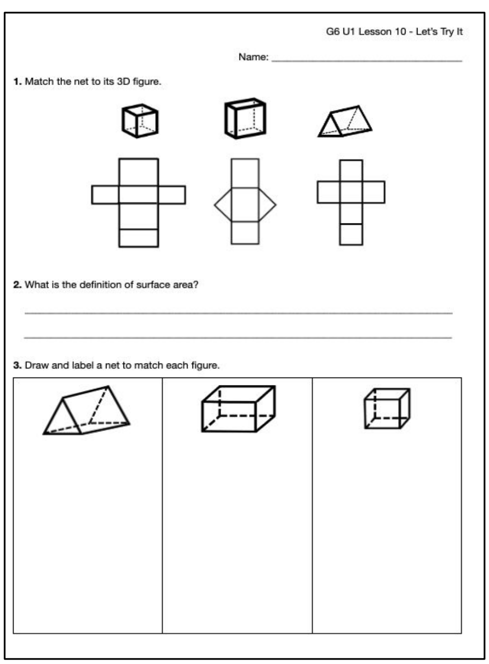
Let's Think:

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

Let's try be a as concise as possible.

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?

____

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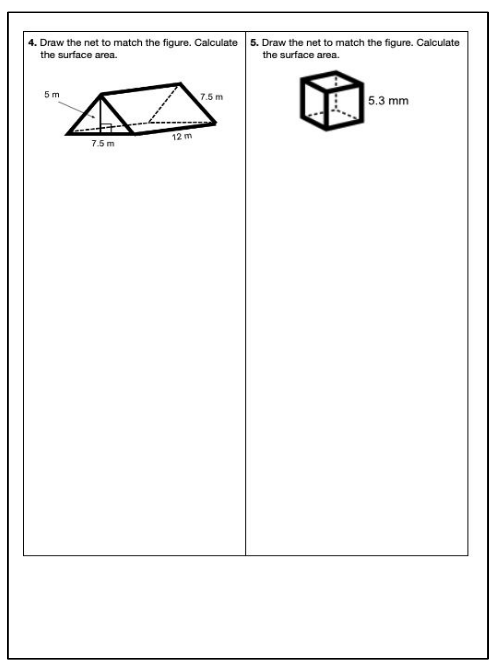
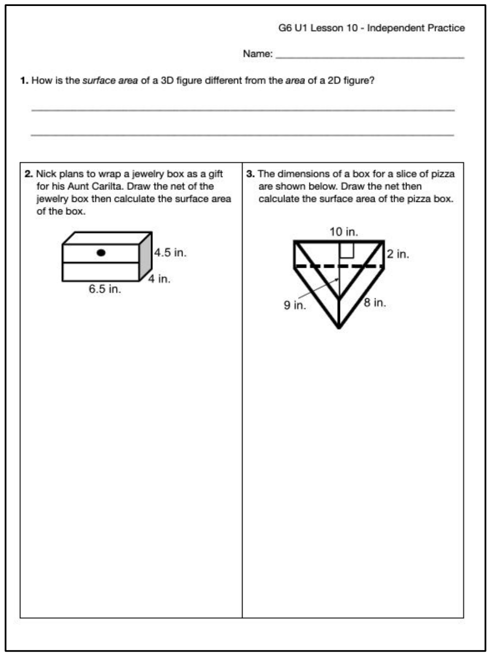
3. Draw and label a net to match each figure.


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

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

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: ______________________________

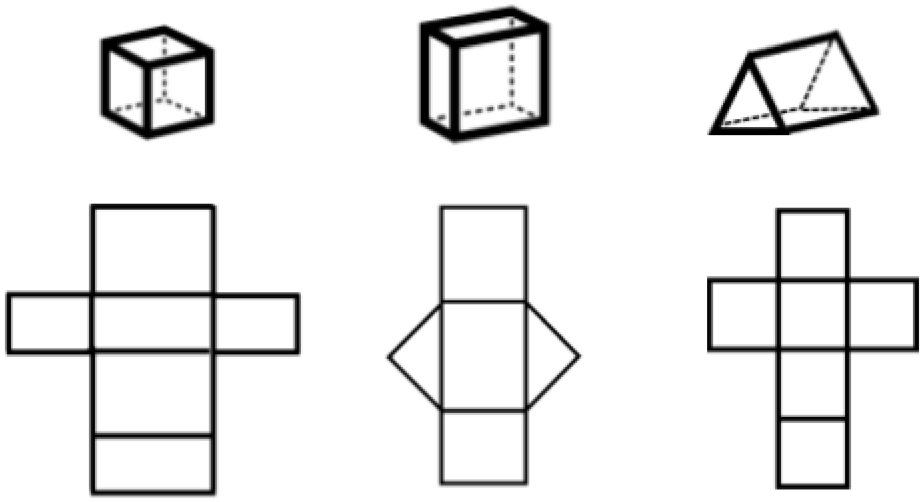
1. How is the *surface area* of a 3D figure different from the *area* of a 2D figure?

____

____

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

1. Match the net to its 3D figure.



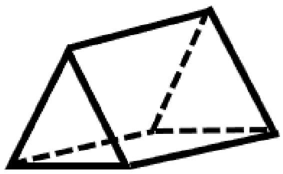
2. What is the definition of surface area?

____

____

3. Name each 3D figure.

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



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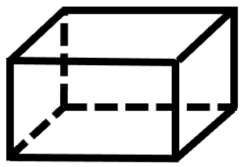

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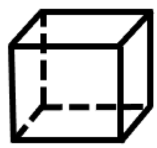

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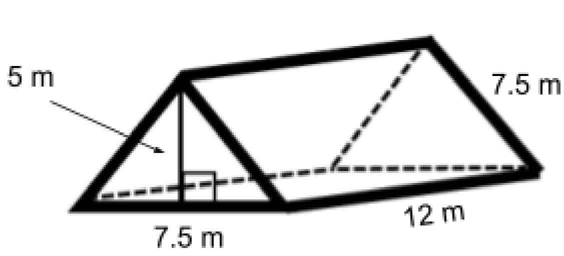

5. Name each 3D figure.

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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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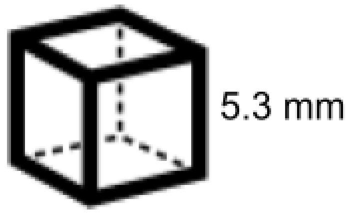
____

____

8. Calculate the surface area.



9. Name each 3D figure.

____

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10. Draw the net to match the figure.

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

____

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____

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12. Calculate the surface area.

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

____

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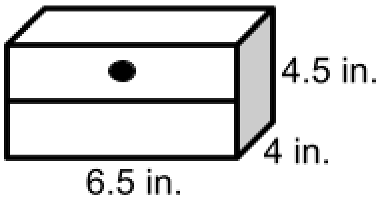
Nick plans to wrap a jewelry box as a gift for his Aunt Carilta.



2. Name the shape of the jewelry box.

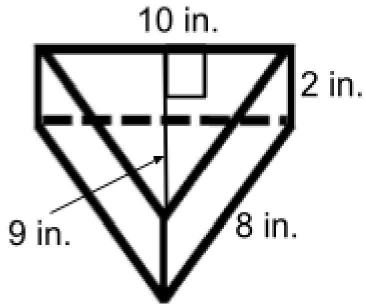
____

____

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?

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



5. Name the shape of the jewelry box.

____

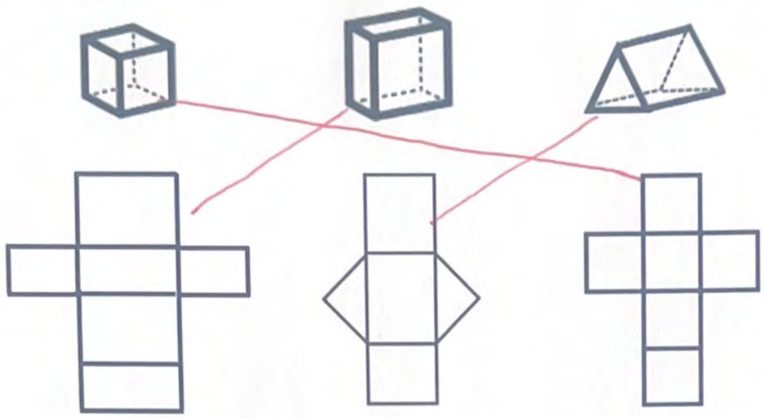
____

6. Draw the net to match the figure.

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

Name: ______________________________

1. Match the net to its 3D figure.



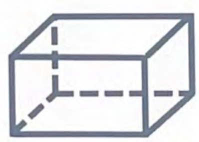
2. What is the definition of surface area?

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

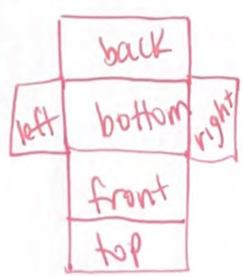
3. Name each 3D figure.

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

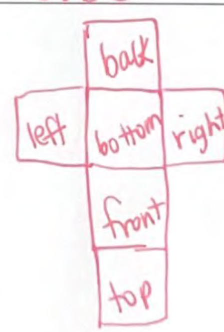
triangular prism

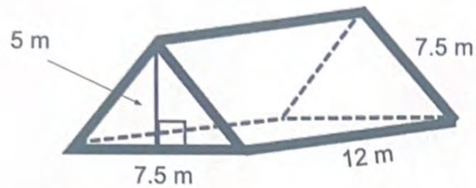


rectangular prism



Also rectangular prism
Cube





5. Name each 3D figure.

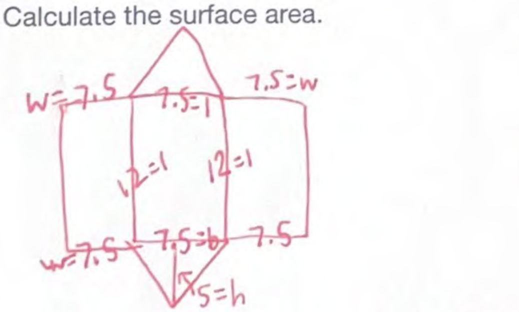
triangular prism

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

$18.75 \times 2 = \boxed{37.5}$

bottom $= l \times w = 7.5 \times 12 = \boxed{90}$

left $= l \times w = 12 \times 7.5 = \boxed{90}$

right $= l \times w = 12 \times 7.5 = \boxed{90}$

$37.5 + 90 + 90 + 90 = 307.5 \text{ m}^2$

9. Name each 3D figure.

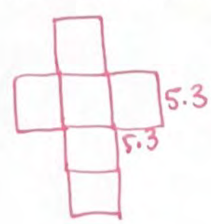
rectangular prism OR cube

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 $= 5.3 \times 5.3 = 28.09$

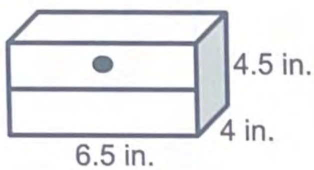
$28.09 \times 6 = 168.54 \text{ mm}^2$

Name: ______________________

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.

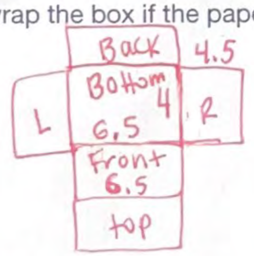


2. Name the shape of the jewelry box.

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 = 4.5×4 = 18×2 = 36

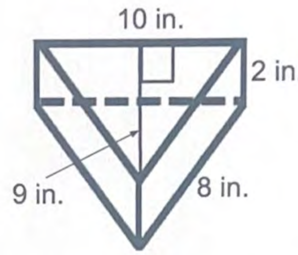
bottom/top = 6.5×4 = 26×2 = 52

front/back = 6.5×4.5 = 29.25×2 = 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.

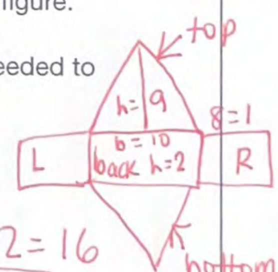


5. Name the shape of the box.

triangular prism

6. Draw the net to match the figure.

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



left/right = l×h = 8×2 = 16
16×2 = 32

back = l×h = 10×2 = 20

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

32+20+90 = 142 in^2

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

G6 U1 Lesson 11

Explore volume of 3-dimensional figures

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!

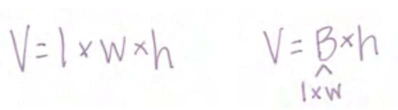
But most times we don't have cubes, sometimes the numbers are too large to represent easily with cubes, and at other times the measurements of the prisms are fractions or decimals, which are even harder to work with. That's why we can use a formula instead of cube packing to determine the volume of prisms.

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*).

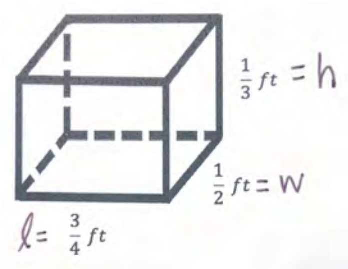
Guess what? There's another volume formula we could use! The other formula is volume equals base times height. If we compare the formulas V = l x w x h and V = B x h we can see that they have similarities and differences. **How are they the same? And how are they different?** Possible Student Answers,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

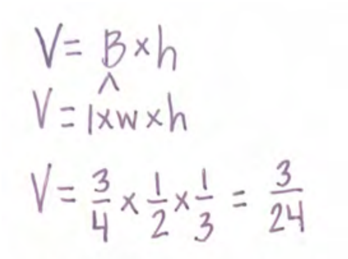
This is interesting! We've seen L x W before, to find the area of a rectangle! Does the L x W part of the formula remind you of anything? Yes, L x W is the area formula for squares and rectangles.



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.

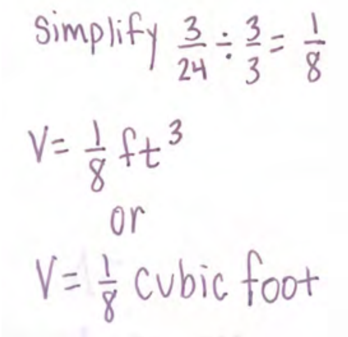


Let's use the big B formula to calculate the volume of this rectangular prism. First we label the length, width, and height.



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.

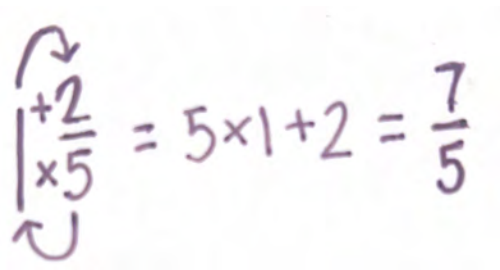


Let's simplify together. If we divide $\frac{3}{24} \div \frac{1}{1}$ you are still left with $\frac{3}{24}$ so that's no help! Let's try $\frac{3}{24} \div \frac{3}{3}$. That's it! $\frac{3}{24}$ simplifies to $\frac{1}{8}$.

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 $\frac{7}{5}$.

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.

WARM WELCOME

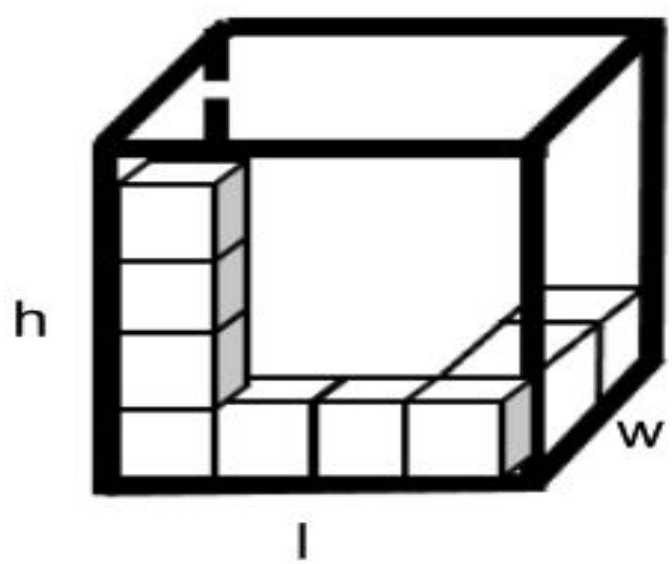
Today we will explore the volume of 3-dimensional figures.

Let's Talk:

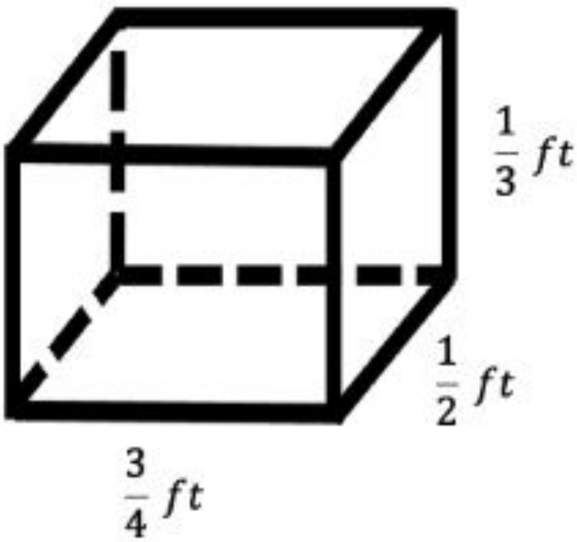
Can you think of some real-world examples where we might need to know the volume of the object?

Let's Think:

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



Let's Think: Let's use the volume formula.

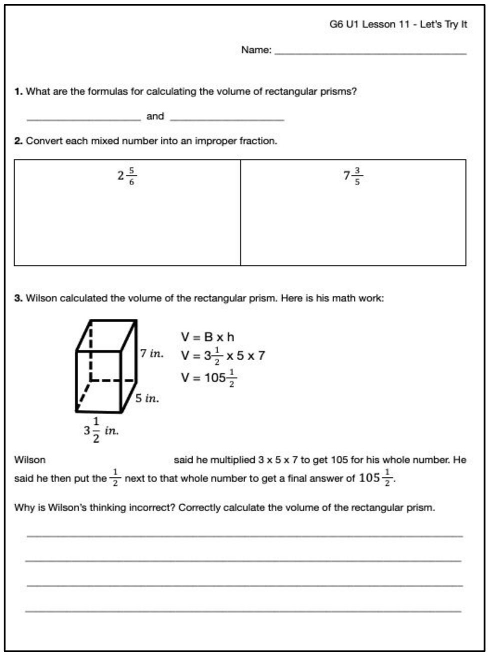


Let's Think: What is the process for converting mixed numbers to improper fractions?

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

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 ________________

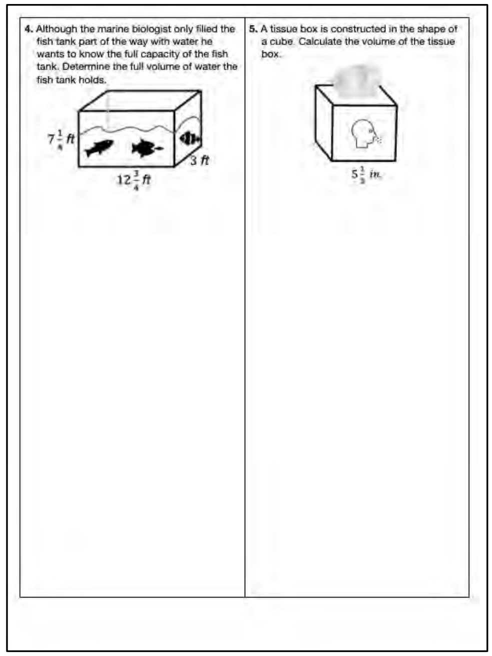
2. Convert each mixed number into an improper fraction.

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

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

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 $105\frac{1}{2}$.

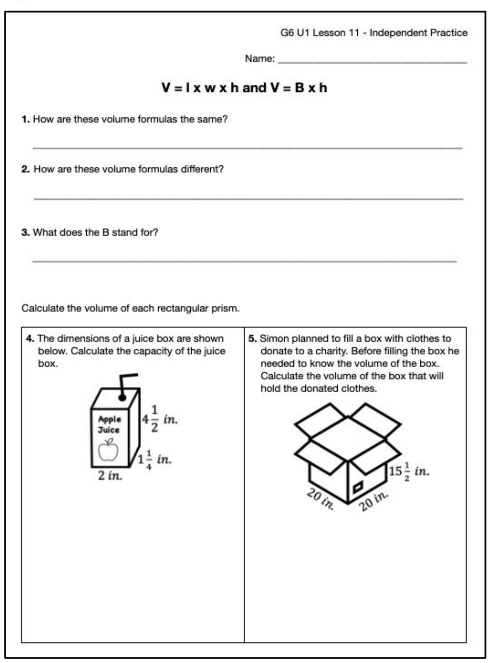
Why is Wilson's thinking incorrect? Correctly calculate the volume of the rectangular prism.


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.

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.

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

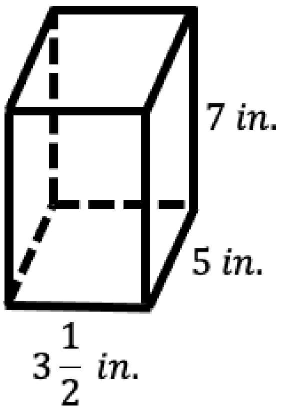
_____________________ and _____________________

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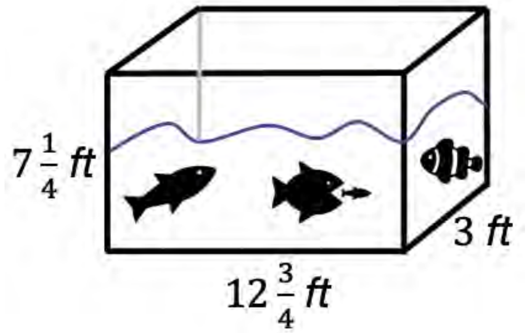
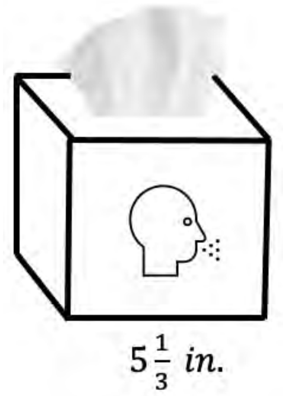
Although the marine biologist only filled the fish tank part of the way with water he wants to know the full capacity of the fish tank.

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.



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

1. How are these volume formulas the same?

____

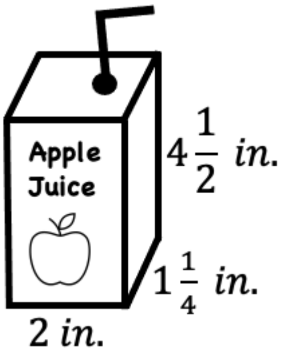
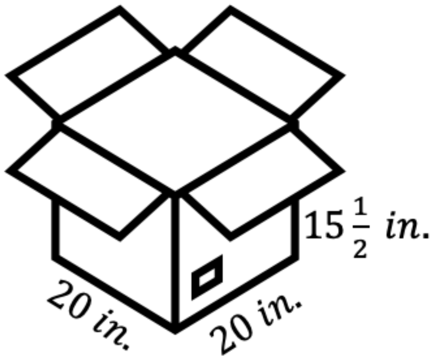
2. How are these volume formulas different?

____

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. 

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

$V = l \times w \times h$ 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.

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

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

$V = B \times h$

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

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

$3\frac{1}{2} = \frac{7}{2}$

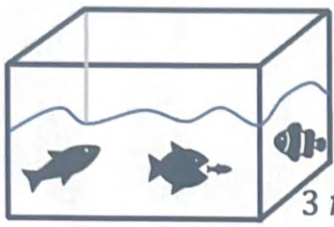
Wilson said he multiplied 3 x 5 x 7 to get 105 for his whole number. He said he then put the $\frac{1}{2}$ next to that whole number to get a final answer of $105\frac{1}{2}$.

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 $122\frac{1}{2}$.

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.



$V = B \times h$

$V = l \times w \times h$

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

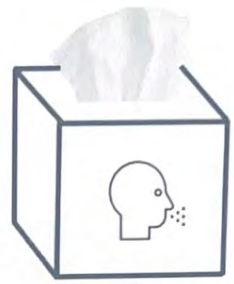
$V = \frac{51}{4} \times \frac{3}{1} \times \frac{29}{4} = \frac{4437}{16}$

$4437 \div 16$: $4437 - 3200 = 1237$ (200); $1237 - 800 = 437$ (50); $437 - 160 = 277$ (10); $277 - 160 = 117$ (10); $117 - 96 = 21$ (6); $21 - 16 = 5$ (1); total 277 R 5

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

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

6. Calculate the volume of the tissue box.



$V = B \times h$

$V = l \times w \times h$

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

$V = \frac{16}{3} \times \frac{16}{3} \times \frac{16}{3} = \frac{4096}{27}$

$4096 \div 27$: $4096 - 2700 = 1396$ (100); $1396 - 270 = 1126$ (10); $1126 - 1080 = 46$ (40); $46 - 27 = 19$ (1); total 151 R 19

$V = 151\frac{19}{27}\ in^3$

Name: ______________________________

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.

$V = B \times h$

$V = l \times w \times h$

$V = 2 \times 1\frac{1}{4} \times 4\frac{1}{2}$

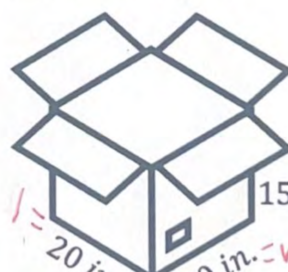
$V = \frac{2}{1} \times \frac{5}{4} \times \frac{9}{2} = \frac{90}{8} = 11\frac{2}{8}\ in^3$

$4\frac{1}{2} = \frac{9}{2}$

$1\frac{1}{4} = \frac{5}{4}$

8 ⟌ 90: − 80 = 10, − 8 = 2; 10 + 1 = 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.



$V = l \times w \times H$

$V = 20 \times 20 \times 15\frac{1}{2}$

$V = \frac{20}{1} \times \frac{20}{1} \times \frac{31}{2} = \frac{12400}{2}$

$15\frac{1}{2} = \frac{31}{2}$

2 ⟌ 12400: − 12000 (6000), 400, − 400 (200), 0; 6000 + 200 = 6200

$V = 6{,}200\ in^3$

G6 U1 Lesson 12

Differentiate between volume and surface area

CITYTUTOR DC

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.

WARM WELCOME

Today we will differentiate between volume and surface area.

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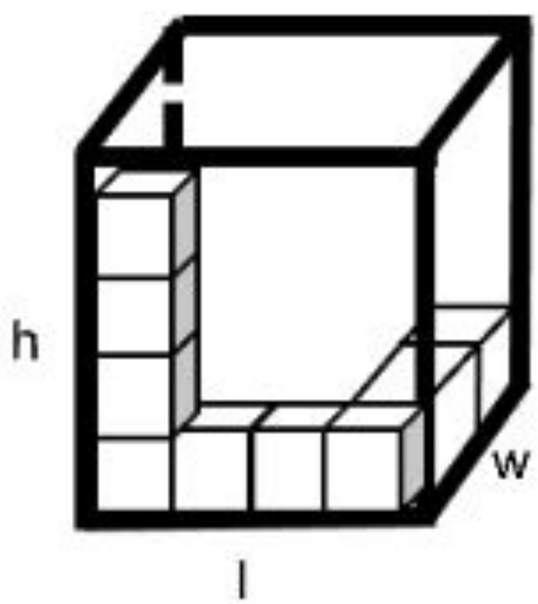
Let's Talk:

Think of a real world example of where you'd have to find the volume and surface area of a 3D object.

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?

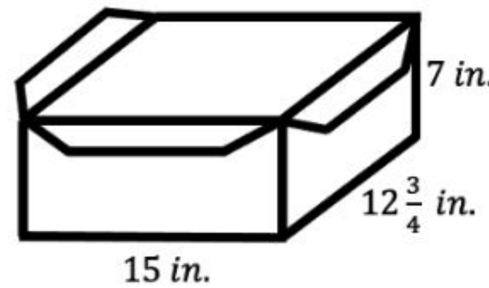
Let's Think: Here are our important formulas.

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)

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.

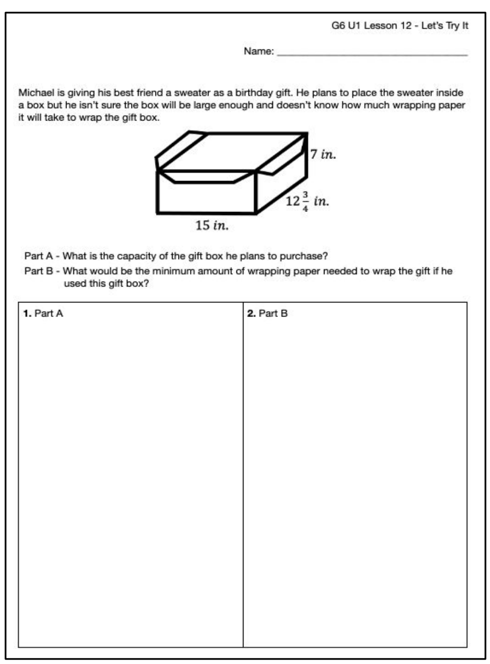


Part A -
What is the capacity of the gift box he plans to purchase?

Part B -
What would be the minimum amount of wrapping paper needed to wrap the gift if he used this gift box?

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.

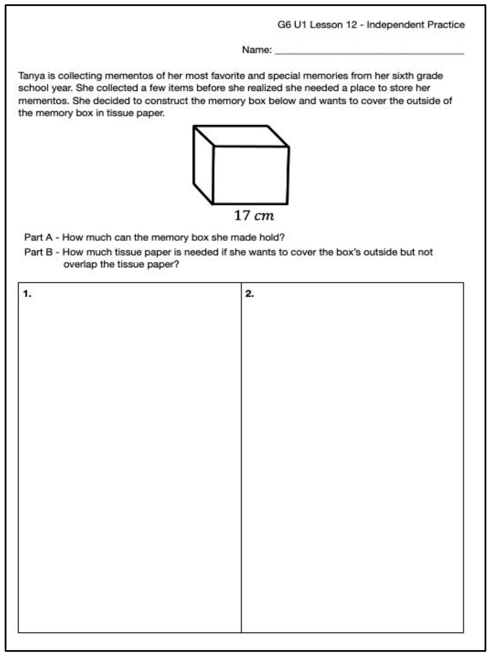
Part A - What is the capacity of the gift box he plans to purchase?

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

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.

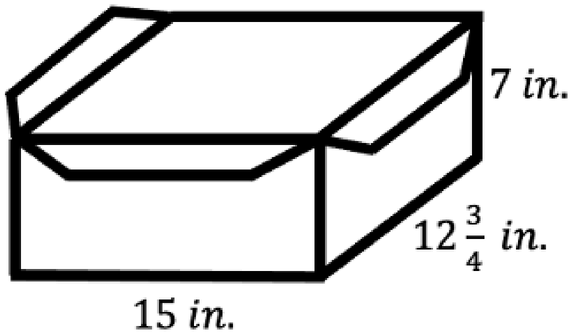
$17\ cm$

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.

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.

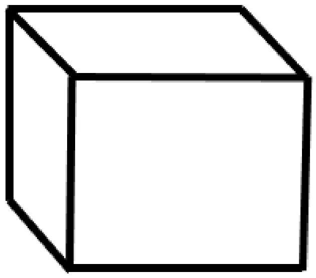


Part A - What is the capacity of the gift box he plans to purchase?

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

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.



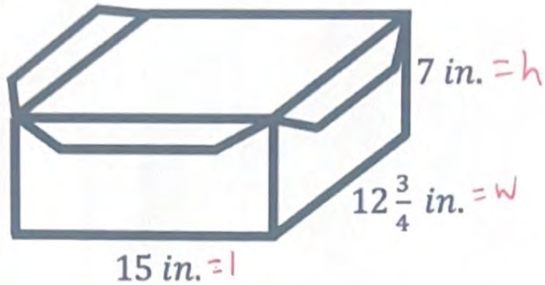
Part A - How much can the memory box Tanya made hold?

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

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 (volume) of the gift box he plans to purchase?

Part B - What would be the minimum amount of wrapping paper needed to wrap the gift (surface area) if he used this gift box?

1. Part A

$V = l \times w \times h$

$V = 15 \times 12\frac{3}{4} \times 7$ $\quad 12\frac{3}{4} = \frac{51}{4}$

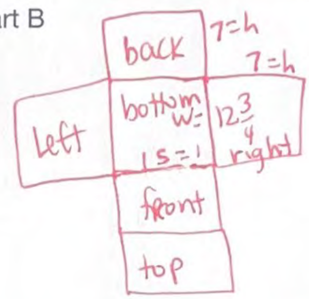
$V = \frac{15}{1} \times \frac{51}{4} \times \frac{7}{1} = \frac{5355}{4}$

4 | 5355
- 4000 → 1000
= 1355
- 800 → 200
= 555
- 400 → 100
= 155
- 120 → 30
= 35
- 32 → 8
= 3

1338

$V = 1338\ in^3$

2. Part B



bottom/top $= 15 \times 12\frac{3}{4} = \frac{15}{1} \times \frac{51}{4} = \frac{765}{4} \times \frac{2}{1} = \frac{1530}{4}$ → $382\frac{2}{4}$

front/back $= 15 \times 7 = 105 \times 2 = 210$

left/right $= 12\frac{3}{4} \times 7 = \frac{51}{4} \times \frac{7}{1} = \frac{357}{4} \times \frac{2}{1} = \frac{714}{4}$ → $178\frac{2}{4}$

4 | 1530
- 1200 → 300
= 330
- 320 → 80
= 10
- 8 → 2
= 2

$382\frac{2}{4}$

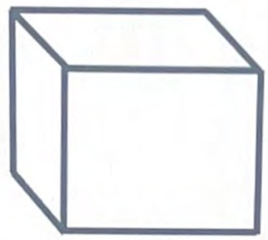
4 | 714
- 400 → 100
= 314
- 200 → 50
= 114
- 80 → 20
= 34
- 32 → 8
= 2

$178\frac{2}{4}$

$178\frac{2}{4} + 382\frac{2}{4} + 210 = 771\ in^2$

Surface area $= 771\ in^2$

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.



$17\ cm$

volume

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?

surface area

1. Part A	2. Part B
$V = l \times w \times h$ $V = 17 \times 17 \times 17$ $V = 4{,}913\ cm^3$	one face → $17 \times 17 = 289$ 289×6 faces $= 1{,}734\ cm^2$ Surface area $= 1{,}734\ cm^2$