CITYTUTOR DC

Sixth Grade Math Lesson Materials

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CITYTUTOR DC

G6 Unit 3:

Unit Rate and Percentage

G6 U3 Lesson 1

Reason about ratios and solve problems using tape diagrams

G6 U3 Lesson 1 - Students will reason about ratios and solve problems using tape diagrams

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Welcome to Unit 3! In this unit we will continue to focus on ratios or the comparison of quantities. We have so far utilized double number lines and tables to organize and analyze ratio information. Today we will be exploring ratios and tape diagrams. A tape diagram is a new diagram for us that we will only add to our toolkit for solving ratio problems.

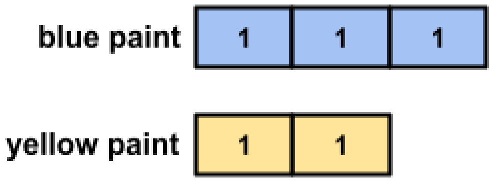
Let's Talk (Slide 3): We spent a lof time using exploring ratios in our last unit. We are going to build on those understandings in this unit. So, let's open with a brainstorm…**think of an example scenario that involves ratios.** Possible Student Answers, Key Points:

- When I'm making pancakes, for every cup of mix, I need half of a cup of milk.
- When I'm cooking, I use a recipe which tells me exactly how much of each ingredient to include in relation to the other ingredients.
- When I'm shopping at the store, I use the unit rate to calculate the price of ONE item.

Great examples. We can compare the quantities of food items to other food items while other examples may compare the cost to the number of items purchased. Let's look at how to solve ratio problems such as these with our newest type of ratio diagram, the tape diagram.

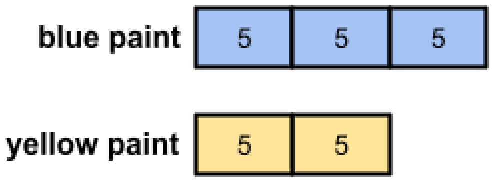
Let's Think (Slide 4): We began this lesson by saying that we would learn a new type of diagram. A tape diagram is just another way to visually represent ratio comparisons, just like the double number lines and tape diagrams we learned to use in Unit 2. Tape diagrams are composed of rectangular blocks that represent quantities, we've used a form of tape diagrams in math to solve story problems. When we duplicate these boxes we find equivalent ratios. The amount of boxes determines the values of what is being compared and the ratio of the quantities.

Here's an example of a simple tape diagram. The colors yellow and blue combine or mix to make the color green. The ratio of gallons of blue and yellow paint used to make green paint is shown on the tape diagram.



When we look at this tape diagram, we notice that the ratio of blue paint to yellow paint is 3 to 2 which means for every 3 gallons of blue paint we need 2 gallons of yellow paint.

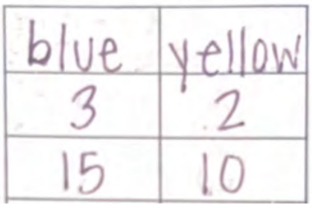
We can tell the ratio is 3:2 because we see 3 blue boxes and 2 yellow boxes. Let's put a number in each block. If the ratio is 3:2 that means the values we put in the 3 blue boxes should total 3. The only way for that to be true is for each box to equal 1 because 1 gallon plus 1 gallon plus 1 gallon equals 3 gallons of paint.That means each box for the yellow paint must also equal 1 gallon. So, if we want to mix green paint for every 3 gallons of blue, we need two gallons of yellow paint.



But here's the cool thing about tape diagrams, the boxes or blocks can represent any number! Instead of 1, let's make each block represent 5. Our tape diagram now represents a different quantity of blue and yellow paint. We now have…5, 10, 15 gallons of blue paint and 5, 10 gallons of yellow paint. The ratio of blue to yellow paint is now 15 to 10 according to the tape diagram and this tape diagram helped us create an equivalent ratio!

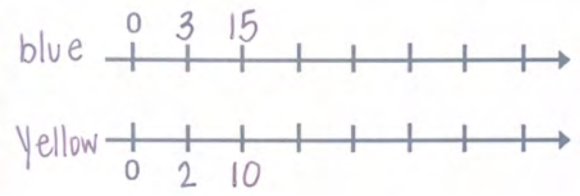
If we created equivalent fractions, what do we know about the color of the green paint when the ratio is 3 to 2 compared to 15 to 10? We have the same color green, or the same ratio. Correct! We would end up with the same exact shade of green because the amount of blue and yellow paint increased within the ratio so the shade of green color will be the same for both ratios of blue and yellow paint.

Let's Think (Slide 5): We learned two other ways to represent ratios in our last unit. Let's connect this tape diagram to the other diagrams we've learned in previous lessons. First, let's put the same information in a table.



blue	yellow
3	2
15	10

Let's start by labeling each column with blue and yellow as the table headings. Our tape diagram showed that for every 3 gallons of blue paint, we need 2 gallons of yellow paint (*write*). We also saw that another equivalent ratio is 15 gallons of blue paint to 10 gallons of yellow paint. That makes sense because to get from 3 to 15 we multiplied by 5 and to get from 2 to 10, we also have to multiply by 5!



Now let's show the same information on our double number line. First we need to label the top number line as blue and the bottom number line as yellow. Let's label the first tick mark as 0 and then from the tape diagram we know that for every 3 gallons of blue paint, we need 2 gallons of yellow paint. So I'll make sure that they are on the exact same tick. Now, we also know that an equivalent ratio is 15 gallons of blue to 10 gallons of yellow.

According to both diagrams, what are our equivalent ratios in fraction form? $\frac{3}{2}$ and $\frac{15}{10}$. That's right! Both diagrams also show that $\frac{3}{2}$ and $\frac{15}{10}$ are equivalent ratios.Tape diagrams involve using rectangular boxes to represent quantities. In this lesson we saw how our boxes, when grouped together, represent those quantities in the same way the individual rows represent the ratios on a table and the matching tick marks represent ratios on a double number line. We will continue to use tape diagrams as well as the other diagrams in our toolkit as we explore ratios throughout Unit 3.

Let's Try it (Slide 6-7): Let's continue applying our knowledge of ratios to tape diagrams. As we continue working with tape diagrams we will see and experience some of their benefits and some of their limitations just as we experienced benefits and limitations with our other diagrams, double number lines and tables. Don't forget, these experiences will help you decide which diagram is best when representing a ratio problem.

WARM WELCOME

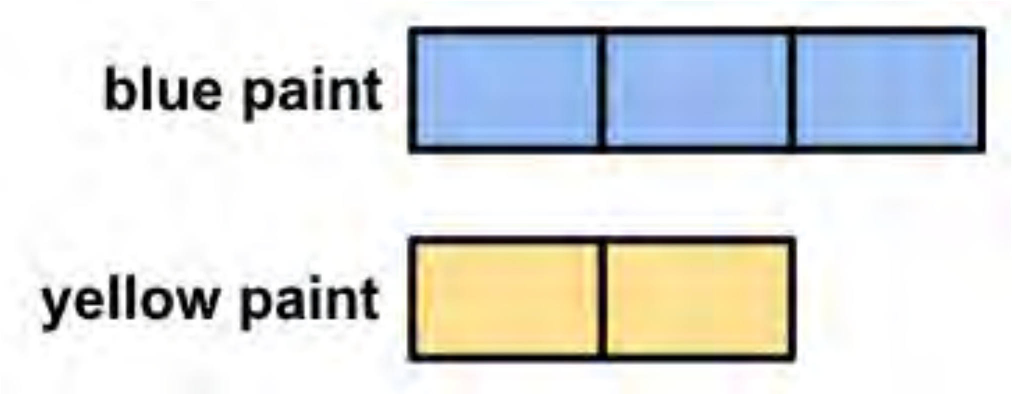
Today we will reason about ratios and solve problems using tape diagrams.

Let's Talk:

Think of an example of a scenario that involves ratios. Be ready to share.

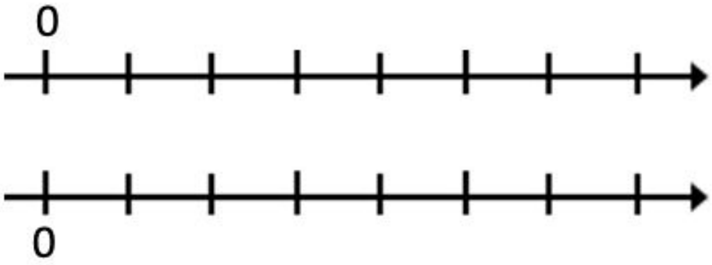
Let's Think:

What could this tape diagram tell us about the ratio of blue paint to yellow paint?



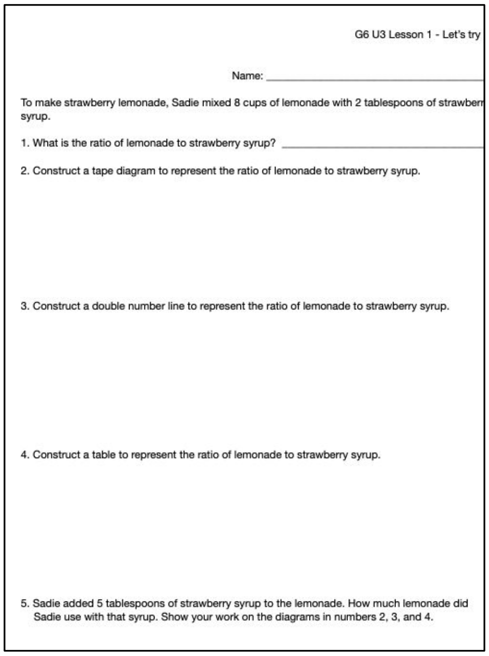
Let's Think:

Let's represent our tape diagram information using the other diagrams we've learned.



Let's Try It:

Let's explore using tape diagrams together.



G6 U3 Lesson 1 - Let's try

Name: ______________________

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawberr syrup.

1. What is the ratio of lemonade to strawberry syrup? ______________________

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.

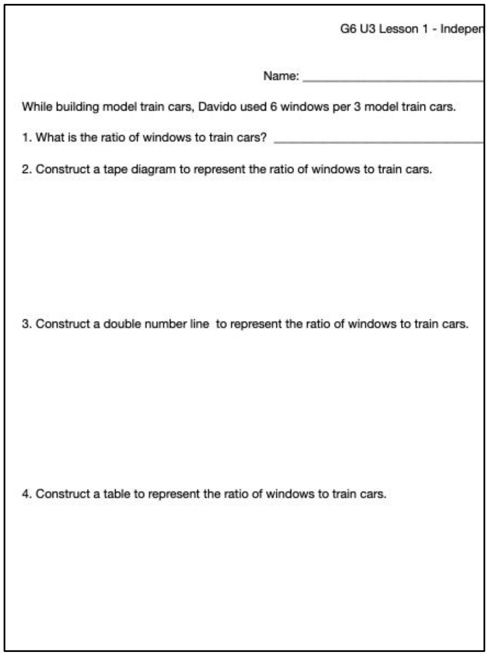
3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.

4. Construct a table to represent the ratio of lemonade to strawberry syrup.

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup. Show your work on the diagrams in numbers 2, 3, and 4.

On your Own:

Now it’s time to explore using tape diagrams on your own.



G6 U3 Lesson 1 - Indepen

Name: ________________________

While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ________________________

2. Construct a tape diagram to represent the ratio of windows to train cars.

3. Construct a double number line to represent the ratio of windows to train cars.

4. Construct a table to represent the ratio of windows to train cars.

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawberry syrup.

1. What is the ratio of lemonade to strawberry syrup? ____________________________________

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.

3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.

4. Construct a table to represent the ratio of lemonade to strawberry syrup.

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup? Show your work on the diagrams in numbers 2, 3, and 4.

While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ___________________________________

2. Construct a tape diagram to represent the ratio of windows to train cars.

3. Construct a double number line to represent the ratio of windows to train cars.

4. Construct a table to represent the ratio of windows to train cars.

5. If Davido made 8 trains, how many windows did he use? Show your work on the diagrams in numbers 2, 3, and 4.

Name: ______________________________

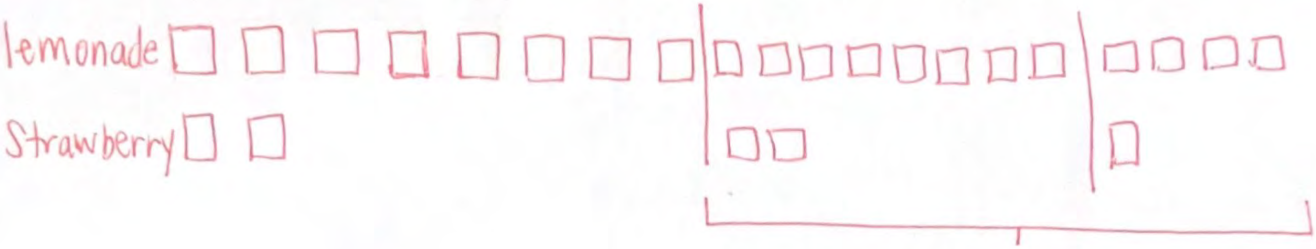
G6 U3 Lesson 1 - Let's Try It

To make strawberry lemonade, Sadie mixed 8 cups of lemonade with 2 tablespoons of strawberry syrup.

L : S

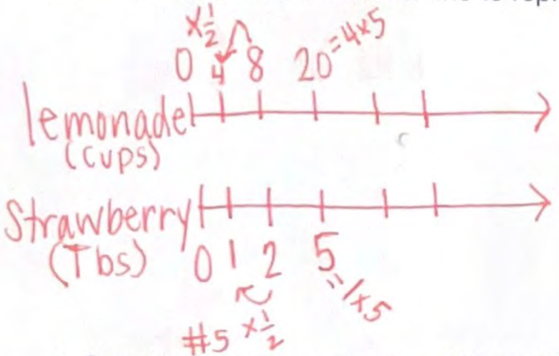
1. What is the ratio of lemonade to strawberry syrup? 8:2

2. Construct a tape diagram to represent the ratio of lemonade to strawberry syrup.



#5

3. Construct a double number line to represent the ratio of lemonade to strawberry syrup.



4. Construct a table to represent the ratio of lemonade to strawberry syrup.

Lemonade	Strawberry
8	2
4	1
20	5

$\times\frac{1}{2}$ $\times 5$ $\times\frac{1}{2}$ $\times 5$ >#5

5. Sadie added 5 tablespoons of strawberry syrup to the lemonade. How much lemonade did Sadie use with that syrup? Show your work on the diagrams in numbers 2, 3, and 4.

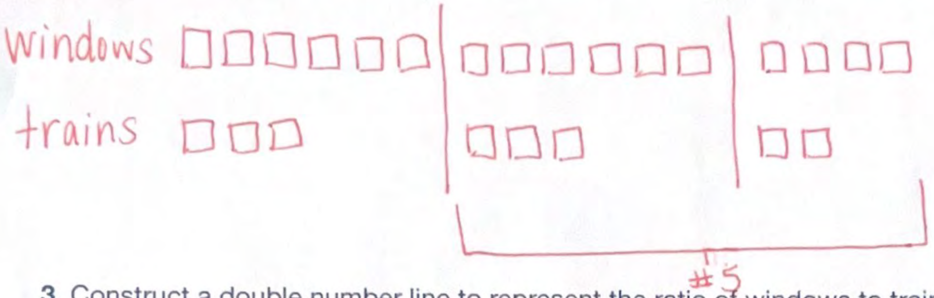
You need 20 cups of lemonade with 5 Tbs of strawberry syrup.

Name: ______________________________ G6 U3 Lesson 1 - Independent Practice

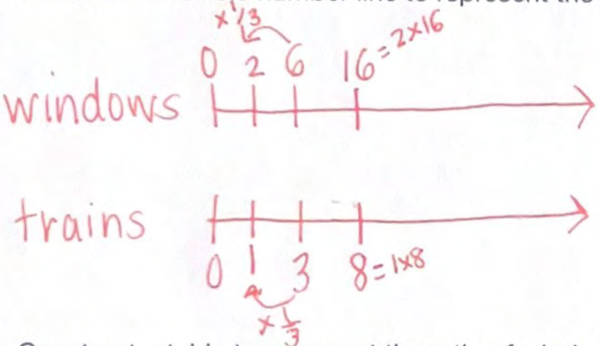
While building model train cars, Davido used 6 windows per 3 model train cars.

1. What is the ratio of windows to train cars? ______________________________

2. Construct a tape diagram to represent the ratio of windows to train cars.



3. Construct a double number line to represent the ratio of windows to train cars.



4. Construct a table to represent the ratio of windows to train cars.

	windows	train	
	6	3	
$\times\frac{1}{3}$	2	1	$\times\frac{1}{3}$
×8	16	8	×8

5. If Davido made 8 trains, how many windows did he use? Show your work on the diagrams in numbers 2, 3, and 4.

Davido used 16 windows for 8 trains.

G6 U3 Lesson 2

Explore approximate and relative sizes for standard units of length, volume, and weight or mass

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G6 U3 Lesson 2 - Students will explore approximate and relative size for standard units of measure

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we learned a third type of diagram to represent ratios. Our toolkit now includes double number lines, tables, and tape diagrams! We also saw how the information from one ratio problem could be represented in each of the three diagrams to represent the equivalent ratios 3:2 and 15:10. In this lesson we will switch gears a little to revisit the concept of measurement which you first explored in elementary school.

Let's Talk (Slide 3): So, measurement is the act of finding a number that shows the size or amount of something. We measure every day, often without realizing! **Can you think of when, what, or how you measure each day?** Possible Student Answers, Key Points:

- At breakfast, when we measure out the amount of pancake batter or a cup of juice.
- At the grocery store, when we buy a certain amount of oranges or apples or meat.
- When I'm telling time on my watch or phone, etc.
- When I'm running a race, I can time how long it takes.

Great thinking. We take and make measurements many, many times in our day from the moment we wake until we go to sleep at night. There are certain categories that measurements fit into. Those categories include…

- Length - How long something is, or the distance between two things
- Volume - How much space in a 3D figure, or the measure of liquid
- Temperature - How hot or cold something is
- And time - The time of day, or the time that is passing, or the time that it takes to get somewhere.

Let's Think (Slide 4): Think of some units of measure that fit within each category. Our category headings will be **weight and mass**, **length**, **volume**, **temperature**, and **time**.

- Weight and mass relate to how heavy something is
- Length relates to how long something is
- Volume relates to how much something can hold within itself
- And, our last two categories are temperature which speak to how hot or cold something is and time references when or how long something takes place.

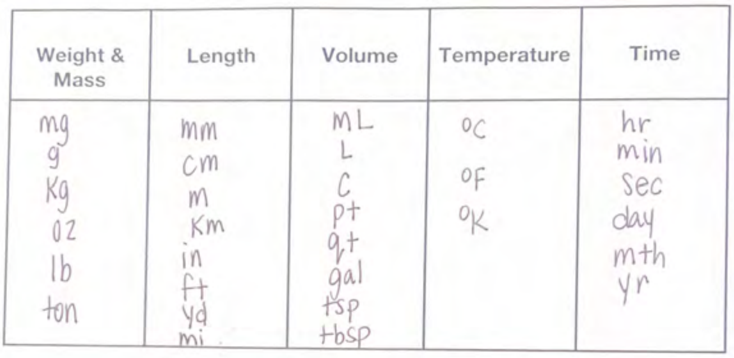
Each of these categories have units that we measure in, so let's brainstorm together some units that flal under each of these measurement categories. I'll help you out by placing one unit of measure in each category to get us started. Ready?

- In the weight and mass category I'll put grams because I know I can measure something's weight in grams.
- In the length category I'll add meters because I know I can measure how long something is in meters.
- In the volume category I'll put liters because I can measure the soda in liters.
- In our second to last category, temperature, I'll put Kelvin which is a temperature unit used in science,
- In our last category, which is time, I'll add hours because I can measure time in hours.

We're off to a good start! Let's brainstorm some other units for each of our measurement categories.

- Let's start with weight and mass, what other units can we measure weight in? Think about measurements of weight we take at the doctor or at the grocery store.
- Now, let's work with length, I think this one will be the easiest, what else can we measure length in? What units are on a ruler or a tape measure?
- Now let's think about volume. When we measure volume, we're often measuring liquid. So think about units of measure for soda or milk or water. We also use a lot of volume recipes in cooking, think about the units you see in recipes.

- Now let's look at temperature, I put kelvin but there are two other ways to measure temperature that are common. Think about the weather forecast, what do you hear people saying with the degrees?
- And finally, time…what units can we measure time in? Think about the clock and then larger units of time.



Weight & Mass	Length	Volume	Temperature	Time
mg g Kg oz lb ton	mm cm m Km in ft yd mi	ML L C pt qt gal tsp tbsp	°C °F °K	hr min Sec day mth yr

Wow! You already know lots of units of measure. Let me add a few that we left off. Speak up if what I add sounds familiar to you *(add any missing units of measure to their appropriate category).*

Our world would be pretty chaotic without units of measure. Imagine a world without units to describe time or temperature measurements. Crazy for sure! What if we couldn't tell how tall we are or our shoe size? Our world would definitely not be as orderly or make as much sense as it does now.

Let's Try it (Slide 5): Let's continue our measurement work by categorizing measurements based on their attributes and size. We put a lot of brain power into our chart. Remember to think about our measurements when you need to know which units of measure fall under which categories.

Note: Keep Slide 4 available for students to look at during work time, they can refer back to it if they need to.

WARM WELCOME

Today we will explore approximate and relative size for standard units of measure.

Let's Talk:

Can you think of when, what, or how you measure each day?

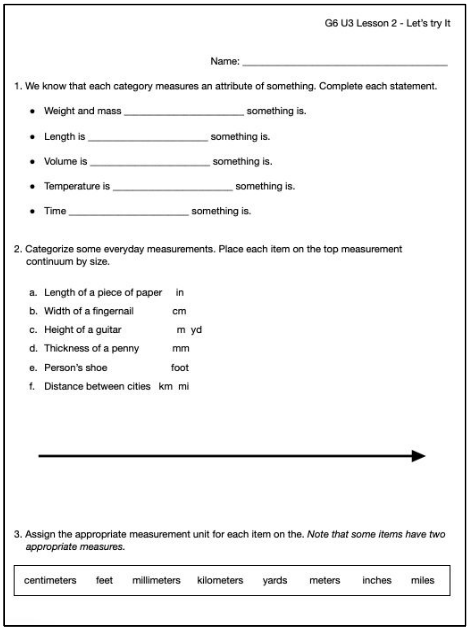
Let's Think:

Think of some units of measure that fit within each category.

Weight & Mass	Length	Volume	Temperature	Time

Let's Try It:

Let's explore units of measure together.



G6 U3 Lesson 2 - Let's try It

Name: ___________________________

1. We know that each category measures an attribute of something. Complete each statement.

- Weight and mass ________________ something is.
- Length is ________________ something is.
- Volume is ________________ something is.
- Temperature is ________________ something is.
- Time ________________ something is.

2. Categorize some everyday measurements. Place each item on the top measurement continuum by size.

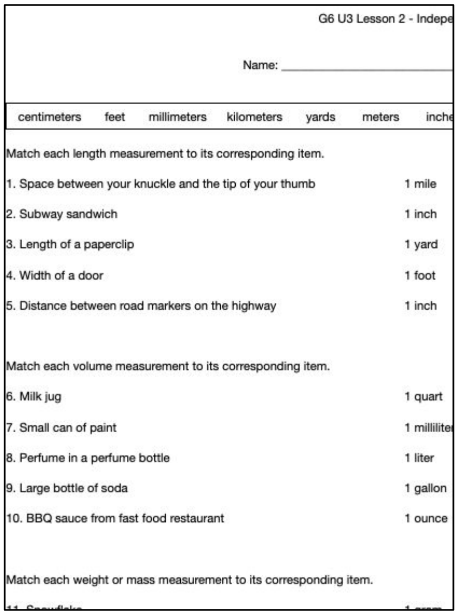
a. Length of a piece of paper in
b. Width of a fingernail cm
c. Height of a guitar m yd
d. Thickness of a penny mm
e. Person's shoe foot
f. Distance between cities km mi

3. Assign the appropriate measurement unit for each item on the. *Note that some items have two appropriate measures.*

centimeters feet millimeters kilometers yards meters inches miles

On your Own:

Now it's time to explore units of measure on your own.



G6 U3 Lesson 2 - Indepe

Name: ___________________

centimeters feet millimeters kilometers yards meters inche

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb 1 mile
2. Subway sandwich 1 inch
3. Length of a paperclip 1 yard
4. Width of a door 1 foot
5. Distance between road markers on the highway 1 inch

Match each volume measurement to its corresponding item.

6. Milk jug 1 quart
7. Small can of paint 1 millilite
8. Perfume in a perfume bottle 1 liter
9. Large bottle of soda 1 gallon
10. BBQ sauce from fast food restaurant 1 ounce

Match each weight or mass measurement to its corresponding item.

Name: ______________________________________

1. We know that each category measures an attribute of something. Complete each statement.

a. Weight and mass are h______ h__________ something is.

b. Length is h_______ l________ something is.

c. Volume is h______ m________ something can hold.

d. Temperature is h_______ h_____ o___ c_______ something is.

e. Time is w________ o___ h______ l_______ something is taking place.

2. Categorize some everyday measurements. Place each item on the measurement continuum by size.

a. length of a piece of paper
b. width of a fingernail
c. height of a guitar
d. thickness of a penny
e. person's shoe
f. distance between cities

3. Assign the appropriate measurement unit from the box below to each item on the continuum. *Note that some items have more than one applicable measure.*

centimeters	feet	millimeters	kilometers	yards	meters	inches	miles

Name: ______________________________

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb

2. Subway sandwich

3. Length of a paperclip

4. Width of a door

5. Distance between road markers on the highway

1 mile

1 inch

1 yard

1 foot

1 inch

Match each volume measurement to its corresponding item.

6. Milk jug

7. Small can of paint

8. Perfume in a perfume bottle

9. Large bottle of soda

10. BBQ sauce from fast food restaurant

1 quart

1 fluid ounce

1 liter

1 gallon

1 ounce

Match each weight or mass measurement to its corresponding item.

11. Snowflake

12. Pineapple

13. Shark

14. Paperclip

15. Box of cereal

1 gram

1 milligram

1 pound

1 kilogram

1 ton

Name: ______________________________ G6 U3 Lesson 2 - Let's Try It

1. We know that each category measures an attribute of something. Complete each statement.

   a. Weight and mass are how heavy something is.

   b. Length is how long something is.

   c. Volume is how much something can hold.

   d. Temperature is how hot or cold something is.

   e. Time is when or how long something is taking place.

2. Categorize some everyday measurements. Place each item on the measurement continuum by size.

   a. length of a piece of paper

   b. width of a fingernail

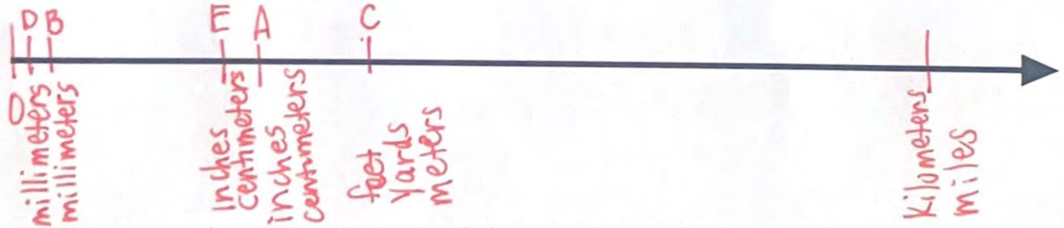
   c. height of a guitar

   d. thickness of a penny

   e. person's shoe

   f. distance between cities

(Note: E & A could be switched)



3. Assign the appropriate measurement unit from the box below to each item on the continuum. *Note that some items have more than one applicable measure.*

centimeters feet millimeters kilometers yards meters inches miles

Name: ______________________________ G6 U3 Lesson 2 - Independent Practice

Match each length measurement to its corresponding item.

1. Space between your knuckle and the tip of your thumb 1 inch
2. Subway sandwich 1 foot
3. Length of a paperclip 1 inch
4. Width of a door 1 yard
5. Distance between road markers on the highway 1 mile

1 mile
1 inch
1 yard
1 foot
1 inch

Match each volume measurement to its corresponding item.

6. Milk jug 1 gallon
7. Small can of paint 1 quart
8. Perfume in a perfume bottle 1 fluid ounce
9. Large bottle of soda 1 liter
10. BBQ sauce from fast food restaurant 1 ounce

1 quart
1 fluid ounce
1 liter
1 gallon
1 ounce

Match each weight or mass measurement to its corresponding item.

11. Snowflake 1 milligram
12. Pineapple 1 Kilogram
13. Shark 1 ton
14. Paperclip 1 gram
15. Box of cereal 1 pound

1 gram
1 milligram
1 pound
1 kilogram
1 ton

G6 U3 Lesson 3

Use different units of measure to explore relative size

G6 U3 Lesson 3 - Students will use different units of measure to explore relative size

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue working with measurement units. In our last lesson we explored many measurement terms we already knew and maybe learned some new measurement terms, too. We organized these measurements into five categories: weight/mass, length, volume, temperature, and time. We did not work with the categories time and temperature but did focus on real-world examples of the other three categories. Today's lesson uses our knowledge of the size of measurement units and can be a little tricky but, I know we can get it. We will be exploring whether it takes more or less of a different-sized unit to measure the same quantity, amount, or thing.

Let's Talk (Slide 3): Let's brainstorm, one of the measurement equivalency or conversion that is common in the United States is 1 yard is equal to 3 feet. This conversion is shown on the slide in the form of a tape diagram. **Create an equivalent ratio based on the ratio of feet to yards that is shown. Explain your thinking.** Possible Student Answers, Key Points:

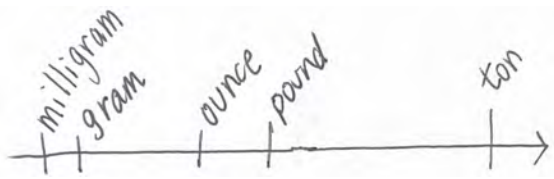
- 6 feet: 2 yards
- 9 feet to 3 yards
- We can multiply both by the same number, or we can use the tape diagram and add another box to each with 3 and 1 in them.

Nice thinking! We can create equivalent ratios visually with our boxes and by using fractions or multiplication and division. If we add another long box with 3 in it and another short box with 1 in it we will have visually created an equivalent ratio like 6 to 2 because 3 plus 3 equals 6 and 1 plus 1 equals 2. Using fractions, $\frac{3}{1} x \frac{2}{2}$ equals $\frac{6}{2}$. Either way 3 to 1 is equivalent to 6 to 2.

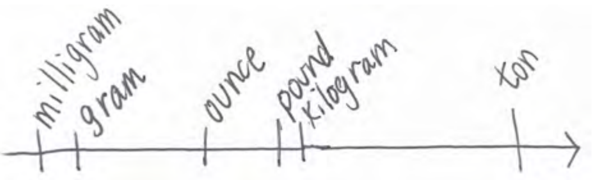
Let's Think (Slide 4): Identifying where, on the continuum of size, our measurements are positioned in relation to one another is an important first step for exploring whether it takes more or less of a different-sized unit to measure the same quantity or amount. Let's explore weights and masses. We are going to place each unit of measure shown in order from lightest to heaviest based on size on our continuum. Let's start by reading all of them…ton, ounce, kilogram, milligram, pound, gram!

Out of ton, ounce, kilogram, milligram, pound, and gram we can start by thinking which is the lightest and heaviest in size. Which measure is the lightest and which is heaviest? Milligram is the lightest and ton is the heaviest. Correct. Milligrams measure tiny objects like paper clips and tons measure really heavy things like cars so it is the greatest when you think of size. Let's place those at each end of our continuum.

That leaves an ounce, kilogram, pound, and gram. The next lightest unit of measure out of the four remaining units is a gram. Do you see that milli…gram has the word gram in it. Well, that's because 1,000 milligrams are the same as each 1 gram...that's what milli means, 1,000. Let's place the gram closer to the milligram.



Of the three units remaining…pound, kilogram, and ounce, ounce is next because an ounce of something is not as heavy as a pound or kilogram of something. An ounce is the next lightest unit followed by the pound. As a matter of fact, it takes 16 ounces just to equal 1 pound! Let's place the ounce then the pound after gram.



That only leaves a kilogram which is between the pound and ton. In terms of weight, a kilogram is a little more than twice the weight of a pound. And look, we see GRAM again in the word kilogram. But this time, it means that 1,000 grams make up 1 kilogram.

So looking at our continuum, we notice many things. Since milligrams are smaller, we notice it would take many milligrams to equal 1 gram *(point)*. We also see that ounces are smaller than pounds, so we notice it would take many ounces to equal 1 pound *(point)*, and it would take A LOT of kilograms to equal 1 ton, about 907 kilograms to be exact! To put these observations concisely, we need a lot more of a smaller unit to equal the weight of a larger unit.

Let's Think (Slide 5): To give you an idea of how big each of these units are, here are a few examples of things that weigh each unit.

- Let's start with the smallest, **milligrams**. Milligrams are teeny tiny, there aren't many things that we can see that weigh a milligram, but one example is a gnat, which are those tiny bugs that fly around in the summer.
- Now, let's move onto a gram. Paperclips weigh about 1 gram, pretty light.
- Now, ounce. A new unsharpened pencil weighs about 1 ounce.
- Now pound, a bag of bread weighs about 1 pound. There are a lot of things that weigh around 1 pound.
- Now, kilogram…a little bit heavier, a pineapple weighs about the same as 1 kilogram.
- And finally…a ton! Tons are heavy, heavy, heavy! A grown rhinoceros weighs about 1 ton…whew!

Notice that when we're measuring mass/weight, it's not about the size of the object but about how much it weighs. So something can be bigger than another thing but weigh less. These are good benchmarks to help us remember each unit of mass/weight.

Let's imagine that we weighed the same truck in kilograms and in tons. **Would it take more kilograms or tons to measure the weight of the truck?** Possible Student Answers, Key Points:

- It would take more kilograms because they're lighter than tons.
- It would take the same amount because you're measuring the same thing.

Those are interesting ideas. It would take MORE kilograms because they are lighter than tons, so we'd need more to weigh the same object.

Let's Think (Slide 6-7): We just looked at how units of mass/weight are related to each other. Now, let's switch measurement and focus on length…how long something is. Let's see if the same ideas apply to length.

Centimeters and inches are common units of measurement, you've been working with those units since first grade. First, using what you know, are centimeters and inches the exact same length? Look at the ruler to help you frame your thinking. No, they are not the exact same length, inches are longer than centimeters.

The ruler helps us compare the size of an inch to the size of a centimeter. We can see that 1 inch, the space between 1 and 2 is longer than 1 cm, the space between 1 and 2 along the bottom. In fact, 1 inch is the same length as about 2 ½ centimeters.

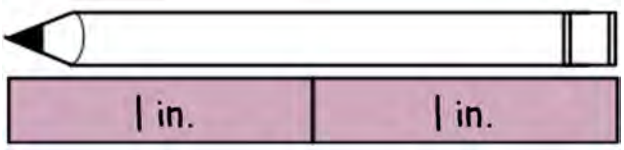
Let's Think (Slide 8): Knowing that a centimeter is smaller than an inch, if we were using centimeters and inches to measure this pencil, which unit, centimeters or inches, would you need more of and why? Possible Student Answers, Key Points:

- We would need more centimeters because centimeters are smaller than inches.
- We would need more inches because inches are bigger.

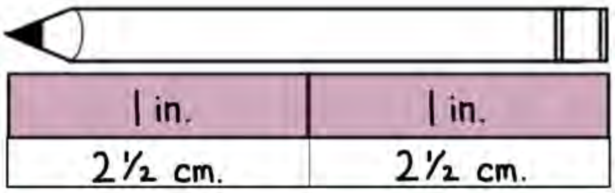
- We’d need the same amount because we’re measuring the same object.

Those are interesting ideas, it sounds like we’re not totally sure whether we’d need more inches, more centimeters, or the exact same amount. Let’s think carefully, we know that centimeters are smaller than inches, they take up less space. So, if we’re measuring the length of this pencil, we’d need MORE centimeters than inches.

Let’s Think (Slide 9): Let’s actually look at the pencil and use a tape diagram to help us think about this.



Let’s make one box equal to 1 inch. We see that this pencil measures 2 inches in length.



Now let’s think about measuring the same pencil with centimeters. We’ve learned earlier in the lesson that we need more centimeters to equal just 1 inch. And to be exact, we need about 2½ centimeters to equal 1 inch. So, every time we see 1 inch it is the same as 2½ centimeters. So for this inch we’d need 2½ *(point)* and for this inch we’d also need 2½ *(point).*

Now, we can calculate how many centimeters in length the pencil is by adding 2½ centimeters and another 2½ centimeters. Well, 2½ + 2½ = 5 because 2 plus 2 equals 4 and ½ plus ½ equals 1 whole. We end up with 5 wholes or 5. So, the pencil is about 5 centimeters long and exactly 2 inches long. Bringing it back to ratios, the ratio of centimeters to inches is 2½:1 and an equivalent ratio to that is 5:2.

We just explored how we need more kilograms than tons to measure the weight of a truck AND we need more centimeters than inches to measure the length of this pencil. That’s always going to be true, we’ll always need more little units than big units to measure the same object. This concept generalizes to weight, volume, temperature, and time. We will continue to think about size and ratios through our diagrams in our upcoming lessons.

Let’s Try it (Slide 10-11): Let’s continue our learning about size comparisons using the unit measures for weight, kilograms and pounds. Remember that the key idea is that we need more little units to measure up to one larger unit

WARM WELCOME

Today we will use different units of measure to explore size.

Let's Talk:

Create an equivalent ratio based on the ratio of feet to yards shown. Explain your thinking.

Let's Think:

Place each measurement of weight/mass on the continuum based on size.

ton **ounce**
kilogram **milligram** **pound** **gram**

Let's Think:

Here are a few examples of things that measure *about* the same as each unit of weight/mass.

1 milligram
a gnat

1 gram
a paperclip

1 ounce
a pencil

1 pound
a bag of bread

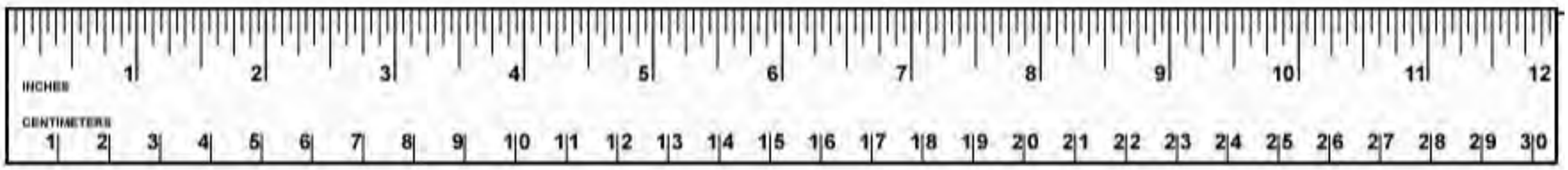
1 kilogram
a pineapple

1 ton
a rhino

IMAGES NOT TO SCALE

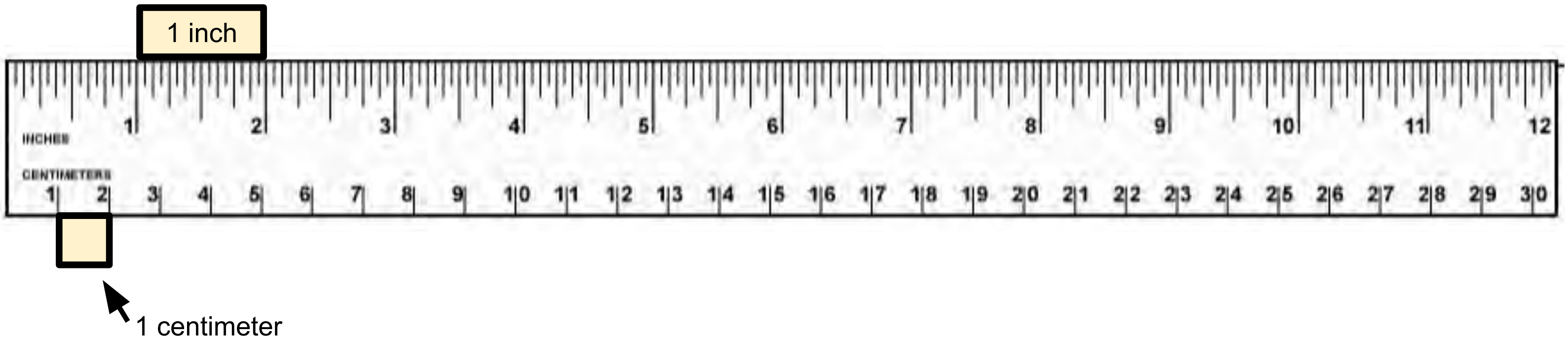
Let's Think:

Are centimeters and inches the exact same length? If not, which is longer?



Let's Think:

It takes about 2.5 centimeters to make 1 inch.

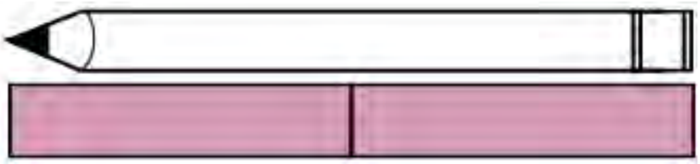


Let's Think:

If we were using centimeters and inches to measure a pencil, which measure, centimeters or inches, would you need more of and why?

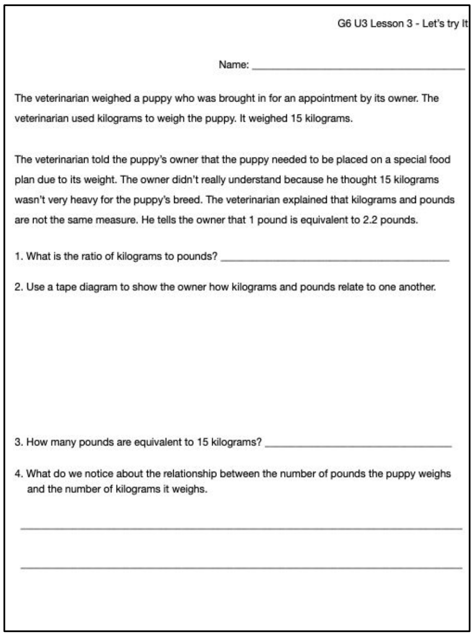
Let’s Think:

About how many centimeters in length does this pencil measure?



Let’s Try It:

Let’s explore using different units to measure size together.



G6 U3 Lesson 3 - Let’s try It

Name: ______________________________

The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 15 kilograms.

The veterinarian told the puppy’s owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn’t really understand because he thought 15 kilograms wasn’t very heavy for the puppy’s breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 pound is equivalent to 2.2 pounds.

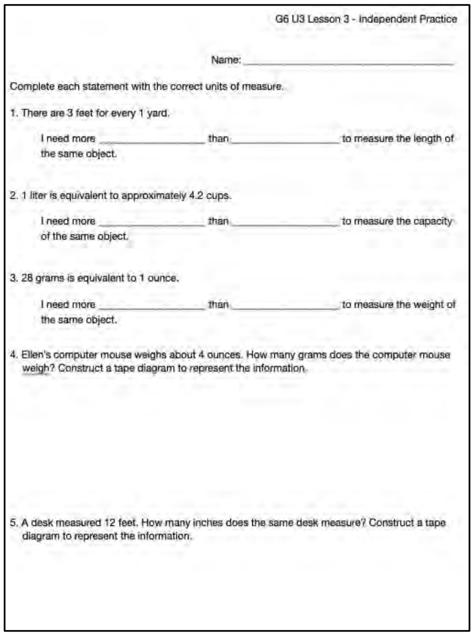
1. What is the ratio of kilograms to pounds? ______________________________
2. Use a tape diagram to show the owner how kilograms and pounds relate to one another.
3. How many pounds are equivalent to 15 kilograms? ______________________________
4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

____

____

On your Own:

Now it’s time to explore using different units to measure size on your own.



G6 U3 Lesson 3 - Independent Practice

Name: ______________________________

Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more _______________ than _______________ to measure the length of the same object.

2. 1 liter is equivalent to approximately 4.2 cups.

I need more _______________ than _______________ to measure the capacity of the same object.

3. 28 grams is equivalent to 1 ounce.

I need more _______________ than _______________ to measure the weight of the same object.

4. Ellen's computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the information.

5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the information.

The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 7 kilograms.

The veterinarian told the puppy's owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn't really understand because he thought 15 kilograms wasn't very heavy for the puppy's breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 kilogram is equivalent to 2.2 pounds.

1. What is the ratio of kilograms to pounds? ____

2. Use a tape diagram to show the owner how kilograms and pounds relate to one another when it comes to the puppy.

3. How many pounds are equivalent to 7 kilograms? _________________________________

4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

____

____

____

Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more ___________________ than ___________________ to measure the length of the same object.

2. 1 liter is equivalent to approximately 4.2 cups.

I need more ___________________ than ___________________ to measure the capacity of the same object.

3. 28 grams is equivalent to 1 ounce.

I need more ___________________ than ___________________ to measure the weight of the same object.

4. Ellen’s computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the number of grams.

5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the number of inches.

Name: ______________________________

G6 U3 Lesson 3 - Let's Try It

The veterinarian weighed a puppy who was brought in for an appointment by its owner. The veterinarian used kilograms to weigh the puppy. It weighed 7 kilograms.

The veterinarian told the puppy's owner that the puppy needed to be placed on a special food plan due to its weight. The owner didn't really understand because he thought 15 kilograms wasn't very heavy for the puppy's breed. The veterinarian explained that kilograms and pounds are not the same measure. He tells the owner that 1 kilogram is equivalent to 2.2 pounds.

1. What is the ratio of kilograms to pounds? 1 Kg to 2.2 pounds

2. Use a tape diagram to show the owner how kilograms and pounds relate to one another when it comes to the puppy.

Kg	1	1	1	1	1	1	1	
lbs	2.2	2.2	2.2	2.2	2.2	2.2	2.2	= 2.2x7 = 15.4

3. How many pounds are equivalent to 7 kilograms? 15.4 pounds

4. What do we notice about the relationship between the number of pounds the puppy weighs and the number of kilograms it weighs.

We notice the number of pounds is more than the number of Kilograms. The pounds are 2.2 times the number of Kilogram.

Name: ______________________ G6 U3 Lesson 3 - Independent Practice

Complete each statement with the correct units of measure.

1. There are 3 feet for every 1 yard.

I need more feet than yards to measure the length of the same object.

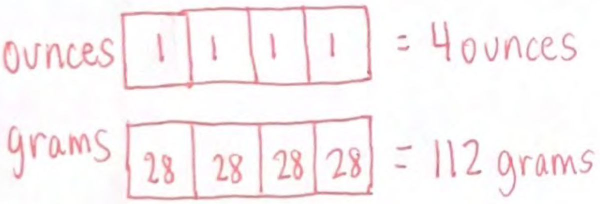
2. 1 liter is equivalent to approximately 4.2 cups.

I need more cups than liters to measure the capacity of the same object.

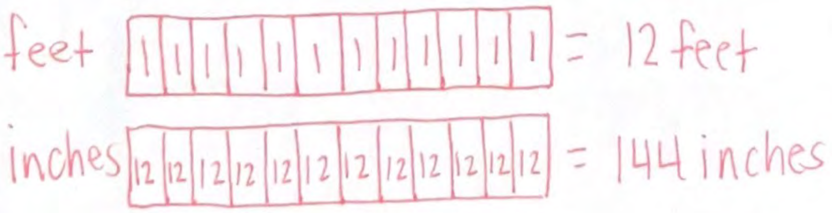
3. 28 grams is equivalent to 1 ounce.

I need more grams than ounces to measure the weight of the same object.

4. Ellen's computer mouse weighs about 4 ounces. How many grams does the computer mouse weigh? Construct a tape diagram to represent the number of grams.



5. A desk measured 12 feet. How many inches does the same desk measure? Construct a tape diagram to represent the number of inches. (there are 12 inches in 1 foot)



G6 U3 Lesson 4

Convert measurement units using double number lines and tables

G6 U3 Lesson 4 - Students will convert measurement units using double number lines and tables

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue using our measurement units to explore size. In our last two lessons we focused on measurement and the relationship between measurement units. We saw that when the units are larger we need fewer of them to measure an object versus when we were using small units and we needed more of those small units to measure the same object. In this lesson we will work with actual conversion equivalencies and our diagrams to convert between measurement units.

Let's Talk (Slide 3): Let's begin by looking at measurement unit abbreviations. Identify the abbreviation as I say the measurement unit aloud. Nice work, **now what do you notice and what do you wonder about the measurement abbreviations?** Possible Student Answers, Key Points:

- Pound, kilogram and centimeter have a two letter abbreviation while the others only have a one letter abbreviation
- Liter and cup can be written with lowercase or uppercase letters
- Most of the abbreviations include the first letters of the word, that makes them easy to remember.
- Why does lb stand for pound?

Those are all interesting noticings and wonderings! The hardest one to remember is lb. for pound, since it doesn't look like the word. This is because lb stands for *libra*. Libra is Latin in origin and means balance and weigh and pounds is a measure of weight.

Let's Think (Slide 4): Let's look at some common conversions between the metric and customary measurement systems. As a recap from a previous lesson and previous year's learning, the United States is one of only three countries in the world that does not use the metric system. In the United States our measurement system is called the customary system, in most other countries they use the metric system.

Today we will specifically focus on the following units of measurement. The first units of measure in each conversion set below is used in the customary system and the second units of measure are used in the metric system.

- In the customary system, we sometimes measure length in inches. In the metric system, we sometimes measure length in centimeters.
- In the customary system, we sometimes measure volume in cups. In the metric system, we sometimes measure volume in liters.
- And finally, in the customary system, we use pounds to measure weight. But in the metric system we often use kilograms.

Let's start by thinking about each unit of measurement and using what we know from previous lessons, let's decide which unit is smaller in each conversion set? Possible Student Answers, Key Points:

- Centimeters are smaller than inches.
- Cups are smaller than liters.
- Pounds are smaller than kilograms.

Yes, that's right! Now, let's think about exactly how many of each smaller unit it takes to make the bigger unit.

2.54cm = 1 in

We know that 1 centimeter is smaller than 1 inch. We need exactly 2.54 centimeters to equal up to just 1 inch *(write 2.54cm = 1 inch)*.

4.2 c = 1 L

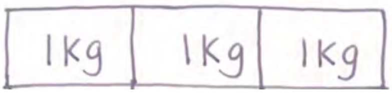
We also know that 1 cup is smaller than 1 liter. We need approximately 4.2 cups to equal up to just 1 liter *(write 4.2C ≈ 1L).*

2.2 lb = 1 kg

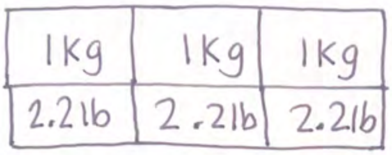
Lastly, 1 pound is smaller than 1 kilogram. We need approximately 2.2 pounds to equal up to just 1 kilogram *(write 2.2lb ≈ 1kg).*

Let's Think (Slide 5): When we think about comparing units of measure to one another we use actual number conversions to talk about their size. In previous years you learned some standard conversions that you are now just expected to have memorized like 12 inches equals 1 foot or that there are 16 cups in 1 gallon. Other times, like in this and previous lessons the conversion is given to you. Let's look at a couple examples of converting between units when given a conversion.

"If we weigh a bowling ball, would we need more pounds or more kilograms to equal the weight of the bowling ball?" We would need more pounds because pounds are smaller, or lighter. Well yes, we know from our work on the measurement continuum that pounds are smaller than kilograms so we would need more pounds to equal the weight of the bowling ball. As a reminder, the conversion between pounds and kilograms is 1 kilogram is approximately 2.2 pounds.



The second part of this question says, what if the bowling ball weighed 3 kg. How much would it weigh in pounds? Let's try using a tape diagram to figure it out. First, let's draw three boxes, one for each kilogram since the bowling ball weighs 3 kgs.



Now, I know that 1 kg is the same as 2.2 lbs. So I can show that for every 1 kg, we need 2.2 lbs. So we need 2.2 lbs for this 1 kg (*point*) and another 2.2 lbs for this one (*point*) and another 2.2 lbs for the last kg.

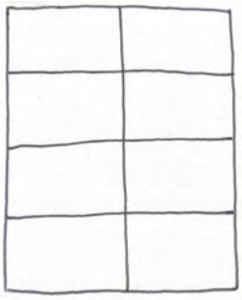
2.2+2.2+2.2=6.6 lb

Lastly, we need to add our pounds together to determine the weight of the bowling ball in pounds. We need to add 2.2 three times. Everybody do the math and tell me how many pounds we have…6.6 pounds!

3kg is 6.6lb

Terrific! We just calculated that a 3 kilogram bowling ball weighs 6.6 pounds.

As we have seen in previous ratio lessons, we can represent the same math problem using different diagram models. Let's represent our math problem about the bowling ball using a table. Our problem told us that the bowling ball weighed 3 kilograms and tasked us with calculating how much the bowling ball weighed in pounds.

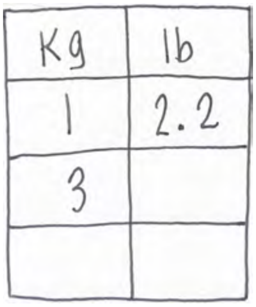


To construct our table we must first draw our table including rows and columns. Our table needs two columns and at least three rows to include the headings, conversion, and a row to show how much the bowling ball weighs in pounds. Let's include an extra row, just in case.

Kg	lb
1	2.2

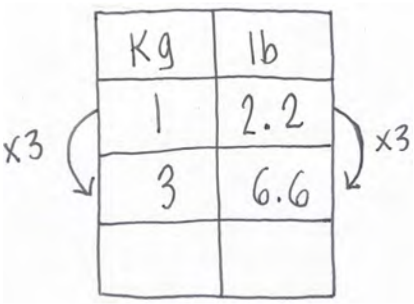
Next, let's fill out the table starting with the headings, which will be the two units of measurement that we're converting between.

Underneath the heading row let's put the conversion by writing a 1 under the kilogram column and 2.2 under the pounds column because we know that 1 kg is the same as 2.2 pounds.



Kg	lb
1	2.2
3	

In the third row let's write 3 in the kilogram column because that's how much our bowling ball weighs in kg, and we're trying to figure out how many pounds it weighs, so we'll leave that blank.



Kg	lb
1	2.2
3	6.6

Now that we have our table completed it is time to calculate! Let's use this arrow to show that we're trying to figure out how we got from 1 to 3. That one is easy, we did 1x3 to get to 3.

We also have to multiply by 3 on the other side of our table. To find how many pounds the bowling ball is, we need to multiply 2.2 by 3. When we do it, we get 6.6 as the answer. Once again we see that a 3 kilogram bowling ball also weighs 6.6 pounds. This diagram makes it even more obvious what we are still creating equivalent ratios even when using unit conversions.

Wow! We are really piecing all your knowledge together to solve ratio math problems. While we didn't solve the bowling ball problem using a double number line, these two problems illustrate for us, once again, that we can choose to represent our ratio information with more than one diagram and still achieve the same answer. We will of course continue to use these diagrams as we solve ratio math problems.

Let's Try it (Slide 6-7): Let's continue our conversions between various measurements of weight, length, and volume. Remember that finding equivalent ratios starts with the equivalent measures like 1 kilogram is equal to 2.2 pounds. If you know that unit conversion and use your diagrams then you can calculate equivalent ratios.

WARM WELCOME

Today we will use measurement conversions to explore size.

Let's Talk:

Let's name the abbreviation for each measurement unit.

1. kilogram ______
2. liter ______
3. centimeter ______
4. inch ______
5. cup ______
6. pound ______

in

L or l

kg

C or c

lb

cm

Let's Think:

Which measurement unit is smaller?

- **Length: 1 in or 1 cm?**
- **Volume: 1 C or 1 L?**
- **Weight/Mass: 1 lb or 1 kg?**

Let’s Think:

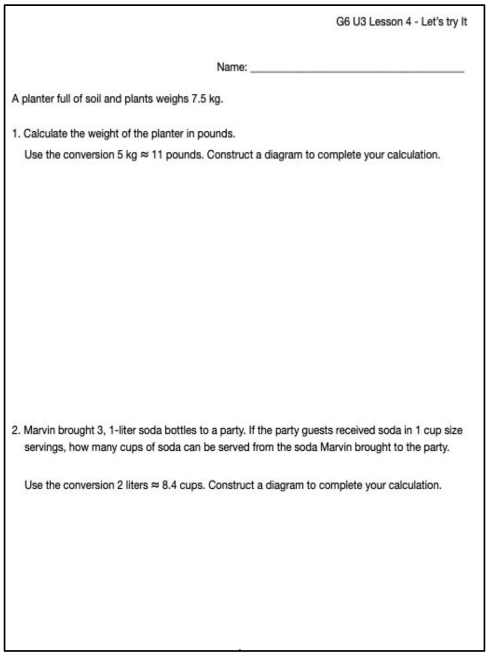
If we weigh a bowling ball, would we need more pounds or more kilograms to equal the weight of the bowling ball?

What if the bowling ball weighed 3 kg. How much would it weigh in pounds? Explain using a tape diagram.

Now, show the same work in a table.

Let’s Try It:

Let’s explore converting measurement units using diagrams together.



G6 U3 Lesson 4 - Let’s try It

Name: ______________________________

A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.
   Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to complete your calculation.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

   Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to complete your calculation.

On your Own:

Now it’s time to explore converting measurement units using diagrams on your own.

G6 U3 Lesson 4 - Independent Practice

Name: ______________________________

The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won’t fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to determine your solution.

A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.

Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to determine the weight of the planter in pounds.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to determine how many cups of soda can be served from the soda Marvin brought.

The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won’t fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to justify your decision.

Name: ______________________________ G6 U3 Lesson 4 - Let's Try It

A planter full of soil and plants weighs 7.5 kg.

1. Calculate the weight of the planter in pounds.

Use the conversion 5 kg ≈ 11 pounds. Construct a diagram to determine the weight of the planter in pounds.

	Kilograms	Pounds	
$\times\frac{1}{5}$	5	11	$\times\frac{1}{5}$
$\times 7.5$ OR $7\frac{1}{2}$	1	$\frac{11}{5}$	$\times 7\frac{1}{2}$
	$7\frac{1}{2}$	$16\frac{1}{2}$	

$\frac{11}{5} \times 7\frac{1}{2}$

$\frac{11}{5} \times \frac{15}{2} = \frac{165}{10} = 10\overline{)165}$

-160 | 16

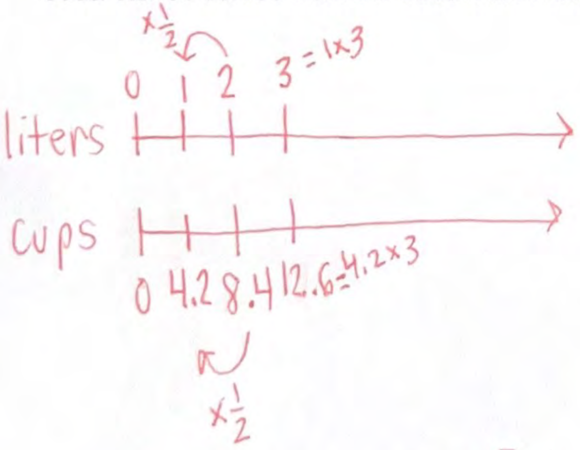
5

$16\frac{5}{10} \div \frac{5}{5} = 16\frac{1}{2}$

The planter weighs $16\frac{1}{2}$ pounds.

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to determine how many cups of soda can be served from the soda Marvin brought.



12.6 cups of soda can be served from the soda Marvin brought to the party.

$\frac{8.4}{1} \times \frac{1}{2} = \frac{8.4}{2}$

$2\overline{)8.4}$ ①

-80 | 40

4

-4 | +2

0 | 4.2 ①

Name: ____________________________ G6 U3 Lesson 4 - Independent Practice

The showroom model television measures 75 inches. The customer measured the space for the television in his home in centimeters. The customer can purchase a television that is no larger than 160 centimeters as a larger television won't fit in the space he has designated. The sales associate knows that 2 inches is equal to approximately 5 centimeters. Should the customer buy the 75 inch television?

Use a diagram to justify your decision.

	Inches	centimeters	
	2	5	
$\times\frac{1}{2}$	1	$\frac{5}{2}$	$\times\frac{1}{2}$
$\times 75$	75	$187\frac{1}{2}$	$\times 75$

$$\frac{5}{2} \times \frac{75}{1} = \frac{375}{2}$$

$2\overline{)375}$	
-200	100
175	
-100	50
75	
-60	30
15	
-10	5
5	
-4	2
1	+
	$187\frac{1}{2}$

The tv is $187\frac{1}{2}$ centimeters so it is too large to fit in the 160 cm space. The customer should not buy the 75 inch television.

G6 U3 Lesson 5

Compare speeds and prices by calculating rates per 1

G6 U3 Lesson 5 - Students will compare speed and price using unit rate

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be revisiting a topic we began exploring in Unit 2. We were introduced to the concepts of speed and price as they relate to ratios in Unit 2. We learned that speed is the rate at which something moves compared to the time it takes. When traveling on the highway, we use a comparison of distance to time, we call that miles per hour. Price is a comparison of cost to quantity like $3.50 for 2 boxes of macaroni. In this lesson we will continue to explore ratios through real-world speed and price situations.

Let's Talk (Slide 3): Imagine that you're at the grocery store and you see this sign. It says that 3 apples cost $8. **How could we determine the price for more apples? Let's decide how many apples you want to buy and calculate the price.** Possible Student Answers, Key Points:

- 6 apples cost $16
- 15 apples cost $40
- 9 apples cost $24

Nice use of diagrams! I notice that most of us found the price of apples by using factors. It was easy to find the price of 3, 6, 9, 12, or 15 apples because we knew the ratio. It would've been harder to find the price of 4 apples because then we would've had to go back and find the unit rate first.

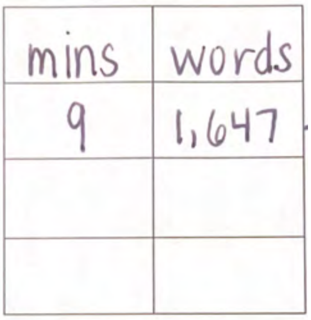
Let's Think (Slide 4): Have you ever heard of speed reading? It's exactly like it sounds, reading a lot in a little bit of time. Speed reading is typically recorded in words per minute or wpm. Annie Jones is the 6-time World's Speed Reading Champion. She was timed at reading 4,700 wpm with 67% comprehension. That means she read 4,700 words in one minute and when done, she proved that she understood at least 67% of what she read. The criteria for being a speed reader is reading 400-700 words per minute without losing comprehension. The average adult, non-speed reader, reads at a rate of about 250 words per minute.

Let's Think (Slide 5): So let's use what we just learned about speed readers to solve a problem. This says, Nelson tested two adults to determine if either of them meet the criteria as a speed reader. The results of the reading assessment are listed below:

- Participant #1: 1,647 words read in 9 minutes
- Participant #2: 1,975 words read in 5 minutes

Nelson is trying to figure out if either of the participants read between 400 and 700 words per minute. We will assume all of the readers could prove they understood at least 67% of what they read during the reading assessment.

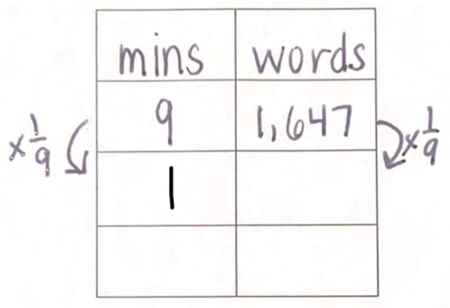
Looking at the data someone may try to guess which participant is the speed reader. But, since we understand ratios we don't need to guess. The speed reading criteria says "per minute" so we know we can find the unit rate for each participant. Then we can compare the unit rates to the speed reading criteria. Let's start with participant #1.



mins	words
9	1,647

Participant #1 read 1,647 words in 9 minutes. Let's use a table to determine if Participant #1 meets the criteria as a speed reader.

Let's start with the headings, we know that we're looking at minutes and words. So, the information that we have is that it took 9 minutes to read 1,647 words, let me put those in the table.

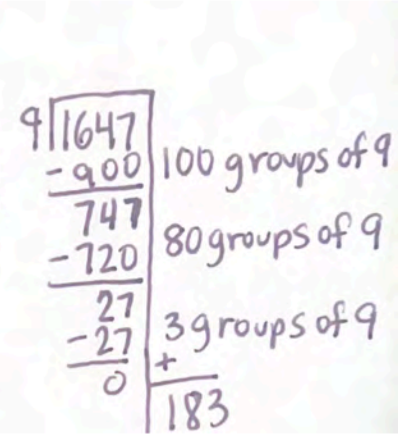


mins	words
9	1,647
1	

Now in order to figure out if this person is a speed reader, we need to figure out how many words they read in ONE minute, the unit rate. So, let me fill out 1 minute in the

Now let's draw an arrow to show that we need to figure out how to get from 9 to 1. To get from 9 to 1, we divided by 9 but that's the same thing as multiplying by the reciprocal of 9 which is $\frac{1}{9}$. So we need to write x$\frac{1}{9}$ next to both arrows and then multiply on both sides of the table.

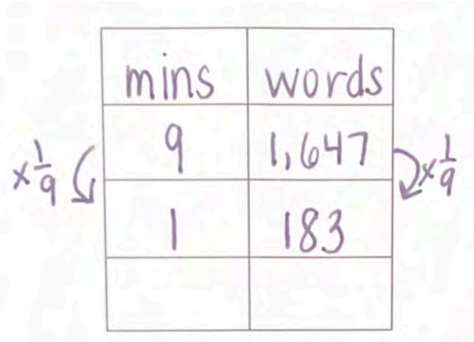
Time to calculate our words column! We need to divide 1,647 by 9.



Let's start by asking ourselves, "How many groups of 9 can we make if we have 1647?" We can at least make 100 groups of 9 which gives me 900 in total. Next, we subtract 1647 minus 900 and we are left with 747. We now only have 747 left with which to make groups of 9.

We then ask ourselves, "How many groups of 9 can we make from the 747 we have left?" We can make at least 80 groups which gives us 720 in total . So, I subtract 747 minus 720 and we are left with 27 in total to make more groups of 9.

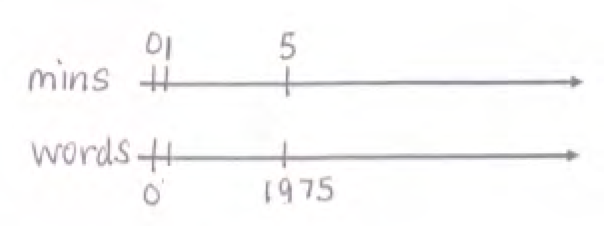
We, again, ask ourselves, "How many groups of 9 can we make from the 27?" We can make 3 groups which gives us 27 in total. So, I subtract 27 minus 27 and am left with 0! My last step is to add together the groups of 9 that I have made. 100 groups of 9 plus 80 groups of 9 plus 3 groups of 9 gives us 183 groups of 9 as my answer *(write 183 in the row next to 1 in the table).*



mins	words
9	1,647
1	183

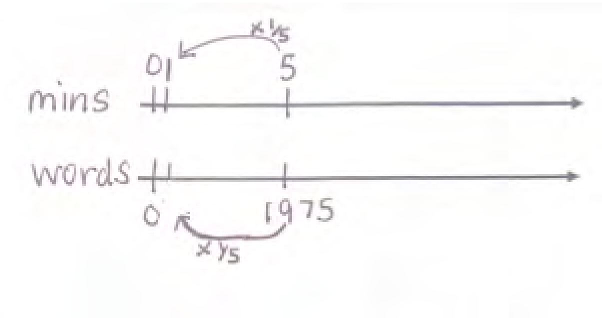
So, Participant #1 read 183 words per minute. We'll keep this in mind as we determine how many words per minute Participant #2 read during the assessment.

Nelsen's data tells us that Participant #2 read 1,975 words in 5 minutes. Let's use a double number line to determine if Participant #2 meets the criteria as a speed reader.



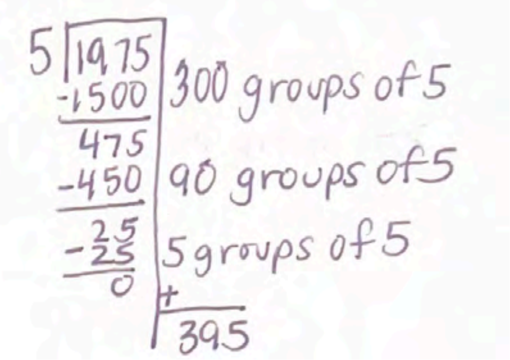
We will begin completing the double number line starting with the headings which are minutes and words.

On the minutes number line we need to add a tick mark right after the 0 and label that tick mark 1 then add another tick mark and label that tick mark 5. On the word number line we need to place a blank tick mark directly under the tick mark labeled 1 and place a tick mark labeled 1,975 directly under the tick mark labeled 5. The reason the tick mark under the 1 is blank is because we still need to calculate the unit rate or how many words per minute Participant #2 read during the assessment.



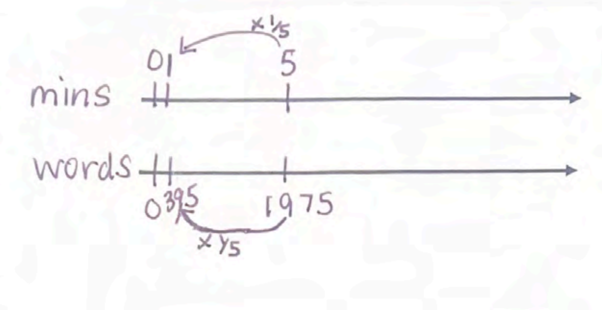
Next we draw our arrows. On the minutes number line draw an arrow from the 5 to the 1 and on the words number line we draw the arrow from 1975 to the empty tick mark next to the 0. In determining what we multiply by to get from 5 to 1 we use the reciprocal of 5 which is $\frac{1}{5}$ because the reciprocal of any number is just 1 divide by the number. So we need to write x$\frac{1}{5}$ next to both arrows and then multiply on the words number line.

Time to calculate! $\frac{1975}{1} x \frac{1}{5} = \frac{1975}{5}$. This answer will tell us how many words Participant #2 read per 1 minute on the reading assessment.



Let's start by asking ourselves, "How many groups of 5 can we make if we have 1975?" We can at least make 300 groups of 5 which gives me 1500 in total. Next, we subtract 1975 minus 1500 and we are left with 475. We now only have 475 left with which to make groups of 5.

We then ask ourselves, "How many groups of 5 can we make from the 475 we have left?" We can make at least 90 groups which gives us 450 in total. So, I subtract 475 minus 450 and we are left with 25 in total to make more groups of 5.



We, again, ask ourselves, "How many groups of 5 can we make from the 25?" We can make 5 groups which gives us 25 in total. So, I subtract 25 minus 25 and am left with 0! My last step is to add together the groups of 5 that I have made…300 groups of 5 plus 90 groups of 5 plus 5 groups of 5 gives us 395 as the answer.

So this participant read 395 words per minute.

Finally, let's go back to the information we know about speed reading. In thinking about whether either of the readers meet the criteria of a speed reader we first need to revisit the criteria for being a speed reader. Who can recall the criteria for being a speed reader? Reading 400-700 words per minute with 67% comprehension.

Did either of the participants read between 400 and 700 words per minute during the assessment? Who can explain? None of the participants met the criteria for being a speed reader because both were below 400 words per minute. That's right! Participant #1 read 183 words per minute and Participant #2 read 395 words per minute which means neither participant read a minimum of the 400 words required to be a speed reader. Participant #2 was so close at 395 words per minute but they still did not actually meet the criteria to be classified as a speed reader. So close yet so far!

Ratios really are all around us! While we can't all be speed readers we can improve upon a skill we possess. It may be improving upon our reading speed but it could also be improving upon a high score in a video game or something like perfecting bike stunts. Regardless, consider collecting data as you improve and maybe even writing and solving a ratio problem to track your improvement.

Let's Try it (Slide 6-7): Let's continue our exploration of speed and explore price. Remember that diagrams are helpful when making sense of ratios and it is your choice as to which diagram you will use to represent the information and calculate equivalent ratios.

WARM WELCOME

Today we will revisit speed and price in real-world situations.

Let's Talk:

How could you determine the price for more apples? Decide how many apples you want to buy and calculate the price. Let's use a diagram to calculate.

Granny Smith Apples

3/$8

Let's Think:

Have you ever heard of speed reading?

The criteria for being a speed reader is reading 400-700 words per minute without losing comprehension.

The average adult reads at a rate of 250 words per minute.

Let’s Think:

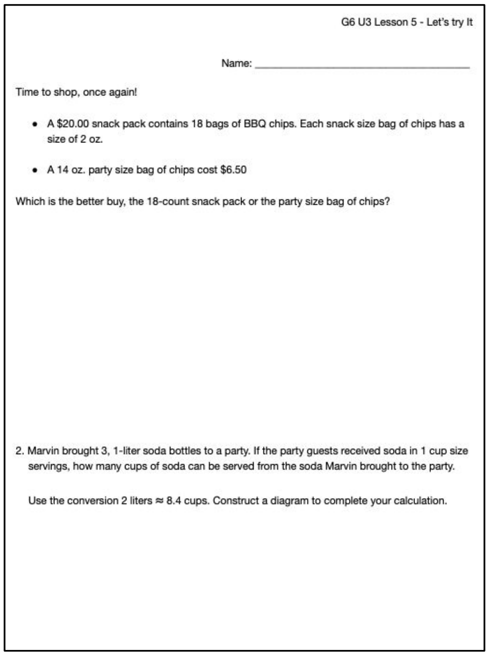
Nelson tested two adults to determine if either of them meet the criteria as a speed reader.

Results of the reading assessment:

- Participant #1: 1,647 words read in 9 minutes
- Participant #2: 1,975 words read in 5 minutes

Let’s Try It:

Let’s explore comparing speed and price together.



G6 U3 Lesson 5 - Let’s try It

Name: ______________________________

Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz. party size bag of chips cost $6.50

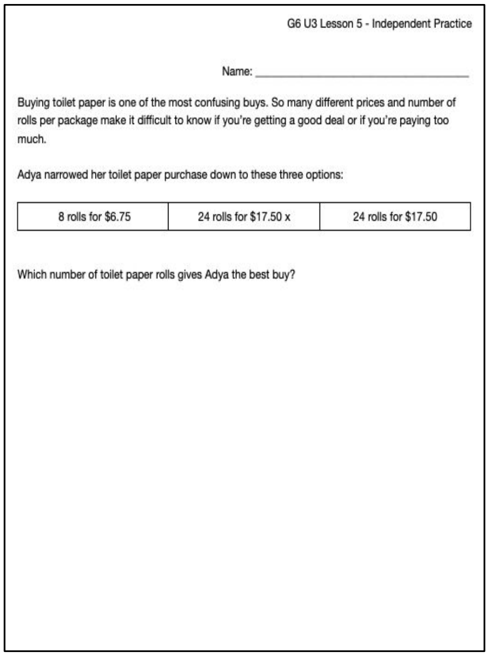
Which is the better buy, the 18-count snack pack or the party size bag of chips?

2. Marvin brought 3, 1-liter soda bottles to a party. If the party guests received soda in 1 cup size servings, how many cups of soda can be served from the soda Marvin brought to the party.

Use the conversion 2 liters ≈ 8.4 cups. Construct a diagram to complete your calculation.

On your Own:

Now it’s time to explore comparing speed and price on your own.



G6 U3 Lesson 5 - Independent Practice

Name: ______________________________

Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you’re getting a good deal or if you’re paying too much.

Adya narrowed her toilet paper purchase down to these three options:

8 rolls for $6.75	24 rolls for $17.50 x	24 rolls for $17.50

Which number of toilet paper rolls gives Adya the best buy?

1. A healthy adult takes an average of 9 minutes to run 1 mile. Cheetahs are the fastest land animals on Earth and far outpace humans. If a cheetah is clocked at running 30 miles per hour, how many **minutes** did it take the cheetah to run 1 mile?

2. Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz party size bag of BBQ chips costs $6.50.

Which is the better buy, the 18-count snack pack or the party size bag of chips?

Name: ____________________________________

1. Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you're getting a good deal or if you're paying too much.

Adya narrowed her toilet paper purchase down to these three options for a brand of toilet paper:

8 rolls for \$6.75	24 rolls for \$17.50	32 rolls for \$28.80

Which price gives Adya the best buy?

Name: ______________________________ G6 U3 Lesson 5 - Let's Try It

1. A healthy adult takes an average of 9 minutes to run 1 mile. Cheetahs are the fastest land animals on Earth and far outpace humans. If a cheetah is clocked at running 30 miles per hour, how many **minutes** did it take the cheetah to run 1 mile?

30 mile per hour

There are 60 minutes in 1 hour.

	minutes	miles	
$\times\frac{1}{30}$	60	30	$\times\frac{1}{30}$
	$\frac{60}{30}=2$	1	

$\frac{60}{1}\times\frac{1}{30}=\frac{60}{30}=2$

The cheetah can run 1 mile in 2 mins.

2. Time to shop, once again!

- A $20.00 snack pack contains 18 bags of BBQ chips. Each snack size bag of chips has a size of 2 oz.
- A 14 oz party size bag of BBQ chips costs $6.50.

Which is the better buy, the 18-count snack pack or the party size bag of chips?

Snack pack

	ounces	cost	
$\times\frac{1}{36}$	36	20.00	$\times\frac{1}{36}$
	1	0.55	

$9\overline{)5.00}$ ②
−450 | 50
50
−45 | 5
5 | +
.55 ②

$\frac{20}{1}\times\frac{1}{36}=\frac{20}{36}\div\frac{4}{4}=\frac{5}{9}$

Snack pack is about $0.55/ounce

Party Size

	ounces	cost	
$\times\frac{1}{14}$	14	6.50	$\times\frac{1}{14}$
		0.46	

$14\overline{)6.50}$ ②
−280 | 20
370
−280 | 20
90
−84 | 6
6 | +
.46 ②

Party size is about $0.46/ounce

The better buy is the party size bag of chips.

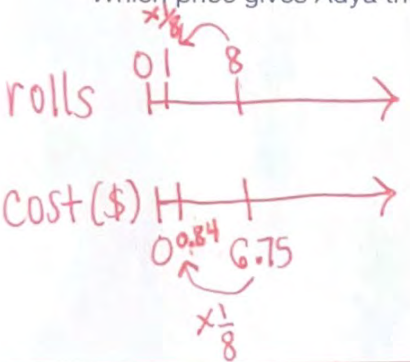
Name: ______________________________ G6 U3 Lesson 5 - Independent Practice

1. Buying toilet paper is one of the most confusing buys. So many different prices and number of rolls per package make it difficult to know if you're getting a good deal or if you're paying too much.

Adya narrowed her toilet paper purchase down to these three options for a brand of toilet paper:

8 rolls for $6.75	24 rolls for $17.50	32 rolls for $28.80

Which price gives Adya the best buy?



$\frac{6.75}{1} \times \frac{1}{8} = \frac{6.75}{8}$

$8\overline{)6.75} \rightarrow ②$
$-640 \mid 80$
35
$-32 \mid +4$ ②
$3 \mid 84\ \frac{3}{8}$

8 rolls for $6.75 is about $0.84 per roll.

---

rolls	cost
24	17.50
1	0.72

$\times\frac{1}{24}$ $\times\frac{1}{24}$

$\frac{17.50}{1} \times \frac{1}{24} = \frac{17.50}{24}$

$24\overline{)17.50} \rightarrow ②$
$-1200 \mid 50$
550
$-480 \mid 20$
70
$-48 \mid +2$ ②
$22 \mid 72\ \frac{22}{24}$

24 rolls for $17.50 is about $0.72 per roll.

---

rolls	cost
32	28.80
1	0.90

$\times\frac{1}{32}$ $\times\frac{1}{32}$

$\frac{28.80}{1} \times \frac{1}{32} = \frac{28.80}{32}$

$32\overline{)28.80} \rightarrow ②$
$-320 \mid 10$
2560
$-960 \mid 30$
1600
$-1600 \mid 50$
$0 \mid + 90$ ②

32 rolls for $28.80 is about $0.90 per roll.

The best buy is 24 rolls for $17.50

G6 U3 Lesson 6

Calculate and use two different unit rates to solve problems

G6 U3 Lesson 6 - Students will calculate and use two different unit rates to solve problems

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore unit rate two different ways using the same information. We have explored unit rate in multiple real-world representations many times so far. We know that ratios are comparisons of quantities and that unit rate focuses on the quantity of 1 when comparing. In this lesson we will focus specifically on using a table to find two different unit rates.

Let's Talk (Slide 3): Let's start with a conversation about unit rate, here are two. **Which unit rate is easier to understand the meaning of for you? Explain. ¼ cookie for $1 or $4 for 1 cookie.** Possible Student Answers, Key Points:

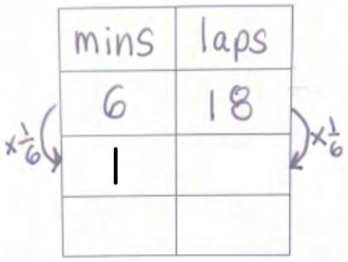
- $4 for 1 cookie is easy to understand because that tells me exactly how much 1 cookie costs.
- ¼ a cookie for $1 is the same thing but it's hard to understand because you never actually buy ¼ of a cookie.
- Whole numbers are easier to understand than fractions.
- ¼ a cookie for $1 makes sense because now I know exactly how much of a cookie $1 can buy.

There's no right answer here, it's how our brains work. But sometimes, fractions can get us turned around. For me, thinking of paying $4 for 1 cookie is a more friendly comparison in my mind while ¼ cookie for $1 does not and is tougher to visualize in the real-world. Hopefully after today's work our minds will be even more comfortable with fractions as parts of ratios.

Let's Think (Slide 4): It may seem odd to find two different unit rates with the same information as it requires you to focus on the problem from two different perspectives or viewpoints, but there are times when being able to interpret unit rate two different ways is necessary and helpful. This is especially true when you are tasked with finding a unit rate of a particular quantity instead of being able to choose for yourself. Let's look at Neil's latest exercise time recorded for his laps around a playground. Neil recorded that he ran 18 laps in 6 minutes. First, let's create our table and then calculate the unit rate two different ways using the same table.

mins	laps
6	18

We know how to construct tables! Since our table is displayed for us we will begin filling in the table starting with the headings which are minutes and laps since Neil was recording his lap times in minutes. Now, let's fill out the information that we know. We know it took 6 minutes for Neil to run 18 laps, let's put each piece of information in the table.



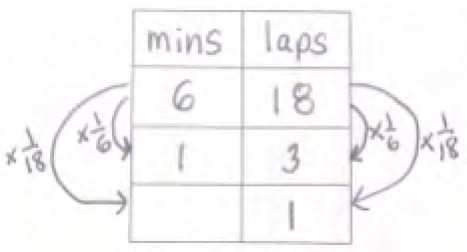
mins	laps
6	18
1	

Now, let's find the unit rate. We can find two different unit rates for this problem. First, we can figure out how many laps Neil can run in ONE minute or we can find out how many minutes it takes Neil to run ONE lap. Let's start with the laps per ONE minute, so we'll put a 1 in the minute column. Now we need to figure out what number multiplied by 6 to give us 1. We always multiply by the reciprocal. The reciprocal of 6 which is ⅙ because the reciprocal of any number is just 1 divide by the number. So we need to write x ⅙ next to both arrows and reciprocals always multiply to 1.

mins	laps
6	18
1	3

Now, let's figure out how many laps Neil can go in ONE minute. This math is a bit easier than some of the other math we've done. This unit rate tells us that Neil can run 3 laps in 1 minute.

Ready to calculate the next unit rate? We are not making a new table! We are just going to continue using the table we've already constructed and use the extra space.



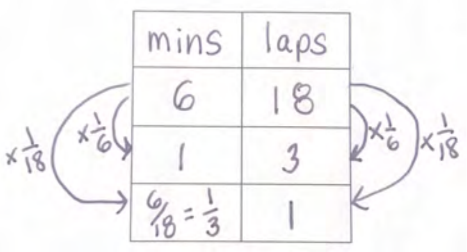
mins	laps
6	18
1	3
	1

Our first unit rate looked for laps per minute. Our second unit rate will look for minutes per lap. The "per lap" part of our unit rate means we put a 1 in the laps column in the fourth row under the 3. To best show that we can use the information we are given in a problem to solve for two different unit rates we are going to answer the question, What would we multiply by 18 to get 1. If you're thinking reciprocal then you are correct.

$$\frac{6}{1} \times \frac{1}{18} = \frac{6}{18}$$

$$\frac{6}{18} \div \frac{6}{6} = \frac{1}{3}$$

The reciprocal of 18 is $\frac{1}{18}$ so now let's multiply by $\frac{1}{18}$ on both sides of the table. We know that reciprocal always equal 1. Then calculate the minutes column, $\frac{6}{18}$ is the correct answer but it is not simplified. Does anyone know what factor we can use to simplify $\frac{6}{18}$? We can use factors 3 or 6. Yes. 3 will reduce the fraction but 6 will completely reduce the fraction. Now let's interpret or understand this second unit rate: It took Neil $\frac{1}{3}$ of a minute to run 1 lap around the playground.



mins	laps
6	18
1	3
$\frac{6}{18} = \frac{1}{3}$	1

So, our two different unit rates are "Neil ran 3 laps in 1 minute" and "it took Neil ⅓ of a minute to run 1 lap." Which unit rate is more difficult to understand the meaning of? Answers will vary. If you said "it took Neil ⅓ of a minute to run 1 lap" you are not alone. Most people find interpreting with numbers in fractional form to be a little challenging. Definitely more challenging than interpreting whole numbers.

As an extra challenge we could convert ⅓ of a minute to seconds. This would bring more clarity to the unit rate for many people. Quickly, if there are 60 seconds in 1 minute and you break that 60 seconds into three large groups, you would get 20 seconds in each group. So, ⅓ of a minute means it took 20 seconds for Neil to run 1 lap around the playground.

Using the same piece of information to calculate unit rate two different ways isn't necessarily more numerically challenging. The challenge comes in the interpretation of the answers especially when fractional answers are involved. The more time you spend working with fractions, the easier they become to understand.

Let's Try it (Slide 6): Let's continue exploring unit rate calculated two different ways using the same information and on the same table. Remember that although it may be easier to interpret a unit rate one way, it is important to also push yourself to try to understand the unit rate for a given problem from another viewpoint.

WARM WELCOME

Today we will explore unit rate two different ways using the same information.

Let's Talk:

Which unit rate is easier to understand? Explain.

¼ cookie for $1

or

$4 for 1 cookie

Let's Think:

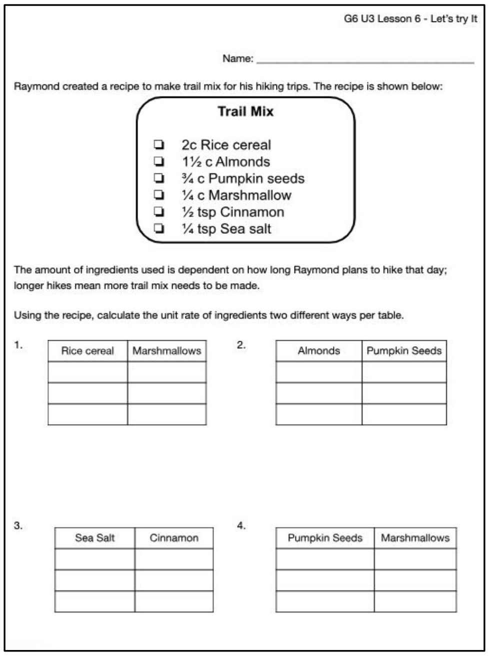
Neil recorded the exercise time for his laps around a playground. Neil recorded that he ran 18 laps in 6 minutes.

Let's create our table and then calculate the unit rate two different ways using that same table.

Let's Think:

Let's Try It:

Let's explore using unit rates to solve problems together.



G6 U3 Lesson 6 - Let's try It

Name: ______________________

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

Rice cereal	Marshmallows

2.

Almonds	Pumpkin Seeds

3.

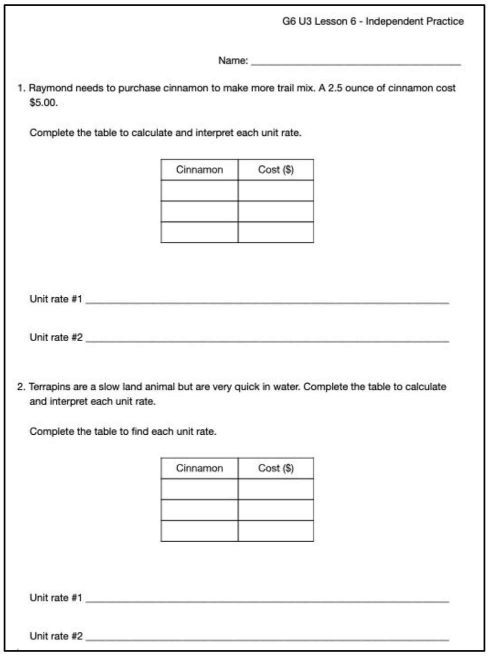
Sea Salt	Cinnamon

4.

Pumpkin Seeds	Marshmallows

On your Own:

Now it's time to explore unit rates to solve problems on your own.



G6 U3 Lesson 6 - Independent Practice

Name: ______________________

1. Raymond needs to purchase cinnamon to make more trail mix. A 2.5 ounce of cinnamon cost $5.00.

   Complete the table to calculate and interpret each unit rate.

Cinnamon	Cost ($)

Unit rate #1 ______________________

Unit rate #2 ______________________

2. Terrapins are a slow land animal but are very quick in water. Complete the table to calculate and interpret each unit rate.

   Complete the table to find each unit rate.

Cinnamon	Cost ($)

Unit rate #1 ______________________

Unit rate #2 ______________________

Name: ____

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made, shorter hikes mean less.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

Rice cereal	Marshmallows

2.

Almonds	Pumpkin Seeds

3.

Sea Salt	Cinnamon

4.

Pumpkin Seeds	Marshmallows

Name: ______________________________________

1. Raymond needs to purchase cinnamon to make more trail mix. A 2½ ounce of cinnamon costs $5.00.

Complete the table to calculate the unit rate two different ways.

Unit rate #1: ____

Unit rate #2: ____

2. The average human swimming speed is about 2 miles per hour. A terrapin is a slow land animal but is very quick in water. Kim tracks a terrapin swimming 24 miles in 2 hours.

Complete the table to calculate the unit rate two different ways.

Unit rate #1: ____

Unit rate #2: ____

Name: ______________________________ G6 U3 Lesson 6 - Let's Try It

Raymond created a recipe to make trail mix for his hiking trips. The recipe is shown below:

Trail Mix

- ☐ 2c Rice cereal
- ☐ 1½ c Almonds
- ☐ ¾ c Pumpkin seeds
- ☐ ¼ c Marshmallow
- ☐ ½ tsp Cinnamon
- ☐ ¼ tsp Sea salt

The amount of ingredients used is dependent on how long Raymond plans to hike that day; longer hikes mean more trail mix needs to be made, shorter hikes mean less.

Using the recipe, calculate the unit rate of ingredients two different ways per table.

1.

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

Rice cereal	Marshmallows
2	1/4
1	1/8
8	1

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

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

2.

$\times\frac{2}{3}$ $\times\frac{4}{3}$

Almonds	Pumpkin Seeds
1 ½ or 3/2	3/4
1	1/2
2	1

$\times\frac{4}{3}$ $\times\frac{2}{3}$

$\frac{3}{4}\times\frac{2}{3}=\frac{6}{12}\div\frac{6}{6}=\frac{1}{2}$

$\frac{3}{2}\times\frac{2}{3}=\frac{6}{6}=1$

$\frac{3}{4}\times\frac{4}{3}=\frac{12}{12}=1$

$\frac{3}{2}\times\frac{4}{3}=\frac{12}{6}=2$

3.

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

Sea Salt	Cinnamon
1/4	1/2
1	2
1/2	1

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

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

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

4.

$\times\frac{4}{3}$ $\times\frac{4}{1}$

Pumpkin Seeds	Marshmallows
3/4	1/4
1	1/3
3	1

$\times\frac{4}{1}$ $\times\frac{4}{3}$

$\frac{3}{4}\times\frac{4}{3}=\frac{12}{12}=1$ $\frac{3}{4}\times\frac{4}{1}=\frac{12}{4}=3$

$\frac{1}{4}\times\frac{4}{3}=\frac{4}{12}\div\frac{4}{4}=\frac{1}{3}$ $\frac{1}{4}\times\frac{4}{1}=\frac{4}{4}=1$

Name: ______________________ G6 U3 Lesson 6 - Independent Practice

1. Raymond needs to purchase cinnamon to make more trail mix. A 2½ ounce of cinnamon costs $5.00.

Complete the table to calculate the unit rate two different ways.

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

$\times\frac{1}{5}$

cost	ounces
$\times\frac{2}{5}$ 5	5/2 $\times\frac{2}{5}$
1	1/2
2	1

$\times\frac{1}{5}$

$\frac{5}{2}\times\frac{1}{5}=\frac{5}{10}\div\frac{5}{5}=\frac{1}{2}$

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

$\frac{5}{2}\times\frac{2}{5}=\frac{10}{10}=1$

$\frac{5}{1}\times\frac{2}{5}=\frac{10}{5}=2$

Unit rate #1: 1 ounce of cinnamon costs $2.00.

Unit rate #2: $1.00 worth of cinnamon weighs 1/2 ounce.

2. The average human swimming speed is about 2 miles per hour. A terrapin is a slow land animal but is very quick in water. Kim tracks a terrapin swimming 24 miles in 2 hours.

Complete the table to calculate the unit rate two different ways.

mins

$\frac{60}{1}\times\frac{1}{12}=\frac{60}{12}=$

5mins

$\times\frac{1}{2}$

hours	miles
$\times\frac{1}{24}$ 2	24 $\times\frac{1}{24}$
1	12
1/12	1

$\times\frac{1}{2}$

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

$\frac{1}{2}\times\frac{24}{1}=\frac{24}{2}=12$

$\frac{24}{1}\times\frac{1}{24}=\frac{24}{24}=1$

$\frac{2}{1}\times\frac{1}{24}=\frac{2}{24}\div\frac{2}{2}=\frac{1}{12}$

Unit rate #1: The terrapin swam 1 mile in 1/12 of an hour (5 mins).

Unit rate #2: The terrapin swan 12 miles in 1 hour.

G6 U3 Lesson 7

Use unit rates to solve problems involving constant speed

G6 U3 Lesson 7 - Students will use unit rate to solve problems comparing deals and distances

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Congratulations! We have come to our last lesson on ratio learning before we switch gears to learn a new concept that will still be related to ratios but with a twist. We've learned so much throughout these two units. We know that ratios are comparisons of quantities and diagrams can be used to visually represent ratios. In this lesson we will, once again, apply our ratio knowledge to different scenarios. Challenge yourself to choose the best diagram for organizing the information and calculate what is being asked for.

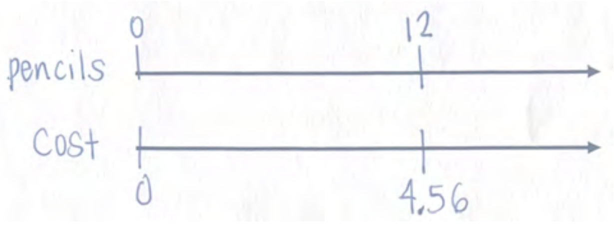
Let's Talk (Slide 3): We've built up quite a toolbox of tools to support our understanding of ratios. I know that all of us have a preferred tool. **Let's discuss which diagram we prefer and why. And then, let's list two ways that diagram is used to represent ratios.** Possible Student Answers, Key Points:

- I like tables because they're easy to look at and nicely organized. They utilize a vertical format, use boxes, and use columns and rows.
- I like double number lines because I've been using number lines since first grade. They utilize a horizontal format, use tick marks, and jumps on a number line.
- I like tape diagrams because they are similar to other tools I've used to solve word problems and fraction problems. They utilize squares to represent quantities, and are drawn horizontally.

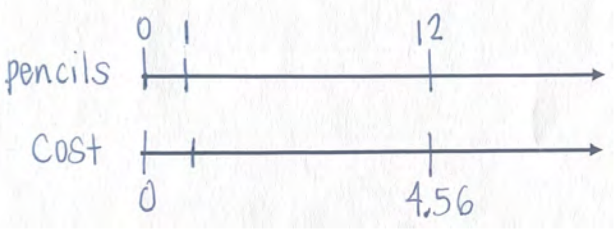
We have learned so much over the last unit and a half and we have worked very hard to understand the math! Certain components of each diagram have made them invaluable in our work. The tape diagram helps make ratios visual, the table aligns the information in a way that makes it easy to find unit rate, and the positioning of the numbers on a double number line makes it easy to see our ratios as fractions. They all help keep our work and thoughts organized.

Let's Think (Slide 4): Are we ready to continue applying all we know to solving ratio math problems? Great! Let's look at this problem. It's time for Clarence to buy classroom supplies. He went to two different stores, Target and Walmart. At Target, a box of 12 pencils costs $4.56. At Walmart, 30 pencils costs $12.30. Clarence wants to know which store has the better deal. This is confusing because we know how much GROUPS of pencils cost but we can't compare the price because the group size is different. So, let's calculate the cost of ONE pencil from each store.

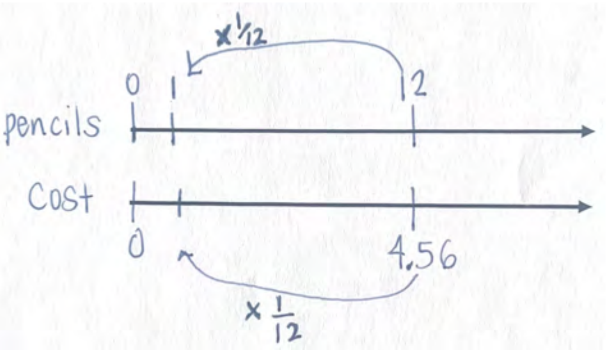
Let's Think (Slides 5): Let's use what we know, and all of our different diagrams and tools, to help Clarence. Let's start with the information about Target. We know that 12 pencils cost $4.56. Let's use a double number line to help us find the price of 1 pencil at Target.



Based on the problem, we know this brand of pencils costs $4.56 for 12 pencils. Let's begin by labeling each number line, pencils and cost. What would we add to our double number line next? A tick mark for 12 pencils and a tick mark for $4.56. Yes, the tick mark for 12 is placed on the pencils number line with 4.56 on a tick mark directly below 12's tick mark.

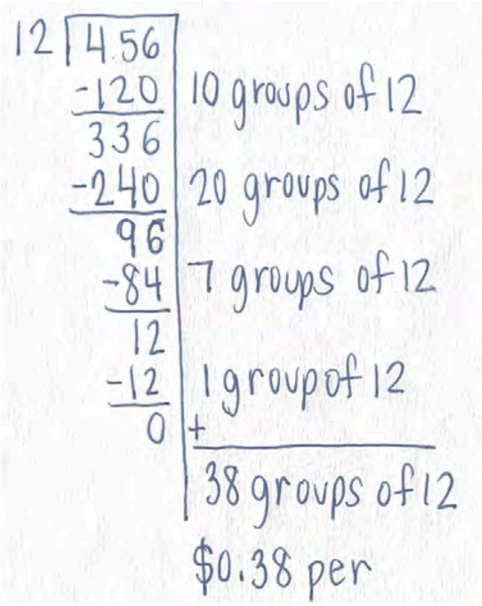


Now, we need to figure out how much 1 pencil costs, so let's label 1 on the number line.



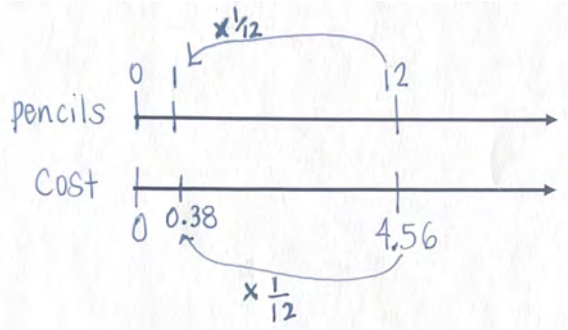
To get from 12 pencils to 1 pencil, we need to divide by 12 or multiply by 1/12.

Let's calculate the unit rate or cost 1 pencil from this smaller pack. We are dividing 4.56 by 12. We can start by removing the decimal, or thinking of 4.56 as well pennies, so instead of 4.56 we can think of it as 456. This will make our division easier!



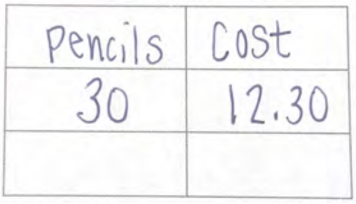
We need to figure out how many groups of 12 we have in the bigger group of 456. We have at least 10 groups of 12 or 120 total. Now, *456 minus 120 leaves us with 336 remaining to be put into groups.* Next, we need to figure out how many groups of 12 we have in the bigger group of 336. We have at least 20 groups of 12 because 20 multiplied by 12 is 240. *And,* 336 minus 240 leaves us with 96 remaining to put into groups. We can make at least 7 groups of 12, which is 96. And, 96 minus 84 leaves us with 12 remaining to put into groups. We can make exactly 1 more group of 12 and 12 minus 12 leaves us with 0 remaining to put into groups.

So, 38 groups of pennies needs to be written as money. In money, 38 pennies looks like $0.38. So, Clarence would pay $0.38 per pencil if he buys them from Target.



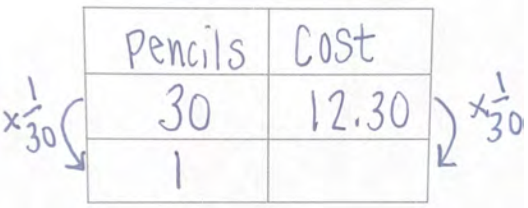
Let's complete the double number line with our unit rate by placing $0.38 on the cost number line directly under 1 pencil. Again, 1 pencil in this smaller pack from Target costs $0.38.

Let's Think (Slides 7-8): Now that we know how much each pencil costs on a box of 12 pencils, it's time to calculate the pencil cost for the other brand at Walmart. Their pencils cost $12.30 for 30 pencils. Let's solve one problem using a table.



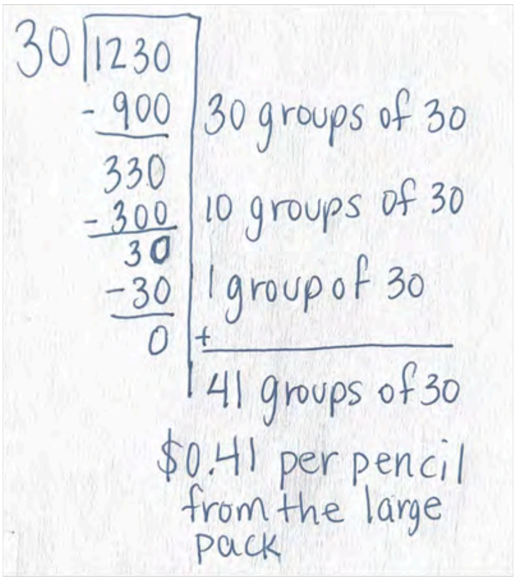
Pencils	Cost
30	12.30

Based on the problem we know this brand of pencils costs $12.30 for 30 pencils. Let's begin by labeling each column, pencils and cost. What would we add to our table next? 30 under the pencil heading and 12.30 under the cost heading. Yes and we know the 30 and the 12.30 go in the second row of the table under those headings.



Pencils	Cost
30	12.30
1	

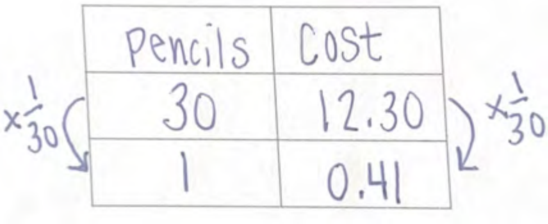
To get from 30 pencils to just 1 pencil, we need to divide by 30 or multiply by the reciprocal which is 1/30.



Let’s calculate the unit rate or cost 1 pencil from this large pack from Walmart. We are dividing 12.30 by 30.

We begin by thinking of 12.30 as all pennies which would be 1230 pennies. This will make our division easier!

We need to figure out how many groups of 30 we have in the bigger group of 1230. We have at least 30 groups of 30 or 900 total. *And, 1230 minus 900 leaves us with 330 remaining to be put into groups.* Next, we need to figure out how many groups of 30 we have in the bigger group of 330. We have 10 groups of 30 because 10 multiplied by 30 is 300. And, 330 minus 300 leaves us with 30 remaining to put into groups. We can make exactly 1 group of 30. And, 30 minus 30 leaves us with 0 or nothing remaining to put into groups. So, 1230 divided by 30 makes 41 groups of pennies, which needs to be written as money. In money, 41 pennies looks like $0.41. So, Clarence would pay $0.41 per pencil with the large pack of pencils from Walmart.



Pencils	Cost
30	12.30
1	0.41

Let’s complete the table with our unit rate by placing 0.41 in the row directly next to the 1 pencil. Again, 1 pencil in this large pack costs $0.41.

Now we know that if Clarnece buys the pencils from Target he’ll pay $0.38 for 1 pencil. If he buys the pencils from Walmart, he’ll pay $0.41 for 1 pencil. So, which is the better deal for Clarence? He should go to Target because 12 pencils for $4.56 because each of those pencils is $0.38 and each of the pencils in the larger pack cost $0.41.

Yes! Great summary! The results tell us that with the smaller pack it costs $0.38 per pencil while with the larger pack it costs $0.41 per pencil. If Clarence wants the best value he would buy the smaller pack of pencils because he pays less per pencil when compared to larger pack of pencils.

We used two different diagrams to represent our ratios but we could have chosen to complete all of our math calculations using just one type of diagram. Remember to choose the diagram with which you are the most comfortable working. The goal is still to choose a diagram though to display your math thinking and work. Even as we move onto other units, ensure that you are maintaining the habit of using diagrams to make your math visible .

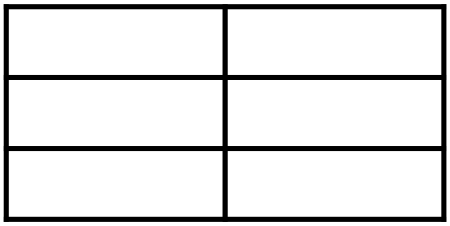
Let’s Try it (Slides 7-8): Let’s wrap up this lesson by finding solutions to ratio problems using diagrams of your choosing. Remember that with ratios we utilize reciprocals to assist with calculating unit rate. The reciprocal of a number is 1 divide by that number. When multiplied together, reciprocals always equal 1.

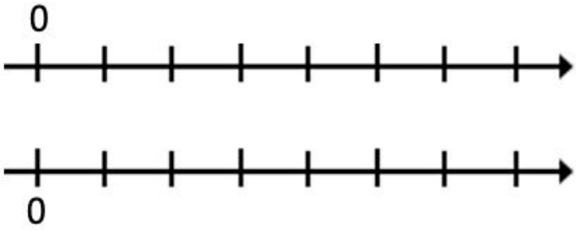
WARM WELCOME

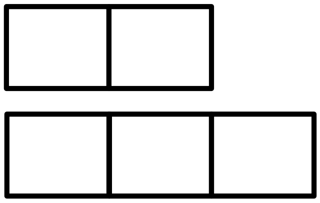
Today we will apply our knowledge of ratios to different scenarios.

Let's Talk:

What's your prefered diagram? Why? List two ways that diagram is used to represent ratios.







Let's Think:

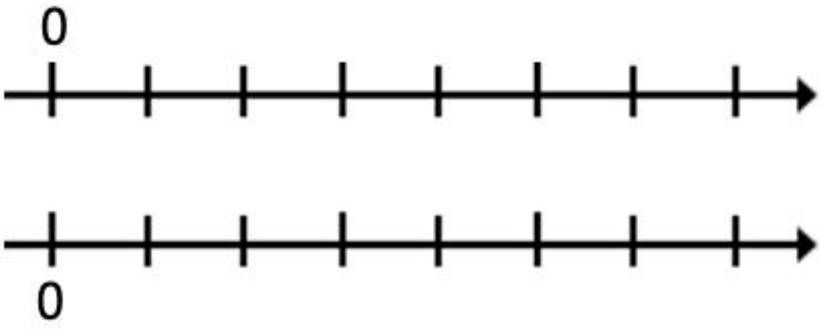
Time to buy classroom supplies!

Target is selling a box of 12 pencils for $4.56.
Walmart is selling a box of 30 pencils for $12.30.

Which store is offering the better deal?

Let's Think:

Target: A box of 12 pencils costs $4.56.

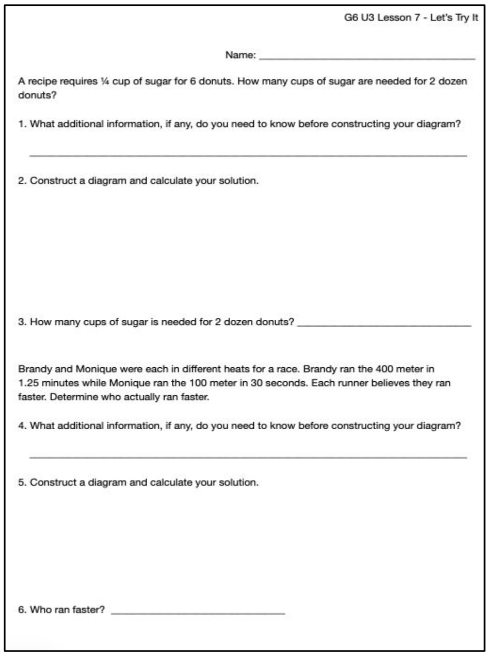


Let's Think:

Walmart: $12.30 for 30 pencils.

Let’s Try It:

Let’s explore using unit rate to compare deals and distance together.



G6 U3 Lesson 7 - Let’s Try It

Name: ______________________________

A recipe requires ¼ cup of sugar for 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How many cups of sugar is needed for 2 dozen donuts? ______________________________

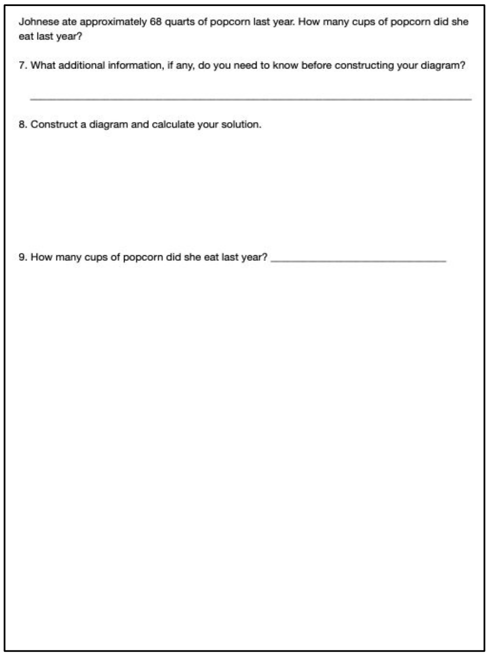
Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran faster. Determine who actually ran faster.

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. Who ran faster? ______________________________



Johnese ate approximately 68 quarts of popcorn last year. How many cups of popcorn did she eat last year?

7. What additional information, if any, do you need to know before constructing your diagram?

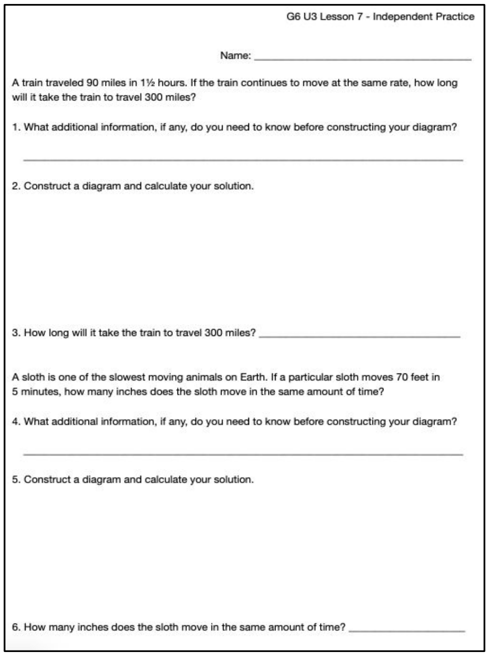
____

8. Construct a diagram and calculate your solution.

9. How many cups of popcorn did she eat last year? ______________________________

On your Own:

Now it’s time to explore using unit rate to compare deals and distance on your own.



G6 U3 Lesson 7 - Independent Practice

Name: ______________________________

A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How long will it take the train to travel 300 miles? ______________________________

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in 5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. How many inches does the sloth move in the same amount of time? ______________________________

A recipe requires ¼ cup of sugar to make 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How many cups of sugar is needed to make 2 dozen donuts? ___________________________

Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran the fastest. Determine who actually ran the fastest.

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. Who ran the fastest? ______________________________

Johnese drank approximately 68 cups of soda last year. How many quarts of soda did she drink last year?

7. What additional information, if any, do you need to know before constructing your diagram?

____

8. Construct a diagram and calculate your solution.

9. How many quarts of soda did she drink last year? ______________________________

A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

____

2. Construct a diagram and calculate your solution.

3. How long will it take the train to travel 300 miles? __________________________________

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in
5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

____

5. Construct a diagram and calculate your solution.

6. How many inches does the sloth move in the same amount of time? ____________________

Name: ______________________

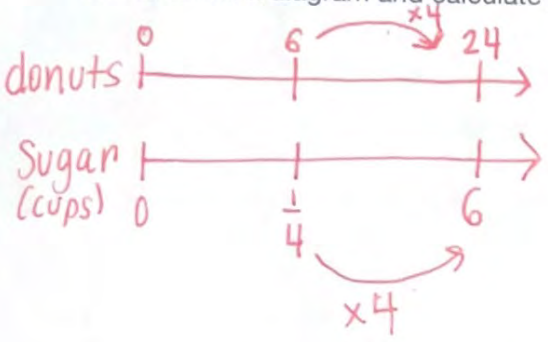
G6 U3 Lesson 7 - Let's Try It

A recipe requires ¼ cup of sugar to make 6 donuts. How many cups of sugar are needed for 2 dozen donuts?

1. What additional information, if any, do you need to know before constructing your diagram?

How many donuts are in 2 dozen.

2. Construct a diagram and calculate your solution.



1 dozen = 12 donuts so, 2 dozen = 24 donut.

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

3. How many cups of sugar is needed to make 2 dozen donuts? 1 cup of sugar

75secs

Brandy and Monique were each in different heats for a race. Brandy ran the 400 meter in 1.25 minutes while Monique ran the 100 meter in 30 seconds. Each runner believes they ran the fastest. Determine who actually ran the fastest.

4. What additional information, if any, do you need to know before constructing your diagram?

How many seconds are in a minute or vice versa.

5. Construct a diagram and calculate your solution.

Brandy

$\times\frac{1}{75}$ | $\times\frac{1}{75}$

Seconds	meters
75	400
1	$\frac{400}{75} = 5\frac{1}{3}$

Monique

$\times\frac{1}{30}$ | $\times\frac{1}{30}$

seconds	meters
30	100
1	$\frac{100}{30} = 3\frac{1}{3}$

1.25 minutes × 60 seconds = 75 seconds

Monique

$100 \div 30$: $100 - 90 = 10$, 3

$3\frac{10}{30} \div \frac{10}{10} = 3\frac{1}{3}$

Brandy

$400 \div 75$: $400 - 150 = 250$, 2; $250 - 150 = 100$, 2; $100 - 75 = 25$, 1; $5\frac{25}{75}$

$5\frac{25}{75} \div \frac{25}{25} = 5\frac{1}{3}$

6. Who ran the fastest? Brandy

She ran $5\frac{1}{3}$ meters in 1 second vs Monique who ran only $3\frac{1}{3}$ meters in 1 second.

Johnese drank approximately 68 cups of soda last year. How many quarts of soda did she drink last year?

7. What additional information, if any, do you need to know before constructing your diagram?

How many cups are equivalent to a quart.

1 quart = 4 cups

8. Construct a diagram and calculate your solution.

	quarts	cups	
$\times \frac{1}{4}$	1	4	$\times \frac{1}{4}$
	$\frac{1}{4}$	1	
$\times 68$	17	68	$\times 68$

$$\frac{68}{1} \times \frac{1}{4} = \frac{68}{4}$$

$$\begin{array}{r|l} 4 \,\overline{)\,68} & \\ -40 & 10 \\ 28 & \\ -28 & 7 \\ 0 & +\overline{17} \end{array}$$

9. How many quarts of soda did she drink last year? 17 quarts

Name: ______________________ G6 U3 Lesson 7 - Independent Practice

A train traveled 90 miles in 1½ hours. If the train continues to move at the same rate, how long will it take the train to travel 300 miles?

1. What additional information, if any, do you need to know before constructing your diagram?

No additional information is needed.

2. Construct a diagram and calculate your solution.

	hours	miles	
	$1\frac{1}{2}=\frac{3}{2}$	90	
$\times\frac{1}{90}$ ↓	$\frac{3}{180}$	1	↓ $\times\frac{1}{90}$
×300 ↓	5	300	↓ ×300

$\frac{3}{2}\times\frac{1}{90}=\frac{3}{180}$

$\frac{3}{180}\times\frac{300}{1}=\frac{900}{180}$

```
180 )900
    -720 | 4
     180
    -180 | 1
       0 | +
           5
```

3. How long will it take the train to travel 300 miles? 5 hours

A sloth is one of the slowest moving animals on Earth. If a particular sloth moves 70 feet in 5 minutes, how many inches does the sloth move in the same amount of time?

4. What additional information, if any, do you need to know before constructing your diagram?

How many inches in 1 foot.

↓

1 foot = 12 inches

5. Construct a diagram and calculate your solution.

	inches	feet	
	12	1	
×70 ↓	840	70	↓ ×70

6. How many inches does the sloth move in the same amount of time? 840 inches

G6 U3 Lesson 8

Understand percentages as rates per 100

G6 U3 Lesson 8 - Students will understand percentages as rates per 100

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Wow! You've really worked hard with ratios over our first two units. For the remainder of this third unit we will be applying everything we've learned about ratios to a new concept we call percentages. You've experienced percents in your everyday life and you may not have even realized it! Today we will begin exploring percentages, looking at how they relate to one another and how they show up in the real-world every day.

Let's Talk (Slide 3): Let's brainstorm, **what do you know about percentages? Where have you seen percentages in your everyday life?** Possible Student Answers, Key Points:

- Percentages are like fractions or decimals
- Sometimes we talk about grades or assignments with percentages.
- On my phone, my battery has a percentage to show how much of the battery is left.

Those are great real-world examples of percentages! Even though you may not have much experience with percentages in a school setting doesn't mean that percentages aren't a part of your everyday life. From phone battery power levels to test scores to sales at stores, we experience percentages all the time.

Let's Think (Slide 4): But what exactly is a percent or percentage? Well, it is a comparison of a part to a whole. So that means a percent is really just a ratio!

Just like with ratios we can write percentages as a fraction where the part is the numerator and the whole is the denominator. We can write a percent with a colon, like a ratio, where we're comparing part to whole. And lastly, we can write a percent with the word "to" as in "part to whole". Remember when I said that percentages are really just ratios because they are a comparison? Well now we see that percentages are even written the same as ratios on our diagrams!

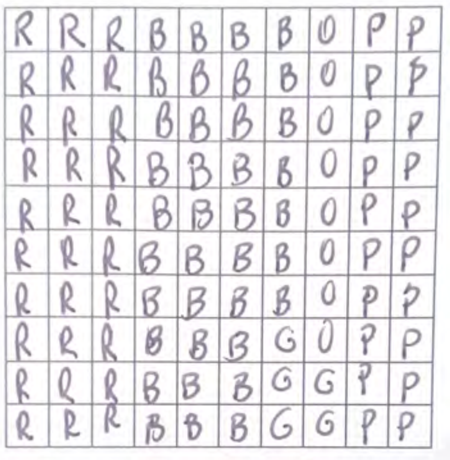
Let's continue by thinking about percentages as a scale. Normally we see and think of percents as being from 0 to 100 like with a phone. In fact, percent means "out of 100." The battery can be at 0% meaning the phone is dead, the battery can also be at 100% meaning the battery is completely full. But, did you know that you can actually have more than 100%? Think of a test or quiz. If the assessment has an extra credit question and you answer every question and the extra credit question on the test correctly, your score would be more than or above 100%.

Let's Think (Slide 5): Let's look at a real-world example where percentages can be applied. "Sixth grade students at Springfield Middle School were asked their favorite color." The results are shown in the table.

Let's use the data contained in the table to explore percentages. How many students were polled about their favorite color? 100 students. That's correct! We know 100 students were polled or asked about their favorite color because we totaled all the responses in our table. We counted how many people voted for all of the colors and found out that 100 students were asked. The number 100 is the most important number when thinking about percentages. All percentages are based out of 100. Remember, percent means "out of 100."

Key	Color	Number
R	Red	30
B	Blue	37
G	Green	5
P	Purple	20
O	Other	8

Let's visually represent the color choices of the 100 students on a 10 by 10 grid made of 100 squares. But, to do that we need a key. A key is a code that represents each piece of data in your information set. We used a key in Unit 2 when we worked with ratios and the chocolate cake recipe. To make this key simple we will use the first letter of each color as our code. You could of course actually use colors as the key instead of letters if you had the right colors. We could even use symbols. But, we'll just use the first letter of each color name. Let's write the first letter of each color in the table/



R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	B	O	P	P
R	R	R	B	B	B	G	O	P	P
R	R	R	B	B	B	G	G	P	P
R	R	R	B	B	B	G	G	P	P

Now let's use our key to complete the grid. Our table tells us that 30 students selected Red as their favorite color when asked. Since the table is made in rows and columns of ten we can simply skip count by ten to see which blocks we will write an R inside of*…*10, 20, 30*.* All the columns I traced will be coded with an R.

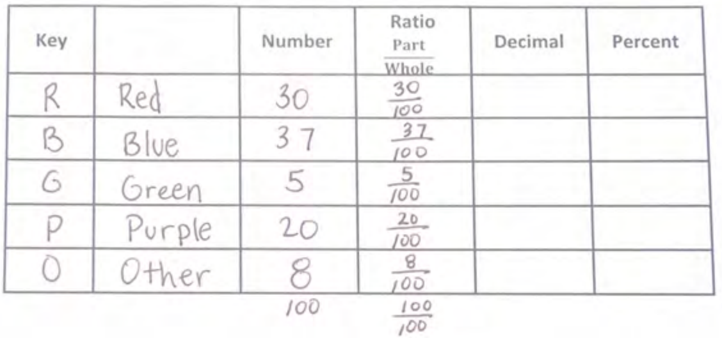
Let's do our 37 Blue blocks. 10, 20, 30, 31, 32, 33, 34, 35, 36, 37*.*

Are we ready for the Green blocks? There are only 5 so let's begin where Blue stops and then count two more over to the right.

Because 20 people chose Purple as their favorite color we're going to use the two columns to the right to fill with Ps. We have eight blocks left. Those eight blocks represent the 8 people who chose a color other than red, blue, green or purple as their favorite color…other! We're done filling in all 100 blocks on our grid!

Let's Think (Slide 6): We now have a visual grid of the student responses to their favorite color. Let's complete a table that will lead us to the percentage of each favorite color.

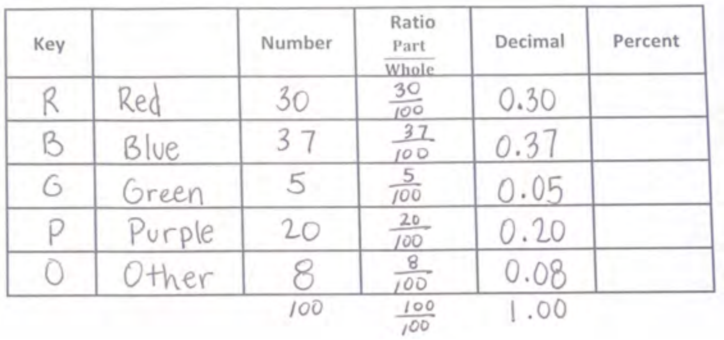
We already discussed that a percent is a ratio that is the comparison of the part to the whole. Based on our survey results, can anyone think of what represents our parts and what represents the whole? The number of each color chosen represents the part and the total number of survey participants is the whole. Nice thinking! The parts are seen in the individual answers to favorite colors on the grid and we found the whole when we totaled all the student responses.



Key		Number	Ratio $\frac{\text{Part}}{\text{Whole}}$	Decimal	Percent
R	Red	30	$\frac{30}{100}$		
B	Blue	37	$\frac{37}{100}$		
G	Green	5	$\frac{5}{100}$		
P	Purple	20	$\frac{20}{100}$		
O	Other	8	$\frac{8}{100}$		
		100	$\frac{100}{100}$		

Let's write that ratio in the fraction form…part over whole. Red is 30 out of 100 or $\frac{30}{100}$, Blue is 37 out of 100 or $\frac{37}{100}$. *(Continue until finished with the fraction column).*

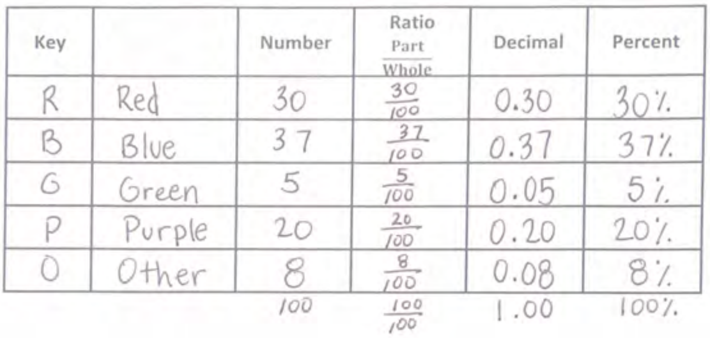
If we were to total these fractions we would get $\frac{100}{100}$ which accounts for all the student responses.



Key		Number	Ratio $\frac{\text{Part}}{\text{Whole}}$	Decimal	Percent
R	Red	30	$\frac{30}{100}$	0.30	
B	Blue	37	$\frac{37}{100}$	0.37	
G	Green	5	$\frac{5}{100}$	0.05	
P	Purple	20	$\frac{20}{100}$	0.20	
O	Other	8	$\frac{8}{100}$	0.08	
		100	$\frac{100}{100}$	1.00	

Guess what? You already have the knowledge to convert a ratio or fraction into a decimal from fifth grade but here is a reminder, the way you correctly read a fraction is the way you write it as a decimal if the denominator is a power of 10. Since 100 is a power of…10 10x10 is 100, we just need to correctly read each fraction. So, $\frac{30}{100}$ is read as thirty hundredths. Thirty hundredths as a decimal is 0.30. Next, $\frac{37}{100}$ is read as thirty-seven hundredths. Thirty-seven hundredths as a decimal is 0.37. *(Continue until finished with the decimal column).*

Now, if we were to add up all of our decimals, the total would be 1.00 or 1.



Key		Number	Ratio Part/Whole	Decimal	Percent
R	Red	30	$\frac{30}{100}$	0.30	30%
B	Blue	37	$\frac{37}{100}$	0.37	37%
G	Green	5	$\frac{5}{100}$	0.05	5%
P	Purple	20	$\frac{20}{100}$	0.20	20%
O	Other	8	$\frac{8}{100}$	0.08	8%
		100	$\frac{100}{100}$	1.00	100%

Our last column is the percent column. A decimal becomes a percent by multiplying the decimal by 100. You learned how to do this in fifth grade as well but here's a reminder. Multiplying a decimal by 100 involves shifting or moving the digits twice to the left on the place value chart. Why to the left? Because multiplying any number by 100 means the number gets larger and moving numbers to the left makes numbers larger. Think "left, larger." Let's shift the digits to left, being careful to leave the decimal point in its same position when we do.

For red, the decimal is 0.30, when the digits are shifted two place values to the left but the decimal point stays in its position, the number becomes 30. So, let's put 30% in the Red row. And, 0.37 becomes 37%. For green, 0.05 becomes 5%. Now looking at purple, 0.20 becomes 20%. Finally, other is 0.08 and that becomes 8%. We're done completing our table of values!

Now that we have the percentages, let's answer some questions! What percentage of survey participants chose Purple as their favorite color? 20%. That's correct. We see on the table in the purple row that 20% of the students chose purple as their favorite color.

Which color was chosen by 5% of the survey participants as their favorite color? Green! Yes. We see on the table in the Green row that 5% of the students chose green as their favorite color.

You may be thinking that all that work wasn't necessary because the percentages match the number of people who responded each time. Know that only works out that way because the total number of students asked their favorite color was 100. If 99 students, or 101, or even 1,573 students were asked their favorite color, the values in our table would not be so friendly. But, the process of converting numbers from decimals to percentages would be the same process whether 99, 100, 100 or even 1,573 students we asked their favorite color. The calculations from fractions to decimals would just be much more challenging. While we won't be relying on the grid in upcoming lessons, we will be focused on the knowledge that percentages are really just ratios and percent means "out of 100."

Let's Try it (Slide 6-7): Let's wrap up this lesson by finding solutions to ratio problems using diagrams. Remember that percentages are always out of the standard 100% and, again, percent means "out of 100."

WARM WELCOME

Today we will explore percents in the real-world.

Let's Talk:

What do you know about percentages? Where have you seen percentages in your everyday life?

Let's Think:

A percent, or a percentage, is a comparison of a part to a whole.

We can show percentages as FRACTIONS:

$$\frac{\text{part}}{\text{whole}}$$

We can show percentages with a RATIO:

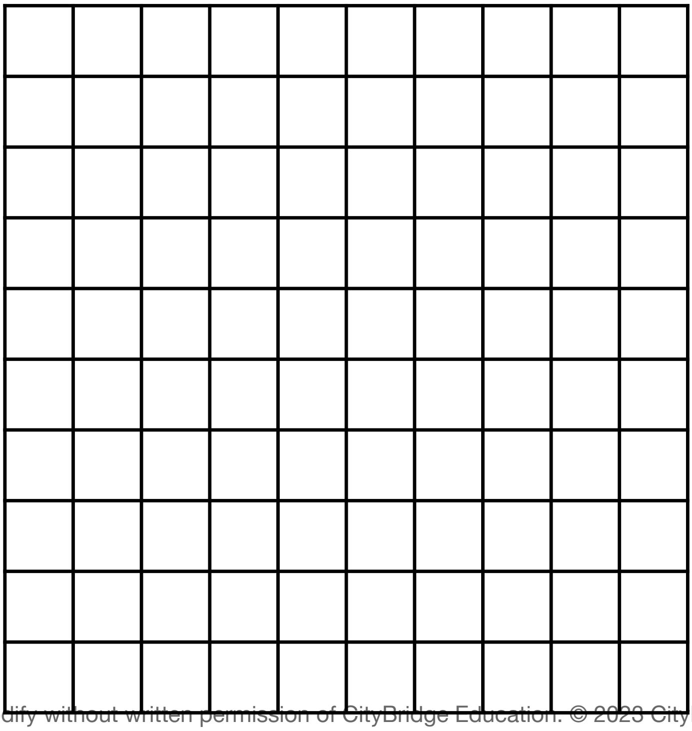
part:whole

We can show percentages with WORDS:

part to whole

Let's Think:

Key	Color	Number
	Red	30
	Blue	37
	Green	5
	Purple	20
	Other	8

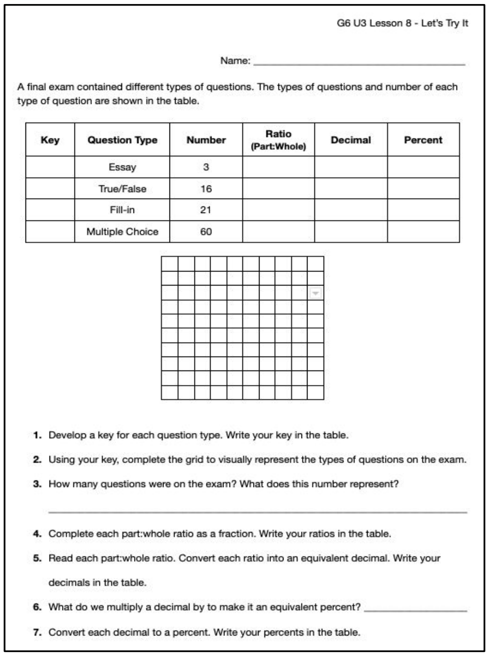


Let's Think:

Key	Color	Number	Ratio	Decimal	Percent
R	Red	30			
B	Blue	37			
G	Green	5			
P	Purple	20			
O	Other	8			

Let's Try It:

Let's explore percentages together.



G6 U3 Lesson 8 - Let's Try It

Name: ______________________________

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

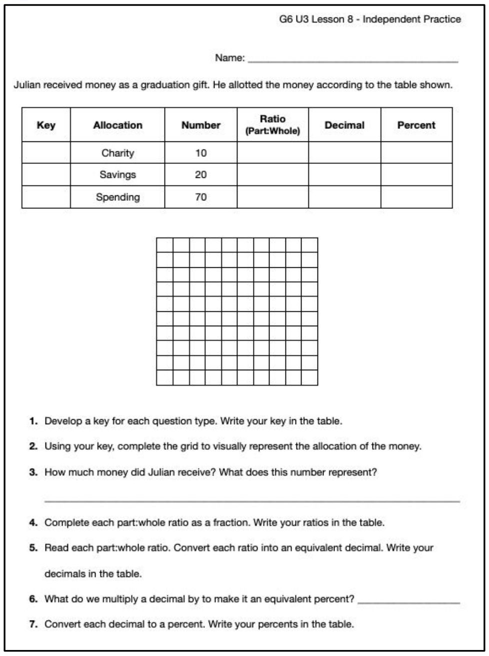
Key	Question Type	Number	Ratio (Part:Whole)	Decimal	Percent
	Essay	3			
	True/False	16			
	Fill-in	21			
	Multiple Choice	60			

1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the types of questions on the exam.
3. How many questions were on the exam? What does this number represent?

   ____
4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ________________
7. Convert each decimal to a percent. Write your percents in the table.

On your Own:

Now it's time to explore percentages on your own.



G6 U3 Lesson 8 - Independent Practice

Name: ______________________________

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	Allocation	Number	Ratio (Part:Whole)	Decimal	Percent
	Charity	10			
	Savings	20			
	Spending	70			

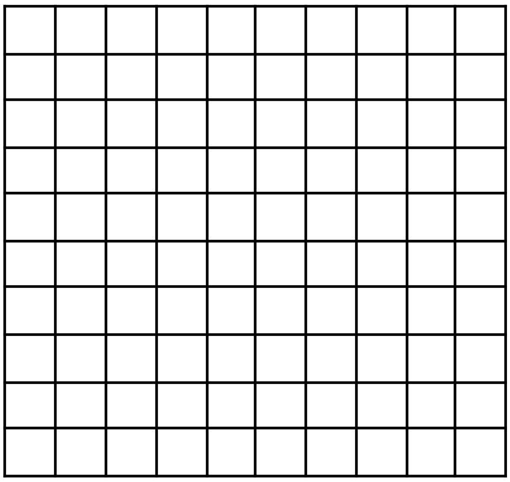
1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?

   ____
4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ________________
7. Convert each decimal to a percent. Write your percents in the table.

Name: ______________________________________

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

Key	**Question Type**	**Number**	**Ratio (Part:Whole)**	**Decimal**	**Percent**
	Essay	3			
	True/False	16			
	Fill-in	21			
	Multiple Choice	60			



1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the types of questions on the exam.
3. How many questions were on the exam? What does this number represent?

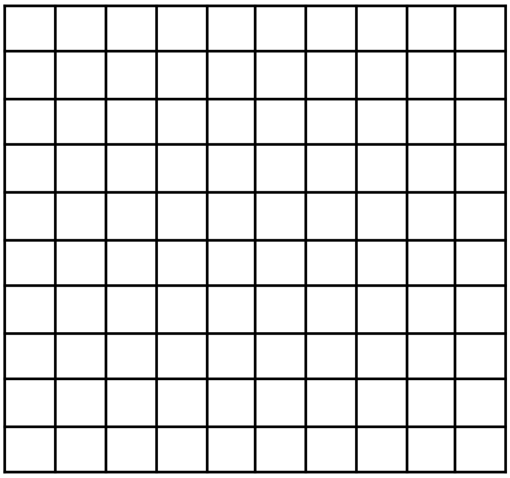
   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ____________________
7. Convert each decimal to a percent. Write your percents in the table.

Name: ______________________________________ G6 U3 Lesson 8 - Independent Practice

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	**Allocation**	**Number**	**Ratio (Part:Whole)**	**Decimal**	**Percent**
	Charity	10			
	Savings	20			
	Spending	70			



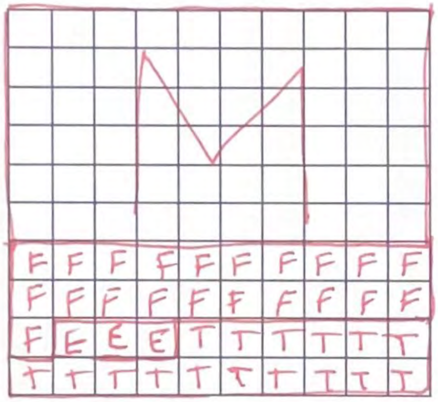
1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?

   ____

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? ____________________
7. Convert each decimal to a percent. Write your percents in the table.

A final exam contained different types of questions. The types of questions and number of each type of question are shown in the table.

Key	Question Type	Number	Ratio (Part:Whole)	Decimal	Percent
E	Essay	3	3:100 = $\frac{3}{100}$	.03	3%
T	True/False	16	16:100 = $\frac{16}{100}$	.16	16%
F	Fill-in	21	21:100 = $\frac{21}{100}$	.21	21%
M	Multiple Choice	60	60:100 = $\frac{60}{100}$	.60	60%



1. Develop a key for each question type. Write your key in the table.

2. Using your key, complete the grid to visually represent the types of questions on the exam.

3. How many questions were on the exam? What does this number represent?

100 questions total. It represents the whole.

4. Complete each part:whole ratio as a fraction. Write your ratios in the table.

5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.

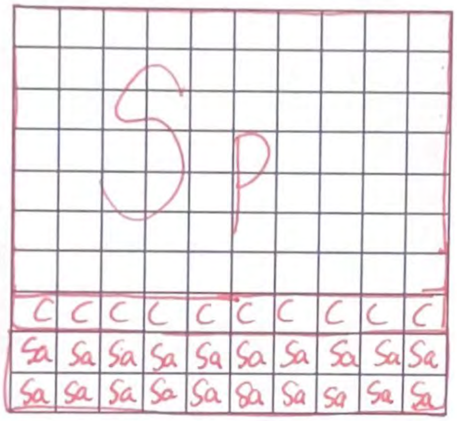
6. What do we multiply a decimal by to make it an equivalent percent? 100

7. Convert each decimal to a percent. Write your percents in the table.

Name: ______________________________ G6 U3 Lesson 8 - Independent Practice

Julian received money as a graduation gift. He allotted the money according to the table shown.

Key	Allocation	Number	Ratio (Part:Whole)	Decimal	Percent
C	Charity	10	10:100= $\frac{10}{100}$	.10	10%
Sa	Savings	20	20:100= $\frac{20}{100}$	.20	20%
Sp	Spending	70	70:100= $\frac{70}{100}$	.70	70%



1. Develop a key for each question type. Write your key in the table.
2. Using your key, complete the grid to visually represent the allocation of the money.
3. How much money did Julian receive? What does this number represent?
   $100. This represents the whole amount received.
4. Complete each part:whole ratio as a fraction. Write your ratios in the table.
5. Read each part:whole ratio. Convert each ratio into an equivalent decimal. Write your decimals in the table.
6. What do we multiply a decimal by to make it an equivalent percent? 100
7. Convert each decimal to a percent. Write your percents in the table.

G6 U3 Lesson 9

Use double number lines to calculate percentages

G6 U3 Lesson 9 - Students will use double number lines to calculate percentages

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will apply our knowledge of double number lines to calculating percentages we encounter in the real-world. In our first percentage lesson we discussed that while percentages can be greater than 100%, 100% represents the whole since percent means “out of 100” or even “per 100’ if you think about ratio language.

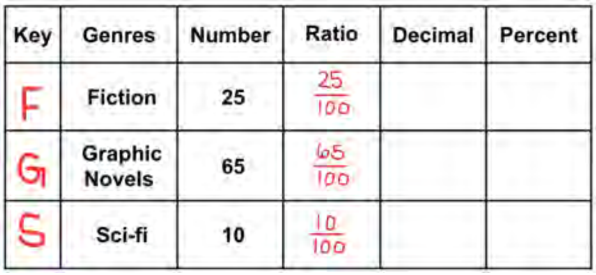
Let’s Talk (Slide 3): So, let’s open with a brainstorm. We know that percentages are always out of the standard 100% but you can have percentages that are less than and more than 100%.

Think of an example where you experienced a percentage less than 100%. Also think of a real-world example where a percentage more than100% couldn’t exist. Possible Student Answers, Key Points:

- When my phone was at 35%
- When something was on sale for 50% off
- I got a score of 75% on a quiz
- You can’t have more than 100% of your phone battery
- You can’t fill your fuel tank more than 100%

Good thinking! Percentages can be tricky. Keep in mind that just because percentages are out of 100 doesn’t mean they’ll always be 100% and just because percentages can go beyond 100% that doesn't mean they can go beyond 100% in all instances. You can’t charge your phone beyond 100%, either the phone’s battery is full meaning 100% or it’s not full. The battery can’t be more than full. Also, most percentages we experience in our world are most often less than 100%. Staying with the phone example, after you have one phone conversation or scroll an app for more than five minutes your phone will no longer be at 100% and will continue to decrease throughout the day unless it is charged at some point in that day.

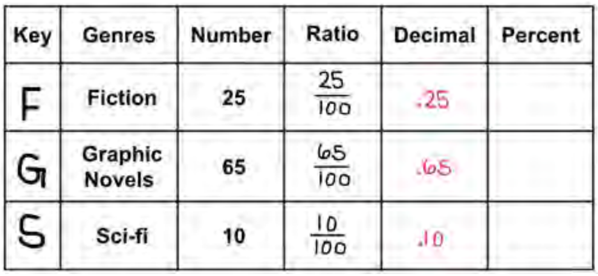
Let’s Think (Slide 4): Yesterday we worked with a table to find percentages of numbers. We were able to relate numbers, ratios, decimals, and percentages to one another. Looking at this table that represents the type of books a student reads by genre, let’s calculate the percentage of each genre read by a student over the course of a school year.



Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$		
G	Graphic Novels	65	$\frac{65}{100}$		
S	Sci-fi	10	$\frac{10}{100}$		

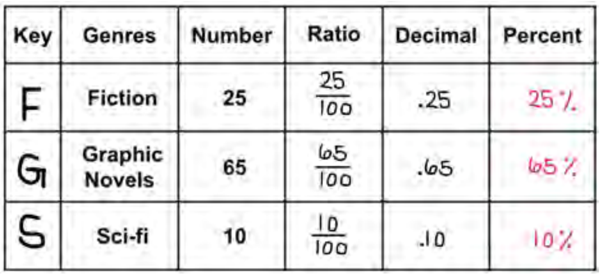
Let’s first choose a key to represent our book genres. Like yesterday, using the first letter of the genre is easy and makes sense. Next, let’s complete the ratio column also known as the comparison of the part to the whole. The number of books in each genre are the parts and the total number of books is the whole. So, the total is 25 and 65 and 10, which is 100–that’s a nice easy total to work with!

So, for fiction 25 out of 100 students chose that genre. So the ratio is 25/100. Now, how many students chose graphic novels? 65! That’s right, 65 out of 100 students picked graphic novels so that ratio is 65/100. And finally, 10 out of 100 students chose sci-fi so that ratio is 10/100.



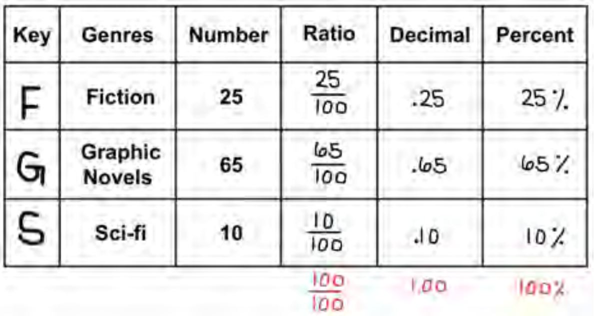
Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$	.25	
G	Graphic Novels	65	$\frac{65}{100}$	.65	
S	Sci-fi	10	$\frac{10}{100}$	.10	

Now, let’s write our ratios as decimals. Remember that decimals are written based on how the fractions are read when the denominator is 100. So, 25/100 is read as twenty-five hundredths (*point as you say it*) so the decimal will also read as twenty-five hundredths or 0.25. Now, graphic novels are sixty-five hundredths, which is 0.65. And finally, sci-fi is ten hundredths, which is 0.10.



Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$	.25	25%
G	Graphic Novels	65	$\frac{65}{100}$	.65	65%
S	Sci-fi	10	$\frac{10}{100}$	.10	10%

Finally, let's convert decimals to percentages by multiplying each decimal by 100 in the last column. In yesterday's lesson we reviewed the process for multiplying decimals by 100. We said multiplying a decimal by 100 involves shifting or moving the digits twice to the left because multiplying any number by 100 means the number gets larger and moving numbers to the left makes numbers larger. Let's shift the digits to the left, being careful to leave the decimal point in its same position.



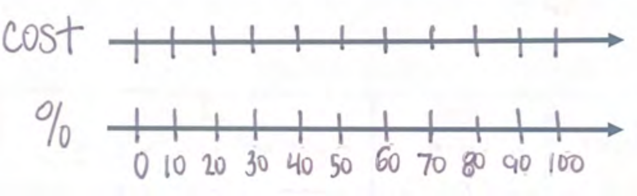
Key	Genres	Number	Ratio	Decimal	Percent
F	Fiction	25	$\frac{25}{100}$	.25	25%
G	Graphic Novels	65	$\frac{65}{100}$	.65	65%
S	Sci-fi	10	$\frac{10}{100}$	.10	10%
			$\frac{100}{100}$	1.00	100%

FInally, let's make sure that our parts all add up to the total. This is a good strategy to use to check our work. All of our ratios should add up to 100 out of 100. All of our decimals should add up to 1, or 1.00 and finally all of our percentages should add up to 100%!

Everyone, do the math and check!

Let's Think (Slide 5): In our first lesson we also learned that percentages are really just ratios because percentages are a comparison of the part to the whole. We even wrote that ratio as a fraction. Just like with ratios, we can represent percents on a double number line by scaling from 0% to 100%. Let's use our double number line with a real-world percent scenario.

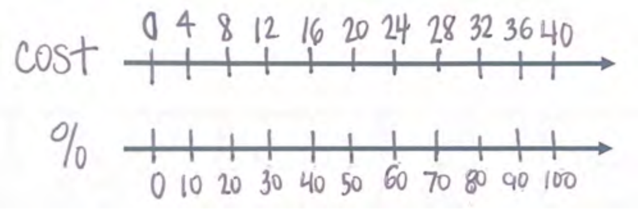
Listen as I read it, "At a store a $40.00 shirt is on sale for 20% off. How much does the shirt cost?" Let's stop and think for a second; what does 20% off mean? You pay less money for the shirt. Correct! Don't we all love a discount? 20% off means you pay 20% less than the full price for the shirt. It also means you only pay 80% of the full price of the shirt because 100% - 80% equals the 20% discount on the purchase of the shirt.



Let's start our double number line by labeling each number line. This shirt scenario deals with two things; money and percents so let's label the number lines cost and percent.

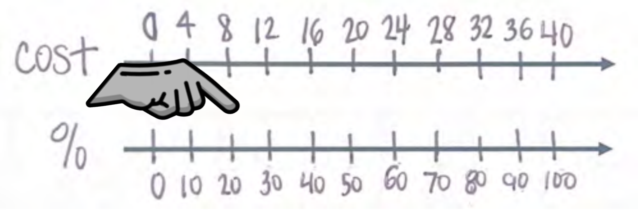
Next, let's label the bottom number line from 0 to 100, since it's percentages. Let's count the spaces between the tick marks so we can decide what we are skip counting by on our percent number line. Count with me. Since we counted 10 spaces that means this number line is divided into 10 equal spaces. And, 100 divided by 10 equals 10 so we need to skip count by 10 starting at 0%. Ready? Skip count with me - 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

Let's finish constructing our double number line to represent the sale price of the shirt. We need to figure out what to skip count by on the cost number line but first we need to know what dollar amount is equal to 100% in this scenario. Ask yourself, if 100% is the whole, then what number originally represents the "whole" cost for the shirt? $40! That's right! Before any discount is applied to the price of the shirt it costs $40.00. Let's put 40 over 100% on our cost number line.



Now we can decide what to skip count by on the cost number line. We are starting at $0 and stopping at $40.00. There are ten spaces between $0 and $40.00 so we divide 40 by 10 and get 4. So, 4 is the number we will skip count by on the top number line. Let's do that aloud together. Ready? 4, 8, 12, 16, 20, 24, 28, 32, 36, 40.

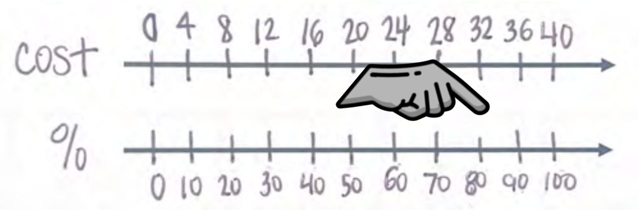
Now that our double number line is complete, we can analyze the diagram to determine how much the $40.00 shirt costs if it is 20% off. We can figure this out two different ways.



First, look at the 20% increment. What is the cost, in dollars, represented by 20%? $8.00. If $8.00 is 20% of the cost that means that $8 is how much you take off the regular price. We know $8 represents the amount of money we take off because the problem stated "for 20% off" and that means to take money away or subtract.

So, we subtract $40 -$8 to get a sale price of $32 for the shirt. We did it! We found out how much the shirt would cost after the discount of 20% was taken off.

There's a second way we can use our double number line to determine how much the shirt costs at 20% off. If you had a test and your teacher said you lost 20 percentage points overall, what would be your score? 80%. That's right because 100% minus 20% equals 80%.



So, 20% off means you actually get 80%. What do we notice when we look at the 80% tick mark on our double number line? $32! Yes! If we are flexible in our thinking about percentages we can jump right to identifying the cost of the shirt with a 20% discount because getting a 20% discount is the same as paying 80% of the original price; in this scenario paying $32!

We have just explored two different ways to determine the percentage or part of a whole. If we keep in mind that percentages are out of 100 and use that knowledge as a base for calculating we will be able to manipulate percentages and see them in more than one way. Seeing percentages in more than one way will continue to come in handy in our upcoming lessons.

Let's Try it (Slide 6-7): Let's continue applying our knowledge of double number lines to percentages. Don't forget that percentages on double number lines are a great diagram for displaying information just like when we are calculating non-percentage ratios.

WARM WELCOME

Today we will use double number lines to calculate percentages.

Let's Talk:

Think of an example where you experienced a percentage less than 100%.

Also, think of a real-world example where a percentage more than 100% couldn't exist.

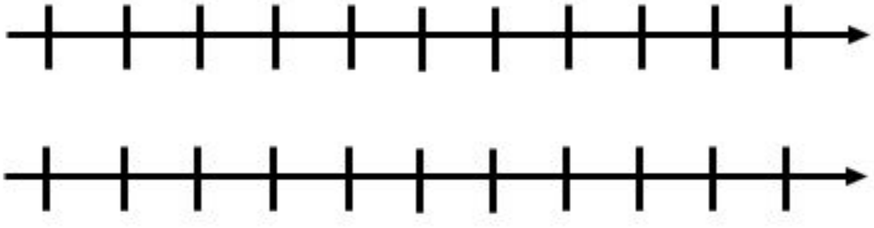
Let's Think:

Let's complete the table.

Key	Genres	Number	Ratio	Decimal	Percent
	Fiction	25			
	Graphic Novels	65			
	Sci-fi	10			

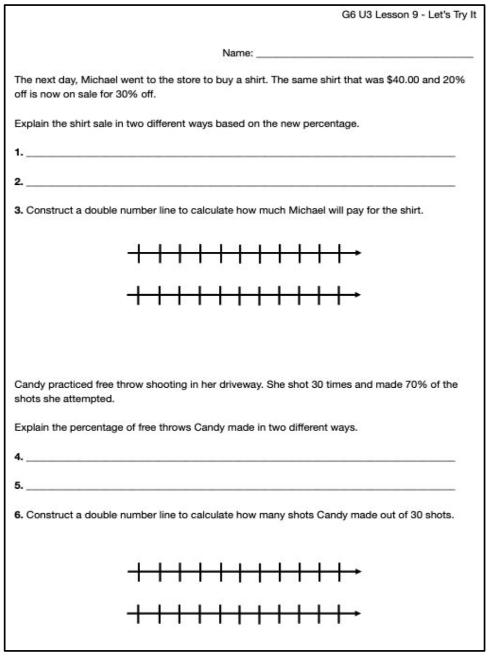
Let's Think:

At a store a $40.00 shirt is on sale for 20% off. How much does the shirt cost?



Let's Try It:

Let's explore percentages with double number lines together.



G6 U3 Lesson 9 - Let's Try It

Name: ______________________________

The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. ____

2. ____

3. Construct a double number line to calculate how much Michael will pay for the shirt.

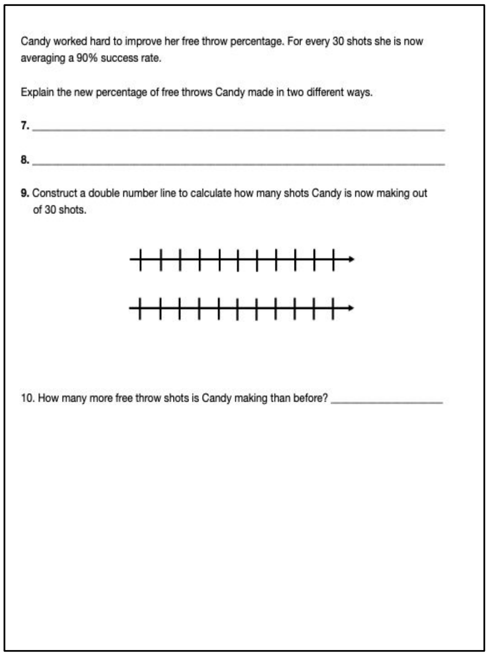
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. ____

5. ____

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. ____

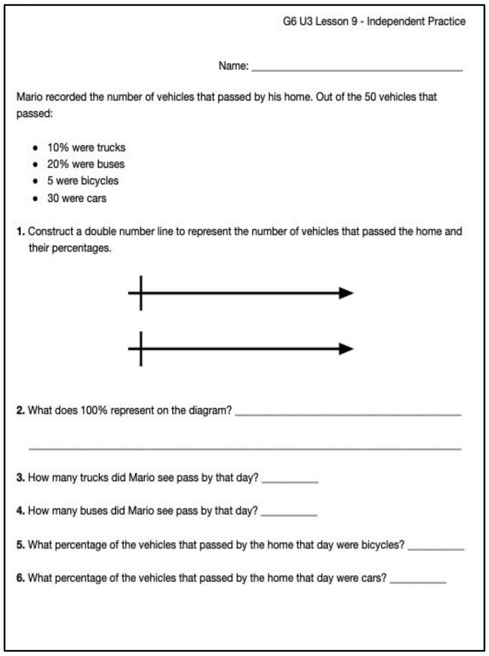
8. ____

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.

10. How many more free throw shots is Candy making than before? ________________

On your Own:

Now it’s time to explore percentages with double number lines on your own.



G6 U3 Lesson 9 - Independent Practice

Name: ______________________________

Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.

2. What does 100% represent on the diagram? ______________________________

____

3. How many trucks did Mario see pass by that day? ________

4. How many buses did Mario see pass by that day? ________

5. What percentage of the vehicles that passed by the home that day were bicycles? ________

6. What percentage of the vehicles that passed by the home that day were cars? ________

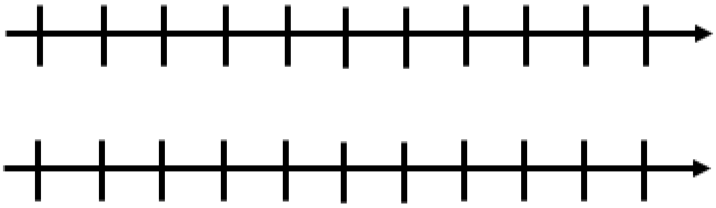
The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. ____

2. ____

3. Construct a double number line to calculate how much Michael will pay for the shirt.



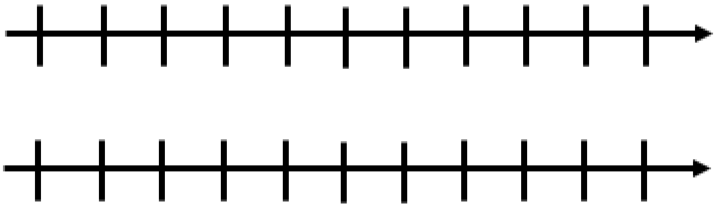
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. ____

5. ____

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



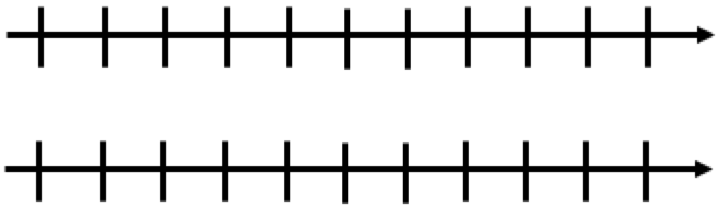
Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. ____

8. ____

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.



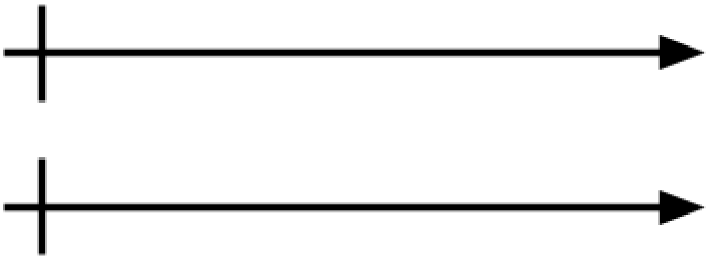
10. How many more free throw shots is Candy making than before? ____________________

Name: ____________________________________

Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.



2. What does 100% represent on the diagram? ____

____

3. How many trucks did Mario see pass by that day? __________

4. How many buses did Mario see pass by that day? __________

5. What percentage of the vehicles that passed by the home that day were bicycles? __________

6. What percentage of the vehicles that passed by the home that day were cars? __________

Name: ______________________ G6 U3 Lesson 9 - Let's Try It

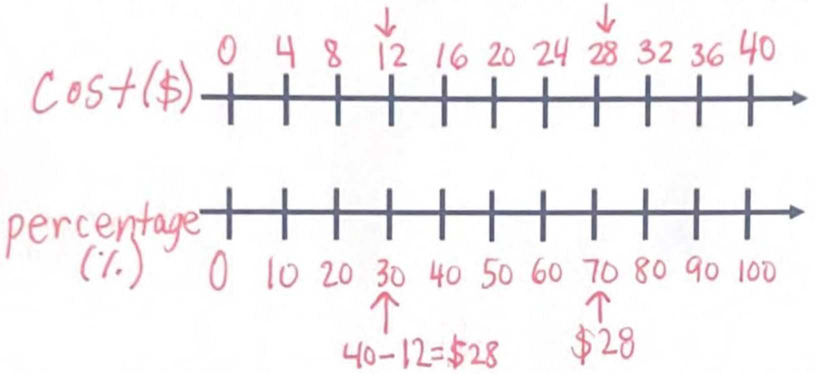
The next day, Michael went to the store to buy a shirt. The same shirt that was $40.00 and 20% off is now on sale for 30% off.

Explain the shirt sale in two different ways based on the new percentage.

1. The shirt is now on sale for 30% off.

2. The cost of the shirt is 70% of the original price.

3. Construct a double number line to calculate how much Michael will pay for the shirt.



40÷10 spaces = 4s

The shirt now costs $28.00 after the discount.

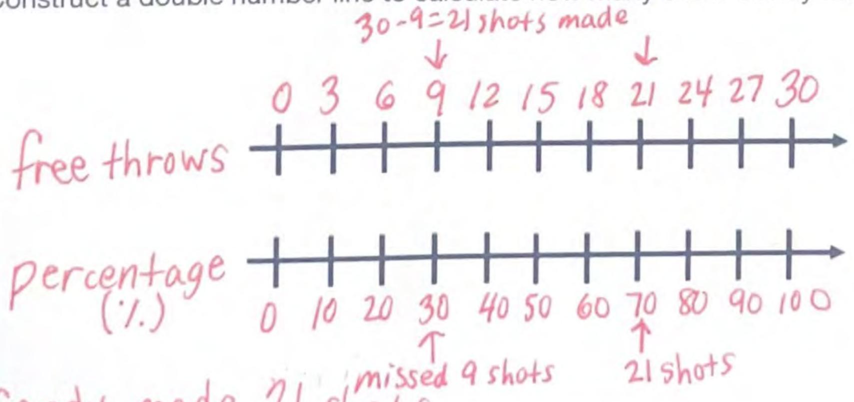
Candy practiced free throw shooting in her driveway. She shot 30 times and made 70% of the shots she attempted.

Explain the percentage of free throws Candy made in two different ways.

4. Candy made 70% of her shots.

5. Candy missed 30% of her shots.

6. Construct a double number line to calculate how many shots Candy made out of 30 shots.



30÷10 spaces = 3s

Candy made 21 shots.

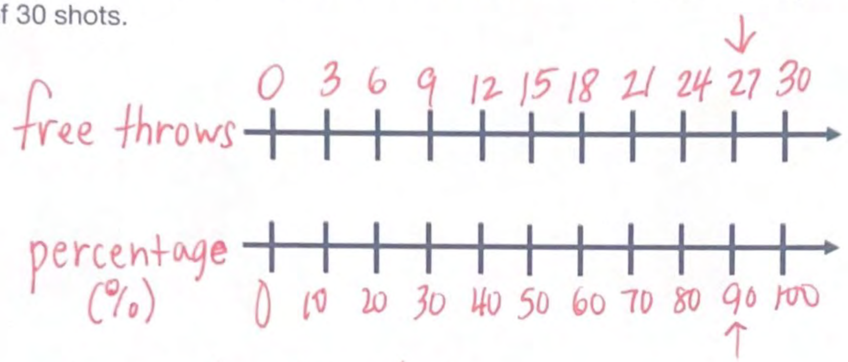
Candy worked hard to improve her free throw percentage. For every 30 shots she is now averaging a 90% success rate.

Explain the new percentage of free throws Candy made in two different ways.

7. Candy made 90% of her shots.

8. Candy missed 10% of her shots.

9. Construct a double number line to calculate how many shots Candy is now making out of 30 shots.



30 ÷ 10 spaces = 3s

She made 27 shots.

10. How many more free throw shots is Candy making than before? 6 shots

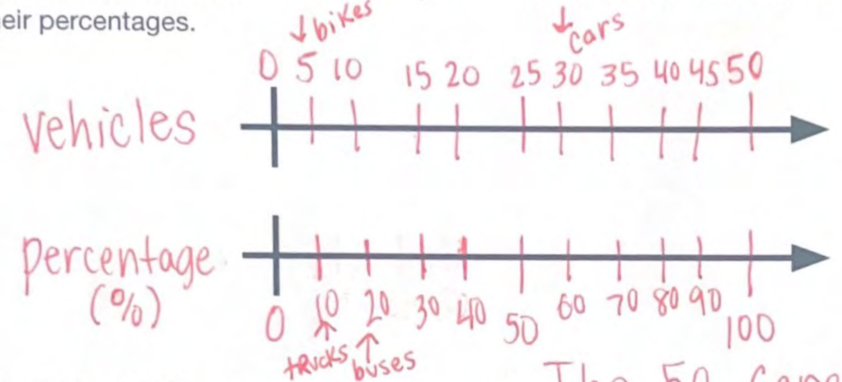
$$\begin{array}{lr} \text{improved} & 27 \\ \text{original} & \underline{-21} \\ & 6 \text{ shot difference} \end{array}$$

Name: ____________________ G6 U3 Lesson 9 - Independent Practice

Mario recorded the number of vehicles that passed by his home. Out of the 50 vehicles that passed:

- 10% were trucks
- 20% were buses
- 5 were bicycles
- 30 were cars

1. Construct a double number line to represent the number of vehicles that passed the home and their percentages.



50÷10 spaces= 5s

2. What does 100% represent on the diagram? The 50 Cars that passed by Mario's home.

3. How many trucks did Mario see pass by that day? 5

4. How many buses did Mario see pass by that day? 10

5. What percentage of the vehicles that passed by the home that day were bicycles? 10%

6. What percentage of the vehicles that passed by the home that day were cars? 60%

G6 U3 Lesson 10

Use tape diagrams to calculate percentages

G6 U3 Lesson 10 - Students will use tape diagrams to calculate percentages

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore tape diagrams as another way to visually represent the information that relates to percentages. So far in this unit we have explored percentages using grids, tables, and double number lines as representations. We recall that a percentage is a ratio that compares a part to the whole and it is out of 100.

Let's Talk (Slide 3): Let's look closely at this double number line. Look at the labels, the numbers, and all of the other information we can find. **Now, share two observations about data presented on the double number line.** Possible Student Answers, Key Points:

- We're looking at the percentage of miles biked by someone.
- The total amount of miles biked is 30 miles, that's 100% of the miles.
- Half, or 50% of the miles biked, is 15 miles.

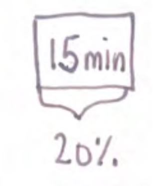
Great observations! We can see that the total miles biked was 30 miles. Also that 15 miles represents 50% of the miles biked while 27 miles represents 90% or almost all of the miles biked.

Let's Think (Slide 4): Let's revisit percentages on double number lines we began exploring in our last lesson. Here's our scenario, "Luke read a 120-page book." Let's answer some questions based on our double number line.

- **On the first day of reading, Luke read 30% of the book. How many pages did he read?** 36 pages. Correct! When we look at the diagram, 30% of the book is represented by having read 36 pages.
- Next question, **what percentage of the book does Luke have left to read after the first day of reading?** 70% of the book is remaining. Yes! If Luke has only read 30% of the book after the first day of reading then you subtract that 30% from 100% to get a difference of 70%.
- Last question, **how many pages represent the percentage of pages remaining in the book?** 84 pages. Right, again! When we look at the diagram, 70% of the book is represented by 84 pages or we could do 120, all the pages in the book, minus the 36 pages that Luke read, which is 84. Great thinking and use of the double number line!

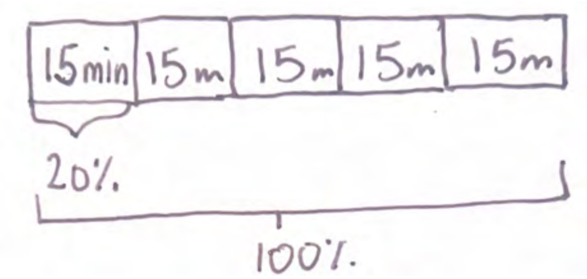
Let's Think (Slide 5): Let's use another diagram, a tape diagram, to display information about percentages. "Carlos started piano lessons last month. He has one lesson a week with a teacher and practices at home between lessons. Today Carlos practiced for 15 minutes. This practice time represents only 20% of the total time he is supposed to practice for the week." Let's construct a tape diagram to answer the following questions:

1. How much time is Carlos supposed to practice piano this week?
2. If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?
3. And lastly, Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?



To construct our tape diagram we must focus on the fact that Carlos practiced 15 minutes today and that time represented only 20% of the total time he needed to practice for the week. We'll start with making a box to represent 15 minutes and label that box 20% on the bottom.

Since percentages are out of 100, we want to continue our tape diagram through 100%. We already have 20% so how many total boxes will we need to reach 100%? 5 boxes. That's right. 5 boxes are needed because when we skip count from 20% to 100% we say 20, 40, 60, 80, 100 which includes five numbers so we need five total boxes in our tape diagram. Also, we know 20 multiplied by 5 equals 100.

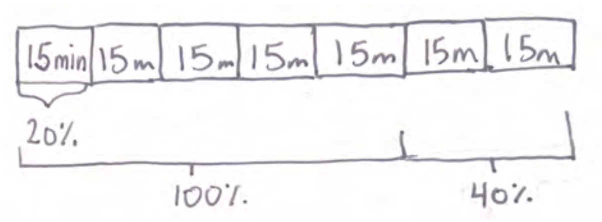


Let's continue our tape diagram by including five total boxes each with 15 min or 15m written inside. If we wanted to label the 100%, what would it represent in our problem? 100% represents the total time he is supposed to practice piano for the week. Yes, because the scenario says Carlos practiced 15 minutes and that made up 20% of the week's practice time. So, 100% would represent the total overall practice time for the week.

We can now answer questions 1 and 2 using our tape diagram.

1. **How much total time is Carlos supposed to practice piano this week?** 75 minutes. Correct! 15 added to itself five times or 15 minutes multiplied by five boxes give us 75 total minutes of practice time for the week.

2. **If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?** 45 minutes. This question is tougher. But, if you look at the tape diagram you will notice that each box represents or equals 20% *(point).* We would need three of those boxes to total 60% because through skip counting I count 20, 40, 60 so three boxes. If you total the minutes inside those three boxes then you get 15 added to itself three times or 15 times by 3 which is 45 minutes of practice time is equal to 60% of the practice time for the week.
3.
4. Let's reread the last question, **Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?** Our current tape diagram only shows 100% of the time. But, we can extend our diagram to include percents greater than 100! All we need to do is continue adding boxes of 15. We need two more boxes of 15 minutes to reach 140% because each box represents 20% and 20% plus 20% equals 40%. 2 We needed that 40% to add to the 100% we already had on our diagram.



After finishing our construction, how much time did Carlos end up practicing the difficult music piece? 105 minutes. Yes, 15 times by 7 equals 105. So, he practiced for 105 minutes which is the same as 1 hour and 45 minutes. So, 1 hour and 45 minutes is the amount of time Carlos ends up practicing.

We are nearly at the end of our work in Unit 3. Our ratio diagrams are really helping make our math easier to understand. In our next lesson we will continue to use tape diagrams as a means to display percentages. Remember that percentages are out of 100 but can be more or less depending on the scenario or depending on what is being asked based on the information.

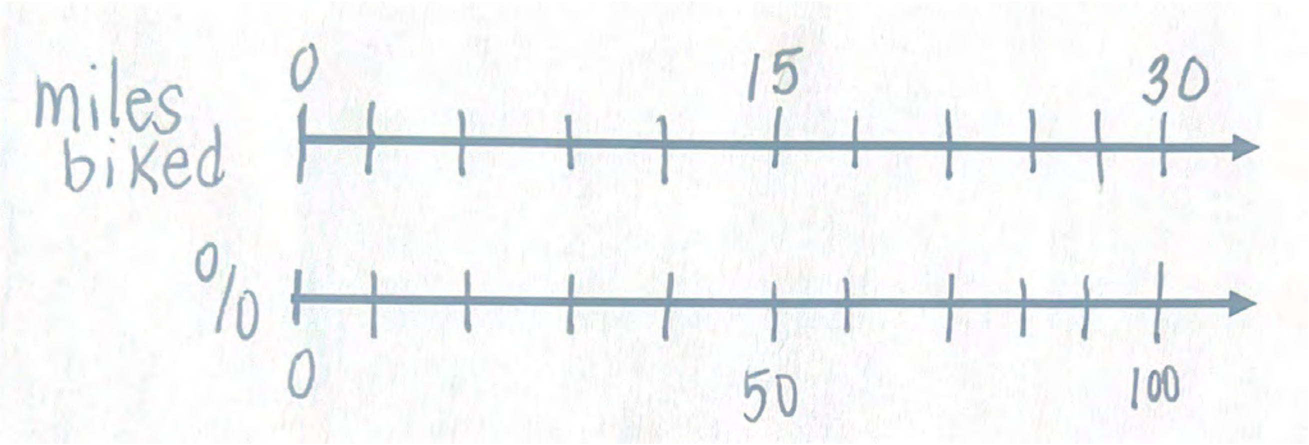
Let's Try it (Slide 6-7): Let's continue applying our knowledge of tape diagrams to percentages. Remember that tape diagrams are constructed with equally-sized boxes. With percentages, each box represents the same percentage as well.

WARM WELCOME

Today we will use tape diagrams to calculate percentages.

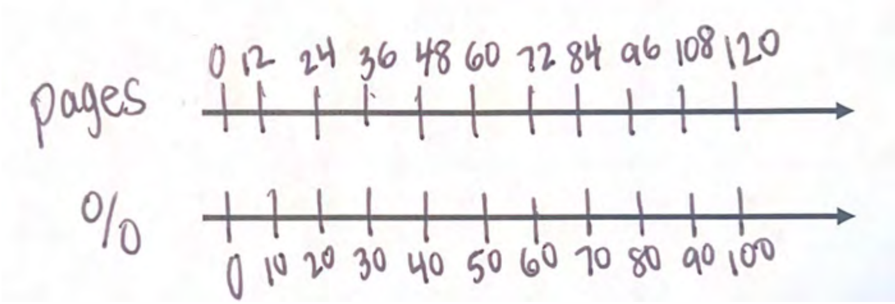
Let's Talk:

Make two observations about data presented on the double number line.



Let's Think:

Luke read a 120-page book.



1. On the first day of reading, Luke read 30% of the book. How many pages did he read?
2. What percentage of the book does Luke have left to read after the first day of reading?
3. How many pages does Luke have left to read after the first day of reading?

Let's Think:

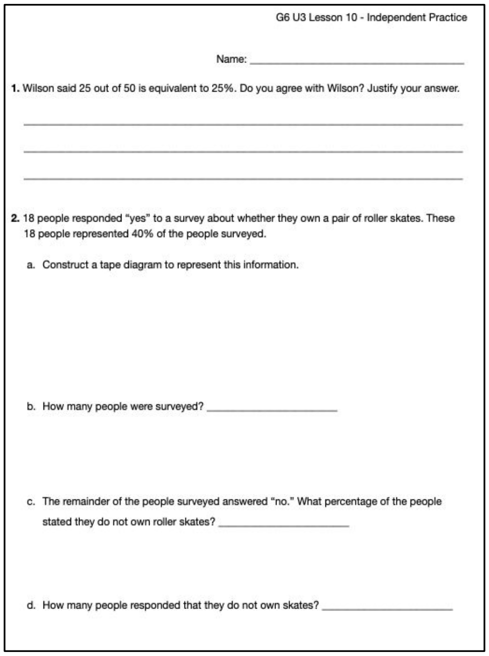
Today Carlos practiced piano for 15 minutes. This practice time represents only 20% of the total time he is supposed to practice for the week.

Let's construct a tape diagram to answer the following questions:

1. How much time is Carlos supposed to practice piano this week?
2. If Carlos only ends up practicing 60% of the time he needs to practice, how much time will Carlos have practiced?
3. Carlos is practicing a very difficult music piece so he decides to practice 140% of the time he was supposed to practice for the week. How much time did Carlos end up practicing?

Let's Try It:

Let's explore percentages with tape diagrams together.



G6 U3 Lesson 10 - Independent Practice

Name: ______________________________

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

____

____

____

2. 18 people responded "yes" to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.

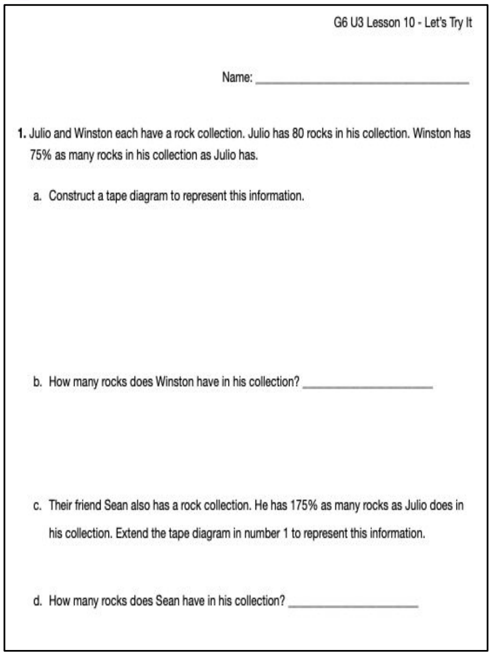
b. How many people were surveyed? ___________________

c. The remainder of the people surveyed answered "no." What percentage of the people stated they do not own roller skates? ___________________

d. How many people responded that they do not own skates? ___________________

On your Own:

Now it's time to explore percentages with tape diagrams on your own.



G6 U3 Lesson 10 - Let's Try It

Name: ______________________________

1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.

b. How many rocks does Winston have in his collection? __________________

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? __________________

1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.

b. How many rocks does Winston have in his collection? _______________________

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? _______________________

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

____

____

____

2. 18 people responded "yes" to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.

b. How many people were surveyed? ______________________

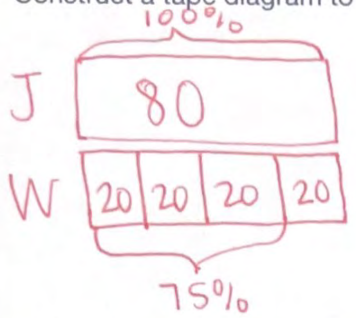
c. The remainder of the people surveyed answered "no." What percentage of the people stated they do not own roller skates? ______________________

d. How many people responded that they do not own skates? ______________________

Name: ______________________________ G6 U3 Lesson 10 - Let's Try It

1. Julio and Winston each have a rock collection. Julio has 80 rocks in his collection. Winston has 75% as many rocks in his collection as Julio has.

a. Construct a tape diagram to represent this information.



80÷4spaces=20

b. How many rocks does Winston have in his collection? 60 rocks

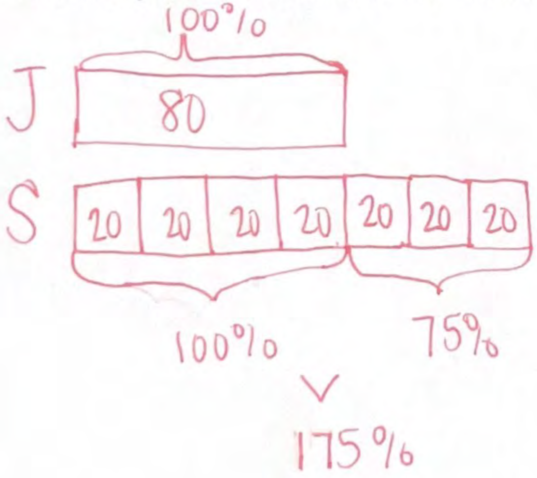
20+20+20=60

OR

20x3=60

c. Their friend Sean also has a rock collection. He has 175% as many rocks as Julio does in his collection. Extend the tape diagram in number 1 to represent this information.

d. How many rocks does Sean have in his collection? 140 rocks



20x7=140

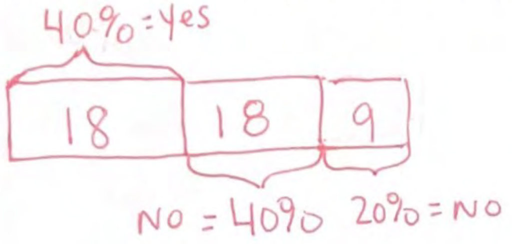
Name: ____________________ G6 U3 Lesson 10 - Independent Practice

1. Wilson said 25 out of 50 is equivalent to 25%. Do you agree with Wilson? Justify your answer.

No, I do not agree. 25 out of 50 is half and half is 50%, not 25%.

2. 18 people responded "yes" to a survey about whether they own a pair of roller skates. These 18 people represented 40% of the people surveyed.

a. Construct a tape diagram to represent this information.



18+18+9=45

b. How many people were surveyed? 45 people

18+18+9=45

c. The remainder of the people surveyed answered "no." What percentage of the people stated they do not own roller skates? 60%

40%+20%=60%

d. How many people responded that they do not own skates? 27 people

18+9=27

G6 U3 Lesson 11

Relate the benchmark percentages of 10%, 25%, 50%, and 75% to fractions, and solve problems with benchmark percentages

G6 U3 Lesson 11 - Students will relate the benchmark percentages of 10%, 25%, 50%, and 75% to fractions

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be focusing on relating percentages to some fractions you know well and use often. Just like with those fractions, we call those commonly used percentages, “benchmark percentages.” So far in this unit we have learned that percent means *out of 100* and that 100 represents the whole in a scenario. In our very first percentage lesson we learned that percentages were really just ratios because they compare a part to a whole. And we’ve been exploring how we can write percentages as fractions to represent the same thing.

Let’s Talk (Slide 3): Let’s start with a brainstorm, remember in elementary school that benchmark fractions are commonly used fractions that can be helpful guides to identify other fractions. So, **think of some benchmark fractions you worked with in elementary school. And, share how these benchmark fractions can be helpful?** Possible Student Answers, Key Points:

- ½ is important because it can help you when you’re comparing fractions, if you know one fraction is greater than ½ and another is smaller than you can compare those two fractions.
- Also, ¾ is important because it’s halfway between ½ and 1 whole.
- And, ¼ is important because it’s halfway between 0 and ½.
- 1/10 is also important because it’s tens and we use tens a lot in place value.

You remember a lot considering elementary was years ago! Today we’re going to be looking at 1/10, ¼, ½, and ¾ and think about how these benchmark fractions are related to important percentages.

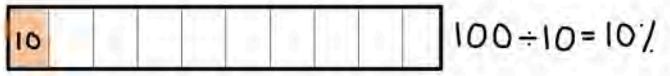
Let’s Think (Slide 4): Let’s continue our journey all the way back to early elementary school! In early elementary school you first learned about fractions. You learned that fractions are parts of wholes, sound familiar? We know that ratios are also parts of wholes! In elementary school you shaded fractions and we’re going to do a little of that now. Let’s construct and shade each fraction.

To construct each fraction we look to the denominator because it tells us how many boxes to break our bar into, in other words, the denominator tells us how many pieces there are in ONE whole.

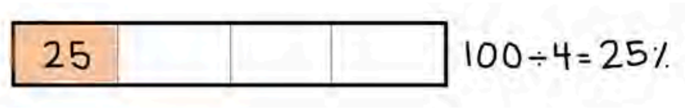
For 1/10, the denominator of 10 *(point)* tells us to break the bar into ten, equally-sized pieces. The easiest way to do that is to split the bar in half then further segment the bar into five boxes on the left and five boxes on the right. Then, we’ll have a total of ten boxes in the whole. Now, the numerator *(point)* tells us how many boxes to shade, so we’ll shade ONE box.

Let’s continue using this knowledge to construct and shade the remaining fractions. How many pieces in one whole? And how many pieces should I shade?

Let’s Think (Slide 5): Believe it or not, we’ve just constructed tape diagrams for fractions but we can use the SAME tape diagrams to write equivalent percentages! We actually explored this in the previous percent lessons when we converted fractions to decimals and percents and when we constructed double number lines.



For one-tenth, we split the whole into 10 spaces and only shaded 1 of those spaces. If this were a tape diagram representing a percentage, we can figure out the percentage for each box by dividing using the whole, which with percentages is always 100. So, 100 divided by 10 equals 10 so each box represents 10%.



In the second tape diagram we made 4 spaces and shaded 1 of those spaces. To figure out how much each box represents, we can divide the whole, 100, by 4. When we do that we get 25. And we just have ONE box, so ¼ is the same as 25%.

Our next tape diagram is only split into 2 spaces. So, when we divide 100 by 2, we get 50. And we just have one box, so ½ is the same as 50%/

The last tape diagram may seem tougher because the numerator isn't 1 but we can do this. We split the whole into 4 spaces, so let's start by figuring out how much ONE box represents. We already know that 100 divided by 4 is 25. So, each box is worth 25. But, we shaded 3 of those spaces. So, 25 and 25 and 25 is 75–kind of like quarters–so ¾ is the same as 75%.

Let's look at our fractions. We see that each fraction has an equivalent percentage even though none of the denominators has a denominator of 100! Being able to identify and calculate the percentage of fractions with denominators that are not 100 is important because most fractions don't usually have a denominator of 100. But, understanding that percentages are parts of wholes and that percentages are out of 100 will help us easily find the equivalence between fractions and percents.

Let's Try it (Slide 5-6): Let's continue applying our knowledge of tape diagrams to percentages when the whole or the denominator isn't 100. Don't forget that ratios are just fractions because they are also comparisons.

WARM WELCOME

Today we will relate benchmark percentages to fractions.

Let’s Talk:

Think of some benchmark fractions you worked with in elementary school. How are they helpful?

Let’s Think:

Let’s construct and shade each fraction and then write an equivalent percentage.

1. $\frac{1}{10}$

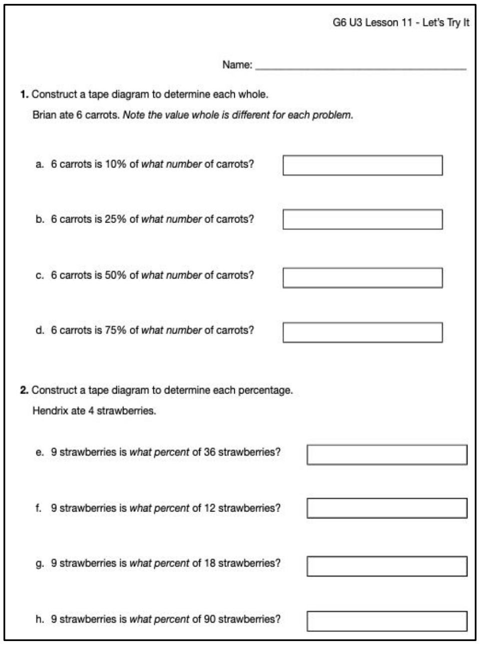
2. ¼

3. ½

4. ¾

Let's Try It:

Let's explore percentages and fractions together.



G6 U3 Lesson 11 - Let's Try It

Name: ______________________________

1. Construct a tape diagram to determine each whole.
Brian ate 6 carrots. *Note the value whole is different for each problem.*

a. 6 carrots is 10% of *what number* of carrots?

b. 6 carrots is 25% of *what number* of carrots?

c. 6 carrots is 50% of *what number* of carrots?

d. 6 carrots is 75% of *what number* of carrots?

2. Construct a tape diagram to determine each percentage.
Hendrix ate 4 strawberries.

e. 9 strawberries is *what percent* of 36 strawberries?

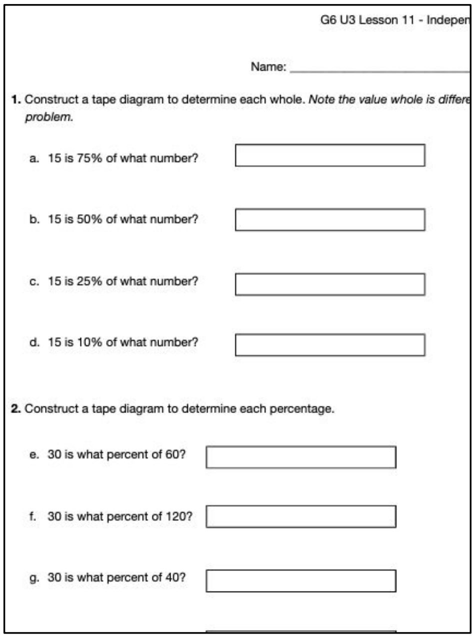
f. 9 strawberries is *what percent* of 12 strawberries?

g. 9 strawberries is *what percent* of 18 strawberries?

h. 9 strawberries is *what percent* of 90 strawberries?

On your Own:

Now it's time to explore percentages and fractions on your own.



G6 U3 Lesson 11 - Indepen

Name: ______________________________

1. Construct a tape diagram to determine each whole. *Note the value whole is differe problem.*

a. 15 is 75% of what number?

b. 15 is 50% of what number?

c. 15 is 25% of what number?

d. 15 is 10% of what number?

2. Construct a tape diagram to determine each percentage.

e. 30 is what percent of 60?

f. 30 is what percent of 120?

g. 30 is what percent of 40?

1. Construct a tape diagram to determine each whole.

Brian ate 6 carrots. *Note the value of the whole is different for each problem.*

a. 6 carrots is 10% of *what number* of carrots?

b. 6 carrots is 25% of *what number* of carrots?

c. 6 carrots is 50% of *what number* of carrots?

d. 6 carrots is 75% of *what number* of carrots?

2. Construct a tape diagram to determine each percentage.

Hendrix ate 4 strawberries.

e. 9 strawberries is *what percent* of 36 strawberries?

f. 9 strawberries is *what percent* of 12 strawberries?

g. 9 strawberries is *what percent* of 18 strawberries?

h. 9 strawberries is *what percent* of 90 strawberries?

Name: ______________________________ G6 U3 Lesson 11 - Independent Practice

1. Construct a tape diagram to determine each whole. *Note the value of the whole is different for each problem.*

a. 15 is 75% of *what number*?

b. 15 is 50% of *what number*?

c. 15 is 25% of *what number*?

d. 15 is 10% of *what number*?

2. Construct a tape diagram to determine each percentage.

e. 30 is *what percent* of 60?

f. 30 is *what percent* of 120?

g. 30 is *what percent* of 40?

h. 30 is *what percent* of 300?

Name: ______________________________ G6 U3 Lesson 11 - Let's Try It

1. Construct a tape diagram to determine each whole.

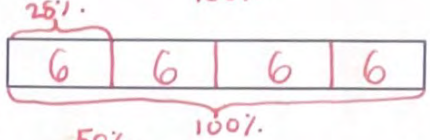
Brian ate 6 carrots. *Note the value of the whole is different for each problem.*

a. 6 carrots is 10% of *what number* of carrots?

60

b. 6 carrots is 25% of *what number* of carrots?

24

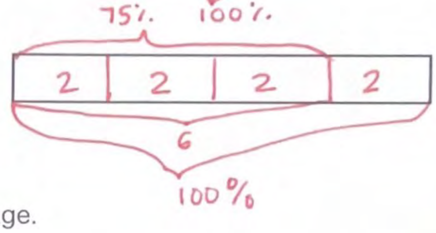


c. 6 carrots is 50% of *what number* of carrots?

12

d. 6 carrots is 75% of *what number* of carrots?

8

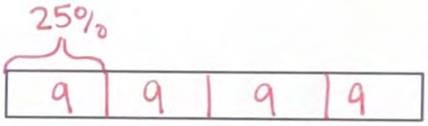


2. Construct a tape diagram to determine each percentage.

Hendrix ate 4 strawberries.

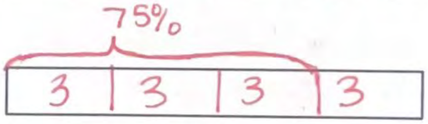
e. 9 strawberries is *what percent* of 36 strawberries?

25%



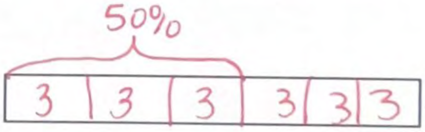
f. 9 strawberries is *what percent* of 12 strawberries?

75%



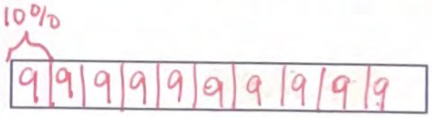
g. 9 strawberries is *what percent* of 18 strawberries?

50%



h. 9 strawberries is *what percent* of 90 strawberries?

10%



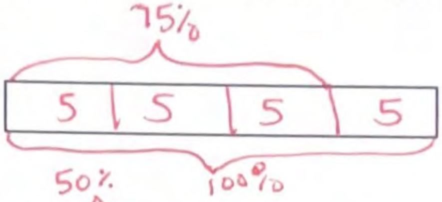
Name: ______________________________

G6 U3 Lesson 11 - Independent Practice

1. Construct a tape diagram to determine each whole. *Note the value of the whole is different for each problem.*

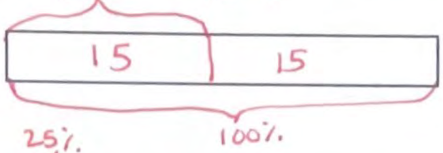
a. 15 is 75% of *what number*?

20



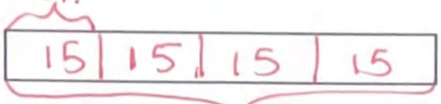
b. 15 is 50% of *what number*?

30



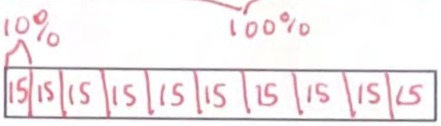
c. 15 is 25% of *what number*?

60



d. 15 is 10% of *what number*?

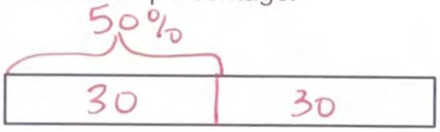
150



2. Construct a tape diagram to determine each percentage.

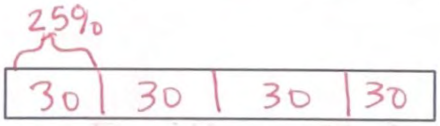
e. 30 is *what percent* of 60?

50%



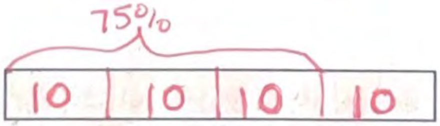
f. 30 is *what percent* of 120?

25%



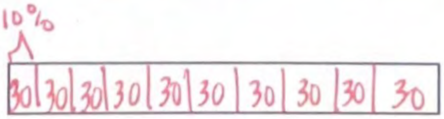
g. 30 is *what percent* of 40?

75%



h. 30 is *what percent* of 300?

10%



G6 U3 Lesson 12

Solve percentage problems using multiplication and division

G6 U3 Lesson 12 - Students will solve percentage problems using multiplication and division

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Here we are, again! We've reached the end of learning about percentages and the end of Unit 3. We've seen how percentages are everywhere in the real-world and we explored how to use diagrams to display percentages. Today, in our final lesson in the unit, we will continue to explore real-world examples and concepts involving percentages through the use of equivalent ratios.

Let's Talk (Slide 3): Let's start with a brainstorm…sometimes you are given a scenario and then you can write your own questions. Let's try that, here's the scenario: Micheal has 60 cookies to sell. Twelve of the cookies are chocolate chip, nine of the cookies are sugar cookies, and the rest are oatmeal cookies. 15 total cookies have been sold so far. **Write a percentage problem to go along with this cookie scenario.**
Possible Student Answers, Key Points:

- What percentage of the cookies are chocolate chip?
- What percentage of the cookies have been sold?
- What percentage of the cookies were chocolate chip or sugar cookies?
- What percentage of cookies have not been sold?

Great, thought-provoking questions! There are so many different questions you could ask about the information we are provided in this scenario. Our questions can be posed around the percentage of each type of cookie or we could write questions around the selling of the cookies. Regardless, our questions involve comparisons–we're comparing a part of the cookies to the whole amount of cookies.

Let's Think (Slide 4): Today's learning involves our last way to model percentages. We call this model a "proportion." A proportion consists of two ratios or fractions that are equivalent to one another. And, this isn't brand new because we are old pros at constructing equivalent fractions by now!

$$\frac{1 \ \times 50 =}{2 \ \times 50 =} = \frac{50}{100}$$

An example of a simple proportion is on the slide…one half is the same as fifth-one hundredths. We know they are equivalent or "proportional" because if you multiply the numerator and denominator by 50, you get 50/100.

A "percent proportion" also comes in this form of equivalent fractions, the only change is that in order to find a percent proportion, we have to make the denominator 100, since we know that percentages are out of 100.

Let's Think (Slide 5): Let's look at a problem that involves percentages so we can explore our percent proportion. Listen as I read this, "There are 32 students in a class. Eight of those students are wearing sneakers. What percent of the students are wearing sneakers?"

Let's start by writing our percent proportion. Our problem states two of the three missing components. Let's underline those two components in the problem and substitute them into the percent proportion. Let's read the problem again.

$$\frac{8}{32}$$

So, let's figure out the parts of our story. We know that there were 32 students in the class, that is ALL of the students in the class so that represents the WHOLE amount of students. It says that 8 students were wearing sneakers, in other words, part of that group of students are wearing sneakers. Another way to say that is 8 out of 32 students are wearing sneakers. So, let's write a fraction to show the part of the whole.

$$\frac{8}{32} = \frac{\%}{100}$$

Now, in order to figure out the percent proportion, we need to make the whole, or the denominator, out of 100–since that's what percentages are out of. So, let's write an equivalent fraction that has a denominator of 100, we'll keep the numerator blank because we don't know the percentage yet.

$$\frac{8}{32} \searrow \frac{\%}{100}$$

$$(8\times100)\div 32$$

$$\downarrow$$

$$800\div 32$$

To solve the proportion we cross multiply which is like multiplying diagonally, 8 x 100 *(write).* Then we divide by the number that's remaining, which is 32. So, 100 times by 8 is 800 and then we have to divide 800 by 32.

```
32 |800
   -640 | 20 groups of 32
    160 |
   -160 | 5 groups of 32
      0 |+
         ----
          25
```

25% of the students in the class are wearing sneakers.

Whew, 800 divided by 32…we can do this! Let's start with 20 groups of 32 which is 640*.* And, 800-640 is 160. So, we have 160 left to split. Well, 5 groups of 32 or 160. This leaves us with 0 or nothing to continue splitting. So, we made 25 groups. So, 25% of the students in the class are wearing sneakers.

Let's Think (Slide 6): Let's continue! Here's another question…a test has 20 questions. Nicolas scored an 80%, how many questions did Nicolas get right?

Oh, this is interesting, this time we have DIFFERENT information but we can use what we know to answer the question. We know that there will be a part, a whole, and a percentage out of 100. Let's see what information we have here. The first part says that there are 20 questions on the test, that is all of the questions so that must be the whole. Then it says that Nicholas scored 80%, that doesn't tell us how many of the 20 questions he got right but it tells us the percentage, which is always out of 100. And it's asking us how many questions Nicholas got wrong.

$$\frac{P}{20} = \frac{80\%}{100}$$

So, we don't know how many questions Nicholas got wrong but we do know that the test was out of 20, so that is the whole. We also know that Nicholas got 80% so that's the percentage and we always know that percentages are out of 100. So now, we have our equivalent fraction set up and we can begin thinking about how we will solve it.

$$\frac{P}{20} \nearrow \frac{80\%}{100}$$

$$(20\times80)\div 100$$

$$1600\div 100$$

To solve the proportion we multiply 80 x 20 then divide by the number that's remaining, 100. Well, 80 times by 20 equals 8 x 2 which gives me 16 and I annex two zeros to get 1600*.* Look, these are easy numbers to divide, 1600 divided by 100, that's 16! In other words, 100 goes into 1600 sixteen times!

$$\frac{P}{20} \nearrow \frac{80\%}{100}$$

$$(20 \times 80) \div 100$$

$$1600 \div 100$$

$$= 16$$

$$\frac{16}{20} = 80\%$$

So, 16 out of 20 questions is 80%. But, let's go back to the question. The question says how many questions did Nicholas get WRONG. We know he got 16 out of 20 RIGHT to get an 80% but in order to figure out how many he got wrong, we have to figure out the questions he didn't get. Well, 20 minus 16 is 4. So Nicholas got 4 questions wrong.

This scenario asked us to find the part while the previous problem asked us to find the percent, we're using the same idea to solve for two different things.

To solve these percent problems it is very important to always read the problem carefully, use the percent proportion, cross multiply, and then divide by whichever number remains after you cross multiplied. But remember, using the percent proportion is just one of many models you have in your toolkit to work with percentages. You can still utilize tape diagrams and double number lines to work with these types of percent problems.

Let's Try it (Slide 7-8): Let's wrap up this unit by applying percent proportions to real-world percent scenarios. Don't forget that percentages are ratios as well. Don't be leery about trying tape diagrams or double number lines to solve as well.

WARM WELCOME

Today we will explore real-world examples of percents through the use of equivalent fractions.

Let's Talk:

Michael has 60 cookies to sell.

- 12 of the cookies are chocolate chip.
- 9 of the cookies are sugar cookies and the rest are oatmeal cookies.
- 15 total cookies have been sold so far.

Let's Think:

Proportions consist of two ratios or fractions that are equivalent to one another.

$$\frac{1}{2} = \frac{50}{100} \qquad \frac{part}{whole} = \frac{percent}{100}$$

Let’s Think:

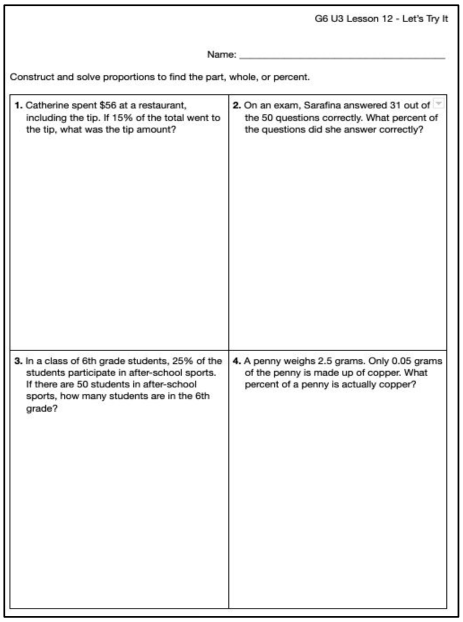
There are 32 students in a class. Eight of those students are wearing sneakers. What percentage of the students are wearing sneakers?

Let’s Think:

A test has 20 questions. Nicolas scored an 80%, how many questions did Nicolas get right?

Let's Try It:

Let's explore percentages using multiplication and division together.



G6 U3 Lesson 12 - Let's Try It

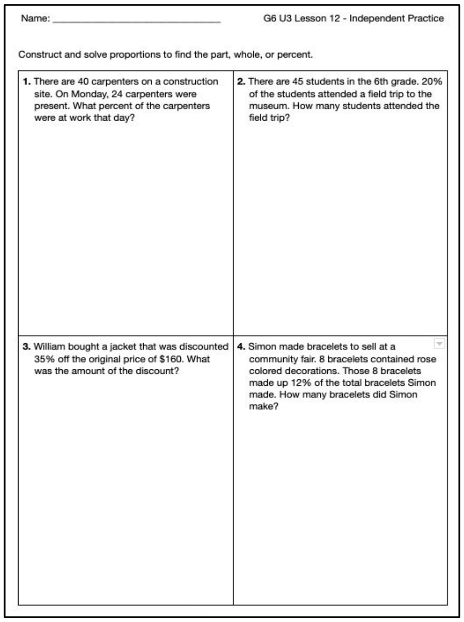
Name: ______________________________

Construct and solve proportions to find the part, whole, or percent.

1. Catherine spent $56 at a restaurant, including the tip. If 15% of the total went to the tip, what was the tip amount?
2. On an exam, Sarafina answered 31 out of the 50 questions correctly. What percent of the questions did she answer correctly?
3. In a class of 6th grade students, 25% of the students participate in after-school sports. If there are 50 students in after-school sports, how many students are in the 6th grade?
4. A penny weighs 2.5 grams. Only 0.05 grams of the penny is made up of copper. What percent of a penny is actually copper?

On your Own:

Now it's time to explore percentages using multiplication and division on your own.



Name: ______________________________

G6 U3 Lesson 12 - Independent Practice

Construct and solve proportions to find the part, whole, or percent.

1. There are 40 carpenters on a construction site. On Monday, 24 carpenters were present. What percent of the carpenters were at work that day?
2. There are 45 students in the 6th grade. 20% of the students attended a field trip to the museum. How many students attended the field trip?
3. William bought a jacket that was discounted 35% off the original price of $160. What was the amount of the discount?
4. Simon made bracelets to sell at a community fair. 8 bracelets contained rose colored decorations. Those 8 bracelets made up 12% of the total bracelets Simon made. How many bracelets did Simon make?

Name: ____ G6 U3 Lesson 12 - Let’s Try It

Construct and solve proportions to find the part, whole, or percent.

1. Catherine spent $56 at a restaurant, including the tip. If 15% of the total went to the tip, what was the tip amount?

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Name: ________________________________ G6 U3 Lesson 12 - Independent Practice

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Name: ______________________________

G6 U3 Lesson 12 - Let's Try It

Construct and solve proportions to find the part, whole, or percent.

$\frac{\text{Part}}{\text{Whole}} = \frac{\%}{100}$

1. Catherine spent $56 at a restaurant, including the tip. If 15% of the total went to the tip, what was the tip amount?

$\frac{P}{56} = \frac{15}{100}$

56x15=840÷100

100 | 840
-800 | 8 groups of 100
40

$8\frac{40}{100}$ or 8.40

The tip amount was $8.40

2. On an exam, Sarafina answered 31 out of the 50 questions correctly. What percent of the questions did she answer correctly?

$\frac{31}{50} = \frac{\%}{100}$

31x100=3100÷50

50 | 3100
-1500 | 30 groups of 50
1600
-1500 | 30 groups of 50
100
-100 | 2 groups of 50
0 | +
62

She answered 62% correctly.

3. In a class of 6th grade students, 25% of the students participate in after-school sports. If there are 50 students in after-school sports, how many students are in the 6th grade?

$\frac{50}{W} = \frac{25\%}{100}$

50x100=5000÷25

25 | 5000
-1000 | 40 groups of 25
4000
-2000 | 80 groups of 25
2000
-2000 | 80 groups of 25
0 | +
200

There are 200 6th graders.

4. A penny weighs 2.5 grams. Only 0.05 grams of the penny is made up of copper. What percent of a penny is actually copper?

$\frac{0.05}{2.5} = \frac{\%}{100}$

0.05x100=5÷2.5

2.5 | 5.0
-50 | 2 groups of 25
0
+
2

2% of a penny is cooper.

Name: ______________________________

G6 U3 Lesson 12 - Independent Practice

Construct and solve proportions to find the part, whole, or percent. $\frac{P}{W} = \frac{\%}{100}$

1. There are 40 carpenters on a construction site. On Monday, 24 carpenters were present. What percent of the carpenters were at work that day?

$\frac{24}{40} = \frac{\%}{100}$

$24 \times 100 = 2400 \div 40$

$40\overline{)2400}$
-1600 | 40 groups of 40
800
-800 | 20 groups of 40
000 | +
60 groups of 40

60% were at work

2. There are 45 students in the 6th grade. 20% of the students attended a field trip to the museum. How many students attended the field trip?

$\frac{P}{45} = \frac{20}{100}$

$45 \times 20 = 900 \div 100$

$100\overline{)900}$
-900 | 9 groups of 100
0

9 students attended the trip

3. William bought a jacket that was discounted 35% off the original price of $160. What was the amount of the discount?

$\frac{P}{160} = \frac{35}{100}$

$160 \times 35 = \frac{56\cancel{00}}{1\cancel{00}}$

$$\begin{array}{r} 160 \\ \times\ 35 \\ \hline 800 \\ +4800 \\ \hline 5600 \end{array}$$

$100\overline{)5600}$
-5000 | 50 groups of 100
600 | 6 groups of 100
-600
0 | +
56

The discount was $56.00

4. Simon made bracelets to sell at a community fair. 9 bracelets contained rose colored decorations. Those 9 bracelets made up 12% of the total bracelets Simon made. How many bracelets did Simon make?

$\frac{9}{W} = \frac{12}{100}$

$100 \times 9 = 900 \div 12$

$12\overline{)900}$