CITYTUTOR DC

Sixth Grade Math Lesson Materials

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G6 Unit 2:

Ratios

G6 U2 Lesson 1

Use ratio language and notation to describe an association between two or more quantities

G6 U2 Lesson 1 - Students will use ratio language to describe the relationship between two or more quantities

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We are beginning a new and exciting unit today! Our new unit focuses on ratios. You aren't expected to know what ratios are or how to work with them yet but, guess what? You already have a lot of information in your brains that will help you with ratios. For example, in third grade you learned about measurement conversions and in fourth grade you learned to work with two-column tables. What you know about multiplication, division, and fractions are going to be key to exploring and understanding ratios in this unit.

Let's Talk (Slide 3): So, let's open with a brainstorm…**what does it mean to compare two things?**
Possible Student Answers, Key Points:
- Comparing two things is figuring out whether one is bigger or smaller than the other.
- Comparing is seeing how two things are the same or how they're different.

Interesting thoughts! Comparing two things means to look at how those two things are the same and how those things are different from one another. In reading, you might have heard this idea called comparing and contrasting.

Let's Think (Slide 4): Let's explore ratios in a bit more detail. The word ratio may sound strange but the concept is actually very simple. A ratio is a comparison between two different quantities or amounts. Just like a lot of ideas in math, ratios can be represented in a few different ways. We can represent rations with words, symbols, AND numbers!

word → to
colon → :
fraction → $\frac{1}{2}$

When we're using words we use the word "TO," and when we represent ratios with symbols we use a COLON, which you've seen before in books, and finally we can use numbers to represent ratios, and when we use numbers they're actually fractions!

Although a ratio or comparison can be written three different ways the value of the comparison is still the same.

It's just like writing a number a few different ways–as the number like 2, or as the word like TWO, or as a picture (*draw 2 circles*). Or, if you wrote your name in block letters, then bubble letters, and then in cursive, is your name still the same name? Yes. Of course it's still the same name. Your name just looks different. This is the same with ratios. They can be written three different ways but it's still the same comparison. Let me show you what I mean.

Let's Think (Slide 5): Here is an example of the number of cowboys and clowns seen at a rodeo. We can write a ratio comparing the number of cowboys and the number of clowns. Comparing the number of cowboys to the number of clowns is considered a ratio because a ratio is simply a comparison between two or more quantities or amounts. When I look at the cowboys and clowns as one big group *(circle the entire group)* I count 6 cowboys and count 3 clowns. So as a ratio, for every 6 cowboys there are 3 clowns. To write the ratio or comparison of cowboys to clowns in words it would say "for every 6 cowboys there are 3 clowns." But what is that ratio written three different ways?

6 to 3

Well, we need to write the ratio using the word "to" so that would be 6 to 3 *(write).*

6:3

We can also write the ratio using a colon so that would be 6:3 *(write).*

$\frac{6}{3}$

Lastly, we can write the ratio, or comparison, as a fraction. The fraction would be $\frac{6}{3}$.

There we go! We've just written the ratio of cowboys to clowns three different ways, let's reread them together describing the cowboys and clowns. The words are easy, read those with me…six to three. Now let's read the colon, this colon means "TO," so we also read this as six to three. And finally, this fraction we read the same way…six to three. So for every 6 cowboys there are 3 clowns.

With ratios we are always thinking about making groups and ensuring our groups are identical meaning that our groups have equal amounts in them. Let's look at our image of cowboys and clowns again and think about another way we can write a ratio for the same picture.

Instead of looking at the WHOLE group, we can see if we can make smaller groups that have the same relationship.

I see 2 cowboys here and 1 clown, and I see another 2 cowboys and 1 clown, and I see ANOTHER 2 cowboys and 1 clown (*circle and point*). We placed 2 cowboys and 1 clown in a group because every time we see 2 cowboys, we see 1 clown. Notice, our groups are all the same, we have 2 cowboys and 1 clown in every single group.

Cowboys to clowns

2 to 1

2 : 1

$\frac{2}{1}$

Let's write our new ratio "for every 2 cowboys there is 1 clown," three different ways? Correct.

First, we can use words to show the ratio…two to one.

Now we can use a symbol, the colon, it means the same thing…two to one.

Finally, we need to write the ratio or comparison as a fraction. That would be $\frac{2}{1}$.

There we go! We've written another ratio of cowboys to clowns three different ways.

Let's Think (Slide 6): Now, look at this slide, look at it carefully…how is it the same or different from the slide we were just working on? Possible Student Answers, Key Points:

- They're the exact same, it's asking us to compare the same to things.
- The picture is the same.
- Instead of asking us to compare cowboys to clowns, it's asking us to do the opposite.

Hmm, interesting thoughts! This is the exact same picture but instead of asking us to compare COWBOYS to CLOWNS, it says to compare CLOWNS to COWBOYS. Just like when we compare 2 and 4 and we can say, 2 is less than 4 or 4 is greater than 2. We can do the same with ratios. So, we compare in the same order as you read this sentence, from left to right–like when we compare numbers. First you count and write the number of cowboys, then you count and write the number of clowns. To count the clowns first results in an answer that compares clowns to cowboys, not cowboys to clowns.

It may seem like a minor difference but it's actually a very important difference. We started out saying a ratio or comparison for cowboys and clowns is "for every 6 cowboys there are 3 clowns." But, instead of cowboys to clowns we could think in terms of "clowns to cowboys." That would change the ratio, verbally and in writing, because it changes the order and the meaning! Let's use words, symbols, and a fraction to compare clowns to cowboys.

Clowns to cowboys

3 to 6

3 : 6

$\frac{3}{6}$

For every 3 clowns, there are 6 cowboys. So we can say 3 to 6 to compare clowns to cowboys.

We can use a colon to show the same ratio…3:6.

And finally, we can use a fraction… so that would be $\frac{3}{6}$.

Remember, ratios are comparisons of quantities or amounts. In addition to paying attention to the order of the quantities that we're comparing. We also learned that we can group quantities in different ways to write different ratios for the same group. When we regrouped our comparison of cowboys to clowns we were able to make more, smaller groups.

Let's Try it (Slide 8): Let's continue writing ratios as we compare quantities to one another. Remember that we will write all our ratios three different ways; using the word "to," using a colon, and as a fraction. The key is, the order you read the ratio comparison is the order you write the ratio comparison.

WARM WELCOME

Today we will use ratio language to describe the relationship between two or more quantities.

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Let's Talk:

What does it mean to compare two things?

Let's Think:

What are ratios and how are they written?

A **ratio** is a comparison between two different quantities.

WORDS:

SYMBOLS:

NUMBERS:

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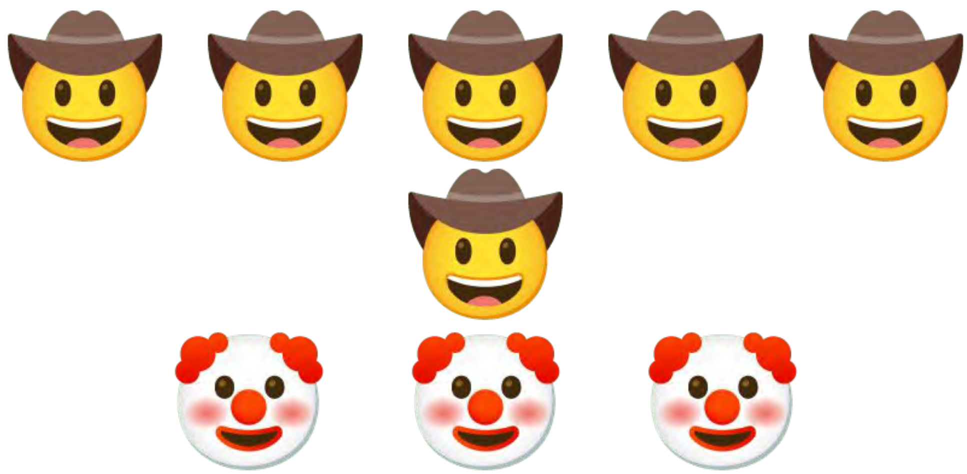
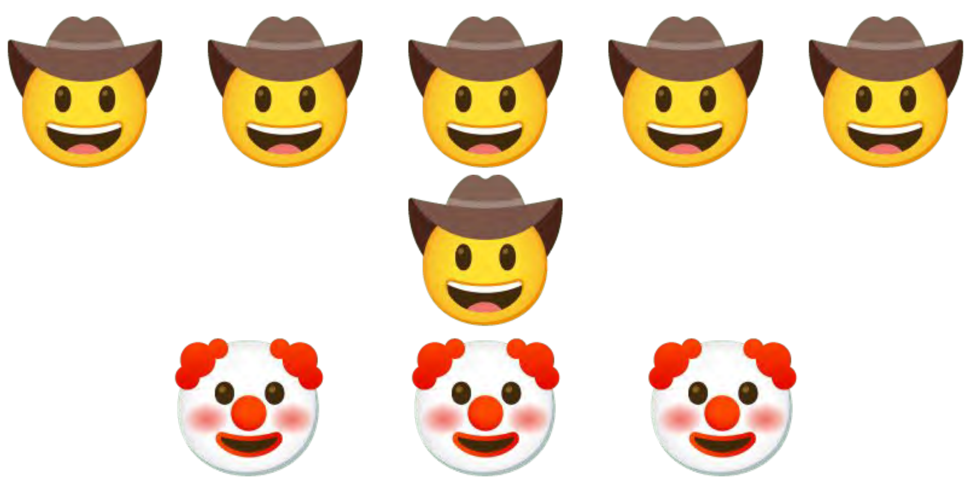
Let's Think: Let's write a ratio comparing the amount of **cowboys** to **clowns**.

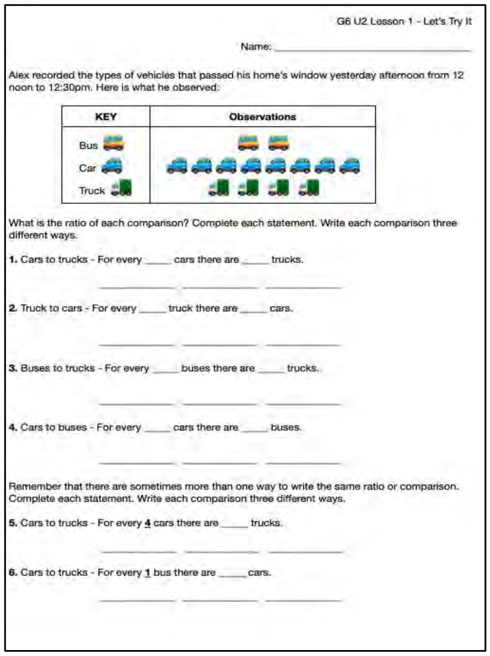


Let's Think: Let's write a ratio comparing the amount of **clowns** to **cowboys**.



Let's Try It:

Let's explore using ratio language together.



G6 U2 Lesson 1 - Let's Try It

Name: ____________________

Alex recorded the types of vehicles that passed his home's window yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:

KEY	Observations
Bus	
Car	
Truck	

What is the ratio of each comparison? Complete each statement. Write each comparison three different ways.

1. Cars to trucks - For every ____ cars there are ____ trucks.

__________ __________ __________

2. Truck to cars - For every ____ truck there are ____ cars.

__________ __________ __________

3. Buses to trucks - For every ____ buses there are ____ trucks.

__________ __________ __________

4. Cars to buses - For every ____ cars there are ____ buses.

__________ __________ __________

Remember that there are sometimes more than one way to write the same ratio or comparison. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every **4** cars there are ____ trucks.

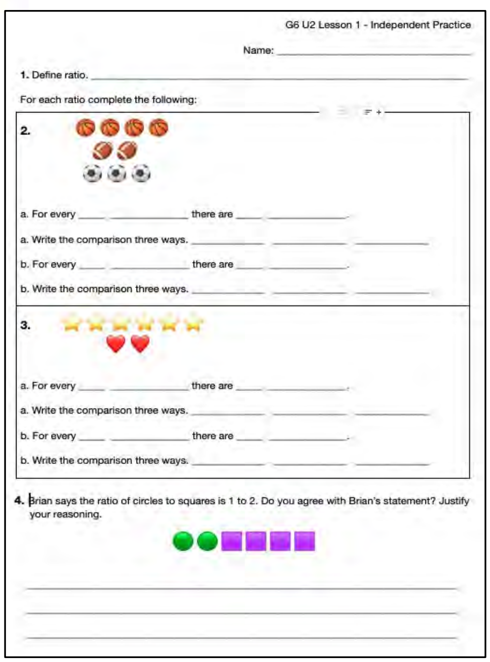
__________ __________ __________

6. Cars to trucks - For every **1** bus there are ____ cars.

__________ __________ __________

On your Own:

Now it's time to explore using ratio language on your own.



G6 U2 Lesson 1 - Independent Practice

Name: ____________________

1. Define ratio. ____________________

For each ratio complete the following:

2.

a. For every ____ __________ there are ____ __________.

a. Write the comparison three ways. __________ __________ __________

b. For every ____ __________ there are ____ __________.

b. Write the comparison three ways. __________ __________ __________

3.

a. For every ____ __________ there are ____ __________.

a. Write the comparison three ways. __________ __________ __________

b. For every ____ __________ there are ____ __________.

b. Write the comparison three ways. __________ __________ __________

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.

Name: ____

Alex recorded the types of vehicles that passed his home yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:

KEY	Observations
Bus Car Truck 	

Complete each ratio statement. Write each comparison three different ways.

1. Cars to trucks - For every _____ cars there are _____ trucks.

_______________ _______________ _______________

2. Truck to cars - For every _____ truck there are _____ cars.

_______________ _______________ _______________

3. Buses to trucks - For every _____ buses there are _____ trucks.

_______________ _______________ _______________

4. Buses to cars - For every _____ buses there are _____ cars.

_______________ _______________ _______________

Remember that there are sometimes more than one way to write the same ratio or comparison. Regroup the vehicles. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every **<u>4</u>** cars there are _____ trucks.

_______________ _______________ _______________

6. Trucks to cars - For every _____ cars there are _____ trucks.

_______________ _______________ _______________

7. Buses to cars - For every _____ bus there are _____ cars.

1. Define ratio. ____

For each ratio complete the following:

2.

a. For every _____ ____________ there are _____ ____________.

a. Write the comparison three ways. ____________ ____________ ____________

b. For every _____ ____________ there are _____ ____________.

b. Write the comparison three ways. ____________ ____________ ____________

3.

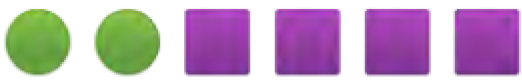
a. For every _____ ____________ there are _____ ____________.

a. Write the comparison three ways. ____________ ____________ ____________

b. For every _____ ____________ there are _____ ____________.

b. Write the comparison three ways. ____________ ____________ ____________

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.

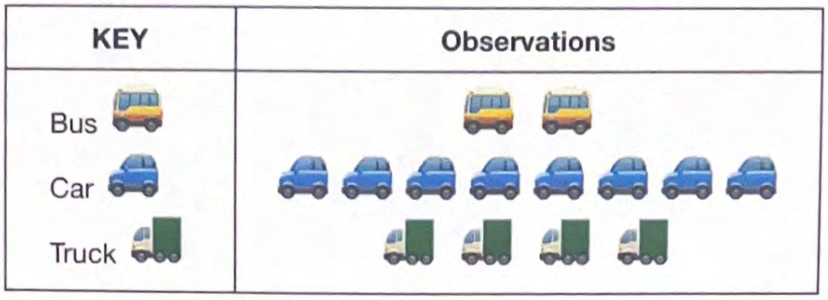


____

____

____

Alex recorded the types of vehicles that passed his home yesterday afternoon from 12 noon to 12:30pm. Here is what he observed:



Complete each ratio statement. Write each comparison three different ways.

1. Cars to trucks - For every __8__ cars there are __4__ trucks.

__8:4__ __8 to 4__ __$\frac{8}{4}$__

2. Truck to cars - For every __4__ truck there are __8__ cars.

__4:8__ __4 to 8__ __$\frac{4}{8}$__

3. Buses to trucks - For every __2__ buses there are __4__ trucks.

__2:4__ __2 to 4__ __$\frac{2}{4}$__

4. Buses to cars - For every __2__ buses there are __8__ cars.

__2:8__ __2 to 8__ __$\frac{2}{8}$__

Remember that there are sometimes more than one way to write the same ratio or comparison. Regroup the vehicles. Complete each statement. Write each comparison three different ways.

5. Cars to trucks - For every **4** cars there are __2__ trucks.

$8 \div 2 = 4$ $4 \div 2 = 2$ __4:2__ __4 to 2__ __$\frac{4}{2}$__

6. Trucks to cars - For every __2__ cars there are __1__ trucks.

$4 \div 4 = 1$ $8 \div 4 = 2$ __2:1__ __2 to 1__ __$\frac{2}{1}$__

7. Buses to cars - For every __1__ bus there are __4__ cars.

$2 \div 2 = 1$ $8 \div 2 = 4$ __1:4__ __1 to 4__ __$\frac{1}{4}$__

Name: ______________________ G6 U2 Lesson 1 - Independent Practice

1. Define ratio. A comparison between two different quantities.

For each ratio complete the following:

2.

(answers will vary)

a. For every 2 footballs there are 3 soccer balls.

a. Write the comparison three ways. 2 : 3   2 to 3 $\frac{2}{3}$

b. For every 3 soccer balls there are 4 basketballs.

b. Write the comparison three ways. 3 : 4   3 to 4 $\frac{3}{4}$

3.

(answers will vary)

a. For every 2 hearts there are 6 stars.

a. Write the comparison three ways. 2 : 6   2 to 6 $\frac{2}{6}$

b. For every 6 stars there are 2 hearts.

b. Write the comparison three ways. 6 : 2   6 to 2 $\frac{6}{2}$

4. Brian says the ratio of circles to squares is 1 to 2. Do you agree with Brian's statement? Justify your reasoning.

Yes, I agree with Brian's statement. If you make groups you could put 1 circle and 2 squares in each group.

G6 U2 Lesson 2

Draw a diagram that represents a ratio and explain what the diagram means

G6 U2 Lesson 2 - Students will construct a diagram to represent a ratio

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In this unit's first lesson we learned that ratios are a comparison of quantities or amounts. We looked at groupings of quantities and determined how they compared to one another based on the amount on each group–like cowboys and clowns. Today we will continue comparing quantities and writing ratios but will also use diagrams to represent our ratios. Remember, when we say we are comparing quantities we are looking to see how things are alike and how they are different.

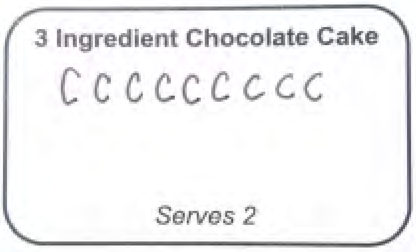
Let's Talk (Slide 3): Let's brainstorm…**have you ever used a recipe to cook or bake? How would you describe the components or parts of a recipe?** Possible Student Answers, Key Points:

- Recipes have ingredients and a specific amount for each ingredient
- Recipes have number amounts for each ingredient
- Recipes give directions for cooking, temperature for the oven, etc.
- Recipes get messed up if you don't follow the directions.

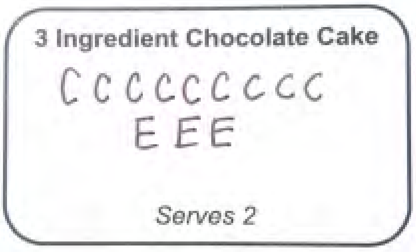
We may have some future chefs in our group! A recipe has a list of ingredients, the temperature to cook or bake the food, specific amounts of ingredients that need to be put together to make a food dish, and even lists the number of servings in a dish. Guess what? Recipes are actually based on ratios. We'll explore ratios through a recipe in today's lesson.

Let's Think (Slide 4): A great way to compare ratio quantities is with diagrams. A diagram is a visual representation that shows the relationship or connection between information. In the last lesson, we started with pictures of objects, in this lesson we will work with written statements of quantities or amounts–like recipes! Visual diagrams can be made to represent information.

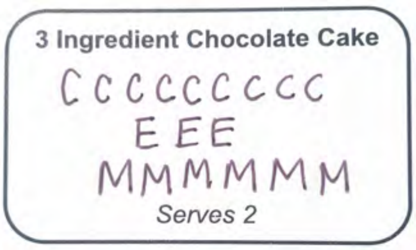
For example, in this recipe, if we know the original amount of ingredients you can construct your diagrams. Let's look at this recipe for 3 Ingredient Chocolate Cake that has a serving size of 2 people; the ingredients are listed: *(read the recipe aloud).*



Let's make a diagram to represent the ingredients in our recipe. First we need a key or code for our diagram. Let's use C to represent chocolate chips, E to represent eggs, and M to represent milk. We will include 9 Cs on our diagram because the recipe says we need 9 ounces of chocolate chips and we are using C to represent chocolate chips.



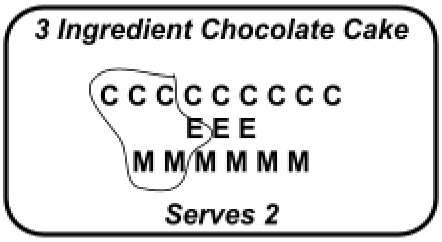
How many Es should we include on our diagram and how do you know? 3 Es because there are 3 eggs. Correct. The recipe says we need 3 large eggs so let's put 3 Es below our 9 Cs in our diagram .



Our last ingredient in our recipe is milk. We'll use M to represent the milk needed for the recipe. The recipe calls for 6 tablespoons of milk so let's write 6 Ms under the 3 eggs we just include on the diagram/

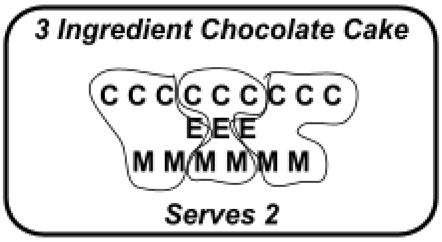
This diagram we completed represents the recipe's ingredient amounts. What could we add to the diagram if we wanted to make it easier for people to understand the ingredients needed? The units of measure like ounces for the chocolate chips and tablespoon for the milk or a key for the codes that are used. Great ideas! If a person read the ingredients as it's currently written on our diagram they would need to guess about the 3 ingredients needed to make the cake. They may guess correctly or they may not. By adding the measurement units and a key anyone could understand which ingredients they needed. But, we won't be adding those things to our diagram though since no one is actually going to be making the cake.

Let's Think (Slide 5): Before we manipulate our recipe, let's look at our ratio of ingredients. Remember, we have to say the ratio in the order that we were asked. So, our ratio of eggs to chocolate chips to milk is 3 to 9 to 6 or 3:9:6. But just like in our last lesson, we can make groups of smaller quantities or amounts.



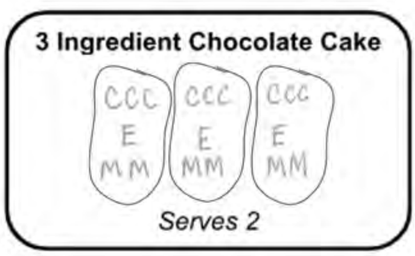
Let's analyze our diagram further by grouping the ingredients to make smaller, equal groups of ingredients. One reason to make smaller, equally-sized groups of ingredients is to make a smaller size cake if you didn't necessarily need a cake that is the size of the cake in the original recipe.

Is there a way to make smaller, equally-sized groups of ingredients? Well, we see that for every 3 ounces of chocolate chips I need 1 egg and 2 tablespoons of milk so that will form my first group *(circle that complete group of ingredients).*



Let's continue making complete groups of ingredients that each include 3 ounces of chocolate chips, 1 egg, and 2 tablespoons of milk.

Are there any ingredients left outside of a group? No. Nice, so that means we split our recipe ingredients evenly into groups. If we had ingredients left over or outside of a group then that would mean the number of ingredients that made up a group was incorrect and we would need to start over with grouping our ingredients.



I'm going to make our diagram look more clear and more organized *(redraw).* Now that it's more organized, we can look for the ratio of eggs to chocolate chips to milk and clearly see that in addition to our original ratio of 3:9:6 we also have a ratio of 1:3:2 meaning we need 1 large egg to 3 ounces chocolate chips to 2 tablespoons of milk to make our delicious chocolate cake.

One of the most important things to remember when making smaller groups of ratios is that the groups must all have the same quantity or amount inside. We call that being "within ratio." If you ever group quantities and have any left over then you are no longer within ratio and need to regroup. We will continue building on this concept of ratios based on the quantity or amount in a group in upcoming lessons.

Let's Try it (Slide 6): Let's continue comparing quantities and using diagrams to represent ratios. Remember that when we construct our diagrams from the original ratio we need to split the quantity evenly between our groups–every group has to have the exact same thing!

WARM WELCOME

Today we will construct diagrams to represent ratios.

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Let's Talk:

Have you ever used a recipe to cook or bake?

How would you describe the components or parts of a recipe?

Let's Think:

Let's draw a diagram to represent the ratio of chocolate chips to eggs to milk.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

Serves 2

Let's Think:

Can we write another ratio to represent the same quantities?

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

C C C C C C C C C
E E E
M M M M M M

Serves 2

Let's Try It:

Let's explore constructing ratio diagrams together.

G6 U2 Lesson 2 - Let's Try It

Name: ______________________________

After grocery shopping Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.

2. Write the ratio of apples to lemons to oranges using the word *to* and a colon *(:)*.

__________________ __________________

3. Complete each statement based on your diagram.

a. There are _____ oranges for every _____ apples.

b. There are _____ oranges for every _____ lemons.

c. There are _____ lemons for every _____ apples.

4. On your diagram, group the apples, lemons, and oranges to make equal groups of fruit.

5. Write the ratio of apples to lemons to oranges using the word *to* and a colon *(:)* based on the new equal groupings.

__________________ __________________

Complete the statements based on your new equal groups.

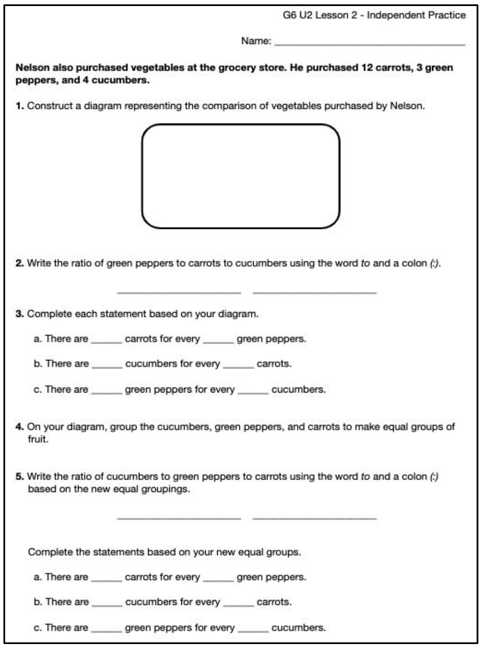
a. There are _____ oranges for every _____ apples.

b. There are _____ oranges for every _____ lemons.

c. There are _____ lemons for every _____ apples.

On your Own:

Now it’s time to explore constructing ratio diagrams on your own.


G6 U2 Lesson 2 - Independent Practice

Name: ______________________________

Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 4 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)*.

________________ ________________

3. Complete each statement based on your diagram.

a. There are _____ carrots for every _____ green peppers.

b. There are _____ cucumbers for every _____ carrots.

c. There are _____ green peppers for every _____ cucumbers.

4. On your diagram, group the cucumbers, green peppers, and carrots to make equal groups of fruit.

5. Write the ratio of cucumbers to green peppers to carrots using the word *to* and a colon *(:)* based on the new equal groupings.

________________ ________________

Complete the statements based on your new equal groups.

a. There are _____ carrots for every _____ green peppers.

b. There are _____ cucumbers for every _____ carrots.

c. There are _____ green peppers for every _____ cucumbers.

Name: ______________________________

After grocery shopping, Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.

2. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)*.

____________________ ____________________

3. Complete each statement based on your diagram.

a. There are ______ oranges for every ______ apples.

b. There are ______ oranges for every ______ lemons.

c. There are ______ lemons for every ______ apples.

4. On your diagram, group the lemons, apples, and oranges to make equal groups of fruit.

5. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)* based on the new equal groupings.

____________________ ____________________

6. Complete the statements based on your new equal groups.

a. There are ______ orange(s) for every ______ apple(s).

b. There are ______ orange(s) for every ______ lemon(s).

c. There are ______ lemon(s) for every ______ apple(s).

Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 9 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)*.

____________________ ____________________

3. Complete each statement based on your diagram.

a. There are ______ carrots for every ______ green peppers.

b. There are ______ cucumbers for every ______ carrots.

c. There are ______ green peppers for every ______ cucumbers.

d. There are ______ cucumbers for every ______ green peppers.

4. On your diagram, group the green peppers, carrots and cucumbers to make equal groups of fruit.

5. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)* based on the new equal groupings.

____________________ ____________________

6. Complete the statements based on your new equal groups.

a. There are ______ carrot(s) for every ______ green pepper(s).

b. There are ______ cucumber(s) for every ______ carrot(s).

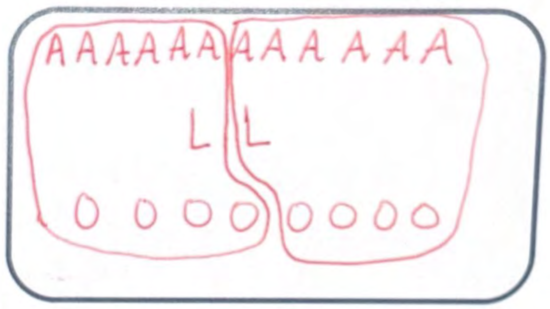
c. There are ______ green pepper(s) for every ______ cucumber(s).

d. There are ______ cucumber(s) for every ______ green pepper(s).

Name: ______________________ G6 U2 Lesson 2 - Let's Try It

After grocery shopping, Nelson took inventory of his purchases. He saw that he purchased 12 apples, 2 lemons, and 8 oranges.

1. Construct a diagram representing the comparison of fruit purchased by Nelson.



L : A : O

2. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)*.

2 : 12 : 8 2 to 12 to 8

3. Complete each statement based on your diagram.

a. There are 8 oranges for every 12 apples.

b. There are 8 oranges for every 2 lemons.

c. There are 2 lemons for every 12 apples.

4. On your diagram, group the lemons, apples, and oranges to make equal groups of fruit.

See diagram above.

L : A : O

5. Write the ratio of lemons to apples to oranges using the word *to* and a colon *(:)* based on the new equal groupings.

1 : 6 : 4 1 to 6 to 4

6. Complete the statements based on your new equal groups.

a. There are 4 orange(s) for every 6 apple(s).

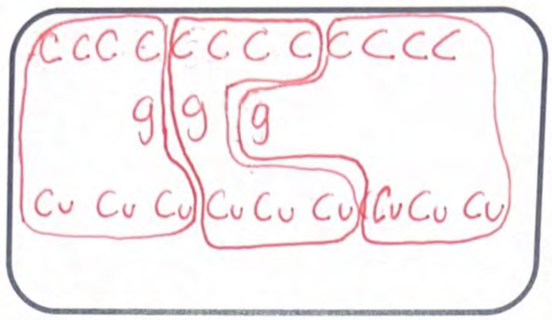
b. There are 4 orange(s) for every 2 lemon(s).

c. There are 1 lemon(s) for every 6 apple(s).

Name: ______________________________ G6 U2 Lesson 2 - Independent Practice

Nelson also purchased vegetables at the grocery store. He purchased 12 carrots, 3 green peppers, and 9 cucumbers.

1. Construct a diagram representing the comparison of vegetables purchased by Nelson.



g : c : cu

2. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)*.

3 : 12 : 9   3 to 12 to 9

3. Complete each statement based on your diagram.

a. There are 12 carrots for every 3 green peppers.

b. There are 9 cucumbers for every 12 carrots.

c. There are 3 green peppers for every 9 cucumbers.

d. There are 9 cucumbers for every 3 green peppers.

4. On your diagram, group the green peppers, carrots and cucumbers to make equal groups of fruit.

See diagram above.

g : c : cu

5. Write the ratio of green peppers to carrots to cucumbers using the word *to* and a colon *(:)* based on the new equal groupings.

1 : 4 : 3   1 to 4 to 3

6. Complete the statements based on your new equal groups.

a. There are 4 carrot(s) for every 1 green pepper(s).

b. There are 3 cucumber(s) for every 4 carrot(s).

c. There are 1 green pepper(s) for every 3 cucumber(s).

d. There are 3 cucumber(s) for every 1 green pepper(s).

G6 U2 Lesson 3

Write equivalent ratios and explain why two ratios are equivalent or not equivalent

G6 U2 Lesson 3 - Students will write equivalent ratios and explain why two ratios are or are not equivalent

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we continued comparing quantities and writing ratios but we incorporated making diagrams to represent our ratios. We recall that ratios are comparisons of quantities or amounts and they can be written using the "to," with a colon, and as a fraction. Today we will use that knowledge of ratios and models to make equivalent ratios.

Let's Talk (Slide 3): Let's brainstorm…I just told you that today we'll be working with equivalent ratios. We've heard the word "equivalent" a lot in our math careers. So, **what does equivalent mean? Give an example.** Possible Student Answers, Key Points:

- Equivalent means two things are the same.
- Equivalent means things are equal.
- For example, 2 and 2 are equivalent to 4.
- Another example is ½ is equivalent to 2/4.

Nice thinking! Equivalent means that two or more things are the same or equal! And you all have known the word equivalent since early elementary school. You worked on finding equivalent numbers and then equivalent fractions. So, today we're going to extend what we know about equivalence to what we know about ratios.

Let's Think (Slide 4): Before we get into exploring equivalent ratios, I want to come back to what we were talking about yesterday. Yesterday we worked with the 3 Ingredient Chocolate Cake recipe, I want to talk about why recipes are important. So, **why do you think recipes are important? What would happen if we didn't follow the recipe?** Possible Student Answers, Key Points:

- The food wouldn't taste right, it would be too sweet or too salty.
- The proportions would be all messed up, like too many chocolate chips or too much egg.

That's right, recipes are important because the food doesn't taste right if we don't follow them. Recipes tell us exactly how much of each thing to put in so that the food is balanced. That's going to be important to our work today.

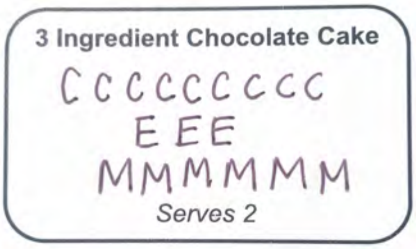
Let's Think (Slide 5): Let's revisit our 3 Ingredient Chocolate Cake recipe from the last lesson. Many people choose to use a recipe exactly as it's written. But, I see that this recipe says "SERVES 2" *(point),* but what if I want to make a cake for more than two people? For example, what if I want to make this cake for four people. I can't just dump more of each ingredient in because it won't taste right. I have to use the same ratio of ingredients so that it tastes right.

Another example of this is that restaurants often need to change a recipe to make more food because they need to make a lot of food to serve their customers. Using ratios, a restaurant can increase the amount of each ingredient to make larger batches of food at one time.

Let's Think (Slide 6): We know that we can construct diagrams to represent ratios. Let's think about how we can use a diagram to help us make a larger cake. But remember, the amount of the new ingredients needs to be within ratio of the original amount of each ingredient. Our recipe from our last lesson said that our cake needs 9 ounces of chocolate chips, 3 large eggs, and 6 tablespoons of milk. And. when we look at the bottom this recipe only serves 2 people.

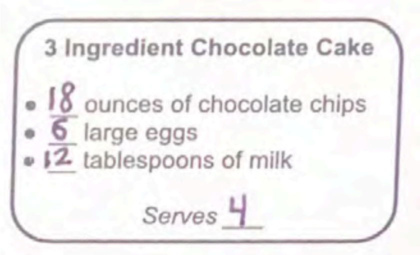
So, if we want to serve 4 people we need to increase the recipe. Let's construct a diagram to help us decide how much of each ingredient we will need to serve 4 people instead of 2 people. Yesterday, we used a key or code in the last lesson. We used C to represent chocolate chips, E to represent eggs, and M to represent milk in our diagram. Let's continue using that key to create a diagram

So we know that one cake serves two people and we want a cake that will serve four people, that means we need to DOUBLE our cake. So we need two times as many ingredients.



One recipe calls for 9 ounces chocolate chips, 3 eggs, and 6 tablespoons of milk. So, I will use my key to draw a digram to represent one recipe.

But, I need to double it. So I need to do the same amount of chocolate chips, eggs, and milk AGAIN. Remember, we have to use the same ratio to make sure that the cake tastes right.

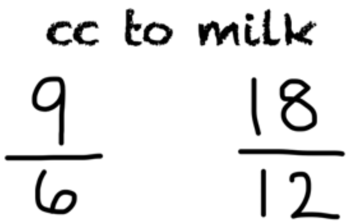


And now, figure out how much that is of each ingredient altogether. So I needed 9 ounces of chocolate chips and another 9, which is 18. I needed 3 eggs and another 3 eggs, that makes 6 eggs in total. And finally, I needed 6 tablespoons of milk and another 6 so that makes 12 tablespoons of milk in all.
And since we double the recipe, that means this new cake can serve twice as many people, so it serves 4!

If we use 18 ounces of chocolate chips, 6 large eggs, and 12 tablespoons of milk will the chocolate cake taste the same as when we use 9 ounces of chocolate chips, 3 eggs, and 6 tablespoons of milk? Yes because all we did was double the recipe. Absolutely! The cake will taste the same because we increased the ingredients within ratio of the original recipe instead of just adding more ingredients randomly.

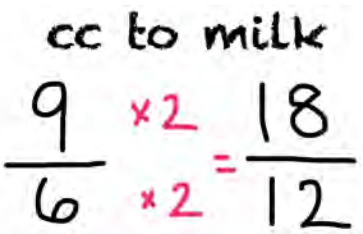
Let's Think (Slide 7): We know that another way to represent ratios is with fractions and you all already told me that we can write equivalent fractions. Remember, equivalent fractions are fractions that take up the same amount of space but have different numerators and denominators.

So, we can also construct equivalent fractions to determine other ratios or ingredients. In the case of our cake, we originally had a ratio of 9 ounces of chocolate chips to 6 tablespoons of milk.



As a fraction that would be 9/6. When we increased the ingredients in the recipe our ratio of chocolate chips to milk became 18/12.

When we look at the two fractions, we see that they are equivalent to one another.



We doubled the recipe so if we multiply 9, the amount of chocolate chips by 2 and 6, the amount of milk, by 2 the new fraction is 18/2. We created equivalent fractions, or in this case, equivalent ratios! We multiplied the numerator and denominator by the same amount.

We can use this idea to find equivalent ratios. For example, if we wanted to TRIPLE the recipe and make a cake that serves…2 and 2 and 2…6 people! We could just multiply all of the ingredients by 3.

We have learned two ways to find equivalent ratios so far, diagrams and equivalent fractions; we still have lots more to learn about ratios as we progress through this unit and the next unit. One thing to keep in mind as we continue working with equivalent fractions is that you must multiply both the numerator and the denominator of a fraction by the same factors in order to achieve equivalency.

Let's Try it (Slide 8-9): Let's continue comparing quantities and using diagrams to create equivalent ratios. Remember that when we construct our diagrams from the original ratio we make exact copies of that original ratio to continue our diagram model.

WARM WELCOME

Today we will write equivalent ratios.

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Let's Talk:

What does equivalent mean? Give an example.

Let's Think:

Why are recipes important?

Let's Think: How can I make the same cake but for FOUR people?

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

Let's Think: Let's double our recipe using a diagram.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake		**3 Ingredient Chocolate Cake**		**3 Ingredient Chocolate Cake**
	+		=	• __ ounces of chocolate chips • __ large eggs • __ tablespoons of milk
Serves 2		*Serves 2*		*Serves ___*

Let's Think:

Let's think about equivalent fractions to represent ratios.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

Let's Try It:

Let's explore equivalent ratios together.

G6 U2 Lesson 3 - Let's Try It

Name: ______________________

The 3 Ingredient Chocolate Cake recipes are shown below.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

Serves 4

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

____

2. Using fractions, complete the table.

Ratio	Original Recipe	New Recipe	Write the Equivalent Fractions
eggs to chocolate chips			
milk to chocolate chips			
eggs to milk			

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

____

____

4. Could the ratio of milk to chocolate chips be 24:40 based on the recipe? Justify your answer.

____

____

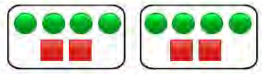
On your Own:

Now it's time to explore equivalent ratios on your own.

G6 U2 Lesson 3 - Independent Practice

Name: ______________________________

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.



1. The ratio of circles to squares is 4:2. ____________
2. The ratio of squares to circles is 1 to 2. ____________
3. There are 4 circles for every square. ____________
4. The ratio of circles to squares is 1 to 2. ____________
5. There are 2 circles for every square. ____________

Create two equivalent fractions for each fraction. Show your work.

6. $\frac{1}{3}$ $\frac{1}{3}$	**7.** $\frac{2}{5}$ $\frac{2}{5}$
8. $\frac{5}{6}$ $\frac{5}{6}$	**9.** $\frac{1}{4}$ $\frac{1}{4}$

A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 7 cups of paint.

10. Linus wants to make more than 7 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint.	**11.** Carl wants to make less than 7 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint.

The 3 Ingredient Chocolate Cake recipes are shown below.

3 Ingredient Chocolate Cake

- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2

3 Ingredient Chocolate Cake

- 18 ounces of chocolate chips
- 6 large eggs
- 12 tablespoons of milk

Serves 4

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

____

2. Write each ratio as a fraction. Complete the table.

Ratio	**Original Recipe**	**New Recipe**	**Write the Equivalent Fractions**
eggs to chocolate chips			
milk to chocolate chips			
eggs to milk			

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

____

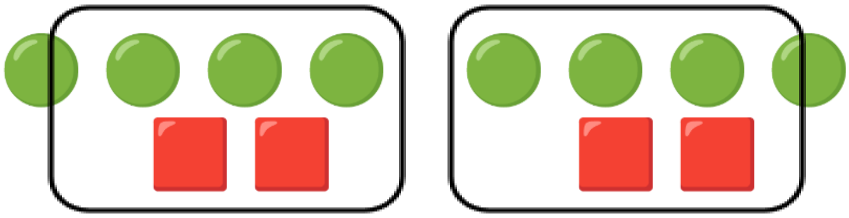
____

4. Could the ratio of milk to chocolate chips be 24:45 based on the recipe? Justify your answer.

____

____

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.



1. The ratio of circles to squares is 4:2. ______________

2. The ratio of squares to circles is 1 to 2. ______________

3. There are 4 circles for every square. ______________

4. The ratio of circles to squares is 1 to 2. ______________

5. There are 2 circles for every square. ______________

Create two equivalent fractions for each fraction. Show your work.

6. $\frac{1}{3}$ $\qquad$ $\frac{1}{3}$	**7.** $\frac{2}{5}$ $\qquad$ $\frac{2}{5}$
8. $\frac{5}{6}$ $\qquad$ $\frac{5}{6}$	**9.** $\frac{1}{4}$ $\qquad$ $\frac{1}{4}$
A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 8 cups of paint.	
10. Linus wants to make more than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint.	**11.** Carl wants to make less than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint.

The 3 Ingredient Chocolate Cake recipes are shown below.

3 Ingredient Chocolate Cake	3 Ingredient Chocolate Cake
• 9 ounces of chocolate chips • 3 large eggs • 6 tablespoons of milk *Serves 2*	• 18 ounces of chocolate chips • 6 large eggs • 12 tablespoons of milk *Serves 4*

1. How does the amount of each ingredient in the new recipe compare to the amount of each ingredient in the original recipe?

The new recipe's ingredients are double the original recipe's.

2. Write each ratio as a fraction. Complete the table.

Ratio	Original Recipe	New Recipe	Write the Equivalent Fractions
eggs to chocolate chips	$\frac{3}{9}$	$\frac{6}{18}$	$\frac{3}{9}=\frac{6}{18}$
milk to chocolate chips	$\frac{6}{9}$	$\frac{12}{18}$	$\frac{6}{9}=\frac{12}{18}$
eggs to milk	$\frac{3}{6}$	$\frac{6}{12}$	$\frac{3}{6}=\frac{6}{12}$

3. What do you notice about the relationship between the amounts of ingredient in the original recipe to the corresponding ingredients in the new recipe?

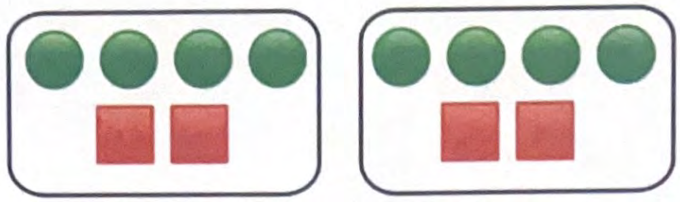
The ingredients in the original recipe are half the corresponding ingredients in the new recipe.

4. Could the ratio of milk to chocolate chips be 24:45 based on the recipe? Justify your answer.

$\frac{6}{9} \neq \frac{24}{25}$. No because milk is 4 times the amount while Choco. chips are 5 times the amount. So the ratios aren't equivalent.

Name: ______________________________ G6 U2 Lesson 3 - Independent Practice

Determine whether each statement is *True* or *False* based on the diagram that represents the ratio of circles to squares.



1. The ratio of circles to squares is 4:2. True
2. The ratio of squares to circles is 1 to 2. True
3. There are 4 circles for every square. False
4. The ratio of circles to squares is 1 to 2. False
5. There are 2 circles for every square. True

Create two equivalent fractions for each fraction. Show your work. (answers will vary)

6. $\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$ $\quad \frac{1}{3} \times \frac{6}{6} = \frac{6}{18}$	**7.** $\frac{2}{5} \times \frac{9}{9} = \frac{18}{45}$ $\quad \frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$
8. $\frac{5}{6} \times \frac{3}{3} = \frac{15}{18}$ $\quad \frac{5}{6} \times \frac{5}{5} = \frac{25}{30}$	**9.** $\frac{1}{4} \times \frac{6}{6} = \frac{6}{24}$ $\quad \frac{1}{4} \times \frac{9}{9} = \frac{9}{36}$

A specific purple paint color is made by mixing a ratio of 2 cups of red paint with 6 cups of blue paint. This will yield 8 cups of paint.

10. Linus wants to make more than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but more cups of purple paint.	**11.** Carl wants to make less than 8 cups of paint. Create an equivalent fraction that would produce the exact same color but fewer cups of purple paint.
(answers will vary) $\frac{\text{red}}{\text{blue}} = \frac{2}{6} \times \frac{3}{3} = \frac{6}{18}$ $\quad 6 + 18 = 24$ cups of paint	(answers will vary) $\frac{\text{red}}{\text{blue}} = \frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$ $\quad 1 + 3 = 4$ cups of paint
6 cups of red & 18 cups of blue paint.	1 cup of red & 3 cups of blue paint

G6 U2 Lesson 4

Use double number line diagrams to find and represent equivalent ratios

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G6 U2 Lesson 4 - Students will use double number lines to find and represent equivalent ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson we explored creating and identifying equivalent ratios using diagrams and equivalent fractions. Today we will explore another model for visually representing ratios. This model is called a "double number line." Although we are working with ratios using a new model, everything we learned in our first few lessons will still apply; the order of your ratio still matters and we must still create equivalent ratios.

Let's Talk (Slide 3): Let's open by studying an image. **What do you notice and wonder about the image on this slide?** Possible Student Answers, Key Points:

- There are two number lines, one is hovering above the other.
- The tick marks are the exact same size and they are perfectly lined up.
- They both start at 0 but nothing is labeled.
- I wonder what each tick represents and how we can fill out the number line.

Good observations! This is a double number line! This is a tool that we'll use today to find equivalent ratios. And you're right, a double number line has two number lines and looks like one is hovering or floating above the other. Each number line has tick marks that align perfectly with the tick marks on the other number line. You all also noticed that the tick marks on a number line are equally spaced.

Let's Think (Slide 4): So, let's think back to our last lesson. What are the two ways we know how to find equivalent ratios? We used a diagram and we used equivalent fractions! We multiplied the numerator and denominator by the same number. That's exactly what we did! We began by making a ratio in fraction form. The next step was to multiply the numerator and denominator by the same number or factor.

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

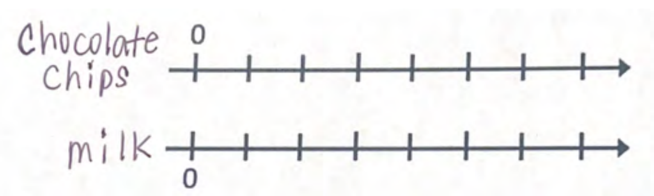
Let's look at an example. We want to create an equivalent ratio for 2:5, we read that as two to five. For example the ratio of 2 eggs for every 5 cups of flour, in other words 2 to 5. Another way to write that ratio is as a fraction, two is the numerator and 5 is the denominator.

$$\frac{2 \times 6}{5 \times 6} = \frac{12}{30}$$

We can create equivalent ratios by multiplying the numerator and the denominator by the same factor. If we were to increase by a factor of 6 we would multiply the numerator, 2, by 6 to get 12. And multiply the denominator, 5, by 6 to get 30. So if we use 12 eggs, we'd need to use 30 cups of flour!

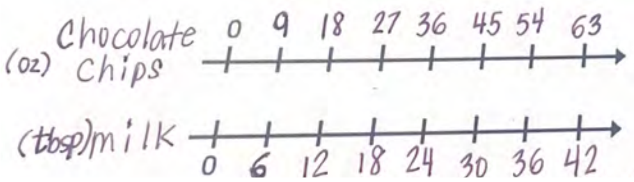
This knowledge will come in handy today as we add to prior learning with double number lines. You already know regular number lines are labeled in equal increments from your previous years in math. Let's continue creating those equal increments and introduce using the information from diagrams and written statements to construct our double number lines.

Let's Think (Slide 5): Revisiting our 3 Ingredient Chocolate Cake recipe we can use a double number line to find equivalent ratios of ingredients. Let's give it a try. We can use the double number line to determine how many ounces of chocolate chips and how much milk we would need to make enough cake to serve a different number of people, other than the 2 people that the original recipe serves.



Let's start by labeling each number line. Since we are looking to determine the ratio of chocolate chips to milk, we use chocolate chips and milk as our labels *(label)*.

Next we notice each number line starts with 0. The recipe tells us that we use 9 ounces of chocolate chips for every 6 tbsp of milk to make our cake. So we label 9 on the chocolate chips number line and 6 on the tick mark directly below that location on the milk number line. This makes sense because to make 1 recipe we need 9 ounces of chocolate chips and 6 tablespoons of milk (*point).*

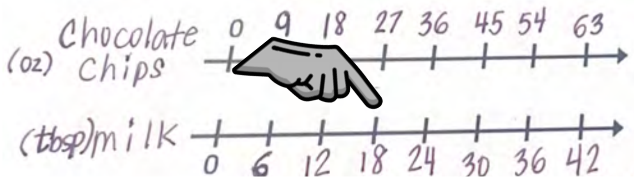


We continue the double number line by skip counting from 9 for the chocolate chips and from 6 for the tablespoons of milk.

You have been using skip counting since elementary school! It's just saying our multiplication math facts in order. Let's start with 9s…9, 18, 27, 36, 45, 54, 63. And if that's hard we can always press and count on 9 more.

Let's do the same with our 6s…6, 12, 18, 24, 30, 36, 42.

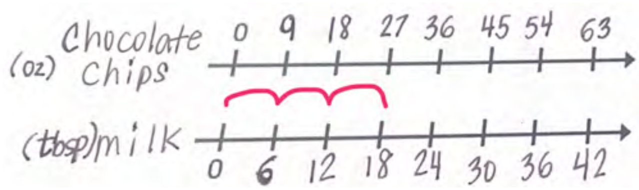
Great work! Once our number lines are complete we are able to analyze the information of the double number line set to determine how much milk and and how many ounces of chocolate chips we'll need as we increase the recipe to serve more people. Our double number line assists us in finding equivalent ratios.



For example, if we use 27 ounces of chocolate chips, how many tablespoons of milk would you need to include so that the cake tastes the same even though you added more of each ingredient? 18 tablespoons of milk. That's right! First, we look at the double number line and we find the 27 on the chocolate chip number line. When we move straight down to the matching tick mark on the other number line we see that 18 tablespoons of milk is needed if we use 27 ounces of chocolate chips.

Now, here's a tricky question. If we use 27 ounces of chocolate chips, and 18 tablespoons of milk…**how many people could we serve with the cake?** Possible Student Answers, Key Points:

- Three people because it's three tick marks in.
- Six people because if you triple the recipe, each recipe serves 2 people.



Interesting! This is a very challenging question but we have all of the information we need. When we use 27 ounces of chocolate chips and 18 tablespoons of milk, we have done the recipe…1, 2, 3 times (*show hops on the number line*). But, each recipe serves 2 people so we can serve 6 people with this cake!

Nice work, this is just the start of using double number lines! If you can quickly recall your multiplication facts it will be easier to skip count as you fill in both number lines. The great part is that once the number lines are completed you have so much information displayed for you to analyze. As we continue constructing double number lines you will see how they can be used to find equivalent fractions that result in smaller quantities and even very large quantities compared to the original ratio.

Let's Try it (Slide 6): Let's continue using double number lines to find equivalent ratios. Constructing double number lines can seem daunting but as we continue to practice they will become an easy, useful tool. Remember that our tick marks keep our information organized and make the information easy to read. They should always align between both number lines.

WARM WELCOME

Today we will use double number lines to calculate equivalent ratios.

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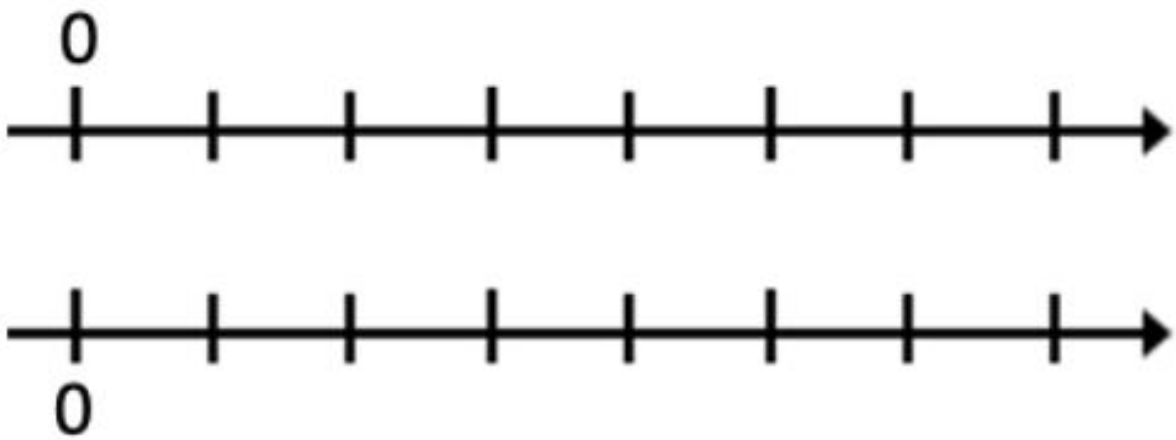
Let's Talk: What do you notice about the image below?



Let's Think: How can we create equivalent ratio for **2:5**?

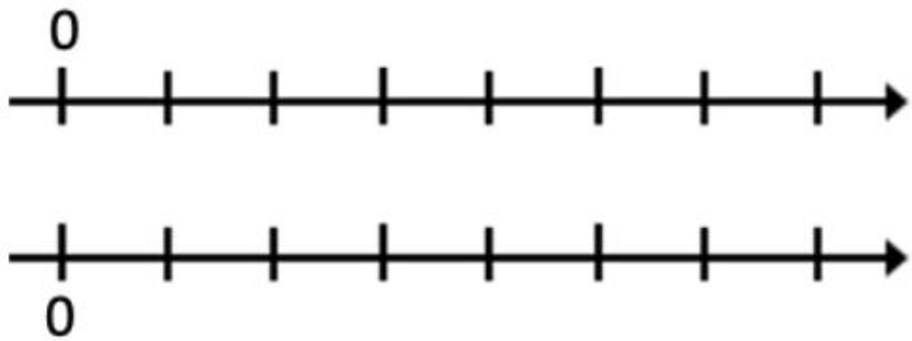
Let’s Think:

Let’s use the double number line to calculate equivalent ratios.

3 Ingredient Chocolate Cake

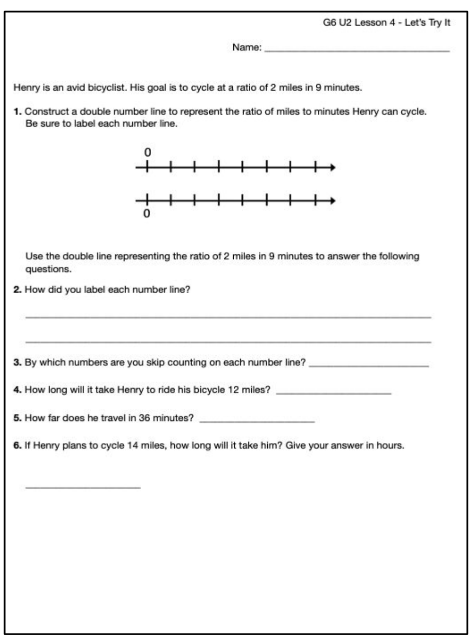
- 9 ounces of chocolate chips
- 3 large eggs
- 6 tablespoons of milk

Serves 2



Let’s Try It:

Let’s explore constructing double number lines to calculate equivalent ratios together.



G6 U2 Lesson 4 - Let’s Try It

Name: ______________________________

Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle. Be sure to label each number line.

0

0

Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

____

____

3. By which numbers are you skip counting on each number line? ________________

4. How long will it take Henry to ride his bicycle 12 miles? ________________

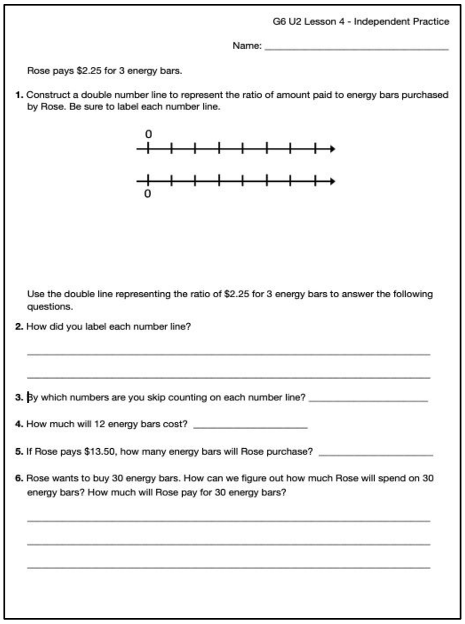
5. How far does he travel in 36 minutes? ________________

6. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

____

On your Own:

Now it's time to explore constructing double number lines and equivalent ratios on your own.



G6 U2 Lesson 4 - Independent Practice

Name: ______________________________

Rose pays $2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of amount paid to energy bars purchased by Rose. Be sure to label each number line.

Use the double line representing the ratio of $2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

____

____

3. By which numbers are you skip counting on each number line? ________________

4. How much will 12 energy bars cost? ________________

5. If Rose pays $13.50, how many energy bars will Rose purchase? ________________

6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

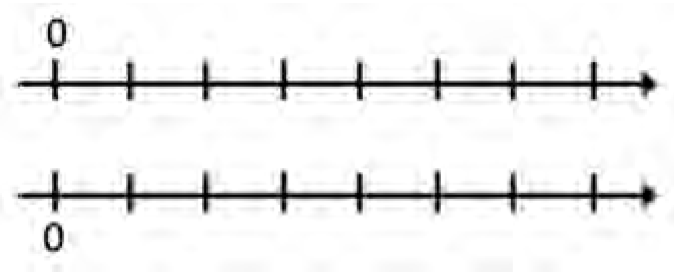
____

____

____

Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle.



Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

____

3. By which numbers are you skip counting on each number line? ______________________

4. How long will it take Henry to ride his bicycle 12 miles? ______________________

5. How far does he travel in 36 minutes? ______________________

6. How many more miles did Henry cycle in 45 minutes compared to 27 minutes? ____________

7. How many fewer minutes did he cycle over 6 miles compared to 14 miles? ____________

8. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

____

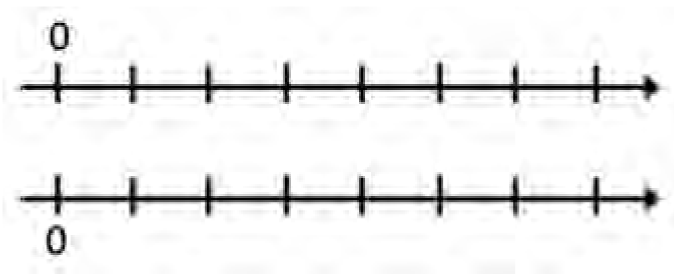
A recipe for Pico de Gallo is shown.

Pico de Gallo

2 cups tomatoes
$\frac{3}{4}$ cup onion
$\frac{1}{2}$ cup cilantro
$\frac{1}{4}$ Tbsp oregano

Yield 3 cups

9. Construct a double number line to represent the ratio of tomatoes to onions.



10. How did you label each number line?

____

11. By which numbers are you skip counting on each number line? ________________________

12. How many cups of tomatoes would be required for $2\frac{1}{4}$ cups of onions? __________________

13. How many cups of onions would you use for 10 cups of tomatoes? __________________

14. Write your own question based on the double number line. Provide the answer.

____

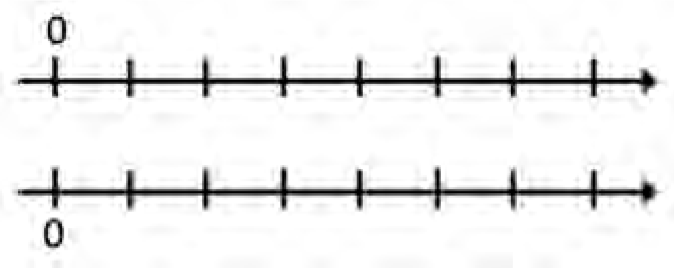
____

____

Name: ___________________________________ G6 U2 Lesson 4 - Independent Practice

Rose pays $2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of the amount paid to energy bars purchased by Rose.



Use the double line representing the ratio of $2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

____

3. By which numbers are you skip counting on each number line? ______________________

4. How much will 12 energy bars cost? ______________________

5. If Rose pays $13.50, how many energy bars will Rose have purchased? _______________

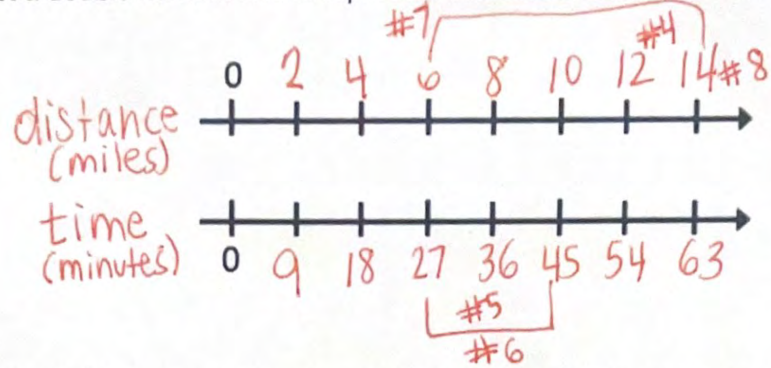
6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

____

____

Henry is an avid bicyclist. His goal is to cycle at a ratio of 2 miles in 9 minutes.

1. Construct a double number line to represent the ratio of miles to minutes Henry can cycle.



Use the double line representing the ratio of 2 miles in 9 minutes to answer the following questions.

2. How did you label each number line?

Distance in miles & time in minutes

3. By which numbers are you skip counting on each number line? 2 & 9

4. How long will it take Henry to ride his bicycle 12 miles? 54 minutes

5. How far does he travel in 36 minutes? 8 miles

subtract

6. How many more miles did Henry cycle in 45 minutes compared to 27 minutes? 4miles

10 miles - 6miles

subtract

7. How many fewer minutes did he cycle over 6 miles compared to 14 miles? 36mins

27 mins 63mins

8. If Henry plans to cycle 14 miles, how long will it take him? Give your answer in hours.

1 hour 3mins

63 minutes

60 + 3 mins

1 hour + 3 mins

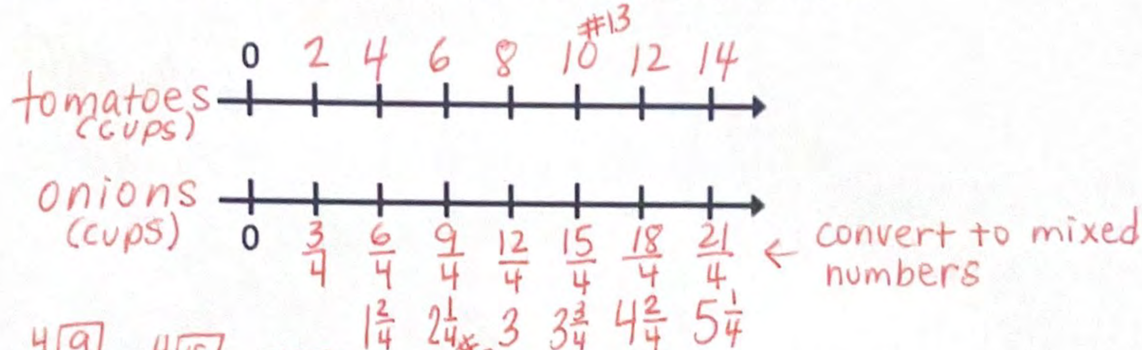
A recipe for Pico de Gallo is shown.

Pico de Gallo

2 cups tomatoes
¾ cup onion
½ cup cilantro
¼ Tbsp oregano

Yield 3 cups

9. Construct a double number line to represent the ratio of tomatoes to onions.



$4\overline{)6}$ = 1 R 2, $1\frac{2}{4}$ $4\overline{)9}$ = 2 R 1, $2\frac{1}{4}$ $4\overline{)15}$ = 3 R 3, $3\frac{3}{4}$ $4\overline{)18}$ = 4 R 2, $4\frac{2}{4}$ $4\overline{)21}$ = 5 R 1, $5\frac{1}{4}$

10. How did you label each number line?

Tomatoes in cups & onions in cups

11. By which numbers are you skip counting on each number line? 2 & $\frac{3}{4}$

12. How many cups of tomatoes would be required for 2¼ cups of onions? 6 cups

13. How many cups of onions would you use for 10 cups of tomatoes? $3\frac{3}{4}$ cups

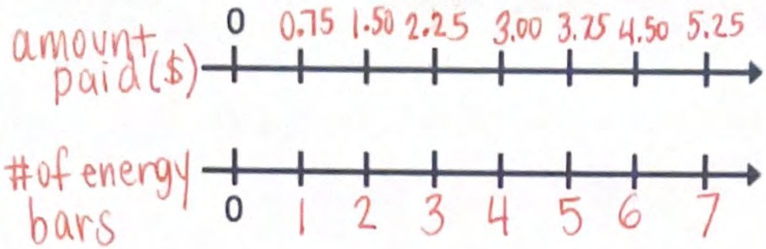
14. Write your own question based on the double number line. Provide the answer. (answers will vary)

How many more cups of onions are needed for 8 versus 2 cups of tomatoes? $3 - \frac{3}{4} = 2\frac{1}{4}$ cup more

Name: ______________________________ G6 U2 Lesson 4 - Independent Practice

Rose pays \$2.25 for 3 energy bars.

1. Construct a double number line to represent the ratio of the amount paid to energy bars purchased by Rose.



Use the double line representing the ratio of \$2.25 for 3 energy bars to answer the following questions.

2. How did you label each number line?

Amount paid in dollars & number of energy bars.

3. By which numbers are you skip counting on each number line? 1 & 0.75

$3\overline{)2.25}$ → ②
-210 | 70
15 | 5
-15 | +
0 | .75 ②

4. How much will 12 energy bars cost? \$9.00

Double 6 bars $\boxed{\text{OR}}$ multiply by unit rate

$4.50 \times 2 = 9.00$ | $12 \times .75 = 9.00$

5. If Rose pays \$13.50, how many energy bars will Rose have purchased? 18 bars

$.75\overline{)13.50}$ ⇒ $75\overline{)1350}$
-750 | 10
600
-600 | 8
0 | +
 | 18

6. Rose wants to buy 30 energy bars. How can we figure out how much Rose will spend on 30 energy bars? How much will Rose pay for 30 energy bars?

Multiply 30 bars by the unit rate which is the cost of 1 bar. $30 \times 0.75 = \$22.50$

G6 U2 Lesson 5

Use equivalent ratios to find unit prices

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G6 U2 Lesson 5 - Students will use equivalent ratios to calculate unit prices

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last lesson on constructing double number lines was foundational for the ratio work ahead. We learned that double number lines have two number lines, one hovering above the other. Their tick markers are perfectly lined up to represent each ratio. This alignment is crucial to finding equivalent ratios. Today we will experience "jumping" on our number lines as opposed to always skip counting like in our previous lesson.

Let's Talk (Slide 3): I want to start with telling you about my friend Martin. Martin loves to read and he is a pretty quick reader. He can read 3 pages per minute. **If we know he can read 3 pages per minute, what else do we know?** Possible Student Answers, Key Points:

- We know that he can read 6 pages in 2 minutes.
- We know he can read 9 pages in 3 minutes.

That's right! If we know that Martin can read 3 pages per minute, or 3 pages for every 1 minute…we can use what we know to create equivalent ratios.

Let's Think (Slide 4): So, we know that fractions and skip counting on double number lines are ways to find equivalent ratios and in this lesson we are going to add to that knowledge by learning about *unit rate*. The term *unit rate* is composed of the terms *unit* and *rate*.

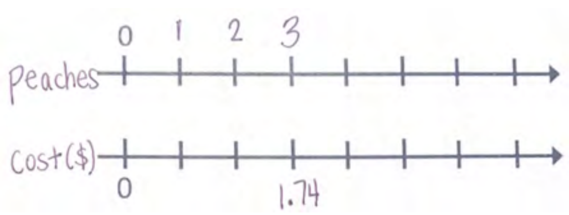
We'll start with rate. A rate is a special ratio that compares quantities with different units like when we talk about the cost of items. The collective term **unit rate** is a type of rate that only focuses on the quantity of 1 when comparing. It may seem a little confusing but it will become much more clear as we continue working.

Here are a few examples of unit rates.

- Imagine I bought a six pack of soda. I know the cost of the whole pack of soda, but unit rate would tell me how much ONE soda costs.
- Or imagine that I run 5 miles, but the unit rate tells me how fast I ran ONE mile.

Let's Think (Slides 5): Look at this sign that I saw at the grocery store. This dash means for so it says 3 peaches for $1.74, in other words three peaches cost $1.74.

Have you ever been to a grocery store and seen a price tag similar to this? Have you ever wondered why they didn't just say how much 1 of the item costs? I certainly have! It's confusing because we don't always want three peaches, so finding the unit rate or the cost of just 1 peach can be helpful. Let's use the double number line to help us.



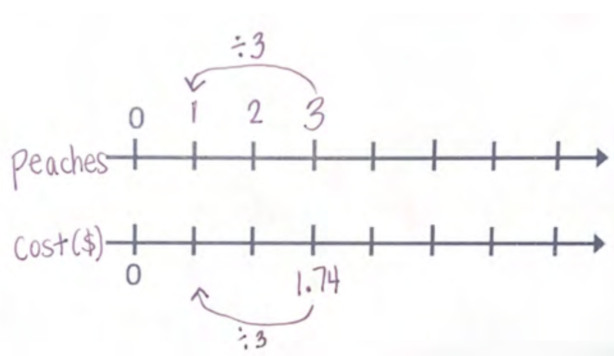
Let's begin by labeling each number line, we're talking about peaches and price, or cost. So let's label the top oneness peaches and the other is labeled cost.

On the peaches number line we can start at 0 and count by one stopping at the third tick mark because we know the price of 3 peaches. And, we know that three peaches cost $1.74 so I am going to put 1.74 on the third tick mark.

Next, we are going to think backwards. In the last lesson we made equivalent ratios by multiplying by whole numbers. But, we are going to use the opposite of multiplication which is division to work backwards to figure out how much ONE peach costs.

Think about this simple math fact family: 3 x 2 = 6 and 2 x 3 = 6. Does anyone know the division facts in our fact family? 6 ÷ 3 = 2 and 6 ÷ 2 = 3 Exactly! 6 divided by 3 equals 2 and 6 divided by 2 equals 3. Our fact family proves that multiplication and division are opposites. So just like our simple fact family, we will be working backwards by dividing to find smaller quantity equivalent ratios, in this case unit price, just like we multiplied to find larger quantity equivalent ratios.

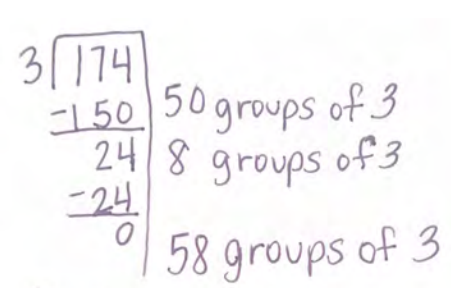
Now remember, ratios are just fractions. To create equivalent fractions we multiplied by the same factor on top and on the bottom of our fraction. That rule works here as well.



We are going to divide by the same number on the top number line and on the bottom number line. Since we know the price of 3 peaches and we want to know the unit price or the price of just 1 peach then we need to figure out what number we will divide 3 by to get to 1.

That's easy; it's 3! 3 divided by 3 equals 1. If we divide by 3 on the top number line then we must also divide by 3 on the bottom number line. So, our math problem will be 1.74 divided by 3.

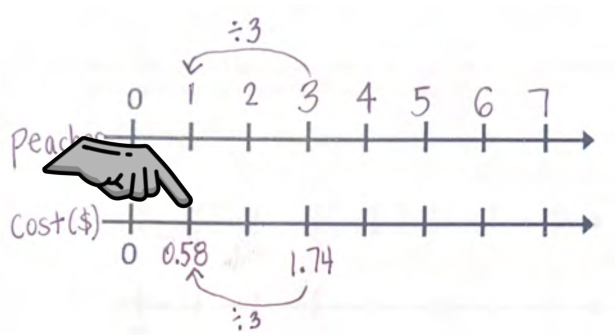
Let's do the math together for 1.74 divided by 3. We begin by thinking of $1.74 as all pennies which would be 174 pennies. This will make our division easier! We need to figure out how many groups of 3 we have in the bigger group of 174.



We have at least 50 groups of 3, which is 150 total, and 174 minus 150 leaves us with 24 remaining to be put into groups.

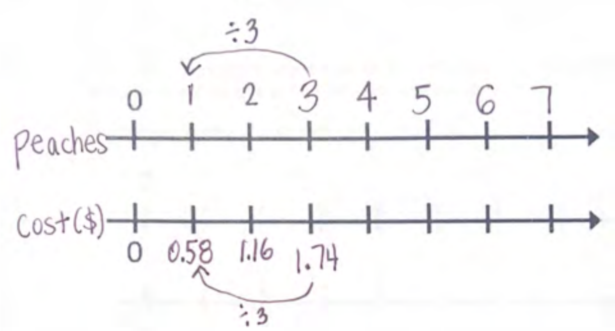
Now, we need to figure out how many groups of 3 we have in the bigger group of 24. That's an easier one, we have 8 groups of 3 because 8 multiplied by 3 is 24. And, 24 minus 24 leaves us with 0 or nothing remaining to put into groups. 50 groups of 3 plus 8 groups of 3 gives us 58 groups of 3.

So, 174 divided by 3 is 58. Almost there! The last thing we need to do is write 58 pennies as dollars and cents…58 pennies is the same as $0.58.



Let's go back to our double number line and label it. We now see that 1 peach costs $0.58. We call the value of 1 thing or quantity the **unit rate** or price. So the unit rate of peaces is $0.58, in other words one peach costs 58 cents!

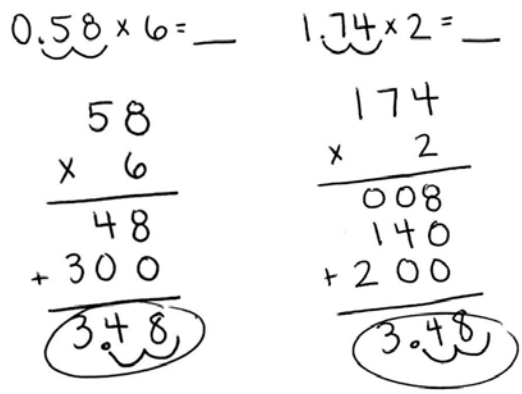
And unit rate is helpful because if we know the unit rate or price of 1 peach then we can figure out the price or cost of any amount of peaches! Let's continue using our double number line to find the price of other numbers of peaches.



First, let's complete the peaches number line by counting on the peaches number line.

Next, we use our unit rate also known as the unit price, 1 peach is $0.58. If we know 1 peach is $0.58 we can multiply 0.58 by 2 peaches to calculate the cost of 2 peaches. 0.58 x 2 = $1.16 for 2 peaches.

Let's Think (Slide 6): Now let's imagine we want to calculate the cost of six peaches. This is when unit rate is helpful, we could again use our unit price.



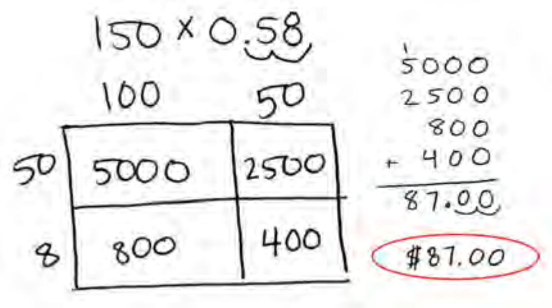
If 1 peach costs $0.58 then we could multiply 0.58 by 6 to calculate the price of 6 peaches. But there is more than one way! We know the price of 3 peaches.

We also know that 3 peaches multiplied by 2 is equal to 6 peaches. So, we can also multiply $1.74 by 2 to calculate the price of 6 peaches.

Aren't double numbers interesting to work with?

Let's Think (Slide 8): One last thing to consider. We are not limited to the tick marks on a double number line. Consider this math problem, "A school cafeteria wants to purchase 150 peaches for a special lunchtime smoothie." The number 150 won't fit on our current number line but that doesn't mean we can't figure it out. How do you think we could calculate the price for 150 peaches? Possible Student Answers, Key Points:

- If we know the price of one peach we can just multiply that by 150.
- Use the unit rate/unit price and multiply $0.58 by 150.
- We know the price of 3 so we could multiply that by 50.



I like how you're thinking! This is why unit rate is helpful! If we know the price of one thing, we can find the price of more than 1 thing. Let's find out the price of 150 peaches. We need to multiply the unit rate, $0.58 by 150, let's use the partial product method.

So, 150 peaches will cost $87!

Wow! We did some deep thinking today. We explored unit rate/unit price to find the cost of one thing. Then we used the price of that one thing to find the cost or price for other, larger quantities. We will continue applying our newly acquired unit rate knowledge in upcoming lessons.

Let's Try it (Slide 8-9): Let's continue applying unit rate/unit price to our double number lines. In our next problem we will see an example of when unit rate/unit price is helpful because of the quantities we are given. Remember that multiplying by the same number for the denominator and numerator creates equivalent ratios and dividing by the same number for the denominator and numerator also creates equivalent ratios.

WARM WELCOME

Today we will use equivalent ratios to calculate unit prices.

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Let's Talk:

If Martin can read 3 pages per minute, what else do we know?

Let's Think:

- ***unit rate*** **is composed of the terms** ***unit*** **and** ***rate***
- ***unit*** **means 1 and** ***rate*** **is a special ratio that compares quantities with different units**
- ***unit rate*** **is a type of rate that focuses on the quantity of 1 when comparing.**

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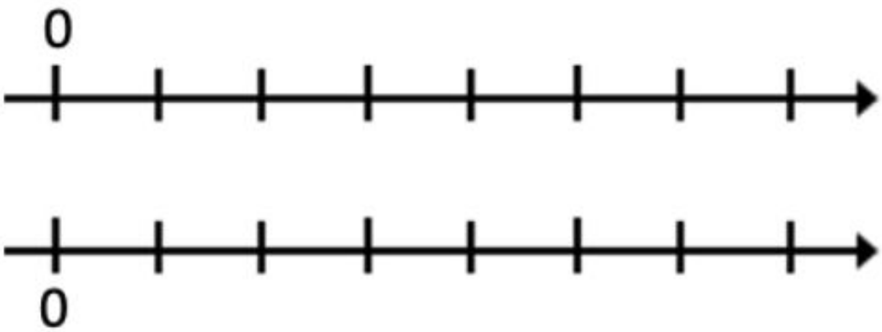
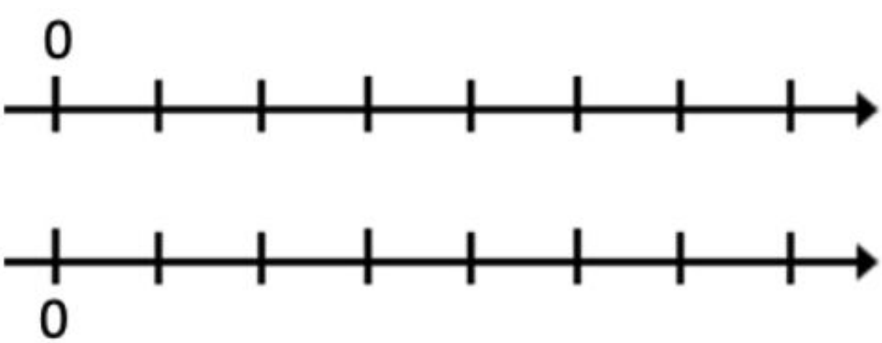
Let's Think: Look at this sign at the grocery store.



Let's Think: How much will 6 peaches cost?



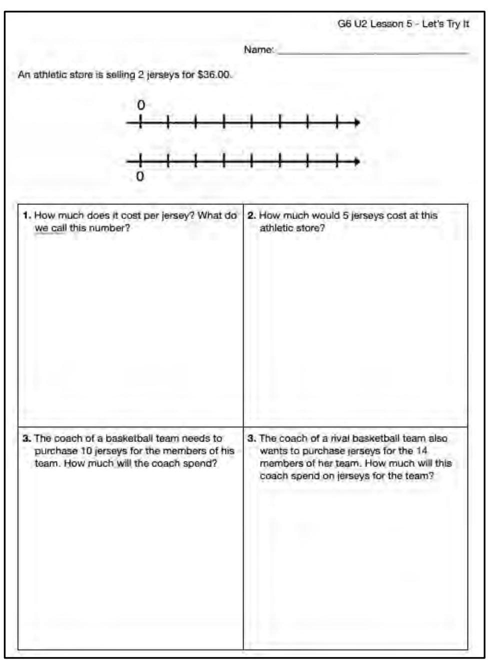
Let's Think:

Imagine a school cafeteria wants to purchase 150 peaches for a special lunchtime smoothie.

How can we calculate the price of 150 peaches?

Let's Try It:

Let's explore using equivalent ratios to calculate unit rate/unit price together.



G6 U2 Lesson 5 - Let's Try It

Name: ____________________

An athletic store is selling 2 jerseys for $36.00.

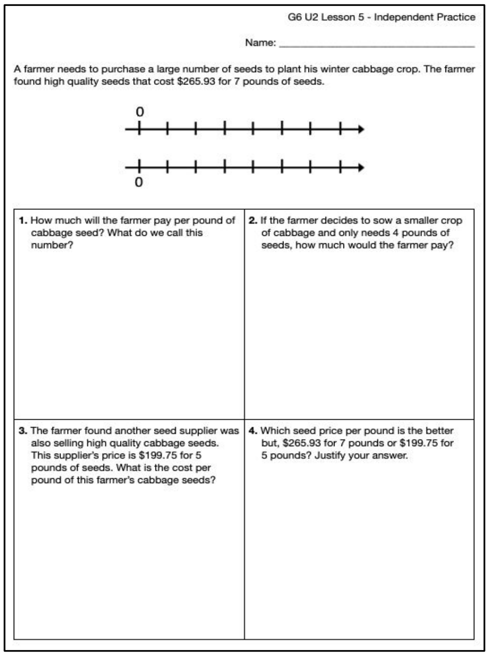
0

0

1. How much does it cost per jersey? What do we call this number?	**2.** How much would 5 jerseys cost at this athletic store?
3. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend?	**3.** The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

On your Own:

Now it's time to explore using equivalent ratios to calculate unit rate/unit price on your own.



G6 U2 Lesson 5 - Independent Practice

Name: ______________________________

A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.

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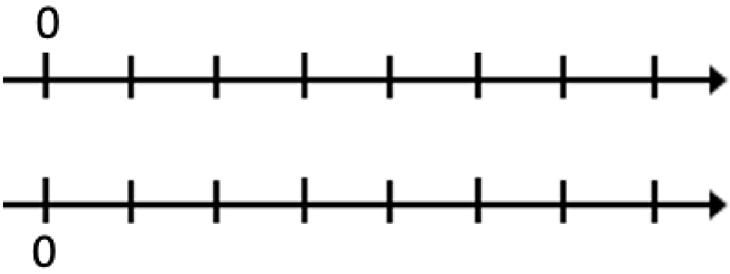
1. How much will the farmer pay per pound of cabbage seed? What do we call this number?	**2.** If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay?
3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier's price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer's cabbage seeds?	**4.** Which seed price per pound is the better but, $265.93 for 7 pounds or $199.75 for 5 pounds? Justify your answer.

An athletic store is selling 2 jerseys for $36.00.



1. How much does it cost per jersey? What do we call this number?

2. How much would 5 jerseys cost at this athletic store?

3. Could you use the double number line to determine your answer? If so, explain how.

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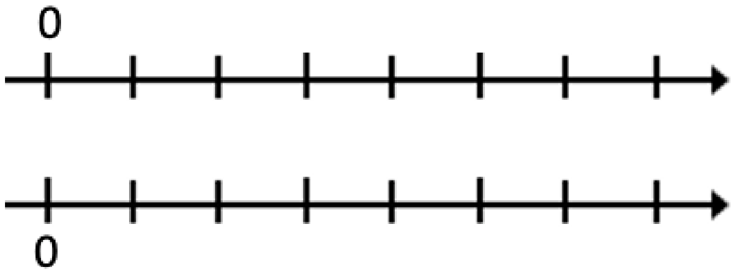
4. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend? Show two different ways to calculate your solution.

5. The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

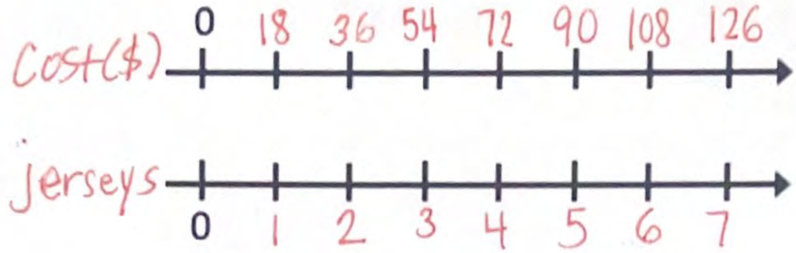
A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.



1. How much will the farmer pay per pound of cabbage seed? What do we call this number?	**2.** If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay?
3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier’s price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer’s cabbage seeds?	**4.** How much money would the famer save by buying from the first seed supplier?

Name: ______________________________ G6 U2 Lesson 5 - Let's Try It

An athletic store is selling 2 jerseys for $36.00.



1. How much does it cost per jersey? What do we call this number?

2 ⟌ 36
−30 | 15
6
−6 | +3
0 | 18

$18 per jersey. We call this the unit rate.

2. How much would 5 jerseys cost at this athletic store?

18 x 5 = $90 for 5 jerseys

3. Could you use the double number line to determine your answer? If so, explain how.

We could complete the number line to include 5 jerseys and the cost of those 5 jerseys.

4. The coach of a basketball team needs to purchase 10 jerseys for the members of his team. How much will the coach spend? Show two different ways to calculate your solution.

Multiply by unit rate
18 x 10 = $180 for 10 jerseys

OR

Double cost of 5 jerseys
5 jerseys costs $90
x 2
$180 for 10 jerseys

5. The coach of a rival basketball team also wants to purchase jerseys for the 14 members of her team. How much will this coach spend on jerseys for the team?

Double 7 jerseys

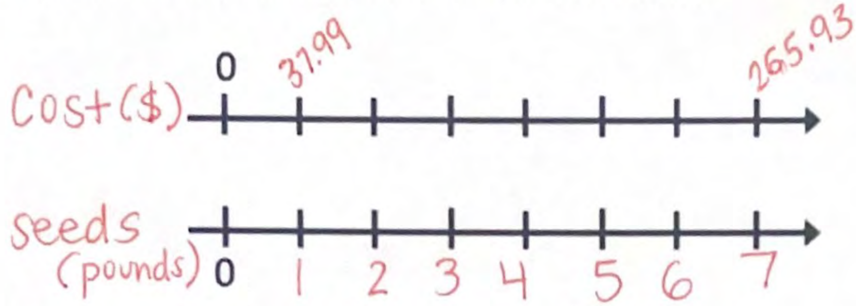
$126 for 7 jerseys
× 2
$252 for 14 jerseys

$\boxed{OR}$

Multiply by the unit rate

18 × 14 = $252 for 14 jerseys

A farmer needs to purchase a large number of seeds to plant his winter cabbage crop. The farmer found high quality seeds that cost $265.93 for 7 pounds of seeds.



1. How much will the farmer pay per pound of cabbage seed? What do we call this number? 7 ⟌265.93 −21000 3000 5593 −4900 700 693 −630 90 63 −63 9 0 + 3799 ② $37.99 per pound of Cabbage seed	**2.** If the farmer decides to sow a smaller crop of cabbage and only needs 4 pounds of seeds, how much would the farmer pay? 37.99 × 4 $151.96 $151.96 for 4 pounds of cabbage seed.
3. The farmer found another seed supplier was also selling high quality cabbage seeds. This supplier's price is $199.75 for 5 pounds of seeds. What is the cost per pound of this farmer's cabbage seeds? 5 ⟌199.75 −15000 3000 4975 −4500 900 475 −450 90 25 5 + 3995 ② $39.95 per pound of Cabbage seed	**4.** How much money would the famer save by buying from the first seed supplier? $39.95 − 37.99 $ 1.96 The farmer would save $1.96.

G6 U2 Lesson 6

Use ratios and diagrams to understand how fast things move

CITYTUTOR DC

G6 U2 Lesson 6 - Students will use ratios and diagrams to understand how fast things move

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last lesson helped us to visually see why double number lines are so important for understanding and calculating equivalent ratios and the special type of ratio called *unit rate*. We saw that when we know the unit rate we are able to determine any number of other quantities within ratio to one another. In our last lesson we looked specifically at unit rate as it related to price. In this lesson we will look at speed or how fast things move.

Let's Talk (Slide 3): Let's go back to the last lesson, **what is unit rate and why is it helpful?** Possible Student Answers, Key Points:

- Unit rate is the rate of 1, for example how much ONE peach costs.
- Unit rate is helpful because if we know how much one thing costs we can multiply by any amount and figure out how much other quantities cost.
- Unit rate can be helpful at the grocery store to help us know how much stuff costs

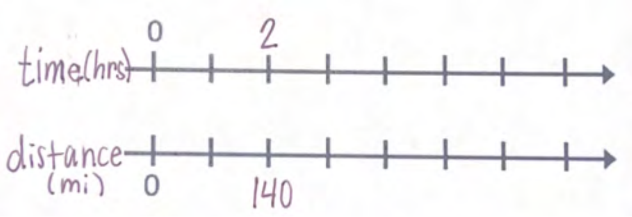
Nice examples of buying or paying for one thing at a store. Our exploration into unit rate and price are showing us that math really is all around us and we use math much more often than we may realize!

Let's Think (Slide 4): Let's continue exploring more unit ratio math in the real-world. You encounter speed, or how fast things move, in your daily life. In ratio form, speed can look like a comparison of distance to time. Some examples include feet per minute, yards per second, or even miles per hour which is the ratio with which you are probably most familiar because that is how a car's speed is calculated. For example, the speed limit is 50 miles per hour. Let's investigate a math problem where we'll look at speed and unit rate.

Let's Think (Slides 5): Listen as I read this slide, Steven and his friends are traveling from their home in Washington, DC to the beach in New Jersey. Before leaving, they decided to record how long it would take them to get to a restaurant for lunch along the way. They recorded that they traveled 140 miles in 2 hours

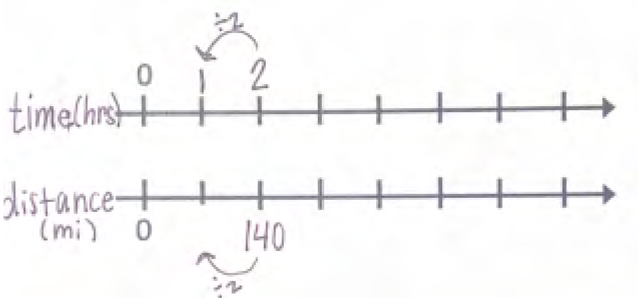
Interesting, so it took them 2 hours to travel 140 miles. Let's use the double number line to calculate the unit rate or how far they traveled in just 1 hour.

Remember that when we travel by car in the United States, we record our speed as a unit rate, we say "miles per hour." "Per hour" means how many miles in 1 hour so that makes it a unit rate.

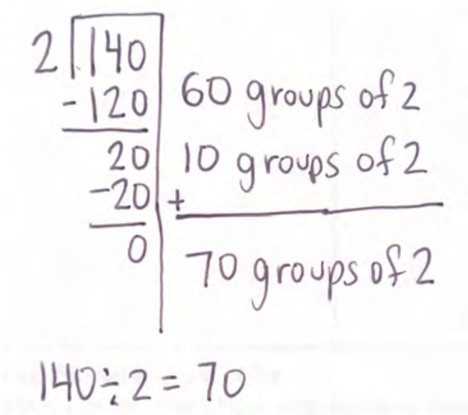


So, on our double number line we will use one number line for distance or miles and the other number line for time or hours.

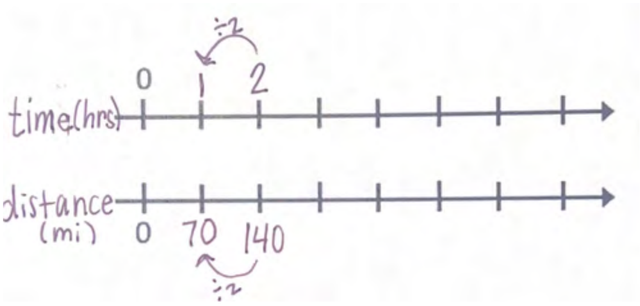
Next we place 2 on the time number line to represent 2 hours and 140 at the same point to represent 140 miles in 2 hours. Notice we are leaving space for our unit rate of 1 hour on the number line, because we don't know that yet.



Our next step is to think about how to calculate the unit rate or the distance at 1 hour. Well, we know the distance for 2 hours but need the distance for 1 hour so we divide 2 by 2 on the top number line. And remember, what we do to the top we have to do to the bottom. So, if we divide by 2 on the top number line then we must also divide by 2 on the bottom number line.



Our math problem will be 140 divided by 2. Let's do the division for 140 by 2. We need to figure out how many groups of 2 we have in the bigger group of 140. We have at least 60 groups of 2 or 120 total. Next, we need to figure out how many groups of 2 we have in the bigger group of 20. That's an easier one, we have 10 groups of 2 because 10 multiplied by 2 is 20. And, 20 minus 20 leaves us with 0 or nothing remaining to put into groups. Last, 60 groups of 2 plus 10 groups of 2 gives us 70 groups of 2. So, 140 divided by 2 is 70! And look, that makes sense because half of 14 is 7, so half of 140 is 70.



Let's place 70 on the distance number line directly under the tick mark with 1. Now we see that the friends traveled 70 miles in 1 hour so their speed was 70 miles per 1 hour or 70 miles per hour; this is our unit rate. Also, 2:140 and 1:70 are equivalent ratios.

Do you see how all of your hard work with ratios is paying off? We were able to construct a double number line using our initial ratio of 140 miles in 2 hours then use that ratio to calculate the unit rate or how far the friends traveled in 1 hour. Remember that unit rate is the amount per 1.

And this unit rate can help us calculate how far they can go in 3 or 4 or 5 hours. And guess what? In our next lesson we will be introduced to a new ratio diagram to help us think about ratios.

Let's Try it (Slide 7): Let's continue using unit rates to calculate equivalent fractions from our double number lines. Remember, whichever operation and number you use to calculate with on one number line, you must also use that operation and number on the other number line. That is the only way to create equivalent fractions or ratios.

WARM WELCOME

Today we will use ratios and diagrams to understand how fast things move.

Let's Talk:

What is unit rate? Why is it helpful?

Let's Think:

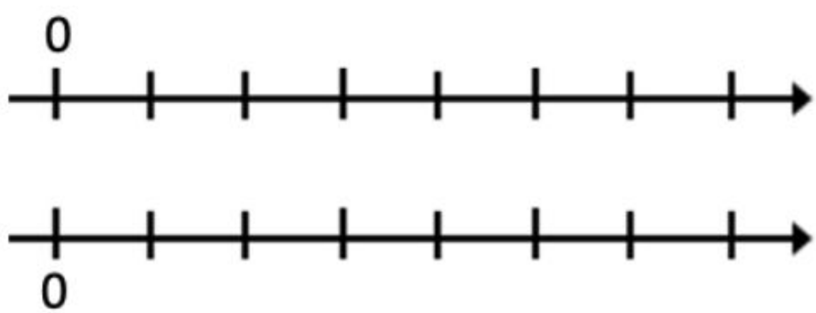
You encounter speed, or how fast things move, in your daily life. In ratio form, speed can look like a comparison of distance to time.

So, speed is how far you go over a period of time.

Let's Think:

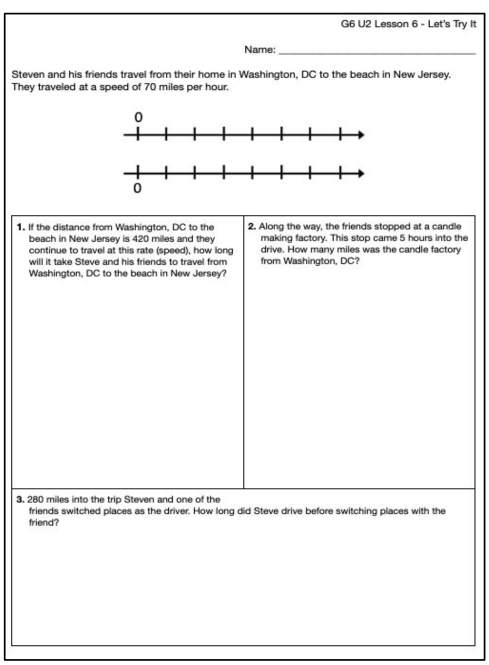
Steven and his friends are traveling from their home in Washington, DC to the beach in New Jersey. Before leaving, they decided to record how long it would take them to get to a restaurant for lunch along the way.

They recorded that they traveled 140 miles in 2 hours.



Let's Try It:

Let's explore how fast things move together.



G6 U2 Lesson 6 - Let's Try It

Name: ______________________

Steven and his friends travel from their home in Washington, DC to the beach in New Jersey. They traveled at a speed of 70 miles per hour.

0

0

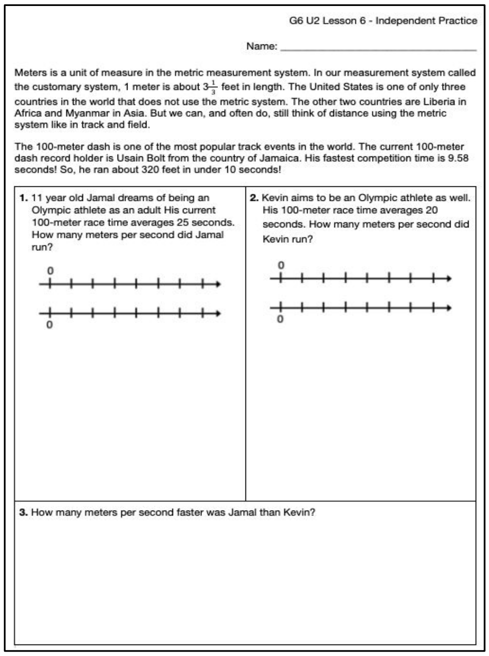
1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this rate (speed), how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?

2. Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?

3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?

On your Own:

Now it's time to explore how fast things move on your own.



G6 U2 Lesson 6 - Independent Practice

Name: ______________________________

Meters is a unit of measure in the metric measurement system. In our measurement system called the customary system, 1 meter is about $3\frac{1}{3}$ feet in length. The United States is one of only three countries in the world that does not use the metric system. The other two countries are Liberia in Africa and Myanmar in Asia. But we can, and often do, still think of distance using the metric system like in track and field.

The 100-meter dash is one of the most popular track events in the world. The current 100-meter dash record holder is Usain Bolt from the country of Jamaica. His fastest competition time is 9.58 seconds! So, he ran about 320 feet in under 10 seconds!

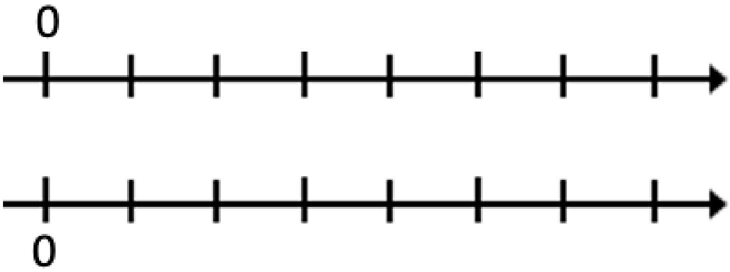
1. 11 year old Jamal dreams of being an Olympic athlete as an adult His current 100-meter race time averages 25 seconds. How many meters per second did Jamal run?

2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second did Kevin run?

3. How many meters per second faster was Jamal than Kevin?

Name: ___________________________________

Steven and his friends travel from their home in Washington, DC to a beach in New Jersey. They traveled at an average speed of 70 miles per hour.

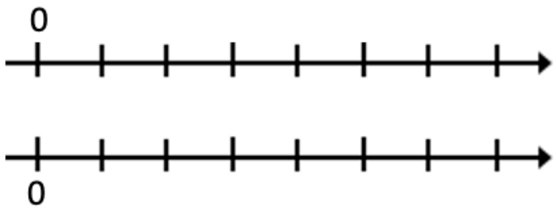


1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this speed, how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?	**2.** Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?
3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?	**4.** They also stopped for a bathroom break 2½ hours into the trip. How many miles had they traveled when they stopped for the break?

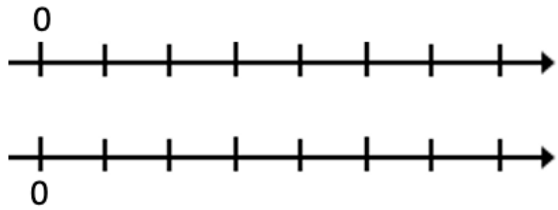
Meters is a unit of measure in the metric measurement system. In our measurement system called the customary system, 1 meter is about $3\frac{1}{3}$ feet in length. The United States is one of only three countries in the world that does not use the metric system. The other two countries are Liberia in Africa and Myanmar in Asia. But we can, and often do, still think of distance using the metric system like in track and field.

The 100-meter dash is one of the most popular track events in the world. The current 100-meter dash record holder is Usain Bolt from the country of Jamaica. His fastest competition time is 9.58 seconds! That means, he ran about 320 feet in under 10 seconds!

1. 11 year old Jamal dreams of being an Olympic athlete. His current 100-meter race time averages 25 seconds. How many meters per second is Jamal running?



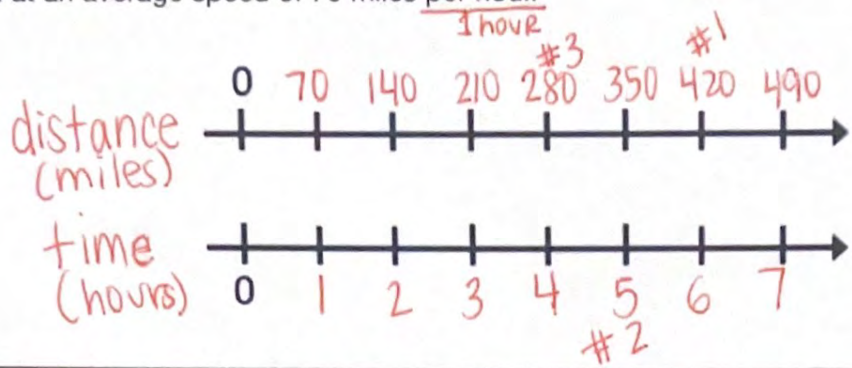
2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second is Kevin running?



3. Who runs faster? How many meters per second faster is that runner?

Name: ______________________________

Steven and his friends travel from their home in Washington, DC to a beach in New Jersey. They traveled at an average speed of 70 miles per hour.



1. If the distance from Washington, DC to the beach in New Jersey is 420 miles and they continue to travel at this speed, how long will it take Steve and his friends to travel from Washington, DC to the beach in New Jersey?

6 hours to the beach

2. Along the way, the friends stopped at a candle making factory. This stop came 5 hours into the drive. How many miles was the candle factory from Washington, DC?

350 miles from Washington DC

3. 280 miles into the trip Steven and one of the friends switched places as the driver. How long did Steve drive before switching places with the friend?

Steve drove 4 hours before switching with a friend.

4. They also stopped for a bathroom break 2½ hours into the trip. How many miles had they traveled when they stopped for the break?

$2\frac{1}{2} \times 70$

$\downarrow$

$\frac{5}{2} \times \frac{70}{1} = \frac{350}{2} = 175$

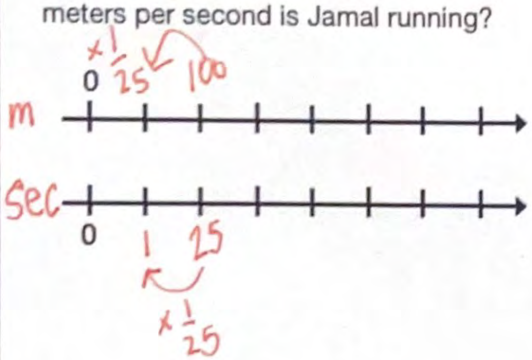
$350 \div 2$: $350 - 300 = 50$ (150); $50 - 50 = 0$ (25); $150 + 25 = 175$

175 miles before a break.

Meters is a unit of measure in the metric measurement system. In our measurement system called the customary system, 1 meter is about $3\frac{1}{3}$ feet in length. The United States is one of only three countries in the world that does not use the metric system. The other two countries are Liberia in Africa and Myanmar in Asia. But we can, and often do, still think of distance using the metric system like in track and field.

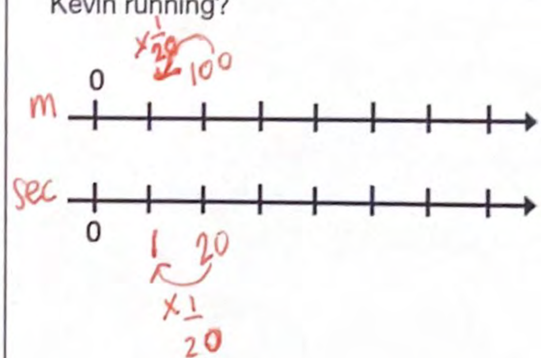
The 100-meter dash is one of the most popular track events in the world. The current 100-meter dash record holder is Usain Bolt from the country of Jamaica. His fastest competition time is 9.58 seconds! That means, he ran about 320 feet in under 10 seconds!

1. 11 year old Jamal dreams of being an Olympic athlete. His current 100-meter race time averages 25 seconds. How many meters per second is Jamal running?



$\frac{100}{1} \times \frac{1}{25} = \frac{100}{25} = 4 m/s$

2. Kevin aims to be an Olympic athlete as well. His 100-meter race time averages 20 seconds. How many meters per second is Kevin running?



$\frac{100}{1} \times \frac{1}{20} = \frac{100}{20} = 5 m/s$

3. Who runs faster? How many meters per second faster is that runner?

Kevin ran faster than Jamal. Kevin ran 5m/s while Jamal ran 4m/s. Kevin ran 1m/s faster than Jamal.

G6 U2 Lesson 7

Use tables to find equivalent ratios

CITYTUTOR DC

G6 U2 Lesson 7 - Students will use tables to calculate equivalent ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Our last few lessons have focused on using double number lines to find equivalent ratios. In this lesson we will explore how tables can help us find equivalent ratios. You used tables in elementary school when looking at data. Using tables with ratios is an important skill in sixth grade math all the way through Algebra 1 which is a high school course.

Let's Talk (Slide 3): Let's brainstorm, **what do you know about tables? How can they help us in math?**
Possible Student Answers, Key Points:

- They have rows and columns.
- They have headings.
- Sometimes, they contain data, the information can be used to make graphs.
- Tables are a way to visually represent information in a way that is easy to see and analyze.

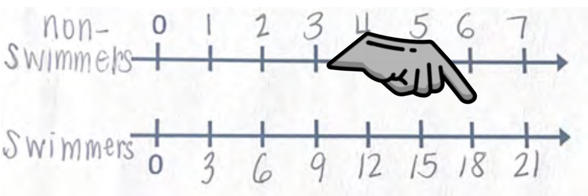
That was long ago but you remember a lot about tables. You may remember using tables connected to graphs like bar graphs, line graphs, and even pictographs. Tables contain information that is often used to make graphs. We have also used tables in the past to help us solve problems.

Let's Think (Slide 4): When reading tables we need to be able to name the parts that they are made of. The most important parts of tables are columns and rows. Recognizing the difference between columns and rows is the first step to fully understanding tables. There are some real-world examples that make it easier to differentiate between columns and rows.

In the real world, the tall structures in front of some buildings are called columns. Notice they go from near the top of the building to the ground, up and down. In that same way, columns on a mathematical table go up and down as well

For rows we think of the nursery rhyme *Row, Row, Row Your Boat*. When you row a boat you use oars and you move the oars from side-to-side. We can also think of rows in a movie theater, they go from side to side. In that same way, rows on a table go from side-to-side, left to right and right to left.

Let's Think (Slide 5): Let's look at a ratio example with which we will use a table to display our information. A summer camp has a strict ratio of campers who can't swim to those campers who can swim. Their ratio of summers who can't swim to those who can is 1:3. What do you think the ratio 1:3 means in this situation? For every 1 camper who can't swim, there are 3 campers who can swim. Nice thinking! The 1:3 ratio means that for every 1 non-swimming camper, there are 3 campers who can swim that are attending the camp.



FIrst, let's complete a double number line to show the information we already have about the campers. To construct a double number line we first label each number line. Next add 1 on the non-swimmer number line and 3 on the swimmer number line at the first tick marks after the zeros.

Based on the double number line, if there are 6 non-swimmers, how many swimmers can attend the camp? 18 swimmers. That's right! Looking at the double number line we see 6 on the top number line for non-swimmers and when we follow that down to its matching tick mark we see 18 on the swimmers number line.

Now, let's use our double number line to put the same information into a table.

Swimmers	non-Swimmers
3	1
6	2
9	3
12	4

The top row of a table is always labeled with headings to describe the quantities we're comparing. In this problem the headings are swimmers and non-swimmers.

Next we will fill in the table being careful to place the information under the correct heading. First, we know that for every 3 swimmers, there can be one non-swimmer (*fill in row*). Just like we can skip count on the double number, we do the same thing with the table. So..3, 6, 9, 12 in the swimmers column. And then we can fill in the information for the non-swimmers, we'll just count by 1.

You may not have noticed yet but if you were to turn your table onto its side it looks really similar to our double number lines.

Just like with the double number line there are so many questions we could ask and answer with our table. What if we were asked to determine how many non-swimmers are attending the camp if 9 swimmers were attending the camp? 3 non-swimmers. Yes. Both our table and double number show us that if 9 swimmers attend camp then 3 non-swimmers can attend camp.

So we have learned to use diagrams, double number lines, and tables to represent our ratios. All of these tools but let's talk about limitations. No diagram is perfect. Sometimes there isn't enough space for your numbers or ratios, sometimes the diagram isn't long enough to include your data. Also, skip counting can result in long tables that take up a lot of room. There will be solutions to these table limitations in upcoming lessons but, for now, focus on mastering either the double number line diagram, the table, or both! As mathematicians, it is really important that we can represent our information and numbers in a visual way.

Let's Try it (Slide 8): Let's continue our work with double number lines and corresponding ratio tables. Don't forget, just like with double number lines, you must ensure that you are correctly placing information with the correct heading/label. That is the only way to create accurate equivalent fractions or ratios.

WARM WELCOME

Today we will use ratio tables to calculate equivalent ratios.

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Let's Talk:

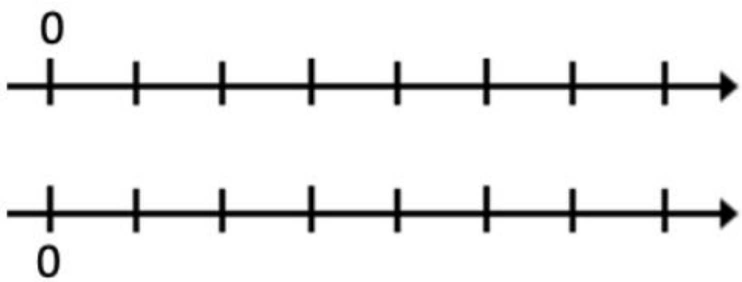
What do you know about tables? How can they help us in math?

Let's Think:

Let's ensure we can read tables, correctly.

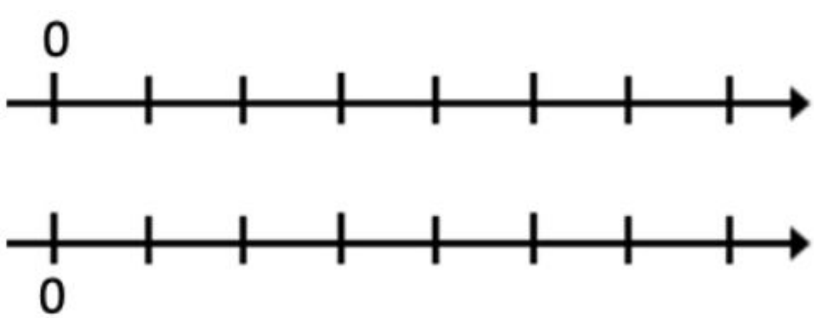
Let's Think:

A summer camp has a strict ratio of campers who can't swim to those campers who can swim. Their ratio is 1:3.



Let's Think:

Let's complete a double number line then translate that information into a table.



Let's Try It:

Let's explore using ratio tables together.

G6 U2 Lesson 7 - Let's Try It

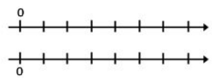
Name: ______________________________

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram as you answer the questions.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4



1. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?	**2.** If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?
3. If 16 tablespoons of sugar are used to make pancakes, how much salt is needed?	**4.** A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed?

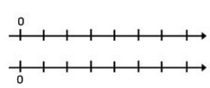
On your Own:

Now it's time to explore ratio tables on your own.

G6 U2 Lesson 7 - Independent Practice

Name: ______________________________

In a shopping plaza there is a 2:5 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram as you answer the questions.



1. There are 35 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?	**2.** There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?
3. If there are 8 compact parking places in front of the dry cleaner's, how many parking spaces in front of the dry cleaner's?	**4.** Complete the table.

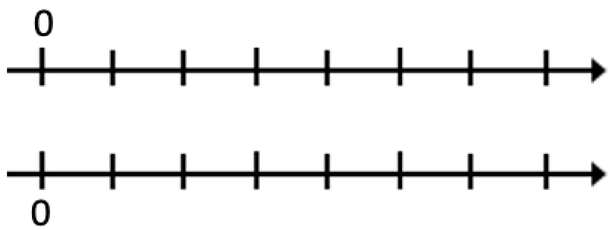
Compact	Standard
2	5
10	
	75
150	

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram based on the information.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4



1. Where do you see the unit rate on the double number line and table?

____

____

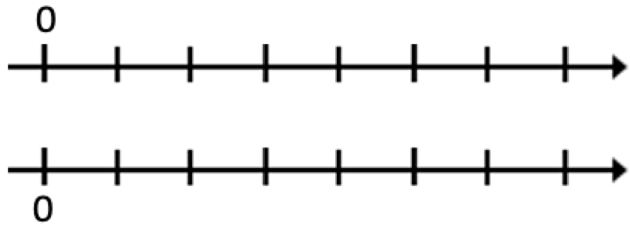
2. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?

3. If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?

4. If 18 tablespoons of sugar are used to make pancakes, how much salt is needed?	**5.** A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed?

Name: ____________________________________

In a shopping plaza there is a 2:6 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram based on the information.



1. Calculate the unit rate for compact vehicles to standard size vehicles. Add the unit rate to your double number line and table.

____

____

2. There are 42 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?

3. There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?

4. Complete the table.

Compact	**Standard**
2	6
10	
	90
150	

5. Wayne believes he counts 12 compact spaces in front of the dry cleaner's and 25 standard size spaces. Is Wayne correct? Explain your answer and justify your reasoning.

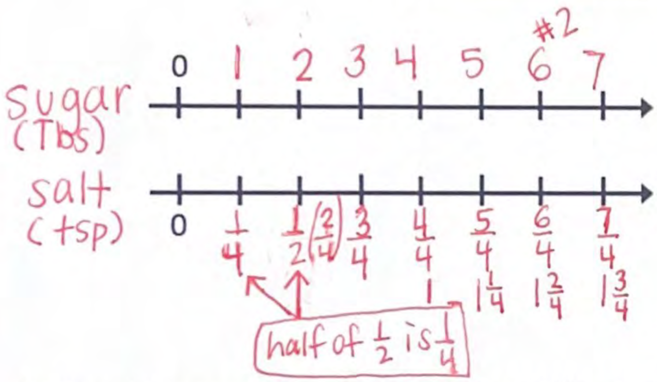
Name: ________________________________

Time to make pancakes! The recipe for pancakes is shown below. We are going to compare the use of salt to sugar in the pancake recipe. Complete each diagram based on the information.

Pancakes

- 1 cup all-purpose flour
- 2 tablespoons sugar
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- 2 tablespoons butter
- 1 large egg

Serves 4



sugar	salt
1	1/4
2	1/2
6	3/2 = 1 1/2
10	2 1/2
18	4 1/2

×3 ×5 ×3 ×3 ×3 ×5

$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=2\frac{1}{2}$ So multiply $\frac{1}{2}$ by 5

1. Where do you see the unit rate on the double number line and table?

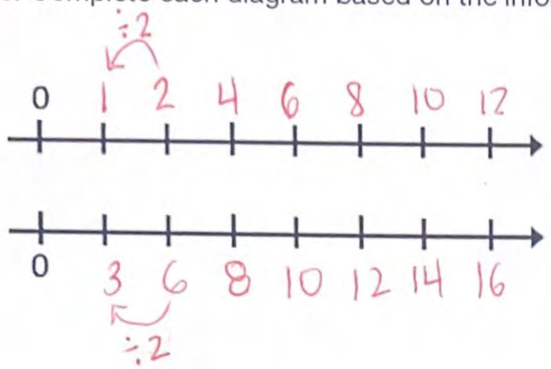
Unit rate is the first tick mark after zero and on the table it is the row below the labels/headings.

2. If 6 tablespoons of sugar are used to make pancakes, how much salt is needed?	**3.** If 2½ teaspoon of salt are used to make pancakes, how much sugar is needed?
$1\frac{1}{2}$ tsp of salt	The table tells me that I need to multiply by 5 to go from $\frac{1}{2}$ to $2\frac{1}{2}$. So, $2 \times 5 = 10$ tbs of sugar.

4. If 18 tablespoons of sugar are used to make pancakes, how much salt is needed? On the table I can multiply 6 by 3 to get 18. So, I also multiply $1\frac{1}{2}$ by 3. $1\frac{1}{2} \times 3$ $\Downarrow$ $\frac{3}{2} \times \frac{3}{1} = \frac{9}{2} = 4\frac{1}{2}$ $9 - 8 = 1$, $9 \div 2 = 4$ r 1 18 Tbs sugar needs $4\frac{1}{2}$ tsp of sugar	**5.** A chef was tasked with making a large batch of pancake batter for customers. The chef used 10 teaspoons of salt in the batter, how much sugar is needed? The double number line tells me 1 tsp of salt needs 4 Tbs of sugar. $\frac{\text{salt } 1}{\text{sug. } 4} \times \frac{10}{10} = \frac{10}{40}$ So 40 Tbs of sugar

Name: ______________________

In a shopping plaza there is a 2:6 ratio for parking spaces for compact vehicles to standard size vehicles. Complete each diagram based on the information.



x½ OR ÷2 ; x7 ; x12 — x½ OR ÷2 ; x7 ; x12

Compact	Stand.
1	3
2	6
14	42
24	72

1. Calculate the unit rate for compact vehicles to standard size vehicles. Add the unit rate to your double number line and table.

Make compact spaces the unit rate because 2÷6 isn't a whole space but 2÷2 will.

2. There are 42 standard size parking spaces in front of the party supply store. How many compact parking spaces are in front of the party supply store?

$\frac{2}{6} \times \frac{7}{7} = \frac{?}{42}$ $\frac{\text{compact}}{\text{standard}}$

$2 \times 7 = 14$

14 compact parking spaces

3. There are 24 compact size parking spaces in front of the bowling alley. How many standard parking spaces are in front of the bowling alley?

$\frac{2}{6} \times \frac{12}{12} = \frac{24}{?}$ $\frac{\text{compact}}{\text{standard}}$

$6 \times 12 = 72$

72 standard cards

4. Complete the table.

Compact	Standard
2	6
10	30
30	90
150	450

×15 ×5 ×5 ×5 ×15 ×5

5. Wayne believes he counts 12 compact spaces in front of the dry cleaner's and 25 standard size spaces. Is Wayne correct? Explain your answer and justify your reasoning.

$$\frac{\text{Compact}}{\text{Standard}} = \frac{2}{6} \overset{\times 6}{\underset{\text{not } \times 6}{=}} \frac{12}{25}$$

Wayne is incorrect. The ratios $\frac{2}{6}$ and $\frac{12}{25}$ are not equivalent. If Wayne counted 12 compact spaces he would have also counted 36 standard spaces and not 25 to be within the 2 to 6 space ratio

G6 U2 Lesson 8

Solve equivalent ratio problems by finding the rate per 1 in a table

CITYTUTOR DC

G6 U2 Lesson 8 - Students will solve equivalent ratio problems using unit rate in a table

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We've already learned so much in this ratio unit! We learned that ratios are comparisons of quantities. We also learned that unit rate tells us the quantity of something per one. And finally, we learned to use diagrams such as double number lines and tables to visually represent information and find equivalent ratios. When we incorporated tables after learning double number lines we found that sometimes there are limitations. In this lesson we will eliminate the most glaring limitation of tables as we learn to be even more efficient by first calculating the unit rate before other equivalent ratios.

Let's Talk (Slide 3): Let's start with a brainstorm, **how are double number lines and tables alike? How are they different?** Possible Student Answers, Key Points:

- Tables and double number lines both have headings or labels.
- They both have numbers, ratios, and are organized.
- They both can help us find equivalent ratios either by multiplying or dividing.
- They're different because tables have columns and rows while double number lines have tick marks.
- Tables are constructed vertically while double number lines are constructed horizontally.

Nice responses. Tables and double number lines both organize information and have headings/labels, numbers, and ratios. They are different because tables have columns and rows and are constructed vertically or up and down while double number lines are marked incrementally with tick marks and are constructed horizontally or from side-to-side.

Let's Think (Slide 4): Most of the double number lines and tables with ratios that we've constructed so far have followed skip counting patterns or they have had compatible or friendly numbers. But, today our focus is on tables with unit rates where skip counting isn't always helpful and numbers aren't always compatible or friendly.

Let's look at this table. What does our table tell us so far? There are 6 pens and they cost $30, also there are 25 pens but we don't know how much they cost. That's right! Our table tells us that you can buy 6 pens for $30 but that we don't yet know the cost of 25 pens.

If we considered buying 25 pens and wanted to know the price it would be easiest to know the price of 1 pen first. That's why there's an empty space on the table underneath the original ratio. In previous lessons we may have jumped directly from 6 to 25 by multiplying but this problem doesn't contain compatible or friendly numbers. Compatible numbers are considered friendly because it is easy to calculate between them, think along the lines of fact families. We can easily decide what to multiply 6 by to reach 24; 24 would be easy because 6 x 4 equals 24 but 25 isn't that easy. There is no whole number you can multiply by 6 to give you 25.

	number of pens	price ($)	
÷6	6	30	÷6
	1		
	25	?	

So, instead let's find the price of 1 pen which is our unit rate. We need to somehow go from 6 pens to 1 pen on the table. In terms of calculating you would divide by 6 because 6 divided by 6 equals 1. But, when we deal with ratios we want to start speaking in terms of multiplying instead of just dividing. So what multiplication problem is equivalent or the same as dividing by 6? Multiplying by $\frac{1}{6}$.

Note: This concept requires a strong number sense; if students struggle to come up with the answer then pose this problem to get them thinking "If you divided by 2, what would be the equivalent or same thing in division?" the answer is multiply by $\frac{1}{2}$; the posed problem is more accessible because dividing by 2 is the same as taking one-half.

So, let's multiply both sides of the table by ⅙ instead of dividing by 6.

	number of pens	price ($)	
	6	30	
$\times\frac{1}{6}$			$\times\frac{1}{6}$
	25	?	

Let's draw arrows from 6 to the empty space underneath it and from 30 to the empty space underneath it. Next, we write *x* ⅙ next to each arrow, remember this is the same as dividing by 6.

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

Let's look again at the math for $\frac{6}{1}$ multiplied by $\frac{1}{6}$ equals $\frac{6}{6}$ or 1. Now we have the factor we need to calculate our unit rate.

$$\frac{30}{1} \times \frac{1}{6} = \frac{30}{6} = 5$$

So, we know we're finding the price of ONE pen. Now we need to know exactly how much is costs. So we'll multiply 60 by ⅙ as well.

Let's put this new information on our table. We see that the price for 1 pen is $5. This is our unit rate and it will help us to determine the price for 25 pens!

	number of pens	price ($)	
	6	30	
$\times\frac{1}{6}$	1	5	$\times\frac{1}{6}$
	25	?	

The same way we figured out that we needed to multiply 6 by ⅙ to give us 1, we now need to figure out what we multiply by 1 to give us 25. It's simpler though because 1 and 25 are compatible numbers; 1 multiplied by 25 equals 25.

	number of pens	price ($)	
	6	30	
$\times\frac{1}{6}$	1	5	$\times\frac{1}{6}$
x25	25	? = 125	x25

So, on each side of our table we draw an arrow and multiply by 25. When we multiply 5 by 25 we see that the price of 25 pens is $125.00 *(write 125 in the table last row, price column).*

Believe it or not, we can now use our unit rate of 1 pen for $5 to find the price of any number of pens, even one million pens! That is the power of unit rate! Once you have calculated the unit rate or amount per 1 of something then you can create an infinite number of equivalent ratios just like 1:$5, 6:$30, and also 25:$125.

Let's Try it (Slide 6): Let's continue our work with tables and unit rate to determine our equivalent ratios. Remember unit rate is amount per 1 of something; per 1 dog, per 1 car, per 1 pen, etc.

WARM WELCOME

Today we will solve equivalent ratio problems using unit rate in a table.

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Let's Talk:

How are double number lines and tables alike? How are they different?

Let's Think:

What does this table tell us so far?

number of pens	price ($)
6	30
25	?

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Let's Try It:

Let's explore unit rate in tables together.

G6 U2 Lesson 8 - Let's Try It

Name: ______________________

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?

goldfish	minnows
4	8
17	?

1. Use the table to calculate the unit rate.	**2.** How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?
3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish. How would you use this table to determine the number of minnows William's fish tank can hold?	**4.** If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

On your Own:

Now it's time to explore unit rate in tables on your own.

G6 U2 Lesson 8 - Independent Practice

Name: ______________________

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

yellow	blue
3	6
10	?

1. Use the table to calculate the unit rate.	**2.** How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?
3. The artist decided they needed 9 gallons of yellow paint. How would you use this table to determine the amount of blue paint the artist needs to purchase?	**4.** If the artist decided they needed 9 gallons of yellow paint. How much blue paint does the artist need to purchase?

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?

goldfish	minnows
4	8
17	?

1. Use the table to calculate the unit rate.	**2.** How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?
3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish. How would you use this table to determine the number of minnows William's fish tank can hold?	**4.** If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

yellow	blue
3	5
10	?

1. Use the table to calculate the unit rate.	**2.** How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?
3. The artist decided they needed 9 gallons of yellow paint. How would you use this table to determine the amount of blue paint the artist needs to purchase?	**4.** If the artist decided they needed 9 gallons of yellow paint. How much blue paint does the artist need to purchase?

Due to how large the fish grow in a tank, the pet shop owner suggests to customers which fish can cohabitate in their home fish tank. In the pet shop, the owner has a tank filled with goldfish and minnows at the ratio he recommends. When counted, the tank is holding 4 goldfish and 8 minnows.

Knowing how many fish are in the tank and that they are within ratio, how many minnows would a tank hold if there are 17 goldfish?

	goldfish	minnows	
	4	8	
$\times\frac{1}{4}$	1	2	$\times\frac{1}{4}$
$\times 17$	17	? 34	$\times 17$

1. Use the table to calculate the unit rate.

See table

	g	m	
	4	8	
$\times\frac{1}{4}$	1	2	$\times\frac{1}{4}$

1 goldfish for every 2 minnows

2. How can we use the unit rate to determine how many minnows would be in the tank if there are 17 goldfish?

See table

	g	m	
	1	2	
$\times 17$	17	34	$\times 17$

34 minnows for 17 goldfish

3. William has a tiny fish tank that only holds a small number of fish. His fish tank can only hold 3 goldfish.

How would you use this table to determine the number of minnows William's fish tank can hold?

I would use the unit rate of goldfish to minnows then, multiply by 3.

	g	m	
	1	2	
$\times 3$	3	?	$\times 3$

4. If the tank can only hold 3 goldfish, how many minnows does the small tank hold?

	g	m	
	1	2	
$\times 3$	3	6	$\times 3$

6 minnows for every 3 goldfish

Name: ______________________________ G6 U2 Lesson 8 - Independent Practice

Juanita is painting a mural and needs to purchase gallons of paint in two colors, yellow and blue. The ratio of yellow to blue paint is 3 to 5.

yellow	blue
3	5
1	$5/3 = 1\frac{2}{3}$
10	?

$\times\frac{1}{3}$ $\times 10$

1. Use the table to calculate the unit rate.

see table

y	b
3	5
1	$\frac{5}{3}$ OR $1\frac{2}{3}$

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

2. How can we use the unit rate to determine how many gallons of blue paint would be needed to stay within the ratio?

Multiply the unit rate by 10 on each side. So, $\frac{5}{3} \times \frac{10}{1} = \frac{50}{3}$ OR $16\frac{2}{3}$ gallons of blue paint.

$50 \div 3$: $50 - 30 = 20$ (10), $20 - 18 = 2$ (6), 16 R 2

3. The artist decided they needed 9 gallons of yellow paint.

How would you use this table to determine the amount of blue paint the artist needs to purchase?

Multiply by 3 on both sides because 3 x 3 will give you 9 gallons of yellow paint. So, you also multiply 5 gallons of blue paint by 3.

4. If the artist decided they needed 9 gallons of yellow paint. How much blue paint does the artist need to purchase?

y	b
3	5
9	15

$\times 3$

15 gallons of blue paint.

G6 U2 Lesson 9

Solve word problems involving equivalent ratios

G6 U2 Lesson 9 - Students will solve word problems involving equivalent ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): In our second-to-last lesson in Unit 2 we are incorporating everything that we have learned about ratios. Now that you know so much, it's time for you to begin making decisions about how you are going to solve the ratio problems and which diagram you will utilize. You may decide to use a double number line or a table depending on the size of the number in your ratios and the compatibility of the numbers but also depending on your comfort level with the diagrams and the math calculations.

Let's Talk (Slide 3): So, let's open with a brainstorm. **Do you prefer double number lines or tables? Why?**

Those are interesting reasons for choosing a double number line or a table to solve ratio problems. Your decision can be anything from the amount of space you have to write, preferring to see your information organized vertically which means up and down versus horizontally which means from side-to-side, or even how easy or difficult the diagram is to draw freehand. Regardless of your reasoning, be sure to continue using a diagram when solving ratio math problems.

Let's Think (Slides 4): Let's continue with another ratio word problem. When driving 25 miles per hour, the average car's wheels revolve or rotate 240 times in 30 seconds. What is the unit rate for revolutions per second of this car's tires?

	seconds	tire revolutions	
$\times\frac{1}{30}$	30	240	$\times\frac{1}{30}$

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

$$\frac{240}{1} \times \frac{1}{30} = \frac{240}{30} = 8$$

$$\begin{array}{r|l} 30\overline{)240} & \\ -120 & \text{4 groups of 30} \\ \hline 120 & \\ -120 & \text{4groups of 30} \\ \hline 0 & + \\ & \text{8groups of 30} \end{array}$$

Let's start with what we know. We know that a car's wheels revolve 240 times in 30 seconds. We are trying to calculate the unit rate for revolutions per second. So, to go from 30 seconds to 1 second for unit rate we need to figure out what to multiply by. Well, let's multiply by the reciprocal of 30 which is $\frac{1}{30}$ because the reciprocal of a number is 1 divided by that number. Multiplying by $\frac{1}{30}$ on both sides of the table is the way to go.

Let's do the math together. $\frac{30}{1}$ multiplied by $\frac{1}{30}$ equals $\frac{30}{30}$ or 1! Of course it's 1 because we're solving for unit rate, which means rate of 1.

Next, we'll calculate $\frac{240}{1}$ multiplied by $\frac{1}{30}$ which equals $\frac{240}{30}$. Time to divide, again.

Let's do the division for 240 by 30 together. We need to figure out how many groups of 30 we have in the bigger group of 240. We have at least 4 groups of 30 or 120 total And, 240 minus 120 leaves us with 120 remaining to be put into groups. Next, we need to figure out how many groups of 30 we have in the bigger group of 120. We can make 4 groups of 30 again because 4 multiplied by 30 is 120. And, 120 minus 120 leaves us with zero or nothing remaining to put into groups. 4 groups of 30 plus 4 groups of 30 gives us 8 groups of 30!

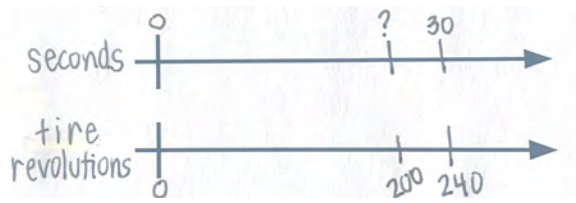
So, 240 divided by 30 is 8! The unit rate for revolutions per second is 8:1 or 8 revolutions per second.

seconds	tire revolutions
30	240
1	8

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

Even though we've just identified the unit rate we still want to put the results of our math on our table because sometimes it's easier to understand the data in diagram form. We place the 1 under the seconds column and the 8 under the tire revolutions column. Again we see that the tire revolves 8 times per second also, 30:240 and 1:8 are equivalent ratios. Great work!

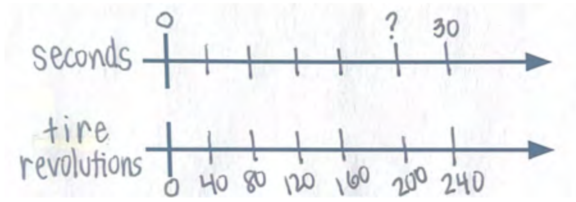
Let's Think (Slide 5): Nick calculated that the tires revolved 200 times. How many seconds did it take for the tires to revolve 200 times? Let's use the original information about the problem and a double number line to calculate the seconds.



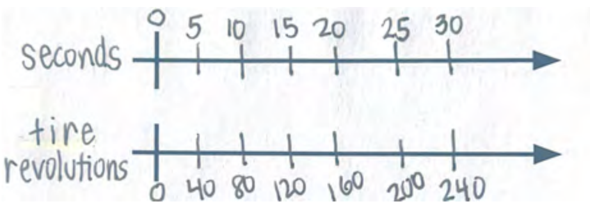
Let's construct our double number line. First label each number line with seconds and tire revolutions. Next let's put the information we know about the ratio from the problem on the number lines. Place 30 on the seconds number line near the right side and 240 on the tire revolutions number line directly underneath the 30 tick mark.

Next we place 200 revolutions on the tire revolutions number line and a question mark for the seconds on the tick mark that is directly above the tick mark with 200.

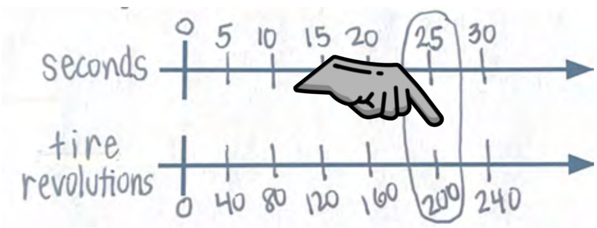
At this point my double number line has all the information we have been given but it has some gaps that we need to fill.



But how to fill that gap? Since 200 and 240 have 40 spaces in between let's try to skip count by 40s in the gap on the tire revolutions number line. Let's skip count together…40, 80, 120, 160. As I mark a tick on the tire revolutions number line, I have to make the same tick up top for the seconds number line.



Now. to figure out the numbers that go with the blank tick marks on the seconds number line we just count the spaces between the tick marks between 0 and 30. There are 6 spaces so we divide 30 by 6 and I get 5. That lets us know we need to count by 5 on the seconds number line. Ready? 5, 10, 15, 20, 25.



We can now answer the question that was posed by looking at the double number line for 200 tire revolutions. We see that 200 tire revolutions corresponds or matches to 25 seconds. That means it took 25 seconds for the tires to revolve 200 times.

Whew, we used a lot of skills to solve these ratio problems. We constructed diagrams based on information given to us in the problem, we used what we know about fractions to find unit rate, not to mention all of the calculations we had to complete. Nice work, everyone! Although we only have one lesson remaining in this unit we will continue using our ratio knowledge into Unit 3.

Let's Try it (Slide 6-7): Let's continue solving real-world experiences involving ratio relationships. Remember you may choose to display the information in any form of ratio diagram with which you are most comfortable and you will still reach the same solution.

WARM WELCOME

Today we will solve word problems involving equivalent ratios.

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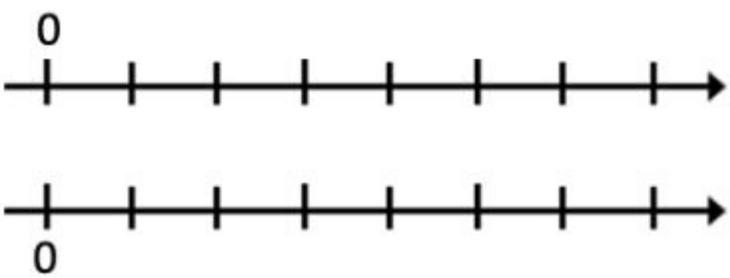
Let's Talk:

Which ratio diagram do you prefer? Why?



Let's Think:

When driving 25 miles per hour, the average car's wheels revolve 240 times in 30 seconds.

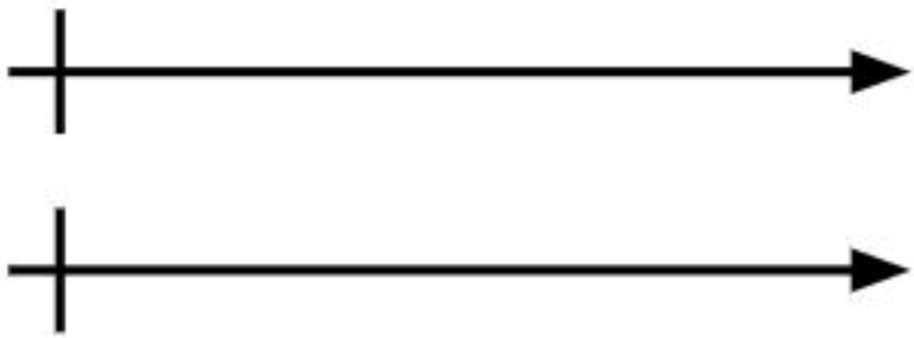
What is the unit rate for revolutions per sec?

seconds	tire revolutions
30	240

Let’s Think:

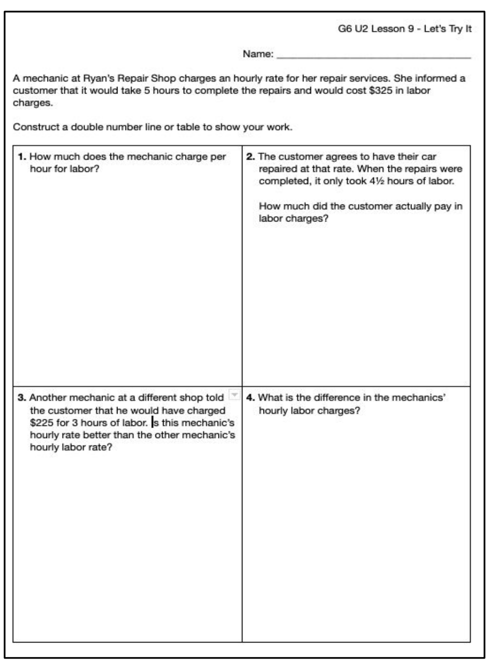
Nick calculated that the tires revolved 200 times.

How many seconds did it take for the tires to revolve 200 times?



Let’s Try It:

Let’s explore solving problems involving equivalent ratios together.



G6 U2 Lesson 9 - Let’s Try It

Name: ______________________

A mechanic at Ryan’s Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete the repairs and would cost $325 in labor charges.

Construct a double number line or table to show your work.

1. How much does the mechanic charge per hour for labor?	2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor. How much did the customer actually pay in labor charges?
3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic’s hourly rate better than the other mechanic’s hourly labor rate?	4. What is the difference in the mechanics’ hourly labor charges?

On your Own:

Now it's time to explore solving problems involving equivalent ratios on your own.

G6 U2 Lesson 9 - Independent Practice

Name: ______________________________

At a grocery store, a 15 oz box of cereal costs $12.00 and a 20 oz box of cereal costs $15.00. Which size cereal box is the better buy for a customer?

Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.	**2.** Calculate the unit rate of a 20 oz box of cereal.

3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?

A mechanic at Ryan's Repair Shop charges an hourly rate for her repair services. She informed a customer that it would take 5 hours to complete repairs and would cost $325 in labor charges.

Construct a double number line or table to represent the given information.

1. How much does the mechanic charge per hour for labor?	**2.** The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor. Using your diagram from question 1, calculate how much the customer actually paid in labor charges?
3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?	**4.** What is the difference in the mechanics' hourly rates for labor charges?

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Construct a double number line or table to represent the given information.

1. How much does the mechanic charge per hour for labor?

$$5\overline{)325}$$
-300 | 60
25
-25 | 5
0 | + 65

hours	cost
5	325
1	65

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

$\frac{325}{1} \times \frac{1}{5} = \frac{325}{5}$

$65 per hour of labor

2. The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor.

Using your diagram from question 1, calculate how much the customer actually paid in labor charges?

hours	cost
5	325
1	65
$\frac{9}{2} = 4\frac{1}{2}$	292.50

$\times\frac{9}{2}$ $\quad$ $\times\frac{9}{2}$

$$2\overline{)585}$$
-500 | 250
85
-80 | 40
5
-4 | 2
1 | + 292

$\frac{65}{1} \times \frac{9}{2} = \frac{585}{2} = 292\frac{1}{2}$

50¢

$292.50 in actual cost

3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?

hours	cost
3	225
1	75

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

$\frac{225}{1} \times \frac{1}{3} = \frac{225}{3}$

$$3\overline{)225}$$
-210 | 70
15
-15 | 5
0 | + 75

No, the rate is not better at this mechanic.

4. What is the difference (subtract) in the mechanics' hourly rates for labor charges?

$75
$-\$65$

$10 difference in the hourly rates.

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Construct a double number line or table to show your work.

1. Calculate the unit rate of a 15 oz box of cereal.

15 ⟌ 12.00 → 2
− 600 | 40
600
− 600 | 40
+ 80 2

$0.80 per oz.

2. Calculate the unit rate of a 20 oz box of cereal.

20 ⟌ 15.00 → 2
− 1400 | 70
100
− 100 | 5
0
75 2

$0.75 per oz.

3. Is it better to buy the 15 oz or 20 oz box of cereal? By how much is it a better buy for the customer?

It is better to buy the 20 oz box of cereal because you pay less per ounce. It is a better buy by 5¢.

$0.80
−$0.75
$0.05

G6 U2 Lesson 10

Apply number lines, tables, and tape diagrams to solve problems about ratios

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G6 U2 Lesson 10 - Students will use number lines and tables to solve problems about ratios

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): We have arrived at the final lesson in our first ratios unit! You now have so many strategies to use when confronted with a ratio problem. We know that when comparing quantities it's often helpful to calculate the unit rate because from the unit rate we will be able to find an infinite number of equivalent ratios. But, we also know that using the unit rate isn't the only way to create equivalent ratios. Today we will continue applying our strategies and use diagrams to calculate those equivalent quantities.

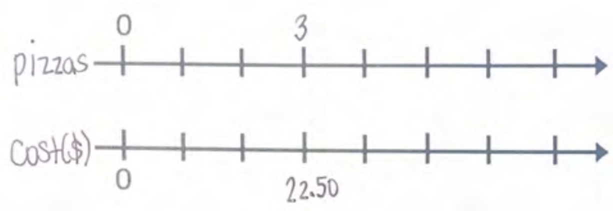
Let's Talk (Slide 3): Let's open by collecting everything we've learned in this unit. **What do you know about ratios?** Possible Student Answers, Key Points:

- Ratios are a way to compare quantities.
- We have to pay attention to the order when we're writing ratios.
- We can use "to" and a colon and fractions to represent ratios.
- We can use what we know about multiplication and division to write equivalent ratios.
- Unit rate is important because it tells us the ratio of a rate of 1 and then we can find anything.

Wow, did you all just hear how much you've learned about ratios? It's been 12 lessons and we've learned so much!

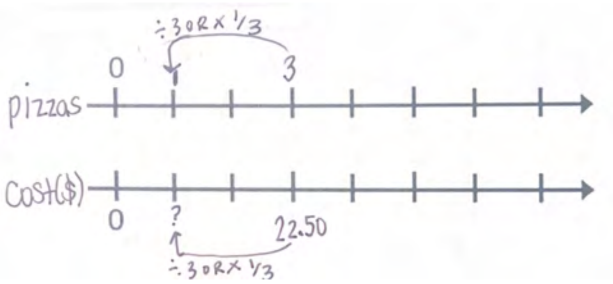
Let's Think (Slide 4): Let's solve a ratio word problem where we construct these diagrams. "A pizza parlor had a dinner special on large pizzas. The special advertises 3, one-topping pizzas for $22.50." Seeing the special, Alison decided to order 1 pepperoni pizza for herself. How much did Alison pay for her pizza?

We have been discussing that we can use *any* of our diagrams to solve ratio problems. Which one do you prefer? Interesting! Let's use the double number line to solve.

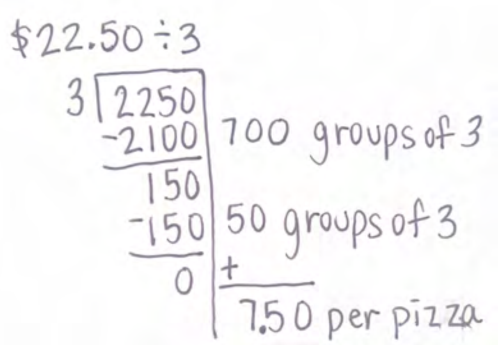


To construct the double number line we first include the information we are given in the problem including the labels for each number line…pizzas and cost.

Our problem tells us that 3 pizzas cost $22.50 so let's skip 3 spaces on the pizzas number line and write 3. Next we write 22.50 directly underneath the tick mark with the 3 because, again, three pizzas costs $22.50.

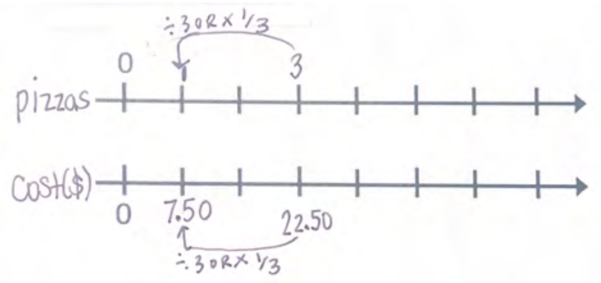


Next we find the unit rate or cost of 1 pizza for Alison. What will we multiply 3 by to get 1? The reciprocal of 3 or ⅓ That's right! Multiplying reciprocals results in an answer of 1. If we multiply by ⅓ on the top number line then we need to do the same on the bottom number line. Let's do the math.



First, let's move the decimal over, so $22.50 would be 2250. This will make our division easier! We need to figure out how many groups of 3 we have in the bigger group of 2250. We have at least 700 groups of 3 or 2100 total. And, 2250 minus 2100 leaves us with 150 remaining to be put into groups. Next, we need to figure out how many groups of 3 we have in the bigger group of 150. That's an easier one, we have 50 groups of 3 because 50 multiplied by 3 is 150. And, 150 minus 150 leaves us with 0 or nothing remaining to put into groups.
Finally, let's add up what we did…700 groups of 3 plus 50

groups of 3 gives us 750 groups of 3. So, 2250 divided by 3 is 750. Almost there! We need to move the decimal point over two places. So 1 piece of pizza costs $7.50.



Let's fill-in the double number line with our unit rate by placing 7.50 on the tick mark directly under the tick mark for 1 pizza. Again, Alison paid $7.50 for 1 pepperoni pizza.

So, we just used a double number line to figure out how much Alison paid for 1 pizza, and we would've followed very similar steps to use the table to solve. Remember that diagrams are here to help you with the math. Today when you're solving choose the diagram that you have the most comfort with and is best suited for the problem being solved. Although this is the end of Unit 2 we will still be working with ratios and using our diagrams when solving in the next unit of study.

Let's Try it (Slide 6-7): Let's bring our unit to a close by exploring more real-world experiences involving ratio relationships. Don't forget that you can choose to display the information in any form of ratio diagram with which you are most comfortable and you will still reach the same solution.

WARM WELCOME

Today we will solve word problems involving equivalent ratios.

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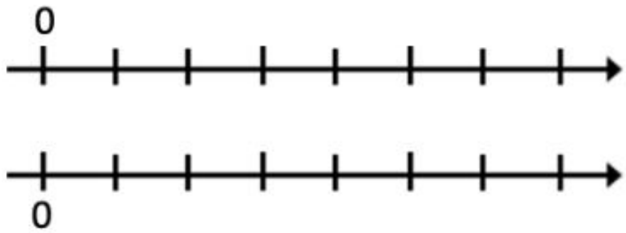
Let's Talk:

What do you know about ratios?



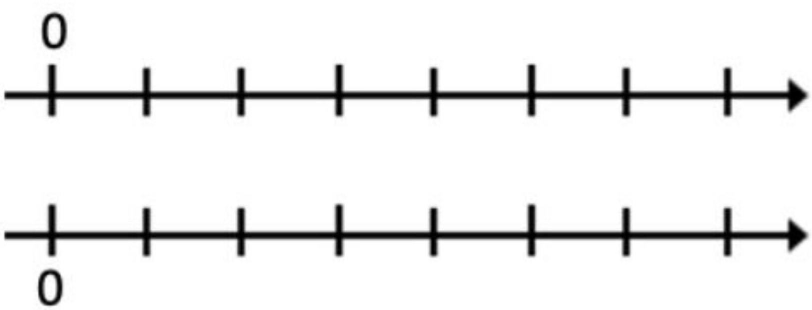
Let's Think:

A pizza parlor had a dinner special on large pizzas. The special advertises 3, one topping pizzas for $22.50.

Seeing the special, Alison decided to order 1 pepperoni pizza for herself. How much did Alison pay for her pizza?

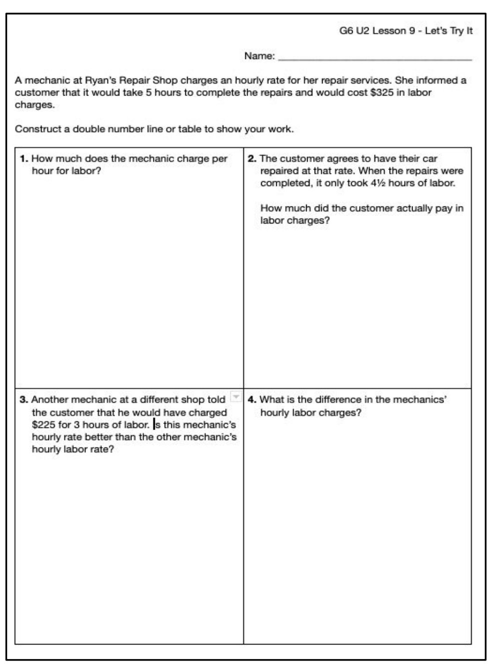
Let's Think:

Which representation are we going to use to solve this problem?



Let's Try It:

Let's explore solving problems involving equivalent ratios together.



G6 U2 Lesson 9 - Let's Try It

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Construct a double number line or table to show your work.

1. How much does the mechanic charge per hour for labor?	**2.** The customer agrees to have their car repaired at that rate. When the repairs were completed, it only took 4½ hours of labor. How much did the customer actually pay in labor charges?
3. Another mechanic at a different shop told the customer that he would have charged $225 for 3 hours of labor. Is this mechanic's hourly rate better than the other mechanic's hourly labor rate?	**4.** What is the difference in the mechanics' hourly labor charges?

On your Own:

Now it's time to explore solving problems involving equivalent ratios on your own.

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It's time for movie night at school! A teacher orders 12 pizzas with the advertised pizza special. Recall the special advertised 3, one-topping pizzas for $22.50. Each pizza the teacher ordered was cut into 10 slices. How much did it cost per slice of pizza?

Construct a double number line or table to show your work.

1. What information do we need to know in order to calculate how much it costs per slice of pizza?

____

____

2. How much did it cost per slice of pizza?

Ron began saving money out of his paychecks that he received every two weeks. He saved some money and put the rest in his checking account. Ron decided on a ratio of saving $8.00 for every $28.00 he put in his checking account.

Construct a double number line or table to represent this information.

1. How much did Ron put in his checking account for every dollar he saves?	**2.** How much would Ron have placed in his checking account when his savings account reached $50.00?

3. When checking his account one day, Ron discovered he had placed $350.00 in his checking account since he began saving money. How much money had Ron placed in savings since he began saving money using this ratio of funds per paycheck?

It's time for movie night at school! A teacher orders 12 pizzas with the advertised pizza special. Recall the special advertised 3, one-topping pizzas for $22.50. Each pizza the teacher ordered was cut into 10 slices. How much did it cost per slice of pizza?

Construct a double number line or table to show your work.

1. What information do we need to know in order to calculate how much it costs per slice of pizza?

You need to know how many slices were ordered in total and the total price paid.

2. How much did it cost per slice of pizza?

- 12 pizzas × 10 slices per pizza = 120 total slices
- 3 pizzas = $22.50

Cost	pizzas
22.50	3
7.50	1
90	12

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

$$\frac{22.50}{1} \times \frac{1}{3} = \frac{22.50}{3}$$

So, it costs $90 for 12 pizzas or 120 total slices so now we divide $90 by 120 slices to find the cost per slice of pizza.

$3\overline{)22.50}$ → 2
- −1500 | 500
- 750
- −750 | 250
- 0 | + 750 2

$120\overline{)90.00}$ → 2
- −6000 | 50
- 3000
- −2400 | 20
- 600
- −600 | 5
- 0 | + .75 2

It cost $0.75 per slice of pizza.

Ron began saving money out of his paychecks that he received every two weeks. He saved some money and put the rest in his checking account. Ron decided on a ratio of saving $8.00 for every $28.00 he put in his checking account.

Construct a double number line or table to represent this information.

1. How much did Ron put in his checking account for every dollar he saves?

savings	checking
8	28
1	3.50
50	175
100	350

$\times\frac{1}{8}$, $\times 50$, $\times 2$

$\frac{28}{1} \times \frac{1}{8} = \frac{28}{8}$

$28 \div 8 = 3$ R 4

$3\frac{4}{8} = 3\frac{1}{2}$

50¢

so, $3.50

$3.50 in his checking for every $1.00 in his savings

2. How much would Ron have placed in his checking account when his savings account reached $50.00?

See table in #1.

$3.50 × 50 = $175.00

$175.00 is in checking if $50 is in his savings account.

3. When checking his account one day, Ron discovered he had placed $350.00 in his checking account since he began saving money. How much money had Ron placed in savings since he began saving money using this ratio of funds per paycheck?

See table in #1.

$50 × 2 = $100

$100 is in his savings account since Ron began saving money.