CITYTUTOR DC

Seventh Grade Math Lesson Materials

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Identification of the copyrighted work claimed to have been infringed, or, if multiple copyrighted works allegedly have been infringed, then a representative list of such copyrighted works;

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CITYTUTOR DC

G7 Unit 2:

Introducing Proportional Relationships

G7 U2 Lesson 1

Compare and create representations to compare ratios in the context of recipes or scaled copies.

G7 U2 Lesson 1 - Today we will use the unit rate to decide if ratios are proportional.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): The next 15 lessons are going to be about proportions! Proportions are everywhere, all around us. I bet you've already been using proportions and you didn't even realize it. There will be some new words to describe the proportion idea. But you are going to understand these ideas as long as you take your time to think.

Let's Review (Slide 3): Let's review a word from last year, which is "ratio." The question here says, "What is the ratio of teddies to kids?" Does anyone know? Possible Student Answers, Key Points:

- 6 to 3
- 2 per kid
- There are 6 teddies and 3 kids.

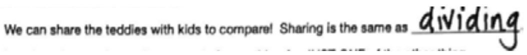
6:3 6 to 3

We write a ratio with a colon between the numbers like this. The ratio of teddies to kids is "six colon three." We say it is "6 TO 3." Sometimes people write the numbers as a fraction like this: "six over three." Sometimes people simplify the numbers too. But we'll stick with what we see.

Is that ratio the same as the ratio of kids to teddies? NO! The words are in a different order so we would have to write our numbers in a different order too. We would write, "three colon six" or "three to six" or "three over six." So there are two things to remember since the last time you worked with ratios. First, we are thinking about two amounts because there are two different things that have a relationship. In this case, teddies and kids. Second, the order of the words we use really matters. Teddies to kids is not the same as kids to teddies. It can get confusing so we are really going to have to label our numbers and be careful about the order.

Let's Talk (Slide 4): Now we will use the ratio of teddies to kids to decide which of the daycares here would be more fun. I see Miss. Joya's Fun Place of Sweetness and Mr. Grump's Serious Building for Kids. I bet you already have an opinion about which one would be nice for the little guys who have to go here. But let's use math to be really exact. One way to compare is to share the kids to compare. What operation do we use when we are sharing or splitting something? Possible Student Answers, Key Points:

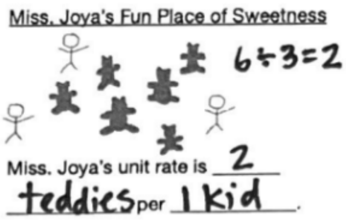
- Division
- Dealing
- Repeated Subtraction



We can share the teddies with kids to compare! Sharing is the same as dividing

We use division! Sharing is the same as dividing. And when we divide teddies by kids then we will find how many teddies for each kid or how many teddies for just one kid.

Read the sentence slowly from the slide twice because this is a key point. "In ratios when we know the amount of something for JUST ONE of the other thing, it is called the UNIT RATE." So when we divide and find how many teddies for each kid, we will be finding the unit rate. Let's do it.

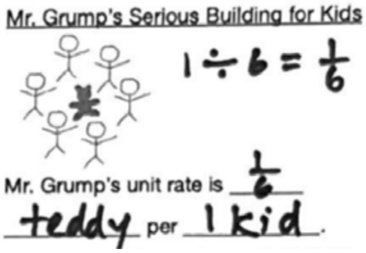


Miss. Joya's Fun Place of Sweetness

6÷3=2

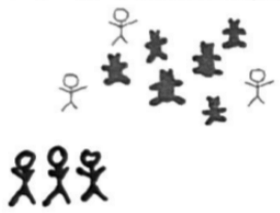
Miss. Joya's unit rate is 2 teddies per 1 Kid.

There are 6 teddies and 3 kids so I am going to do 6 divided by 3. That's 2. Miss. Joya's unit rate is 2 teddies per 1 kid. Usually we don't write 1 after the word per because we know it's there. But I'll write it for today.

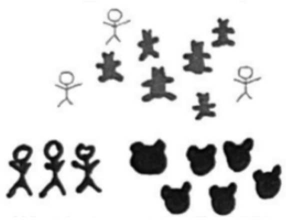


Now let's look at Mr. Grump's Serious Building for Kids. We can find the unit rate here too. The unit rate is still the amount of teddies for one kid and we still find it using division. The kids still have to share the teddies, right? Now there is 1 teddy. And there are 1 - 2 - 3 - 4 - 5 - 6 kids! Oh no! If I do 1 divided by 6, I don't even get a whole number! I get 1 sixth. Mr. Grump's unit rate is 1 sixth of a teddy per 1 kid. That's just a piece of a teddy per kid.

Now, this problem was obvious and silly. But the big idea is we can divide to find the unit rate. And the unit rate will help us compare ratios.



Let's Think (Slide 5): Ratios are called PROPORTIONAL when their unit rate is the same. Here's an example. Let's imagine that Miss. Joya decides to double the size of her daycare! I am going to double the kids. I am going to draw three more kids.



Now, Miss. Joya has a nice daycare. She cares about her kids. If she gets double the number of kids, she's not going to keep the same amount of teddies. If she gets double the number of kids, what do you think she is going to do with the number of teddies? Possible Student Answers, Key Points:

- She is going to get 6 more teddies.
- She is going to double the number of teddies.

If Miss. Joya gets double the amount of kids, she is going to have double the amount of teddies. There were 6 before so she needs 6 more.

Teddies	Kids
6	3

We can fill in the new amounts on the table and we will notice some super important things. First, remember that we said the order of the words is super important. Notice that this column is teddies. *Point to the teddies column.* And this column is kids. *Point to the kids column.* Let's fill in the numbers for the first picture. There were 6 teddies and 3 kids.

Teddies	Kids
6	3
12	6

Then Miss. Joys doubled the size of her daycare. Let's count. *Count all the teddies.* She needed 12 teddies for 6 kids. What do you notice about our table? Possible Student Answers, Key Points:

- The teddies are times two.
- The kids are times two.
- If you go down, it goes plus 6 and plus 3.
- If you go across, it is divided by 2.

There are going to be lots of ways to describe ratios when they have this special doubling relationship. Or a tripling relationship. That's why we need a whole fifteen lessons for this unit! But for today, let's focus on the unit rate. This says, "what is the new unit rate?" How do we find the unit rate again? Possible Student Answers, Key Points:

- Divide.
- Divide 12 by 6.

What is the new UNIT RATE? 2 teddies per 1 kid

We divide! In this case, 12 divided by 6 is 2. And that's 2 teddies per 1 kid.

Wow! This is really super important! I see that my new unit rate is the same as my old unit rate! Before it was 2 teddies per kid and it's still 2 teddies per kid! That is important! The unit rate stayed the same because when we doubled the kids, we doubled the teddies too. And the relationship between teddies and kids stayed the same. When the relationship between two amounts is the same, it has a special name. It is called a PROPORTION. We can write, the first ratio is PROPORTIONAL to the second ratio.

The the first ratio is proportional to the second ratio.

Reread the heading of the slide. This is the main idea for today: "Ratios are proportional when their unit rate is the same."

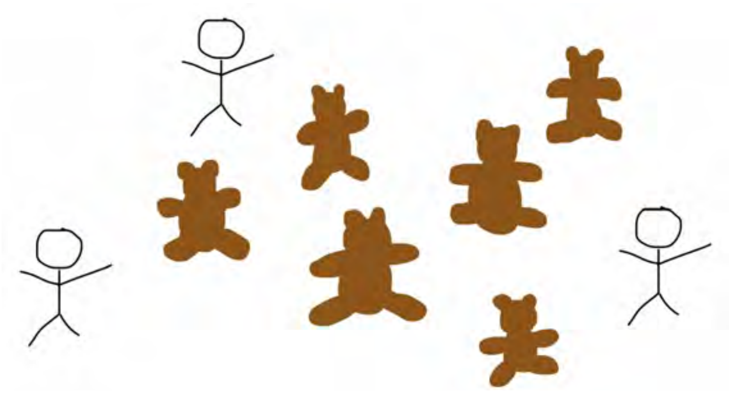
Let's Try It (Slide 6): Let's practice writing division and fractions together from stories. I will walk you through step by step and we will make sure we figure out which number is the dividend so it can go before the division sign.

WARM WELCOME

Today we will use the unit rate to decide if ratios are proportional.

Let's Review:

What is the ratio of teddies to kids? Is that the same as the ratio of kids to teddies?



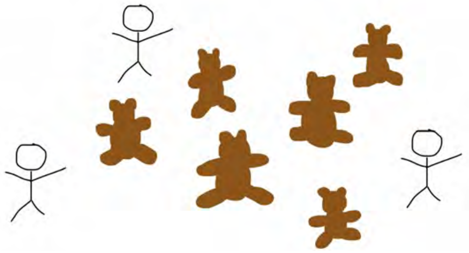
Let's Talk:

Use the ratio of teddies to kids to decide which daycare would be more fun.

We can share the teddies with kids to compare! Sharing is the same as ________________.

In ratios when we know the amount of something for JUST ONE of the other thing, it is called the **UNIT RATE**.

Miss. Joya's Fun Place of Sweetness



Miss. Joya's unit rate is _______

_____________ per _____________.

Mr. Grump's Serious Building for Kids

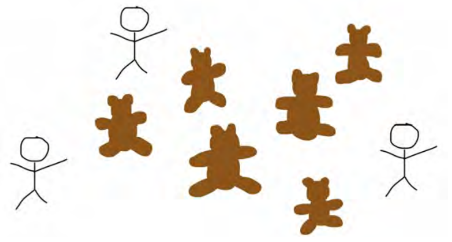
Mr. Grump's unit rate is _______

_____________ per _____________.

Let’s Think:

Ratios are PROPORTIONAL when their unit rate is the same.

Let’s imagine that Miss. Joya decides to double the size of her daycare!



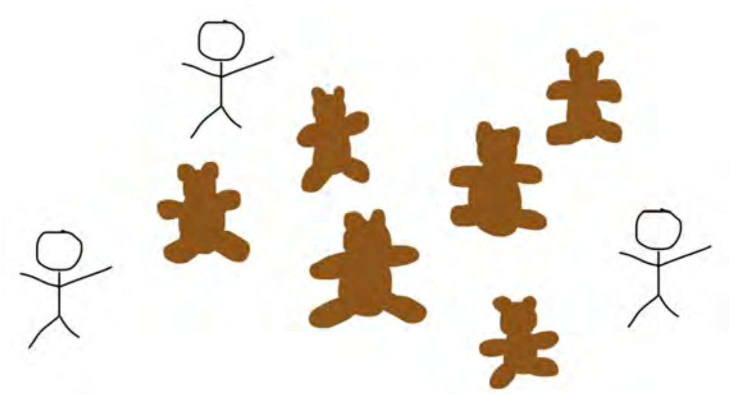
Teddies	Kids

What is the new UNIT RATE? ______ _______________ per __________________

The the first ratio is _____________________ to the second ratio.

Let’s Review:

What is the ratio of teddies to kids? Is that the same as the ratio of kids to teddies?



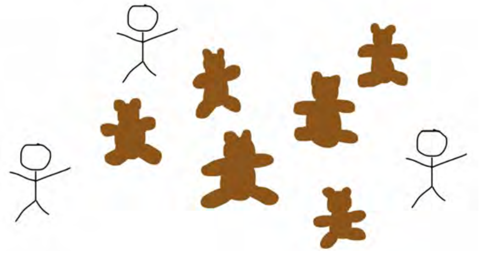
Let's Talk:

Use the ratio of teddies to kids to decide which daycare would be more fun.

We can share the teddies with kids to compare! Sharing is the same as _______________.

In ratios when we know the amount of something for JUST ONE of the other thing, it is called the **UNIT RATE**.

Miss. Joya's Fun Place of Sweetness



Miss. Joya's unit rate is ______

___________ per ___________.

Mr. Grump's Serious Building for Kids

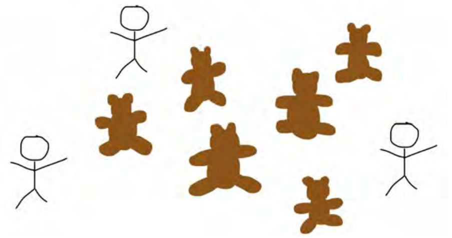
Mr. Grump's unit rate is ______

___________ per ___________.

Let's Think:

Ratios are PROPORTIONAL when their unit rate is the same.

Let's imagine that Miss. Joya decides to double the size of her daycare!



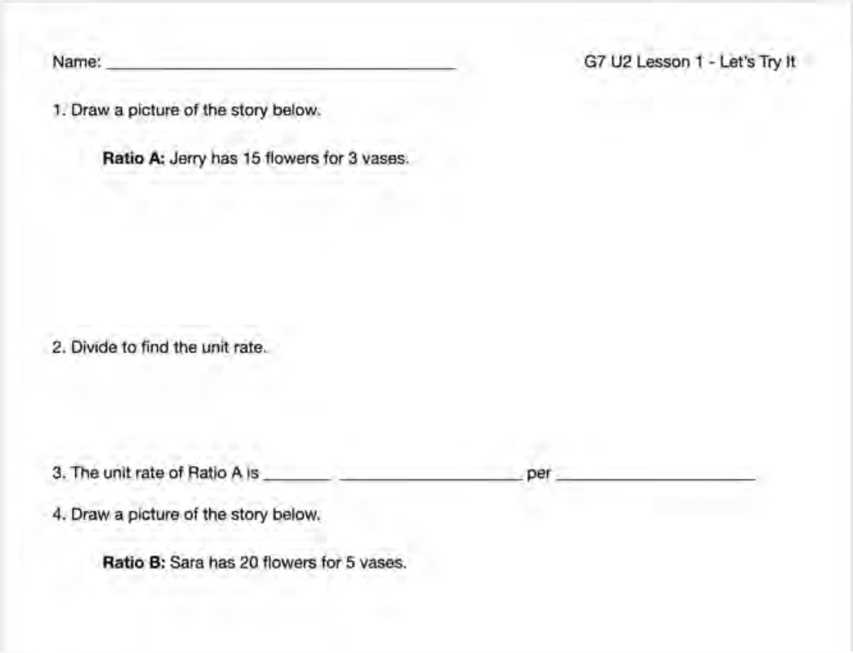
Teddies	Kids

What is the new UNIT RATE? _____ _______________ per __________________

The first ratio is _____________________ to the second ratio.

Let’s Try It:

Let’s practice finding unit rates and deciding if the ratios are proportional.



Name: ____________________ G7 U2 Lesson 1 - Let's Try It

1. Draw a picture of the story below.

Ratio A: Jerry has 15 flowers for 3 vases.

2. Divide to find the unit rate.

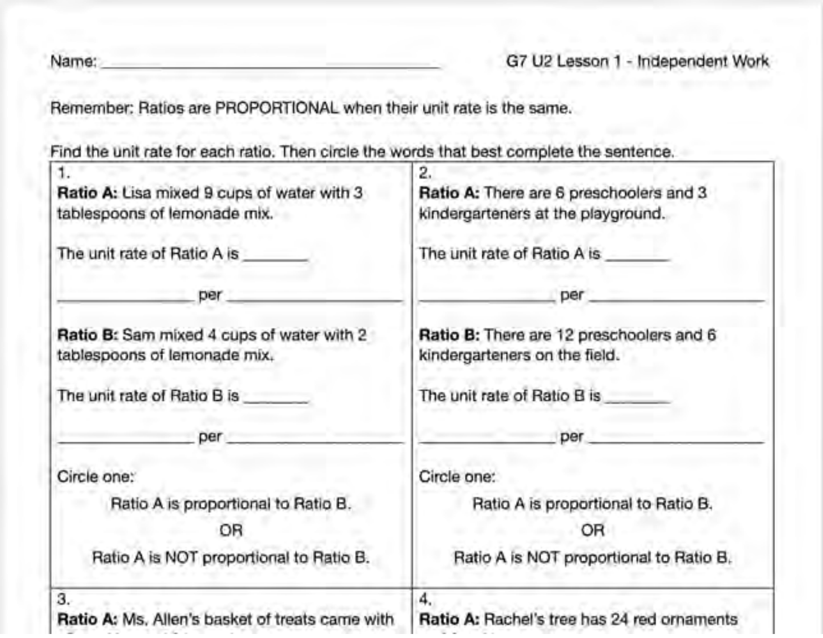
3. The unit rate of Ratio A is _______ ______________ per ______________

4. Draw a picture of the story below.

Ratio B: Sara has 20 flowers for 5 vases.

On your Own:

Now it’s time for you to do it on your own.



Name: ____________________ G7 U2 Lesson 1 - Independent Work

Remember: Ratios are PROPORTIONAL when their unit rate is the same.

Find the unit rate for each ratio. Then circle the words that best complete the sentence.

1. **Ratio A:** Lisa mixed 9 cups of water with 3 tablespoons of lemonade mix. The unit rate of Ratio A is _______ __________ per __________ **Ratio B:** Sam mixed 4 cups of water with 2 tablespoons of lemonade mix. The unit rate of Ratio B is _______ __________ per __________ Circle one: Ratio A is proportional to Ratio B. OR Ratio A is NOT proportional to Ratio B.	2. **Ratio A:** There are 6 preschoolers and 3 kindergarteners at the playground. The unit rate of Ratio A is _______ __________ per __________ **Ratio B:** There are 12 preschoolers and 6 kindergarteners on the field. The unit rate of Ratio B is _______ __________ per __________ Circle one: Ratio A is proportional to Ratio B. OR Ratio A is NOT proportional to Ratio B.
3. **Ratio A:** Ms. Allen's basket of treats came with	4. **Ratio A:** Rachel's tree has 24 red ornaments

Name: ____

1. Draw a picture of the story below.

Ratio A: Jerry has 15 flowers for 3 vases.

2. Divide to find the unit rate.

3. The unit rate of Ratio A is ________ ______________________ per ________________________

4. Draw a picture of the story below.

Ratio B: Sara has 20 flowers for 5 vases.

5. Divide to find the unit rate.

6. The unit rate of Ratio B is ________ ______________________ per ________________________

7. Circle one:

The unit rates are the same.

OR

The unit rates are different.

8. Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

9. Draw a picture of the story below.

Ratio A: A 20 gallon tank requires 5 drops of special fish solution to purify the water.

10. Divide to find the unit rate.

11. The unit rate of Ratio A is ________ ______________________ per ________________________

12. Draw a picture of the story below.

Ratio B: A 12 gallon fish tank requires 3 drops of special fish solution to purify the water.

13. Divide to find the unit rate.

14. The unit rate of Ratio B is ________ ______________________ per ________________________

15. Circle one:

The unit rates are the same.

OR

The unit rates are different.

16. Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

Name: ____ G7 U2 Lesson 1 - Independent Work

Remember: Ratios are PROPORTIONAL when their unit rate is the same.

Find the unit rate for each ratio. Then circle the words that best complete the sentence.

1.

Ratio A: Lisa mixed 9 cups of water with 3 tablespoons of lemonade mix.

The unit rate of Ratio A is ________

________________ per _____________________

Ratio B: Sam mixed 4 cups of water with 2 tablespoons of lemonade mix.

The unit rate of Ratio B is ________

________________ per _____________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

2.

Ratio A: There are 6 preschoolers and 3 kindergarteners at the playground.

The unit rate of Ratio A is ________

________________ per _____________________

Ratio B: There are 12 preschoolers and 6 kindergarteners on the field.

The unit rate of Ratio B is ________

________________ per _____________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

3.

Ratio A: Ms. Allen's basket of treats came with 15 cookies and 3 brownies.

The unit rate of Ratio A is ________

________________ per _____________________

Ratio B: Mr Buford's basket of treats came with 20 cookies and 4 brownies.

The unit rate of Ratio B is ________

________________ per _____________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

4.

Ratio A: Rachel's tree has 24 red ornaments and 6 gold ornaments.

The unit rate of Ratio A is ________

________________ per _____________________

Ratio B: Peter's tree has 5 gold ornaments and 20 red ornaments.

The unit rate of Ratio B is ________

________________ per _____________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

Find the unit rate for each ratio. Then circle the words that best complete the sentence.

1.
Ratio A: At the class party, there are 20 juice boxes for 4 kids.

The unit rate of Ratio A is ________

_________________ per ______________________

Ratio B: In the lunch room, there are 10 juice boxes for 10 kids.

The unit rate of Ratio B is ________

_________________ per ______________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

2.
Ratio A: Susannah got paid $12 for babysitting 3 hours.

The unit rate of Ratio A is ________

_________________ per ______________________

Ratio B: Susannah got paid $10 for mowing lawns for 2 hours.

The unit rate of Ratio B is ________

_________________ per ______________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

3.
Ratio A: Rose's bowl of fruit salad has 3 strawberries and 6 blueberries.

The unit rate of Ratio A is ________

_________________ per ______________________

Ratio B: Nathaniel's bowl of fruit salad has 4 strawberries and 8 blueberries.

The unit rate of Ratio B is ________

_________________ per ______________________

Circle one:

Ratio A is proportional to Ratio B.

OR

Ratio A is NOT proportional to Ratio B.

4.
Ratio A: Dennis got 6 mg of Vitamin C by eating 2 pieces of fruit.

The unit rate of Ratio A is ________

_________________ per ______________________

Ratio B: Lila got 2 mg of Vitamin C by eating 6 pieces of fruit.

The unit rate of Ratio B is ________

_________________ per ______________________

Circle one:

Ratio A is proportional to Ratio B.

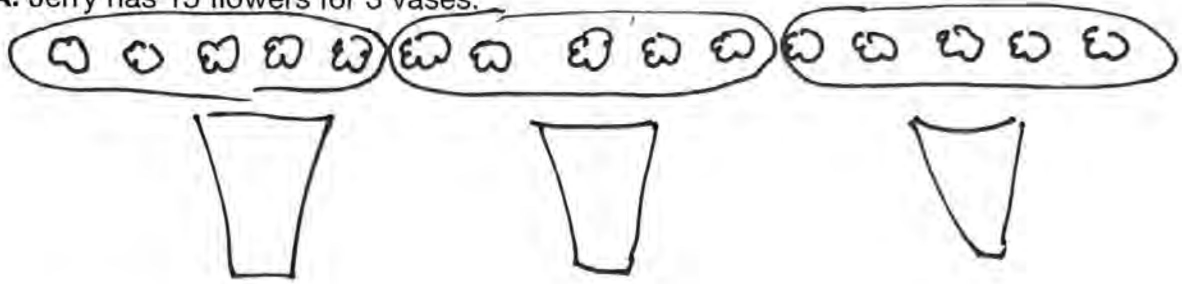
OR

Ratio A is NOT proportional to Ratio B.

Name: ANSWER KEY

1. Draw a picture of the story below.

Ratio A: Jerry has 15 flowers for 3 vases.



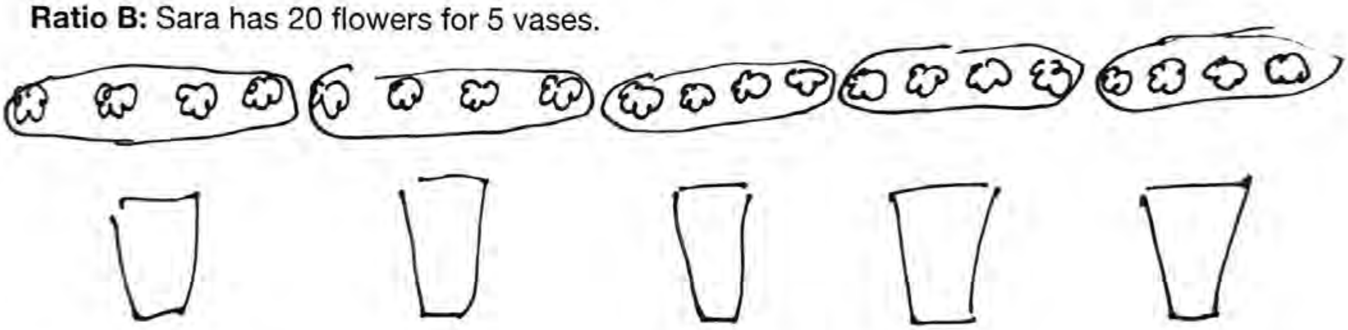
2. Divide to find the unit rate.

$15 \div 3 = 5$

3. The unit rate of Ratio A is 5 flowers per 1 vase

4. Draw a picture of the story below.

Ratio B: Sara has 20 flowers for 5 vases.



5. Divide to find the unit rate.

$20 \div 5 = 4$

6. The unit rate of Ratio B is 4 flowers per 1 vase

7. Circle one:

The unit rates are the same.

OR

[✓ The unit rates are different.]

8. Circle one:

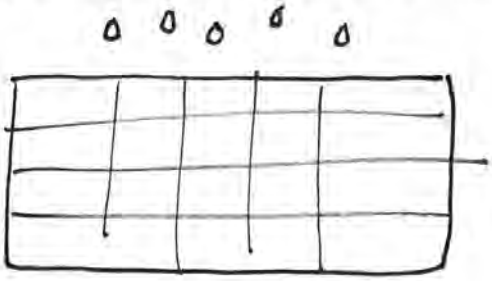
Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

9. Draw a picture of the story below.

Ratio A: A 20 gallon tank requires 5 drops of special fish solution to purify the water.



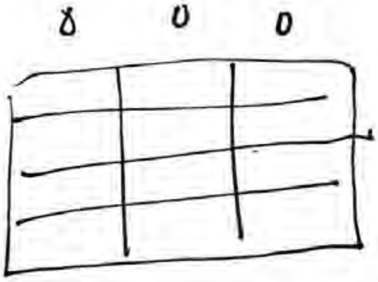
10. Divide to find the unit rate.

20 ÷ 5 = 4 gallons per drop

11. The unit rate of Ratio A is 4 gallons per 1 drop

12. Draw a picture of the story below.

Ratio B: A 12 gallon fish tank requires 3 drops of special fish solution to purify the water.



13. Divide to find the unit rate.

12 ÷ 3 = 4 gallons per drop

14. The unit rate of Ratio B is 4 gallons per 1 drop

15. Circle one:

[✓ The unit rates are the same.]

OR

The unit rates are different.

16. Circle one:

[✓ Ratio A is proportional to Ratio B.]

OR

Ratio A is NOT proportional to Ratio B.

Name: ANSWER KEY

G7 U2 Lesson 1 - Independent Work

Remember: Ratios are PROPORTIONAL when their unit rate is the same.

Find the unit rate for each ratio. Then circle the words that best complete the sentence.

1.

Ratio A: Lisa mixed 9 cups of water with 3 tablespoons of lemonade mix.

The unit rate of Ratio A is 3

cups per tablespoon

Ratio B: Sam mixed 4 cups of water with 2 tablespoons of lemonade mix.

The unit rate of Ratio B is 2

cups per tablespoon

Circle one:

Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

2.

Ratio A: There are 6 preschoolers and 3 kindergarteners at the playground.

The unit rate of Ratio A is 2

preschoolers per kindergartener

Ratio B: There are 12 preschoolers and 6 kindergarteners on the field.

The unit rate of Ratio B is 2

preschoolers per kindergarten

Circle one:

[✓ Ratio A is proportional to Ratio B.]

OR

Ratio A is NOT proportional to Ratio B.

3.

Ratio A: Ms. Allen's basket of treats came with 15 cookies and 3 brownies.

The unit rate of Ratio A is 5

cookies per brownie

Ratio B: Mr Buford's basket of treats came with 20 cookies and 4 brownies.

The unit rate of Ratio B is 5

cookies per brownie

Circle one:

[✓ Ratio A is proportional to Ratio B.]

OR

Ratio A is NOT proportional to Ratio B.

4.

Ratio A: Rachel's tree has 24 red ornaments and 6 gold ornaments.

The unit rate of Ratio A is 4

red ornaments per gold ornament

Ratio B: Peter's tree has 5 gold ornaments and 20 red ornaments.

The unit rate of Ratio B is $\frac{1}{4}$

red ornaments per gold ornament

Circle one:

Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

Find the unit rate for each ratio. Then circle the words that best complete the sentence.

1.

Ratio A: At the class party, there are 20 juice boxes for 4 kids.

The unit rate of Ratio A is 5

juice boxes per kid

Ratio B: In the lunch room, there are 10 juice boxes for 10 kids.

The unit rate of Ratio B is 1

juice box per kid

Circle one:

Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

2.

Ratio A: Susannah got paid $12 for babysitting 3 hours.

The unit rate of Ratio A is 4

dollars per hour

Ratio B: Susannah got paid $10 for mowing lawns for 2 hours.

The unit rate of Ratio B is 5

dollars per hour

Circle one:

Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

3.

Ratio A: Rose's bowl of fruit salad has 3 strawberries and 6 blueberries.

The unit rate of Ratio A is $\frac{1}{2}$ or $\frac{3}{6}$

strawberries per blueberry

Ratio B: Nathaniel's bowl of fruit salad has 4 strawberries and 8 blueberries.

The unit rate of Ratio B is $\frac{1}{2}$ or $\frac{4}{8}$

strawberries per blueberry

Circle one:

[✓ Ratio A is proportional to Ratio B.]

OR

Ratio A is NOT proportional to Ratio B.

4.

Ratio A: Dennis got 6 mg of Vitamin C by eating 2 pieces of fruit.

The unit rate of Ratio A is 3

mg per piece of fruit

Ratio B: Lila got 2 mg of Vitamin C by eating 6 pieces of fruit.

The unit rate of Ratio B is $\frac{2}{6}$ or $\frac{1}{3}$

mg per piece of fruit

Circle one:

Ratio A is proportional to Ratio B.

OR

[✓ Ratio A is NOT proportional to Ratio B.]

G7 U2 Lesson 2

Use a table to describe a proportional relationship, calculate the constant of proportionality, and find missing values.

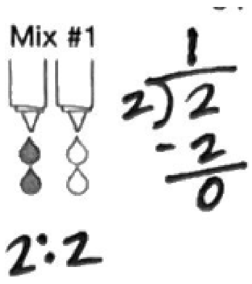
CITYTUTOR DC

G7 U2 Lesson 2 - Today we will generate proportions to find the constant of proportionality.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we're going to generate proportions to find the constant of proportionality. You're going to see that we're just using the same ratios that we've been learning about. Let's go!

Let's Review (Slide 3): We learned in our last class that we decide if two ratios are proportional using their unit rate. That means the ratio when the second amount is just one. Let's use that here. *Read the text and then point to each mix as you discuss it.* I see that for Mix #1, Rose used two drops of red and two drops of yellow. Red and yellow make orange. What is the ratio of red drops to yellow drops?



Possible Student Answers, Key Points:

- 2 to 2
- They are the same.

The ratio is 2 to 2. There are the same amount of each. Let's find the unit rate. How do I do that? Possible Student Answers, Key Points:

- Divide!
- Red divided by yellow
- 2 divided by 2

I divide! 2 divided by 2 is 1. That's 1 red drop per 1 yellow drop.

Let's look at the next mix. Look at that! It's NOT the same color orange! Why isn't it the same color orange? Possible Student Answers, Key Points:

- She put more red.

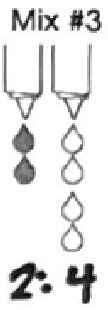
What is the ratio of red drops to yellow drops? Possible Student Answers, Key Points:

- 4 to 2
- There are double.

The ratio is 4 to 2. Let's find the unit rate. How do I do that? Possible Student Answers, Key Points:

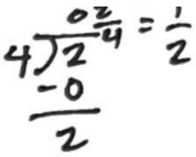
- Divide!
- Red divided by yellow
- 4 divided by 2

I divide! 4 divided by 2 is 1. That's 2 red drops per 1 yellow drop. This is important! Notice that the unit rate is NOT the same. That makes sense though, right? The color is NOT the same. Rose switched up her formula for Mix #2, right? She got a much darker orange because there are 2 drops of red for every 1 drop of yellow.



Let's look at Mix #3. What is the ratio of red drops to yellow drops? Possible Student Answers, Key Points:

- 2 to 4
- There are half as many.



The ratio is 2 to 4. Now this is going to be a little trickier but does anyone think they know the unit rate? Possible Student Answers, Key Points:

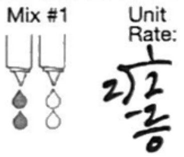
- We divide 2 by 4.
- It is half.

We have to keep the same order that we used for the other mixes, which was red drops divided by yellow drops. So this time it's not 4 divided by 2. It's 2 divided by 4. I can't get a whole number if I do 2 divided by 4 because 2 is smaller than 4 so I get a fraction, 2 over 4. You can simplify that. I happen to know 2 is half of 4. Notice AGAIN that the unit rate is NOT the same. And that makes sense because the color is NOT the same. She got a much lighter orange this time because there was only half the red as yellow.

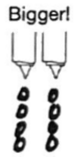
The ratios are NOT proportional

Let's fill in this blank. We saw that the unit rates are NOT the same. So we say that the ratios are NOT proportional. And we can see that because the paint mixes are different colors.

Let's Talk (Slide 4): This is our big idea for the day. *Point to the top of the slide and read the main idea in bold.* "When unit rates are the same, the number is the CONSTANT OF PROPORTIONALITY." We're going to make some mixes where the unit rates are the same and find the constant of proportionality. Let's read. *Read the story about Rose.*



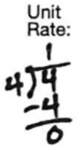
Let's start with Mix #1. We already know the unit rate for this one because we did it on the last slide. 2 divided by 2 is 1. That's 1 red drop per 1 yellow drop.



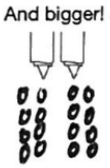
Now Rose wants to make bigger amounts of the SAME color. She doesn't want a darker orange or a lighter orange this time. So let's imagine she doubles the amount of red. Now she has four drops of red. What do you think Rose has to do with the yellow? Possible Student Answers, Key Points:

- She has to double the amount of yellow.
- She needs four drops of yellow.

If she is going to put in more red then she needs to put in more yellow the exact same way so the color stays the same. If she doubles the red, she has to double the yellow.



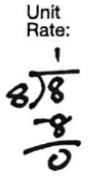
Let's see what happens to our unit rate! I do 4 divided by 4. That's 1! 1 red drop per 1 yellow drop. This time, it's the SAME unit rate. We kept the relationship between red and yellow. These ratios are proportional!



Let's do even more! I'm going to double the red again! Now I have 8 drops of red. What do you think Rose has to do with the yellow? Possible Student Answers, Key Points:

- She has to double the amount of yellow.
- She needs eight drops of yellow.

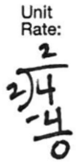
If she is going to put in more red then she needs to put in more yellow the exact same way so the color stays the same. If she doubles the red, she has to double the yellow.



Let's see what happens to our unit rate! I do 8 divided by 8. That's still 1! 1 red drop per 1 yellow drop. Once again, it's the SAME unit rate. We kept the relationship between red and yellow so we kept the unit rate. These ratios are still proportional!

The constant of proportionality is 1.

Now, we said that when unit rates are the same, the number is called the constant of proportionality. So there isn't extra math to do here. The unit rate was 1 and then it was 1 and then it was 1. So the constant of proportionality is 1.

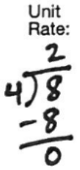


Let's Talk (Slide 5): We can find the constant of proportionality using any set of proportional ratios. This says, "Let's make bigger amounts of Mix #2. Draw a picture. Find the unit rate." Now we're working with the darker orange. We already found the unit rate. It was 4 divided by 2. Now we have 2 drops of red per 1 drop of yellow.

Let's try to make more paint. We want it to be the same color. So let's imagine we double the amount of red. Now there are 8 drops of red. What do we have to do with the yellow? Possible Student Answers, Key Points:

- We have to double the amount of yellow.
- We need four drops of yellow.

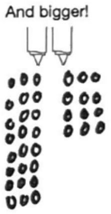
If we are going to put in more red then we need to put in more yellow. We increase it the exact same way we increased the red so the color stays the same. If she doubles the red, she has to double the yellow. That means 4 drops of yellow.



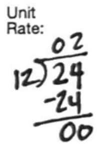
Let's see what happens to our unit rate! I do 8 divided by 4. That's 2! 2 red drops per 1 yellow drop. Look! It's the SAME unit rate as before. We kept the relationship between red and yellow. These ratios are proportional!

Okay, now we're going to go really crazy. Let's TRIPLE the red! That would be 8 x 3. That would be 24 drops of red. That's tough to even draw. What do you think Rose has to do with the yellow? Possible Student Answers, Key Points:

- She has to triple the amount of yellow.
- She needs 12 drops of yellow.



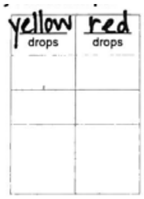
Once again, if she is going to put in more red then she needs to put in more yellow the exact same way so the color stays the same. If she triples the red, she has to triple the yellow.



Let's see what happens to our unit rate! I do 24 divided by 12. That's 2! We tripled our mix but it's still 2 red drops per 1 yellow drop. It's still the SAME unit rate. We kept the relationship between red and yellow, and these ratios are proportional!

The constant of proportionality is 2.

Now, just like before, we said that when unit rates are the same, the number is called the constant of proportionality. So there isn't extra math to do here. The unit rate was 2 and then it was 2 and then it was 2. So the constant of proportionality is 2.

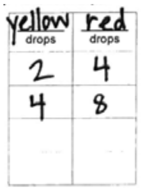


yellow drops	red drops

Let's Think (Slide 6): We are going to be spending a lot more time with graphs but let's see our work lined up on a table so you can see why the constant of proportionality is so important. We're going to follow these steps. *Read the first step.* I did red drops divided by yellow drops. So I am going to put red on the right and yellow on the left. You'll see why in a minute.

yellow drops	red drops
2	4

Now I have to put in the numbers from my mixes. On the last slide, there were 4 drops of red and 2 drops of yellow.

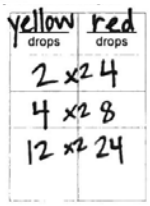


yellow drops	red drops
2	4
4	8

Then we doubled it so there were 8 drops of red and 4 drops of yellow.

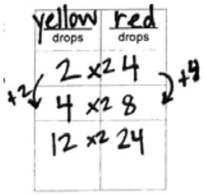
yellow drops	red drops
2	4
4	8
12	24

And then we tripled that so there were 24 drops of red and 12 drops of yellow.



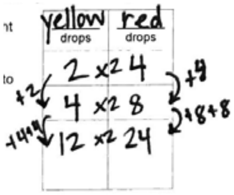
yellow drops	red drops
2 ×2	4
4 ×2	8
12 ×2	24

Next step! *Read the second step.* I told you, you'd see why we write the number we divided on the right hand side. Because now we can use it for a related fact and we can multiply across. Look! I use that constant of proportionality. 2 times 2 makes 4. 4 times 2 makes 8. 12 times 2 makes 24. This will work no matter how big our table gets.



yellow drops	red drops
2 ×2	4
4 ×2	8
12 ×2	24

Next step! *Read the third step.* You might notice that we can also see patterns going up and down. That's because we doubled and tripled. So I can show that as 2 plus itself and 4 plus itself. You might have done some of this repeated addition on both sides in 6th grade.



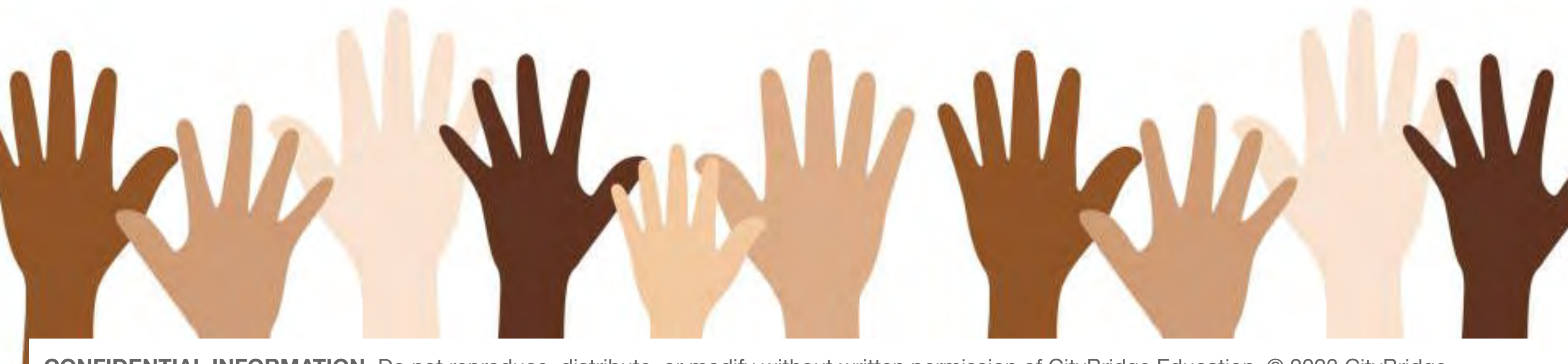
yellow drops	red drops
2 ×2	4
4 ×2	8
12 ×2	24

For the next line, we could think of it as 4 plus itself plus itself and 8 plus itself plus itself. You don't need to worry about all of this now. But these relationships are going to help us make sure that the numbers in our table really are proportional. *Read the fourth step.* For now, let's just focus on the constant of proportionality.

Let's Try It (Slide 7): Let's practice finding the constant of proportionality together. We just have to remember that it's the same as the unit rate so division each time. I am going to take you through step by step.

Today we will generate proportions to find the constant of proportionality.

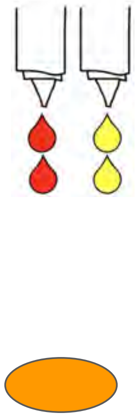
WARM WELCOME



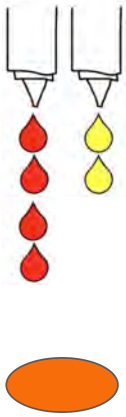
Let’s Review: We decide if two ratios are proportional using their unit rate.

Rose was mixing paints. What is the ratio of red to yellow drops for each mixture?

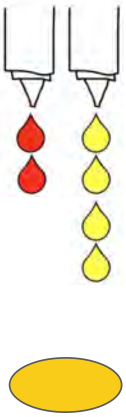
Mix #1



Mix #2



Mix #3

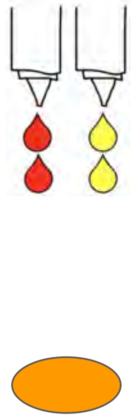


The ratios are ______________________________.

Let’s Talk: When unit rates are the same, the number is the CONSTANT OF PROPORTIONALITY.

Rose wants to make bigger amounts of Mix #1. Draw a picture of what she could do. Find the unit rate of each mixture.

Mix #1



Unit Rate:

Bigger!

Unit Rate:

And bigger!

Unit Rate:

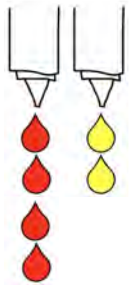
The constant of proportionality is _____.

Let's Talk:

We can find the constant of proportionality using any set of proportional ratios.

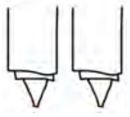
Let's make bigger amounts of Mix #2. Draw a picture. Find the unit rate.

Mix #2



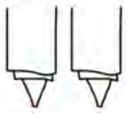
Unit Rate:

Bigger!



Unit Rate:

And bigger!



Unit Rate:

The constant of proportionality is _____.

Let's Think:

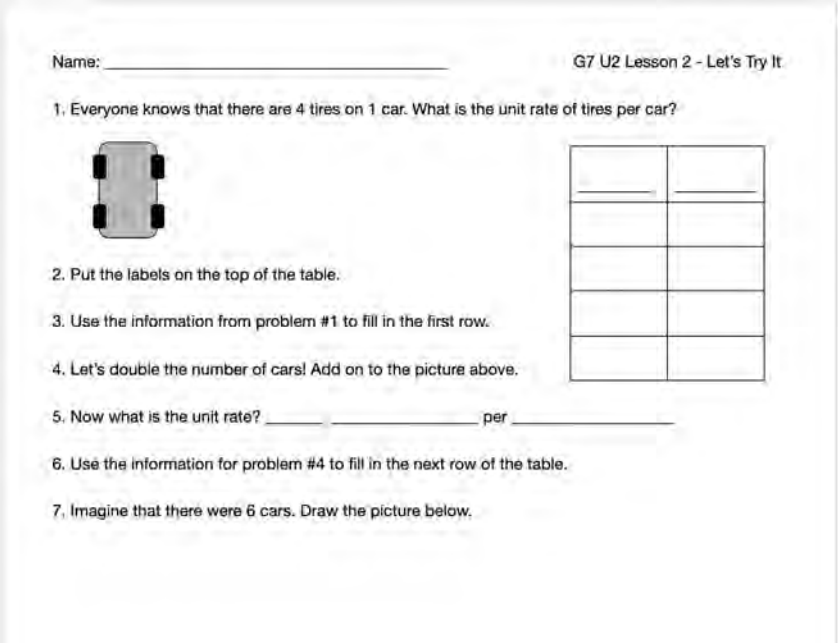
When we record proportional ratios in a table, we will see many relationships.

1. We usually put the number we divided on the right side of the table.
2. Then we can use our constant of proportionality to multiply HORIZONTALLY.
3. We will also see that the numbers are adding repeated VERTICALLY on each side.
4. In our next lesson, we can use this to find out other values that would work on our chart.

_______ drops	_______ drops

Let's Try It:

Let's practice finding the constant of proportionality.



Name: ______________________________ G7 U2 Lesson 2 - Let's Try It

1. Everyone knows that there are 4 tires on 1 car. What is the unit rate of tires per car?

______	______

2. Put the labels on the top of the table.

3. Use the information from problem #1 to fill in the first row.

4. Let's double the number of cars! Add on to the picture above.

5. Now what is the unit rate? ______ ____________ per ____________

6. Use the information for problem #4 to fill in the next row of the table.

7. Imagine that there were 6 cars. Draw the picture below.

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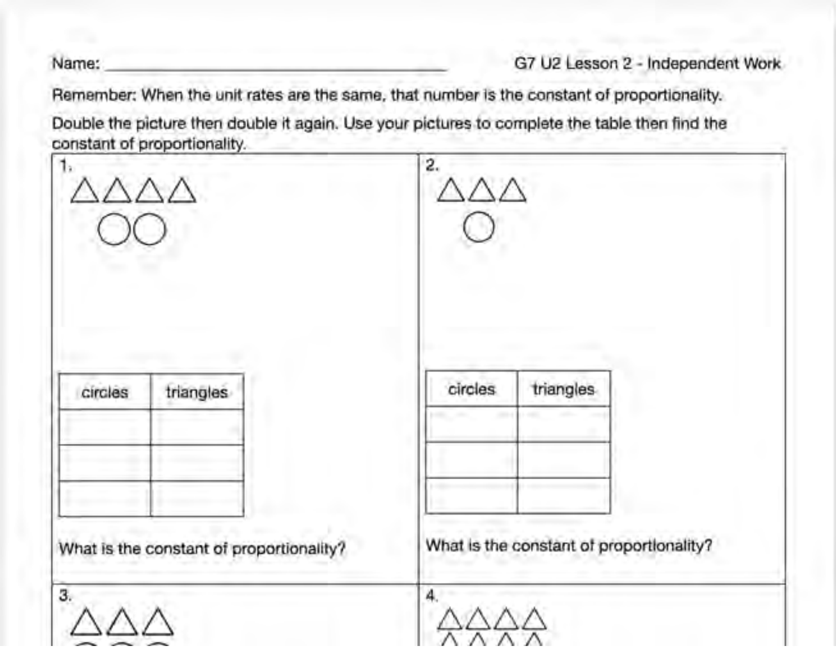
On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 2 - Independent Work

Remember: When the unit rates are the same, that number is the constant of proportionality.

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

1.

circles	triangles

What is the constant of proportionality?

2.

circles	triangles

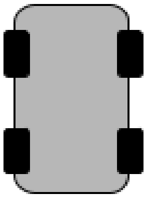
What is the constant of proportionality?

3.

4.

Name: ____ G7 U2 Lesson 2 - Let’s Try It

1. Everyone knows that there are 4 tires on 1 car. What is the unit rate of tires per car?



________	________

2. Put the labels on the top of the table.

3. Use the information from problem #1 to fill in the first row.

4. Let’s double the number of cars! Add on to the picture above.

5. Now what is the unit rate? _______ _________________ per ___________________

6. Use the information for problem #4 to fill in the next row of the table.

7. Imagine that there were 3 cars. Draw the picture below.

8. Now what is the unit rate? _______ _________________ per ___________________

9. Use the information for problem #7 to fill in the next row of the table.

10. What do you notice about the table going from left to right?

____

11. What do you notice about the table going from top to bottom?

____

12. What is the constant of proportionality for this table? ______

13. Imagine that it costs $6 to buy 2 cupcakes.

________	________

14. What is the unit rate?

_______ ________________ per ___________________

15. Put the labels on the top of the table.

16. Use the information from problem #13 to fill in the first row.

17. Let's draw another box in the picture above.

18. Now what is the unit rate? _______ ________________ per ___________________

19. Use the information for problem #16 to fill in the next row of the table.

20. Let's draw ANOTHER box in the picture above.

21. Now what is the unit rate? _______ ________________ per ___________________

22. Use the information for problem #19 to fill in the next row of the table.

23. What do you notice about the table going from left to right?

____

24. What do you notice about the table going from top to bottom?

____

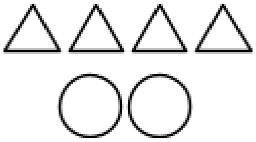
25. What is the constant of proportionality for this table? ______

Name: ____ G7 U2 Lesson 2 - Independent Work

Remember: When the unit rates are the same, that number is the constant of proportionality.

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

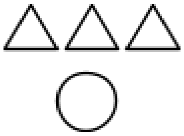
1.



circles	triangles

What is the constant of proportionality?

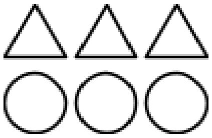
2.



circles	triangles

What is the constant of proportionality?

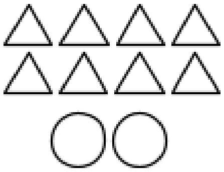
3.



circles	triangles

What is the constant of proportionality?

4.

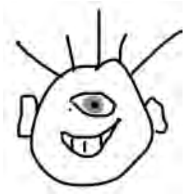


circles	triangles

What is the constant of proportionality?

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

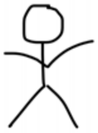
5.



eyes	ears

What is the constant of proportionality?

6.



arms	legs

What is the constant of proportionality?

7.

eyes	arms

What is the constant of proportionality?

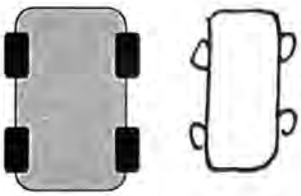
8.

fangs	nose

What is the constant of proportionality?

Name: ANSWER KEY

1. Everyone knows that there are 4 tires on 1 car. What is the unit rate of tires per car?



$$\begin{array}{r} 4 \\ 1\overline{)4} \\ -4 \\ \hline 0 \end{array}$$

4 tires per car

car	tires
1	4
2	8
3	12

2. Put the labels on the top of the table.

3. Use the information from problem #1 to fill in the first row.

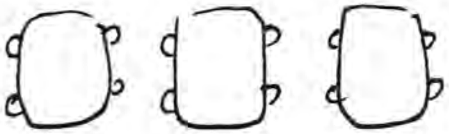
4. Let's double the number of cars! Add on to the picture above.

5. Now what is the unit rate? 4 tires per car

$$\begin{array}{r} 4 \\ 2\overline{)8} \\ -8 \\ \hline 0 \end{array}$$

6. Use the information for problem #4 to fill in the next row of the table.

7. Imagine that there were 3 cars. Draw the picture below.



8. Now what is the unit rate? 4 tires per car

$$\begin{array}{r} 04 \\ 3\overline{)12} \\ -12 \\ \hline 00 \end{array}$$

9. Use the information for problem #7 to fill in the next row of the table.

10. What do you notice about the table going from left to right?

It is cars time 4 to get tires.

11. What do you notice about the table going from top to bottom?

It kept adding the 4 number over and over on each side.

12. What is the constant of proportionality for this table? 4

13. Imagine that it costs $6 to buy 2 cupcakes.

$\begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array}$

cupcake	dollars
2	$6
4	$12

14. What is the unit rate?

3 dollars per cupcake

15. Put the labels on the top of the table.

16. Use the information from problem #13 to fill in the first row.

17. Let's draw another box in the picture above.

18. Now what is the unit rate? 3 dollars per cupcake

$\begin{array}{r} 03 \\ 4\overline{)12} \\ -12 \\ \hline 0 \end{array}$

19. Use the information for problem #16 to fill in the next row of the table.

20. Let's draw ANOTHER box in the picture above.

21. Now what is the unit rate? 3 dollars per cupcake

$\begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$

22. Use the information for problem #19 to fill in the next row of the table.

23. What do you notice about the table going from left to right?

It is cupcakes times 3 to get dollars.

24. What do you notice about the table going from top to bottom?

It adds the 1st number over and over on each side.

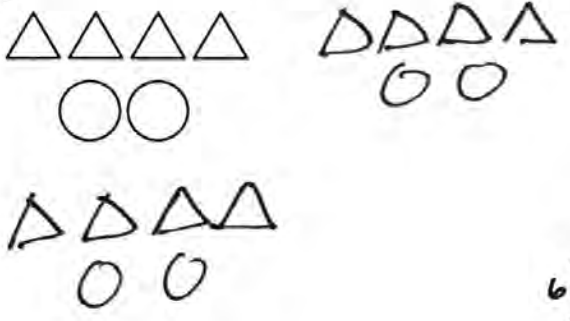
25. What is the constant of proportionality for this table? 3

Name: ANSWER KEY G7 U2 Lesson 2 - Independent Work

Remember: When the unit rates are the same, that number is the constant of proportionality.

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

1.



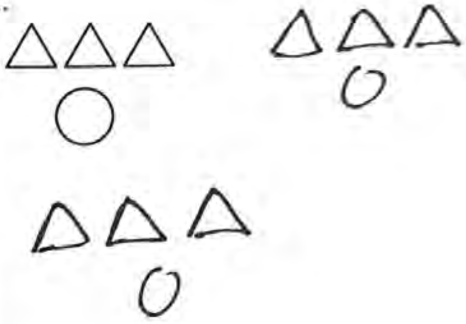
$$\begin{array}{r} 02 \\ 6\overline{)12} \\ -12 \\ \hline 00 \end{array}$$

circles	triangles
2	4
4	8
6	12

$$\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array} \quad \begin{array}{r} 2 \\ 4\overline{)8} \\ -8 \\ \hline 0 \end{array}$$

What is the constant of proportionality? 2

2.

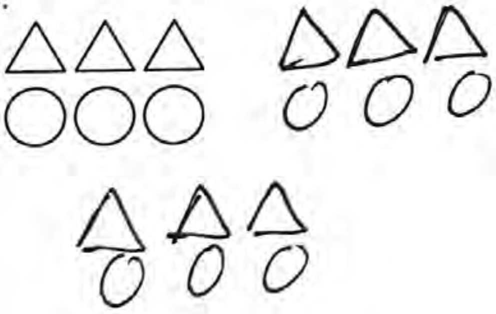


circles	triangles
1	3
2	6
3	9

$$\begin{array}{r} 3 \\ 1\overline{)3} \\ -3 \\ \hline 0 \end{array} \quad \begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 6 \end{array} \quad \begin{array}{r} 3 \\ 3\overline{)9} \\ -9 \\ \hline 0 \end{array}$$

What is the constant of proportionality? 3

3.

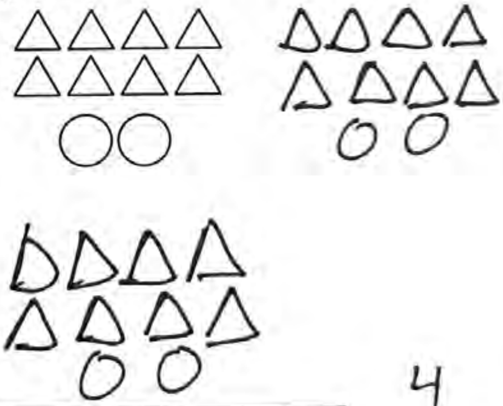


circles	triangles
3	3
6	6
9	9

$$\begin{array}{r} 1 \\ 3\overline{)3} \\ -3 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ 6\overline{)6} \\ -6 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ 9\overline{)9} \\ -9 \\ \hline 0 \end{array}$$

What is the constant of proportionality? 1

4.



circles	triangles
2	8
4	16
6	24

$$\begin{array}{r} 4 \\ 2\overline{)8} \\ -8 \\ \hline 0 \end{array} \quad \begin{array}{r} 4 \\ 4\overline{)16} \\ -16 \\ \hline 00 \end{array} \quad \begin{array}{r} 06 \\ 4\overline{)24} \\ -24 \\ \hline 00 \end{array}$$

What is the constant of proportionality? 4

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

5.

eyes	ears
1	2
2	4
3	6

$\begin{array}{r} 2 \\ 1\overline{)2} \\ -2 \\ \hline 0 \end{array}$ $\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array}$ $\begin{array}{r} 2 \\ 3\overline{)6} \\ -6 \\ \hline 0 \end{array}$

What is the constant of proportionality? 2

6.

arms	legs
2	2
4	4
6	6

$\begin{array}{r} 1 \\ 2\overline{)2} \\ -2 \\ \hline 0 \end{array}$ $\begin{array}{r} 1 \\ 4\overline{)4} \\ -4 \\ \hline 0 \end{array}$ $\begin{array}{r} 1 \\ 6\overline{)6} \\ -6 \\ \hline 0 \end{array}$

What is the constant of proportionality? 1

7.

$\begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \\ -4 \\ \hline 1 \end{array}$ $\begin{array}{r} 2\frac{2}{4} \\ 4\overline{)10} \\ -8 \\ \hline 2 \end{array}$

eyes	arms
2	5
4	10
6	15

$\begin{array}{r} 02\frac{3}{6} \\ 6\overline{)15} \\ -12 \\ \hline 3 \end{array}$

What is the constant of proportionality? $2\frac{1}{2}$

8.

$\begin{array}{r} 0\frac{1}{2} \\ 2\overline{)1} \\ -0 \\ \hline 1 \end{array}$ $\begin{array}{r} 0\frac{2}{4} \\ 4\overline{)2} \\ -0 \\ \hline 2 \end{array}$

fangs	nose
2	1
4	2
6	3

$\begin{array}{r} 0\frac{3}{6} \\ 6\overline{)3} \\ -0 \\ \hline 3 \end{array}$

What is the constant of proportionality? $\frac{1}{2}$

Double the picture then double it again. Use your pictures to complete the table then find the constant of proportionality.

5.

eyes	ears
1	2
2	4
3	6

$$1\overline{)2}^{\,2}\quad -2,\ 0$$

$$2\overline{)4}^{\,2}\quad -4,\ 0$$

$$3\overline{)6}^{\,2}\quad -6,\ 0$$

What is the constant of proportionality? 2

6.

arms	legs
2	2
4	4
6	6

$$2\overline{)2}^{\,1}\quad -2,\ 0$$

$$4\overline{)4}^{\,1}\quad -4,\ 0$$

$$6\overline{)6}^{\,1}\quad -6,\ 0$$

What is the constant of proportionality? 1

7.

eyes	arms
2	5
4	10
6	15

$$2\overline{)5}^{\,2\frac{1}{2}}\quad -4,\ 1$$

$$4\overline{)10}^{\,2\frac{2}{4}}\quad -8,\ 2$$

$$6\overline{)15}^{\,02\frac{3}{6}}\quad -12,\ 3$$

What is the constant of proportionality? $2\frac{1}{2}$

8.

fangs	nose
2	1
4	2
6	~~3~~3

$$2\overline{)1}^{\,0\frac{1}{2}}\quad -0,\ 1$$

$$4\overline{)2}^{\,0\frac{2}{4}}\quad -0,\ 2$$

$$6\overline{)3}^{\,0\frac{3}{6}}\quad -0,\ 3$$

What is the constant of proportionality? $\frac{1}{2}$

G7 U2 Lesson 3

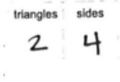
Find the constant of proportionality from information given on a table and use the constant of proportionality to fill information on a table.

G7 U2 Lesson 3 - Today we will use the constant of proportionality to fill information on a table.

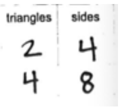
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we're going to keep working with the constant of proportionality. You have already found it so today we'll explore how it can be used to fill in a ratio table.

Let's Review (Slide 3): We already learned that we can collect ratios on a table and check if they are proportional. Let's do an example with these pictures. It says, "Use the pictures to fill in the first 3 rows of the table." I look at my table and there are triangles. *Point to where it says "triangles" on top of the table.* And there are sides. *Point to where it says "sides" on top of the table.* I just need to count to fill this in. *Point to the triangles as you count.* Here, I see 1, 2. So I put a 2 in the triangles column. Now let's trace the sides. *Use your fingertip to trace each side as you count.* I see 1, 2, 3, 4. So I put a 4 in the side column.

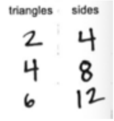


triangles	sides
2	4



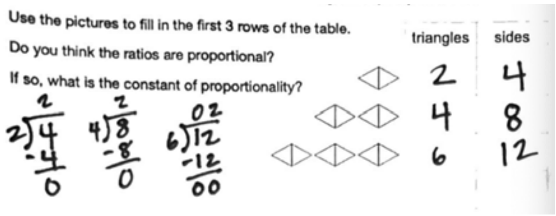
triangles	sides
2	4
4	8

Let's do the next one. *Model counting the triangles out loud while you point. Then count the side out loud while you trace them with your fingers.* There are 4 triangles and 8 sides. I am going to write that in my table.



triangles	sides
2	4
4	8
6	12

Let's do the next one. *Model counting the triangles out loud while you point. Then count the side out loud while you trace them with your fingers.* There are 6 triangles and 12 sides. I am going to write that in my table.



Use the pictures to fill in the first 3 rows of the table.

Do you think the ratios are proportional?

If so, what is the constant of proportionality?

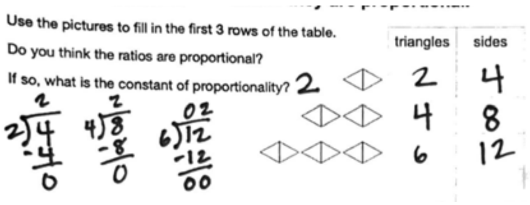
triangles	sides
2	4
4	8
6	12

$\overset{2}{2\overline{)4}}$ -4 0 $\overset{2}{4\overline{)8}}$ -8 0 $\overset{02}{6\overline{)12}}$ -12 00

Now it says, "Do you think the ratios are proportional?" What do you think? Possible Student Answers, Key Points:

- They are proportional because it is just the same picture over and over.
- They are proportional because it is always 2 sides per triangle.
- They are proportional because they have the same unit rate.
- They are proportional because they have the same constant of proportionality.
- They are proportional because you can keep adding 2 to the triangles and 4 to the sides columns.

In our last lesson we learned that if the unit rate is the same for a set of ratios then they are proportional. So let's find the unit rate. For the first row, I am going to do 4 divided by 2 is 2. That's 2 sides per triangle. Let's do the next one. It's 8 divided by 4 is 2. That's 2 sides per triangle. Let's do the next one. It's 12 divided by 6 is 2. That's 2 sides per triangle. So, are they proportional? YES! Because the unit rates are the same.



Use the pictures to fill in the first 3 rows of the table.

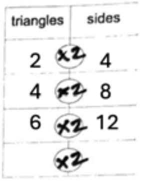
Do you think the ratios are proportional?

If so, what is the constant of proportionality? 2

triangles	sides
2	4
4	8
6	12

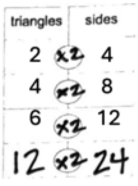
$\overset{2}{2\overline{)4}}$ -4 0 $\overset{2}{4\overline{)8}}$ -8 0 $\overset{02}{6\overline{)12}}$ -12 00

So then, what is the constant of proportionality? That's easy. It's just 2. It's just the unit rate we already found.



triangles		sides
2	x2	4
4	x2	8
6	x2	12
	x2	

Let's Talk (Slide 4): Now here's the cool thing. *Read the top of the slide.* "When there is a constant of proportionality, we can use it to find missing values." The first thing we need to think about is here: "Notice that the constant of proportionality multiplies each row from left to right. Write it in the circles." So I am going to write in the circle, "times 2" and "times 2" and "times 2." And I don't even have any numbers in this bottom row but I know whatever numbers we put will have to have that same relationship so "times 2."

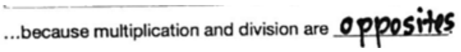


triangles		sides
2	x2	4
4	x2	8
6	x2	12
12	x2	24

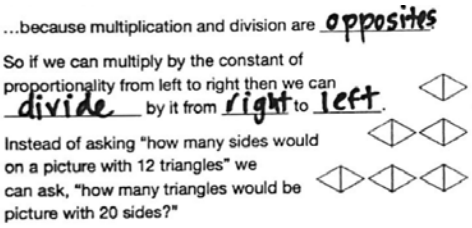
Read from the slide. "Now we can use this to find out how many sides there would be for a picture with 12 triangles. Let's use the table then draw to check." If I use the table, I am going to put a 12 in the triangle column. I have to be careful because there could be a different problem that asks about 12 sides. So it is not always going to be the first column. It is all based on the words. The problem said "12 triangles" so 12 goes in the triangles column. Now I can just do the math I have in the circle. 12 times 2 is 24 so there must be 24 sides.

Let's draw a picture to check. I drew 12 triangles. Now let's count the sides. We were right!

Let's Think (Slide 5): There's one more idea that we need to put together here. This is the same table we just saw. The numbers were just brought over from the last slide to this slide. Now we can keep exploring. *Read from the slide.* "If we can multiply by the constant of proportionality then we can divide by it." That's because multiplication and division are OPPOSITES!



...because multiplication and division are opposites

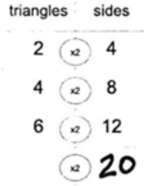


...because multiplication and division are opposites

So if we can multiply by the constant of proportionality from left to right then we can divide by it from right to left.

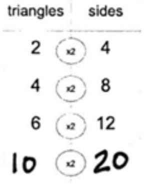
Instead of asking "how many sides would on a picture with 12 triangles" we can ask, "how many triangles would be picture with 20 sides?"

Keep reading the slide as you fill in the words. So if we can multiply by the constant of proportionality from left to right then we can also DIVIDE by it from RIGHT to LEFT. Let's look at it row by row. *Point from the left column across to the right column.* We can do 2 times 2 makes 4. *Point from the right column across to the left column.* But we can also think of it as 4 divided by 2 makes 2. Let's keep going. 4 times 2 is 8 or 8 divided by 2 is 4. Next row, 6 times 2 is 12 and 12 divided by 2 is 6.



triangles		sides
2	x2	4
4	x2	8
6	x2	12
	x2	20

Read the rest of the slide. Now, iInstead of asking "how many sides would be on a picture with 12 triangles" we can ask, "how many triangles would be on a picture with 20 sides? This is a totally DIFFERENT problem than the last one because it is asking about 20 sides now - not 20 triangles. So now I am going to put the 20 in the sides column.



triangles		sides
2	x2	4
4	x2	8
6	x2	12
10	x2	20

We can still think of it as multiplication but now instead of multiplying 20, we are asking, "what times 2 makes 20?" Or we can do the opposite! Division! It would be 20 divided by 2 makes 10.

Let's draw a picture to check. I am going to draw until I have 20 sides. Now let's count the triangles. There are 10. So, from now on, we are going to find the constant of proportionality by dividing like we did before. But now when we put it on our table. We can multiply from left to right or divided from right to left.

Let's Try It (Slide 6): Let's practice! I am going to take you through step by step.

WARM WELCOME

Today we will use the constant of proportionality to fill information on a table.

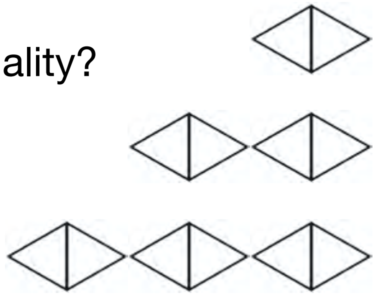
Let's Review:

We can collect ratios on a table and check if they are proportional.

Use the pictures to fill in the first 3 rows of the table.

Do you think the ratios are proportional?

If so, what is the constant of proportionality?



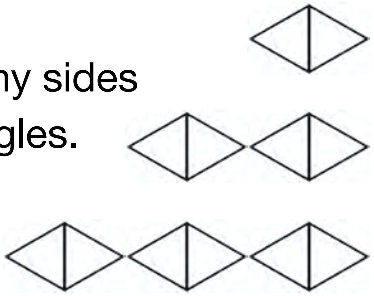
triangles	sides

Let's Talk:

When there is a constant of proportionality, we can use it to find missing values.

Notice that the constant of proportionality multiplies each row from left to right. Write it in the circles.

Now we can use this to find out how many sides there would be for a picture with 12 triangles. Let's use the table then draw to check.



triangles	sides
2	○ 4
4	○ 8
6	○ 12
	○

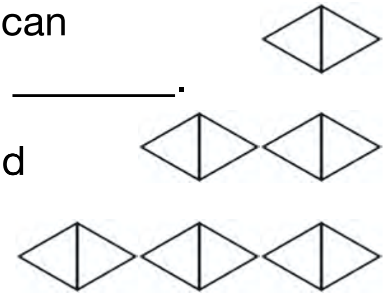
Let's Think:

If we can multiply by the constant of proportionality then we can divide by it.

…because multiplication and division are ____________!

So if we can multiply by the constant of proportionality from left to right then we can _______________ by it from _______ to _______.

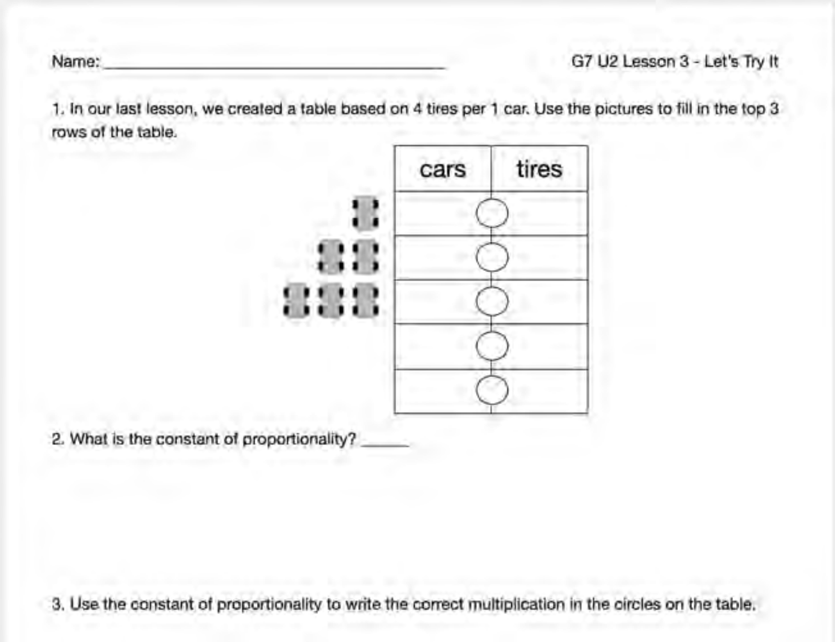
Instead of asking "how many sides would on a picture with 12 triangles" we can ask, "how many triangles would be picture with 20 sides?"



triangles		sides
2	x2	4
4	x2	8
6	x2	12
	x2	

Let's Try It:

Let's use the constant of proportionality to fill in tables together.



Name: ______________________________ G7 U2 Lesson 3 - Let's Try It

1. In our last lesson, we created a table based on 4 tires per 1 car. Use the pictures to fill in the top 3 rows of the table.

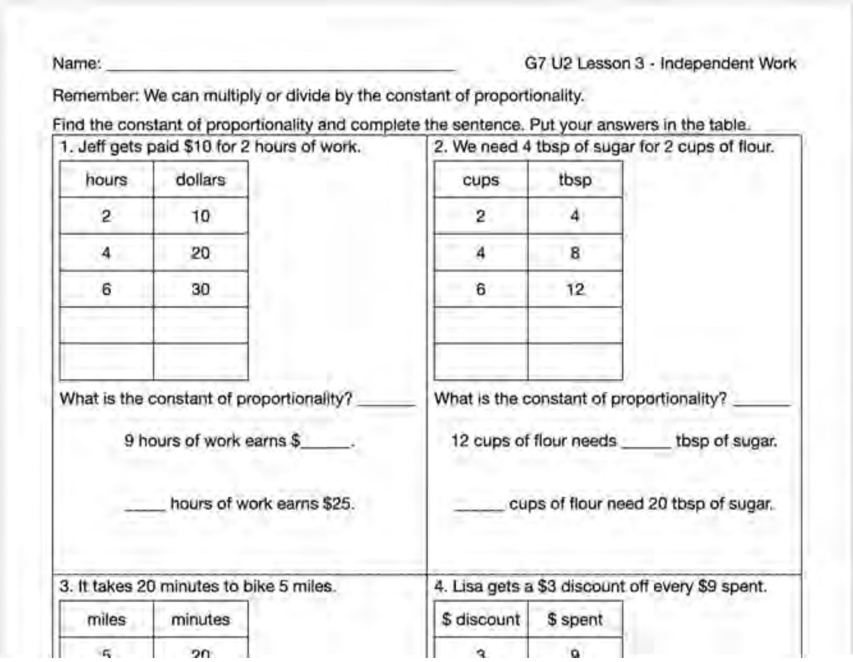
cars		tires
	○	
	○	
	○	
	○	
	○	

2. What is the constant of proportionality? _____

3. Use the constant of proportionality to write the correct multiplication in the circles on the table.

On your Own:

Now it’s time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 3 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality and complete the sentence. Put your answers in the table.

1. Jeff gets paid $10 for 2 hours of work.

hours	dollars
2	10
4	20
6	30

What is the constant of proportionality? ______

9 hours of work earns $_____.

_____ hours of work earns $25.

2. We need 4 tbsp of sugar for 2 cups of flour.

cups	tbsp
2	4
4	8
6	12

What is the constant of proportionality? ______

12 cups of flour needs _____ tbsp of sugar.

_____ cups of flour need 20 tbsp of sugar.

3. It takes 20 minutes to bike 5 miles.

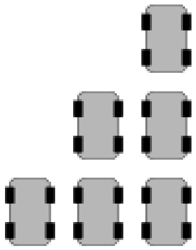
miles	minutes
5	20

4. Lisa gets a $3 discount off every $9 spent.

$ discount	$ spent
3	9

Name: ____ G7 U2 Lesson 3 - Let’s Try It

1. In our last lesson, we created a table based on 4 tires per 1 car. Use the pictures to fill in the top 3 rows of the table.



cars	tires
○	
○	
○	
○	
○	

2. What is the constant of proportionality? ______

3. Use the constant of proportionality to write the correct multiplication in the circles on the table.

Use the table to find how many tires would be on 7 cars.

4. Write 7 cars in the correct place on the table.

5. Write the constant of proportionality in the correct place on the table.

6. Find the number of tires that would complete the table and complete the sentence below.

7 cars would have ______ tires.

Use the table to find how many cars would have 40 tires.

7. Write 40 tires in the correct place on the table.

8. Write the constant of proportionality in the correct place on the table.

9. Find the number of cars that would complete the table and complete the sentence below.

______ cars would have 40 tires.

10. In our last lesson, we also used the cupcakes shown below. Use the pictures to fill in the top 3 rows of the table.

cupcakes	dollars

11. What is the constant of proportionality? ______

12. Use the constant of proportionality to write the correct multiplication in the circles on the table.

Use the table to find the cost of 9 cupcakes.

13. Write 9 cupcakes in the correct place on the table.

14. Write the constant of proportionality in the correct place on the table.

15. Find the number of dollars that would complete the expression and complete the sentence.

9 cupcakes would cost ______ dollars.

Use the table to find how many cupcakes can be bought with $30.

16. Write 30 dollars in the correct place on the table.

17. Write the constant of proportionality in the correct place on the table.

18. Find the number of cupcakes that would complete the expression and complete the sentence.

______ cupcakes would cost $30.

Name: ____ G7 U2 Lesson 3 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality and complete the sentence. Put your answers in the table.

1. Jeff gets paid $10 for 2 hours of work.

hours	dollars
2	10
4	20
6	30

What is the constant of proportionality? _______

9 hours of work earns $______.

_____ hours of work earns $25.

2. We need 4 tbsp of sugar for 2 cups of flour.

cups	tbsp
2	4
4	8
6	12

What is the constant of proportionality? _______

12 cups of flour needs ______ tbsp of sugar.

______ cups of flour need 20 tbsp of sugar.

3. It takes 20 minutes to bike 5 miles.

miles	minutes
5	20
10	40
15	60

What is the constant of proportionality? _______

2 miles will take ______ minutes.

______ miles will take 12 minutes.

4. Lisa gets a $3 discount off every $9 spent.

$ discount	$ spent
3	9
6	18
9	27

What is the constant of proportionality? _______

Lisa will get a _____ discount on $12 spent.

Lisa will get a $5 discount on $_____ spent.

Find the constant of proportionality and complete the sentence. Put your answers in the table.

5. Jeff gets paid $10 for 2 hours of work.

hours	dollars
2	10
4	20
6	30

What is the constant of proportionality? _______

9 hours of work earns $______.

_____ hours of work earns $25.

6. We need 4 tbsp of sugar for 2 cups of flour.

cups	tbsp
2	4
4	8
6	12

What is the constant of proportionality? _______

12 cups of flour needs ______ tbsp of sugar.

______ cups of flour need 20 tbsp of sugar.

7. It takes 20 minutes to bike 5 miles.

miles	minutes
5	20
10	40
15	60

What is the constant of proportionality? _______

2 miles will take ______ minutes.

______ miles will take 12 minutes.

8. Lisa gets a $3 discount off every $9 spent.

$ discount	$ spent
3	9
6	18
9	27

What is the constant of proportionality? _______

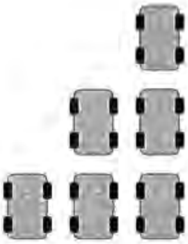
Lisa will get a _____ discount on $12 spent.

Lisa will get a $5 discount on $_____ spent.

Name: ANSWER KEY

G7 U2 Lesson 3 - Let's Try It

1. In our last lesson, we created a table based on 4 tires per 1 car. Use the pictures to fill in the top 3 rows of the table.



cars		tires
1	×4	4
2	×4	8
3	×4	12
7	×4	28
10	×4	40

2. What is the constant of proportionality? 4

$1\overline{)4}$ quotient 4; -4; 0

$2\overline{)8}$ quotient 4; -8; 0

$3\overline{)12}$ quotient 04; -12; 00

3. Use the constant of proportionality to write the correct multiplication in the circles on the table.

Use the table to find how many tires would be on 7 cars.

4. Write 7 cars in the correct place on the table.

5. Write the constant of proportionality in the correct place on the table.

6. Find the number of tires that would complete the table and complete the sentence below.

7×4 = ?

7×4 = 28

7 cars would have 28 tires.

Use the table to find how many cars would have 40 tires.

7. Write 40 tires in the correct place on the table.

8. Write the constant of proportionality in the correct place on the table.

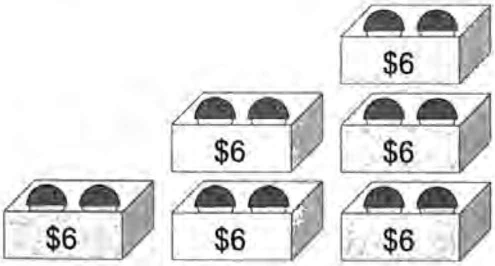
9. Find the number of cars that would complete the table and complete the sentence below.

? × 4 = 40

10 × 4 = 40

10 cars would have 40 tires.

10. In our last lesson, we also used the cupcakes shown below. Use the pictures to fill in the top 3 rows of the table.



cupcakes		dollars
2	×3	6
4	×3	12
6	×3	18
9	×3	27
10	×3	30

11. What is the constant of proportionality? 3

$$\begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array} \qquad \begin{array}{r} 03 \\ 4\overline{)12} \\ -12 \\ \hline 00 \end{array} \qquad \begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$$

12. Use the constant of proportionality to write the correct multiplication in the circles on the table.

Use the table to find the cost of 9 cupcakes.

13. Write 9 cupcakes in the correct place on the table.

14. Write the constant of proportionality in the correct place on the table.

15. Find the number of dollars that would complete the expression and complete the sentence.

$9 \times 3 = ?$
$9 \times 3 = 27$

9 cupcakes would cost 27 dollars.

Use the table to find how many cupcakes can be bought with $30.

16. Write 30 dollars in the correct place on the table.

17. Write the constant of proportionality in the correct place on the table.

18. Find the number of cupcakes that would complete the expression and complete the sentence.

$? \times 3 = 30$
$10 \times 3 = 30$

10 cupcakes would cost $30.

Name: ANSWER KEY

G7 U2 Lesson 3 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality and complete the sentence. Put your answers in the table.

1. Jeff gets paid $10 for 2 hours of work.

hours	dollars
2 ×5	10
4 ×5	20
6 ×5	30
9 ×5	45
5 ×5	25

$\begin{array}{r} 05 \\ 2\overline{)10} \\ -10 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 4\overline{)20} \\ -20 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 6\overline{)30} \\ -30 \\ \hline 00 \end{array}$

What is the constant of proportionality? 5

9 hours of work earns $45.

5 hours of work earns $25.

2. We need 4 tbsp of sugar for 2 cups of flour.

cups	tbsp
2 ×2	4
4 ×2	8
6 ×2	12
12 ×2	24
10 ×2	20

$\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array}$ $\begin{array}{r} 2 \\ 4\overline{)8} \\ -8 \\ \hline 0 \end{array}$ $\begin{array}{r} 02 \\ 6\overline{)12} \\ -12 \\ \hline 00 \end{array}$

What is the constant of proportionality? 2

12 cups of flour needs 24 tbsp of sugar.

10 cups of flour need 20 tbsp of sugar.

3. It takes 20 minutes to bike 5 miles.

miles	minutes
5 ×4	20
10 ×4	40
15 ×4	60
2 ×4	8
3 ×4	12

$\begin{array}{r} 04 \\ 5\overline{)20} \\ -20 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 10\overline{)40} \\ -40 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 15\overline{)60} \\ -60 \\ \hline 00 \end{array}$

What is the constant of proportionality? 4

2 miles will take 8 minutes.

3 miles will take 12 minutes.

4. Lisa gets a $3 discount off every $9 spent.

$ discount	$ spent
3 ×3	9
6 ×3	18
9 ×3	27
4 ×3	12
5 ×3	15

$\begin{array}{r} 3 \\ 3\overline{)9} \\ -9 \\ \hline 0 \end{array}$ $\begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$ $\begin{array}{r} 03 \\ 9\overline{)27} \\ -27 \\ \hline 00 \end{array}$

What is the constant of proportionality? 3

Lisa will get a $4 discount on $12 spent.

Lisa will get a $5 discount on $12 spent.

Find the constant of proportionality and complete the sentence. Put your answers in the table.

5. Jeff gets paid $10 for 2 hours of work.

hours	dollars
2 ×5	10
4 ×5	20
6 ×5	30
9 ×5	45
5 ×5	25

$\begin{array}{r} 05 \\ 2\overline{)10} \\ -10 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 4\overline{)20} \\ -20 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 6\overline{)30} \\ -30 \\ \hline 00 \end{array}$

What is the constant of proportionality? 5

9 hours of work earns $45.

5 hours of work earns $25.

6. We need 4 tbsp of sugar for 2 cups of flour.

cups	tbsp
2 ×2	4
4 ×2	8
6 ×2	12
12 ×2	24
10 ×2	20

$\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array}$ $\begin{array}{r} 2 \\ 4\overline{)8} \\ -8 \\ \hline 0 \end{array}$ $\begin{array}{r} 02 \\ 6\overline{)12} \\ -12 \\ \hline 00 \end{array}$

What is the constant of proportionality? 2

12 cups of flour needs 24 tbsp of sugar.

10 cups of flour need 20 tbsp of sugar.

7. It takes 20 minutes to bike 5 miles.

miles	minutes
5 ×4	20
10 ×4	40
15 ×4	60
2 ×4	8
3 ×4	12

$\begin{array}{r} 04 \\ 5\overline{)20} \\ -20 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 10\overline{)40} \\ -40 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 15\overline{)60} \\ -60 \\ \hline 00 \end{array}$

What is the constant of proportionality? 4

2 miles will take 8 minutes.

3 miles will take 12 minutes.

8. Lisa gets a $3 discount off every $9 spent.

$ discount	$ spent
3 ×3	9
6 ×3	18
9 ×3	27
4 ×3	12
5 ×3	15

$\begin{array}{r} 3 \\ 3\overline{)9} \\ -9 \\ \hline 0 \end{array}$ $\begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$ $\begin{array}{r} 03 \\ 9\overline{)27} \\ -27 \\ \hline 00 \end{array}$

What is the constant of proportionality? 3

Lisa will get a 4 discount on $12 spent.

Lisa will get a $5 discount on $15 spent.

G7 U2 Lesson 4

Write equations to represent a proportional relationship described in a table.

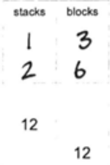
G7 U2 Lesson 4 - Today we will write two equations to represent a proportional relationship in a table.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will be writing two equations to represent a proportional relationship in a table. We will see how this is not different than what we've been doing. It's just another way to represent the same idea.

stacks	blocks
1	3
12	
	12

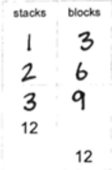
Let's Review (Slide 3): We know we can multiply or divide by the constant of proportionality. Let's apply it to a problem. *Read the story.* "Jacob is using stacks of blocks to build a wall. Use the picture to fill in the first 3 rows of the table." I see in this first picture that I have 1 stack so I will write 1 under the word stacks. I count the blocks and there are 1 - 2 - 3. So I will write 3 under the word blocks.



stacks	blocks
1	3
2	6
12	
	12

You tell me what to write for the next picture. Possible Student Answers, Key Points:

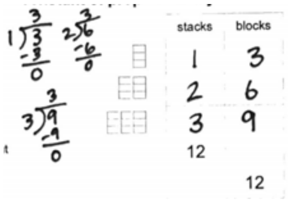
- There are 2 stacks and 6 blocks.
- Put 2 in the stacks column and 6 in the blocks column.



stacks	blocks
1	3
2	6
3	9
12	
	12

You tell me what to write for the next picture. Possible Student Answers, Key Points:

- There are 3 stacks and 9 blocks.
- Put 3 in the stacks column and 9 in the blocks column.

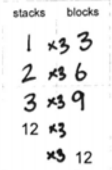


stacks	blocks
1	3
2	6
3	9
12	
	12

Now, how do I find the constant of proportionality? Possible Student Answers, Key Points:

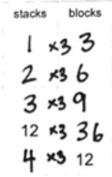
- You can divide each ratio.
- You can see that it is always "times 3" going across.

I can kind of see that it is "times 3" going across. But if I couldn't see it then I can just divide each ratio. I am going to divide 3 by 1 and get 3. I am going to divide 6 by 2 and get 3. I am going to divide 9 by 3 and get 3.



stacks		blocks
1	×3	3
2	×3	6
3	×3	9
12	×3	
	×3	12

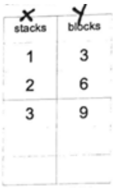
The constant of proportionality is 3. And I can write that in circles that show me what math to do from left to write.



stacks		blocks
1	×3	3
2	×3	6
3	×3	9
12	×3	36
4	×3	12

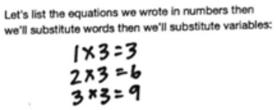
Now, the final question is, "how can we use the constant of proportionality to find the missing values?" This is what we learned in our last lesson. It is easy to see the 12 x 3. That's makes 36. What about this 12 in the blocks column. It is NOT 12 times 3. It is something times 3 to make 12. This is where I have to work backwards. I have to do the opposite. I have to divide. 12 divided by 3 makes 4. And that makes sense right, there are always fewer stacks than blocks.

Let's Talk (Slide 4): That is some really special thinking that we just did. And in mathematics, we like to find a way to represent the special thinking especially when it will work over and over for any number. *Read the heading.* "An equation with variables can represent the operations we see on the table." Variables are letters that represent a place where you can plug in any number. So if I have x in an equation. Then I am saying you can put 1 in the place of x or 2 in the place of x, etc. In the case of our example with Jacob, it says, "Let x stand for the number of stacks and y stand for the number of



x stacks	y blocks
1	3
2	6
3	9

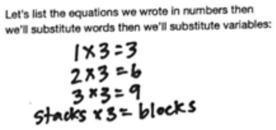
blocks.” That’s important because remember on the last slide, when there were 12 stacks, we multiplied. But when there were 12 blocks, we divided. I am going to write an x over the stacks column and a y over the blocks column so that I remember which side is which.



Let's list the equations we wrote in numbers then we'll substitute words then we'll substitute variables:

$1 \times 3 = 3$
$2 \times 3 = 6$
$3 \times 3 = 9$

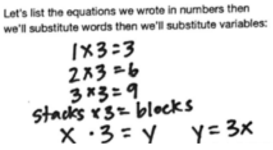
Now, let’s list the equations we wrote in numbers. We have 1 x 3 equals 3, 2 x 3 equals 6 and 3 x 3 equals 9.



Let's list the equations we wrote in numbers then we'll substitute words then we'll substitute variables:

$1 \times 3 = 3$
$2 \times 3 = 6$
$3 \times 3 = 9$
Stacks x 3 = blocks

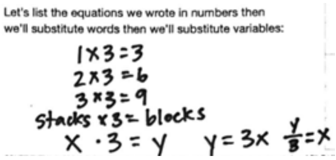
If I substitute words for these equations, every time I multiplied, it was stacks x 3 equals blocks.



Let's list the equations we wrote in numbers then we'll substitute words then we'll substitute variables:

$1 \times 3 = 3$
$2 \times 3 = 6$
$3 \times 3 = 9$
Stacks x 3 = blocks
$X \cdot 3 = Y$ $\quad Y = 3X$

And now for the final step, if I put in my variables instead of the words, we can write x times 3 is y. Sometimes we write it like this: 3x = y or y = 3x. They all mean the same thing: multiply the numbers on the x side of the table which means multiply the stacks.



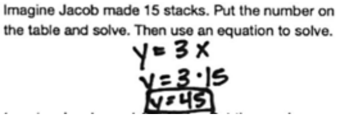
Let's list the equations we wrote in numbers then we'll substitute words then we'll substitute variables:

$1 \times 3 = 3$
$2 \times 3 = 6$
$3 \times 3 = 9$
Stacks x 3 = blocks
$X \cdot 3 = Y$ $\quad Y = 3X$ $\quad \frac{Y}{3} = X$

But we know that we can always do the opposite operation too, right? So let’s do our division list. It is 3 divided by 1 equals 3 and 6 divided by 2 equals 3 and 9 divided by 3 equals 3.If I substitute words for these equations, every time I divided, it was blocks divided by 3 equals stacks. And below, for the final step, if I put in my variables instead of the words, we can write y divided by 3 is x. Sometimes we write it like this: y over 3 equals x or x = y divided by 3. They all mean the same thing: divide the numbers on the y side of the table which means divide the blocks.

stacks	blocks
1	3
2	6
3	9
15	

Let’s Think (Slide 5): Let’s put this into practice for a real life example. You’re not going to need to do all this today but I want you to see how we use our equations. This says, “we can use any of our equivalent equations to solve for a missing value.” Let’s read. “Imagine Jacob made 15 stacks. Put the number on the table and solve. Then use an equation to solve.” 15 stacks mean I want to put 15 in the stacks column. 15 is x.



Imagine Jacob made 15 stacks. Put the number on the table and solve. Then use an equation to solve.

$y = 3x$
$y = 3 \cdot 15$
$\boxed{y = 45}$

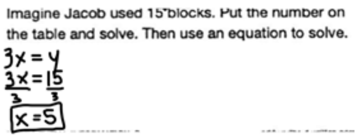
So I can use the equation x times 3 = y. When I substitute 15 for x, I get 15 times 3 equals y or 15 times 3 equals 45.

stacks	blocks
1	3
2	6
3	9
15	45

Now I know 45 goes on the y side of the equation.

stacks	blocks
1	3
2	6
3	9
15	45
	15

Let’s read the next one, “Imagine Jacob used 15 blocks. Put the number on the table and solve. Then use an equation to solve.” In this case, it is not 15 stacks, it is 15 blocks. I would write 15 on this side of the equation. And so I wouldn’t multiply by 3, I would do the opposite, I would divide. 15 divided by 3 is 5.



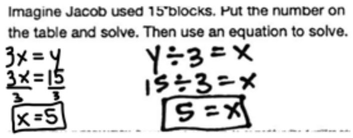
Imagine Jacob used 15 blocks. Put the number on the table and solve. Then use an equation to solve.

$3x = y$

$\frac{3x}{3} = \frac{15}{3}$

$\boxed{x=5}$

Now let’s think about using an equation. If I use the equation, I just used, it works but I have to put the 15 in a different place. The equation was x times 3 equals y. Now y is 15 so I subsitute the y. I get x times 3 equals 15. Do you see how I don’t multiply the 15? I need something times 3 to make 15. I can work backwards using algebra to solve. I divide by 3 on both sides. I get x = 5. Notice that I ended up dividing after all.



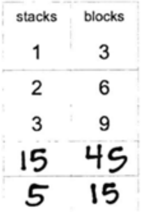
Imagine Jacob used 15 blocks. Put the number on the table and solve. Then use an equation to solve.

$3x = y$ $\quad$ $y \div 3 = x$

$\frac{3x}{3} = \frac{15}{3}$ $\quad$ $15 \div 3 = x$

$\boxed{x=5}$ $\quad$ $\boxed{5 = x}$

Another way that I could do this is to use the other related equation. Instead of x times 3 equals y, I could use y divided by 3 equals x. Then I substitute 15 for y just like before. But the equation says 15 divided by 3 equals x. Which becomes 5 = x. We get the same answer.



stacks	blocks
1	3
2	6
3	9
15	45
5	15

I am going to put the 5 on my table. Here’s the main idea: if you can think of two opposite equations for your table then you can solve for the missing values in either column. I’m not going to ask you to find missing values today but you are going to have to write two opposite equations.

Let’s Try It (Slide 6): Let’s practice! I am going to take you through step by step.

WARM WELCOME

Today we will write two equations to represent a proportional relationship in a table.

Let’s Review:

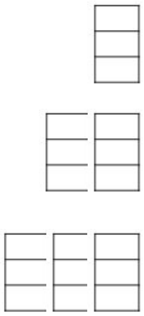
We can multiply or divide by the constant of proportionality.

Jacob is using stacks of blocks to build a wall.

Use the pictures to fill in the first 3 rows of the table.

What is the constant of proportionality?

How can we use the constant of proportionality to find the missing values?



stacks	blocks
12	
	12

Let’s Talk:

An equation with variables can represent the operations we see on the table.

Let x stand for the number of stacks and y stand for the number of blocks.

Let’s list the equations we wrote in numbers then we’ll substitute words then we’ll substitute variables:

stacks	blocks
1	3
2	6
3	9

Let's Think:

We can use any equivalent equation to solve for a missing value.

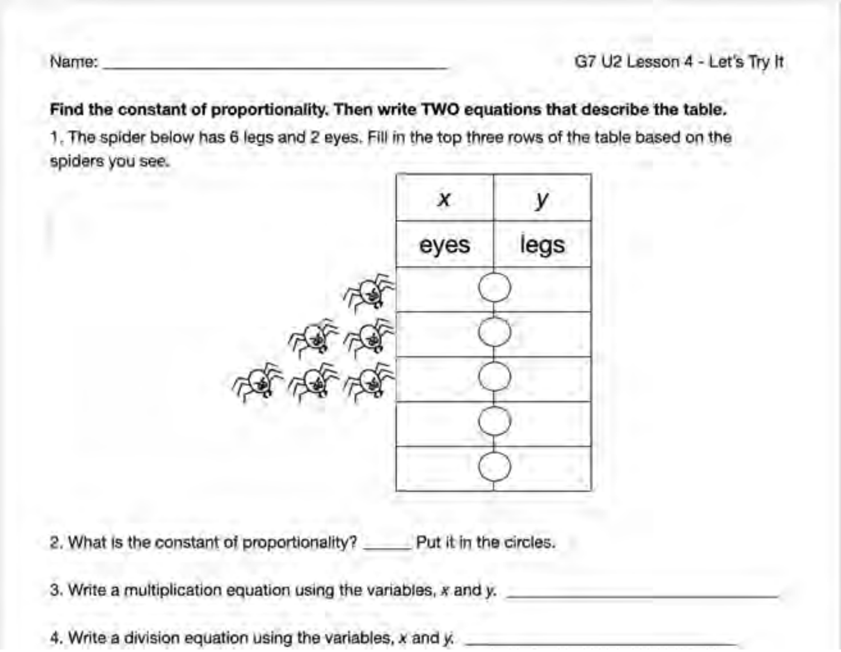
Imagine Jacob made 15 stacks. Put the number on the table and solve. Then use an equation to solve.

Imagine Jacob used 15 blocks. Put the number on the table and solve. Then use an equation to solve.

stacks	blocks
1	3
2	6
3	9

Let's Try It:

Let's find two related equations for each table together.



Name: ____________________

G7 U2 Lesson 4 - Let's Try It

Find the constant of proportionality. Then write TWO equations that describe the table.

1. The spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.

x	*y*
eyes	legs

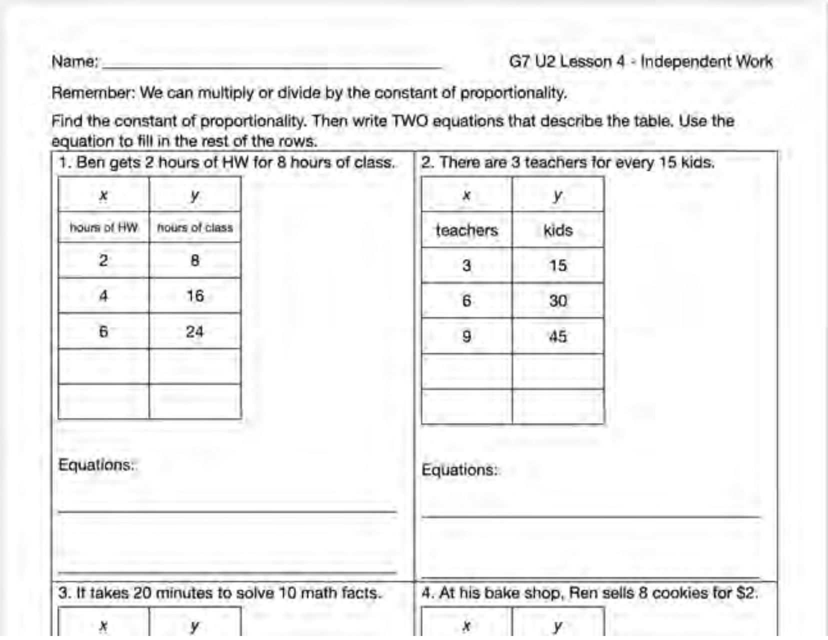
2. What is the constant of proportionality? _____ Put it in the circles.

3. Write a multiplication equation using the variables, *x* and *y*. ____________________

4. Write a division equation using the variables, *x* and *y*. ____________________

On your Own:

Now it’s time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 4 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality. Then write TWO equations that describe the table. Use the equation to fill in the rest of the rows.

1. Ben gets 2 hours of HW for 8 hours of class.

x	y
hours of HW	hours of class
2	8
4	16
6	24

Equations:

____

____

2. There are 3 teachers for every 15 kids.

x	y
teachers	kids
3	15
6	30
9	45

Equations:

____

____

3. It takes 20 minutes to solve 10 math facts.

x	y

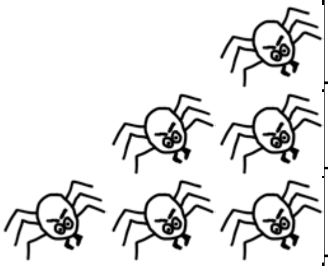
4. At his bake shop, Ren sells 8 cookies for $2.

x	y

Name: ____

Find the constant of proportionality. Then write TWO equations that describe the table.

1. The spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.



x	y
eyes	legs

2. What is the constant of proportionality? ______ Put it in the circles.

3. Write a multiplication equation using the variables, x and y. _______________________________

4. Write a division equation using the variables, x and y. _______________________________

Use the equation to fill in the rest of the rows.

5. Let's imagine x is _______. Plug x into the equation you wrote for #5 and solve.

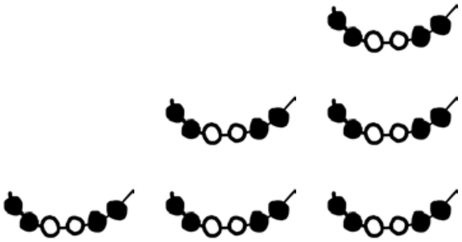
6. Put your numbers in a row of the table. Draw a picture to check your work.

7. Let's imagine y is _______. Plug y into the equation you wrote for #6 and solve.

8. Put your numbers in a row of the table. Draw a picture to check your work.

Find the constant of proportionality. Then write TWO equations that describe the table.

1. Jade made a necklace with 4 black beads and 2 white beads. Fill in the top three rows of the table based on the spiders you see.



x	y
white	black

2. What is the constant of proportionality? ______ Put it in the circles.

3. Write a multiplication equation using the variables, x and y. ________________________________

4. Write a division equation using the variables, x and y. ________________________________

Use the equation to fill in the rest of the rows.

5. Let's imagine x is _______. Plug x into the equation you wrote for #5 and solve.

6. Put your numbers in a row of the table. Draw a picture to check your work.

7. Let's imagine y is _______. Plug y into the equation you wrote for #6 and solve.

8. Put your numbers in a row of the table. Draw a picture to check your work.

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality. Then write TWO equations that describe the table. Use the equation to fill in the rest of the rows.

1. Ben gets 2 hours of HW for 8 hours of class.

x	y
hours of HW	hours of class
2	8
4	16
6	24

Equations:

____

____

2. There are 3 teachers for every 15 kids.

x	y
teachers	kids
3	15
6	30
9	45

Equations:

____

____

3. It takes 20 minutes to solve 10 math facts.

x	y
math facts	minutes
10	20
20	40
30	60

Equations:

____

____

4. At his bake shop, Ren sells 8 cookies for $2.

x	y
$	cookies
2	8
4	16
6	24

Equations:

____

____

Find the constant of proportionality. Then write TWO equations that describe the table. Use the equation to fill in the rest of the rows.

5. We need 3 scoops of cocoa in 3 cups of milk.

x	*y*
scoops	cups
3	3
6	6
9	9

Equations:

____

____

6. Taylor Swift rehearses 100 hours for a 20 minute concert.

x	*y*
minutes	hours
20	100
40	200
60	300

Equations:

____

____

7. The trail mix has 2 scoops of nuts for every 6 scoops of pretzels.

x	*y*
scoops of nuts	scoops of pretzels
2	6
4	12
6	18

Equations:

____

____

8. You can drive 60 miles on 2 gallons of gas.

x	*y*
gallons	miles
2	60
4	120
6	180

Equations:

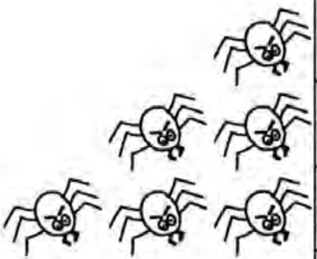
____

____

Name: ANSWER KEY

Find the constant of proportionality. Then write TWO equations that describe the table.

1. The spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.



x		y
eyes		legs
2	×3	6
4	×3	12
6	×3	18
10	×3	30
20	×3	60

$$\begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array} \qquad \begin{array}{r} 03 \\ 4\overline{)12} \\ -12 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$$

2. What is the constant of proportionality? 3 Put it in the circles.

3. Write a multiplication equation using the variables, x and y. $x \cdot 3 = y$ or $3x = y$

4. Write a division equation using the variables, x and y. $y \div 3 = x$ or $\frac{y}{3} = x$

Use the equation to fill in the rest of the rows.

5. Let's imagine x is 10. Plug x into the equation you wrote for #5 and solve.

$x \cdot 3 = y$
$10 \cdot 3 = y$
$\boxed{30 = y}$

6. Put your numbers in a row of the table. Draw a picture to check your work.

7. Let's imagine y is 60. Plug y into the equation you wrote for #6 and solve.

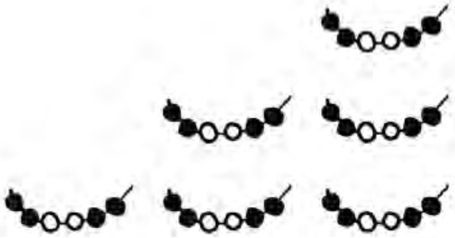
$y \div 3 = x$
$60 \div 3 = x$
$\boxed{20 = x}$

8. Put your numbers in a row of the table. Draw a picture to check your work.

Find the constant of proportionality. Then write TWO equations that describe the table.

1. Jade made a necklace with 4 black beads and 2 white beads. Fill in the top three rows of the table based on the spiders you see.

$$\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array} \quad \begin{array}{r} 2 \\ 4\overline{)8} \\ -8 \\ \hline 0 \end{array} \quad \begin{array}{r} 02 \\ 6\overline{)12} \\ -12 \\ \hline 00 \end{array}$$



x		y
white		black
2	×2	4
4	×2	8
6	×2	12
10	×2	20
5	×2	10

2. What is the constant of proportionality? 2 Put it in the circles.

3. Write a multiplication equation using the variables, *x* and *y*. $x \cdot 2 = y$ or $2x = y$

4. Write a division equation using the variables, *x* and *y*. $y \div 2 = x$ or $\frac{y}{2} = x$

Use the equation to fill in the rest of the rows.

5. Let's imagine *x* is 10. Plug *x* into the equation you wrote for #5 and solve.

$x \cdot 2 = y$

$10 \cdot 2 = y$

$\boxed{20 = y}$

6. Put your numbers in a row of the table. Draw a picture to check your work.

7. Let's imagine *y* is 10. Plug *y* into the equation you wrote for #6 and solve.

$y \div 2 = x$

$10 \div 2 = x$

$\boxed{5 = x}$

8. Put your numbers in a row of the table. Draw a picture to check your work.

Name: ANSWER KEY

G7 U2 Lesson 4 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality. Then write TWO equations that describe the table. Use the equation to fill in the rest of the rows.

1. Ben gets 2 hours of HW for 8 hours of class.

x	y
hours of HW	hours of class
2 ×4	8
4 ×4	16
6 ×4	24
5 ×4	20
8 ×4	32

many right answers

$\begin{array}{r} 4 \\ 2\overline{)8} \\ -8 \\ \hline 0 \end{array}$ $\begin{array}{r} 04 \\ 4\overline{)16} \\ -16 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 6\overline{)24} \\ -24 \\ \hline 00 \end{array}$

Equations:

$x \cdot 4 = y$ or $4x = y$

$y \div 4 = x$ or $\frac{y}{4} = x$

2. There are 3 teachers for every 15 kids.

x	y
teachers	kids
3 ×5	15
6 ×5	30
9 ×5	45
many right answers	

$\begin{array}{r} 05 \\ 3\overline{)15} \\ -15 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 6\overline{)30} \\ -30 \\ \hline 00 \end{array}$ $\begin{array}{r} 05 \\ 9\overline{)45} \\ -45 \\ \hline 00 \end{array}$

Equations:

$x \cdot 5 = y$ or $5x = y$

$y \div 5 = x$ or $\frac{y}{5} = x$

3. It takes 20 minutes to solve 10 math facts.

x	y
math facts	minutes
10 ×2	20
20 ×2	40
30 ×2	60
many right answers	

$\begin{array}{r} 02 \\ 10\overline{)20} \\ -20 \\ \hline 00 \end{array}$ $\begin{array}{r} 02 \\ 20\overline{)40} \\ -40 \\ \hline 00 \end{array}$ $\begin{array}{r} 02 \\ 30\overline{)60} \\ -60 \\ \hline 00 \end{array}$

Equations:

$x \cdot 2 = y$ or $2x = y$

$y \div 2 = x$ or $\frac{y}{2} = x$

4. At his bake shop, Ren sells 8 cookies for $2.

x	y
$	cookies
2 ×4	8
4 ×4	16
6 ×4	24
many right answers	

$\begin{array}{r} 4 \\ 2\overline{)8} \\ -8 \\ \hline 0 \end{array}$ $\begin{array}{r} 04 \\ 4\overline{)16} \\ -16 \\ \hline 00 \end{array}$ $\begin{array}{r} 04 \\ 6\overline{)24} \\ -24 \\ \hline 00 \end{array}$

Equations:

$x \cdot 4 = y$ or $4x = y$

$y \div 4 = x$ or $\frac{y}{4} = x$

Find the constant of proportionality. Then write TWO equations that describe the table. Use the equation to fill in the rest of the rows.

5. We need 3 scoops of cocoa in 3 cups of milk.

x	y
scoops	cups
3 ×1	3
6 ×1	6
9 ×1	9
many right answers	

$\begin{array}{r} 1 \\ 3\overline{)3} \\ -3 \\ \hline 0 \end{array}$ $\begin{array}{r} 1 \\ 6\overline{)6} \\ -6 \\ \hline 0 \end{array}$ $\begin{array}{r} 1 \\ 9\overline{)9} \\ -9 \\ \hline 0 \end{array}$

Equations:

$1x = y$ or $x = y$

$y \div 1 = x$ or $\frac{y}{1} = x$ or $y = x$

6. Taylor Swift rehearses 100 hours for a 20 minute concert.

x	y
minutes	hours
20 ×5	100
40 ×5	200
60 ×5	300
many right answers	

$\begin{array}{r} 005 \\ 20\overline{)100} \\ -100 \\ \hline 000 \end{array}$ $\begin{array}{r} 005 \\ 40\overline{)200} \\ -200 \\ \hline 000 \end{array}$ $\begin{array}{r} 005 \\ 60\overline{)300} \\ -300 \\ \hline 000 \end{array}$

Equations:

$x \cdot 5 = y$ or $5x = y$

$y \div 5 = x$ or $\frac{y}{5} = x$

7. The trail mix has 2 scoops of nuts for every 6 scoops of pretzels.

x	y
scoops of nuts	scoops of pretzels
2 ×3	6
4 ×3	12
6 ×3	18
many right answers	

$\begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array}$ $\begin{array}{r} 03 \\ 4\overline{)12} \\ -12 \\ \hline 00 \end{array}$ $\begin{array}{r} 03 \\ 6\overline{)18} \\ -18 \\ \hline 00 \end{array}$

Equations:

$x \cdot 3 = y$ or $3x = y$

$y \div 3 = x$ or $\frac{y}{3} = x$

8. You can drive 60 miles on 2 gallons of gas.

x	y
gallons	miles
2 ×30	60
4 ×30	120
6 ×30	180
many right answers	

$\begin{array}{r} 30 \\ 2\overline{)60} \\ -60 \\ \hline 0 \end{array}$ $\begin{array}{r} 030 \\ 4\overline{)120} \\ -12 \\ \hline 000 \end{array}$ $\begin{array}{r} 030 \\ 6\overline{)180} \\ -18 \\ \hline 000 \end{array}$

Equations:

$x \cdot 30 = y$ or $30x = y$

$y \div 30 = x$ or $\frac{y}{30} = x$

G7 U2 Lesson 5

Write two equations that represent the same proportional relationship.

G7 U2 Lesson 5 - Today we will use a table and equation to solve problems that involve proportional relationships.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use a table and equation to solve problems that involve proportional relationships. We are not really learning anything new. We are just practicing using what we've already learned. You're going to be great at it.

x Liters	y balls

Let's Review (Slide 3): The big idea of our last lesson was that there will always be at least two related equations for a proportion table. Let's find them for this story. Read along with me silently while I read out loud. "Ethan can fit 10 ping pong balls in a 2 Liter bottle. Let x equal the number of liters. Let y equal the number of balls. What two equations represent the table?" The first thing I am going to do is write in x and y on my table. X is the liters and y is the balls.

x Liters	y balls
2	10
4	20
6	30

Next I can use this picture to fill in the table. Here we have a 2 liter bottle with 10 balls so I put 2 under liters and 10 under balls. Let's count the next picture. There are 2 - 4 liters. I put 4 under liters. Now we count the balls. *Touch each one as you count out loud to 20.* I put 20 under balls. Let's keep going. There are 2 - 4 - 6 liters. I put 6 under liters. Now we count the balls. *Touch each one as you count out loud to 30.* I put 30 under balls.

x Liters		y balls
2	×5	10
4	×5	20
6	×5	30

The correct operation might already be jumping out at you! If not, you can divide the right side by the left side. I don't think you need to do that though. What is the operation that is happening? Possible Student Answers, Key Points:

- It is times 5.
- We multiply the left side by 5 to get the left side.

I can write x5 is little circles in the middle of my table.

Now let's write our equations. *Point from left to right as you name the equations.* I see 2 times 5 is 10. I see 4 times 5 is 20. I see 6 times 5 is 30. If I wanted to explain what is happening in words, I would say liters times 5 equals balls. And if I substitute in x and y, it is x times 5 equals y. A lot of times we rewrite that is 5x = y.

$$x \cdot 5 = y \qquad 5x = y$$

Now let's think about it going the opposite way. *Point from right to left as you name the equations.* I see 10 divided by 5 is 2. I see 20 divided by 5 is 4. I see 30 divided by 5 is 6. If I wanted to explain what is happening in words, I would say balls divided by 5 is liters. And if I substitute in x and y, it is y divided by 5 equal x. A lot of times we rewrite that is y over 5 equal x. These two equations both represent the same proportional relationship just in opposite ways.

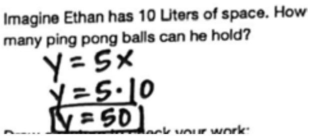
$$y \div 5 = x \qquad \frac{y}{5} = x$$

Liters	balls
2	10
4	20
6	30
10	

Let's Talk (Slide 4): Once we have equations, we can plug in one variable and find the other. Read silently with me while I read out loud. "Imagine Ethan has 10 Liters of space. How many ping pong balls can he hold?" I am going to put 10 under liters on my table. I can already guess what this side is going to be but let's use the equation.

The equation is x times 5 equals y or y equals 5 x. Now we have one very important question to ask ourselves. That is, "should 10 go in the place of x or the place of y?" Remember we can substitute either variable so we have to decide based on what the variables represent. X is liters and Y is balls. So should 10 go in the place of the x or the place of the y? Possible Student Answers, Key Points:

- 10 should go in place of the x because it is 10 Liters and x is Liters.
- 10 is on the x side of the table.
- X equals 10.

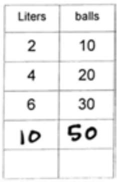

Imagine Ethan has 10 Liters of space. How many ping pong balls can he hold?

$Y = 5x$

$Y = 5 \cdot 10$

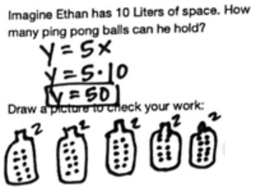
$\boxed{Y = 50}$

The 10 should go in place of the x because it is 10 Liters and x is Liters. Also, we wrote the 10 on the x side of the table because it was Liters. So I put 10 in place of x. Then I can solve for y. 5 times 10 is 50.



Liters	balls
2	10
4	20
6	30
10	50

So I can put 50 on the table.


Imagine Ethan has 10 Liters of space. How many ping pong balls can he hold?

$Y = 5x$

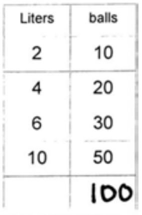
$Y = 5 \cdot 10$

$\boxed{Y = 50}$

Draw a picture to check your work:

Let's draw a picture to check our work. I will draw 2 liters then 4 liters then 6 liters then 8 liters then 10 liters. Now let's fill them with balls: 10 - 20 - 30 - 40 - 50! Our pictures matches the table and the equation. Who can put our final answer in a complete sentence using the words from the story? I'll help you start. We would say, "With 10 Liters of space, Ethan…" Possible Student Answers, Key Points:

- With 10 Liters of space, Ethan can hold 50 ping pong balls.

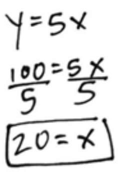


Liters	balls
2	10
4	20
6	30
10	50
	100

Let's Talk (Slide 5): Now let's try a different problem with the same table. Read silently with me while I read out loud. "Imagine Ethan wants to hold 100 ping pong balls. How many Liters does he need?" I am going to put 100 under balls on my table this time. It's not Liters. And I can already guess what this other side is going to be but let's use the equation.

Now, I can use a related division equation but let's stick with the same equation, x times 5 equals y, just to see what happens. We are going to ask ourselves the same very important question. That is, "should 100 go in the place of x or the place of y?" Remember we can substitute either variable so we have to decide based on what the variables represent. X is liters and Y is balls. So should 100 go in the place of the x or the place of the y? Possible Student Answers, Key Points:

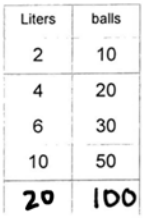
- 100 should go in place of the y because it is 100 balls and y is balls.
- 100 is on the y side of the table.
- Y equals 100.



$Y = 5x$

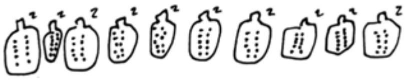
$\frac{100}{5} = \frac{5x}{5}$

$\boxed{20 = x}$



Liters	balls
2	10
4	20
6	30
10	50
20	100

The 100 should go in place of the y because it is 100 ping pong balls and y is balls. Also, we wrote the 100 on the y side of the table because it was balls. So I put 100 in place of y. Now I need to solve. I can't solve by multiplying by 5 this time. Instead, this equation is asking, what times five makes 100. I can solve by using the algebra you learned in 6th grade, which mean doing the opposite operations. I am going to divide by 5 on this side and on this side. Then I get y = 20. So I can put 20 on the Liters side of the table.



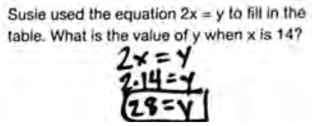
Let's draw a picture to check our work. I will dots so I can do this a bit faster. There would be 10 balls then 20 - 30 - 40 - 50 - 60 - 70 - 80 - 90 - 100. Let's label the Liters. This is 2 Liters, 4 Liters, 6, 8, 10.

Our pictures matches the table and the equation. Who can put our final answer in a complete sentence using the words from the story? I'll help you start. We would say, "To hold 100 ping pong balls, Ethan…" Possible Student Answers, Key Points:

- To hold 100 ping pong balls, Ethan needs 10 Liters of space.

x	y
1	2
2	4
3	6
14	

Let's Think (Slide 6): Even if we only have one equation, we can use algebra to solve. Read this example problem along with me silently while I read out loud. "Susie used the equation 2x = y to fill in the table. What is the value of y when x is 14." 14 goes in the x side of the table.



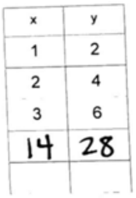
Susie used the equation 2x = y to fill in the table. What is the value of y when x is 14?

$2x = y$

$2 \cdot 14 = y$

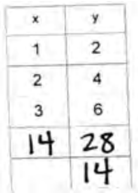
$\boxed{28 = y}$

You can probably see the operation on the table but let's practice with the equation. First, I write the equation as it is given, 2x = y. Now I put in 14 for x. I get 2 times 14 equals y. That's 28 equals y.



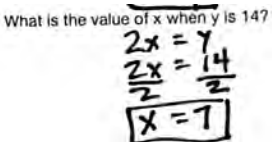
x	y
1	2
2	4
3	6
14	28

I can put 28 in the y column.



x	y
1	2
2	4
3	6
14	28
	14

Now, this might seem like the exact same question but it's not. It says, "what is the value of x when y is 14?" So now y is 14 not x. We put 14 in the y column.



What is the value of x when y is 14?

$2x = y$

$\frac{2x}{2} = \frac{14}{2}$

$\boxed{x = 7}$

Let's use the same equation but replace y this time. I write 2x = y. Then I rewrite it with y as 14 so 2x = 14. To solve this, I have to work backwards and divide by 2 on each side. The 2 divided by 2 is cancelled out so we get x on this side. 14 divided by 2 is 7. So our answer is x = 7.

x	y
1	2
2	4
3	6
14	28
7	14

I will put 7 on the table, and it looks right, doesn't it. So I can see that I thought of all this correctly.

Let's Try It (Slide 7): Great thinking! Now, let's practice! I am going to take you through step by step.

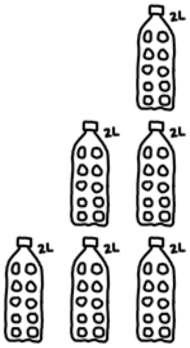
WARM WELCOME

Today we will use a table and equation to solve problems that involve proportional relationships.

Let's Review: There will always be at least two related equations for a proportion table.

Ethan can fit 10 ping pong balls in a 2 Liter bottle. Let x equal the number of liters. Let y equal the number of balls.

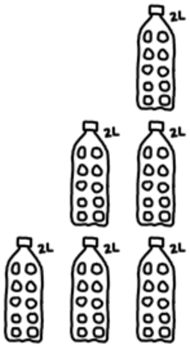
What two equations represent the table?



Liters	balls

Let's Talk: Once we have equations, we can plug in one variable and find the other.

Imagine Ethan has 10 Liters of space. How many ping pong balls can he hold?



Liters	balls
2	10
4	20
6	30

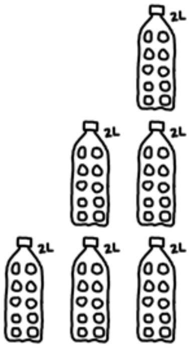
Draw a picture to check your work:

Let's Talk:

Once we have equations, we can plug in one variable and find the other.

Imagine Ethan wants to hold 100 ping pong balls. How many Liters does he need?

Draw a picture to check your work:



Liters	balls
2	10
4	20
6	30
10	50

Let's Think:

Even if we only have one equation, we can use algebra to solve.

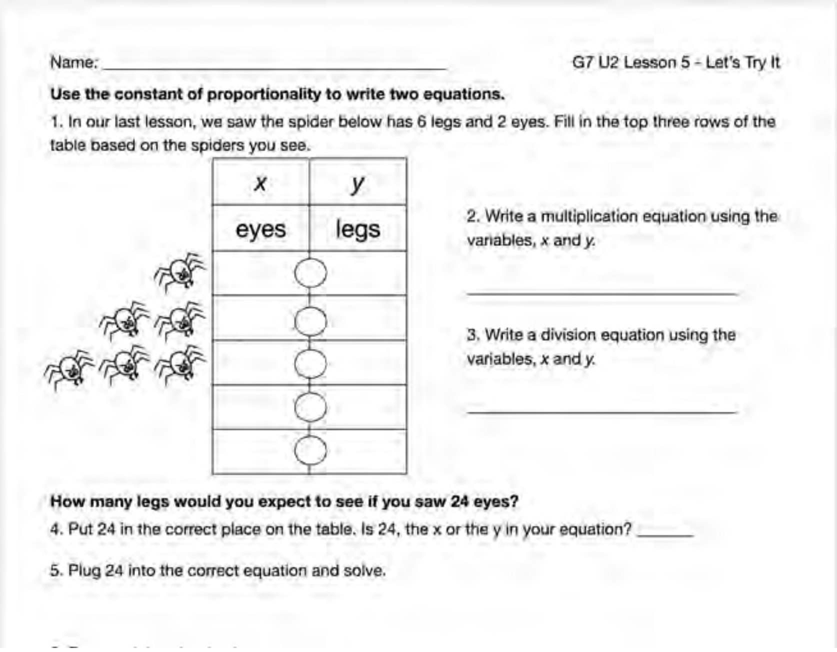
Susie used the equation $2x = y$ to fill in the table. What is the value of y when x is 14?

What is the value of x when y is 14?

x	y
1	2
2	4
3	6

Let’s Try It:

Let’s do somet practice together!



Name: ____________________ G7 U2 Lesson 5 - Let’s Try It

Use the constant of proportionality to write two equations.

1. In our last lesson, we saw the spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.

x	y
eyes	legs

2. Write a multiplication equation using the variables, x and y.

____

3. Write a division equation using the variables, x and y.

____

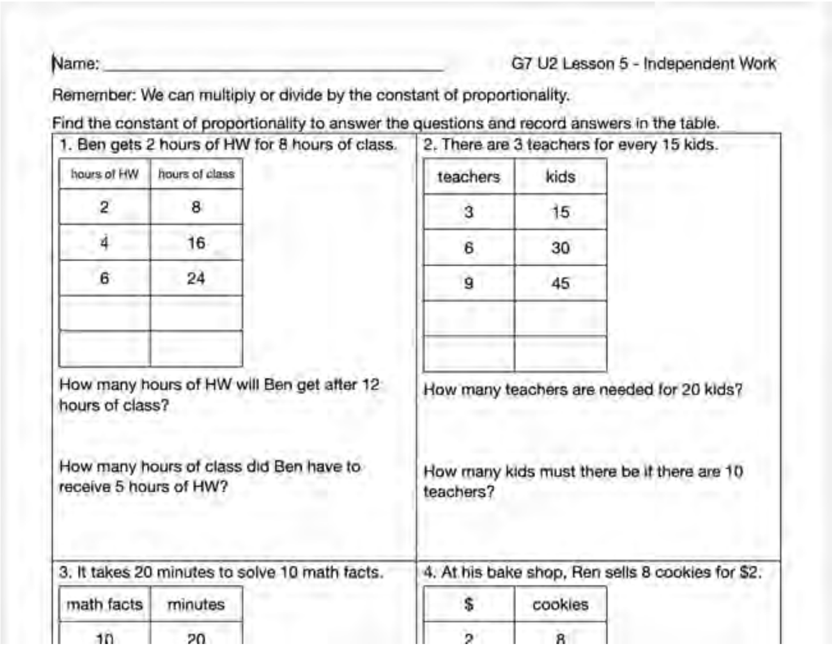
How many legs would you expect to see if you saw 24 eyes?

4. Put 24 in the correct place on the table. Is 24, the x or the y in your equation? ______

5. Plug 24 into the correct equation and solve.

On your Own:

Now it’s time for you to do it on your own.



Name: ____________________ G7 U2 Lesson 5 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality to answer the questions and record answers in the table.

1. Ben gets 2 hours of HW for 8 hours of class.

hours of HW	hours of class
2	8
4	16
6	24

How many hours of HW will Ben get after 12 hours of class?

How many hours of class did Ben have to receive 5 hours of HW?

2. There are 3 teachers for every 15 kids.

teachers	kids
3	15
6	30
9	45

How many teachers are needed for 20 kids?

How many kids must there be if there are 10 teachers?

3. It takes 20 minutes to solve 10 math facts.

math facts	minutes
10	20

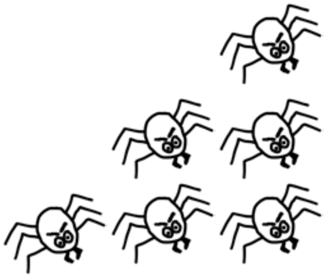
4. At his bake shop, Ren sells 8 cookies for $2.

$	cookies
2	8

Name: ____ G7 U2 Lesson 5 - Let’s Try It

Use the constant of proportionality to write two equations.

1. In our last lesson, we saw the spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.



x		*y*
eyes		legs
	○	
	○	
	○	
	○	
	○	

2. Write a multiplication equation using the variables, *x* and *y.*

____

3. Write a division equation using the variables, *x* and *y.*

____

How many legs would you expect to see if you saw 24 eyes?

4. Put 24 in the correct place on the table. Is 24, the x or the y in your equation? _______

5. Plug 24 into the correct equation and solve.

6. Draw a picture to check your answer.

7. Write a complete answer sentence using the correct words from the problem:

____

How many eyes would you expect to see if you saw 24 legs?

8. Put 24 in the correct place on the table. Is 24, the x or the y in your equation? _______

9. Plug 24 into the correct equation and solve.

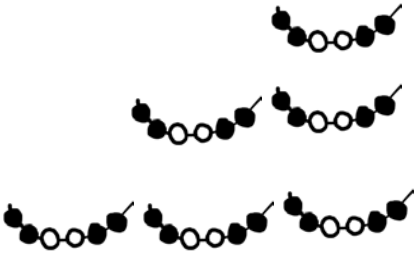
10. Draw a picture to check your answer.

11. Write a complete answer sentence using the correct words from the problem:

____

Use the constant of proportionality. Then write TWO equations that describe the table.

12. In our last lesson, Jade made a necklace with 4 black beads and 2 white beads. Fill in the top three rows of the table based on the spiders you see.



x	y
white	black

13. Write a multiplication equation using the variables, *x* and *y.*

____

14. Write a division equation using the variables, *x* and *y.*

____

How many white beads would you expect to see if you saw 40 black beads?

15. Put 40 in the correct place on the table. Is 40, the x or the y in your equation? _______

16. Plug 40 into the correct equation and solve.

17. Draw a picture to check your answer.

18. Write a complete answer sentence using the correct words from the problem:

____

How many black beads would you expect to see if you saw 40 white beads?

19. Put 40 in the correct place on the table. Is 40, the x or the y in your equation? _______

20. Plug 40 into the correct equation and solve.

21. Draw a picture to check your answer.

22. Write a complete answer sentence using the correct words from the problem:

____

Name: ____ G7 U2 Lesson 5 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality to answer the questions and record answers in the table.

1. Ben gets 2 hours of HW for 8 hours of class.

hours of HW	hours of class
2	8
4	16
6	24

How many hours of HW will Ben get after 12 hours of class?

How many hours of class did Ben have to receive 5 hours of HW?

2. There are 3 teachers for every 15 kids.

teachers	kids
3	15
6	30
9	45

How many teachers are needed for 20 kids?

How many kids must there be if there are 10 teachers?

3. It takes 20 minutes to solve 10 math facts.

math facts	minutes
10	20
20	40
30	60

How long would it take to solve 34 math facts?

How many math facts will be solved in 100 min?

4. At his bake shop, Ren sells 8 cookies for $2.

$	cookies
2	8
4	16
6	24

How many cookies can be bought with $5?

How much would it cost for 20 cookies?

Find the constant of proportionality to answer the questions and record answers in the table.

5. We need 3 scoops of cocoa in 3 cups of milk.

scoops	cups
3	3
6	6
9	9

How many cups of milk use 5 scoops of cocoa?

How many scoops of cocoa do we need for 30 cups of milk?

6. Taylor Swift rehearses 100 hours for a 20 minute concert.

minutes	hours
20	100
40	200
60	300

How long does Taylor Swift rehearse for a 120 minute concert?

How long must the concert be if Taylor Swift rehearses for 500 hours?

7. DC charges $5 tax on a $50 purchase.

$ tax	$ purchase
5	50
10	100
15	150

How much was the purchase if there was $30 in tax?

How much was the tax if there was a $30 purchase?

8. The 3 person swim team needs 2 quarts of gatorade after each game.

quarts	people
2	3
4	6
6	9

How many quarts of gatorade are needed for 30 people?

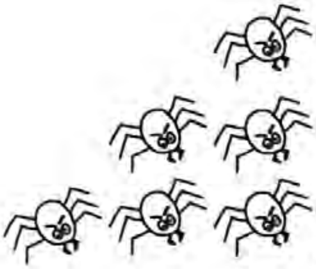
How many people would served with 30 quarts of gatorade?

Name: ANSWER KEY

G7 U2 Lesson 5 - Let's Try It

Use the constant of proportionality to write two equations.

1. In our last lesson, we saw the spider below has 6 legs and 2 eyes. Fill in the top three rows of the table based on the spiders you see.



x		y
eyes		legs
2	×3	6
4	×3	12
6	×3	18
24	×3	72
8	×3	24

2. Write a multiplication equation using the variables, x and y.

$x \cdot 3 = y$ or $3x = y$

3. Write a division equation using the variables, x and y.

$y \div 3 = x$ or $\frac{y}{3} = x$

How many legs would you expect to see if you saw 24 eyes?

4. Put 24 in the correct place on the table. Is 24, the x or the y in your equation? x

5. Plug 24 into the correct equation and solve.

$$x \cdot 3 = y$$
$$24 \cdot 3 = y$$
$$72 = y$$

$$\begin{array}{r} \overset{1}{2}4 \\ \times\ 3 \\ \hline 72 \end{array}$$

6. Draw a picture to check your answer.

7. Write a complete answer sentence using the correct words from the problem:

Spiders with 24 eyes would have 72 legs.

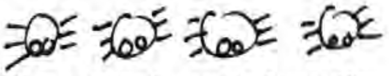
How many eyes would you expect to see if you saw 24 legs?

8. Put 24 in the correct place on the table. Is 24, the x or the y in your equation? y

9. Plug 24 into the correct equation and solve.

$$y \div 3 = x$$
$$24 \div 3 = x$$
$$8 = x$$

10. Draw a picture to check your answer.

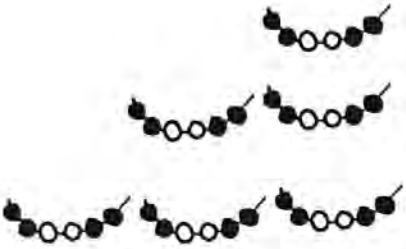


11. Write a complete answer sentence using the correct words from the problem:

Spiders with 24 legs would have 8 eyes.

Use the constant of proportionality. Then write TWO equations that describe the table.

12. In our last lesson, Jade made a necklace with 4 black beads and 2 white beads. Fill in the top three rows of the table based on the spiders you see.



x		y
white		black
2	×2	4
4	×2	8
6	×2	12
20	×2	40
40	×2	80

13. Write a multiplication equation using the variables, *x* and *y*.

$x \cdot 2 = y$ or $2x = y$

14. Write a division equation using the variables, *x* and *y*.

$y \div 2 = x$ or $\frac{y}{2} = x$

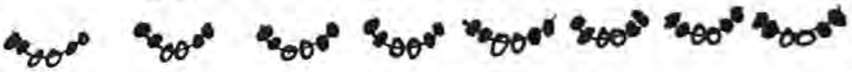
How many white beads would you expect to see if you saw 40 black beads?

15. Put 40 in the correct place on the table. Is 40, the x or the y in your equation? y

16. Plug 40 into the correct equation and solve.

$y \div 2 = x$
$40 \div 2 = x$
$20 = x$

17. Draw a picture to check your answer.



18. Write a complete answer sentence using the correct words from the problem:

Necklaces with 40 black beads would have 20 white beads.

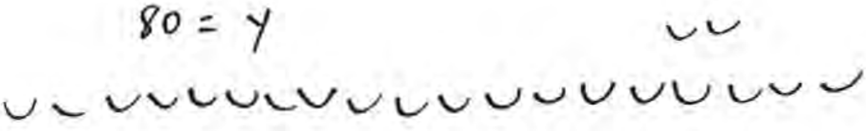
How many black beads would you expect to see if you saw 40 white beads?

19. Put 40 in the correct place on the table. Is 40, the x or the y in your equation? x

20. Plug 40 into the correct equation and solve.

$x \cdot 2 = y$
$40 \cdot 2 = y$
$80 = y$

21. Draw a picture to check your answer.



22. Write a complete answer sentence using the correct words from the problem:

Necklaces with 40 white beads would have 80 black beads.

Name: ANSWER KEY

G7 U2 Lesson 5 - Independent Work

Remember: We can multiply or divide by the constant of proportionality.

Find the constant of proportionality to answer the questions and record answers in the table.

1. Ben gets 2 hours of HW for 8 hours of class.

hours of HW	hours of class
2 ×4	8
4 ×4	16
6 ×4	24
3 ×4	12
5 ×4	20

$x \cdot 4 = y$

$y \div 4 = x$

How many hours of HW will Ben get after 12 hours of class?

$y \div 4 = x$

$12 \div 4 = x$

$\boxed{3 = x}$

How many hours of class did Ben have to receive 5 hours of HW?

$x \cdot 4 = y$

$5 \cdot 4 = y$

$\boxed{20 = y}$

2. There are 3 teachers for every 15 kids.

teachers	kids
3 ×5	15
6 ×5	30
9 ×5	45
4 ×5	20
10 ×5	50

$x \cdot 5 = y$

$y \div 5 = x$

How many teachers are needed for 20 kids?

$y \div 5 = x$

$20 \div 5 = x$

$\boxed{4 = x}$

How many kids must there be if there are 10 teachers?

$x \cdot 5 = y$

$10 \cdot 5 = y$

$\boxed{50 = y}$

3. It takes 20 minutes to solve 10 math facts.

math facts	minutes
10 ×2	20
20 ×2	40
30 ×2	60
34 ×2	68
50 ×2	100

$x \cdot 2 = y$

$y \div 2 = x$

How long would it take to solve 34 math facts?

$x \cdot 2 = y$

$34 \cdot 2 = y$

$\boxed{68 = y}$

How many math facts will be solved in 100 min?

$y \div 2 = x$

$100 \div 2 = x$

$\boxed{50 = x}$

4. At his bake shop, Ren sells 8 cookies for $2.

$	cookies
2 ×4	8
4 ×4	16
6 ×4	24
5 ×4	20
5 ×4	20

$x \cdot 4 = y$

$y \div 4 = x$

How many cookies can be bought with $5?

$x \cdot 4 = y$

$5 \cdot 4 = y$

$\boxed{20 = y}$

How much would it cost for 20 cookies?

$y \div 4 = x$

$20 \div 4 = x$

$\boxed{5 = x}$

Find the constant of proportionality to answer the questions and record answers in the table.

5. We need 3 scoops of cocoa in 3 cups of milk.

scoops	cups
3 ×1	3
6 ×1	6
9 ×1	9
5 ×1	5
30 ×1	30

$1x = y$

$\frac{y}{1} = x$

$x - y$

How many cups of milk use 5 scoops of cocoa?

$x \cdot 1 = y$
$5 \cdot 1 = y$
$\boxed{5 = y}$

How many scoops of cocoa do we need for 30 cups of milk?

$y \div 1 = x$
$30 \div 1 = x$
$\boxed{30 = x}$

6. Taylor Swift rehearses 100 hours for a 20 minute concert.

minutes	hours
20 ×5	100
40 ×5	200
60 ×5	300
120 ×5	600
×5	

$x \cdot 5 = y$

$y \div 5 = x$

How long does Taylor Swift rehearse for a 120 minute concert?

$x \cdot 5 = y$
$120 \cdot 5 = y$
$\boxed{600 = y}$

$$\begin{array}{r} 120 \\ \times \quad 5 \\ \hline 600 \end{array}$$

How long must the concert be if Taylor Swift rehearses for 500 hours?

$y \div 5 = x$
$500 \div 5 = x$
$\boxed{100 = x}$

7. DC charges $5 tax on a $50 purchase.

$ tax	$ purchase
5 ×10	50
10 ×10	100
15 ×10	150
30 ×10	300
3 ×10	30

$x \cdot 10 = y$

$y \div 10 = x$

How much was the purchase if there was $30 in tax?

$x \cdot 10 = y$
$30 \cdot 10 = y$
$\boxed{300 = y}$

How much was the tax if there was a $30 purchase?

$y \div 10 = x$
$30 \div 10 = x$
$\boxed{3 = x}$

8. The 3 person swim team needs 2 quarts of gatorade after each game.

$$\begin{array}{r} 1\frac{1}{2} \\ 2\overline{)3} \\ -2 \\ \hline 1 \end{array}$$

quarts	people
2 ×$1\frac{1}{2}$	3
4 ×$1\frac{1}{2}$	6
6 ×$1\frac{1}{2}$	9
20 ×$1\frac{1}{2}$	30
30 ×$1\frac{1}{2}$	

$x \cdot 1\frac{1}{2} = y$

$y \div 1\frac{1}{2} = x$

How many quarts of gatorade are needed for 30 people?

$y \div 1\frac{1}{2} = x$
$30 \div 1\frac{1}{2} = x$
$\boxed{20 = x}$

$30 \div \frac{3}{2}$
$30 \times \frac{2}{3} = \frac{60}{3}$

How many people would served with 30 quarts of gatorade?

$x \cdot 1\frac{1}{2} = y$
$30 \cdot 1\frac{1}{2} = y$
$\boxed{45 = y}$

$30 \times \frac{3}{2} = \frac{90}{2}$
45

G7 U2 Lesson 6

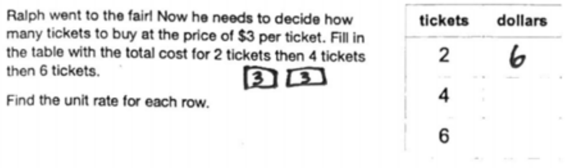
Use tables and equations to solve problems involving proportional relationships.

G7 U2 Lesson 6 - Today we will use a table and equation to solve problems that are not always proportional.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use a table and equation to solve problems that are not always proportional. A lot of what we are going to do - filling out a table and finding unit rates and writing equations - is going to be what you already know. Let's go!

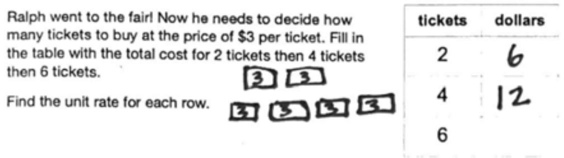
Let's Review (Slide 3): We know a relationship is proportional when the unit rates are the same. Let's explore an example that we already know how to do. Read along with me silently in your mind while I read out loud. "Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets. You don't have to do this every time but let's draw a little picture on the side.There are two tickets. The price is $3 per ticket. I can see that I have 2 groups of 3 which is 2 times 3 equals $6.


Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	6
4	
6	

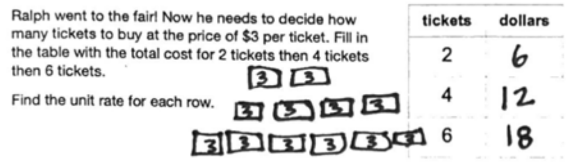
Let's do the next one. Now we need 4 tickets. They still cost $3 each. I can see that I have 4 groups of 3 now. That's 4 times 3 is 12.


Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	6
4	12
6	

Let's do one more. We need 6 tickets. They still cost $3 each. I can see that I have 6 groups of 3 now. That's 6 x 3 is 18.


Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

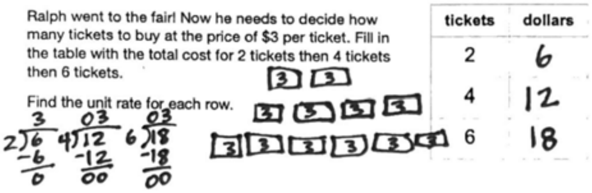
tickets	dollars
2	6
4	12
6	18

Now, the next step says to find the unit rate for each row. This is about to seem a little bit silly but you will see why we are exploring this in a minute. For now, let's just try it out. How do I find the unit rate?

Possible Student Answers, Key Points:

- You divide one quantity by the other.
- You divide 6 by 2 and 12 by 4 and 18 by 6.

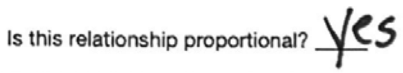
We always divide one quantity by the other. So, let's do each row. We have 6 divided by 2 is 3. We have 12 divided by 4 is 3, and we have 18 divided by 6 is 3. Of course we got three for all of these because we multiplied by 3 in the first place. But let's say we didn't know what we had multiplied, the unit rate helps us figure it out, right?


Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

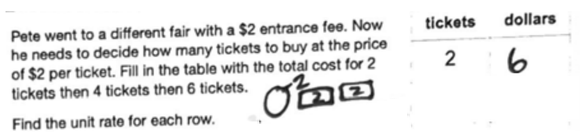
Find the unit rate for each row.

tickets	dollars
2	6
4	12
6	18

Then the question says, "Is this relationship proportional?" We see that this ratio has a unit rate of 3 and this ratio has a unit rate of 3 and this ratio has a unit rate of 3. So they all have the same unit rate. So is this relationship proportional? Yes! And now that unit rate is called the constant of proportionality.


Is this relationship proportional? Yes

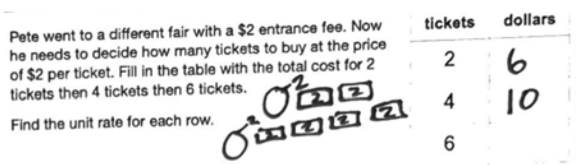
Let's Talk (Slide 4): Now let's do the same steps but with a story that's a little different because there are other relationships with more than one step that we can explore. Read the story silently in your mind while I read it out loud. "Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets." Let's draw pictures again. There's a $2 entry fee. I'll draw one of those bracelets you sometimes get when you go inside a place. Then we'll start with two tickets. It costs $2 per ticket. That is 2 groups of 2, which is $4. But we have this entry fee so we have to add that $2 in too. That means the cost will be $6. So far, it's the same as the last problem. Let's see if it stays the same.



Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	6

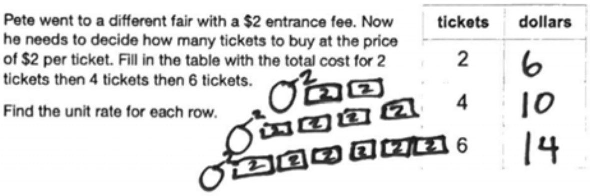


Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	6
4	10
6	

Now we need 4 tickets so I'll draw more. They still cost $2 each. That is 4 groups of 2, which is $8. But we still have entry fee so we have to add that $2 in too. That means the cost will be $10. That's not the same as the last problem. Because the tickets are cheaper but there's this entrance fee, right?



Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

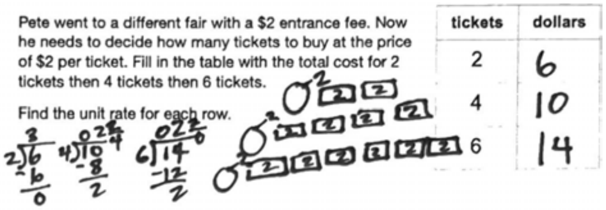
Find the unit rate for each row.

tickets	dollars
2	6
4	10
6	14

Let's do 6 tickets now. I'll draw some more. They still cost $2 each. That is 6 groups of 2, which is $12. But we still have entry fee so we have to add that $2 in too. That means the cost will be $14.

Now, the next step says to find the unit rate for each row. This might seem like something we've already done. But stick with me. Something interesting is about to happen. How do I find the unit rate? Possible Student Answers, Key Points:

- You divide one quantity by the other.
- You divide 6 by 2 and 10 by 4 and 14 by 6.



Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

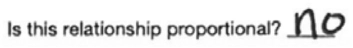
tickets	dollars
2	6
4	10
6	14

We always divide one quantity by the other. So, let's do each row. I will do 6 divided by 2. That's 3. Next, I will do 10 divided by 4. That's 2 and then we subtract 8 so we have 2 leftover. I can write my final answer as 2 and 2 fourths. One more. We do 14 divided by 6. 6 goes into 14 twice. I subtract 12 and 2 left so the final answer is 2 and 2 sixths. Interesting!

There is something very important to notice here! What did you notice? Possible Student Answers, Key Points:

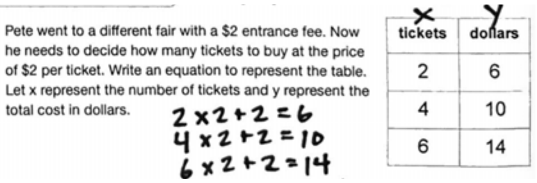
- The unit rates are different.
- There isn't a constant of proportionality.
- We didn't get the same answer to our division.

We didn't get the same answer to our division. In other words, the unit rates are different and so there is no constant of proportionality. Is this relationship proportional? No! And of course, that makes sense because we always had to add this entrance fee, right? It didn't change as we got more tickets the way that the cost in the last table was totally only based on tickets.



Is this relationship proportional? no

Let's Think (Slide 5): We can write equations for many non-proportional tables too. I want to do that for the problem we just did. But I'm not going to ask you to do that on your independent practice. I just want you to see what we write and start thinking about it. Read along with your eyes as I read aloud. It starts out as the same problem we just did. “Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Write an equation to represent the table. Let x represent the number of tickets and y represent the total cost in dollars.” Remember the last time we started writing equations with variables, we started by listing out equations for what we did with numbers. We did 2 times 3 plus 2 equals 6. We did 4 times 2 plus 2 equals 10. We did 6 times 2 plus 2 equals 14.



Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Write an equation to represent the table. Let x represent the number of tickets and y represent the total cost in dollars.

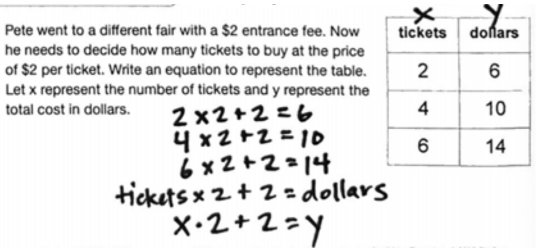
2 x 2 + 2 = 6
4 x 2 + 2 = 10
6 x 2 + 2 = 14

x tickets	y dollars
2	6
4	10
6	14

Notice what is the same here. I see times 2 plus 2 and times 2 plus 2 and times 2 plus 2. This part that is the same isn’t a variable because variables can change. Now remember that in our last lesson, we also wrote an equation with words. This first number would be tickets. So that’s tickets times 2 plus 2 equals dollars. And finally, we can put in x and y. It says to let x represent the number of tickets so I will put x in place of tickets. It says let y represent the total cost in dollars so I will put y in place of dollars. Our equation is x times 2 plus 2 equals y. Sometimes we write it as 2x plus 2 equals y. What do you notice about this equation compared to the equations we’ve been working with? Possible Student Answers, Key Points:

- It has addition.
- It is not just multiplication.
- It has two operations.
- It is a longer equation.

The equation doesn’t just have multiplication. It has addition too! It is a two step equation. We’ll talk more about that next week. For now, it’s enough to notice that an equation that looks like this is NOT proportional.



Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Write an equation to represent the table. Let x represent the number of tickets and y represent the total cost in dollars.

2 x 2 + 2 = 6
4 x 2 + 2 = 10
6 x 2 + 2 = 14
tickets x 2 + 2 = dollars
$x \cdot 2 + 2 = y$

x tickets	y dollars
2	6
4	10
6	14

Let’s Try It (Slide 6): Great listening today! Now, let’s practice! I am going to take you through step by step.

WARM WELCOME

Today we will use a table and equation to solve problems that are not always proportional.

Let's Review:

We know a relationship is proportional when the unit rates are the same.

Ralph went to the fair! Now he needs to decide how many tickets to buy at the price of $3 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	
4	
6	

Is this relationship proportional? _____

Let's Talk:

There are other relationships with more than one step that we can explore.

Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Fill in the table with the total cost for 2 tickets then 4 tickets then 6 tickets.

Find the unit rate for each row.

tickets	dollars
2	
4	
6	

Is this relationship proportional? _____

Let's Think:

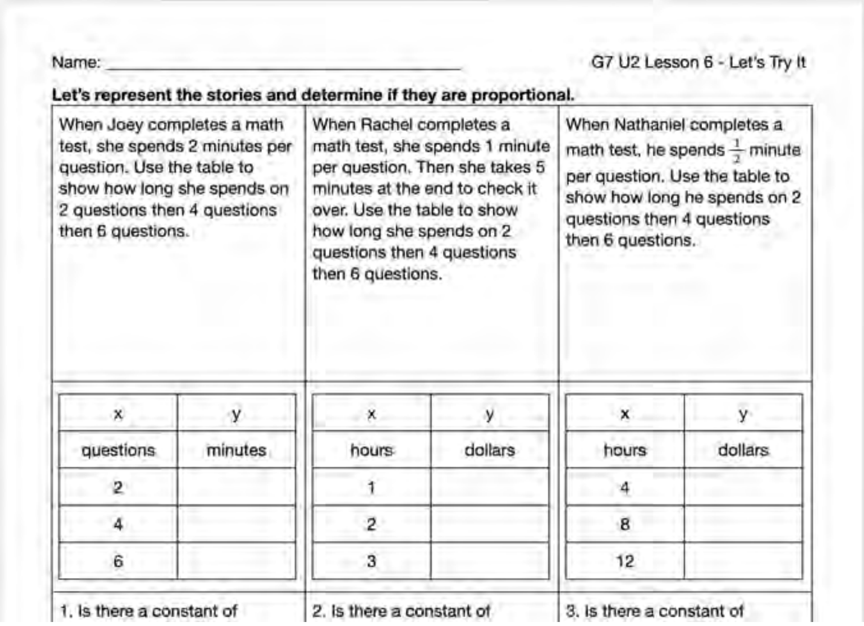
We can write equations for many non-proportional tables too.

Pete went to a different fair with a $2 entrance fee. Now he needs to decide how many tickets to buy at the price of $2 per ticket. Write an equation to represent the table. Let x represent the number of tickets and y represent the total cost in dollars.

tickets	dollars
2	6
4	10
6	14

Let's Try It:

Let's use equations to solve problems together.



Name: ____________________ G7 U2 Lesson 6 - Let's Try It

Let's represent the stories and determine if they are proportional.

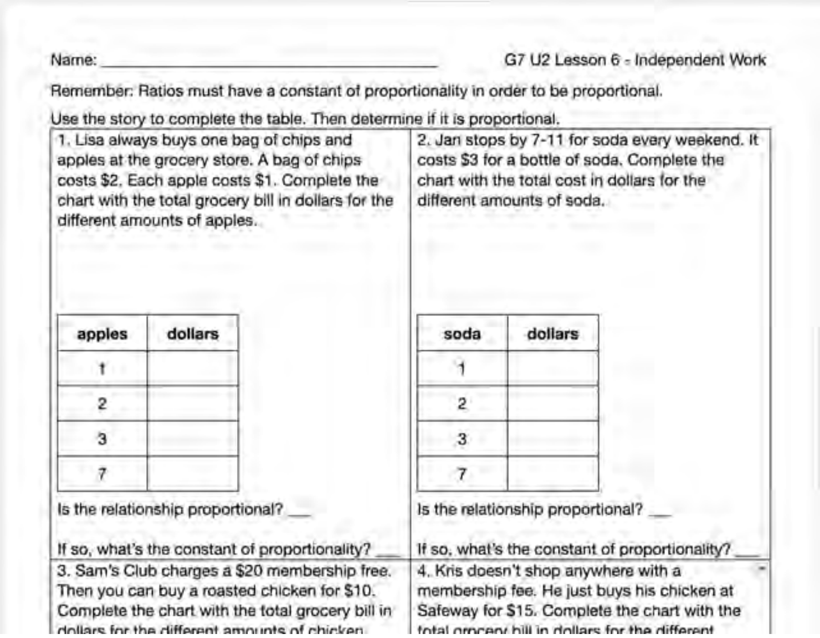
When Joey completes a math test, she spends 2 minutes per question. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.	When Rachel completes a math test, she spends 1 minute per question. Then she takes 5 minutes at the end to check it over. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.	When Nathaniel completes a math test, he spends $\frac{1}{2}$ minute per question. Use the table to show how long he spends on 2 questions then 4 questions then 6 questions.

x	y	x	y	x	y
questions	minutes	hours	dollars	hours	dollars
2		1		4	
4		2		8	
6		3		12	

1. Is there a constant of	2. Is there a constant of	3. Is there a constant of

On your Own:

Now it’s time for you to do it on your own.



Name: ________________________________ G7 U2 Lesson 6 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the story to complete the table. Then determine if it is proportional.

1. Lisa always buys one bag of chips and apples at the grocery store. A bag of chips costs $2. Each apple costs $1. Complete the chart with the total grocery bill in dollars for the different amounts of apples.

apples	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what’s the constant of proportionality? ___

2. Jan stops by 7-11 for soda every weekend. It costs $3 for a bottle of soda. Complete the chart with the total cost in dollars for the different amounts of soda.

soda	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what’s the constant of proportionality? ___

3. Sam’s Club charges a $20 membership free. Then you can buy a roasted chicken for $10. Complete the chart with the total grocery bill in dollars for the different amounts of chicken.

4. Kris doesn’t shop anywhere with a membership fee. He just buys his chicken at Safeway for $15. Complete the chart with the total grocery bill in dollars for the different

Name: ____ G7 U2 Lesson 6 - Let’s Try It

Let’s represent the stories and determine if they are proportional.

<table>
<tr>
<td>When Joey completes a math test, she spends 2 minutes per question. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.</td>
<td>When Rachel completes a math test, she spends 1 minute per question. Then she takes 5 minutes at the end to check it over. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.</td>
<td>When Nathaniel completes a math test, he spends $\frac{1}{2}$ minute per question. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long he spends on 2 questions then 4 questions then 6 questions.</td>
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<tr>
<td><table><tr><th>x</th><th>y</th></tr><tr><td></td><td></td></tr><tr><td>2</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>6</td><td></td></tr></table></td>
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</tr>
<tr>
<td>1. Is there a constant of proportionality? If so, what?
__________________________</td>
<td>2. Is there a constant of proportionality? If so, what?
__________________________</td>
<td>3. Is there a constant of proportionality? If so, what?
__________________________</td>
</tr>
<tr>
<td>4. Is the relationship proportional?</td>
<td>5. Is the relationship proportional?</td>
<td>6. Is the relationship proportional?</td>
</tr>
<tr>
<td colspan="3">6. What do you notice about the types of stories that had a constant of proportionality?</td>
</tr>
</table>

Name: ____ G7 U2 Lesson 6 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the story to complete the table. Then determine if it is proportional.

1. Lisa always buys one bag of chips and apples at the grocery store. A bag of chips costs $2. Each apple costs $1. Complete the chart with the total grocery bill in dollars for the different amounts of apples.

apples	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

2. Jan stops by 7-11 for soda every weekend. It costs $3 for a bottle of soda. Complete the chart with the total cost in dollars for the different amounts of soda.

soda	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

3. Sam's Club charges a $20 membership fee. Then you can buy a roasted chicken for $10. Complete the chart with the total grocery bill in dollars for the different amounts of chicken.

Roasted chicken	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

4. Kris doesn't shop anywhere with a membership fee. He just buys his chicken at Safeway for $15. Complete the chart with the total grocery bill in dollars for the different amounts of chicken.

Roasted chicken	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

Use the story to complete the table. Then determine if it is proportional.

5. Willie gets paid $10 per hour and then he always gets a $5 tip. Complete the chart with the total amount that Willie can earn for different hours.

hours	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

6. Stacie gets paid $12 per hour. She doesn't get any tips! Complete the chart with the total amount that Stacie can earn for different hours.

hours	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

7. Alex rented a truck for $8 per hour. Complete the chart with the total amount that Alex will have to pay for different amounts of time.

hours	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

If so, what's the constant of proportionality? ___

8. Adam rented a truck for $10 per hour but she had a coupon for $6 off. Complete the chart with the total amount that Adam will have to pay for different amounts of time.

hours	dollars
1	
2	
3	
7	

Is the relationship proportional? ___

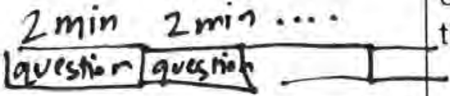
If so, what's the constant of proportionality? ___

Name: ANSWER KEY

G7 U2 Lesson 6 - Let's Try It

Let's represent the stories and determine if they are proportional.

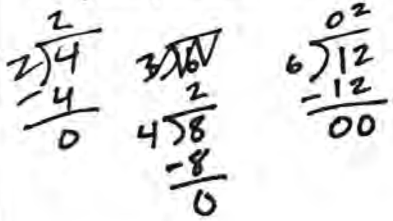
When Joey completes a math test, she spends 2 minutes per question. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.



x	y
questions	minutes
2 ×2	4
4 ×2	8
6 ×2	12

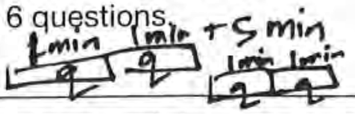
1. Is there a constant of proportionality? If so, what?

Yes, it is 2.



4. Is the relationship proportional? Yes

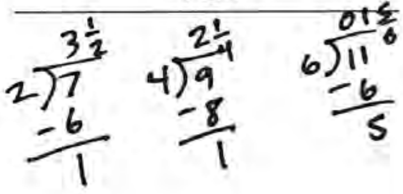
When Rachel completes a math test, she spends 1 minute per question. Then she takes 5 minutes at the end to check it over. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long she spends on 2 questions then 4 questions then 6 questions.



x	y
questions	minutes
2 ×1+5	7
4 ×1+5	9
6 ×1+5	11

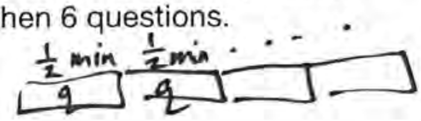
2. Is there a constant of proportionality? If so, what?

No



5. Is the relationship proportional? No

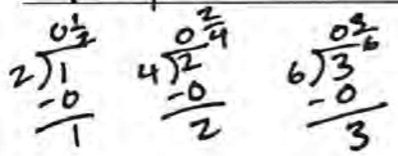
When Nathaniel completes a math test, he spends $\frac{1}{2}$ minute per question. Let x represent the number of questions and let y represent the number of minutes. Use the table to show how long he spends on 2 questions then 4 questions then 6 questions.



x	y
questions	minutes
2 ÷2	1
4 ÷2	2
6 ÷2	3

3. Is there a constant of proportionality? If so, what?

Yes, it is ½



6. Is the relationship proportional? yes

6. What do you notice about the types of stories that had a constant of proportionality?

The stories with a constant of proportionality have a single number for each question and that is all. It is one step just like the y=kx equation.

Name: ANSWER KEY G7 U2 Lesson 6 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the story to complete the table. Then determine if it is proportional.

1. Lisa always buys one bag of chips and apples at the grocery store. A bag of chips costs $2. Each apple costs $1. Complete the chart with the total grocery bill in dollars for the different amounts of apples.

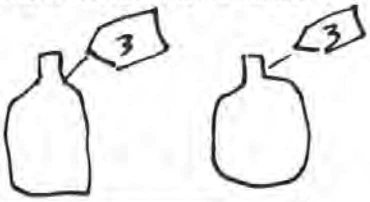
apples	dollars
1 ×1+2	3
2 ×1+2	4
3 ×1+2	5
7 ×1+2	9

$\begin{array}{r}3\\1\overline{)3}\\-3\\\hline 0\end{array}$ $\begin{array}{r}2\\2\overline{)4}\\-4\\\hline 0\end{array}$

Is the relationship proportional? NO

If so, what's the constant of proportionality? None

2. Jan stops by 7-11 for soda every weekend. It costs $3 for a bottle of soda. Complete the chart with the total cost in dollars for the different amounts of soda.



soda	dollars
1 ×3	3
2 ×3	6
3 ×3	9
7 ×3	21

$\begin{array}{r}3\\1\overline{)3}\\-3\\\hline 0\end{array}$ $\begin{array}{r}3\\2\overline{)6}\\-6\\\hline 0\end{array}$

Is the relationship proportional? YES

If so, what's the constant of proportionality? 3

3. Sam's Club charges a $20 membership fee. Then you can buy a roasted chicken for $10. Complete the chart with the total grocery bill in dollars for the different amounts of chicken.

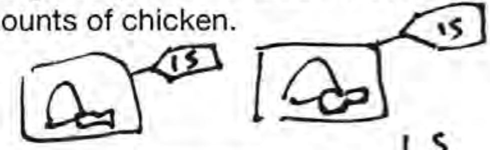
Roasted chicken	dollars
1 ×10+20	30
2 ×10+20	40
3 ×10+20	50
7 ×10+20	90

$\begin{array}{r}30\\1\overline{)30}\\-0\\\hline 0\end{array}$ $\begin{array}{r}20\\2\overline{)40}\\-4\\\hline 00\end{array}$

Is the relationship proportional? NO

If so, what's the constant of proportionality? None

4. Kris doesn't shop anywhere with a membership fee. He just buys his chicken at Safeway for $15. Complete the chart with the total grocery bill in dollars for the different amounts of chicken.



Roasted chicken	dollars
1 ×15	15
2 ×15	30
3 ×15	45
7 ×15	105

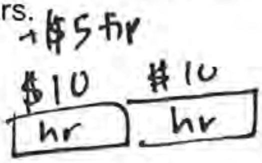
$\begin{array}{r}15\\1\overline{)15}\\-1\downarrow\\\hline 05\\-5\\\hline 0\end{array}$ $\begin{array}{r}15\\2\overline{)30}\\-2\downarrow\\\hline 10\\-10\\\hline 00\end{array}$

Is the relationship proportional? Yes

If so, what's the constant of proportionality? 15

Use the story to complete the table. Then determine if it is proportional.

5. Willie gets paid $10 per hour and then he always gets a $5 tip. Complete the chart with the total amount that Willie can earn for different hours.



hours	dollars
1 ×10+5	15
2 ×10+5	25
3 ×10+5	35
7 ×10+5	75

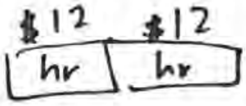
15
1)15
-1
05
-5
0

$12\frac{1}{2}$
2)25
-2
05
-4
1

Is the relationship proportional? NO

If so, what's the constant of proportionality? none

6. Stacie gets paid $12 per hour. She doesn't get any tips! Complete the chart with the total amount that Stacie can earn for different hours.



hours	dollars
1 ×12	12
2 ×12	24
3 ×12	36
7 ×12	84

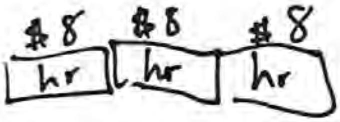
12
1)12
-1
02
-2
0

12
2)24
-2
04
-4
0

Is the relationship proportional? Yes

If so, what's the constant of proportionality? 12

7. Alex rented a truck for $8 per hour. Complete the chart with the total amount that Alex will have to pay for different amounts of time.



hours	dollars
1 ×8	8
2 ×8	16
3 ×8	24
7 ×8	56

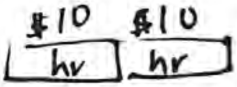
8
1)8
-8
0

08
2)16
-16
00

Is the relationship proportional? Yes

If so, what's the constant of proportionality? 8

8. Adam rented a truck for $10 per hour but she had a coupon for $6 off. Complete the chart with the total amount that Adam will have to pay for different amounts of time.



$6 off

hours	dollars
1 ×10-6	4
2 ×10-6	14
3 ×10-6	24
7 ×10-6	64

4
1)4
-4
0

07
2)14
-14
00

Is the relationship proportional? No

If so, what's the constant of proportionality? none

G7 U2 Lesson 7

Use a table of values to determine if a relationship is proportional.

2G7 U2 Lesson 7 - Today we will recognize that proportional relationships are characterized by equations in the form y = kx.

Warm Welcome (Slide 1): Tutor choice

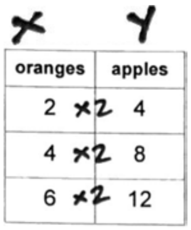
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will recognize that proportional relationships are characterized by equations in the form y = kx. You have already done a lot of work with tables and equations so you are going to do great!

Let's Review (Slide 3): If we see a pattern, we can write an equation from the table. Let's do an example. Read along silently with me while I read out loud. "Mary fills the fruit baskets that she sells at her shop with apples and oranges. The table shows how much fruit she buys for different amounts of baskets. Let x represent the number of oranges and y represent the number of apples. Write an equation to represent the amount of each fruit that Maria buys." Remember the last time we started writing equations with variables, we started by listing out equations for what we did with numbers. What operation do you see on this table? It has to be the same operation for each row?

Possible Student Answers, Key Points:

- It is multiplication.
- It is times 2.

It is 2 x 2 equals 4 and 4 times 2 equals 8 and 6 times 2 equals 12. Let me write those down.

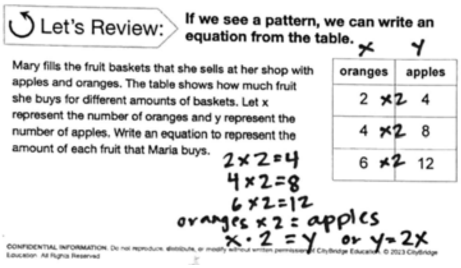


x y

oranges	apples
2 ×2	4
4 ×2	8
6 ×2	12

2×2=4
4×2=8
6×2=12

We see that the "times 2" is the same every time. The variable is needed for the other parts that can change. Now remember that in our last lesson, we also wrote an equation with words. This first number would be oranges. So that's oranges times 2 equals apples. And finally, we can put in x and y. It says to let x represent the number of oranges so I will put x in place of oranges. It says let y represent the number of apples so I will put y in place of apples. Our equation is x times 2 equals y. Sometimes we write it as 2x equals y. This is all very familiar. And most importantly, we can see that this is a proportion because it has a constant of proportionality.



Let's Review: If we see a pattern, we can write an equation from the table.

Mary fills the fruit baskets that she sells at her shop with apples and oranges. The table shows how much fruit she buys for different amounts of baskets. Let x represent the number of oranges and y represent the number of apples. Write an equation to represent the amount of each fruit that Maria buys.

x y

oranges	apples
2 ×2	4
4 ×2	8
6 ×2	12

2×2=4
4×2=8
6×2=12
oranges ×2 = apples
x · 2 = y or y=2x

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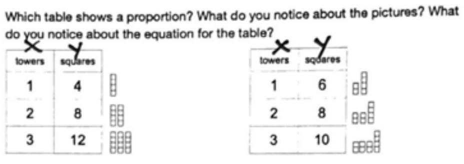
Let's Talk (Slide 4): Equations from proportion tables always have the same form. Let's look at two more examples. On this first table, I see it is a times 4 relationship. I am going to call the towers x and the squares y.

Then it would be 1 times 4 equals 4, 2 times 4 equals 8, 3 times 4 equals 12. In other words, towers times 3 equals squares, which means x times 3 = y which we usually write as 3x = y. That is because the number next to a letter means multiply. Three x is a quicker way to write the equation. I can see in this picture how there's a relationship and that relationship just keeps increasing and increasing the same way.



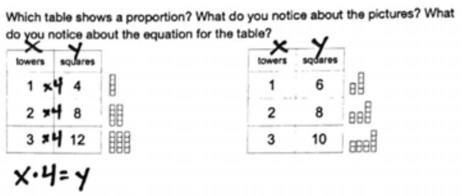
Which table shows a proportion? What do you notice about the pictures? What do you notice about the equation for the table?

x y

towers	squares
1	4
2	8
3	12

x y

towers	squares
1	6
2	8
3	10



Which table shows a proportion? What do you notice about the pictures? What do you notice about the equation for the table?

x y

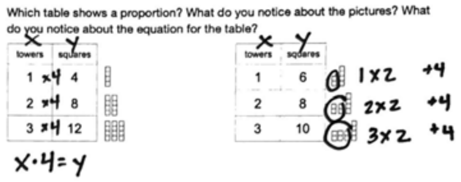
towers	squares
1 ×4	4
2 ×4	8
3 ×4	12

x·4=y

x y

towers	squares
1	6
2	8
3	10

Now let's look at the next table. Can you look and see an obvious operation? Not really. It's not times 4 because 1 times 6 equals 6 but 2 times 6 doesn't equal 6. It would have to be 2 times 4. And I can't think of something to turn 3 into 10. This is a signal to me that something special must be happening. I'm already thinking that there might not be a constant of proportionality. Maybe this is like the non-proportional stories we explored in our last lesson! Let's use the picture to help us figure out an equation. I see that there are towers of 2. 1 group of 2 then 2 groups of 2 then 3 groups of 2. That's like times 2 over and over. But each of these pictures also has an extra tower at the end with 4 squares. That's like a plus 4. Let's see if times 2 plus 4 works for our table. *Point from left to right in each row as you do the math.* 1 times 2 is 2 plus 4 is 4. That works! Next row, 2 times 2 is 4 plus 4 is 8. That works! Next row, 2 times 3 is 6 plus 4 is 10. That works! Yay!

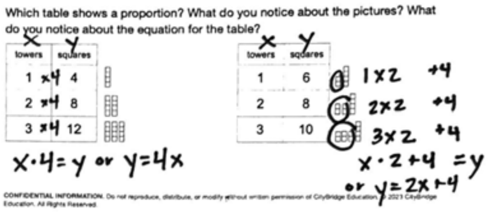


Which table shows a proportion? What do you notice about the pictures? What do you notice about the equation for the table?

towers	squares
1	4
2	8
3	12

towers	squares
1	6
2	8
3	10

So we did times 2 plus 2 every time. That's towers times 2 plus 2 equals squares. So, let's label towers as x and squares as y. That means our equation is x times 2 plus 2 equal y. Or if we want to rewrite the equation, it can be written as 2x + 2 =y. Let's go back to these questions on the slide. First, which table shows a proportion? It is this first one that had a constant of proportionality.



Which table shows a proportion? What do you notice about the pictures? What do you notice about the equation for the table?

towers	squares
1	4
2	8
3	12

towers	squares
1	6
2	8
3	10

Next, what do you notice about the pictures? The one on the left, the proportional one, is repetitive groups. The one of the right had an extra bit added on. It was NOT proportional. Now, most importantly, what do you notice about the equations? Possible Student Answers, Key Points:

- The first equation only has multiplication.
- The second equation has addition.
- The second equation has two operations.

The first equation only has multiplication. The second multiplication has multiplication and addition. The proportional equation has multiplication. The NON proportional equation has two operations. That is really helpful for us to notice because now we can just look at equations and we will already know if they are proportions. In fact, it is so important that mathematicians gave that kind of equation a special name. They call is y = kx. K stands for a number of some kind. So this just means y equals some number times x. And that's what we have for y = 3x on the left. But it is NOT y = kx on the right. It is y = 2x + 2. It is NOT proportional.

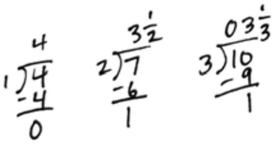
Let's Think (Slide 5): So, this is our big idea for today. *Read the top line of the slide.* "An equation in the form y = kx will always be proportional." Let's look at an equation we've been given here. It says, "Use the equation, y = 3x +1 to complete the table. Find the unit rates for each row." I'm already noticing that this equation isn't just multiplication. It is a two part equation. But, let's get some numbers. All we have to do to complete the table is plug in the number in the x column into the where the letter x is. So, I will write the equation as it is. Then on the next line I will substitute x. Then I do 3 times 1, which is 3. And I am going to recopy everything else to make a full next line. Now I see 3 plus 1 so y = 4. Let's do the next one. I will write the equation as it is. Then on the next line I will substitute x. Then I do 3 times 2, which is 6. And I am going to recopy everything else to make a full next line. Now I see 6 plus 1 so y = 7. Let's do the next one. I will write the equation as it is. Then on the next line I will substitute x. Then I do 3 times 3, which is 9. And I am going to recopy everything else to make a full next line. Now I see 9 plus 1 so y = 10.

$y=3x+1$
$y=3\cdot1+1$
$y=3+1$
$\boxed{y=4}$

$y=3x+1$
$y=3\cdot2+1$
$y=6+1$
$\boxed{y=7}$

$y=3x+1$
$y=3\cdot3+1$
$y=9+1$
$\boxed{y=10}$

x	y
1	4
2	7
3	10



Now we can find the unit rates. In the first row, we do 4 divided by 1, which is 4. For the next row, we do 7 divided by 2. 2 goes into seven 3 times. I subtract 6 and have a remainder of 1 so my answer is two and one half. For the next row, we do 10 divided by 3. 3 goes into ten 3 times. I subtract 9 and have a remainder of 1 so my answer is two and one third.

Are the equation and table here proportional? How do you know? Possible Student Answers, Key Points:

- No because the equation has an extra plus 1 in it.
- No because the unit rates are not the same.
- No because there isn't a constant of proportionality.
- No because it doesn't keep increasing the same way.

No, they are not proportional! First of all, we could predict that because we see the equation 3x +1 has this extra plus 1. It is not in the form y = kx. But also, when we used the equation to fill in the table and found the unit rates, we saw that all the unit rates were different. So there isn't a constant of proportionality.

Let's Think (Slide 6): Now we can look at equations and just know if they are proportional even without doing the math. We just have to know that an equation in the form y = kx will always be proportional. And if they can't be written in that form, they aren't proportional. This says, "Cross out all the equation that you think are NOT proportional. In other words, cross out the equations that are not in the form, y = kx." I am going to let you show me with a SILENT thumbs up or thumbs down. Let's start with y = 7x. Is that in the form y = kx? Is that proportional? YES! So I am not going to cross it out.

(a) $y = 7x$ ✓

(b) $y \cancel{= x +} 4$

Let's look at the next one. Show me with a SILENT thumbs up or thumbs down. Is that in the form y = kx? Is that proportional? NO! It has addition! I am going to cross it out.

Now this one might seem tricky but don't get tricked. Equations can be written in equivalent ways where they still mean the same thing. So, show me with a SILENT thumbs up or thumbs down. Is 4x = y in the form y = kx? Is it proportional? It is! The y and the 4x are on opposite sides of the equal sign but it still means the same idea. So it is still in the form y = kx. I'm not going to cross it out.

(c) $4x = y$ ✓

(d) $5x \cancel{- 2 =} y$

Let's look at the next one. It says 5x - 2 = y. Show me with a SILENT thumbs up or thumbs down. Is 5x - 2 = y in the form y = kx? Is it proportional? NO! It has subtraction. That is not kx. Kx is multiplication. I am going to cross it out.

(e) $y = \frac{1}{2}x$ ✓

Let's look at the next one. It is y equals one half x. Show me with a SILENT thumbs up or thumbs down. Is it in the form y = kx? Is it proportional? YES! It has a fraction but it is still just multiplying x. It does not have addition or subtraction. It is proportional.

(f) $y = x \div 2$ ✓

Okay, now for the last one. This one is the trickiest and it is going to teach us something new. I'll give you one big hint - division is just the opposite of multiplication. So what do you think? Show me with a SILENT thumbs up or thumbs down. Is it in the form y = kx? It is! Dividing by 2 is the same as multiplying by one half. So really this division equation is related to a multiplication equation. It is proportional.

Let's Try It (Slide 7): Great thinking today! Now, let's practice! I am going to take you through step by step.

WARM WELCOME

Today we will recognize that proportional relationships are characterized by equations in the form y = kx.

Let's Review:

If we see a pattern, we can write an equation from the table.

Mary fills the fruit baskets that she sells at her shop with apples and oranges. The table shows how much fruit she buys for different amounts of baskets. Let x represent the number of oranges and y represent the number of apples. Write an equation to represent the amount of each fruit that Maria buys.

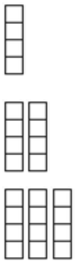
oranges	apples
2	4
4	8
6	12

Let's Talk:

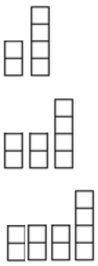
Equations from proportion tables always have the same form.

Which table shows a proportion? What do you notice about the pictures? What do you notice about the equation for the table?

towers	squares
1	4
2	8
3	12



towers	squares
1	6
2	8
3	10



Let's Think:

An equation in the form $y = kx$ will always be proportional.

Use the equation, $y = 3x + 1$, to complete the table.

x	y
1	
2	
3	

Find the unit rates for each row.

Are the equation and table proportional? ______ How do you know.

Let's Think:

An equation in the form $y = kx$ will always be proportional.

Cross out all the equation that you think are NOT proportional. In other words, cross out the equations that are not in the form, $y = kx$.

(a) $y = 7x$

(b) $y = x + 4$

(c) $4x = y$

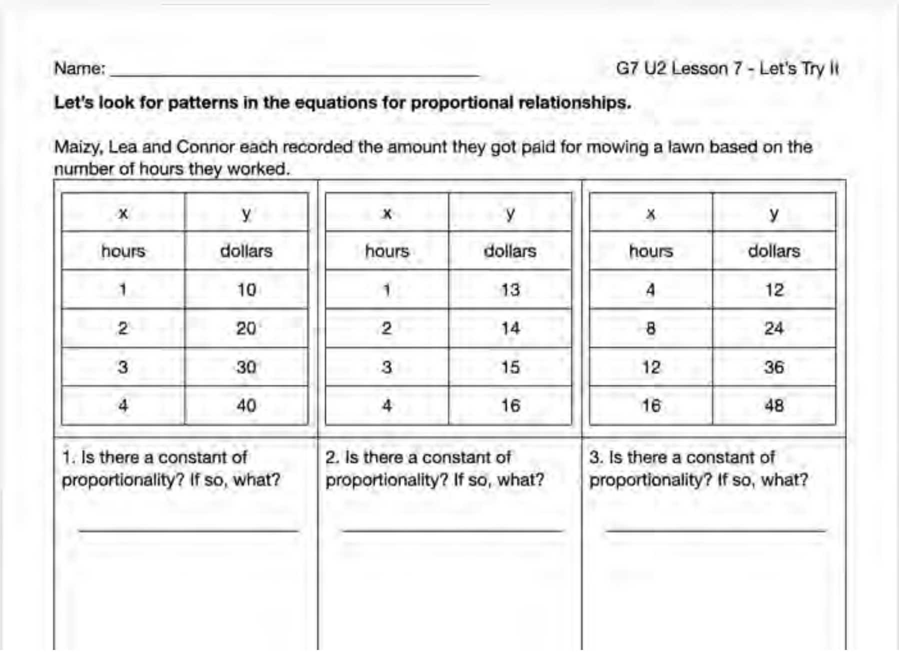
(d) $5x - 2 = y$

(e) $y = \frac{1}{2}x$

(f) $y = x \div 2$

Let's Try It:

Let's determine if equations are proportional together.



Name: ______________________________ G7 U2 Lesson 7 - Let's Try It

Let's look for patterns in the equations for proportional relationships.

Maizy, Lea and Connor each recorded the amount they got paid for mowing a lawn based on the number of hours they worked.

x	y
hours	dollars
1	10
2	20
3	30
4	40

1. Is there a constant of proportionality? If so, what?

____

x	y
hours	dollars
1	13
2	14
3	15
4	16

2. Is there a constant of proportionality? If so, what?

____

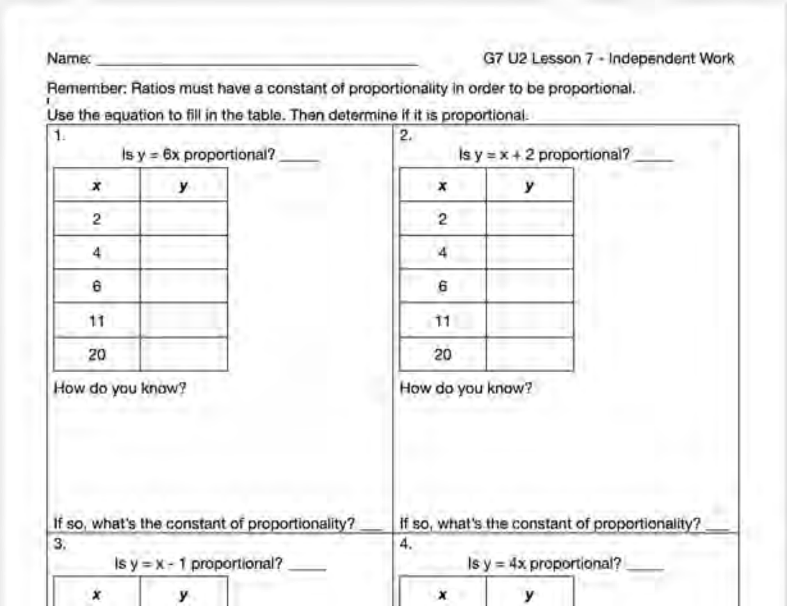
x	y
hours	dollars
4	12
8	24
12	36
16	48

3. Is there a constant of proportionality? If so, what?

____

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 7 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the equation to fill in the table. Then determine if it is proportional.

1. Is $y = 6x$ proportional? _____

x	y
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ____

2. Is $y = x + 2$ proportional? _____

x	y
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ____

3. Is $y = x - 1$ proportional? _____

x	y

4. Is $y = 4x$ proportional? _____

x	y

Name: ____ G7 U2 Lesson 7 - Let's Try It

Let's look for patterns in the equations for proportional relationships.

Maizy, Lea and Connor each recorded the amount they got paid for mowing a lawn based on the number of hours they worked.

x	y
hours	dollars
1	10
2	20
3	30
4	40

x	y
hours	dollars
1	13
2	14
3	15
4	16

x	y
hours	dollars
4	12
8	24
12	36
16	48

1. Is there a constant of proportionality? If so, what?

____

2. Is there a constant of proportionality? If so, what?

____

3. Is there a constant of proportionality? If so, what?

____

4. Which equation can be used to represent the table?

(a) $y = 10x$
(b) $y = x + 10$
(c) $y = 3x$
(d) $y = x + 12$

5. Which equation can be used to represent the table?

(a) $y = 10x$
(b) $y = x + 10$
(c) $y = 3x$
(d) $y = x + 12$

6. Which equation can be used to represent the table?

(a) $y = 10x$
(b) $y = x + 10$
(c) $y = 3x$
(d) $y = x + 12$

6. What do you notice about the types of equations that had a constant of proportionality?

Use the equation to fill in the table: y = 2x + 1.

6. Notice what operations are happening to x in the equation. Put that in each circle of the table.

7. Use the operation in the circle on x to find y.

8. Check for the constant of proportionality.

x	*y*
3	○
6	○
9	○
30	○
24	○

7. Are the equation and table above proportional? _______ How do you know? ___________________

____

____

____

8. If they are proportional, what is the constant of proportionality? ______

Use the equation to fill in the table: y = x ÷ 3.

9. Notice what operations are happening to x in the equation. Put that in each circle of the table.

10. Use the operation in the circle on x to find y.

11. Check for the constant of proportionality.

x	*y*
3	○
6	○
9	○
30	○
24	○

12. Are the equation and table above proportional? _______ How do you know? __________________

____

____

____

13. If they are proportional, what is the constant of proportionality? ______

Name: ____ G7 U2 Lesson 7 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the equation to fill in the table. Then determine if it is proportional.

1.

Is $y = 6x$ proportional? _____

x	**y**
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

2.

Is $y = x + 2$ proportional? _____

x	**y**
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

3.

Is $y = x - 1$ proportional? _____

x	**y**
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

4.

Is $y = 4x$ proportional? _____

x	**y**
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

Use the equation to fill in the table. Then determine if it is proportional.

5.

Is $y = x \div 2$ proportional? _____

x	*y*
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

6.

Is $y = 2x + 1$ proportional? _____

x	*y*
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

7.

Is $y = \frac{1}{2}x$ proportional? _____

x	*y*
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

8.

Is $y = 3x - 2$ proportional? _____

x	*y*
2	
4	
6	
11	
20	

How do you know?

If so, what's the constant of proportionality? ___

Name: ANSWER KEY

G7 U2 Lesson 7 - Let's Try It

Let's look for patterns in the equations for proportional relationships.

Maizy, Lea and Connor each recorded the amount they got paid for mowing a lawn based on the number of hours they worked.

x		y
hours		dollars
1	×10	10
2	×10	20
3	×10	30
4	×10	40

x		y
hours		dollars
1	+12	13
2	+12	14
3	+12	15
4	+12	16

x		y
hours		dollars
4	×3	12
8	×3	24
12	×3	36
16	×3	48

1. Is there a constant of proportionality? If so, what?

10

10
1)10
-10
00

10
2)20
-2↓
00

10
3)30
-3
00

2. Is there a constant of proportionality? If so, what?

NO

13
1)13
-1↓
03
-3
0

07
2)14
-14
00

05
3)15
-15
00

3. Is there a constant of proportionality? If so, what?

3

03
4)12
-12
00

03
8)24
-24
00

03
12)36
-36
00

4. Which equation can be used to represent the table?

[✓ (a) y = 10x]
(b) y = x + 10
(c) y = 3x
(d) y = x + 12

5. Which equation can be used to represent the table?

(a) y = 10x
(b) y = x + 10
(c) y = 3x
[✓ (d) y = x + 12]

6. Which equation can be used to represent the table?

(a) y = 10x
(b) y = x + 10
[✓ (c) y = 3x]
(d) y = x + 12

6. What do you notice about the types of equations that had a constant of proportionality?

All the equations had some number times x.
They are in the form y=kx.

Use the equation to fill in the table: y = 2x + 1.

6. Notice what operations are happening to x in the equation. Put that in each circle of the table.

7. Use the operation in the circle on x to find y.

8. Check for the constant of proportionality.

x		y
3	×2+1	7
6	×2+1	13
9	×2+1	19
30	×2+1	61
24	×2+1	49

$$\begin{array}{r} 2\frac{1}{3} \\ 3\overline{)7} \\ -6 \\ \hline 1 \end{array} \qquad \begin{array}{r} 02\frac{1}{6} \\ 6\overline{)13} \\ -12 \\ \hline 1 \end{array}$$

7. Are the equation and table above proportional? NO How do you know?

There is no constant of proportionality.

The equation is not in the form y=kx.

8. If they are proportional, what is the constant of proportionality? none

Use the equation to fill in the table: y = x ÷ 3.

9. Notice what operations are happening to x in the equation. Put that in each circle of the table.

10. Use the operation in the circle on x to find y.

11. Check for the constant of proportionality.

x		y
3	÷3	1
6	÷3	2
9	÷3	3
30	÷3	10
24	÷3	8

$$\begin{array}{r} 0\frac{1}{3} \\ 3\overline{)1} \\ -0 \\ \hline 1 \end{array} \qquad \begin{array}{r} 0\frac{2}{6} \\ 6\overline{)2} \\ -0 \\ \hline 2 \end{array} \qquad \begin{array}{r} 0\frac{3}{9} \\ 9\overline{)3} \\ -0 \\ \hline 3 \end{array}$$

12. Are the equation and table above proportional? Yes How do you know?

There is a constant of proportionality.

Dividing by 3 is like multiplying by $\frac{1}{3}$ so the equation is $y=\frac{1}{3}x$ which is in the form y=kx.

13. If they are proportional, what is the constant of proportionality? $\frac{1}{3}$

Name: ANSWER KEY

G7 U2 Lesson 7 - Independent Work

Remember: Ratios must have a constant of proportionality in order to be proportional.

Use the equation to fill in the table. Then determine if it is proportional.

1.

Is y = 6x proportional? yes

x	y
2	12
4	24
6	36
11	66
20	120

$$\begin{array}{r} 6 \\ 2\overline{)12} \\ -12 \\ \hline 00 \end{array} \qquad \begin{array}{r} 6 \\ 4\overline{)24} \\ -24 \\ \hline 00 \end{array}$$

How do you know?

They have a constant of proportionality.

and/or

The equation is in the form y=kx.

If so, what's the constant of proportionality? 6

2.

Is y = x + 2 proportional? no

x	y
2	4
4	6
6	8
11	13
20	22

$$\begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array} \qquad \begin{array}{r} 1\frac{2}{4} \\ 4\overline{)6} \\ -4 \\ \hline 2 \end{array}$$

How do you know?

There is not a constant of proportionality.

and/or

It is not in y=kx form.

If so, what's the constant of proportionality? none

3.

Is y = x - 1 proportional? no

x	y
2	1
4	3
6	5
11	10
20	19

$$\begin{array}{r} 0\frac{1}{2} \\ 2\overline{)1} \\ -0 \\ \hline 1 \end{array} \qquad \begin{array}{r} 0\frac{3}{4} \\ 4\overline{)3} \\ -0 \\ \hline 3 \end{array}$$

How do you know?

There is not a constant of proportionality.

and/or

It is not in y=kx form.

If so, what's the constant of proportionality? none

4.

Is y = 4x proportional? yes

x	y
2	8
4	16
6	24
11	44
20	80

$$\begin{array}{r} 4 \\ 2\overline{)8} \\ -8 \\ \hline 0 \end{array} \qquad \begin{array}{r} 4 \\ 4\overline{)16} \\ -16 \\ \hline 00 \end{array}$$

How do you know?

They have a constant of proportionality.

and/or

The equation is in y=kx form.

If so, what's the constant of proportionality? 4

Use the equation to fill in the table. Then determine if it is proportional.

5.

Is y = x ÷ 2 proportional? yes

x	y
2	1
4	2
6	3
11	$5\frac{1}{2}$
20	10

$0\frac{1}{2}$
$2\overline{)1}$
-0
1

$0\frac{2}{4}$
$4\overline{)2}$
-0
2

How do you know?

Dividing by 2 is the same as $x \frac{1}{2}$ so the equation is in the form y=kx.

and/or

There is a constant of proportionality.

If so, what's the constant of proportionality? $\frac{1}{2}$

6.

Is y = 2x + 1 proportional? no

x	y
2	5
4	9
6	13
11	23
20	41

How do you know?

It is not in y=kx form.

and/or

There is no constant of proportionality.

If so, what's the constant of proportionality? ___

7.

Is y = $\frac{1}{2}$x proportional? yes

x	y
2	1
4	2
6	3
11	$5\frac{1}{2}$
20	10

$0\frac{1}{2}$
$2\overline{)1}$
-0
1

$0\frac{2}{4}$
$4\overline{)2}$
-0
2

How do you know?

It has the same constant of proportionality.

an/or

It is in the form y=kx

If so, what's the constant of proportionality? ___

8.

Is y = 3x - 2 proportional? no

x	y
2	4
4	12
6	16
11	31
20	58

2
$2\overline{)4}$
-4
0

3
$4\overline{)12}$
-12
00

How do you know?

There is no constant of proportionality.

and/or

It is not in the form y=kx.

If so, what's the constant of proportionality? none

G7 U2 Lesson 8

Recognize that proportional relationships are characterized by equations in the form y = kx.

CITYTUTOR DC

G7 U2 Lesson 8 - Today we will use an equation to solve problems that involve proportional relationships.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use an equation to solve problems that involve proportional relationships. We are just putting all the ideas from the previous lessons together now.

Let's Review (Slide 3): We are going to review algebra for the work that we are going to do today. There are two things to remember. Read along silently with me while I read aloud: "We must keep equations balanced by doing the same opposite operation on both sides. We must substitute the correct letter." These are ideas from 6th grade but let's remind ourselves what this means. It says, "Use y = 4x. Solve for y when x = 12." First, I am going to write the equation just like it is. Then I am going to rewrite the equation except for the part I want to substitute. It's like subbing a player in soccer or any sport. I am going to take out the x and put 12 in its place. So now I have y = 4 times 12. Now in this case, y is alone. All the math is on this sign and I just need to do it. 4 times 12 is 48 so y equals 48.

Solve for y when x = 12.

$$y = 4x$$
$$y = 4 \cdot 12$$
$$\boxed{y = 48}$$

Let's do the next one. It says, "solve for x when y = 12." I still write the equation I've been given without changing a thing. Then I am going to rewrite the equation except for the part that I want to substitute. Except this time, I want to substitute the y not the x. That's why it said we must substitute the correct letter. I am going to rewrite it as 12 = 4x. This time I can't just multiply by 4. I don't know what to multiply it by. That's what I'm trying to figure out. Instead, I'm going to do just what it said. It said, "we must keep equations balanced by doing the same opposite operation on both sides." The opposite of "times 4" is dividing by 4. I have to do that on both sides. Now I have 12 divided by 4 equals 4x divided by 4. 12 divided by 4 is 3 on this side. 4x divided by 4 is just x because 4 divided by 4 is 1. And we have 3 = x.

Solve for x when y = 12.

$$y = 4x$$
$$\frac{12}{4} = \frac{4x}{4}$$
$$\boxed{3 = x}$$

Let's Talk (Slide 4): Just like we had to substitute the correct letter with numbers, we must substitute the correct letter in a word problem as well. Let's try this word problem. Read along silently with me while I read it out loud. "Each week, AJ uses the equation y = 4x to determine how many pounds of dog food to buy for each of his dog. X represents the number of dogs. Y represents the number of pounds of dog food. Complete the table." Let's start by labeling our table with x and y. It said x represents the number of dogs so I'm going to put x above dogs. It said y represents the number of pounds of dog food so I'm going to put y above pounds of food.

x	y
dogs	pounds of food
1	
2	
3	

Now I can see on the table that these numbers are x's. The first row is x = 1 then x = 2 then x = 3. We can plug these in. y = 4x so we rewrite it as y = 4 times 1. That's y = 4. Then we put it on the table. Next one. We start with y = 4x. We rewrite it as y = 4 times 2. That's y = 8. Then we put it on the table. Next one. We start with y = 4x. We rewrite it as y = 4 times 3. That's y = 12. Then we put it on the table.

$$y = 4x$$
$$y = 4 \cdot 1$$
$$\boxed{y = 4}$$

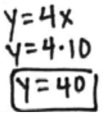
$$y = 4x$$
$$y = 4 \cdot 2$$
$$\boxed{y = 8}$$

$$y = 4x$$
$$y = 4 \cdot 3$$
$$\boxed{y = 12}$$

x	y
dogs	pounds of food
1	4
2	8
3	12

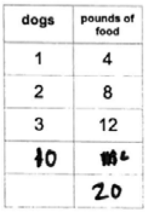
x dogs	y pounds of food
1	4
2	8
3	12
10	

Those were easier because we labeled the x. To figure out what to plug in for the question, we're going to have to do the same kind of thinking about, "Is this number an x or y?" The question is, "how many pounds of food would AJ need for 10 dogs?" We can think about what variable this is a few ways. First, we can put 10 in the table under dogs and see that it is x. Also, the story said x equals dogs.



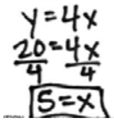
$$y=4x$$
$$y=4\cdot10$$
$$\boxed{Y=40}$$

Our problem says 10 dogs. So it has to go in the x place. We write y = 4x then substitute x. We get y = 4 times 10 so y equals 40.



dogs	pounds of food
1	4
2	8
3	12
10	[illegible]
	20

Let's Think (Slide 5): Let's try another question for the same problem. It still says the same story about AJ. But let's read the question. It says, "How many dogs must AJ have to buy 20 pounds of food?" Remember, we have to substitute the correct letter in the word problem. There are a few ways to think about it. We can put 20 on the table. It has to be 20 in the pounds of food column, right? So we can already see that 20 is y.



$$y=4x$$
$$\frac{20}{4}=\frac{4x}{4}$$
$$\boxed{5=x}$$

Or we can notice that the word after 20 is pounds of food and it said y represents pounds of food. Either way, we write the equation, y = 4x. Now we put 20 in the y spot. It is 20 = 4x. This problem is going to be a work backwards problem. I divide by 4 on each side. We get 20 divided by 4 is 5. On the other side we have 4x divided 4 is just x. So 5 = x.

Let's Try It (Slide 6): Great thinking! Now, let's practice! I am going to take you through step by step.

WARM WELCOME

Today we will use an equation to solve problems that involve proportional relationships.

Let's Review:

We must keep equations balanced by doing the same opposite operation on both sides. We must substitute the correct letter.

Use $y = 4x$.

Solve for y when $x = 12$.

Solve for x when $y = 12$.

Let's Talk:

We must substitute the correct letter in a word problem.

Each week, AJ uses the equation $y = 4x$ to determine how many pounds of dog food to buy for each of his dog. X represents the number of dogs. Y represents the number of pounds of dog food. Complete the table.

How many pounds of food would AJ need for 10 dogs?

dogs	pounds of food
1	
2	
3	

Let's Think:

We must substitute the correct letter in a word problem.

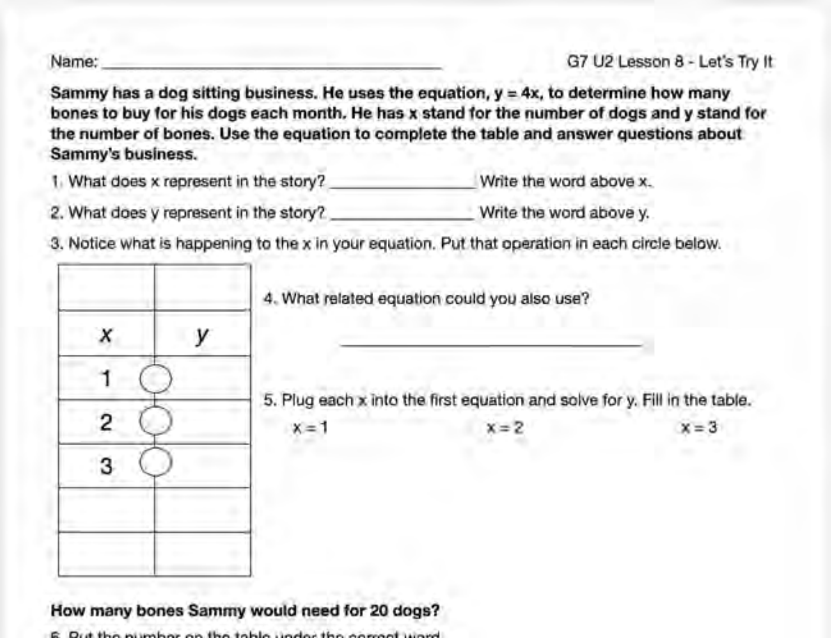
Each week, AJ uses the equation y = 4x to determine how many pounds of dog food to buy for each of his dog. X represents the number of dogs. Y represents the number of pounds of dog food. Complete the table.

How many dogs must AJ have to buy 20 pounds of food?

dogs	pounds of food
1	4
2	8
3	12
10	40

Let's Try It:

Let's use equations to solve problems together.



Name: ______________________________ G7 U2 Lesson 8 - Let's Try It

Sammy has a dog sitting business. He uses the equation, y = 4x, to determine how many bones to buy for his dogs each month. He has x stand for the number of dogs and y stand for the number of bones. Use the equation to complete the table and answer questions about Sammy's business.

1. What does x represent in the story? ______________ Write the word above x.
2. What does y represent in the story? ______________ Write the word above y.
3. Notice what is happening to the x in your equation. Put that operation in each circle below.

x	y
1 ○	
2 ○	
3 ○	

4. What related equation could you also use?

____

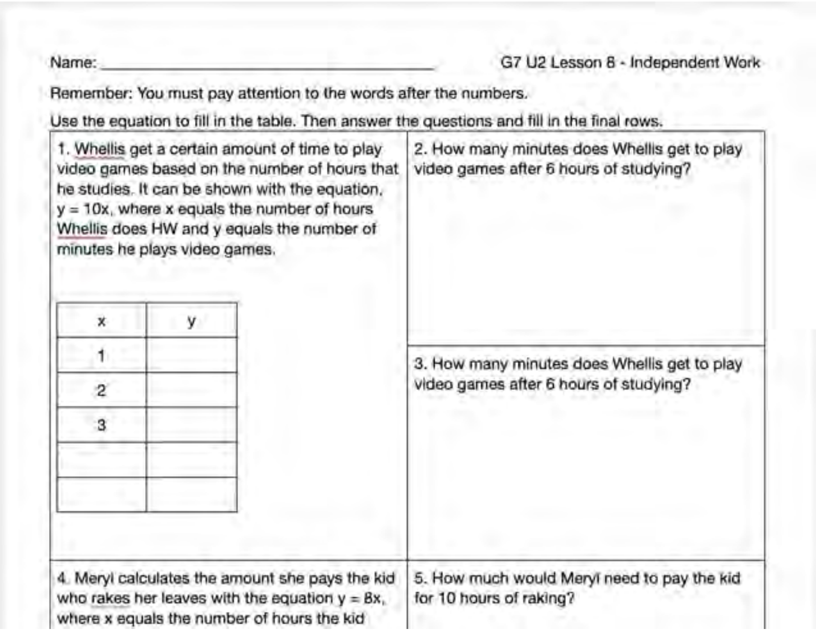
5. Plug each x into the first equation and solve for y. Fill in the table.

x = 1 x = 2 x = 3

How many bones Sammy would need for 20 dogs?

On your Own:

Now it’s time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 8 - Independent Work

Remember: You must pay attention to the words after the numbers.

Use the equation to fill in the table. Then answer the questions and fill in the final rows.

1. Whellis get a certain amount of time to play video games based on the number of hours that he studies. It can be shown with the equation, y = 10x, where x equals the number of hours Whellis does HW and y equals the number of minutes he plays video games.

x	y
1	
2	
3	

2. How many minutes does Whellis get to play video games after 6 hours of studying?

3. How many minutes does Whellis get to play video games after 6 hours of studying?

4. Meryl calculates the amount she pays the kid who rakes her leaves with the equation y = 8x, where x equals the number of hours the kid

5. How much would Meryl need to pay the kid for 10 hours of raking?

Name: ____

Sammy has a dog sitting business. He uses the equation, $y = 4x$, to determine how many bones to buy for his dogs each month. He has x stand for the number of dogs and y stand for the number of bones. Use the equation to complete the table and answer questions about Sammy's business.

1. What does x represent in the story? _________________ Write the word above x.

2. What does y represent in the story? _________________ Write the word above y.

3. Notice what is happening to the x in your equation. Put that operation in each circle below.

x	y
1 ○	
2 ○	
3 ○	

4. What related equation could you also use?

____

5. Plug each x into the first equation and solve for y. Fill in the table.

$x = 1$ $x = 2$ $x = 3$

How many bones Sammy would need for 20 dogs?

6. Put the number on the table under the correct word.

7. Plug it into the correct place of an equation and solve. Write the value on the table.

How many dogs must Sammy have if he purchased 20 bones?

8. Put the number on the table under the correct word.

9. Plug it into the correct place of the equation and solve. Write the value on the table.

Lindsey uses this equation, y = 3x to plan how to make rice and beans, where x represents the cups of uncooked beans and y represents the cups of uncooked rice.

1. What does x represent in the story? _________________ Write the word above x.

2. What does y represent in the story? _________________ Write the word above y.

3. Notice what is happening to the x in your equation. Put that operation in each circle below.

x	*y*
	○ 6
	○ 9
	○ 12

4. What related equation could you also use?

____

5. Plug each x into the first equation and solve for y. Fill in the table.

y = 6

y = 9

y = 12

How many cups of uncooked rice will Lindsey need for 4 cups of beans?

6. Put the number on the table under the correct word.

7. Plug it into the correct place of an equation and solve. Write the value on the table.

How many cups of uncooked beans will Lindsey need for 1 cup of rice?

8. Put the number on the table under the correct word.

9. Plug it into the correct place of the equation and solve. Write the value on the table.

Name: ____ G7 U2 Lesson 8 - Independent Work

Remember: You must pay attention to the words after the numbers.

Use the equation to fill in the table. Then answer the questions and fill in the final rows.

1. Whellis gets a certain amount of time to play video games based on the number of hours that he studies. It can be shown with the equation, $y = 10x$, where x equals the number of hours Whellis does HW and y equals the number of minutes he plays video games.

x	y
1	
2	
3	

2. How many minutes does Whellis get to play video games after 6 hours of studying?

3. How many minutes does Whellis get to play video games after 8 hours of studying?

4. Meryl calculates the amount she pays the kid who rakes her leaves with the equation $y = 8x$, where x equals the number of hours the kid spends raking and y equals the number of dollars.

x	y
	16
	32
	64

5. How much would Meryl need to pay the kid for 10 hours of raking?

6. How many hours of raking must have been done if Meryl paid $80?

Use the equation to fill in the table. Then answer the questions and fill in the final rows.

7. The store stocks short sleeve and long sleeve shirts using the equation, $y = 2x$, where x is the number of long sleeve shirts and y is the short sleeve shirts.

x	y
1	
2	
3	

8. How many short sleeve shirts will the store have when they have 16 long sleeve shirts?

9. How many long sleeve shirts will the store have when they have 16 short sleeve shirts?

10. The equation for the amount of flea medicine that a kitty needs is $y = 5x$ where x is the number of days and y is the amount of medicine in milligrams.

x	y
	10
	20
	30

11. How many milligrams does a kitty need over 7 days?

12. How many days will 45 mg of medicine last?

13. Jason gave his kitty 9 mg of medicine over 45 days. Was that the correct amount? Explain.

Name: ANSWER KEY

Sammy has a dog sitting business. He uses the equation, $y = 4x$, to determine how many bones to buy for his dogs each month. He has x stand for the number of dogs and y stand for the number of bones. Use the equation to complete the table and answer questions about Sammy's business.

1. What does x represent in the story? dogs Write the word above x.

2. What does y represent in the story? bones Write the word above y.

3. Notice what is happening to the x in your equation. Put that operation in each circle below.

dogs		bones
x		y
1	×4	4
2	×4	8
3	×4	12
20	×4	80
5	×4	20

4. What related equation could you also use?

$y \div 4 = x$

5. Plug each x into the first equation and solve for y. Fill in the table.

x = 1

$y = 4x$
$y = 4 \cdot 1$
$\boxed{y = 4}$

x = 2

$y = 4x$
$y = 4 \cdot 2$
$\boxed{y = 8}$

x = 3

$y = 4x$
$y = 4 \cdot 3$
$\boxed{y = 12}$

How many bones Sammy would need for 20 dogs?

6. Put the number on the table under the correct word.

7. Plug it into the correct place of an equation and solve. Write the value on the table.

$y = 4x$
$y = 4 \cdot 20$
$\boxed{y = 80}$ bones

How many dogs must Sammy have if he purchased 20 bones?

8. Put the number on the table under the correct word.

9. Plug it into the correct place of the equation and solve. Write the value on the table.

$y = 4x$
$\frac{20}{4} = \frac{4x}{4}$
$\boxed{5 = x}$ dogs

Lindsey uses this equation, y = 3x to plan how to make rice and beans, where x represents the cups of uncooked beans and y represents the cups of uncooked rice.

1. What does x represent in the story? cups of beans Write the word above x.

2. What does y represent in the story? cups of rice Write the word above y.

3. Notice what is happening to the x in your equation. Put that operation in each circle below.

cups of beans	cups of rice
x	y
2 ×3	6
3 ×3	9
4 ×3	12
8 ×3	24
$\frac{1}{3}$ ×3	1

4. What related equation could you also use?

$y \div 3 = x$

5. Plug each x into the first equation and solve for y. Fill in the table.

y = 6

$y = 3x$

$\frac{6}{3} = \frac{3x}{3}$

$\boxed{2 = x}$

y = 9

$y = 3x$

$\frac{9}{3} = \frac{3x}{3}$

$\boxed{3 = x}$

y = 12

$y = 3x$

$\frac{12}{3} = \frac{3x}{3}$

$\boxed{4 = x}$

How many cups of uncooked rice will Lindsey need for 8 cups of beans?

6. Put the number on the table under the correct word.

7. Plug it into the correct place of an equation and solve. Write the value on the table.

$y = 3x$

$y = 3 \cdot 8$

$\boxed{y = 24}$ cups of rice

How many cups of uncooked beans will Lindsey need for 1 cup of rice?

8. Put the number on the table under the correct word.

9. Plug it into the correct place of the equation and solve. Write the value on the table.

$\frac{1}{3} = \frac{3x}{3}$

$\boxed{\frac{1}{3} = x}$ cups of beans

Name: ANSWER KEY

G7 U2 Lesson 8 - Independent Work

Remember: You must pay attention to the words after the numbers.

Use the equation to fill in the table. Then answer the questions and fill in the final rows.

1. Whellis get a certain amount of time to play video games based on the number of hours that he studies. It can be shown with the equation, y = 10x, where x equals the number of hours Whellis does HW and y equals the number of minutes he plays video games.

hours	minutes
x	y
1 ×10	10
2 ×10	20
3 ×10	30
6 ×10	60
8 ×10	80

2. How many minutes does Whellis get to play video games after 6 hours of studying?

$y = 10x$

$y = 10 \cdot 6$

$\boxed{y = 60}$

3. How many minutes does Whellis get to play video games after 8 hours of studying?

$y = 10x$

$y = 10 \cdot 8$

$\boxed{y = 80}$

4. Meryl calculates the amount she pays the kid who rakes her leaves with the equation y = 8x, where x equals the number of hours the kid spends raking and y equals the number of dollars.

hours	dollars
x	y
2 ×8	16
4 ×8	32
8 ×8	64
10 ×8	80
10 ×8	80

5. How much would Meryl need to pay the kid for 10 hours of raking?

$y = 8x$

$y = 8 \cdot 10$

$\boxed{y = 80}$

6. How many hours of raking must have been done if Meryl paid $80?

$y = 8x$

$\frac{80}{8} = \frac{8x}{8}$

$\boxed{10 = x}$

Use the equation to fill in the table. Then answer the questions and fill in the final rows.

7. The store stocks short sleeve and long sleeve shirts using the equation, $y = 2x$, where x is the number of long sleeve shirts and y is the short sleeve shirts.

long short

x	y
1 ×2	2
2 ×2	4
3 ×2	6
16 ×2	32
8 ×2	16

8. How many short sleeve shirts will the store have when they have 16 long sleeve shirts?

$$y = 2x$$
$$y = 2 \cdot 16$$
$$\boxed{y = 32}$$

9. How many long sleeve shirts will the store have when they have 16 short sleeve shirts?

$$y = 2x$$
$$\frac{16}{2} = \frac{2x}{2}$$
$$\boxed{8 = x}$$

10. The equation for the amount of flea medicine that a kitty needs is $y = 5x$ where x is the number of days and y is the amount of medicine in milligrams.

days mg

x	y
2 ×5	10
4 ×5	20
6 ×5	30
7 ×5	35
9 ×5	45

11. How many milligrams does a kitty need over 7 days?

$$y = 5x$$
$$y = 5 \cdot 7$$
$$\boxed{y = 35}$$

12. How many days will 45 mg of medicine last?

$$y = 5x$$
$$\frac{45}{5} = \frac{5x}{5}$$
$$\boxed{9 = x}$$

13. Jason gave his kitty 9 mg of medicine over 45 days. Was that the correct amount? Explain.

No, that is not the right amount. Jason switched x and y. x is the number of days and y is the mg. So $y = 5x$ means 5 times the number of days. Jason's answer of 9 mg and 45 days would be 5 times the number of milligrams. The right answer is 45 × 5 which is 225 so 45 days needs 225 mg.

G7 U2 Lesson 9

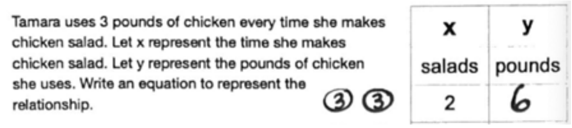
Write an equation to represent a proportional relationship and solve problems about proportional relationships.

G7 U2 Lesson 9 - Today we will write an equation for story problems and determine if it is a proportion.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will write an equation for story problems and determine if it is a proportion. Most of this will be things you already know. But you are going to have to be super readers to make sure you can understand the story problems. Let's go!

Let's Review (Slide 3): To fill in a table, we use the values we are given to find the corresponding values. Let's read the problem and then we'll use the values we are given. "Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship." Someone who read this story problem might think, "It only gives us one number! It's impossible to do any math with just one number!" But we also have numbers to work with on this table. So let's start with the first row. There is a 2 and the 2 is in the salads column so that means I have 2 salads. I am going to draw a picture to think about what's happening in the story. I will draw 2 salads. Then in the story it said that Tamara uses 3 pounds of chicken in each salad. So I will draw 3 in each. I can see that this is 2 groups of 3 which means 2 times 3 which equals 6.

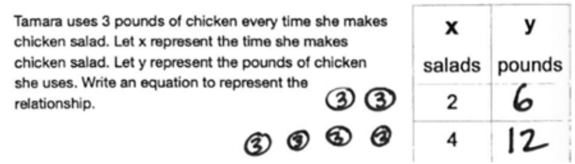


Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship.

③ ③

x	y
salads	pounds
2	6

If I make this 4 salads now, I will have 3 pounds of chicken in each salad. That would be 4 groups of 3, which is 4 times 3 makes 12.



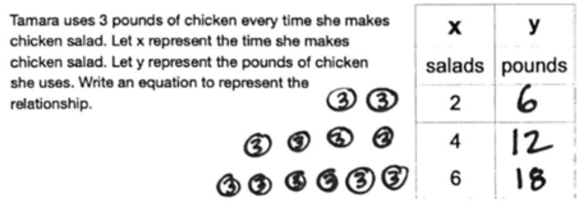
Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship.

③ ③

③ ③ ③ ③

x	y
salads	pounds
2	6
4	12

And then 6 salads with 3 pounds in each is 6 groups of 3 which is 6 times 3 which is 18.



Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship.

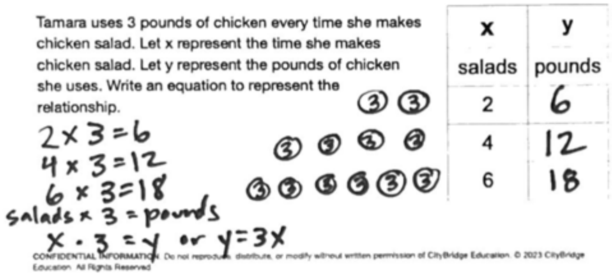
③ ③

③ ③ ③ ③

③ ③ ③ ③ ③ ③

x	y
salads	pounds
2	6
4	12
6	18

This is something you already know how to do but there is a very important lesson here. You can use any number to draw out a problem and understand what is happening. Then you can go back and write the equation. We did 2 x 3 = 6 and 4 x 3 = 12 and 6 x 3 = 18. It is always salads times 3 equals pounds. I can put x in for salads and y in for pounds and now we have our final equation: 3 times x equals y. We can also write it as y = 3x and it means the same thing.



Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship.

③ ③

③ ③ ③ ③

③ ③ ③ ③ ③ ③

x	y
salads	pounds
2	6
4	12
6	18

$2 \times 3 = 6$

$4 \times 3 = 12$

$6 \times 3 = 18$

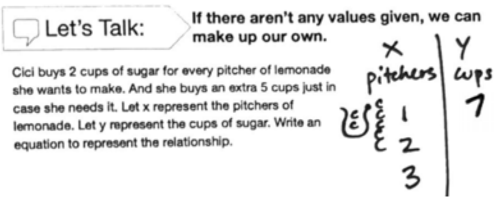
salads × 3 = pounds

$x \cdot 3 = y$ or $y = 3x$

Let's Talk (Slide 4): If there aren't any values given, we can make up our own. Let's read this problem and see how that might work. Read along with your eyes while I read out loud. "Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship." It might be tempting to jump to some operation with the 2 and the 5 here. Maybe I add them! Maybe I multiply them! If we just choose an idea that pops into our head without taking time to think, we are likely to get the wrong answer. Instead we're going to do exactly what we did on the last slide. We're going to take a few numbers and draw out the story to understand

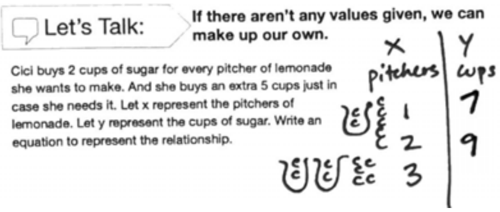
what is happening. One of the clues that I should do this is that the problem wants us to use an x and a y. So I need to make a table with x and y. I also want to put the words that the x and y stand for. So, x is pitchers and y is cups. Now, I don't have to use the numbers in the story yet. The variables can be any numbers so let's just start with 1, 2 and 3.

Now this problem is exactly the same as what we just did on the last slide. Remember how we drew a picture and we wrote out the equations and then we put in the variables? It will be the exact same. The important thing we're learning here is that if they don't give us a table of values, we can just draw one ourselves with our own numbers. Let's draw. I have 1 pitcher of lemonade. *Underline the sentence in the story as you reread it.* Cici buys 2 cups of sugar for every pitcher. So I am going to draw 2 cups in this pitcher. But I'm not done this time. Because it also says she buys an extra 5 cups. So I need to draw an extra 5 cups. That is 1 group of 2, which is 2, plus 5, which is 7. I did x 2 plus 5.


Let's Talk: If there aren't any values given, we can make up our own.

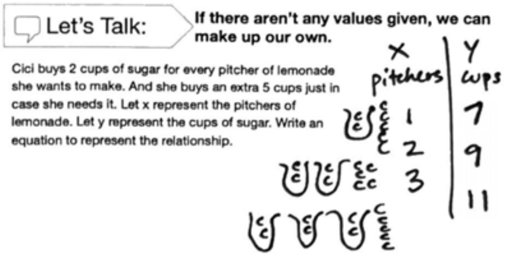
Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

Let's turn this into 2 pitchers. There are 2 more cups in this pitcher. I don't draw another 5 though. It didn't say 5 for every pitcher. It just said an extra 5 and we already have that extra 5. So this problem is 2 groups of 2 plus 5, which is 4 plus 5. I did x 2 plus 5 to get 9.


Let's Talk: If there aren't any values given, we can make up our own.

Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

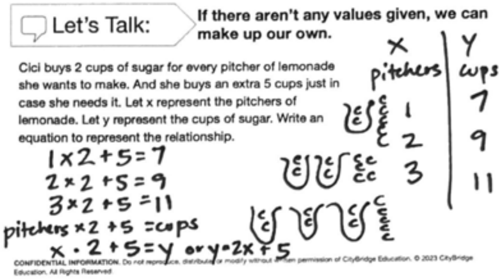
Let's turn this into 3 pitchers. There are 2 more cups in this pitcher. I don't draw another 5 though. It didn't say 5 for every pitcher. It just said an extra 5 and we already have that extra 5. So this problem is 3 groups of 2 plus 5, which is 6 plus 5. I did x 2 plus 5 to get 11.


Let's Talk: If there aren't any values given, we can make up our own.

Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

1x2+5=7
2x2+5=9
3x2+5=11
pitchers x2 +5 =cups

Our table is complete so now we can list out the equations. I did 1 x 2 + 5 = 7 and 2 x 2 + 5 = 9 and 3 x 2 + 5 = 11. I can see that it is always "times 2 plus 5" so I am going to put in words. Pitchers x 2 + 5 = cups. And now I can put in letters, x is pitchers so x times 2 plus 5 equals y.


Let's Talk: If there aren't any values given, we can make up our own.

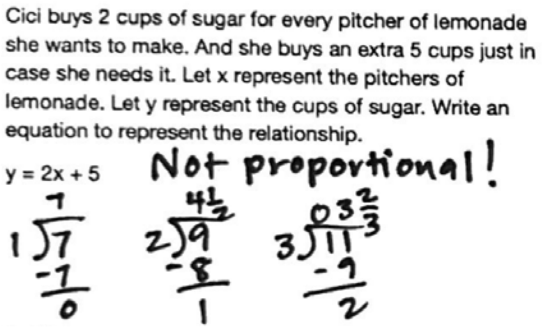
Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

1x2+5=7
2x2+5=9
3x2+5=11
pitchers x2 +5 =cups
x · 2 + 5 = y or y = 2x + 5

Remember that the equal sign is just telling us both sides are the same so I can put y on this side and say y = 2x + 5.

Let's Think (Slide 5): This might seem a little new but one thing never changes, "We always evaluate whether a story is proportional with the equation or constant of proportionality" just like we've done for all these lessons. So let's think about the story that we just did. Is it a proportion? Possible Student Answers, Key Points:

- No, it’s not proportional because it’s not in the form y = kx.
- No, it’s not proportional because it has a two step equation instead of just multiplication or division.
- No, it’s not proportional because you wouldn’t get the same unit rate for each row.
- No, it’s not proportional because there isn’t a constant of proportionality.



Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

y = 2x + 5

It’s NOT proportional! And there are many ways to tell. First, the equation isn’t in the form y = kx where there is just multiplication or the related division. It’s a two step equation with some addition in there. Second, when we look at the table that matches the equation, we can find the unit rates for each row and they will not be the same. Let me show you. I do 7 divided by 1 is 7. I do 9 divided by 2. 2 goes into 9 four times with a remainder of 1 so the answer is 4 and one half. I do 11 divided by 3. 3 goes into 11 three times with a remaineder of 2 so the answer is 3 and two thirds.

Those unit rates are not the same so there is not a constant of proportionality and this relationship is not proportional. The story isn’t proportional. The equation isn’t proportional, and the table isn’t proportional. They are all different ways of looking at the same thing and none of them are proportional.

Let’s Try It (Slide 6): Now we will write more equations together. I will take you through step by step.

WARM WELCOME

Today we will write an equation for story problems and determine if it is a proportion.

Let's Review:

To fill in a table, we use the values we are given to find the corresponding values.

Tamara uses 3 pounds of chicken every time she makes chicken salad. Let x represent the time she makes chicken salad. Let y represent the pounds of chicken she uses. Write an equation to represent the relationship.

x	y
salads	pounds
2	
4	
6	

Let's Talk:

If there aren't any values given, we can make up our own.

Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

Let's Think:

We always evaluate whether a story is proportional with the equation or constant of proportionality.

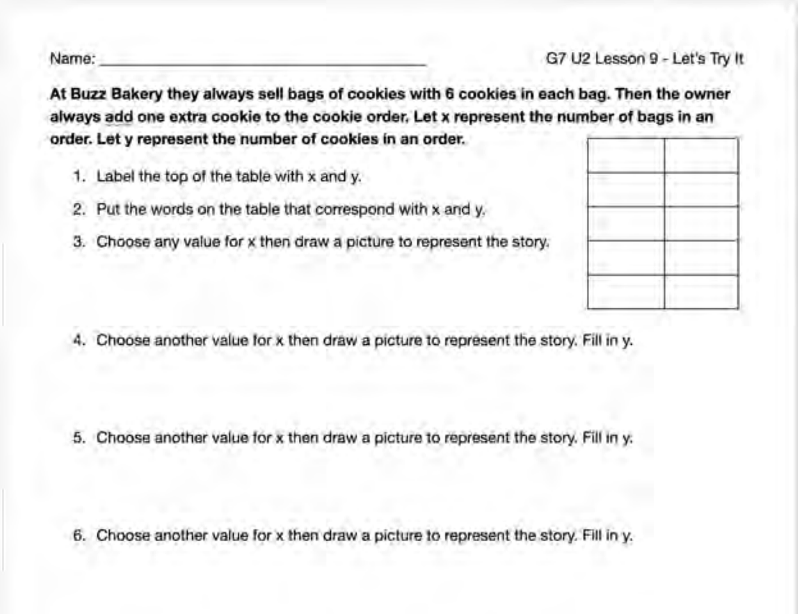
Cici buys 2 cups of sugar for every pitcher of lemonade she wants to make. And she buys an extra 5 cups just in case she needs it. Let x represent the pitchers of lemonade. Let y represent the cups of sugar. Write an equation to represent the relationship.

$y = 2x + 5$

x	**y**
pitchers	cups
1	7
2	9
3	11

Let's Try It:

Now we will write more equations together!



Name: ______________________________ G7 U2 Lesson 9 - Let's Try It

At Buzz Bakery they always sell bags of cookies with 6 cookies in each bag. Then the owner always add one extra cookie to the cookie order. Let x represent the number of bags in an order. Let y represent the number of cookies in an order.

1. Label the top of the table with x and y.
2. Put the words on the table that correspond with x and y.
3. Choose any value for x then draw a picture to represent the story.

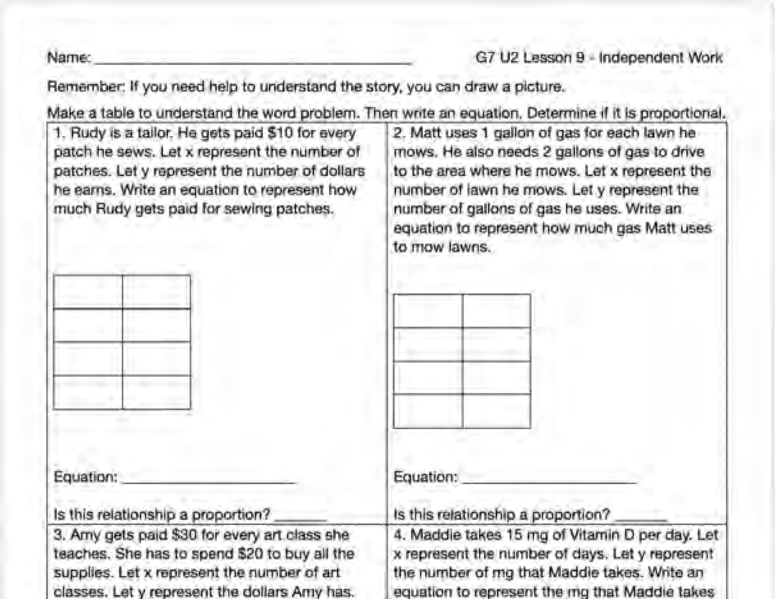
4. Choose another value for x then draw a picture to represent the story. Fill in y.

5. Choose another value for x then draw a picture to represent the story. Fill in y.

6. Choose another value for x then draw a picture to represent the story. Fill in y.

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 9 - Independent Work

Remember: If you need help to understand the story, you can draw a picture.

Make a table to understand the word problem. Then write an equation. Determine if it is proportional.

1. Rudy is a tailor. He gets paid $10 for every patch he sews. Let x represent the number of patches. Let y represent the number of dollars he earns. Write an equation to represent how much Rudy gets paid for sewing patches.

Equation: ____________________

Is this relationship a proportion? ______

2. Matt uses 1 gallon of gas for each lawn he mows. He also needs 2 gallons of gas to drive to the area where he mows. Let x represent the number of lawn he mows. Let y represent the number of gallons of gas he uses. Write an equation to represent how much gas Matt uses to mow lawns.

Equation: ____________________

Is this relationship a proportion? ______

3. Amy gets paid $30 for every art class she teaches. She has to spend $20 to buy all the supplies. Let x represent the number of art classes. Let y represent the dollars Amy has.

4. Maddie takes 15 mg of Vitamin D per day. Let x represent the number of days. Let y represent the number of mg that Maddie takes. Write an equation to represent the mg that Maddie takes

Name: ____ G7 U2 Lesson 9 - Let’s Try It

At Buzz Bakery they always sell bags of cookies with 6 cookies in each bag. Then the owner always add one extra cookie to the cookie order. Let x represent the number of bags in an order. Let y represent the number of cookies in an order.

1. Label the top of the table with x and y.
2. Put the words on the table that correspond with x and y.
3. Choose any value for x then draw a picture to represent the story.
4. Choose another value for x then draw a picture to represent the story. Fill in y.
5. Choose another value for x then draw a picture to represent the story. Fill in y.
6. Choose another value for x then draw a picture to represent the story. Fill in y.
7. Make a list of the equations for each row. ______________________________

____

____

____

8. Write an equation with x and y. ______________________________
9. Find the unit rate for each row.
10. Is the relationship proportional? ______

At Donut Dash, they sell boxes of donuts with 12 donuts per box. Let x represent the number of boxes in an order. Let y represent the number of donuts in an order.

11. Label the top of the table with x and y.
12. Put the words on the table that correspond with x and y.
13. Choose any value for x then draw a picture to represent the story.
14. Choose another value for x then draw a picture to represent the story. Fill in y.
15. Choose another value for x then draw a picture to represent the story. Fill in y.
16. Choose another value for x then draw a picture to represent the story. Fill in y.
17. Make a list of the equations for each row. ______________________________

____

____

____

18. Write an equation with x and y. ______________________________
19. Find the unit rate for each row.
20. Is the relationship proportional? ______

Name: ____ G7 U2 Lesson 9 - Independent Work

Remember: If you need help to understand the story, you can draw a picture.

Make a table to understand the word problem. Then write an equation. Determine if it is proportional.

1. Rudy is a tailor. He gets paid $10 for every patch he sews. Let x represent the number of patches. Let y represent the number of dollars he earns. Write an equation to represent how much Rudy gets paid for sewing patches.

Equation: ______________________

Is this relationship a proportion? _______

2. Matt uses 1 gallon of gas for each lawn he mows. He also needs 2 gallons of gas to drive to the area where he mows. Let x represent the number of lawn he mows. Let y represent the number of gallons of gas he uses. Write an equation to represent how much gas Matt uses to mow lawns.

Equation: ______________________

Is this relationship a proportion? _______

3. Amy gets paid $30 for every art class she teaches. She has to spend $20 to buy all the supplies. Let x represent the number of art classes. Let y represent the dollars Amy has. Write an equation to show the total amount of money Amy gets from teaching.

Equation: ______________________

Is this relationship a proportion? _______

4. Maddie takes 15 mg of Vitamin D per day. Let x represent the number of days. Let y represent the number of mg that Maddie takes. Write an equation to represent the mg that Maddie takes over several days.

Equation: ______________________

Is this relationship a proportion? _______

Make a table to understand the word problem. Then write an equation. Determine if it is proportional.

5. Rachel's lawn requires 10 gallons of water plus an additional 2 gallons of water for each potted plant. Let x represent the number of potted plants. Let y represent the gallons of water. Write an equation for the gallons of water Rachel uses.

Equation: ______________________

Is this relationship a proportion? _______

6. It costs $5 to get into the Spring Fair. Then each ride costs $2. Let x represent the number of rides. Let y represent the total cost. Write an equation for the total cost the Spring Fair based on the number of rides.

Equation: ______________________

Is this relationship a proportion? _______

7. Percy gets 10 points for each basket at the Spring Fair game. Let x represent the number of baskets. Let y represent the number of points. Write an equation to find the points depending on the number of baskets.

Equation: ______________________

Is this relationship a proportion? _______

8. Caryn takes 5 weeks to make a quilt. Let x represent the number of quilts. Let y represent the number of weeks she needs to make one. Write an equation for the number of weeks Caryn needs based on the number of quilts.

Equation: ______________________

Is this relationship a proportion? _______

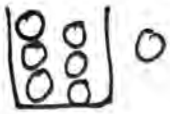
ame: ANSWER KEY

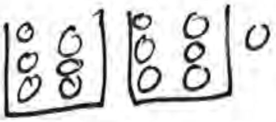
G7 U2 Lesson 9 - Let's Try It

At Buzz Bakery they always sell bags of cookies with 6 cookies in each bag. Then the owner always add one extra cookie to the cookie order. Let x represent the number of bags in an order. Let y represent the number of cookies in an order.

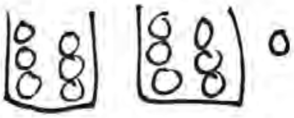
x	y
bags	cookies
1	7
2	13
3	19
4	25

1. Label the top of the table with x and y.
2. Put the words on the table that correspond with x and y.
3. Choose any value for x then draw a picture to represent the story.

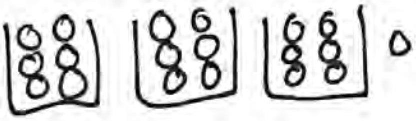




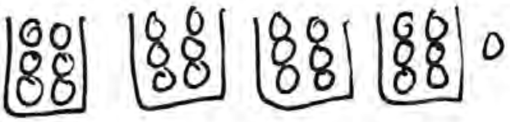
4. Choose another value for x then draw a picture to represent the story. Fill in y.



5. Choose another value for x then draw a picture to represent the story. Fill in y.



6. Choose another value for x then draw a picture to represent the story. Fill in y.



7. Make a list of the equations for each row.

$1 \times 6 + 1 = 7$

$2 \times 6 + 1 = 13$

$3 \times 6 + 1 = 19$

$4 \times 6 + 1 = 25$

8. Write an equation with x and y. $x \cdot 6 + 1 = y$

9. Find the unit rate for each row.

$$\begin{array}{r} 7 \\ 1\overline{)7} \\ -7 \\ \hline 0 \end{array} \qquad \begin{array}{r} 06\frac{1}{2} \\ 2\overline{)13} \\ -12 \\ \hline 1 \end{array} \qquad \begin{array}{r} 06\frac{1}{3} \\ 3\overline{)17} \\ -18 \\ \hline 1 \end{array} \qquad \begin{array}{r} 06\frac{1}{4} \\ 4\overline{)25} \\ 24 \\ \hline 1 \end{array}$$

10. Is the relationship proportional? NO

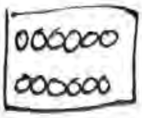
At Donut Dash, they sell boxes of donuts with 12 donuts per box. Let x represent the number of boxes in an order. Let y represent the number of donuts in an order.

x	y
boxes	donuts
1	12
2	24
3	36
4	48

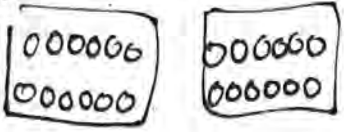
11. Label the top of the table with x and y.

12. Put the words on the table that correspond with x and y.

13. Choose any value for x then draw a picture to represent the story.

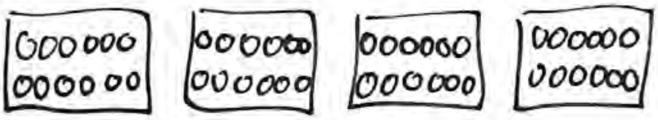


14. Choose another value for x then draw a picture to represent the story. Fill in y.



15. Choose another value for x then draw a picture to represent the story. Fill in y.

16. Choose another value for x then draw a picture to represent the story. Fill in y.



17. Make a list of the equations for each row.

$1 \times 12 = 12$

$2 \times 12 = 24$

$3 \times 12 = 36$

$4 \times 12 = 48$

18. Write an equation with x and y. $x \cdot 12 = y$

19. Find the unit rate for each row.

$1\overline{)12}$ = 12
-1↓
02
-2
0

$2\overline{)24}$ = 12
-2↓
04
-4
0

$3\overline{)36}$ = 12
-3↓
06
-6
0

$4\overline{)48}$ = 12
-4↓
08
-8
0

20. Is the relationship proportional? Yes

Name: ANSWER KEY

G7 U2 Lesson 9 - Independent Work

Remember: If you need help to understand the story, you can draw a picture.

Make a table to understand the word problem. Then write an equation. Determine if it is proportional.

1. Rudy is a tailor. He gets paid $10 for every patch he sews. Let x represent the number of patches. Let y represent the number of dollars he earns. Write an equation to represent how much Rudy gets paid for sewing patches.

x patches	y dollars
1	10
2	20
3	30

$1\overline{)10}$ = 10, −10, 0

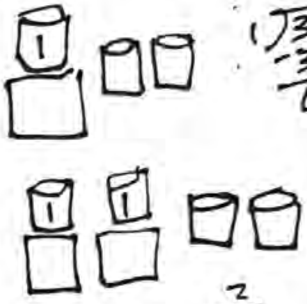
$2\overline{)20}$ = 10, −20, 00

Equation: y = 10x

Is this relationship a proportion? yes

2. Matt uses 1 gallon of gas for each lawn he mows. He also needs 2 gallons of gas to drive to the area where he mows. Let x represent the number of lawn he mows. Let y represent the number of gallons of gas he uses. Write an equation to represent how much gas Matt uses to mow lawns.

x lawns	y gallons
1	3
2	4
3	5



$1\overline{)3}$ = 3, −3, 0

$2\overline{)4}$ = 2, −4, 0

Equation: y = 1x + 2

Is this relationship a proportion? no

3. Amy gets paid $30 for every art class she teaches. She has to spend $20 to buy all the supplies. Let x represent the number of art classes. Let y represent the dollars Amy has. Write an equation to show the total amount of money Amy gets from teaching.

x classes	y dollars
1	10
2	40
3	70

$1\overline{)10}$ = 10, −10, 00

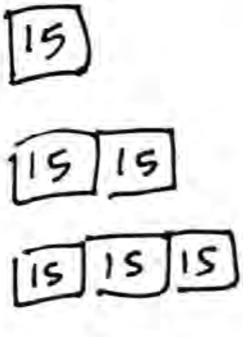
$2\overline{)40}$ = 20, −40, 00

Equation: y = 30x − 20

Is this relationship a proportion? no

4. Maddie takes 15 mg of Vitamin D per day. Let x represent the number of days. Let y represent the number of mg that Maddie takes. Write an equation to represent the mg that Maddie takes over several days.

x day	y mg
1	15
2	30
3	45



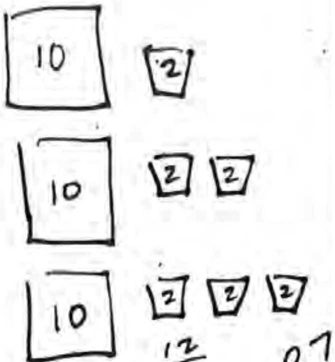
Equation: y = 15x

Is this relationship a proportion? ______

Make a table to understand the word problem. Then write an equation. Determine if it is proportional.

5. Rachel's lawn requires 10 gallons of water plus an additional 2 gallons of water for each potted plant. Let x represent the number of potted plants. Let y represent the gallons of water. Write an equation for the gallons of water Rachel uses.

X	Y
plants	gallons
1	12
2	14
3	16



12
1)12
-1↓
02
-2
0

07
2)14
-14
00

Equation: $y = 2x + 10$

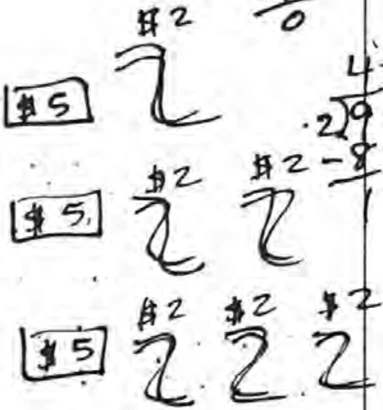
Is this relationship a proportion? no

6. It costs $5 to get into the Spring Fair. Then each ride costs $2. Let x represent the number of rides. Let y represent the total cost. Write an equation for the total cost the Spring Fair based on the number of rides.

7
1)7
-7
0

4½
2)9
-8
1

X	Y
rides	dollars
1	7
2	9
3	11



Equation: $y = 2x + 5$

Is this relationship a proportion? no

7. Percy gets 10 points for each basket at the Spring Fair game. Let x represent the number of baskets. Let y represent the number of points. Write an equation to find the points depending on the number of baskets.

X	Y
basket	point
1	10
2	20
3	30

10
1)10
-1↓
00

10
2)20
-2↓
0

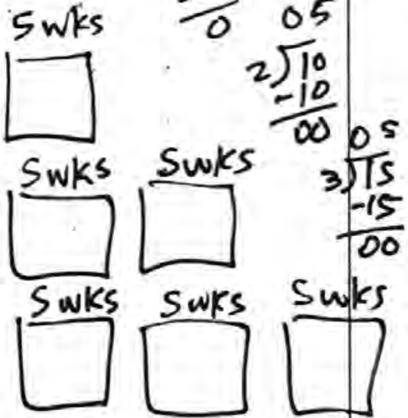
10
3)30
3
0

Equation: $y = 10x$

Is this relationship a proportion? yes

8. Caryn takes 5 weeks to make a quilt. Let x represent the number of quilts. Let y represent the number of weeks she needs to make one. Write an equation for the number of weeks Caryn needs based on the number of quilts.

X	Y
quilt	weeks
1	5
2	10
3	15



5
1)5
-5
0

05
2)10
-10
00

05
3)15
-15
00

Equation: $y = 5x$

Is this relationship a proportion? yes

G7 U2 Lesson 10

Generalize that the graph of a proportional relationship lies on a line through the origin.

CITYTUTOR DC

G7 U2 Lesson 10 - Today we will represent a proportional relationship with a graph, equation, table and story.

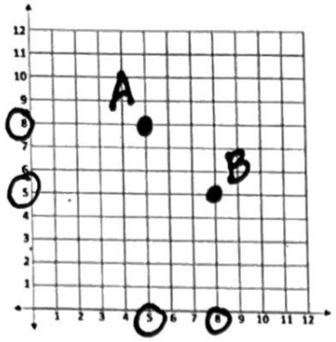
Warm Welcome (Slide 1): Tutor choice

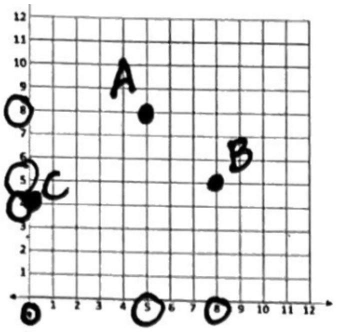
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will represent a proportional relationship with a graph, equation, table and story. It is going to involve applying something you learned in 6th grade to what we've been working on.

Let's Review (Slide 3): We know how to graph coordinate pairs from previous grades. How do I graph (5, 8)? Possible Student Answers, Key Points:

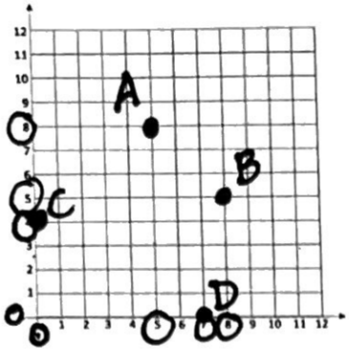
- You find the 5 on the horizontal line and 8 on the vertical line and then you see where they meet up.
- You go over 5 and up 8.
- You look for the point above 5 on the x-axis and next to 8 on the y-axis.

Just to refresh your memory, the first number always is marked on the horizontal line and the second number is marked on the vertical line. I always thinking of it as babies learn to go side to side before they learn to go up and down. So we always do side to side before we go up and down. I circle the 5 on this line. I circle the 8 on this line and then I follow them both until I see where they meet up. This point is (5, 8) and we will label it A. Let's quickly do the next one. Now this one might seem like it's the same because it has the same number just in different order. But it is not the same because the first number is always on the horizontal axis and the second number is always on the vertical axis. We always do side to side before we go up and down. I circle the 8 on this line. I circle the 5 on this line and then I follow them both until I see where they meet up. This is point (8, 5) and we label it B.

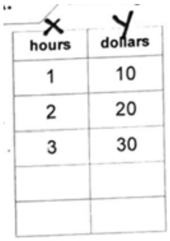




Next, let's do (0,4). We always do side to side before we go up and down. This is kind of tricky because of the zero. The zero is right before the one and then I look for the 5 on the vertical line and see where they meet up. I will label it C.

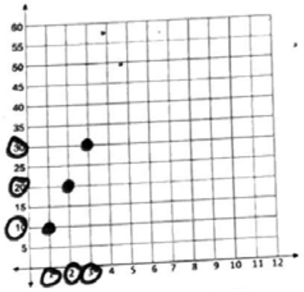


And finally, (7,0). There is another zero but it is second so I am going to find the 7 first on the horizontal line and then I find the 0 on the vertical line which is right under the 1. I follow them both until I see where they meet up. I will label it D. Great job!

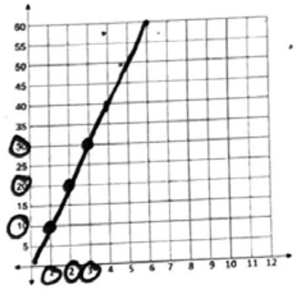


x hours	y dollars
1	10
2	20
3	30

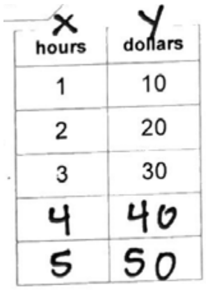
Let's Talk (Slide 4): We can get coordinates from tables and we'll graph those just like we did in the last slide. Read along with me silently while I read out loud. "The table shows what Ben gets paid for working different numbers of hours. Graph each row as a coordinate pair. This is so easy. You just look at a row, and you can think of the numbers the same way as you thought of the last ones. So, this is really (1,10). This is really (2, 20). This is really (3, 30). The first number is x and the second number is y.



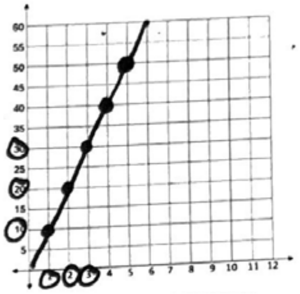
Let's graph the first one. We always do side to side before we go up and down. I circle the 1 on this line. I circle the 10 on this line and then I follow them both until I see where they meet up. Let's graph the next one. We always do side to side before we go up and down. I circle the 2 on this line. I circle the 20 on this line and then I follow them both until I see where they meet up. Let's graph the next one. We always do side to side before we go up and down. I circle the 3 on this line. I circle the 30 on this line and then I follow them both until I see where they meet up.



Now I can take a straight edge and draw a line that goes through all the points. *Be sure to draw the line perfectly straight so that it goes through the points you drew and the additional points you'll be mentioning.* Notice that it goes through more points than just the ones we have. That's useful.

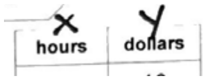


x hours	y dollars
1	10
2	20
3	30
4	40
5	50

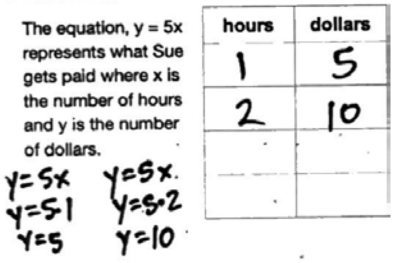


I see it is here at (0,0) and I can see it is here at (4,40) and (5,50). I can even add those to the table, and you'll notice that the constant of proportionality still works. The first row was "times 10." The next row was "times 10." And so on and so on.

Let's Think (Slide 5): We can get coordinates from tables and we'll graph those just like we did the last ones. We just have to do a little extra number crunching. This says, "The equation, y = 5x represents what Sue gets paid where x is the number of hours and y is the number of dollars." I am going to label the hours x and the dollars y.



x hours	y dollars



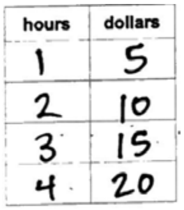
The equation, y = 5x represents what Sue gets paid where x is the number of hours and y is the number of dollars.

$y=5x$
$y=5\cdot1$
$y=5$

$y=5x$
$y=5\cdot2$
$y=10$

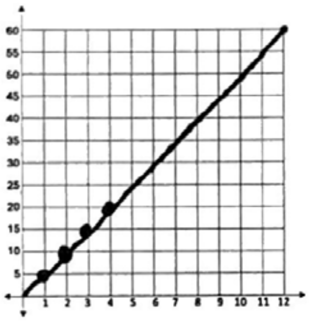
hours	dollars
1	5
2	10

You already know from previous lessons that you can use the equation to get points on the table. Remember we can pick any numbers we want. To keep it simple, I'm just going to pick 1, 2, 3. Now let's plug those in. First, we'll do x equals 1. I write y = 5x then I put 1 in place of the x so it's y equals 5 times 1. That's 5. I will put that in my table. Next we'll do x equals 2. I write y = 5x then I put 2 in place of the x so it's y equals 5 times 2. That's 10. I will put that in my table.



hours	dollars
1	5
2	10
3	15
4	20

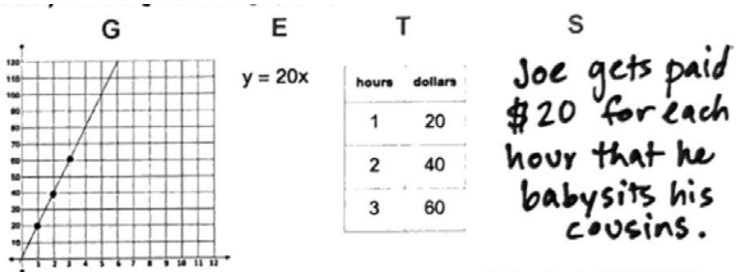
I can do x equals 3 so 5 times 3. That’s 15. I will put that in my table. I can do x equals 4 so 5 times 4. That’s 20. I will put that in my table.



Now we can just look at a row and think of the numbers as regular graphing coordinates. So, the first row is really (1,5) then (2,10) then (3,15) then (4,20). Let’s graph the first one. We always do side to side before we go up and down. I look at the 1 on this line. I look at the 5 on this line and then I follow them both until I see where they meet up. Let’s graph the next one. We always do side to side before we go up and down. I look at the 2 on this line. I look at the 10 on this line and then I follow them both until I see where they meet up. Let’s graph the next one. We always do side to side before we go up and down. I look at the 3 on this line. I look at the 15 on this line and then I follow them both until I see where they meet up. Let’s graph the next one. We always do side to side before we go up and down. I look at the 4 on this line. I look at the 20 on this line and then I follow them both until I see where they meet up. Look! We made a line! Let’s use a straight edge to draw it through all the points and beyond.

Let’s Think (Slide 6): Graphs, equations, tables and stories are all equivalent ways to show a proportion. Just like a story can be told in a book and then they make a TV show or a movie out of it. We can use the word GETS to remember that all four ways can be used. G stands for graph. E stands for equation. T stands for table. S stands for story. G - E - T - S spells GETS. This question asks, “What is the story that can go with our graph, equation and table?” *Give the students a whole minute of silent think time. Then collect answers. Be sure that the stories are exactly correct. If not, correct them. Then write down your final right answer.* Possible Student Answers, Key Points:

- Jenny gets paid 20 dollars per hour
- It costs 20 dollars for each hour of renting a lawnmower



y = 20x

hours	dollars
1	20
2	40
3	60

Joe gets paid $20 for each hour that he babysits his cousins.

There are millions of possible correct stories. But whatever it is, it is going to involve x times 10 to make y or hours times 10 to make y. Just for today I will write, Joe gets paid $20 for each hour that he babysits his cousins. We will always be able to have a graph, equation, table and story for any proportion we have, and we can use the acronym, GETS, to remember that.

Let’s Try It (Slide 7): Now we will graph from tables and equations together. I will take you through step by step.

WARM WELCOME

Today we will represent a proportional relationship with a graph, equation, table and story.

Let's Review: We know how to graph coordinates from previous grades.

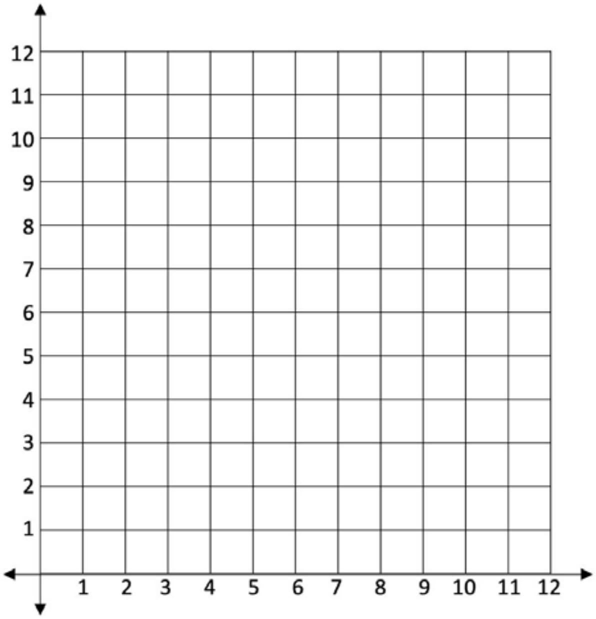
Graph the coordinate pairs.

Point A: (5, 8)

Point B: (8, 5)

Point C: (0, 4)

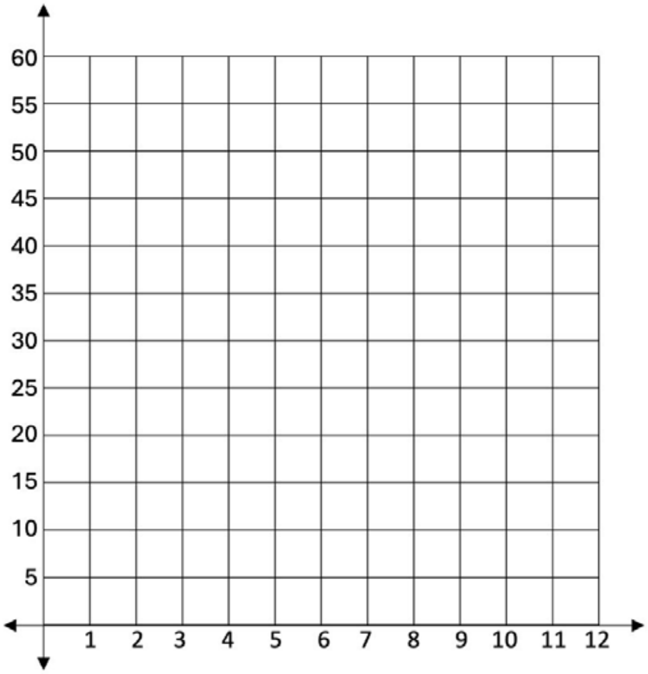
Point D: (7, 0)



Let's Talk: We can get coordinates from tables.

The table shows what Ben gets paid for working different numbers of hours. Graph each row as a coordinate pair.

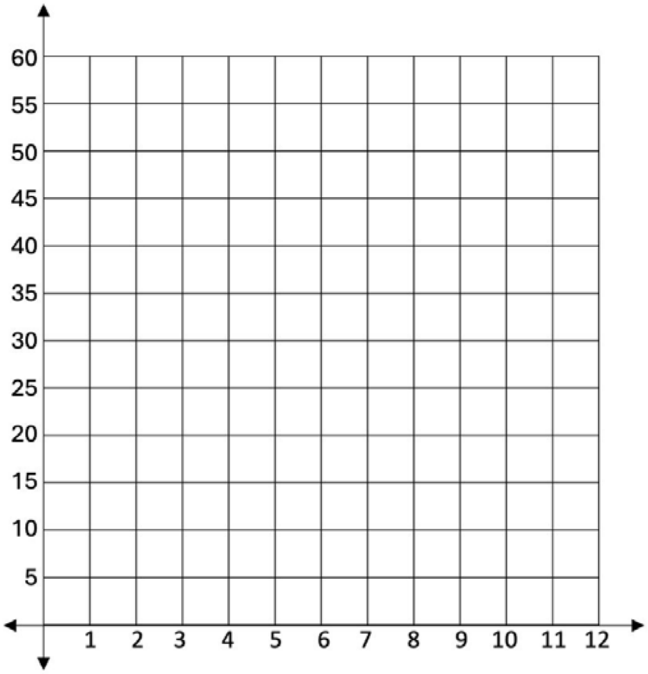
hours	dollars
1	10
2	20
3	30



Let’s Think: We can get coordinates from equations.

The equation, y = 5x represents what Sue gets paid where x is the number of hours and y is the number of dollars.

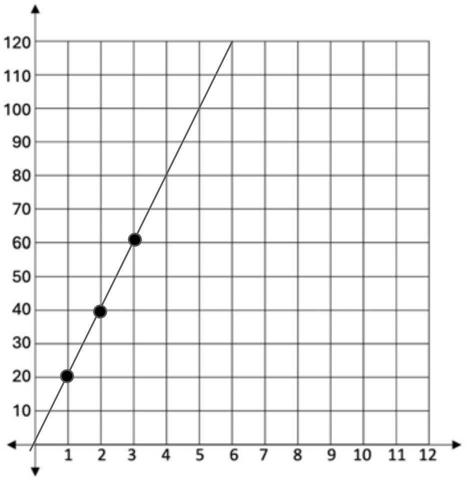
hours	dollars



Let’s Think: Graphs, equations, tables and stories are all equivalent ways to show a proportion.

We can use the word GETS to remember that all four ways can be used. What is the story that can go with our graph, equation and table?

G **E** **T** **S**

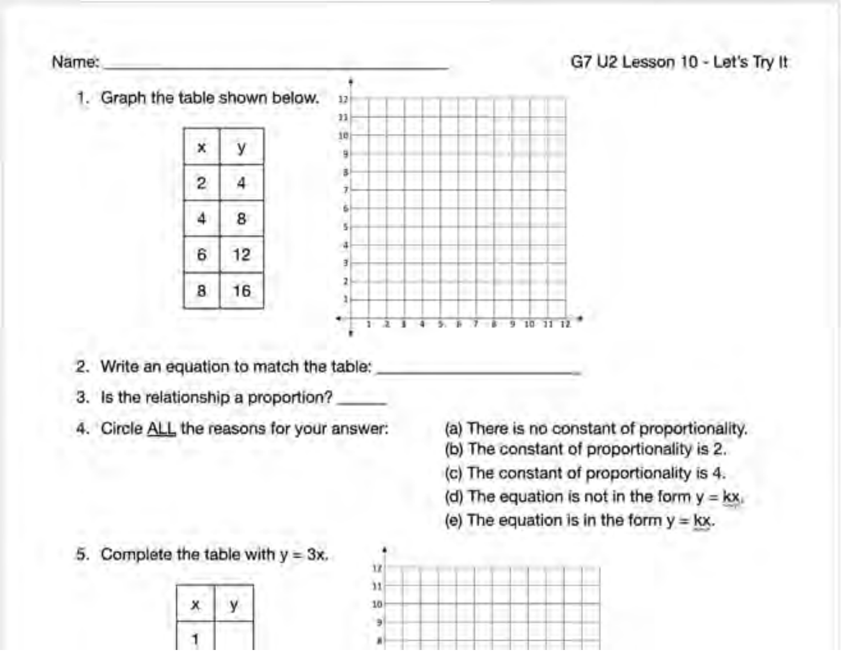


$y = 20x$

hours	dollars
1	20
2	40
3	60

Let's Try It:

We will do it together step by step.



Name: ______________________________ G7 U2 Lesson 10 - Let's Try It

1. Graph the table shown below.

x	y
2	4
4	8
6	12
8	16

2. Write an equation to match the table: ____________________

3. Is the relationship a proportion? _____

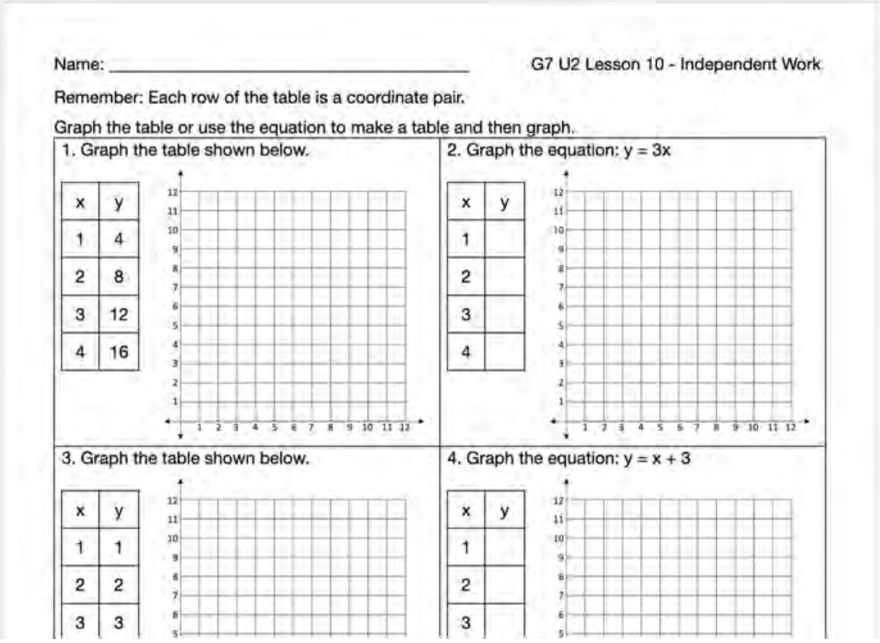
4. Circle ALL the reasons for your answer:
   - (a) There is no constant of proportionality.
   - (b) The constant of proportionality is 2.
   - (c) The constant of proportionality is 4.
   - (d) The equation is not in the form $y = kx$.
   - (e) The equation is in the form $y = kx$.

5. Complete the table with $y = 3x$.

x	y
1	

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 10 - Independent Work

Remember: Each row of the table is a coordinate pair.

Graph the table or use the equation to make a table and then graph.

1. Graph the table shown below.

x	y
1	4
2	8
3	12
4	16

2. Graph the equation: $y = 3x$

x	y
1	
2	
3	
4	

3. Graph the table shown below.

x	y
1	1
2	2
3	3

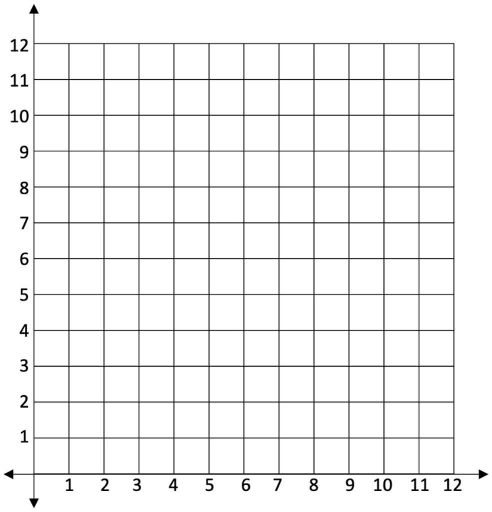
4. Graph the equation: $y = x + 3$

x	y
1	
2	
3	

Name: ____ G7 U2 Lesson 10 - Let’s Try It

1. Graph the table shown below.

x	y
2	4
4	8
6	12
8	16



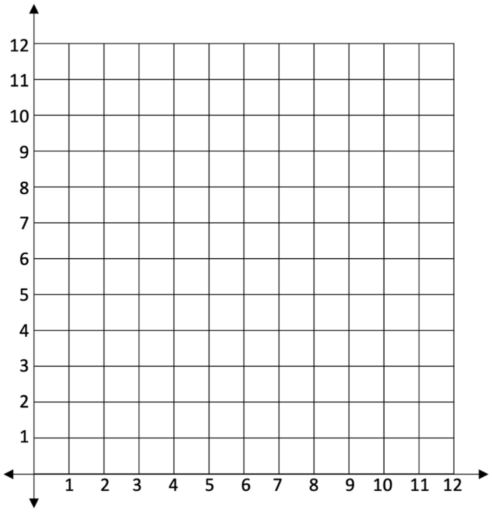
2. Write an equation to match the table: ________________________

3. Is the relationship a proportion? ______

4. Circle ALL the reasons for your answer:
   (a) There is no constant of proportionality.
   (b) The constant of proportionality is 2.
   (c) The constant of proportionality is 4.
   (d) The equation is not in the form y = kx.
   (e) The equation is in the form y = kx.

5. Complete the table with y = 3x.

x	y
1	
2	
3	
4	



6. Graph the points from the table.

7. Write an equation to match the table: ________________________

8. Is the relationship a proportion? ______

9. Circle ALL the reasons for your answer:
   (a) There is no constant of proportionality.
   (b) The constant of proportionality is 1.
   (c) The constant of proportionality is 3.
   (d) The equation is not in the form y = kx.
   (e) The equation is in the form y = kx.

Name: ____

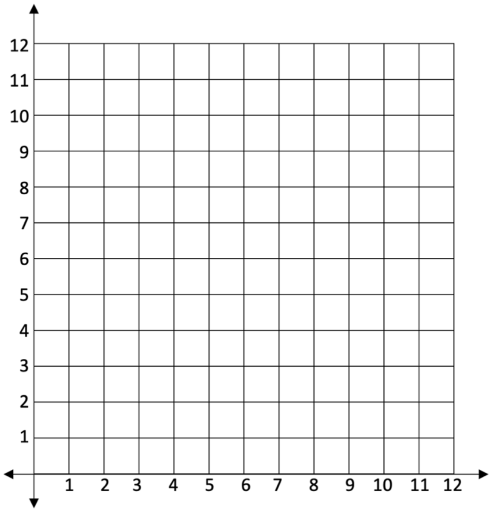
G7 U2 Lesson 10 - Independent Work

Remember: Each row of the table is a coordinate pair.

Graph the table or use the equation to make a table and then graph.

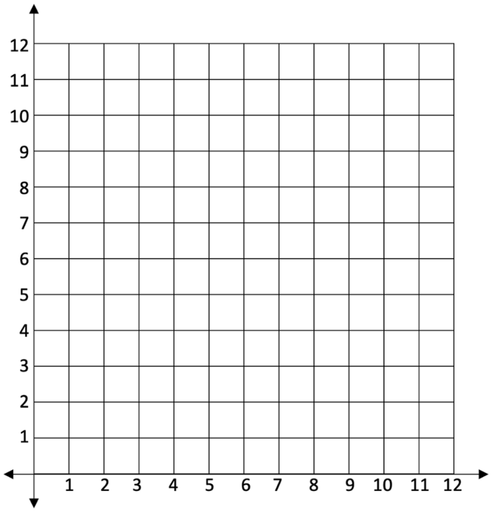
1. Graph the table shown below.

x	y
1	4
2	8
3	12
4	16



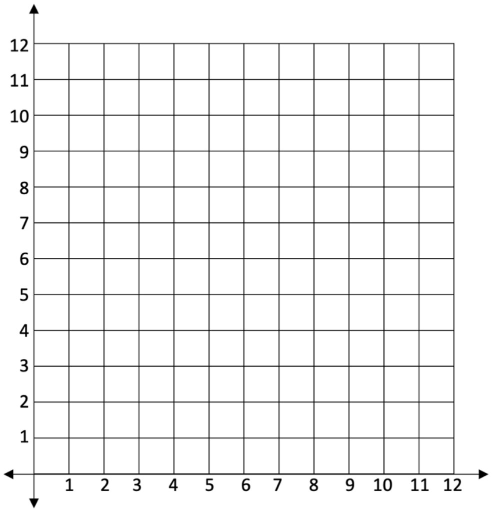
2. Graph the equation: $y = 3x$

x	y
1	
2	
3	
4	



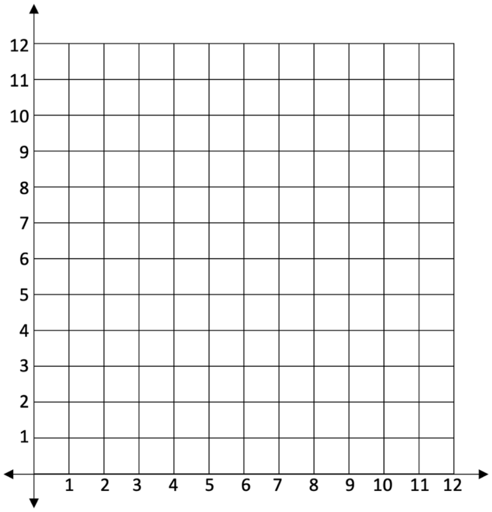
3. Graph the table shown below.

x	y
1	1
2	2
3	3
4	4



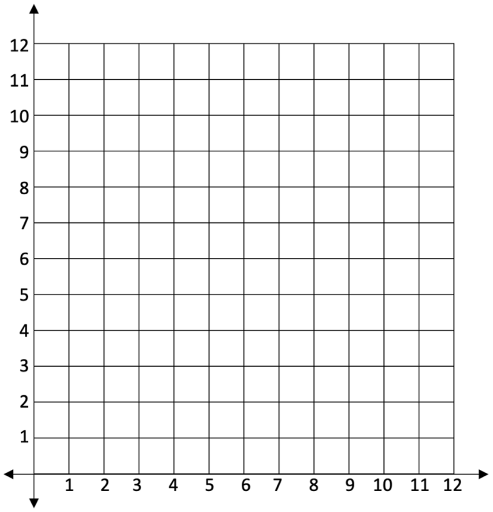
4. Graph the equation: $y = x + 3$

x	y
1	
2	
3	
4	



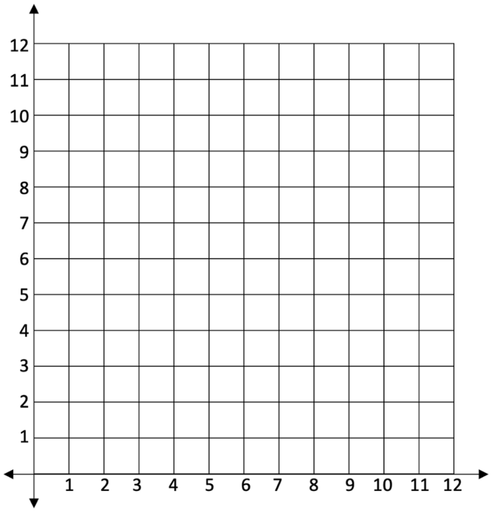
5. Graph the table shown below.

x	y
4	2
8	4
12	6
16	8



6. Graph the equation: $y = x - 1$

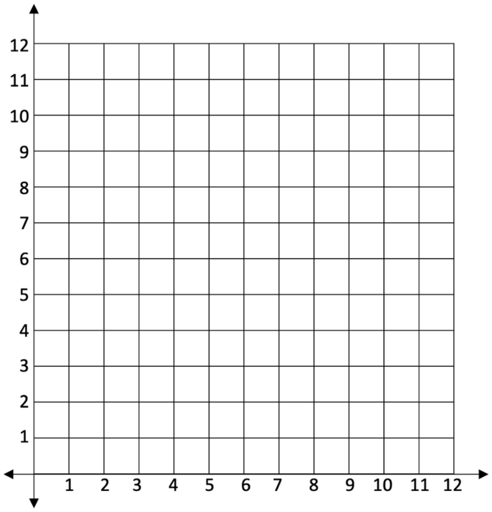
x	y
1	
2	
3	
4	



Graph the table or use the equation to make a table and then graph.

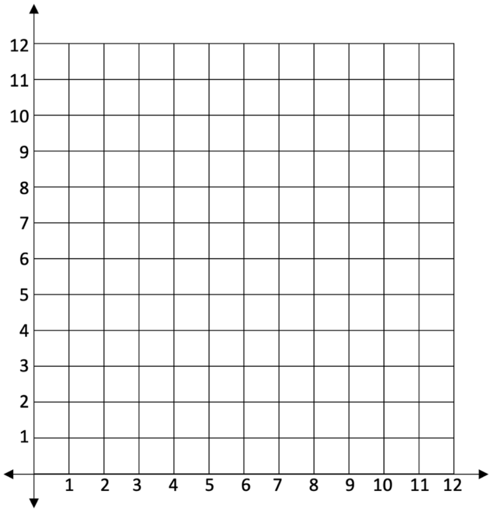
7. Graph the table shown below.

x	y
1	2
2	3
3	4
4	5



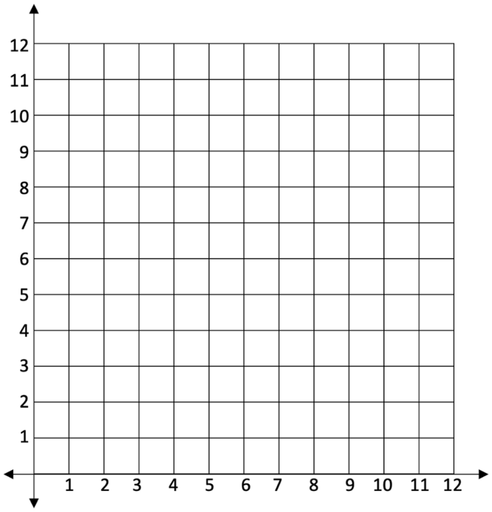
8. Graph the equation: y = 2x

x	y
1	
2	
3	
4	



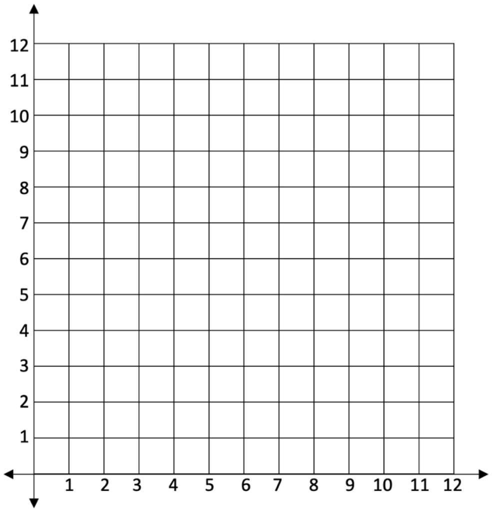
9. Graph the table shown below.

x	y
3	1
6	4
9	7
12	10



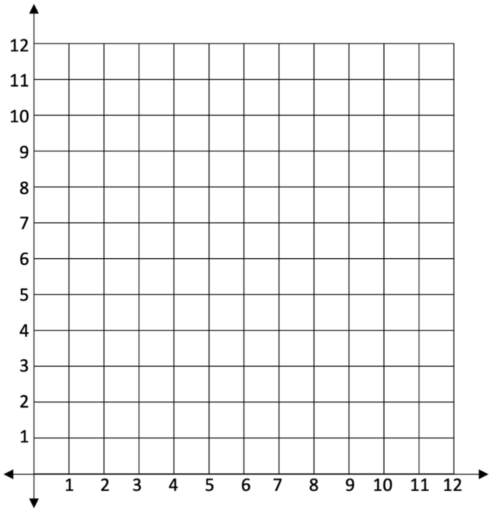
10. Graph the equation: y = x ÷ 2

x	y
2	
4	
6	
8	



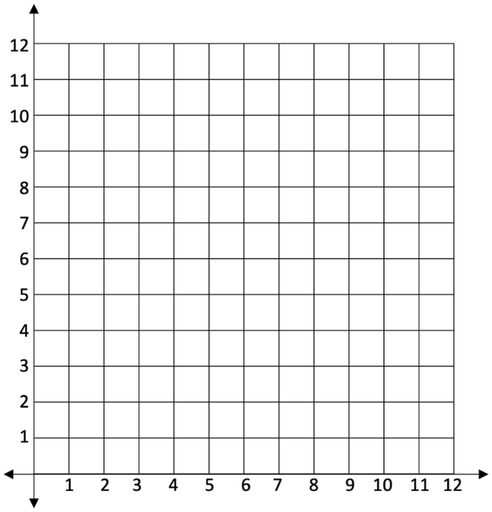
11. Graph the table shown below.

x	y
4	1
8	2
12	3
16	4



12. Graph the equation: y = x

x	y
1	
2	
3	
4	

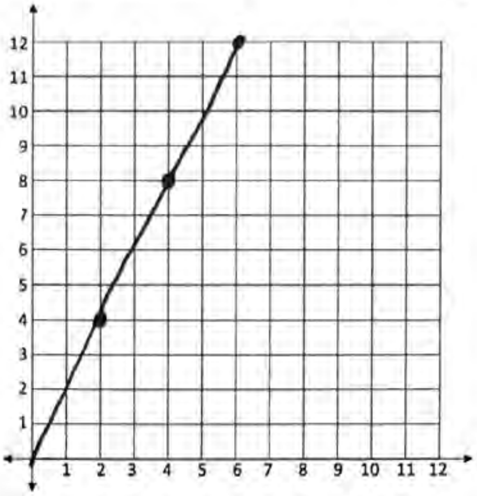


Name: ANSWER KEY

G7 U2 Lesson 10 - Let's Try It

1. Graph the table shown below.

x	y
2 ×2	4
4 ×2	8
6 ×2	12
8 ×2	16



2. Write an equation to match the table: $y = 2x$

3. Is the relationship a proportion? yes

4. Circle ALL the reasons for your answer:

(a) There is no constant of proportionality.

[✓ (b) The constant of proportionality is 2.]

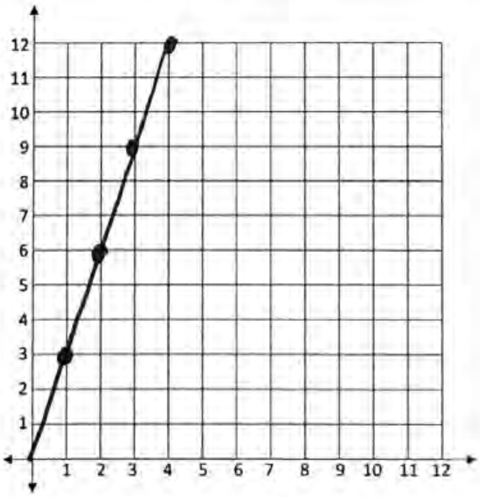
(c) The constant of proportionality is 4.

(d) The equation is not in the form y = kx.

[✓ (e) The equation is in the form y = kx.]

5. Complete the table with y = 3x.

x	y
1	3
2	6
3	9
4	12



6. Graph the points from the table.

7. Write an equation to match the table: $y = 3x$

8. Is the relationship a proportion? yes

9. Circle ALL the reasons for your answer:

(a) There is no constant of proportionality.

(b) The constant of proportionality is 1.

[✓ (c) The constant of proportionality is 3.]

(d) The equation is not in the form y = kx.

[✓ (e) The equation is in the form y = kx.]

Name: ANSWER KEY

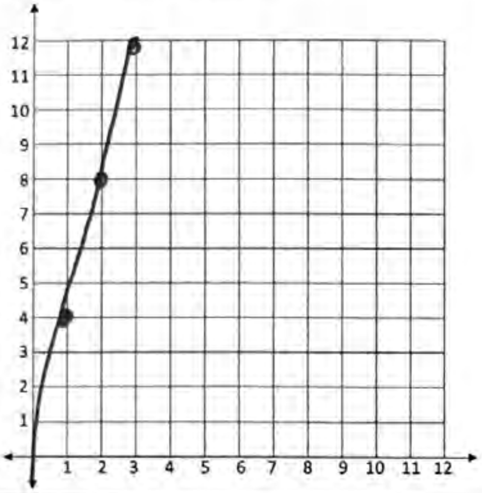
G7 U2 Lesson 10 - Independent Work

Remember: Each row of the table is a coordinate pair.

Graph the table or use the equation to make a table and then graph.

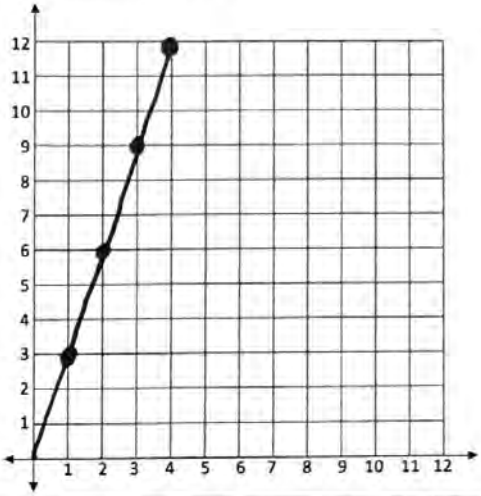
1. Graph the table shown below.

x	y
1	4
2	8
3	12
4	16



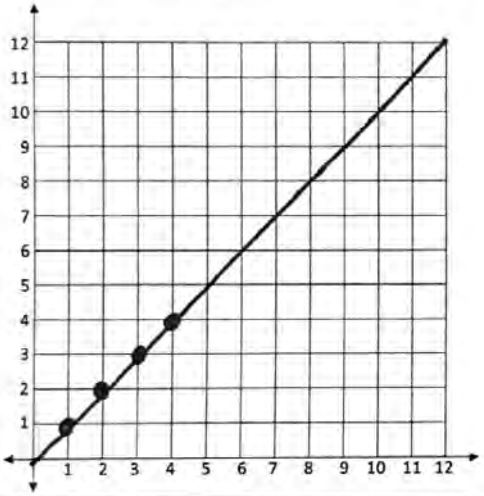
2. Graph the equation: y = 3x

x	y
1	3
2	6
3	9
4	12



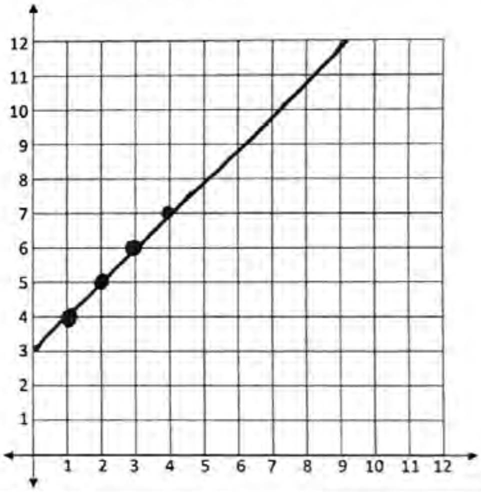
3. Graph the table shown below.

x	y
1	1
2	2
3	3
4	4



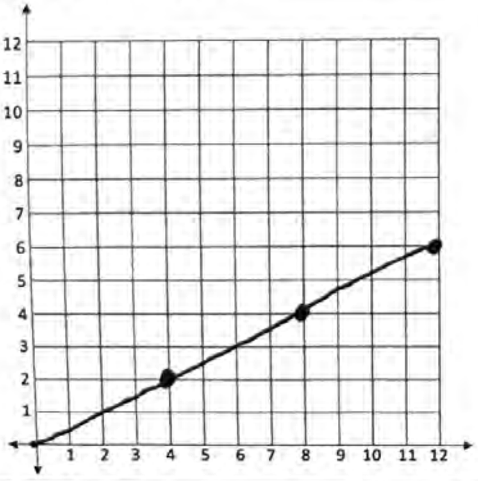
4. Graph the equation: y = x + 3

x	y
1	4
2	5
3	6
4	7



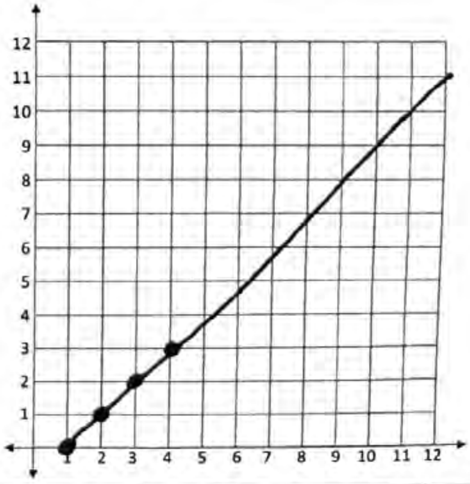
5. Graph the table shown below.

x	y
4	2
8	4
12	6
16	8



6. Graph the equation: y = x - 1

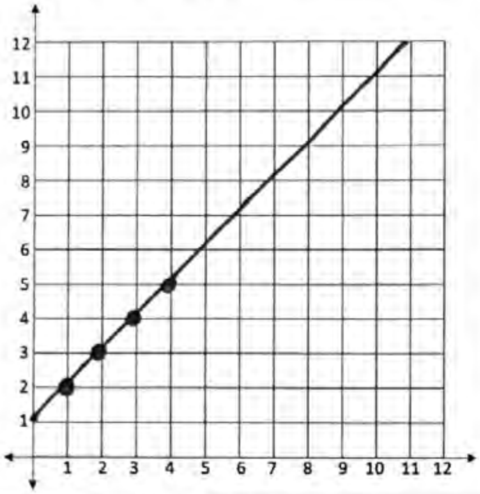
x	y
1	0
2	1
3	2
4	3



Graph the table or use the equation to make a table and then graph.

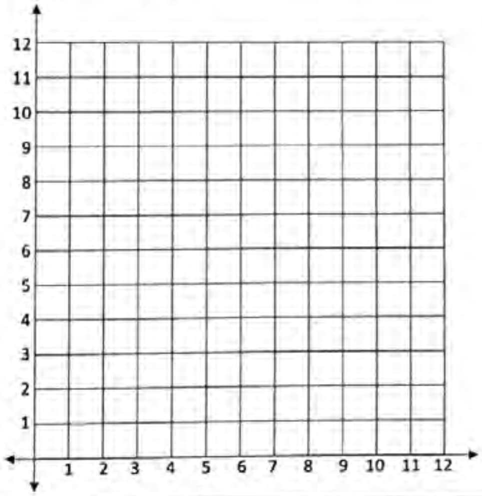
7. Graph the table shown below.

x	y
1	2
2	3
3	4
4	5



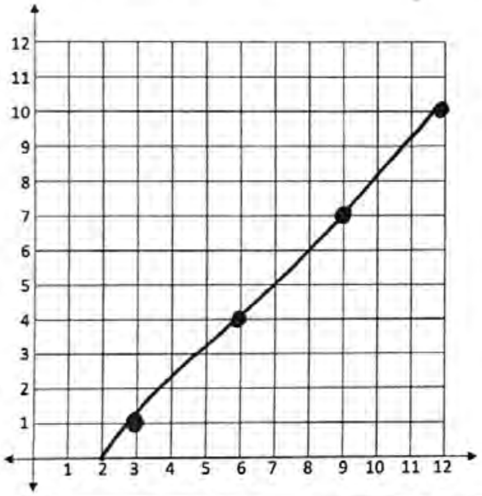
8. Graph the equation: $y = 2x$

x	y
1	
2	
3	
4	



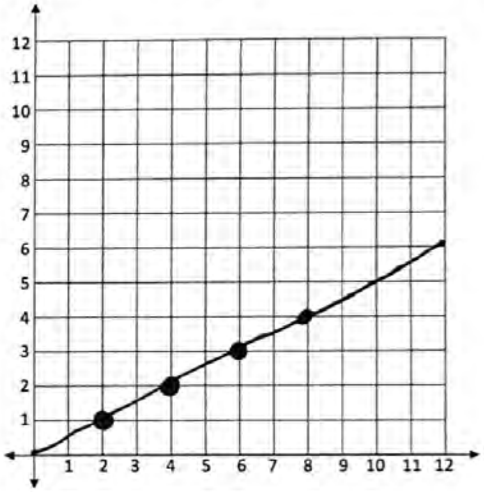
9. Graph the table shown below.

x	y
3	1
6	4
9	7
12	10



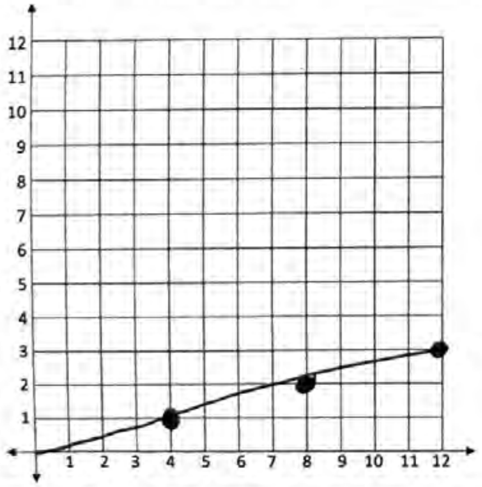
10. Graph the equation: $y = x \div 2$

x	y
2	1
4	2
6	3
8	4



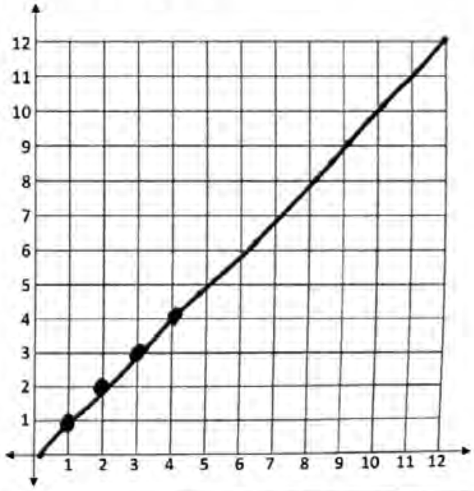
11. Graph the table shown below.

x	y
4	1
8	2
12	3
16	4



12. Graph the equation: $y = x$

x	y
1	1
2	2
3	3
4	4



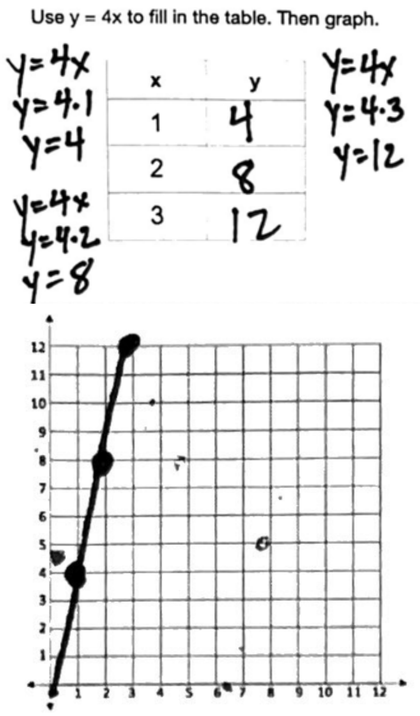
G7 U2 Lesson 11

Interpret points on the graph of a proportional relationship, and identify the constant of proportionality from the graph of a proportional relationship.

G7 U2 Lesson 11 - Today we will represent a story with a table, equation and graph.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will represent a story with a table, equation and graph. You have already worked on all of these things so you just have to put them together.


Use y = 4x to fill in the table. Then graph.

y=4x
y=4·1
y=4

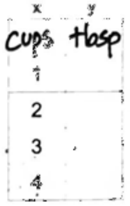
y=4x
y=4·2
y=8

x	y
1	4
2	8
3	12

y=4x
y=4·3
y=12

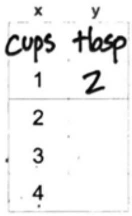
Let's Review (Slide 3): We know how to graph coordinates from a table and equation. This says, "Use y = 4x to fill in the table. Then graph." First, I am going to plug in each value of x. I write y = 4x then with x =1, it becomes y = 4 times 1. I do the math and write it underneath, y equals 4. I'll write that on my table. Let's do it again. I write y = 4x then with x = 2, it becomes y = 4 times 2. I do the math and write it underneath, y equals 8. I'll write that on my table. Let's do it again. I write y = 4x then with x = 3, it becomes y = 4 times 3. I do the math and write it underneath, y equals 12. I'll write that on my table.

Now that I have complete rows, I can think of each row as a coordinate pair. I have (1,4). We always do side to side before we go up and down. I circle the 1 on this line. I circle the 4 on this line and then I follow them both until I see where they meet up. The next row is (2,8). I circle the 2 on this line. I circle the 8 on this line and then I follow them both until I see where they meet up. The next row is (3,12). I circle the 3 on this line. I circle the 12 on this line and then I follow them both until I see where they meet up. And look, I can use a straight edge to draw a line through these points.



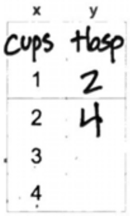
x cups	y tbsp
1	
2	
3	
4	

Let's Talk (Slide 4): We can get coordinates from stories too. We know this because we have the acronym, "GETS." Where G stands for graph, E stands for equation, T stands for table and S stands for story. Let's read this story together. Follow along with your eyes while I read out loud. "In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk. Let x represent the cups of milk. Let y represent the tablespoons of cocoa." First, let's label the x and y on the table.



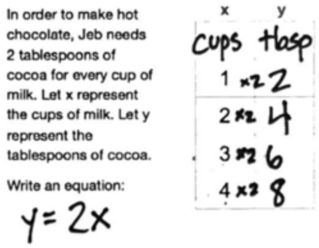
x cups	y tbsp
1	2
2	
3	
4	

We've done story problems like this before and I know you remember that you can always draw a picture. Here's a cup of milk, and we need 2 tablespoons. So I know to put a 2 here.



x cups	y tbsp
1	2
2	4
3	
4	

And we can keep going, right? Another cup needs another 2 tablespoons. Now we see that 2 cups has 4 tablespoons. I put that on the table.



In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk. Let x represent the cups of milk. Let y represent the tablespoons of cocoa.

x	y
cups	tbsp
1 ×2	2
2 ×2	4
3 ×2	6
4 ×2	8

Write an equation:

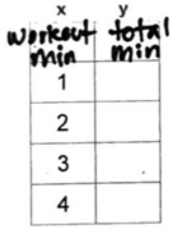
$y = 2x$

By now, I'm noticing a pattern but I can keep drawing if I need to. It's "times 2." Let me write that on every line.

This helps me understand what the equation is. We multiply x by 2 to get y so I will write y equals 2x.

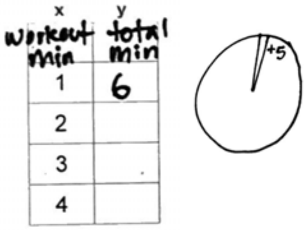
All the rest is very familiar, just like we did on the last slide. But before we plot the points, we want to label the graph. The horizontal axis is first so it's x. I am going to label that cups of milk. The vertical axis is next so it's y. I am going to label that tablespoons of cocoa.

Now I can think of each row as a coordinate pair. I have (1,2). We always do side to side before we go up and down. I circle the 1 on this line. I circle the 2 on this line and then I follow them both until I see where they meet up. The next row is (2,4). I circle the 2 on this line. I circle the 8 on this line and then I follow them both until I see where they meet up. The next row is (3,6). I circle the 3 on this line. I circle the 6 on this line and then I follow them both until I see where they meet up. And again, we've made a line.



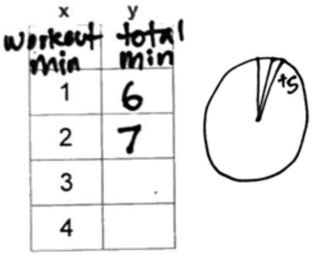
x	y
workout min	total min
1	
2	
3	
4	

Let's Think (Slide 5): Let's do one more example. "Jason always needs 5 minutes to cool down from a workout no matter how long it is. Let x represent the length of Jason's workout in minutes. Let y represent the total number of minutes." I am going to put the words on table. X is workout minutes. Y is total minutes.



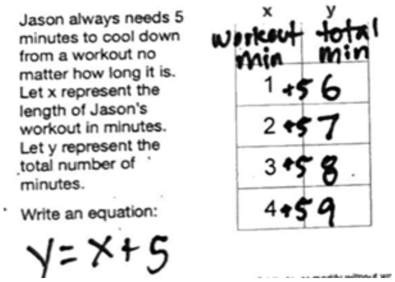
x	y
workout min	total min
1	6
2	
3	
4	

This is a bit hard to draw but let's think of clock. Jason works out for one minute. Then he does a 5 minute cooldown. That's 6 minutes all together. I write that on the table.



x	y
workout min	total min
1	6
2	7
3	
4	

Now, Jason does 2 minutes instead. I'm going to do a new drawing because he would workout for 2 minutes. Then he would do a 5 minutes cooldown. That's 7 minutes all together. I write that on the table.



Jason always needs 5 minutes to cool down from a workout no matter how long it is. Let x represent the length of Jason's workout in minutes. Let y represent the total number of minutes.

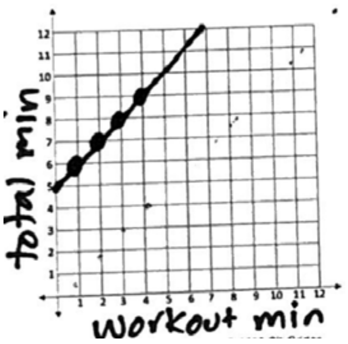
Write an equation:

$y = x + 5$

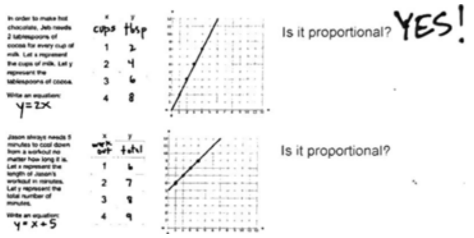
x workout min	y total min
1 +5	6
2 +5	7
3 +5	8
4 +5	9

Now I start to see the pattern. It was 1 plus the 5 minute cooldown. Then 2 plus the 5 minute cooldown. I will write in all the plus fives. So then it would be 3 plus 5 is 8 and 4 plus 5 is 9. It is easy to see what my equation would be, y equals x plus 5.

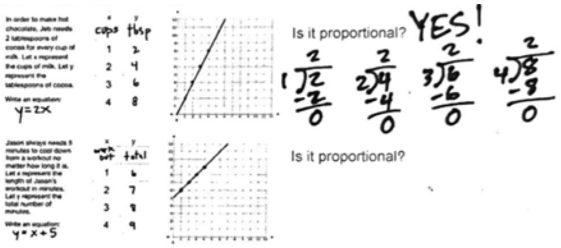
Time to graph! But it is super important that before we plot the points, we label the graph. The horizontal axis is first so it's x. I am going to label that workout minutes. The vertical axis is next so it's y. I am going to label that total minutes.



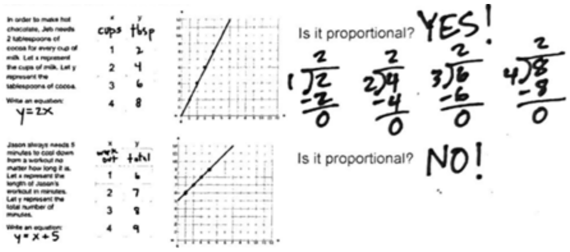
We start with (1,6). I circle the 1 on this line. I circle the 6 on this line and then I follow them both until I see where they meet up. The next row is (2,7). I circle the 2 on this line. I circle the 7 on this line and then I follow them both until I see where they meet up. The next row is (3,8). I circle the 3 on this line. I circle the 8 on this line and then I follow them both until I see where they meet up. The next row is (4,9). I circle the 4 on this line. I circle the 9 on this line and then I follow them both until I see where they meet up. And again, we've made a line. Now, this graph isn't proportional like our last one. But we still see the acronym, GETS. We can still make a graph, equation, table and story as all equivalent representations.



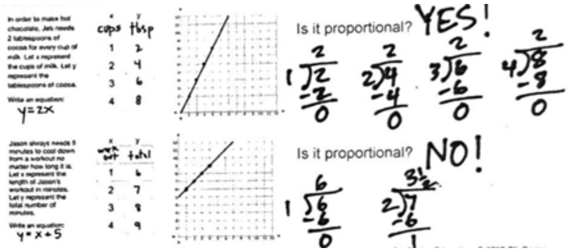
Let's Think (Slide 6): We've done three different equations with tables and graphs. For all of those, "we still determine if a relationship is proportional the same way we know." Here are pictures from the last two slides we just did. Let's figure out if they are proportional. We know they need to have a constant of proportionality and they need to have an equation in the form, y = kx. I can see that here with y = 2x. So is it proportional? YES!



We can also divide each row, y divided by x. If they have the same unit rate then it's a constant of proportionality. I am going to do this super quickly. 2 divided by 1 is 2. 4 divided by 2 is 2. 6 divided by 3 is 2. 8 divided by 4 is 2. So again, is it proportional? YES!



Let's look at the next one. First of all, the equation is y = x + 5. That is not in y = kx form. So, is it proportional? NO!



Let's divide each row to check. 6 divided by 1 is 6. But 7 divided by 2 is 3 and then I have a remainder. I do not get the same number so I do not have a constant of proportionality. And so the answer to that question, "Is it proportional?" is still NO!

Let's Try It (Slide 7): Now we will graph from tables and equations together. I will take you through step by step.

WARM WELCOME

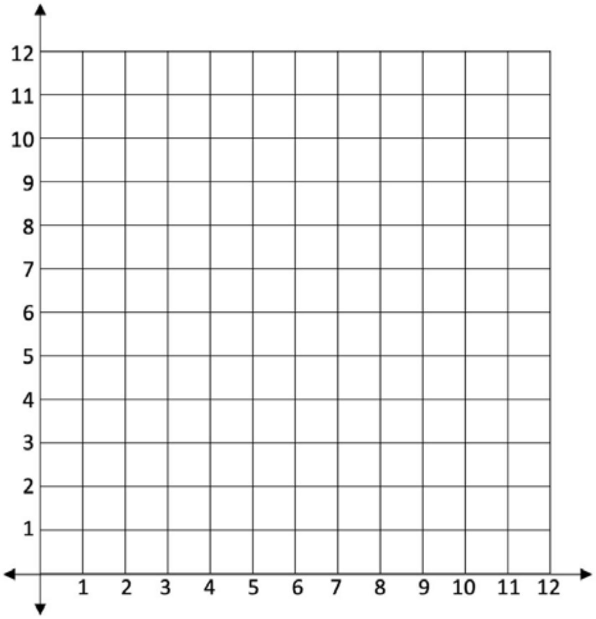
Today we will represent a story with a table, equation and graph.

Let’s Review:

We know how to graph coordinates from a table and equation.

Use y = 4x to fill in the table. Then graph.

x	y
1	
2	
3	



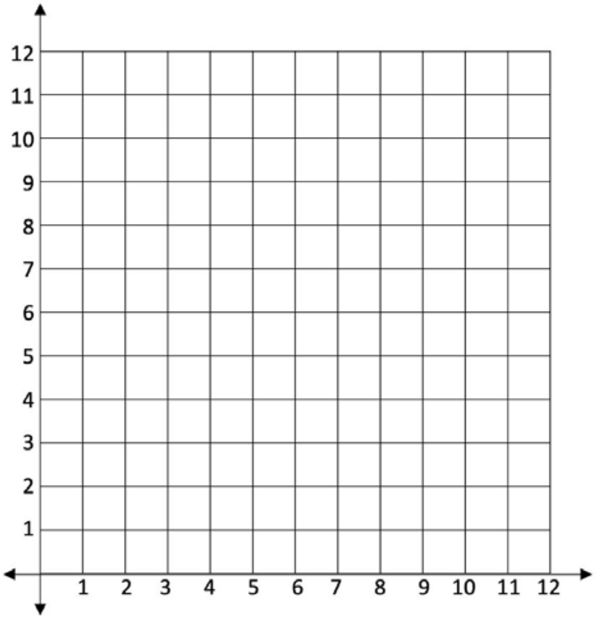
Let’s Talk:

We can get coordinates from stories.

In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk. Let x represent the cups of milk. Let y represent the tablespoons of cocoa.

Write an equation:

x	y
1	
2	
3	
4	



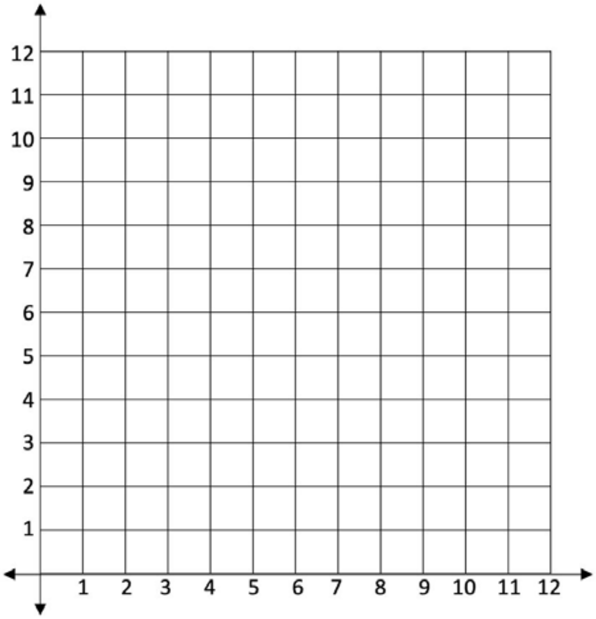
Let's Think:

We can get coordinates from equations.

Jason always needs 5 minutes to cool down from a workout no matter how long it is. Let x represent the length of Jason's workout in minutes. Let y represent the total number of minutes.

Write an equation:

x	y
1	
2	
3	
4	



Let's Think:

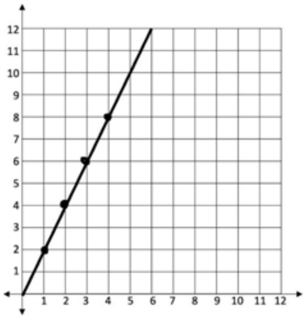
We still determine if a relationship is proportional the same way we know.

In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk. Let x represent the cups of milk. Let y represent the tablespoons of cocoa.

Write an equation:

$y=2x$

x	y
cups	tbsp
1	2
2	4
3	6
4	8



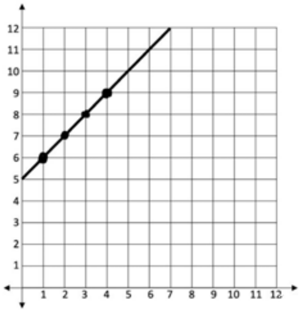
Is it proportional?

Jason always needs 5 minutes to cool down from a workout no matter how long it is. Let x represent the length of Jason's workout in minutes. Let y represent the total number of minutes.

Write an equation:

$y=x+5$

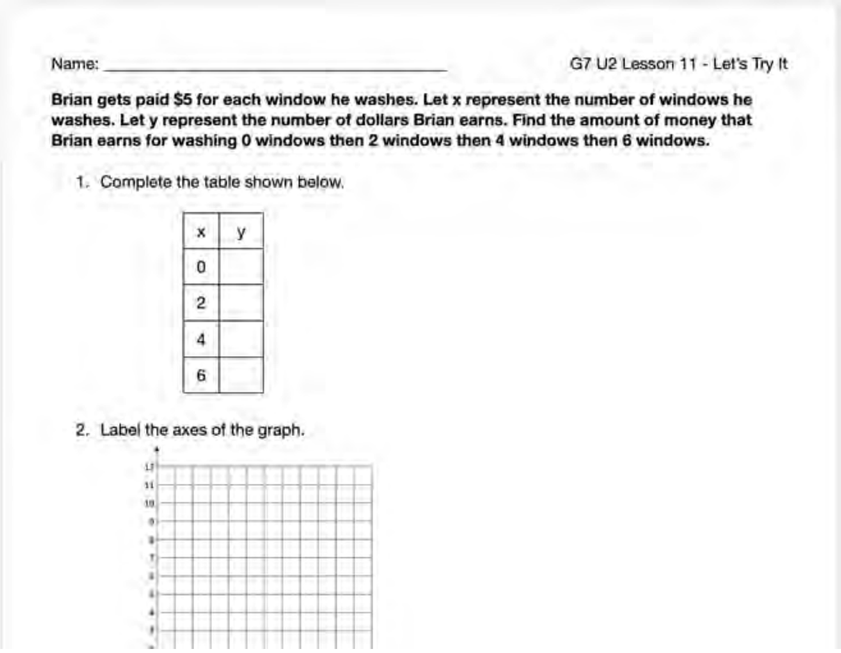
x	y
work out	total
1	6
2	7
3	8
4	9



Is it proportional?

Let's Try It:

We will do it together step by step.



Name: ______________________________ G7 U2 Lesson 11 - Let's Try It

Brian gets paid $5 for each window he washes. Let x represent the number of windows he washes. Let y represent the number of dollars Brian earns. Find the amount of money that Brian earns for washing 0 windows then 2 windows then 4 windows then 6 windows.

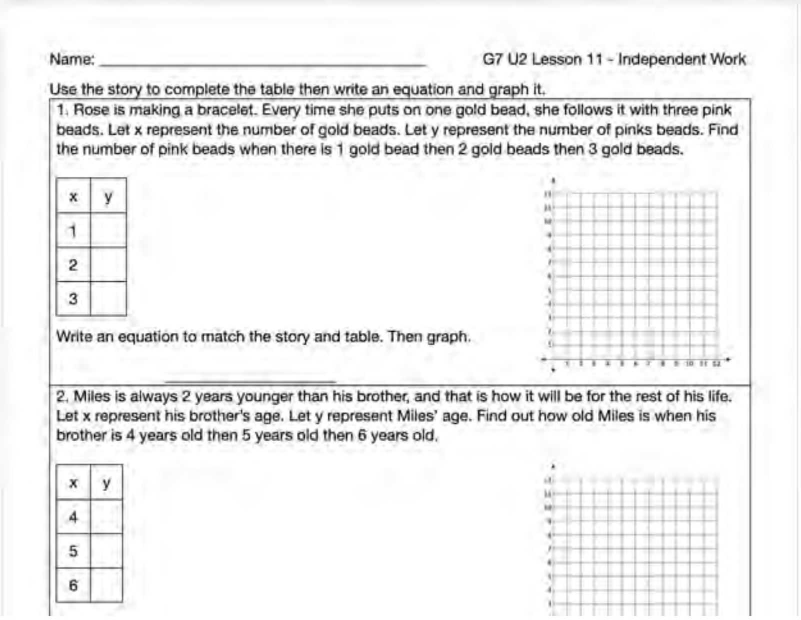
1. Complete the table shown below.

x	y
0	
2	
4	
6	

2. Label the axes of the graph.

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 11 - Independent Work

Use the story to complete the table then write an equation and graph it.

1. Rose is making a bracelet. Every time she puts on one gold bead, she follows it with three pink beads. Let x represent the number of gold beads. Let y represent the number of pinks beads. Find the number of pink beads when there is 1 gold bead then 2 gold beads then 3 gold beads.

x	y
1	
2	
3	

Write an equation to match the story and table. Then graph.

____

2. Miles is always 2 years younger than his brother, and that is how it will be for the rest of his life. Let x represent his brother's age. Let y represent Miles' age. Find out how old Miles is when his brother is 4 years old then 5 years old then 6 years old.

x	y
4	
5	
6	

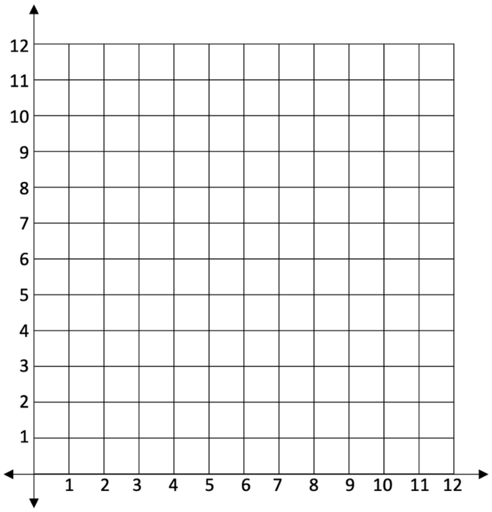
Name: ____

Brian gets paid $5 for each window he washes. Let x represent the number of windows he washes. Let y represent the number of dollars Brian earns. Find the amount of money that Brian earns for washing 0 windows then 2 windows then 4 windows then 6 windows.

1. Complete the table shown below.

x	y
0	
2	
4	
6	

2. Label the axes of the graph.



3. Graph the points from the table.

4. Write an equation to match the table: ________________________

5. Is the relationship a proportion? ______

6. Circle ALL the reasons for your answer:

   (a) There is no constant of proportionality.

   (b) The constant of proportionality is 5.

   (c) The constant of proportionality is 10.

   (d) The equation is not in the form y = kx.

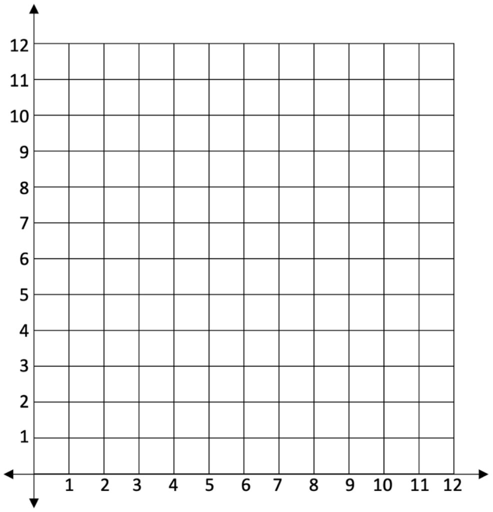
   (e) The equation is in the form y = kx.

Whenever Lisa works at the cafe, her boss always gives her an extra $5 on top of whatever money is in the tip jar. Let x represent the number of dollars in the tip jar. Let y represent the total number of dollars that Lisa gets. Find the total number of dollars Lisa gets when there are 0 dollars in the tip jar then 2 dollars then 4 dollars then 6 dollars.

7. Complete the table shown below.

x	y
0	
2	
4	
6	

8. Label the axes of the graph.



9. Graph the points from the table.

10. Write an equation to match the table: ________________________

11. Is the relationship a proportion? ______

12. Circle <u>ALL</u> the reasons for your answer:

(a) There is no constant of proportionality.

(b) The constant of proportionality is 5.

(c) The constant of proportionality is 10.

(d) The equation is not in the form y = kx.

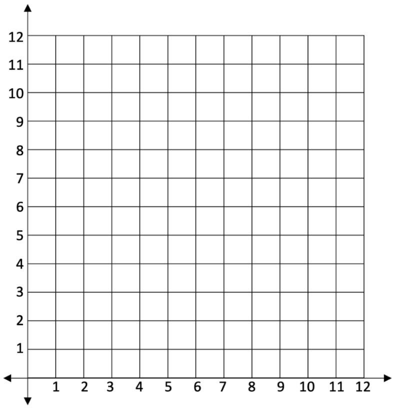
(e) The equation is in the form y = kx.

Name: ____ G7 U2 Lesson 11 - Independent Work

Use the story to complete the table then write an equation and graph it.

1. Rose is making a bracelet. Every time she puts on one gold bead, she follows it with three pink beads. Let x represent the number of gold beads. Let y represent the number of pinks beads. Find the number of pink beads when there is 1 gold bead then 2 gold beads then 3 gold beads.

x	y
1	
2	
3	

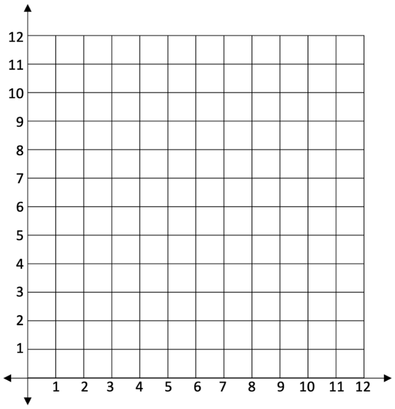


Write an equation to match the story and table. Then graph.

____

2. Miles is always 2 years younger than his brother, and that is how it will be for the rest of his life. Let x represent his brother's age. Let y represent Miles' age. Find out how old Miles is when his brother is 4 years old then 5 years old then 6 years old.

x	y
4	
5	
6	

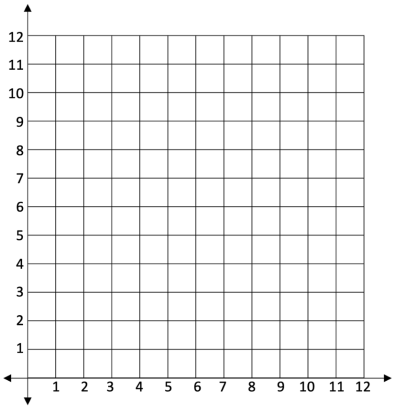


Write an equation to match the story and table. Then graph.

____

3. Nathaniel always tries to get twice as many gems on Roblox as his brother. Let x represent his brother's gems. Let y represent Nathaniel's gems. Find the number of gems Nathaniel has when his brother has 1 gem then 2 gems then 3 gems.

x	y
1	
2	
3	



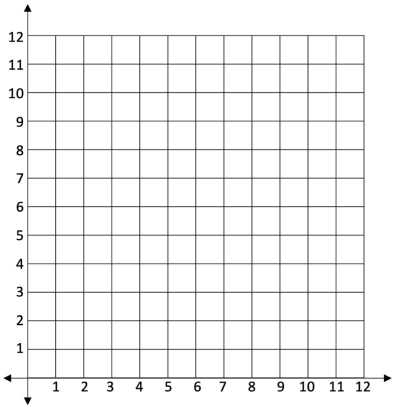
Write an equation to match the story and table. Then graph.

____

Use the story to complete the table then write an equation and graph it.

4. Leo likes to practice for two hours for every piano lesson that he has. Let x represent the number of piano lessons. Let y represent the hours of practice. Find the number of hours of practice for 1 piano lesson then 2 piano lessons then 3 piano lessons.

x	y
1	
2	
3	

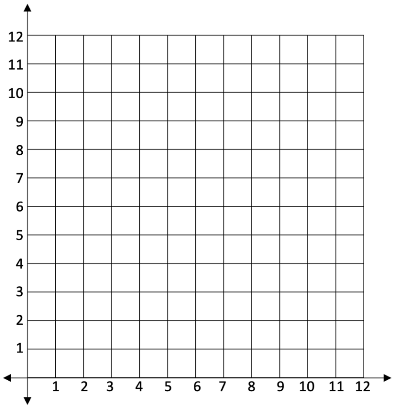


Write an equation to match the story and table. Then graph.

____

5. Martin gets $1 for every cookie he sells. Let x represent the number of cookies. Let y represent the number of dollars. Find the amount of money Martin gets for 4 cookies then 5 cookies then 6 cookies.

x	y
4	
5	
6	

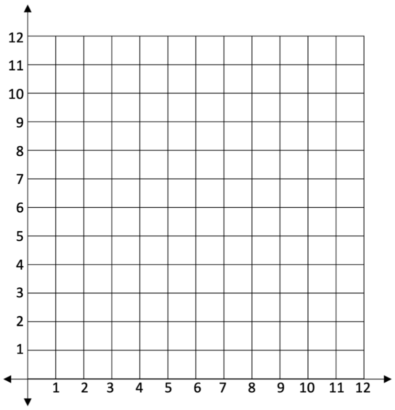


Write an equation to match the story and table. Then graph.

____

6. Delish Donut shop always adds one extra donut to its customers orders. Let x represent the number of donuts a customer orders. Let y represent the number of donuts the shop gives. Find the total number of donuts that the shop packs when a customer order 4 donuts then 5 donuts then 6 donuts.

x	y
4	
5	
6	



Write an equation to match the story and table. Then graph.

____

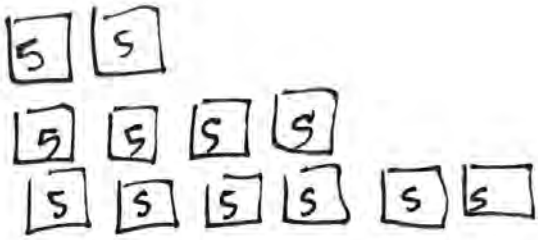
Name: ANSWER KEY

Brian gets paid $5 for each window he washes. Let x represent the number of windows he washes. Let y represent the number of dollars Brian earns. Find the amount of money that Brian earns for washing 0 windows then 2 windows then 4 windows then 6 windows.

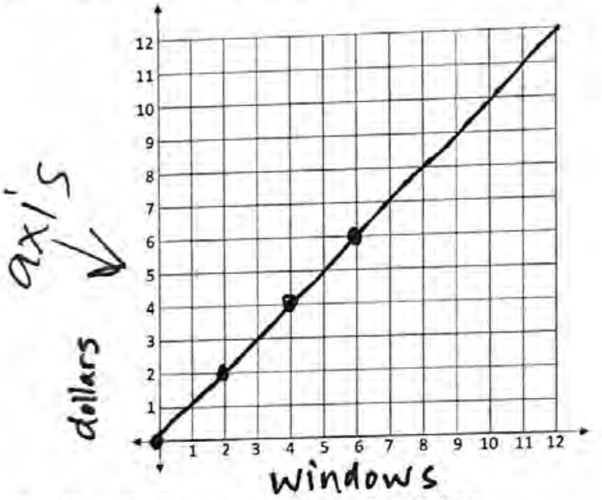
1. Complete the table shown below.

windows

x	y
0	0
2 ×5	10
4 ×5	20
6 ×5	30



2. Label the axes of the graph.



3. Graph the points from the table.

4. Write an equation to match the table: $y = 5x$

5. Is the relationship a proportion? yes

6. Circle ALL the reasons for your answer:

(a) There is no constant of proportionality.

[✓ (b)] The constant of proportionality is 5.

(c) The constant of proportionality is 10.

(d) The equation is not in the form y = kx.

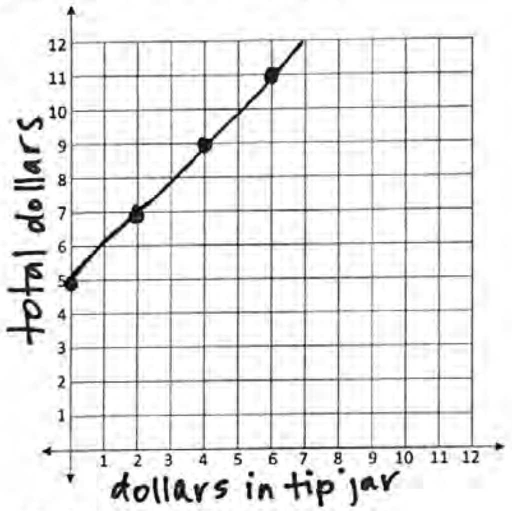
[✓ (e)] The equation is in the form y = kx.

Whenever Lisa works at the cafe, her boss always gives her an extra $5 on top of whatever money is in the tip jar. Let x represent the number of dollars in the tip jar. Let y represent the total number of dollars that Lisa gets. Find the total number of dollars Lisa gets when there are 0 dollars in the tip jar then 2 dollars then 4 dollars then 6 dollars.

7. Complete the table shown below.

dollars in tip jar	total dollars
x	y
0	5
2	7
4	9
6	11

8. Label the axes of the graph.



$0\overline{)5}$ $\quad$ $\begin{array}{r} 3\frac{1}{2} \\ 2\overline{)7} \\ -6 \\ \hline 1 \end{array}$ $\quad$ $\begin{array}{r} 2\frac{1}{4} \\ 4\overline{)9} \\ -8 \\ \hline 1 \end{array}$

9. Graph the points from the table.

10. Write an equation to match the table: $y = x + 5$

11. Is the relationship a proportion? NO

12. Circle ALL the reasons for your answer:

[✓ (a)] There is no constant of proportionality.

(b) The constant of proportionality is 5.

(c) The constant of proportionality is 10.

[✓ (d)] The equation is not in the form y = kx.

(e) The equation is in the form y = kx.

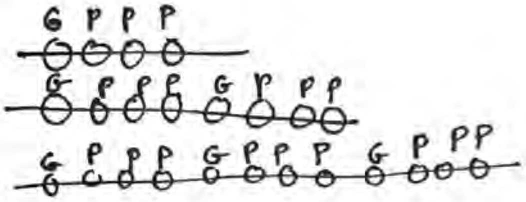
Name: ANSWER KEY

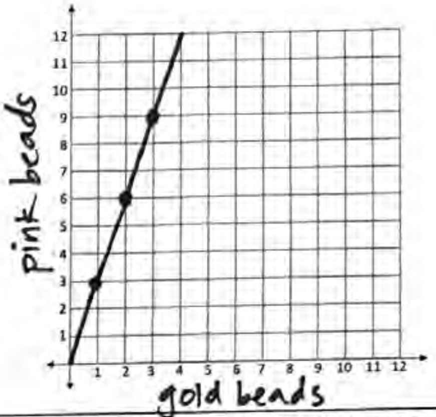
G7 U2 Lesson 11 - Independent Work

Use the story to complete the table then write an equation and graph it.

1. Rose is making a bracelet. Every time she puts on one gold bead, she follows it with three pink beads. Let x represent the number of gold beads. Let y represent the number of pinks beads. Find the number of pink beads when there is 1 gold bead then 2 gold beads then 3 gold beads.

gold beads	pink beads
x	y
1×3	3
2×3	6
3×3	9



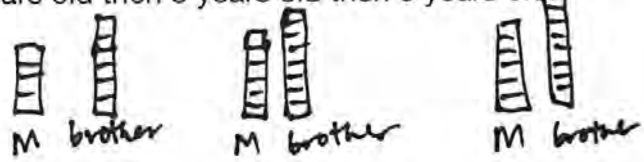


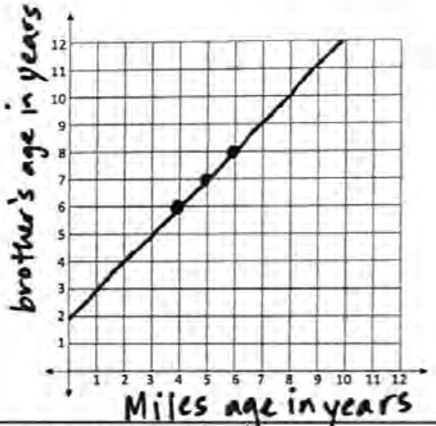
Write an equation to match the story and table. Then graph.

$y = 3x$

2. Miles is always 2 years younger than his brother, and that is how it will be for the rest of his life. Let x represent his brother's age. Let y represent Miles' age. Find out how old Miles is when his brother is 4 years old then 5 years old then 6 years old.

Miles age	brothers age
x	y
4+2	6
5+2	7
6+2	8



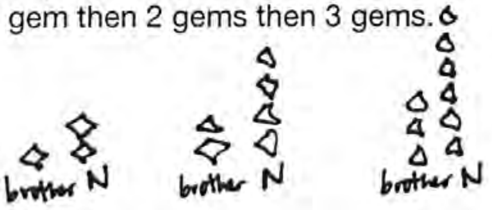


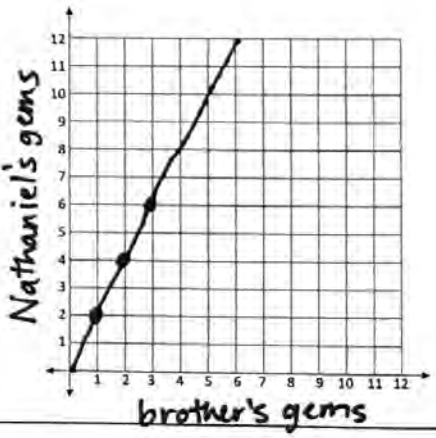
Write an equation to match the story and table. Then graph.

$y = x + 2$

3. Nathaniel always tries to get twice as many gems on Roblox as his brother. Let x represent his brother's gems. Let y represent Nathaniel's gems. Find the number of gems Nathaniel has when his brother has 1 gem then 2 gems then 3 gems.

brothers gems	Nathaniel's gems
x	y
1×2	2
2×2	4
3×2	6





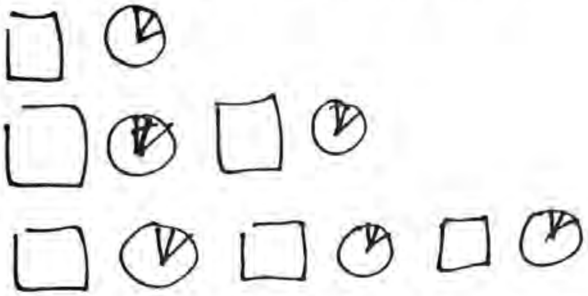
Write an equation to match the story and table. Then graph.

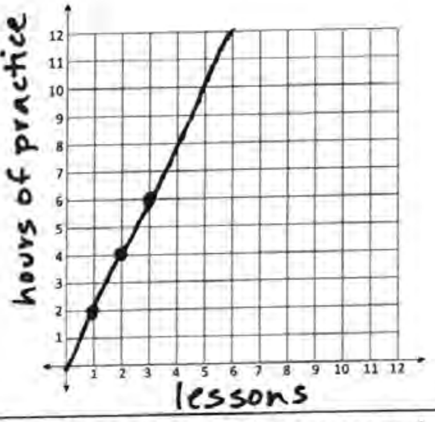
$y = 2x$

Use the story to complete the table then write an equation and graph it.

4. Leo likes to practice for two hours for every piano lesson that he has. Let x represent the number of piano lessons. Let y represent the hours of practice. Find the number of hours of practice for 1 piano lesson then 2 piano lessons then 3 piano lessons.

lessons	hours
x	y
1 ×2	2
2 ×2	4
3 ×2	6



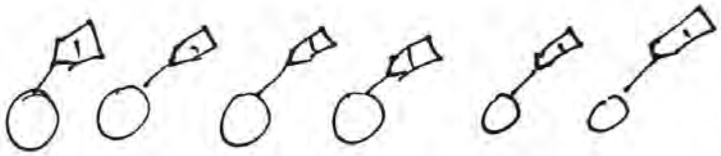


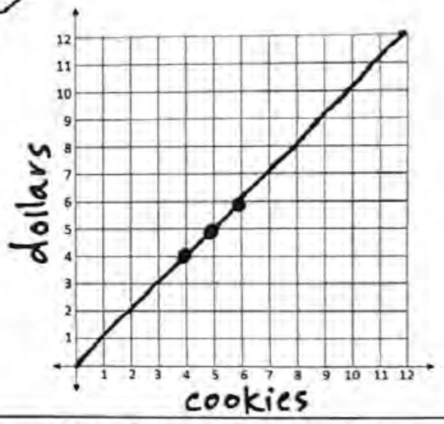
Write an equation to match the story and table. Then graph.

$y = 2x$

5. Martin gets $1 for every cookie he sells. Let x represent the number of cookies. Let y represent the number of dollars. Find the amount of money Martin gets for 4 cookies then 5 cookies then 6 cookies.

cookies	dollars
x	y
4 ×1	4
5 ×1	5
6 ×1	6



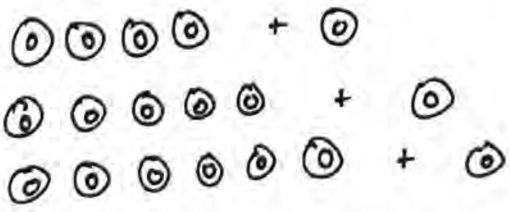


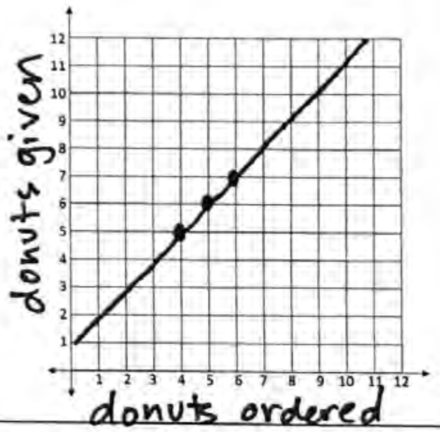
Write an equation to match the story and table. Then graph.

$y = 1x$

6. Delish Donut shop always adds one extra donut to its customers orders. Let x represent the number of donuts a customer orders. Let y represent the number of donuts the shop gives. Find the total number of donuts that the shop packs when a customer order 4 donuts then 5 donuts then 6 donuts.

donuts ordered	donuts given
x	y
4+1	5
5+1	6
6+1	7





Write an equation to match the story and table. Then graph.

$y = x + 1$

G7 U2 Lesson 12

Interpret and compare two related proportional relationships on the same graph.

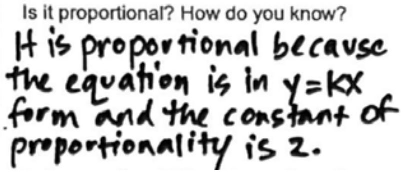
G7 U2 Lesson 12 - Today we will make a generalization about graphs of proportional relationships.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will make a generalization or notice a pattern in the graph of proportional relationships versus not proportional relationships. Eventually we will be able to just look at a graph and tell if it is a proportion. It's going to be very cool Let's do this!

Let's Review (Slide 3): A relationship is proportional if it has a constant of proportionality. We already know this from previous lessons. These are two stories and graphs from our last lesson. We worked on them already together but let's read them again. Follow along with your eyes while I read it out loud. "In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk." We see the equation, y = 2x. And the question is, "Is it proportional? How do you know?" What do you think?
Possible Student Answers, Key Points:

- I think it is proportional because the equation is in the form, y = kx.
- I think it is proportional because the equation is a one step multiplication equation.
- I think it is proportional because it is "times 2" for each row of the table.
- I think it is proportional because the constant of proportionality is 2.
- I think it is proportional because 2 divided by 1 is 2 and 4 divided by 2 is 2 and 6 divided by 3 is 2 and 8 divided by 4 is 2.



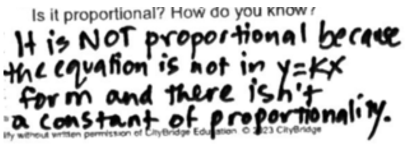
Is it proportional? How do you know?

It is proportional because the equation is in y=kx form and the constant of proportionality is 2.

You all had a lot of great ideas. It is proportional! I am going to write an explanation using the best math vocabulary I know. I will write, "It is proportional because the equation is in y = kx form and the constant of proportionality is 2."

Let's look at the next one. It said, "Jason always needs 5 minutes to cool down from a workout no matter how long it is." We see the equation, y = x + 5. And the question is, "Is it proportional? How do you know?" What do you think? Possible Student Answers, Key Points:

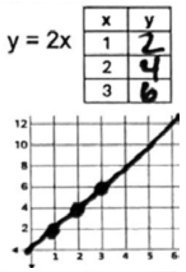
- I think it is NOT proportional because the equation is not in the form, y = kx.
- I think it is NOT proportional because the equation is a one step addition equation.
- I think it is NOT proportional because it is "plus 5" for each row of the table.
- I think it is NOT proportional because there isn't a constant of proportionality.
- I think it is NOT proportional because 6 divided by 1 is 6 and 7 divided by 2 is 2 and a little bit.



Is it proportional? How do you know?

It is NOT proportional becaue the equation is not in y=kx form and there isn't a constant of proportionality.

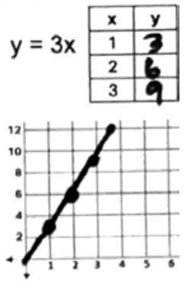
You all had a lot of great ideas. It is NOT proportional! I am going to write an explanation using the best math vocabulary I know. I will write, "It is not proportional because the equation is not in y = kx form and there isn't constant of proportionality." Now we've reviewed equations and tables. Let's see what we can learn about graphs.



y = 2x

x	y
1	2
2	4
3	6

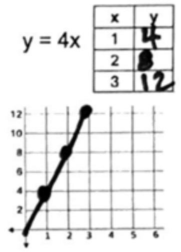
Let's Talk (Slide 4): We can notice a pattern in the graphs of proportions. We can see that all these equations are in the form y = kx so these are all proportions. Let's graph them and see what we notice. First, I will plug each number into y = 2x. That would be 2 times 1 is 2, 2 times 2 is 4 and 2 times 3 is 6. I am going to graph each of these, (1,2) and (2,4) and (3,6).



y = 3x

x	y
1	3
2	6
3	9

Next I will plug each number into y = 3x. That would be 3 times 1 is 3, 3 times 2 is 6 and 3 times 3 is 9. I am going to graph each of these, (1,3) and (2,6) and (3,9).



y = 4x

x	y
1	4
2	8
3	12

Finally, I will plug each number into y = 4x. That would be 4 times 1 is 4, 4 times 2 is 8 and 4 times 3 is 12. I am going to graph each of these, (1,4) and (2,8) and (3,12).

What do you notice about all of these graphs? Possible Student Answers, Key Points:

- They all make straight lines.
- They all go up diagonally.
- They all start in the bottom corner.

All of these are straight lines. They go up diagonally. But the important thing we are going to pay attention is that they all go through this bottom corner here. That bottom corner has a special name called the "origin." Origin means start. This is called the origin because the axes that make the graph all start here. The coordinates of the origin are (0,0). This first graph starts at (0,0). This middle graph starts at (0,0) and the last graph starts at (0,0). Now we can fill in the blanks. Graphs of proportions always go through the origin, (0,0).

Graphs of proportions always go through the origin (0,0)

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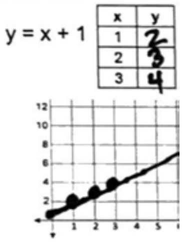
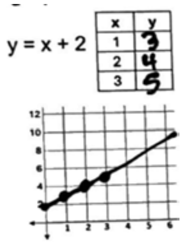


y = x + 1

x	y
1	2
2	3
3	4

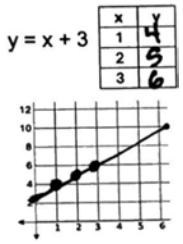
Let's Think (Slide 5): The pattern we just saw is NOT there for graphs that are NOT proportions. Let's explore. First, I will plug each number into y = x + 1. That would be 1 plus 1 is 2 and 2 plus 1 is 3 and 3 plus 1 is 4. I am going to graph each of these, (1,2) and (2,3) and (3,4).



y = x + 2

x	y
1	3
2	4
3	5

Next I will plug each number into y = x + 2. That would be 1 plus 2 is 3 and 2 plus 2 is 4 and 3 plus 2 is 5. I am going to graph each of these, (1,3) and (2,4) and (3,5).



Next I will plug each number into y = x + 3. That would be 1 plus 3 is 4 and 2 plus 3 is 5 and 3 plus 3 is 6. I am going to graph each of these, (1,4) and (2,5) and (3,6).

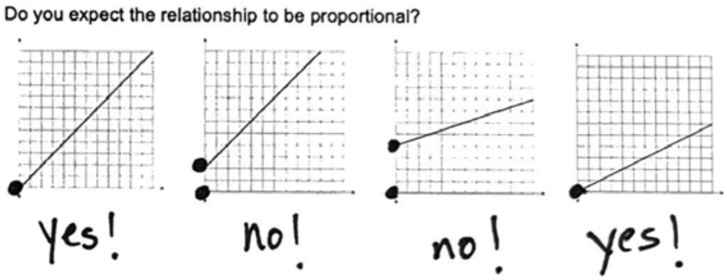
What do you notice about all of these graphs? Possible Student Answers, Key Points:

- They all make straight lines.
- They all go up diagonally.
- They do NOT all start in the bottom corner.

All of these are straight lines. They go up diagonally. But the important thing we are going to pay attention is that they do NOT go through this bottom corner like on the last slide. Now we can fill in the blanks. Lines that don't go through the origin (0,0) are not proportions.


Lines that don't go through (0,0) are not proportions.

Let's Think (Slide 6): Now we know the important origin trick! We should be able to tell which graph is proportional just by looking. The graphs below don't even have numbers. Let's do a quick thumbs up and thumbs down. Thumbs up means yes and thumbs down means know. Do you think this first graph is proportional? *Give some think time for kids to show their thumbs up or down.* Yes, this is proportional because the line goes through the origin (0,0) right here. Let's do the next one. Do you think this first graph is proportional? *Give some think time for kids to show their thumbs up or down.* No, this is NOT proportional because the line does NOT go through the origin (0,0) right here. Let's do the next one. Do you think this first graph is proportional? *Give some think time for kids to show their thumbs up or down.* No, this is NOT proportional because the line does NOT go through the origin (0,0) right here. Let's do the next one. Do you think this first graph is proportional? *Give some think time for kids to show their thumbs up or down.* Yes, this is proportional because the line goes through the origin (0,0) right here.



Let's Try It (Slide 7): Now we will look at some more graphs together and I will walk you through checking if they are proportions step by step.

WARM WELCOME

Today we will make a generalization about graphs of proportional relationships.

Let's Review:

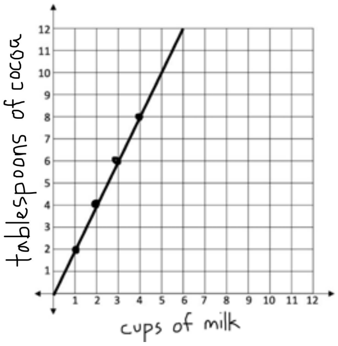
A relationship is proportional if it has a constant of proportionality.

In order to make hot chocolate, Jeb needs 2 tablespoons of cocoa for every cup of milk. Let x represent the cups of milk. Let y represent the tablespoons of cocoa.

Write an equation:

$y=2x$

x	y
cups	tbsp
1	2
2	4
3	6
4	8



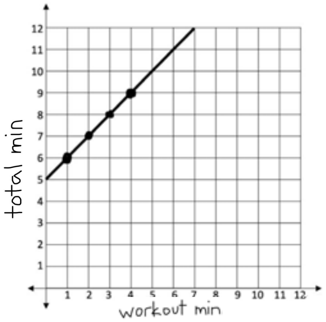
Is it proportional? How do you know?

Jason always needs 5 minutes to cool down from a workout no matter how long it is. Let x represent the length of Jason's workout in minutes. Let y represent the total number of minutes.

Write an equation:

$y = x + 5$

x	y
work out	total
1	6
2	7
3	8
4	9



Is it proportional? How do you know?

Let's Talk:

We can notice a pattern in the graphs of proportions.

$y = 2x$

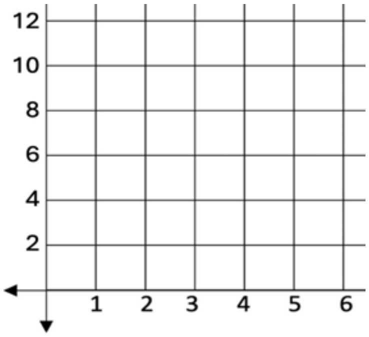
x	y
1	
2	
3	

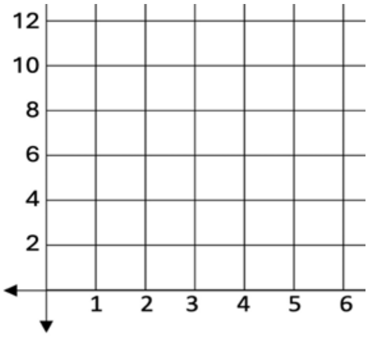
$y = 3x$

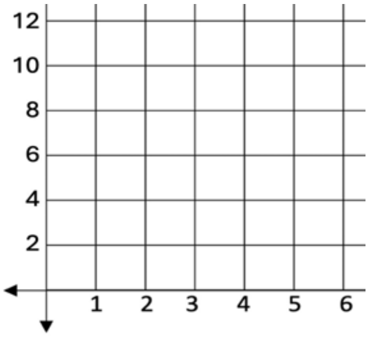
x	y
1	
2	
3	

$y = 4x$

x	y
1	
2	
3	







Graphs of proportions always ______________________________

Let's Think:

The pattern we just saw is not there for graphs that are NOT proportions.

$y = x + 1$

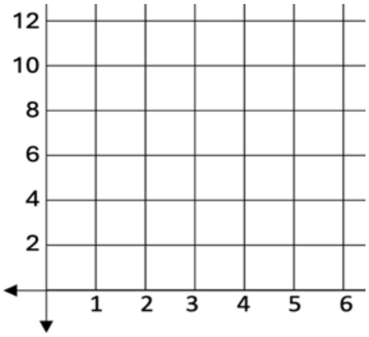
x	y
1	
2	
3	

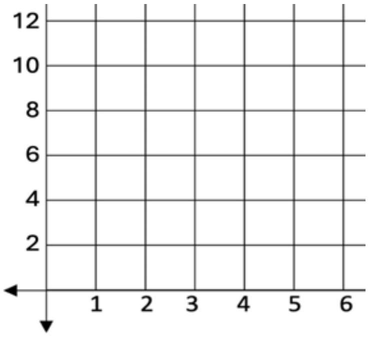
$y = x + 2$

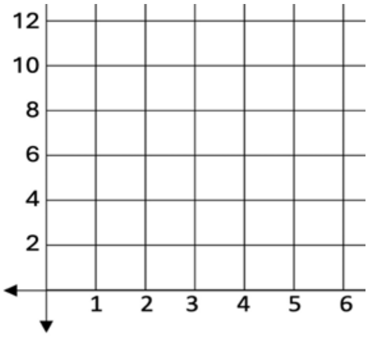
x	y
1	
2	
3	

$y = x + 3$

x	y
1	
2	
3	





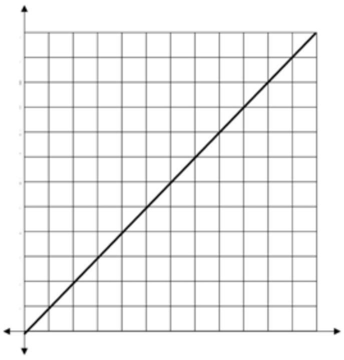


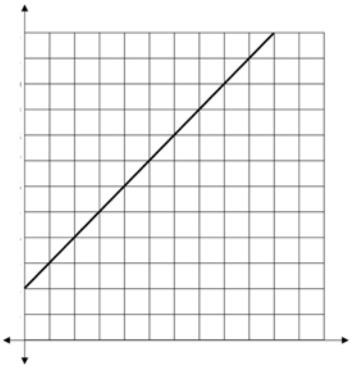
Lines that ______________________________ are not proportions.

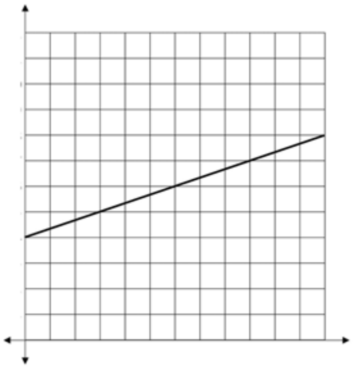
Let's Think:

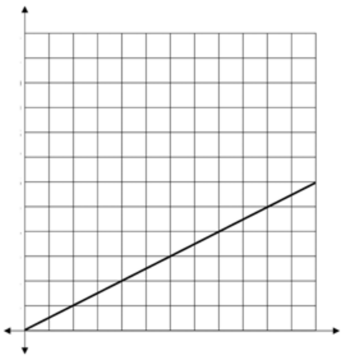
We should be able to tell which graph is proportional just by looking.

Do you expect the relationship to be proportional?



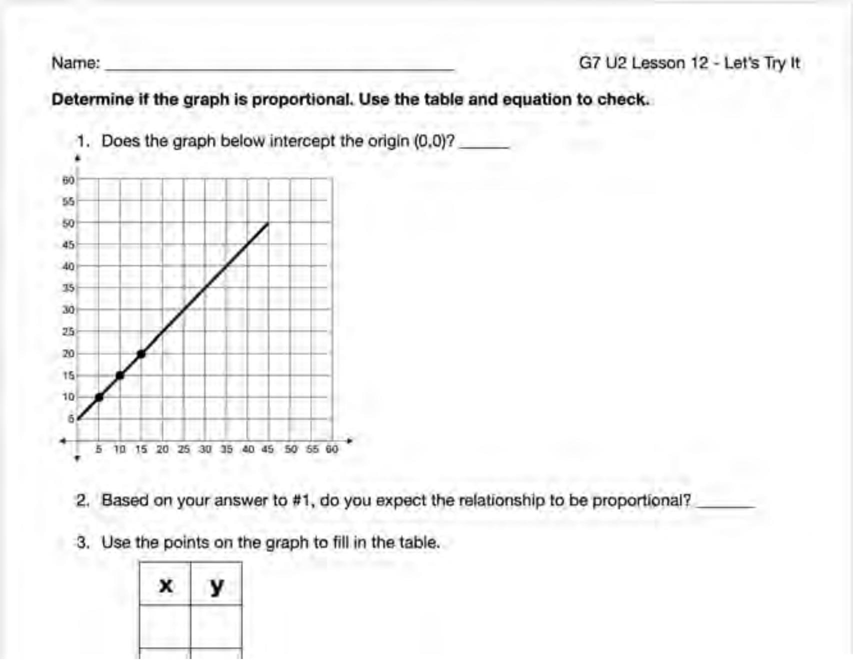






Let's Try It:

We will do it together step by step.



Name: ______________________________ G7 U2 Lesson 12 - Let's Try It

Determine if the graph is proportional. Use the table and equation to check.

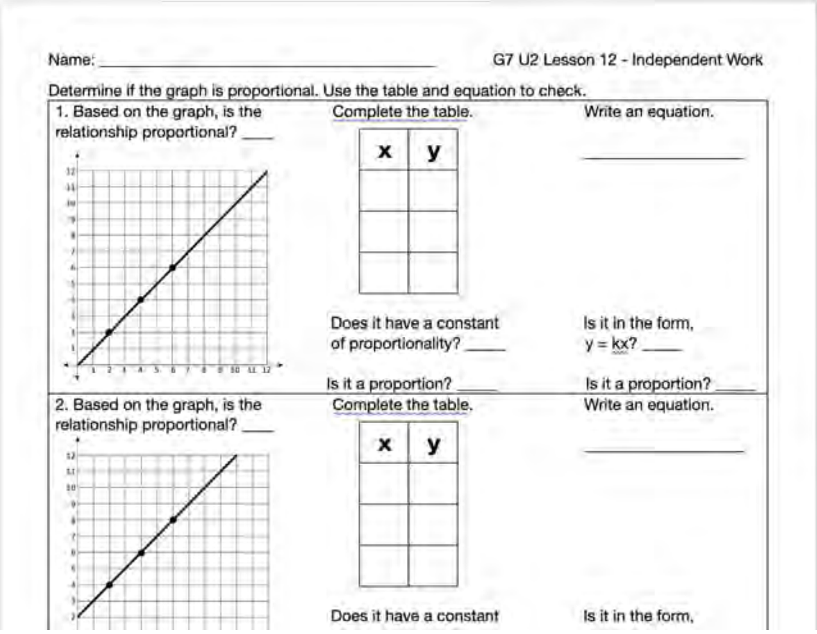
1. Does the graph below intercept the origin (0,0)? _____

2. Based on your answer to #1, do you expect the relationship to be proportional? ______
3. Use the points on the graph to fill in the table.

x	y

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 12 - Independent Work

Determine if the graph is proportional. Use the table and equation to check.

1. Based on the graph, is the relationship proportional? ____

Complete the table.

x	y

Write an equation.

____

Does it have a constant of proportionality? _____

Is it in the form, y = kx? _____

Is it a proportion? _____

Is it a proportion? _____

2. Based on the graph, is the relationship proportional? ____

Complete the table.

x	y

Write an equation.

____

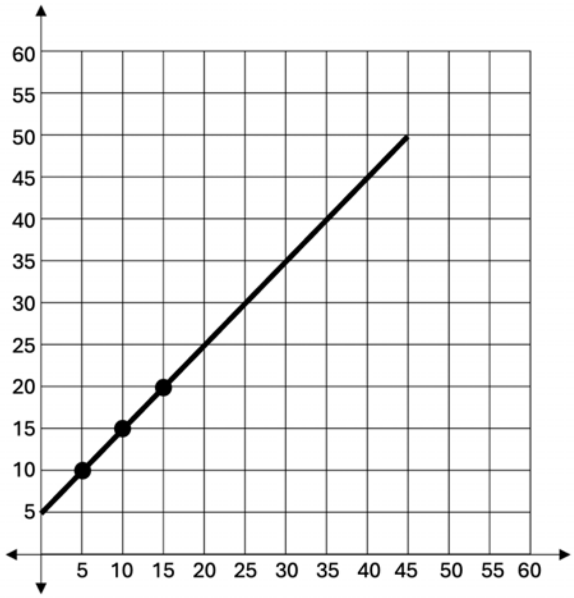
Does it have a constant

Is it in the form,

Name: ____ G7 U2 Lesson 12 - Let’s Try It

Determine if the graph is proportional. Use the table and equation to check.

1. Does the graph below intercept the origin (0,0)? ______



2. Based on your answer to #1, do you expect the relationship to be proportional? _______

3. Use the points on the graph to fill in the table.

x	**y**

4. Does the table have a constant of proportionality? If so, what is it? ________________________

5. Based on your answer to #4, do you expect the relationship to be proportional? _______

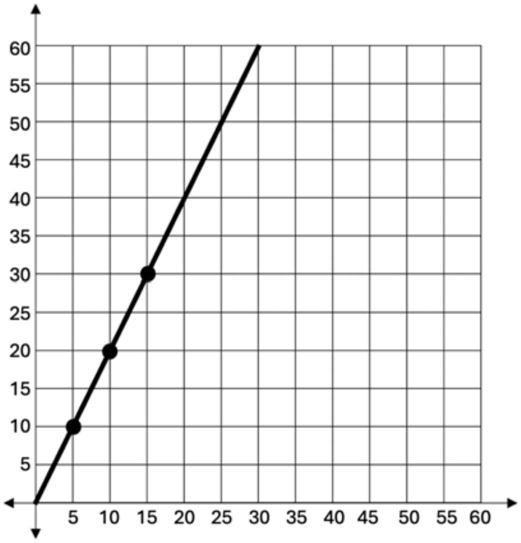
6. Make an equation to match the table. _________________

7. Is the equation in y = kx form? ______

8. Based on your answer to #7, do you expect the relationship to be proportional? _______

Determine if the graph is proportional. Use the table and equation to check.

9. Does the graph below intercept the origin (0,0)? ______



10. Based on your answer to #9, do you expect the relationship to be proportional? _______

11. Use the points on the graph to fill in the table.

x	y

12. Does the table have a constant of proportionality? If so, what is it? ________________________

13. Based on your answer to #12, do you expect the relationship to be proportional? _______

14. Make an equation to match the table. __________________

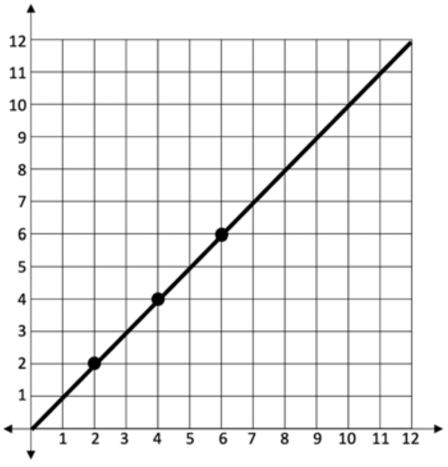
15. Is the equation in y = kx form? ______

16. Based on your answer to #15, do you expect the relationship to be proportional? _______

Name: ______________________________________ G7 U2 Lesson 12 - Independent Work

Determine if the graph is proportional. Use the table and equation to check.

1. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

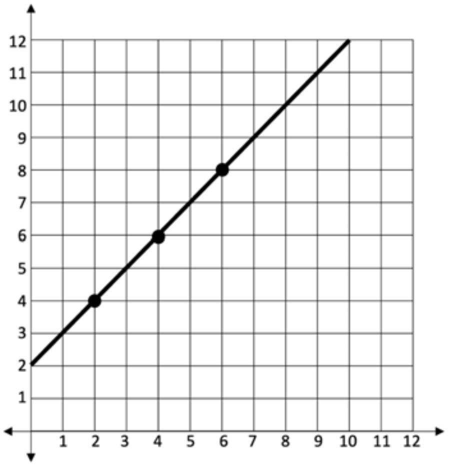
Write an equation.

____

Is it in the form, y = kx? _____

Is it a proportion? _____

2. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

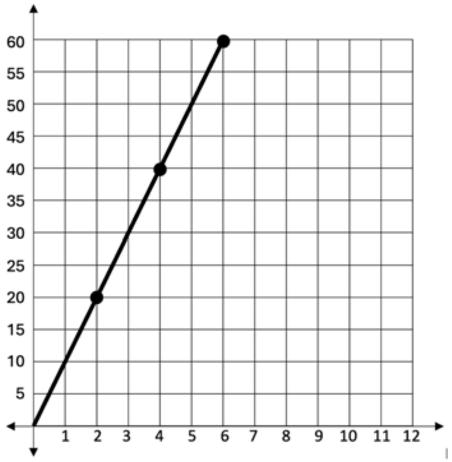
Write an equation.

____

Is it in the form, y = kx? _____

Is it a proportion? _____

3. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

Write an equation.

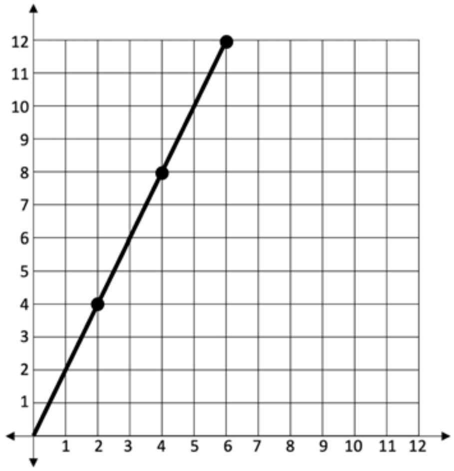
____

Is it in the form, y = kx? _____

Is it a proportion? _____

Determine if the graph, table and equation are proportional.

1. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

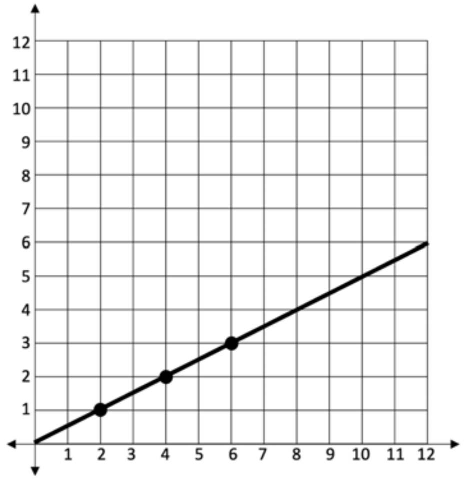
Write an equation.

____

Is it in the form, y = kx? _____

Is it a proportion? _____

2. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

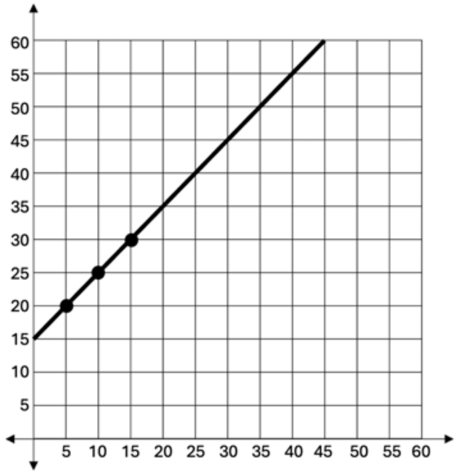
Write an equation.

____

Is it in the form, y = kx? _____

Is it a proportion? _____

3. Based on the graph, is the relationship proportional? ____



Complete the table.

x	y

Does it have a constant of proportionality? _____

Is it a proportion? _____

Write an equation.

____

Is it in the form, y = kx? _____

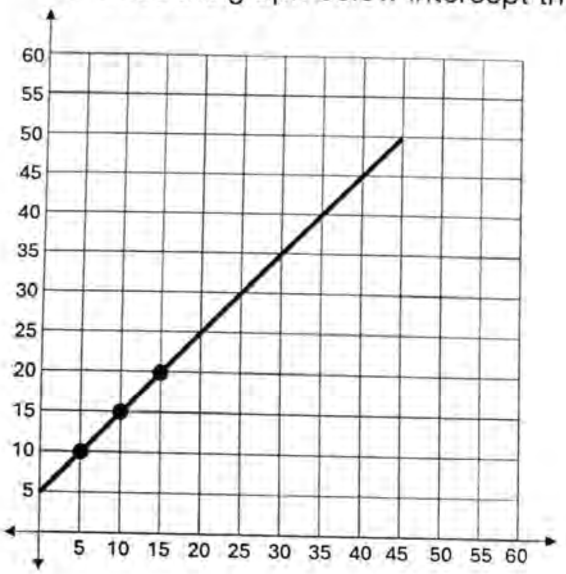
Is it a proportion? _____

Name: ANSWER KEY

G7 U2 Lesson 12 - Let's Try It

Determine if the graph is proportional. Use the table and equation to check.

1. Does the graph below intercept the origin (0,0)? NO



2. Based on your answer to #1, do you expect the relationship to be proportional? NO

3. Use the points on the graph to fill in the table.

x	y
5 +5	10
10 +5	15
15 +5	20

$$\begin{array}{r} 02 \\ 5\overline{)10} \\ -10 \\ \hline 00 \end{array} \qquad \begin{array}{r} 01\frac{5}{10} \\ 10\overline{)15} \\ -10 \\ \hline 5 \end{array}$$

4. Does the table have a constant of proportionality? If so, what is it? NO

5. Based on your answer to #4, do you expect the relationship to be proportional? NO

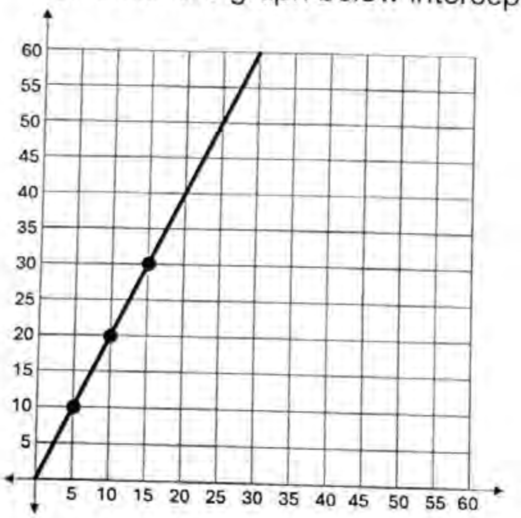
6. Make an equation to match the table. $y = x + 5$

7. Is the equation in $y = kx$ form? NO

8. Based on your answer to #7, do you expect the relationship to be proportional? NO

Determine if the graph is proportional. Use the table and equation to check.

9. Does the graph below intercept the origin (0,0)? YES



10. Based on your answer to #9, do you expect the relationship to be proportional? YES

11. Use the points on the graph to fill in the table.

x	y
5 ×2	10
10 ×2	20
15 ×2	30

12. Does the table have a constant of proportionality? If so, what is it? Yes, it is 2.

13. Based on your answer to #12, do you expect the relationship to be proportional? Yes

14. Make an equation to match the table. $y = 2x$

15. Is the equation in y = kx form? Yes

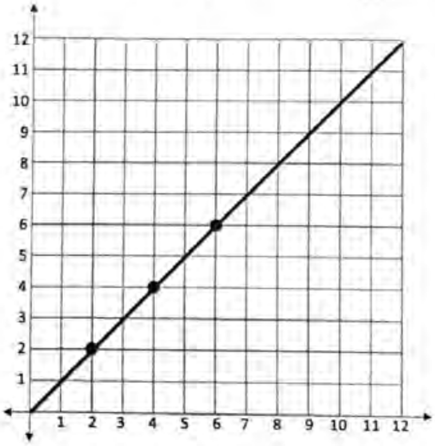
16. Based on your answer to #15, do you expect the relationship to be proportional? Yes

Name: ANSWER KEY

G7 U2 Lesson 12 - Independent Work

Determine if the graph is proportional. Use the table and equation to check.

1. Based on the graph, is the relationship proportional? yes



Complete the table.

x	y
2 ×1	2
4 ×1	4
6 ×1	6

$\begin{array}{r}1\\2\overline{)2}\\-2\\\hline 0\end{array}$

$\begin{array}{r}1\\4\overline{)4}\\-4\\\hline 0\end{array}$

$\begin{array}{r}1\\6\overline{)6}\\-6\\\hline 0\end{array}$

Does it have a constant of proportionality? yes

Is it a proportion? yes

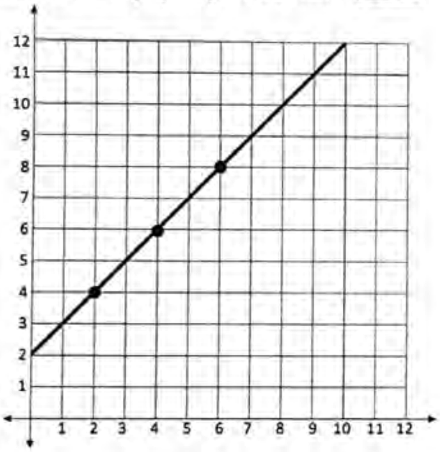
Write an equation.

$y = 1x$

Is it in the form, $y = kx$? yes

Is it a proportion? yes

2. Based on the graph, is the relationship proportional? no



Complete the table.

x	y
2 +2	4
4 +2	6
6 +2	8

$\begin{array}{r}2\\2\overline{)4}\\-4\\\hline 0\end{array}$

$\begin{array}{r}1\frac{2}{4}\\4\overline{)6}\\-4\\\hline 2\end{array}$

Does it have a constant of proportionality? no

Is it a proportion? no

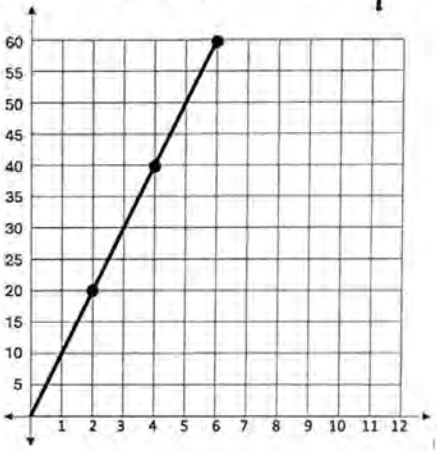
Write an equation.

$y = x + 2$

Is it in the form, $y = kx$? no

Is it a proportion? no

3. Based on the graph, is the relationship proportional? yes



Complete the table.

x	y
2 ×10	20
4 ×10	40
6 ×10	60

$\begin{array}{r}10\\2\overline{)20}\\-2\\\hline 0\end{array}$

$\begin{array}{r}10\\4\overline{)40}\\-4\\\hline 0\end{array}$

$\begin{array}{r}10\\6\overline{)60}\\-6\\\hline 00\end{array}$

Does it have a constant of proportionality? yes

Is it a proportion? yes

Write an equation.

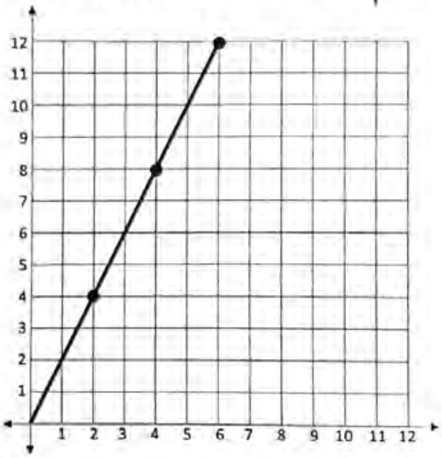
$y = 10x$

Is it in the form, $y = kx$? yes

Is it a proportion? yes

Determine if the graph, table and equation are proportional.

1. Based on the graph, is the relationship proportional? Yes



Complete the table.

x	y
2 ×2	4
4 ×2	8
6 ×2	12

2
2)4
-4
0

2
4)8
-8
0

02
6)12
-12
00

Does it have a constant of proportionality? Yes

Is it a proportion? Yes

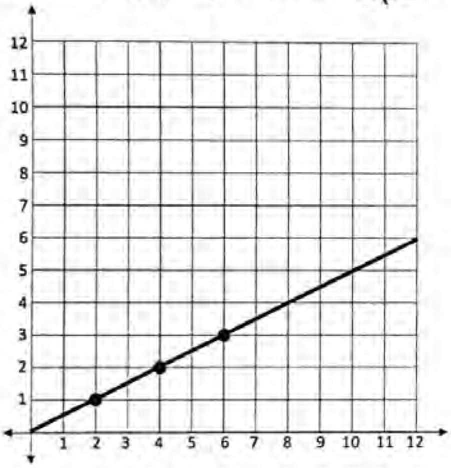
Write an equation.

$y = 2x$

Is it in the form, y = kx? Yes

Is it a proportion? Yes

2. Based on the graph, is the relationship proportional? Yes



Complete the table.

x	y
2 ×$\frac{1}{2}$	1
4 ×$\frac{1}{2}$	2
6 ×$\frac{1}{2}$	3

0 $\frac{1}{2}$
2)1
-0
1

0 $\frac{2}{4}$
4)2
-0
2

0 $\frac{3}{6}$
6)3
-0
3

Does it have a constant of proportionality? Yes

Is it a proportion? Yes

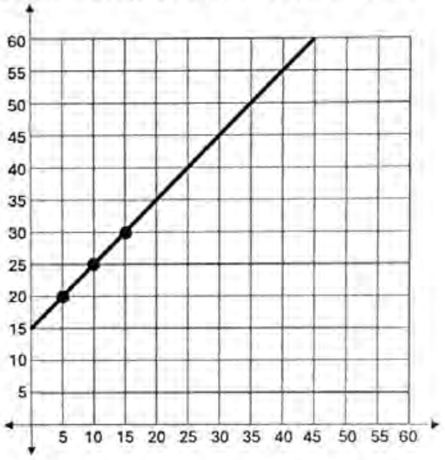
Write an equation.

$y = \frac{1}{2}x$

Is it in the form, y = kx? Yes

Is it a proportion? Yes

3. Based on the graph, is the relationship proportional? No



Complete the table.

x	y
5 +15	20
10 +15	25
15 +15	30

04
5)20
-20
00

0 2 $\frac{5}{10}$
10)25
-20
5

Does it have a constant of proportionality? No

Is it a proportion? No

Write an equation.

$y = x + 15$

Is it in the form, y = kx? No

Is it a proportion? No

G7 U2 Lesson 13

Interpret and compare the same proportional relationship using two different sets of tables, graphs, and equations.

G7 U2 Lesson 13 - Today we will interpret points on the graph with the context of a story.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will interpret points on the graph with the context of a story. You already know all the math parts of this. Now you just need to make sure you pay really close attention to the words. It's easy to jump in and just crunch numbers. But you could do it incorrectly if you aren't paying attention to the words.

Let's Review (Slide 3): We know that a graph can also be represented as a table and equation. This says, "Write an equation for the graph shown below." This thought bubble is reminding me to stop and think. Because just like I said, we don't want to just jump to answer-getting. We stop and think and if we try to show work on our paper for every problem. So, what work can we show for this before jumping to an answer? Possible Student Answers, Key Points:

- We could look at what operation is being done to x to get y.
- We could see if we notice a pattern.
- We could draw a table.

To write the equation, we will need an operation and maybe you can just see it with your eyeballs. But the very easiest thing would be to make a table.

x	y
2	4
4	6
6	8

I am going to draw one here with an x and y. Now let's start putting points. This first dot is above the 2 and next to the 4. I am going to write 2 and 4 in my table. Now, I put the 2 in the x column because that is on the horizontal axis. The 4 goes in the y column because that is on the vertical axis. If I switch these and put the 4 and then the 2, I will get the wrong answer. Let's do the next point. It is above the 4 so 4 is x. It is next to the 6 so 6 is y. Let's do the next point. It is above the 6 so 6 is x. It next to the 8 so 8 is y.

x	y
2+2	4
4+2	6
6+2	8

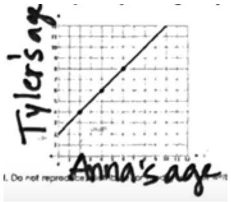
Now I can look at my table and find the operation. I can even put circles here to write it down. At first, I must think it is "times 2" because 2 times 2 makes 4. But that doesn't work for the next row because 4 times 2 would be 8. Let me try "plus 2." 2 plus 2 is 4. 4 plus 2 is 6. 6 plus 2 is 8. That's it!

$y=x+2$

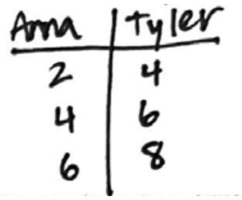
Now that I've found the operation, I can write the equation. I see that x is getting added by 2 so I write y = x + 2. The big idea here is making a table from a graph is really really helpful in writing an equation. And guess what? It is going to be really help in answering story problem questions with a graph too. So we have to make a promise here and now that we are always going to show our work by drawing a table.

Let's Talk (Slide 4): Because a graph can be represented with a story, we can use it to answer questions. This is the big idea for today so I am going to write it down. Every time we want to answer a question about graph, we will use a TABLE with WORDS. Remember, the words are very important. The words tell us if we're looking for x or y.

Every time we want to answer a question about a graph, we will use a table with words.

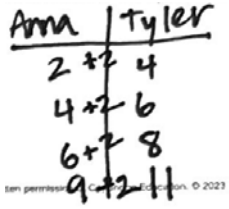


Let's try this problem. Read along silently with your eyes while I read out loud. "The graph below shows the relationship between Anna's age and Tyler's age. Let x be Anna's age in years. Let y be Tyler's age in years. How old will Tyler be when Anna is 9 years old?" The first thing I am going to do is label my graph. X is Anna's age in years. Y is Tyler's age in years.



Anna	Tyler
2	4
4	6
6	8

Now, we said we would always make a table with words. This is the same graph as before. So we know the numbers. That's not the important part. The important part is which side is Anna's age and which side is Tyler's age. It matters because one person is younger and one is older, right? Here are the numbers from before.

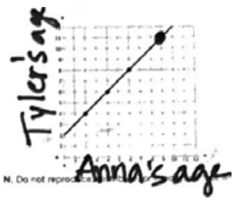


Anna		Tyler
2	+2	4
4	+2	6
6	+2	8
9	+2	11

Now, x is Anna's age so the left hand column is Anna. Y is Tyler's age so the right hand column is Tyler. We already talked about how the operation is "plus 2." When I go to answer this equation, "how old will Tyler be when Anna is 9 years old," the most important thing is asking myself, is the 9 an x or a y? In this case, the 9 is an x. Why is that? Possible Student Answers, Key Points:

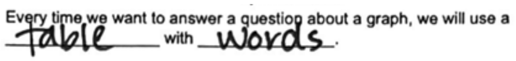
- Anna is 9 years old and it said let x be Anna's age in years.
- We labeled the left column as Anna's age so the 9 goes there.

The story said "let x be Anna's age in years" so if the 9 is Anna's age then it is x and it goes in the left column. Now it is easy to see that we add 2 and Tyler's age would be 11.

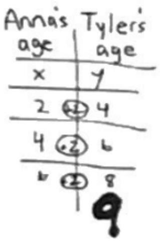


And look, if I put a dot on that point, it is on my line so I know I am right.

Let's Think (Slide 5): It is really important that we don't mix up the words on the x-axis and y-axis. Let me know you why. We know from before that every time we want to answer a question about a graph, we will use a TABLE with WORDS.

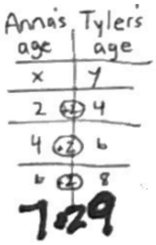


Every time we want to answer a question about a graph, we will use a table with words.



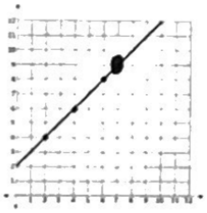
Anna's age		Tyler's age
x		y
2	+2	4
4	+2	6
6	+2	8
		9

Now we have the exact same problem as before but look! The words in the the question were crossed out and changed. Now it says, "how old will Anna be when Tyler is 9 years old?" It's a totally different question with that little change. Because remember we said we have to ask ourselves, is 9 an x or a y? This time the 9 is the y because Tyler is 9 years old and y is Tyler's age. When I put that 9 in the table, I have to put it on the right hand side now. That is why we have to pay attention to the words and not just the numbers.



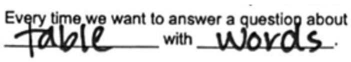
Anna's age		Tyler's age
x		y
2	+2	4
4	+2	6
6	+2	8
7	+2	9

Now I'm not going to add 2. I am asking what plus 2 makes 9. That is 7. So if Tyler is 9 then Anna is 7. I got a different answer because there were different words.

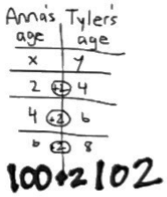


And look, if I put a dot on that point, it is on my line so I know I am right.

Let's Try It (Slide 6): Now here's what's really cool. Even if the point is not shown on the graph, we can find the relationship to answer a question. We still remember that every time we want to answer a question about a graph, we will use a TABLE with WORDS.



Every time we want to answer a question about a graph, we will use a table with words.



Anna's age		Tyler's age
x		y
2	+2	4
4	+2	6
6	+2	8
100	+2	102

We have the same problem as before but let's look at the question. It says, "how old will Tyler be when Anna is 100 years old?" There's no 100 on my graph but I can still figure it out. Now, we still ask ourselves that key question, "Is 100 the x or the y?" It is the x because it is Anna's age so it goes on the left hand side of my table. Now I can see that I need to do 100 plus 2 equals 102. So when Anna is 100 then Tyler is 102.

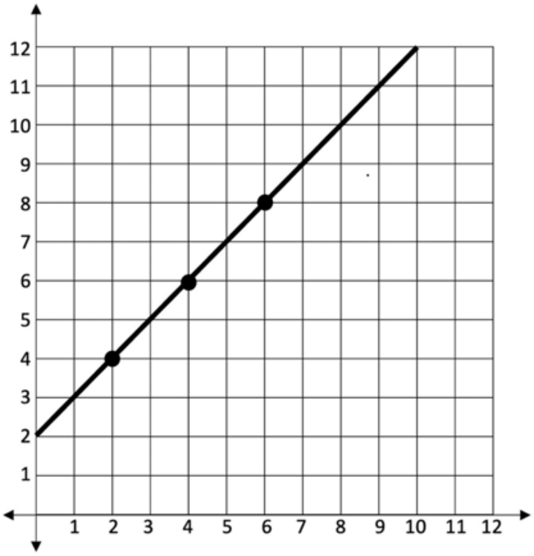
Let's Try It (Slide 7): Now we will graph from tables and equations together. I will take you through step by step.

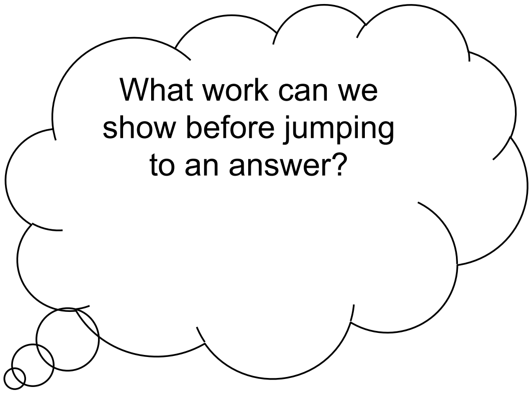
WARM WELCOME

Today we will interpret points on the graph with the context of a story.

Let's Review: We know that a graph can also be represented as a table and equation.

Write an equation for the graph shown below.

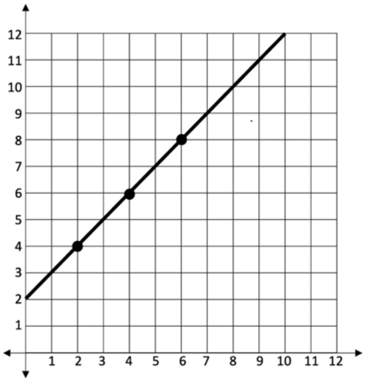




Let's Talk: Because a graph can be represented with a story, we can use it to answer questions.

Every time we want to answer a question about a graph, we will use a __________________ with ________________.

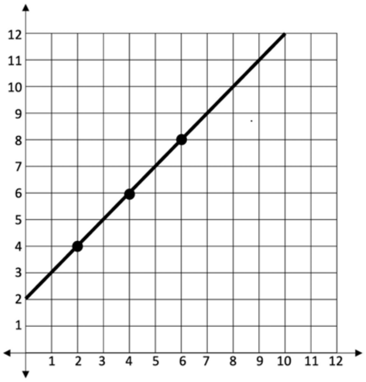
The graph below shows the relationship between Anna's age and Tyler's age. Let x be Anna's age in years. Let y be Tyler's age in years. How old will Tyler be when Anna is 9 years old?



Let's Think: **It is really important that we don't mix up the words on the x-axis and y-axis.**

Every time we want to answer a question about a graph, we will use a
__________________ with _______________.

The graph below shows the relationship between Anna's age and Tyler's age. Let x be Anna's age in years. Let y be Tyler's age in years. How old will ~~Tyler~~ be when Anna
Anna
~~is 9 ye~~ars old?
Tyler

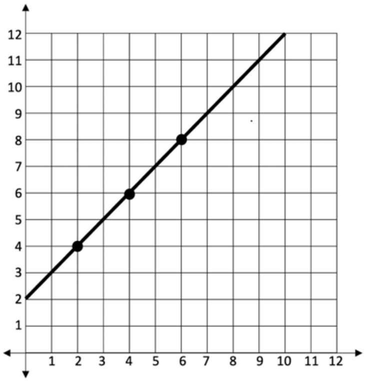


Anna's age		Tyler's age
x		y
2	+2	4
4	+2	6
6	+2	8

Let's Think: **Even if the point is not shown on the graph, we can find the relationship to answer a question.**

Every time we want to answer a question about a graph, we will use a
__________________ with _______________.

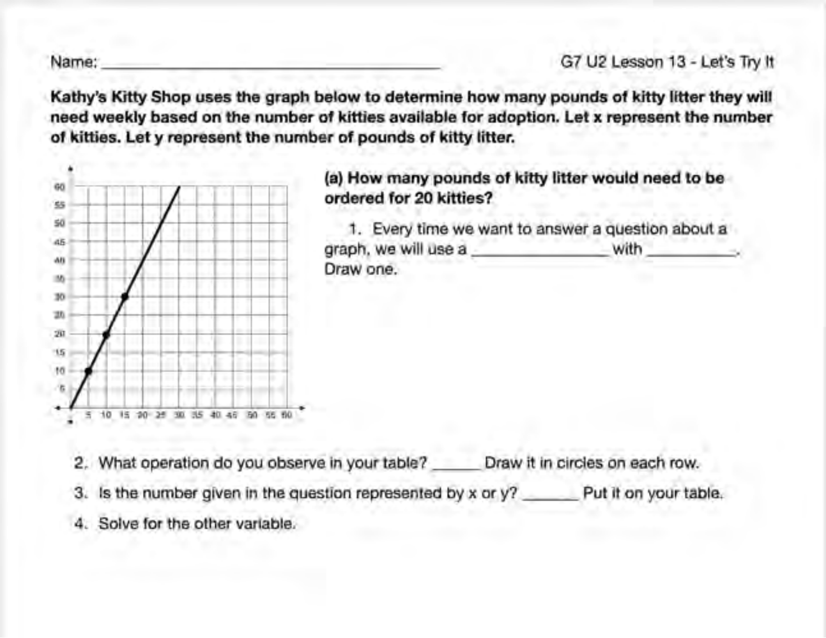
The graph below shows the relationship between Anna's age and Tyler's age. Let x be Anna's age in years. Let y be Tyler's age in years. How old will Tyler be when Anna is 100 years old?



Anna's age		Tyler's age
x		y
2	+2	4
4	+2	6
6	+2	8

Let’s Try It:

We will do it together step by step!



Name: ______________________________ G7 U2 Lesson 13 - Let’s Try It

Kathy’s Kitty Shop uses the graph below to determine how many pounds of kitty litter they will need weekly based on the number of kitties available for adoption. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter.

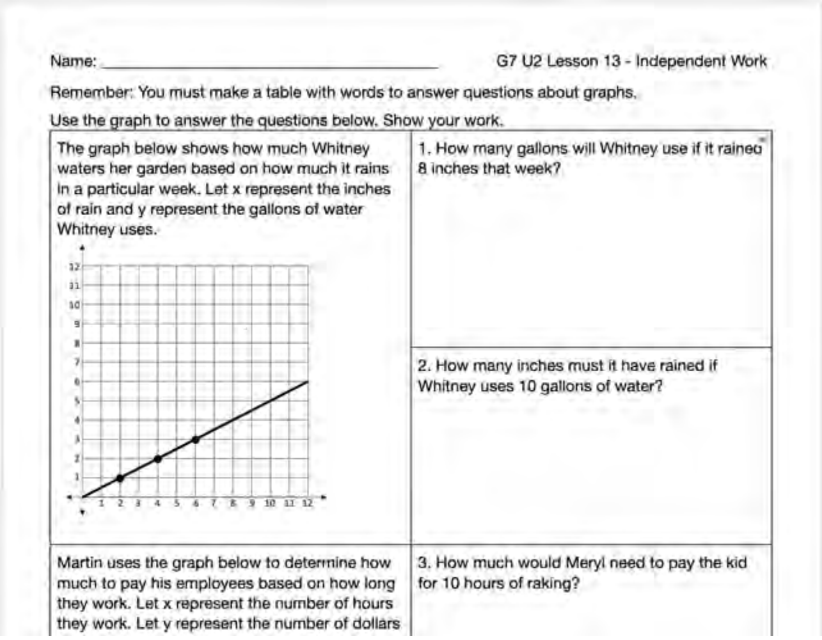
(a) How many pounds of kitty litter would need to be ordered for 20 kitties?

1. Every time we want to answer a question about a graph, we will use a ____________ with _________. Draw one.

2. What operation do you observe in your table? _____ Draw it in circles on each row.
3. Is the number given in the question represented by x or y? _____ Put it on your table.
4. Solve for the other variable.

On your Own:

Now it’s time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 13 - Independent Work

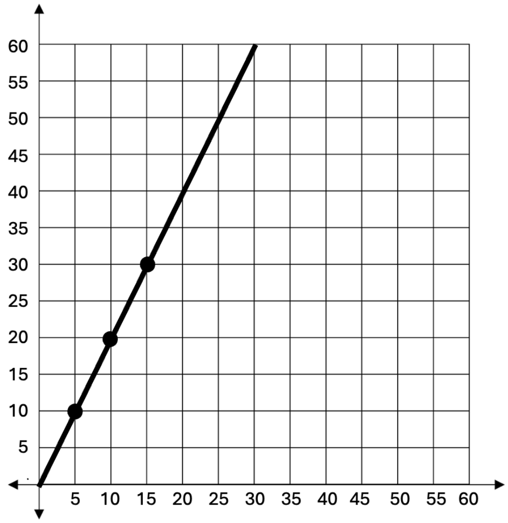
Remember: You must make a table with words to answer questions about graphs.

Use the graph to answer the questions below. Show your work.

The graph below shows how much Whitney waters her garden based on how much it rains in a particular week. Let x represent the inches of rain and y represent the gallons of water Whitney uses.	1. How many gallons will Whitney use if it rained 8 inches that week?
	2. How many inches must it have rained if Whitney uses 10 gallons of water?
Martin uses the graph below to determine how much to pay his employees based on how long they work. Let x represent the number of hours they work. Let y represent the number of dollars	3. How much would Meryl need to pay the kid for 10 hours of raking?

Name: ____ G7 U2 Lesson 13 - Let’s Try It

Kathy’s Kitty Shop uses the graph below to determine how many pounds of kitty litter they will need weekly based on the number of kitties available for adoption. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter.



(a) How many pounds of kitty litter would need to be ordered for 20 kitties?

1. Every time we want to answer a question about a graph, we will use a ________________ with __________. Draw one.
2. What operation do you observe in your table? ______ Draw it in circles on each row.
3. Is the number given in the question represented by x or y? _______ Put it on your table.
4. Solve for the other variable.
5. Write your answer in a complete sentence using words from the story.

(b) How many kitties must there be if 80 pounds of kitty litter were ordered?

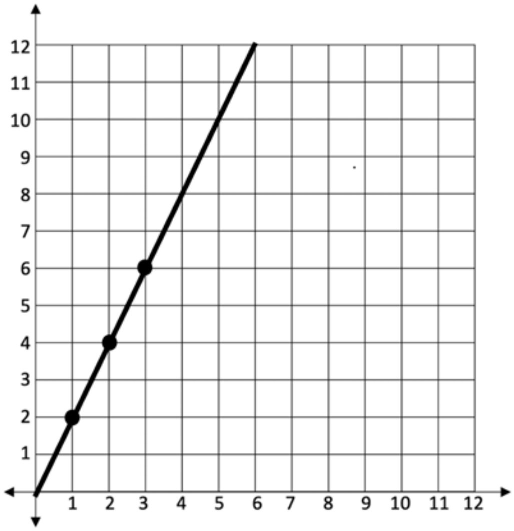
6. Is the number given in the question represented by x or y? _______ Put it on your table.
7. Solve for the other variable.
8. Write your answer in a complete sentence using words from the story.

Name: ______________________________________ G7 U2 Lesson 13 - Independent Work

Remember: You must make a table with words to answer questions about graphs.

Use the graph to answer the questions below. Show your work.

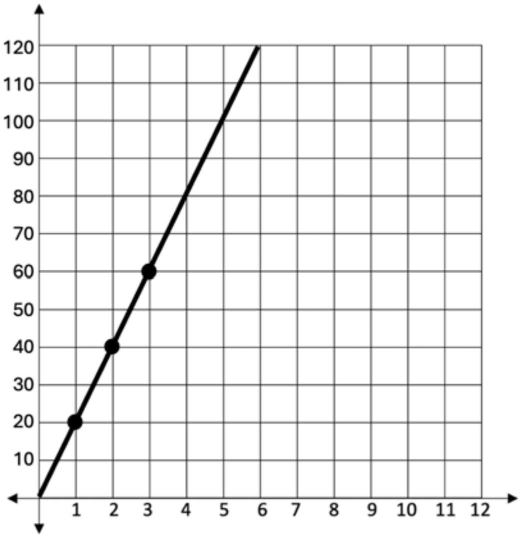
The graph below shows how much Whitney waters her garden based on the number of days it does not rain. Let x represent the days it does not rain and y represent the gallons of water Whitney uses.



1. How many gallons will Whitney use if it did not rain for 8 days?

2. How many days must it have not rained if Whitney uses 10 gallons of water?

Martin uses the graph below to determine how much to pay his employees based on how long they work. Let x represent the number of hours they work. Let y represent the number of dollars they get paid.

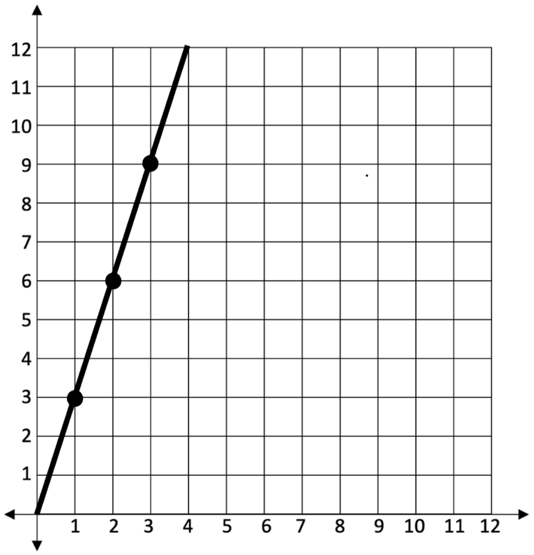


3. How much would Meryl need to pay the kid for 10 hours of raking?

4. How many hours of raking must have been done if Meryl paid $80?

Use the graph to answer the questions below. Show your work.

Charlie's Hat Shop uses the graph below to determine how many hats to buy for the teams in the Superbowl. Let x represent the number of boxes of away team hats. Let y represent the number of home team hats.

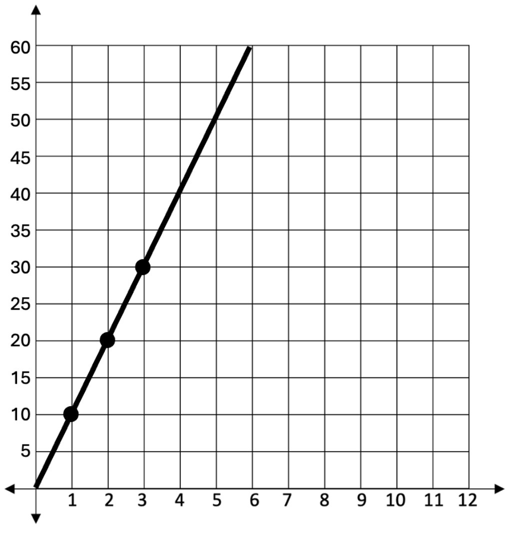


5. How many boxes of home team hats would Charlie buy if he planned to buy 5 boxes of away team hats?

6. How many boxes of away team hats would Charline buy if he planned to buy 4 boxes of home team hats?

7. How many boxes of away team hats would Charline buy if he planned to buy 100 boxes of home team hats?

The graph below shows how many months Julia must train based on the length of her upcoming race. Let x represent the length of the race in miles. Let y represent the number of days Julia must train.



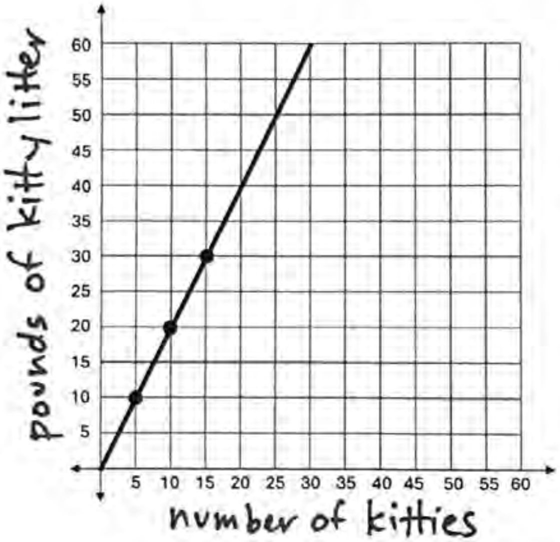
8. How long must the race be if Julia trained for 60 days?

9. How many days would Julia train for a 5 mile race?

10. How many days would Julia train for a 10 mile race?

Name: ANSWER KEY

Kathy's Kitty Shop uses the graph below to determine how many pounds of kitty litter they will need weekly based on the number of kitties available for adoption. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter.



(a) How many pounds of kitty litter would need to be ordered for 20 kitties?

1. Every time we want to answer a question about a graph, we will use a table with words. Draw one.

kitties		pounds of kitty litter
5	×2	10
10	×2	20
15	×2	30
20	×2	40

2. What operation do you observe in your table? ×2 Draw it in circles on each row.
3. Is the number given in the question represented by x or y? x Put it on your table.
4. Solve for the other variable.

$$y = 2x$$
$$y = 2 \cdot 20$$
$$\boxed{y = 40}$$

5. Write your answer in a complete sentence using words from the story.

20 kitties will need 40 pounds of kitty litter.

(b) How many kitties must there be if 80 pounds of kitty litter were ordered?

6. Is the number given in the question represented by x or y? y Put it on your table.
7. Solve for the other variable.

$$y = 2x$$
$$\frac{80}{2} = \frac{2x}{2}$$
$$\boxed{40 = x}$$

8. Write your answer in a complete sentence using words from the story.

If 80 pounds of kitty litter were ordered, there must be 40 kitties.

Name: ANSWER KEY

Remember: You must make a table with words to answer questions about graphs.

Use the graph to answer the questions below. Show your work.

The graph below shows how much Whitney waters her garden based on the number of days it does not rain. Let x represent the days it does not rain and y represent the gallons of water Whitney uses.

1. How many gallons will Whitney use if it did not rain for 8 days?

days of no rain	gallons of water
1 ×2	2
2 ×2	4
3 ×2	6
8 ×2	16

$y = 2x$

$y = 2 \cdot 8$

$\boxed{y = 16}$

2. How many days must it have not rained if Whitney uses 10 gallons of water?

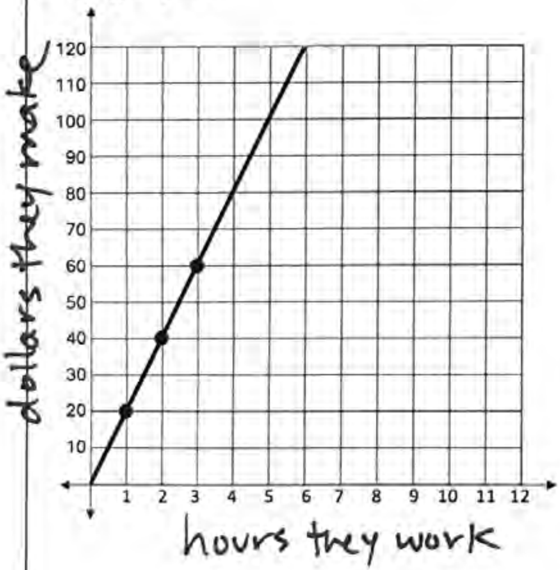
5 ×2	10

$y = 2x$

$\frac{10}{2} = \frac{2x}{2}$

$\boxed{5 = x}$

Martin uses the graph below to determine how much to pay his employees based on how long they work. Let x represent the number of hours they work. Let y represent the number of dollars they get paid.



3. How much would Meryl need to pay the kid for 10 hours of raking?

hours	dollars
1 ×20	20
2 ×20	40
3 ×20	60
10 ×20	200

$y = 20x$

$y = 20 \cdot 10$

$\boxed{y = 200}$

4. How many hours of raking must have been done if Meryl paid $80?

4 ×20	80

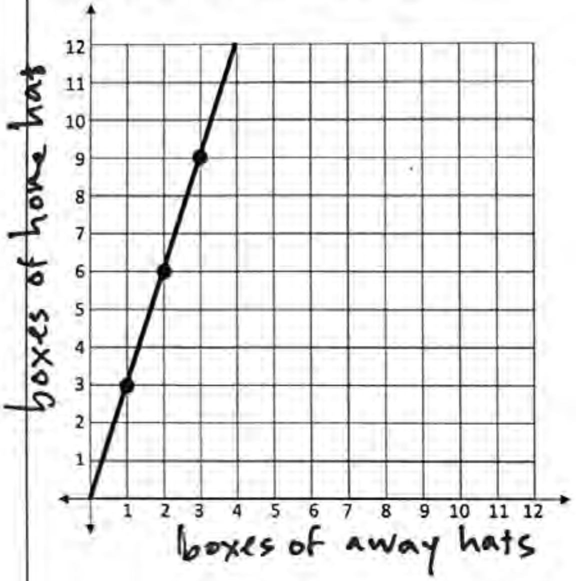
$y = 20x$

$\frac{80}{20} = \frac{20x}{20}$

$\boxed{4 = x}$

Use the graph to answer the questions below. Show your work.

Charlie's Hat Shop uses the graph below to determine how many hats to buy for the teams in the Superbowl. Let x represent the number of boxes of away team hats. Let y represent the number of home team hats.



5. How many boxes of home team hats would Charlie buy if he planned to buy 5 boxes of away team hats?

boxes of away hats	boxes of home hats
1 ×3	3
2 ×3	6
3 ×3	9
5 ×3	15

$y = 3x$

$y = 3 \cdot 5$

$\boxed{y = 15}$

6. How many boxes of away team hats would Charline buy if he planned to buy 4 boxes of home team hats?

$1\frac{1}{3}$ ×3	4

$y = 3x$

$\frac{4}{3} = \frac{3x}{3}$

$\boxed{1\frac{1}{3} = x}$

7. How many boxes of away team hats would Charline buy if he planned to buy 100 boxes of home team hats?

$33\frac{1}{3}$ ×3	100

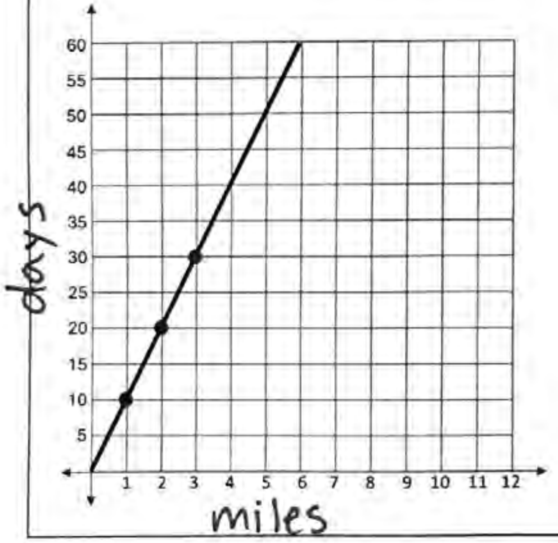
$y = 3x$

$\frac{100}{3} = \frac{3x}{3}$

$\boxed{33\frac{1}{3} = x}$

$$\begin{array}{r} 033 \\ 3\overline{)100} \\ -9\downarrow \\ 10 \\ -9 \\ 1 \end{array}$$

The graph below shows how many months Julia must train based on the length of her upcoming race. Let x represent the length of the race in miles. Let y represent the number of days Julia must train.



8. How long must the race be if Julia trained for 60 days?

miles	days
1 ×10	10
2 ×10	20
3 ×10	30
6 ×10	60

$y = 10x$

$\frac{60}{10} = \frac{10x}{10}$

$\boxed{6 = x}$

9. How many days would Julia train for a 5 mile race?

5 ×10	50

$y = 10x$

$y = 10 \cdot 5$

$\boxed{y = 50}$

10. How many days would Julia train for a 10 mile race?

10 ×10	100

$y = 10x$

$y = 10 \cdot 10$

$\boxed{y = 100}$

G7 U2 Lesson 14

Represent a proportional relationship in four different ways.

CITYTUTOR DC

G7 U2 Lesson 14 - Today we will use the constant of proportionality for more complicated proportion problems.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use the constant of proportionality for more complicated proportion problems. These ones are going to involve fractions. But that's no problem. We're still going to use the same ideas we've been using for this unit.

$$y=\frac{1}{2}\cdot 2$$

Let's Review (Slide 3): We will need to multiply, divide and simplify fractions for our work today. I want to show you the correct work for each of these. First it says, "Given the equation y equals one half x, what is y when x equals 2?" I am going to recopy the equation with a 2 in place of x so it is y equals one half times 2.

$$y=\frac{1}{2}\cdot\frac{2}{1}$$

When I am multiplying a fraction by a whole number, I can help myself see which numbers to multiply by putting a 1 under the whole number.

$$y=\frac{2}{2} \qquad \begin{array}{r} 1 \\ 2\overline{)2} \\ -2 \\ \hline 0 \end{array}$$

$$\boxed{y=1}$$

Now I multiply across like any normal fractions. 1 x 2 is 2 in the numerator and 2 x 1 is 2 in the denominator. I write it as y = 2 over 2, which is the same as 1 whole. That's because it's like saying, I have 2 pieces and it takes 2 pieces to make a whole pie. Hopefully this is reminding you of what you learned in 6th grade.

Let's do the next one. I will copy it over with 2 in place of the y this time. It would be 2 equals one half x. Now I want to get x by itself so I have to do the opposite operations to both sides. The opposite operation is division but another way to do the opposite is to do what division secretly is, multiplying by the reciprocal. Hopefully you learned that in sixth grade too.

$$2=\frac{1}{2}\cdot x$$

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

$$\boxed{4=x}$$

So to get rid of 1 over 2, I am going to multiply each side by 2 over 1.

The right side cancels out and on the left side, we are back to think of 2 as 2 over 1. That gives us 2 times 2 in the numerator and 1 times 1 in the denominator. 4 over 1 is 4.

$$\begin{array}{r} 1\frac{2}{4}=1\frac{1}{2} \\ 4\overline{)6} \\ -4 \\ \hline 2 \end{array}$$

Let's do the next one. It says, "how do we simplify 6 over 4?" This is called an improper fraction because the top is bigger than the bottom. The fraction sign is like a secret division symbol. So this is like 6 divided by 4. It goes in 1 time. Subtract 4 and there is 2 left. So we get 1 and 2 fourths. We can simplify this even more by dividing the top and bottom by the same number. In this case, I'll divide by 2 on the top and divide by 2 on the bottom. That's 1 and 1 half.

$$y=1\frac{1}{3}\cdot 2$$

$$y=\frac{4}{3}\cdot\frac{2}{1}$$

Okay, two more, this time we have mixed numbers because there is a whole number and a fraction. I rewrite the problem with 2 in place of x and get y equals one and one third times 2. But I can't really multiply this yet. I have to turn the mixed number into something more manageable. I think of 1 whole as a group of 3 or 1 times 3 so really there is 3 plus 1 on top. That's 4 thirds.

$$y=\frac{8}{3}$$

Now I can multiply like normal by putting that 1 under the 2. I multiply 4 x 2 is 8 for the top and 3 x 1 is 3 for the bottom. Y equals 8 thirds.

$2\frac{2}{3}$
$3\overline{)8}$
-6
2

Or I can divide this and then I will get 2 and 2 thirds.

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

$2 = \frac{4}{3}x$

$\cdot\frac{3}{4} \qquad \cdot\frac{3}{4}$

$\frac{6}{4} = x$

$\boxed{1\frac{1}{2} = x}$

Last one, I copy the equation with y equals 2. So 2 equals one and one third x. I can't do anything until I change this for a mixed number. That would be 2 equals 4 thirds x.

Now just like last time, I wanted to get rid of the fraction, I multiply by the reciprocal. I write times 3 fourths on this side and times 3 fourths on this side.

To multiply 3 fourths times 2, I put a 1 under the 2 and now I have 3 times 2 is 6 on top and 4 times 1 is 4 on the bottom. I get 6 fourths.

$1\frac{2}{4} = 1\frac{1}{2}$
$4\overline{)6}$
-4
2

Or I can divide this and then I will get 1 and 2 fourths.

This is actually the hardest part of our work. The rest are ideas that you've already learned. This stuff is also review but it might be a little rusty because it has been a while. That's okay. I can remind you if you get stuck.

Let's Review (Slide 4): One other thing we can review is that we use the constant of proportionality to find other pairs on a table or graph. This is a problem from your practice page in our last lesson with a different question. Let's review. Read silently with your eyes while I read out loud. "Kathy's Kitty Shop uses the graph below to determine how many pounds of kitty litter they will need weekly based on the number of kitties available for adoption. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter. How many pounds of kitty litter would we buy for 4 kitties?" We always make a table for this kind of problem. I am going to write x and y with kitties for x and pounds for y.

Kitties	pounds
5	10
10	20
15	30

I see 5 for kitties and 10 for pounds. I see 10 for kitties and 20 for pounds. I see 15 for kitties and 30 for pounds.

Kitties	pounds
5 ×2	10
10 ×2	20
15 ×2	30

Now here's the thing, for this problem and the other problems we've been doing up to now, the operation really jumps out at you. It is kind of obvious that it is "times 2" because 5 times 2 is 10 and 10 times 2 is 20 and so on. But if I didn't know what number to do, that's okay. I can divide to find the constant of proportionality. Even though we know it's true, let me know you because you're going to need it when the numbers get harder.

02
$5\overline{)10}$
-10
00

02
$10\overline{)20}$
-20
00

I will do y divided by x so 10 divided by 5. That's 2. That's what we said it would be! Let's do another. 20 divided by 10. That's 2.

Kitties	pounds
5 ×2	10
10 ×2	20
15 ×2	30
4 ×2	8

So when I put 4 kitties on the graph, I am going to use that same constant of proportionality. 4 times 2 is 8.

$y = 2x$

$y = 2 \cdot 4$

$\boxed{y = 8}$

Or if I need to, I can think of it like an equation, y = 2x. Then I plug in 4 to get y = 2 times 4 and y equals 8.

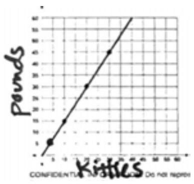
This is maybe the only brand new idea for today, and it is something I want you to pay attention to. When we find the constant of proportionality, it is actually another point on the graph. The constant of proportionality is y when x is 1. That's because we divided y by the number of x and now we just have 1 group of x.

The constant of proportionality is y when x is 1.

Kitties	pounds
5 ×2	10
10 ×2	20
15 ×2	30
4 ×2	8
1 ×2	2

In this case, we can put another line on our table. X is 1 and y is the constant of proportionality, 2.

Let's Talk (Slide 5): Now we're going to explore this same idea with fractional answers. This says, "When the constant of proportionality is not obvious, we have to divide to find it." This is what we just reviewed on the last slide. Sometimes the operation on the graph isn't going to be obvious and we'll have to do some number crunching to figure it out. Here's an example. Read along with my silently while I read out loud. "Let's imagine the numbers were a little different… Kathy's Kitty Shop decides to this new graph. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter. How many pounds of kitty litter would we buy for 4 kitties?" Let's label our axes again.



Kitties	pounds
10	15
20	30
30	45

We know we need to make a table. I see 10 on x and 15 on y. Then I see 20 on x and 30 on y. Then I see 30 on x and 45 on y. By the way, I can also put (0,0) on here. But there isn't an obvious operation for each row here. I can't think of 10 times what to make 15 or 20 times what to make 30. So it is going to be really hard to figure out 4 kitties.

$$0\,1\tfrac{5}{10} = 1\tfrac{1}{2}$$
$$10\overline{)15}$$
$$\underline{-10}$$
$$5$$

I am going to divide to find the constant of proportionality. 15 divided by 10 is 1 then subtract 10 and have 5 left over. So I get 1 and 5 tenths. I am going to divide the top by 5 and the bottom by 5. This is really 1 and 1 half.

The constant of proportionality is y when x is 1.

Kitties	pounds
10 ×$1\frac{1}{2}$	15
20 ×$1\frac{1}{2}$	30
30 ×$1\frac{1}{2}$	45
1 ×$1\frac{1}{2}$	$1\frac{1}{2}$

Now remember, the constant of proportionality is y when x is 1.

So I can put this right here on my table and I can fill in the circles for each row now.

Kitties	Pounds
10 $\times 1\frac{1}{2}$	15
20 $\times 1\frac{1}{2}$	30
30 $\times 1\frac{1}{2}$	45
1 $\times 1\frac{1}{2}$	$1\frac{1}{2}$
4 $\times 1\frac{1}{2}$	

And now I can put 4 on my table and see that I have to multiply 4 times 1 and 1 half.

$$y = 1\tfrac{1}{2}x$$
$$y = 1\tfrac{1}{2} \cdot 4$$
$$y = \tfrac{3}{2} \cdot 4$$
$$y = \tfrac{12}{2} = 6$$

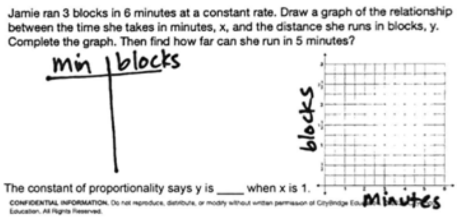
I also can make an equation if I want to. It would be y equals 1 and 1 half times x. So when I plug in 4, I see I have to do 1 and 1 half times 4.

Let's remember what we said at the beginning about multiplying by a mixed number. We have to change 1 and 1 half into 3 halves. That's because we have 1 whole which is 1 group of 2 halves plus 1 half. That's 3 halves. So this is really y equals 3 halves times 4. Now I can do the math with a 1 under the 4. 3 times 4 is 12. 1 times 1 is 2. I get 12 over 2 which is like 12 divided by 2, which is 6.

Kitties	Pounds
10 $\times 1\frac{1}{2}$	15
20 $\times 1\frac{1}{2}$	30
30 $\times 1\frac{1}{2}$	45
1 $\times 1\frac{1}{2}$	$1\frac{1}{2}$
4 $\times 1\frac{1}{2}$	6

Let's put that on the table and graph.

Let's Think (Slide 6): If the graph isn't provided for us, we can use the origin to make a graph from a story. Read along silently with your eyes while I read out loud. "Jamie ran 3 blocks in 6 minutes at a constant rate. Draw a graph of the relationship between the time she takes in minutes, x, and the distance she runs in blocks, y. Complete the graph. Then how far can she run in 5 minutes?" Let's start with the meaning of x and y. I can put minutes on the graph for x and blocks on the graph for y. On my table, it's the same minutes for x and blocks for y.



Jamie ran 3 blocks in 6 minutes at a constant rate. Draw a graph of the relationship between the time she takes in minutes, x, and the distance she runs in blocks, y. Complete the graph. Then find how far can she run in 5 minutes?

min	blocks

The constant of proportionality says y is ____ when x is 1.

min	blocks
0	0

Now since this is a "constant rate," I know it's a proportion so I can put 0 and 0 on the table for the origin and I can make that a point on my graph too.

min	blocks
0	0
6	3

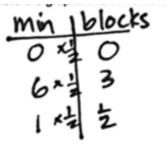
The story says 3 blocks in 6 minutes. So I am going to put 6 for x and 3 for y, and I can make that point on my graph too.

$$0\tfrac{3}{6} = \tfrac{1}{2}$$
$$6\overline{)3}$$
$$-0$$
$$3$$

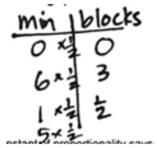
Now, remember that we have to divide to find the constant of proportionality. That's 3 divided by 6. 6 doesn't go into 3. So we get 0 with a remainder of 3. That's 3 sixths. I can simplify that to 1 half.

The constant of proportionality is y when x is 1.

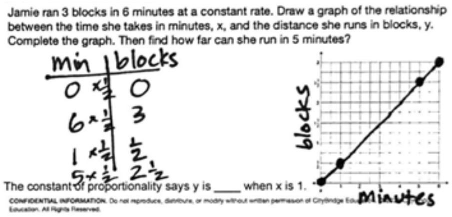
Remember, the constant of proportionality is y when x is 1.



So we can put that on our table. It’s 1 and 1 half. I can graph that too.



And now I know that the equation for this table is y equals 1 half x. I am finally ready to answer the question. Notice how much work I had to do before jumping into solving the problem. There was this secret hidden constant of proportionality that I had to find before I even dealt with the 5 minutes. Okay, so 5 minutes goes on the graph under x. Now I can plug it into the equation. I get y equals 1 half times 5. I put a 1 under the 5. I get y equals 5 over 2. I do some division on the side. 2 goes into 5 two times. I subtract 4 and have 1 left. So it is 1 and 1 half.


Jamie ran 3 blocks in 6 minutes at a constant rate. Draw a graph of the relationship between the time she takes in minutes, x, and the distance she runs in blocks, y. Complete the graph. Then find how far can she run in 5 minutes?

The constant of proportionality says y is ____ when x is 1.

Now I can put that on the table and I can graph that too.

Let’s Try It (Slide 7): Now let’s try another one of these together. I will lead you through step by step.

WARM WELCOME

Today we will use the constant of proportionality for more complicated proportion problems.

Let's Review: We will need to multiply, divide and simplify fractions for our work today.

Given the equation $y = \frac{1}{2}x$, what is y when x = 2?

Given the equation $y = \frac{1}{2}x$, what is y when y = 2?

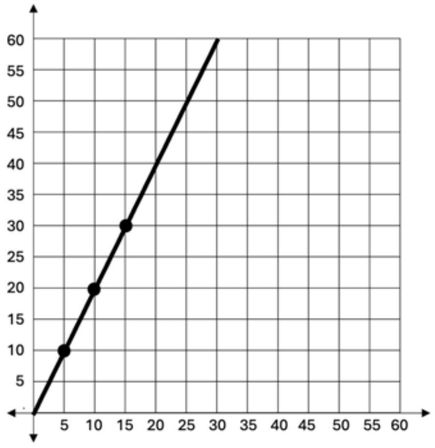
How do we simplify $\frac{6}{4}$?

Given the equation $y = 1\frac{1}{3}x$, what is y when x = 2?

Given the equation $y = 1\frac{1}{3}x$, what is y when y = 2?

Let's Review: We use the constant of proportionality to find other pairs on a table or graph.

Kathy's Kitty Shop uses the graph below to determine how many pounds of kitty litter they will need weekly based on the number of kitties available for adoption. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter.

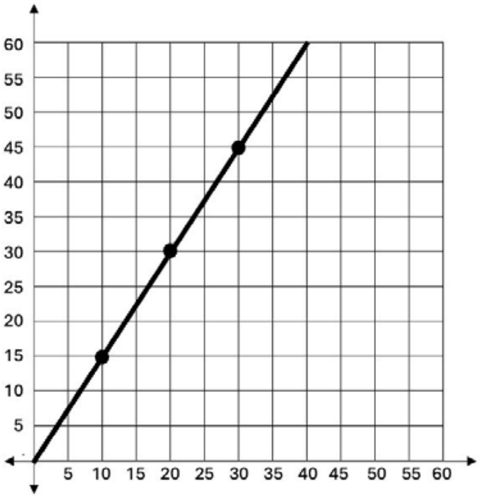


How many pounds of kitty litter would we buy for 4 kitties?

The constant of proportionality is y when x is ____.

Let’s Talk: When the constant of proportionality is not obvious, we have to divide to find it.

Let’s imagine the numbers were a little different…. Kathy’s Kitty Shop decides to this new graph. Let x represent the number of kitties. Let y represent the number of pounds of kitty litter.

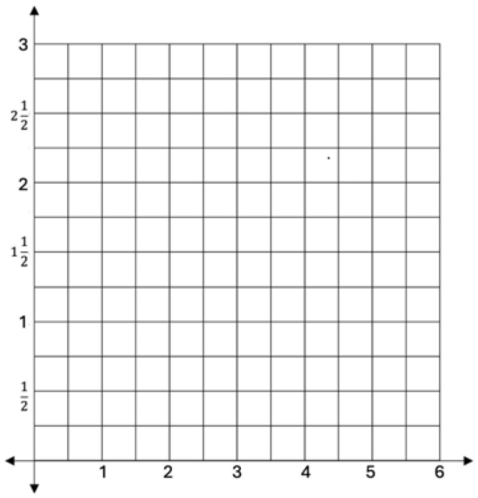


How many pounds of kitty litter would we buy for 4 kitties?

The constant of proportionality is y when x is ____.

Let’s Think: We can use the origin to make a graph from a story.

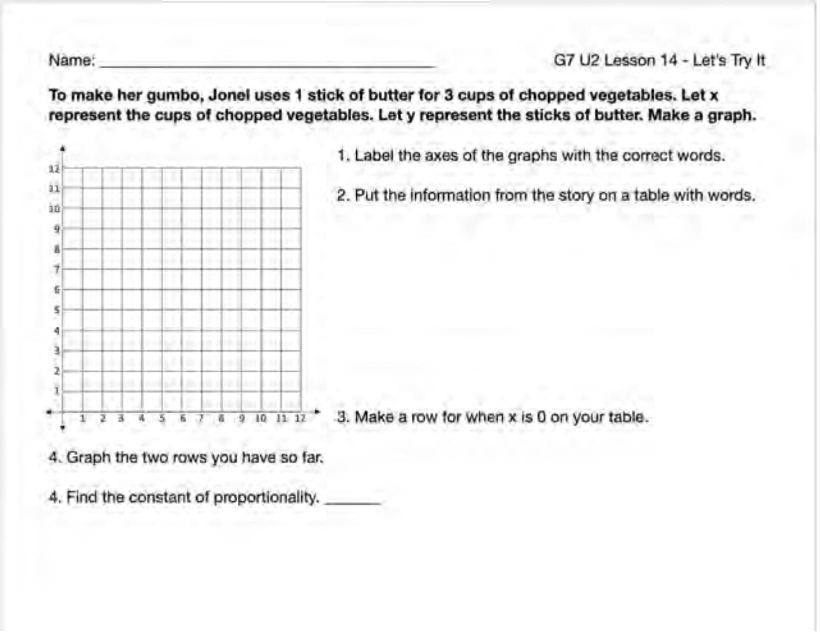
Jamie ran 3 blocks in 6 minutes at a constant rate. Draw a graph of the relationship between the time she takes in minutes, x, and the distance she runs in blocks, y. Complete the graph. Then how far can she run in 5 minutes?



The constant of proportionality is y when x is ____.

Let's Try It:

We will do it together step by step!



Name: ______________________________ G7 U2 Lesson 14 - Let's Try It

To make her gumbo, Jonel uses 1 stick of butter for 3 cups of chopped vegetables. Let x represent the cups of chopped vegetables. Let y represent the sticks of butter. Make a graph.

1. Label the axes of the graphs with the correct words.

2. Put the information from the story on a table with words.

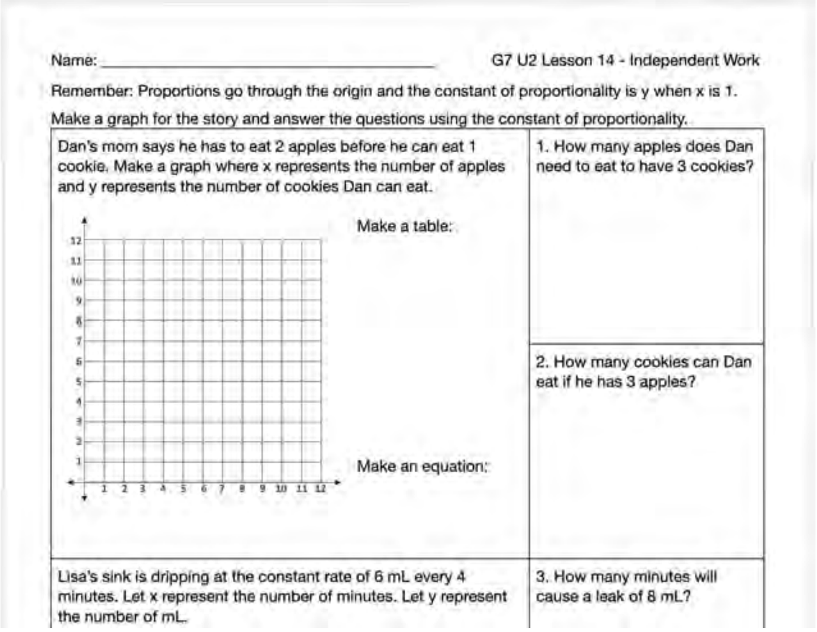
3. Make a row for when x is 0 on your table.

4. Graph the two rows you have so far.

4. Find the constant of proportionality. ______

On your Own:

Now it's time for you to do it on your own.



Name: ______________________________ G7 U2 Lesson 14 - Independent Work

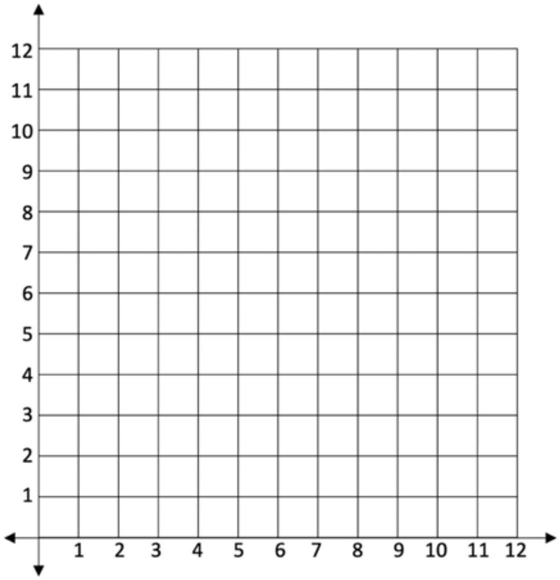
Remember: Proportions go through the origin and the constant of proportionality is y when x is 1.

Make a graph for the story and answer the questions using the constant of proportionality.

Dan's mom says he has to eat 2 apples before he can eat 1 cookie. Make a graph where x represents the number of apples and y represents the number of cookies Dan can eat. Make a table: Make an equation:	1. How many apples does Dan need to eat to have 3 cookies?
	2. How many cookies can Dan eat if he has 3 apples?
Lisa's sink is dripping at the constant rate of 6 mL every 4 minutes. Let x represent the number of minutes. Let y represent the number of mL.	3. How many minutes will cause a leak of 8 mL?

Name: ______________________________________ G7 U2 Lesson 14 - Let’s Try It

To make her gumbo, Jonel uses 1 stick of butter for 3 cups of chopped vegetables. Let x represent the cups of chopped vegetables. Let y represent the sticks of butter. Make a graph.



1. Label the axes of the graphs with the correct words.

2. Put the information from the story on a table with words.

3. Make a row for when x is 0 on your table.

4. Graph the two rows you have so far.

4. Find the constant of proportionality. _______

5. The constant of proportionality is y when x equals ______. Put the constant of proportionality on the table.

6. Write an equation with your constant of proportionality. ________________________

How many sticks of butter will Jonel need for 5 cups of vegetables?

7. Is the number given in the question represented by x or y? _______ Put it on your table.

8. Solve for the other variable.

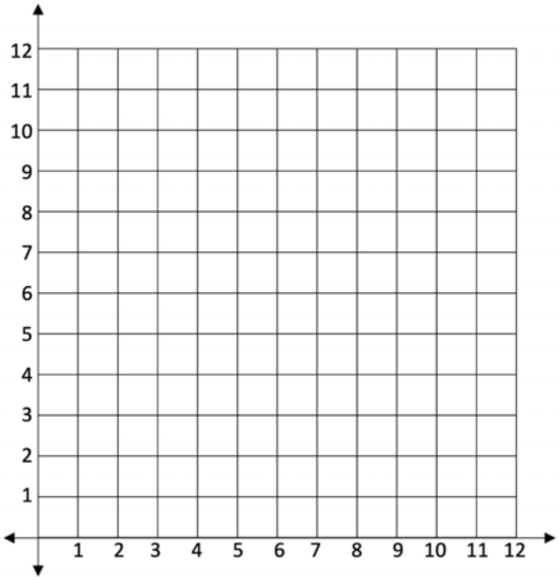
9. Write your answer in a complete sentence using words from the story.

Name: ______________________________________ G7 U2 Lesson 14 - Independent Work

Remember: Proportions go through the origin and the constant of proportionality is y when x is 1.

Make a graph for the story and answer the questions using the constant of proportionality.

Dan's mom says he has to eat 2 apples before he can eat 1 cookie. Make a graph where x represents the number of apples and y represents the number of cookies Dan can eat.



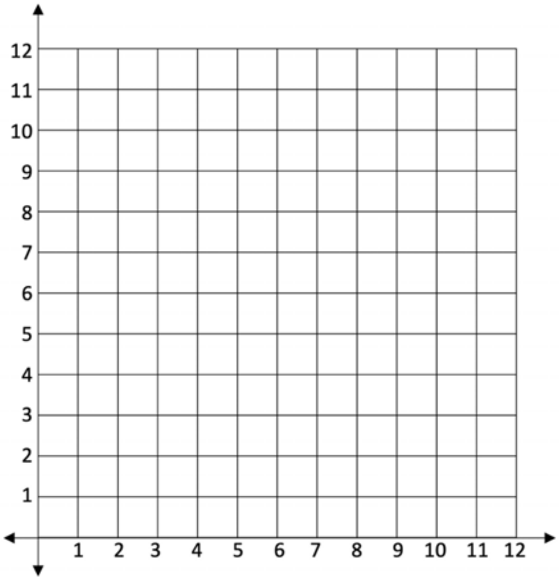
Make a table:

Make an equation:

1. How many apples does Dan need to eat to have 3 cookies?

2. How many cookies can Dan eat if he has 3 apples?

Lisa's sink is dripping at the constant rate of 6 mL every 4 minutes. Let x represent the number of minutes. Let y represent the number of mL.



Make a table:

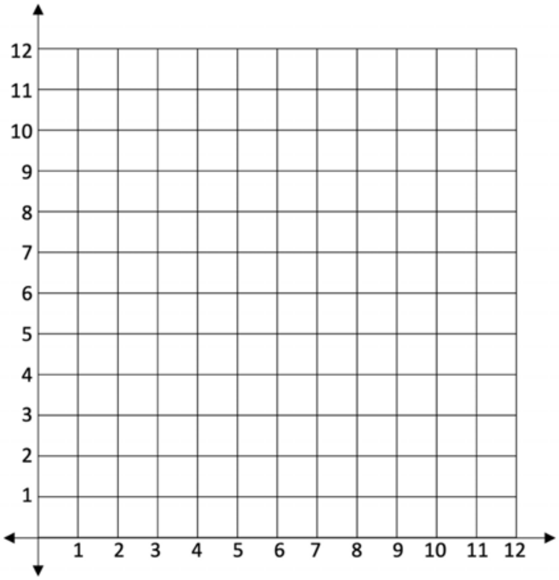
Make an equation:

3. How many minutes will cause a leak of 8 mL?

4. How much water will drip over 5 minutes?

Make a graph for the story and answer the questions using the constant of proportionality.

Dan uses 1 jar of sauce for every 2 pounds of pasta that he cooks. Let x represent the number of pounds of pasta. Let y represent the number of jars of sauce.



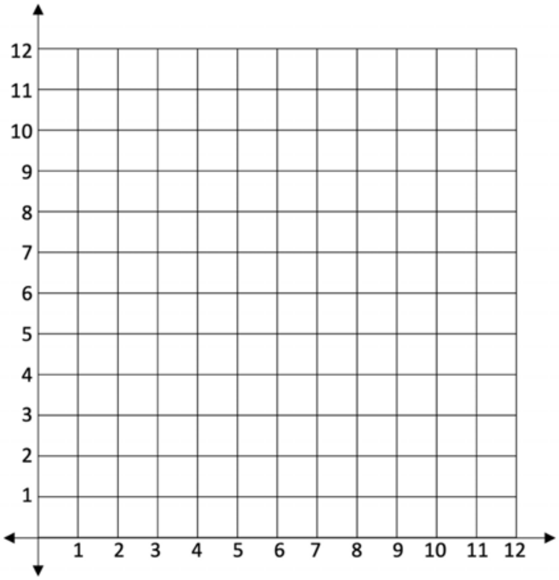
Make a table:

Make an equation:

5. How many jars of sauce will Dan use for 5 pounds of pasta?

6. How many pounds of pasta would Dan use for 3 jars of sauce?

Lisa spends 5 hours to edit 4 pages of her writing. Let x represent the number of pages. Let y represent the number of hours Lisa spends editing.



Make a table:

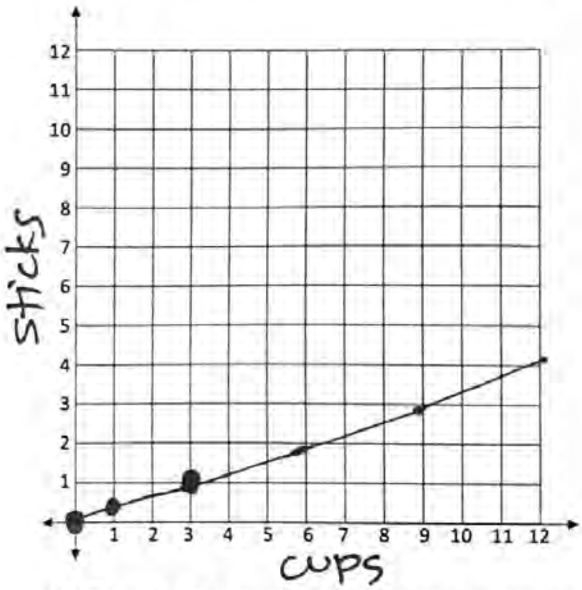
Make an equation:

7. How long will Lisa spend editing 10 pages?

8. How many pages can Lisa edit in 4 hours?

Name: ANSWER KEY

To make her gumbo, Jonel uses 1 stick of butter for 3 cups of chopped vegetables. Let x represent the cups of chopped vegetables. Let y represent the sticks of butter. Make a graph.



1. Label the axes of the graphs with the correct words.

2. Put the information from the story on a table with words.

cups	sticks
0 $\times\frac{1}{3}$	0
3 $\times\frac{1}{3}$	1
1 $\times\frac{1}{3}$	$\frac{1}{3}$

3. Make a row for when x is 0 on your table.

4. Graph the two rows you have so far.

4. Find the constant of proportionality. $\frac{1}{3}$

$$\begin{array}{r} 0\frac{1}{3} \\ 3\overline{)1} \\ -0 \\ \hline 1 \end{array}$$

5. The constant of proportionality is y when x equals 1. Put the constant of proportionality on the table.

6. Write an equation with your constant of proportionality. $y = \frac{1}{3}x$

How many sticks of butter will Jonel need for 5 cups of vegetables?

7. Is the number given in the question represented by x or y? X Put it on your table.

8. Solve for the other variable.

$$\begin{array}{r} 1\frac{2}{3} \\ 3\overline{)5} \\ -3 \\ \hline 2 \end{array}$$

$$y = \frac{1}{3}x$$

$$y = \frac{1}{3} \cdot \frac{5}{1}$$

$$\boxed{y = \frac{5}{3} = 1\frac{2}{3}}$$

9. Write your answer in a complete sentence using words from the story.

If Jonel cooks 5 cups of vegetables, she will need $1\frac{2}{3}$ sticks of butter.

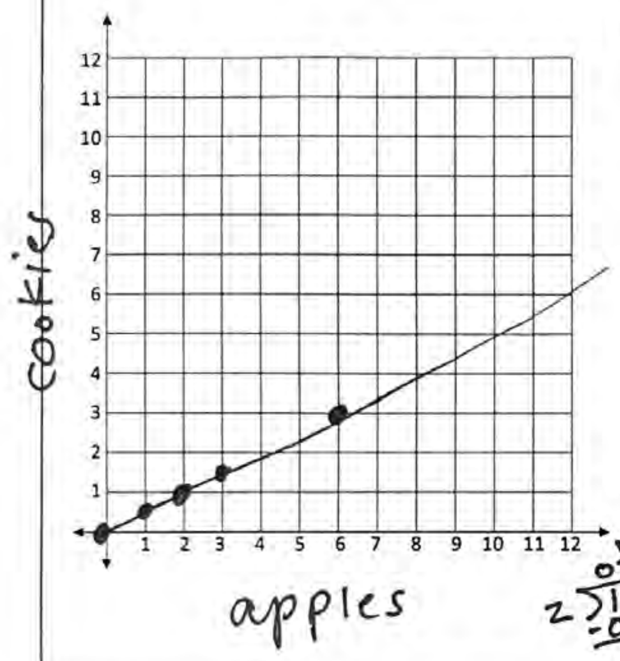
Name: ANSWER KEY

G7 U2 Lesson 14 - Independent Work

Remember: Proportions go through the origin and the constant of proportionality is y when x is 1.

Make a graph for the story and answer the questions using the constant of proportionality.

Dan's mom says he has to eat 2 apples before he can eat 1 cookie. Make a graph where x represents the number of apples and y represents the number of cookies Dan can eat.



Make a table:

apples	cookies
0	0
2 ×½	1
1 ×½	½
6 ×½	3
3 ×½	1½

0½
2)1
-0
1

Make an equation:

$y = \frac{1}{2}x$

1. How many apples does Dan need to eat to have 3 cookies?

$y = \frac{1}{2}x$

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

$\cdot\frac{2}{1} \quad \cdot\frac{2}{1}$

$\boxed{\frac{6}{1} = x}$

2. How many cookies can Dan eat if he has 3 apples?

$y = \frac{1}{2}x$

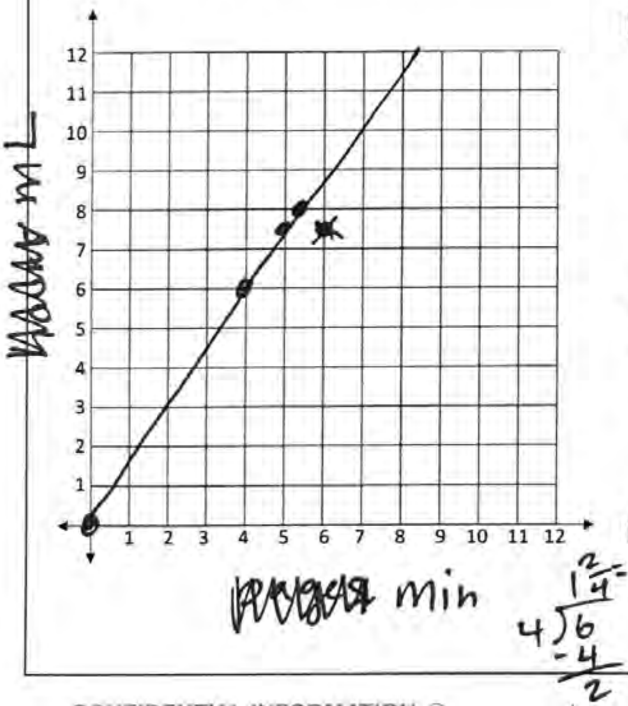
$y = \frac{1}{2} \cdot \frac{3}{1}$

$y = \frac{3}{2}$

$\boxed{y = 1\frac{1}{2}}$

1½
2)3
-2
1

Lisa's sink is dripping at the constant rate of 6 mL every 4 minutes. Let x represent the number of minutes. Let y represent the number of mL.



Make a table:

min	mL
4 ×1½	6
0 ×1½	0
5⅓ ×1½	8
5 ×1½	7½

Make an equation:

1 2/4 = 1½
4)6
-4
2

$y = 1\frac{1}{2}x$

3. How many minutes will cause a leak of 8 mL?

$y = 1\frac{1}{2}x$

$8 = \frac{3}{2}x$

$\cdot\frac{2}{3} \quad \cdot\frac{2}{3}$

$\frac{16}{3} = x$

$\boxed{5\frac{1}{3} = x}$

05⅓
3)16
-15
1

4. How much water will drip over 5 minutes?

$y = 1\frac{1}{2}x$

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

$y = \frac{3}{2} \cdot \frac{5}{1}$

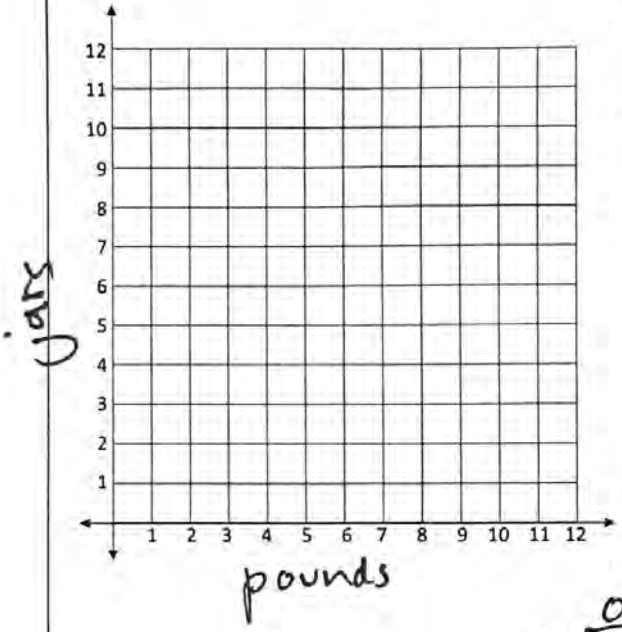
$y = \frac{15}{2}$

$\boxed{y = 7\frac{1}{2}}$

07½
2)15
-14
1

Make a graph for the story and answer the questions using the constant of proportionality.

Dan uses 1 jar of sauce for every 2 pounds of pasta that he cooks. Let x represent the number of pounds of pasta. Let y represent the number of jars of sauce.



Make a table:

pounds	jars
0 ×$\frac{1}{2}$	0
2 ×$\frac{1}{2}$	1
5 ×$\frac{1}{2}$	$2\frac{1}{2}$
6 ×$\frac{1}{2}$	3

Make an equation:

$$y = \frac{1}{2}x$$

$$\begin{array}{r} 0\frac{1}{2} \\ 2\overline{)1} \\ -0 \\ \hline 1 \end{array}$$

5. How many jars of sauce will Dan use for 5 pounds of pasta?

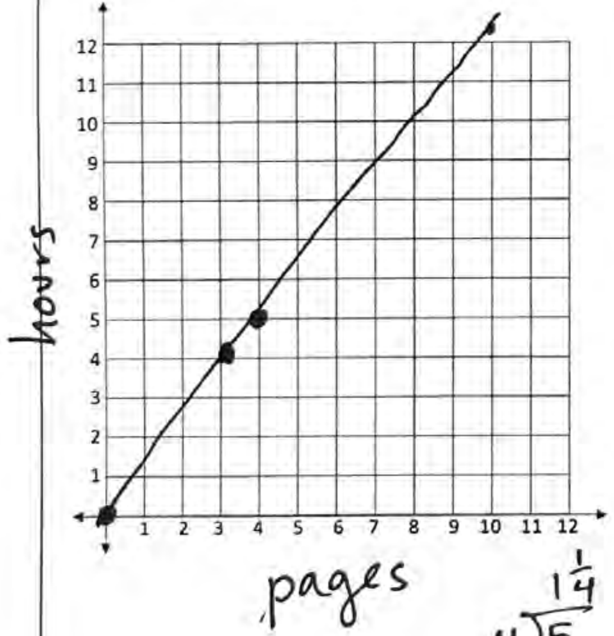
$$y = \frac{1}{2}x$$
$$y = \frac{1}{2} \cdot \frac{5}{1}$$
$$y = \frac{5}{2}$$
$$\boxed{y = 2\frac{1}{2}}$$

$$\begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \\ -4 \\ \hline 1 \end{array}$$

6. How many pounds of pasta would Dan use for 3 jars of sauce?

$$y = \frac{1}{2}x$$
$$3 = \frac{1}{2}x$$
$$\cdot\frac{2}{1} \qquad \cdot\frac{2}{1}$$
$$\frac{6}{1} = x$$
$$\boxed{6 = x}$$

Lisa spends 5 hours to edit 4 pages of her writing. Let x represent the number of pages. Let y represent the number of hours Lisa spends editing.



Make a table:

pages	hours
4 ×$1\frac{1}{4}$	5
0 ×$1\frac{1}{4}$	0
10 ×$1\frac{1}{4}$	$12\frac{1}{2}$
$3\frac{1}{5}$ ×$1\frac{1}{4}$	4

Make an equation:

$$y = 1\frac{1}{4} \cdot x$$

$$\begin{array}{r} 1\frac{1}{4} \\ 4\overline{)5} \\ -4 \\ \hline 1 \end{array}$$

7. How long will Lisa spend editing 10 pages?

$$y = 1\frac{1}{4} \cdot x$$
$$y = \frac{5}{4} \cdot \frac{10}{1}$$
$$y = \frac{50}{4}$$
$$\boxed{y = 12\frac{2}{4} = 12\frac{1}{2}}$$

$$\begin{array}{r} 1\ 2\frac{2}{4} \\ 4\overline{)50} \\ -4 \\ \hline 10 \\ -8 \\ \hline 2 \end{array}$$

8. How many pages can Lisa edit in 4 hours?

$$y = 1\frac{1}{4} \cdot x$$
$$4 = \frac{5}{4}x$$
$$\frac{4}{5}\cdot \qquad \cdot\frac{4}{5}$$
$$\frac{16}{5} = x$$
$$\boxed{3\frac{1}{5} = x}$$

$$\begin{array}{r} 03 \\ 5\overline{)16} \\ -15 \\ \hline 1 \end{array}$$

G7 U2 Lesson 15

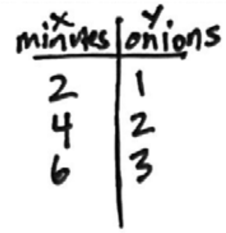
Interpret and compare the same proportional relationship using two different sets of tables, graphs, and equations.

G7 U2 Lesson 15 - Today we will find and compare rates.

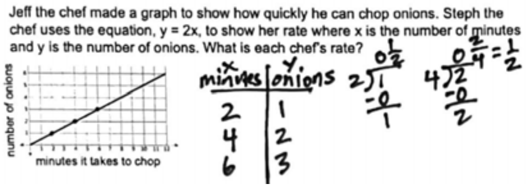
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will find and compare rates. We are going to make sure we use the correct language to describe the rate and then we just put together all the things we've learned in the rest of the unit. Let's go!

Let's Review (Slide 3): We know the constant of proportionality is the unit rate for each proportion on a graph, table or equation. We learned that at the very beginning of this unit when we were learning what proportions even were. This says, "Jeff the chef made a graph to show how quickly he can chop onions. Steph the chef uses the equation, y = 2x, to show her rate. What is each chef's rate?" Let's start by finding the rate or constant of proportionality for Jeff. You already know how to do this. We make a table to start. X is minutes and y is onions. I will fill it in with the numbers. The first point is 2 minutes and 1 onion. The next point is 4 minutes and 2 onions. The next point is 6 minutes and 3 onions.



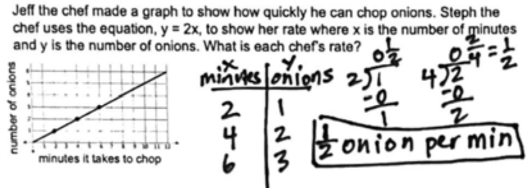
x minutes	y onions
2	1
4	2
6	3



Jeff the chef made a graph to show how quickly he can chop onions. Steph the chef uses the equation, y = 2x, to show her rate where x is the number of minutes and y is the number of onions. What is each chef's rate?

x minutes	y onions
2	1
4	2
6	3

To find the constant of proportionality, we divide each row, y divided by x. 1 divided by 2 is really 0. But then I take that remainder and turn it into a fraction. It's one half.

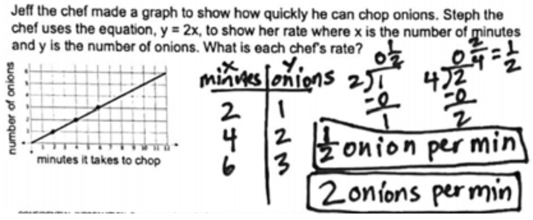


Jeff the chef made a graph to show how quickly he can chop onions. Steph the chef uses the equation, y = 2x, to show her rate where x is the number of minutes and y is the number of onions. What is each chef's rate?

x minutes	y onions
2	1
4	2
6	3

$\frac{1}{2}$ onion per min

All these rows should be the same. That's why it is called a CONSTANT. But let's just check the next row. 2 divided by 4 is also zero. The remainder becomes two fourths. I can simplify that fraction by dividing the top and bottom by two and I see it is equivalent to one half. Now, this is the big idea of today's lesson - the words that go with this rate are really important so that we know what we're talking about. Y divided by x means onions divided by minutes so this means Jeff can chop half an onion per minute.



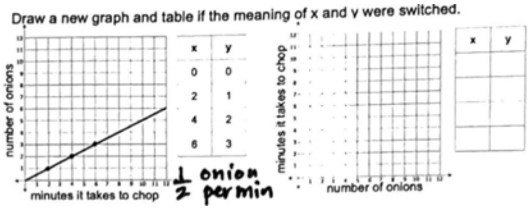
Jeff the chef made a graph to show how quickly he can chop onions. Steph the chef uses the equation, y = 2x, to show her rate where x is the number of minutes and y is the number of onions. What is each chef's rate?

x minutes	y onions
2	1
4	2
6	3

$\frac{1}{2}$ onion per min

2 onions per min

Let's do Steph's rate. She uses the equation y = 2x. This is actually soooo easy because the constant of proportionality is right there in the problem. It is 2. But again, the words matter. Y is onions divided by x, which is minutes. So she can chop 2 onions per minute. It is helpful to know the two people's rate because now we can figure out who is faster. Jeff can chop half an onion every minute. Steph can chop two onions every minute. Steph is faster.



Draw a new graph and table if the meaning of x and y were switched.

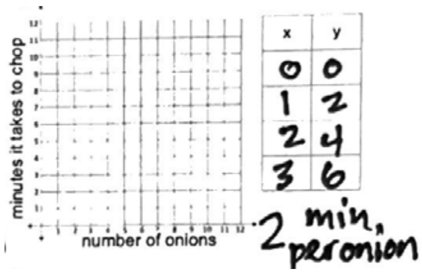
x	y
0	0
2	1
4	2
6	3

$\frac{1}{2}$ onion per min

x	y

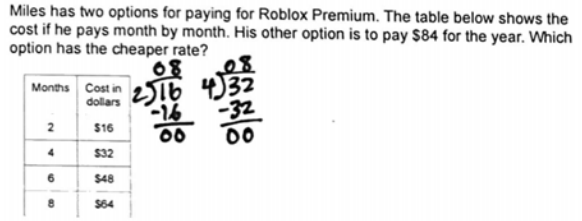
Let's Talk (Slide 4): If we switch the meaning of the x and y axis, we switch the meaning of the constant of proportionality or unit rate. So we have to be super duper careful that we pay attention to what is y and what is x because the rate is y divided by x or y per x. Let me show you what I mean. We just used this graph on the previous slide so the table is already filled in. We found the unit rate was half an onion per minute.

Now it says, “Draw a new graph and table if the meaning of x and y were switched. And you can see on the second graph that now x is the number of onions and y is the number of minutes. I am just going to flip the order of the numbers in each row. Let’s find the new unit rate. I know I divide the row. This time it’s 2 divided by 1, which is 2. The next row is 4 divided by 2, which is 2. So the unit rate or the constant of proportionality here is 2. Our final question asks, “What is the new meaning of the unit rate?” It’s not 2 onions per minute. That was when we divided onions by minutes on the last graph. In this graph we divided minutes by onions. So it is 2 minutes per onion.



You can hear how we get different pieces of information. The first graph tells us how many onions if we were to set a timer for 1 minute - like a race against the clock. The second graph tells us how many minutes for 1 onion. So I can plan how long 1 onion will take. This brings up back to the main idea for today: the words we use for a rate are very important. But now we see it is not just the words but the order of the words. Onions per minute is not the same as minutes per onion. We’re going to have to be very careful moving forward.

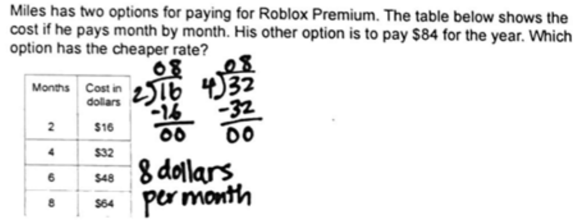
Let’s Think (Slide 5): We can compare rates if they are set up with the same units. So now that we understand that means the words AND the order of the words. Let’s solve this problem together. Read along with me while I read the problem out loud. *Read the word problem.* Let’s start by finding the rate for the table. We know we can divide each row. We will divide 16 by 2 and get 8. We will divide $32 by 4 and get 8. You see what’s happening here.



Miles has two options for paying for Roblox Premium. The table below shows the cost if he pays month by month. His other option is to pay $84 for the year. Which option has the cheaper rate?

Months	Cost in dollars
2	$16
4	$32
6	$48
8	$64

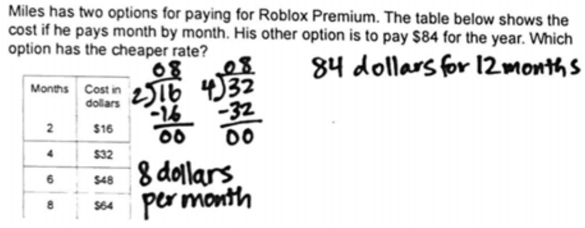
The rate is 8. But 8 what?!?!? It’s 8 dollars per month because y was dollars and x was months and we divided y by x.



Miles has two options for paying for Roblox Premium. The table below shows the cost if he pays month by month. His other option is to pay $84 for the year. Which option has the cheaper rate?

Months	Cost in dollars
2	$16
4	$32
6	$48
8	$64

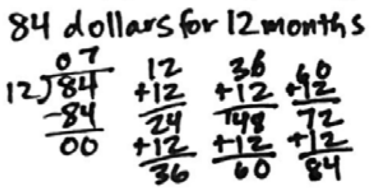
Now let’s figure out the other option. It says that “his other option is to pay $84 for the year.” If our first rate is dollars per month, it is super helpful to have another rate in dollars per year. We need this one to be in dollars per month too. I am going to translate this to $84 for 12 months because that’s how many months are in a year.

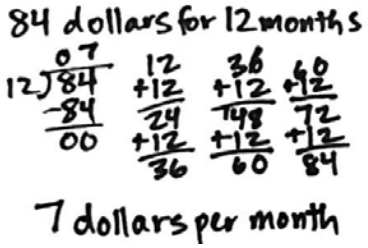


Miles has two options for paying for Roblox Premium. The table below shows the cost if he pays month by month. His other option is to pay $84 for the year. Which option has the cheaper rate?

Months	Cost in dollars
2	$16
4	$32
6	$48
8	$64

Now I can find the unit rate with division. 84 divided by 12. 12 doesn’t go into 8. If I don’t know how many times it goes into 84, I can add it up on the side of my paper. 12 plus 12 is 24. 24 plus 12 is 36. 36 plus 12 is 48. 48 plus 12 is 60. 60 plus 12 is 72. 72 plus 12 is 84. There we go! I count those up and I have 7 twelves.





The rate if Miles pays for the whole year is 7. But we need words! We divided dollars by months so it’s 7 dollars per month.

We can compare these because BOTH of them are now written in dollars per month. We see that paying for the whole year is cheaper than paying month by month like on the table. That is often the case, by the way. Companies will often give a discount when people commit to paying for a longer amount of time.

Let’s Try It (Slide 6): Now we will work through some problems together. I will take you through step by step.

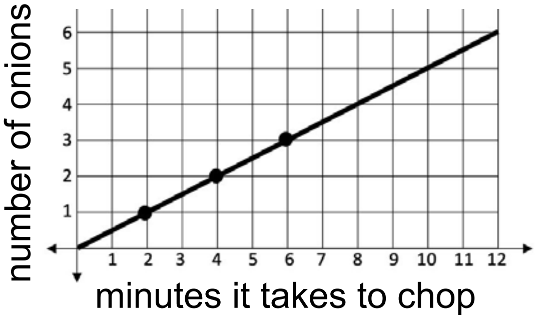
WARM WELCOME

Today we will find and compare rates.

Let's Review:

We know the constant of proportionality is the unit rate for each proportion on a graph, table or equation.

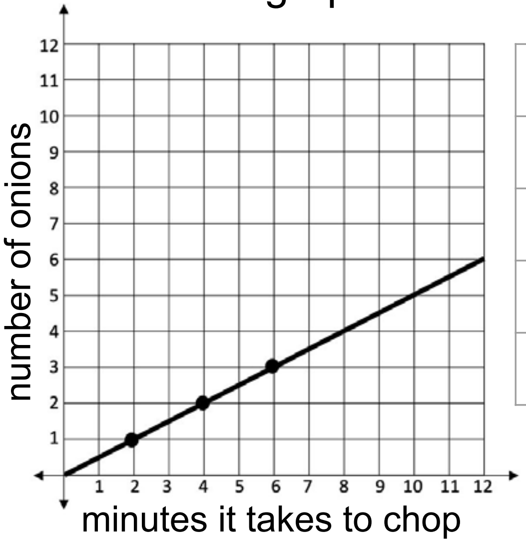
Jeff the chef made a graph to show how quickly he can chop onions. Steph the chef uses the equation, y = 2x, to show her rate where x is the number of minutes and y is the number of onions. What is each chef's rate?



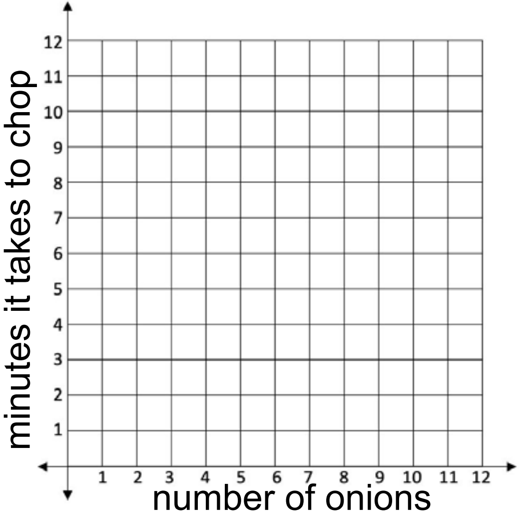
Let's Talk:

If we switch the meaning of the x and y axis, we switch the meaning of the constant of proportionality or unit rate.

Draw a new graph and table if the meaning of x and y were switched.



x	y
0	0
2	1
4	2
6	3



x	y

What is the new meaning of the unit rate?

Let's Think:

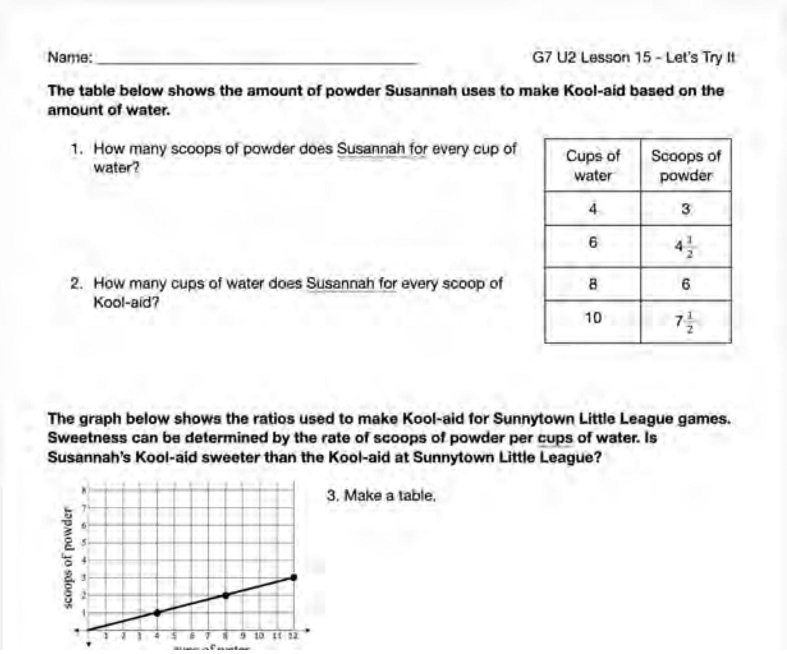
We can compare rates if they are set up with the same units.

Miles has two options for paying for Roblox Premium. The table below shows the cost if he pays month by month. His other option is to pay $84 for the year. Which option has the cheaper rate?

Months	Cost in dollars
2	$16
4	$32
6	$48
8	$64

Let's Try It:

We will do it together step by step!



Name: ______________________________ G7 U2 Lesson 15 - Let's Try It

The table below shows the amount of powder Susannah uses to make Kool-aid based on the amount of water.

1. How many scoops of powder does Susannah for every cup of water?

2. How many cups of water does Susannah for every scoop of Kool-aid?

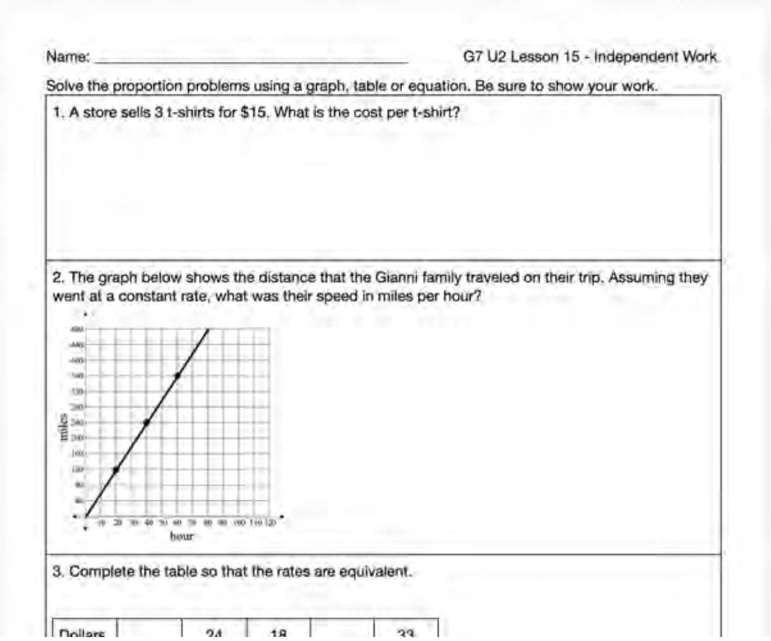
Cups of water	Scoops of powder
4	3
6	$4\frac{1}{2}$
8	6
10	$7\frac{1}{2}$

The graph below shows the ratios used to make Kool-aid for Sunnytown Little League games. Sweetness can be determined by the rate of scoops of powder per cups of water. Is Susannah's Kool-aid sweeter than the Kool-aid at Sunnytown Little League?

3. Make a table.

On your Own:

Now it’s time for you to do it on your own.



Name: ____________________ G7 U2 Lesson 15 - Independent Work

Solve the proportion problems using a graph, table or equation. Be sure to show your work.

1. A store sells 3 t-shirts for $15. What is the cost per t-shirt?

2. The graph below shows the distance that the Gianni family traveled on their trip. Assuming they went at a constant rate, what was their speed in miles per hour?

3. Complete the table so that the rates are equivalent.

Dollars		24	18		33

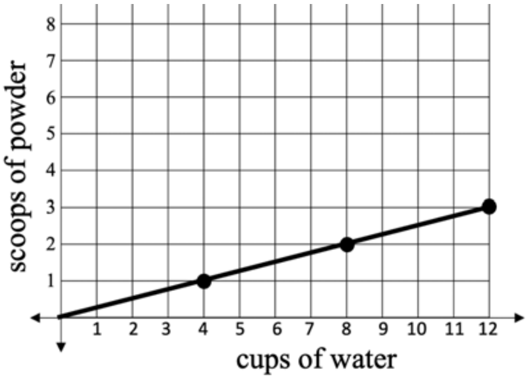
The table below shows the amount of powder Susannah uses to make Kool-aid based on the amount of water.

Cups of water	Scoops of powder
4	3
6	$4\frac{1}{2}$
8	6
10	$7\frac{1}{2}$

1. How many scoops of powder does Susannah for every cup of water?

2. How many cups of water does Susannah for every scoop of Kool-aid?

The graph below shows the ratios used to make Kool-aid for Sunnytown Little League games. Sweetness can be determined by the rate of scoops of powder per cups of water. Is Susannah's Kool-aid sweeter than the Kool-aid at Sunnytown Little League?



3. Make a table.

4. Find the rate of scoops of powder per cups of water on the graph.

5. Write your answer in a complete sentence.

____

____

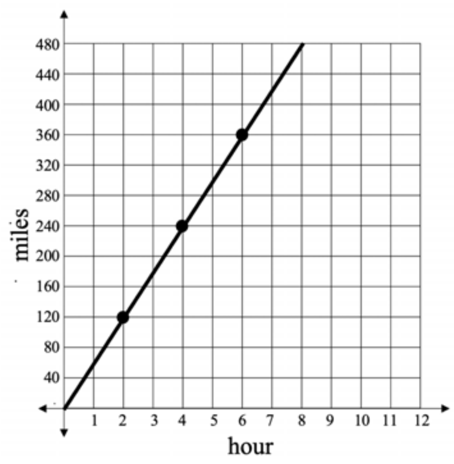
____

Name: ____ G7 U2 Lesson 15 - Independent Work

Solve the proportion problems using a graph, table or equation. Be sure to show your work.

1. A store sells 3 t-shirts for $15. What is the cost per t-shirt?

2. The graph below shows the distance that the Gianni family traveled on their trip. Assuming they went at a constant rate, what was their speed in miles per hour?



3. Complete the table so that the rates are equivalent.

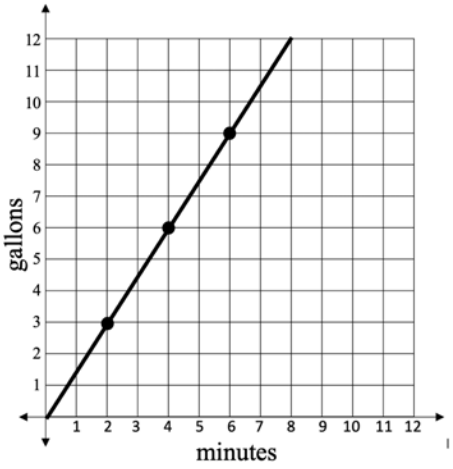
Dollars		24	18		33
Hours	1	4		7	

4. Lisa answered 30 math facts in 2 minutes. Dan wrote 12 math facts in $\frac{1}{2}$ minute. Who solves math facts at a faster rate?

Solve the proportion problems using a graph, table or equation. Be sure to show your work.

5. Because of the different amounts of gravity on different planets, a person who weighs 100 pounds on Earth will feel like they weigh 38 pounds on Mercury. Write an equation using the variables, *x* and *y*, to calculate the weight of a person on each planet. Let x represent the weight in pounds on Mercury. Let y represent the weight in pounds on Earth.

6. John uses the equation, $y = 2x$, to find the flow of the hose at his house in gallons per minute. Sammy used the graph below to find the flow of the hose at his house. Whose hose flows at a faster rate?



7. The table below shows the amount of sugar used in a bread recipe based on the amount of flour.

Cups of sugar	Cups of flour
2	5
3	$7\frac{1}{2}$
4	10
5	$12\frac{1}{2}$

a. How many cups of sugar are used for every cup of flour?

b. How many cups of flour are used for every cup of sugar?

Name: ANSWER KEY

G7 U2 Lesson 15 - Let's Try It

The table below shows the amount of powder Susannah uses to make Kool-aid based on the amount of water.

Cups of water	Scoops of powder
4	3
6	$4\frac{1}{2}$
8	6
10	$7\frac{1}{2}$

1. How many scoops of powder does Susannah for every cup of water?

$0\frac{3}{4}$
$4\overline{)3}$
-0
3

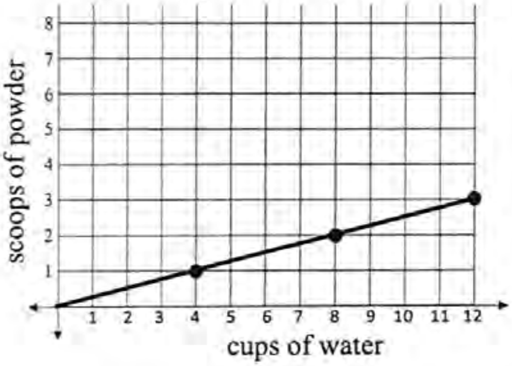
$\frac{3}{4}$ scoop per cup

2. How many cups of water does Susannah for every scoop of Kool-aid?

$1\frac{1}{3}$
$3\overline{)4}$
-3
1

$1\frac{1}{3}$ cup per scoop

The graph below shows the ratios used to make Kool-aid for Sunnytown Little League games. Sweetness can be determined by the rate of scoops of powder per cups of water. Is Susannah's Kool-aid sweeter than the Kool-aid at Sunnytown Little League?



3. Make a table.

cups	scoops
4	1
8	2
12	3

4. Find the rate of scoops of powder per cups of water on the graph.

$0\frac{1}{4}$
$4\overline{)1}$
-0
1

$\frac{1}{4}$ scoop per cup

5. Write your answer in a complete sentence.

Susannah's Kool-aid is sweeter because she does $\frac{3}{4}$ scoops per cup and the little league does $\frac{1}{4}$ scoops per cup.

Name: ANSWER KEY G7 U2 Lesson 15 - Independent Work

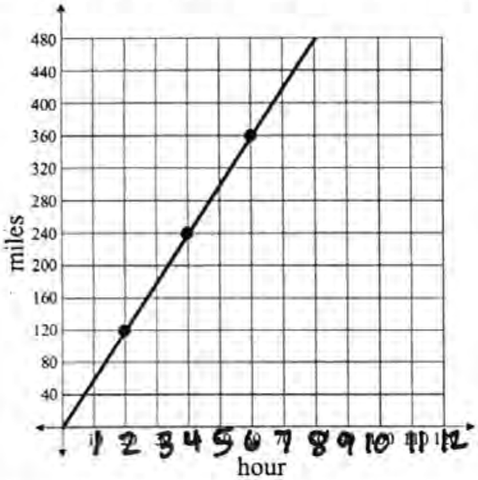
Solve the proportion problems using a graph, table or equation. Be sure to show your work.

1. A store sells 3 t-shirts for $15. What is the cost per t-shirt?

$$\begin{array}{r} 05 \\ 3\overline{)15} \\ -15 \\ \hline 00 \end{array}$$

$5 per t-shirt

2. The graph below shows the distance that the Gianni family traveled on their trip. Assuming they went at a constant rate, what was their speed in miles per hour?



hour	miles
2	120
4	240
6	360

$$\begin{array}{r} 060 \\ 2\overline{)120} \\ -120 \\ \hline 000 \end{array}$$

60 miles per hour

3. Complete the table so that the rates are equivalent.

Dollars	6 ×6	24 ×6	18 ×6	42 ×6	33 ×6
Hours	1	4	3	7	5 $\frac{1}{2}$

$$\begin{array}{r} 06 \\ 4\overline{)24} \\ -24 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 05\frac{3}{6} = 5\frac{1}{2} \\ 6\overline{)33} \\ -30 \\ \hline 3 \end{array}$$

4. Lisa answered 30 math facts in 2 minutes. Dan wrote 12 math facts in $\frac{1}{2}$ minute. Who solves math facts at a faster rate?

Lisa:

$$\begin{array}{r} 15 \\ 2\overline{)30} \\ -2 \\ \hline 10 \\ -10 \\ \hline 00 \end{array}$$

15 facts per min

Dan:

$\frac{1}{2}\overline{)12}$

$12 \div \frac{1}{2}$

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

24 facts per min

Solve the proportion problems using a graph, table or equation. Be sure to show your work.

5. Because of the different amounts of gravity on different planets, a person who weighs 100 pounds on Earth will feel like they weigh 38 pounds on Mercury. Write an equation using the variables, *x* and *y*, to calculate the weight of a person on each planet. Let x represent the weight in pounds on Mercury. Let y represent the weight in pounds on Earth.

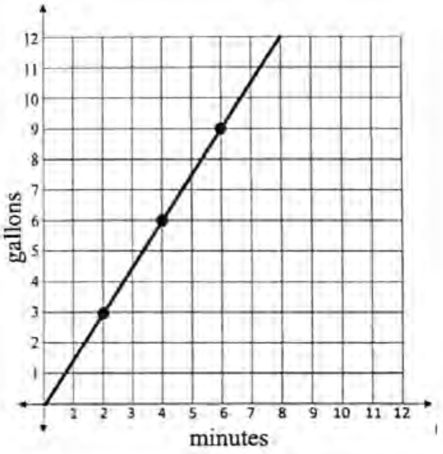
Mercury - x	y - Earth
38	100

$\boxed{y = 2\frac{24}{38}x \text{ or } y = 2.6x}$

$$\begin{array}{r} 002.6 \\ 38\overline{)100.0} \\ -76 \\ \hline 240 \\ -228 \\ \hline 12 \end{array}$$

$$\begin{array}{r} 38 \\ +38 \\ \hline 76 \\ +38 \\ \hline 114 \\ +38 \\ \hline 152 \end{array} \qquad \begin{array}{r} 152 \\ +38 \\ \hline 190 \\ +38 \\ \hline 228 \end{array}$$

6. John uses the equation, y = 2x, to find the flow of the hose at his house in gallons per minute. Sammy used the graph below to find the flow of the hose at his house. Whose hose flows at a faster rate?



John: 2 gallons per min

Sammy:

min	gallons
2	3
4	6
6	9

$$\begin{array}{r} 1\frac{1}{2} \\ 2\overline{)3} \\ -2 \\ \hline 1 \end{array}$$

$1\frac{1}{2}$ gallons per min

John's hose is faster.

7. The table below shows the amount of sugar used in a bread recipe based on the amount of flour.

Cups of sugar	Cups of flour
2	5
3	$7\frac{1}{2}$
4	10
5	$12\frac{1}{2}$

a. How many cups of sugar are used for every cup of flour?

$$\begin{array}{r} 0\frac{2}{5} \\ 5\overline{)2} \\ -0 \\ \hline 2 \end{array}$$

$\frac{2}{5}$ cups of sugar per cup of flour

b. How many cups of flour are used for every cup of sugar?

$$\begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \\ -4 \\ \hline 1 \end{array}$$

$2\frac{1}{2}$ cups of flour per cup of sugar