CITYTUTOR

Fifth 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;

Identification of the material that is claimed to be infringing and that is to be removed or access to which is to be disabled, and information reasonably sufficient to permit us to locate the allegedly infringing material, e.g., the specific web page address on the Platform;

Information reasonably sufficient to permit us to contact the party alleging infringement, including an email address;

A statement that the party alleging infringement has a good-faith belief that use of the copyrighted work in the manner complained of is not authorized by the copyright owner or its agent, or is not otherwise permitted under the law; and

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The invalidity of any provision of this Agreement will not affect the validity of the remaining provisions.

CITYTUTOR DC

G5 Unit 4:

Multiply and Divide Fractions

G5 U4 Lesson 1

Interpret fractions as division

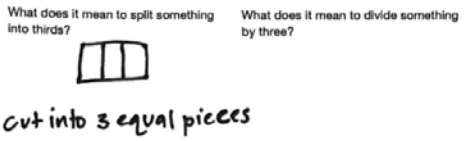
G1 U4 Lesson 1 - Today we will interpret fractions as division.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will interpret fractions as division. This is going to be great because it is going to help us understand how multiplying and dividing fractions working in future lessons.

Let's Review (Slide 3): Let's review what we already know about fractions and division. What does it mean to split something into thirds? Possible Student Answers, Key Points:

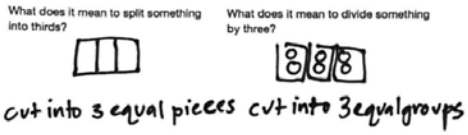
- Draw a circle with three slices.
- It means to cut something into three equal pieces.



Note: This is your chance to hear students' initial thoughts. Take 3 ideas then draw a picture and offer your own wording, which you should write down, "cut into three equal pieces."

What does it mean to divide something by three? Possible Student Answers, Key Points:

- It means do 3 times something to make a number.
- It is the opposite of multiplication.
- It means to see how many times you can take away three.
- It means to split something into three equal groups.



Note: This is your chance to hear students' initial thoughts. Take 3 ideas then draw a picture and offer your own wording, which you should write down, "cut into three equal groups." So, we already see that taking a fraction and dividing are very similar, don't we. Both involve splitting and both have equal pieces or equal groups.

Let's Talk (Slide 4): Now let's see how fractions and division can mean the same thing in a division story problem. I'll read it: Jeffrey has 1 big cookie. He wants to split it between his 3 sisters. How much cookie should each sister get? What would make us think this is a division story problem? Possible Student Answers, Key Points:

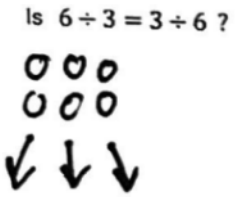
- They are splitting the cookie.
- Jeffrey has to divide the cookie.

Jeffrey wants to split the cookie or divide the cookie between the 3 sisters. It's a sharing story. We can think of this as 1 divided by 3. We have to write it like this.

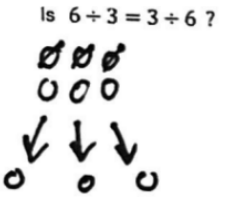
Now let's draw a picture. I need 1 big cookie. Then I am going to split it into 3 equal pieces for the 3 sisters. It's one third! We have to write it like this.

1 divided by 3 and 1 over 3 are the same! It's like this line in the middle is a division symbol!

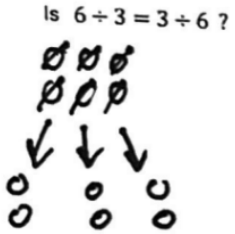
Let's Think (Slide 5): Now that we have connected these two important ideas, it helps us realize a big idea about both of them - if we switch the order of the numbers in division OR fractions, we will change the answer. Let's explore.



Here we see 6 divided by 3 and 3 divided by 6. Can someone give me a story for 6 divided by 3. Possible Student Answers, Key Points:
John has 6 cookies that he wants to share between 3 friends. How many cookies can each friend get?
Troy has 6 books and he wants to put 3 on a shelf. How may shelves can he fill?
Lisa has 6 stickers that she wants to put on 3 pages. How many stickers can she put on each page?



Imagine it was 6 cookies shared by 3 people. That story would look like this. I am going to draw 6 cookies. Now I will draw 3 arrows to show them getting handed out to 3 people. Time to deal them out! I give one and one and one.



I can keep going. One more and one more and one more. That's 6 divided by 3. That's 6 cookies shared by 3 people, each person gets 2 cookies.

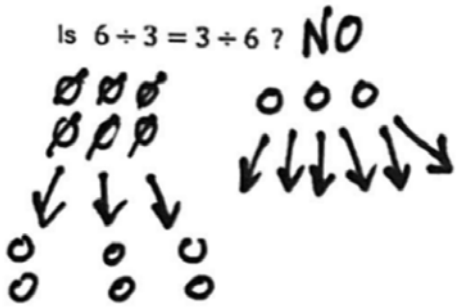
Now, what would that same story using cookies and people be for 3 divided by 6. It's not the same. Possible Student Answers, Key Points:

- 3 cookies dealt out to 6 people.
- John has 3 cookies that he wants to share between 6 friends. How many cookies can each friend get?

The numbers are in a different order so now 6 is not getting split into 3 equal amounts. 3 is getting split into 6 equal amounts. The story has to be that there are 3 cookies that have to be shared by 6 people. Whoa! Hold up! That's gonna be tricky! What do you think is going to happen? Can we still do it? Possible Student Answers, Key Points:

- You can do it.
- You don't have enough cookies so you will have to cut them.

Note: You may hear a range of right and wrong answers here. That is fine. Check to see if anyone understands and then give your own clear answer.



Let's draw a picture. 3 divided by 6 means there are 3 cookies. Since I want to split them between 6 people, I need 6 arrows coming from the cookies. There is not enough cookies for each person to get 1. I will have to cut these cookies in order to share them. We don't need to get an answer right now.

The most important thing for you to understand is that you cannot switch the order of the numbers in division and get the same answer. Is 6 divided by 3 the same as 3 divided by 6? NO!

Let's explore this next question - is 6 over 3 the same as 3 over 6? Our slide says that if we switch the order of the numbers in division or fractions, we will change the answer. I am going to draw a picture. 6 over 3 means I have thirds. This is what thirds look like - one whole cut into 3 pieces.

But I need 6 thirds. Let's count and I'll write - 1 third, 2 thirds, 3 thirds.

Uh-oh! I don't have enough. Let's draw some more thirds - 4 thirds, 5 thirds, 6 thirds. What do I end up with here? Possible Student Answers, Key Points:

- 2 wholes

- 2 circles

Now let's draw 3 over 6. I need sixths. This is what sixths look like - one whole cut into 6 pieces. I need 3 sixths. Let's count and I'll write - 1 sixth, 2 sixths, 3 sixths. Is that the same as 6 thirds? No! Is that 2 wholes? No! So 6 over 3 is NOT the same as 3 over 6 just like 6 divided by 3 is NOT the same as 3 divided by 6. The way we say this in fancy math language is "division is not commutative." In addition and multiplication, we can do turnaround facts. We can switch the order and we get the same answer. But in division, the order matters. The number before the division symbol is the whole amount that is going to be split up called the dividend. The number after the division symbol is the number it is going to be divided by called the divisor.

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 interpret fractions as division.

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Let's Review:

What do you already know about fractions and division?

What does it mean to split something into thirds?

What does it mean to divide something by three?

Let's Talk:

Now let's see how fractions and division can mean the same thing in a division story problem.

Jeffrey has 1 big cookie. He wants to split it between his 3 sisters. How much cookie should each sister get?

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Let's Think:

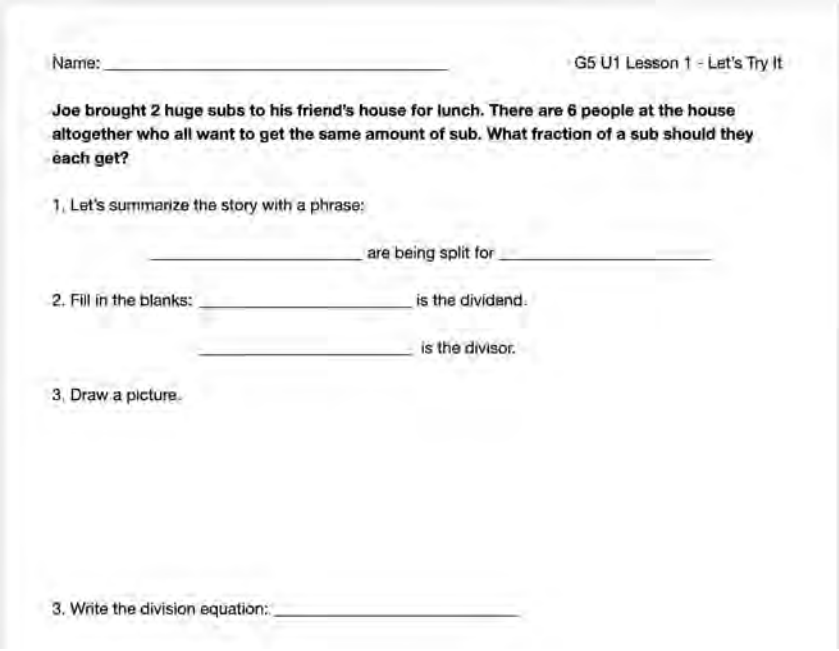
If we switch the order of the numbers in division OR fractions, we will change the answer.

Is $6 \div 3 = 3 \div 6$?

Is $\frac{6}{3} = \frac{3}{6}$?

Let's Try It:

Let's practice writing division and fractions together from stories.



Name: _____ G5 U1 Lesson 1 - Let's Try It

Joe brought 2 huge subs to his friend's house for lunch. There are 6 people at the house altogether who all want to get the same amount of sub. What fraction of a sub should they each get?

1. Let's summarize the story with a phrase:

_____ are being split for _____

2. Fill in the blanks: _____ is the dividend.

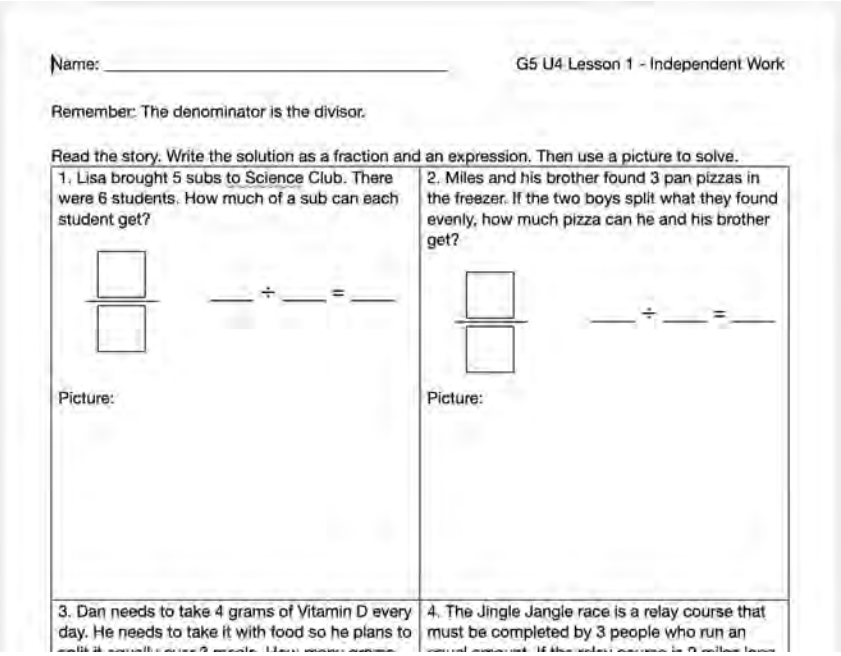
_____ is the divisor.

3. Draw a picture.

3. Write the division equation: _____

On your Own:

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



Name: _____ G5 U4 Lesson 1 - Independent Work

Remember: The denominator is the divisor.

Read the story. Write the solution as a fraction and an expression. Then use a picture to solve.

1. Lisa brought 5 subs to Science Club. There were 6 students. How much of a sub can each student get? $\frac{\square}{\square}$ ____ ÷ ____ = ____ Picture:	2. Miles and his brother found 3 pan pizzas in the freezer. If the two boys split what they found evenly, how much pizza can he and his brother get? $\frac{\square}{\square}$ ____ ÷ ____ = ____ Picture:
3. Dan needs to take 4 grams of Vitamin D every day. He needs to take it with food so he plans to	4. The Jingle Jangle race is a relay course that must be completed by 3 people who run an

Joe brought 2 huge subs to his friend's house for lunch. There are 6 people at the house altogether who all want to get the same amount of sub. What fraction of a sub should they each get?

1. Let's summarize the story with a phrase:

_____ are being split for _____

2. Fill in the blanks: _____ is the dividend.

_____ is the divisor.

3. Draw a picture.

3. Write the division equation: _____

4. Write the equivalent fraction:

Keiran wants to put together 3 equal bags of cookies for the school bake sale. He made 12 cookies. How many cookies can he put into each bag?

5. Let's summarize the story with a phrase:

_____ are being split for _____

6. Fill in the blanks: _____ is the dividend.

_____ is the divisor.

7. Draw a picture.

8. Write the division equation: _____

9. Write the equivalent fraction:

Write $6 \div 5$ as a fraction.

10. Fill in the blanks:_____ is the dividend and _____ is the divisor.

11. Draw a picture.

12. Write the equivalent fraction:

Write $\frac{2}{3}$ as a fraction.

13. Fill in the blanks:_____ is the dividend and _____ is the divisor.

14. Draw a picture.

15. Write the division equation: _____

Name: _____ G5 U4 Lesson 1 - Independent Work

Remember: The denominator is the divisor.

Read the story. Write the solution as a fraction and an expression. Then use a picture to solve.

1. Lisa brought 5 subs to Science Club. There were 6 students. How much of a sub can each student get?

$\frac{\square}{\square}$ _____ ÷ _____ = _____

Picture:

2. Miles and his brother found 3 pan pizzas in the freezer. If the two boys split what they found evenly, how much pizza can he and his brother get?

$\frac{\square}{\square}$ _____ ÷ _____ = _____

Picture:

3. Dan needs to take 4 grams of Vitamin D every day. He needs to take it with food so he plans to split it equally over 3 meals. How many grams of Vitamin D should he take with each meal?

$\frac{\square}{\square}$ _____ ÷ _____ = _____

Picture:

4. The Jingle Jangle race is a relay course that must be completed by 3 people who run an equal amount. If the relay course is 2 miles long, how much must each person run?

$\frac{\square}{\square}$ _____ ÷ _____ = _____

Picture:

Read the story. Write the solution as a fraction and an expression and long division.

5. There are 2 donuts left in the box. 4 kids are standing around the box looking hungry. If they share the donuts fairly, how many donuts can each kid get?

$\frac{\square}{\square}$ ____ ÷ ____ = ____

Picture:

6. At Billy's birthday party, there are 6 kids. They each want to get an equal amount of the 2 Liter soda bottle. How many liters of soda can each kid have?

$\frac{\square}{\square}$ ____ ÷ ____ = ____

Picture:

7. Janice picked 2 kilograms of apples. She put them evenly in 4 baskets. How many kilograms of apples did she put in each basket?

$\frac{\square}{\square}$ ____ ÷ ____ = ____

Picture:

8. For Halloween, Rachel made 3 equal bottles of slime to give to her friends. If the recipe she used made 5 cups of slime, how much slime did Rachel put in each bottle?

$\frac{\square}{\square}$ ____ ÷ ____ = ____

Picture:

Name: ANSWER KEY

Joe brought 2 huge subs to his friend's house for lunch. There are 6 people at the house altogether who all want to get the same amount of sub. What fraction of a sub should they each get?

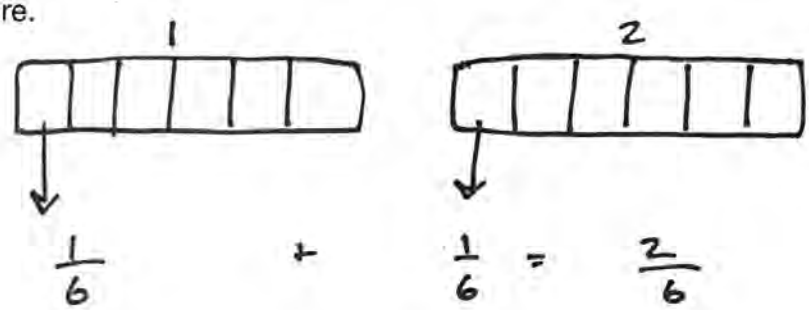
1. Let's summarize the story with a phrase:

subs are being split for people

2. Fill in the blanks: subs is the dividend.

people is the divisor.

3. Draw a picture.



3. Write the division equation: $2 \div 6 = \frac{2}{6}$

4. Write the equivalent fraction: $\frac{2}{6}$

Keiran wants to put together 3 equal bags of cookies for the school bake sale. He made 12 cookies. How many cookies can he put into each bag?

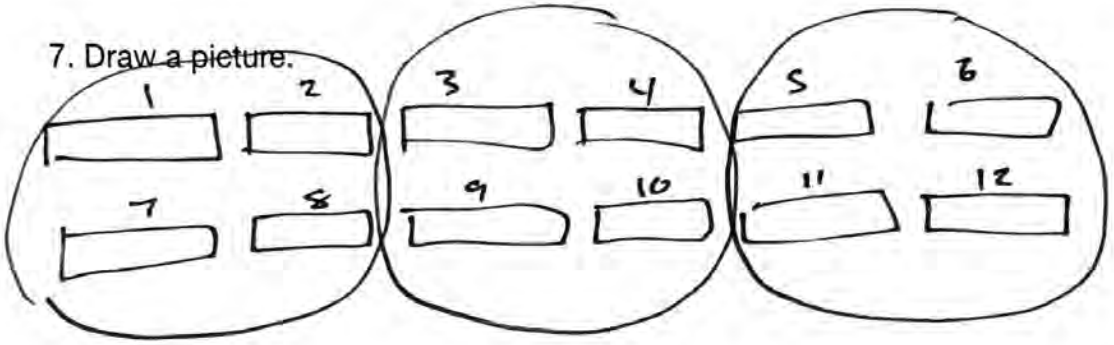
5. Let's summarize the story with a phrase:

cookies are being split for bags

6. Fill in the blanks: cookies is the dividend.

bags is the divisor.

7. Draw a picture.



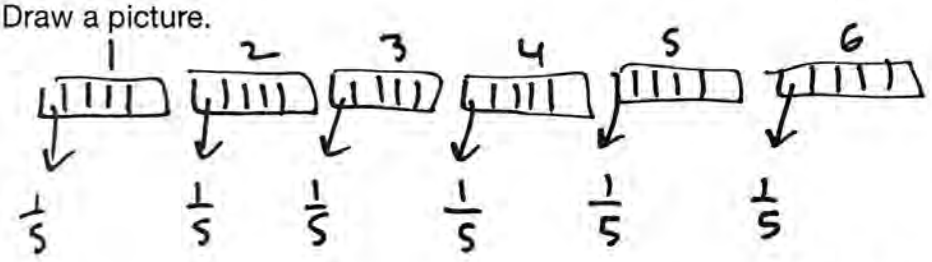
8. Write the division equation: $12 \div 3 = 4$

9. Write the equivalent fraction: $\frac{12}{3} = 4$

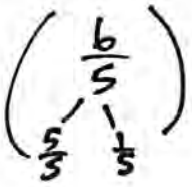
Write $6 \div 5$ **as a fraction.**

10. Fill in the blanks: 6 is the dividend and 5 is the divisor.

11. Draw a picture.



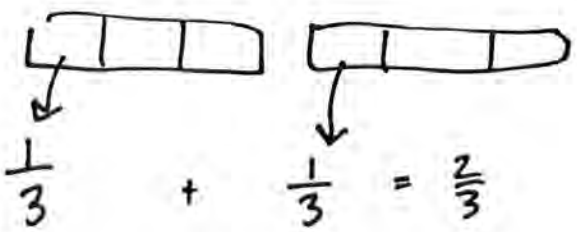
12. Write the equivalent fraction: $\frac{6}{5} = 1\frac{1}{5}$



Write $\frac{2}{3}$ **as a fraction.**

13. Fill in the blanks: 2 is the dividend and 3 is the divisor.

14. Draw a picture.



15. Write the division equation: $2 \div 3$

Name: ANSWER KEY

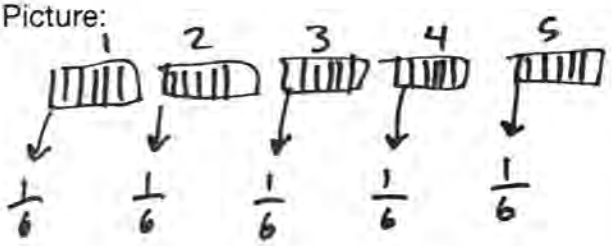
G5 U4 Lesson 1 - Independent Work

Read the story. Write the solution as a fraction and an expression. Then use a picture to solve.

1. Lisa brought 5 subs to Science Club. There were 6 students. How much of a sub can each student get?

$\frac{5}{6}$ $5 \div 6 = \frac{5}{6}$

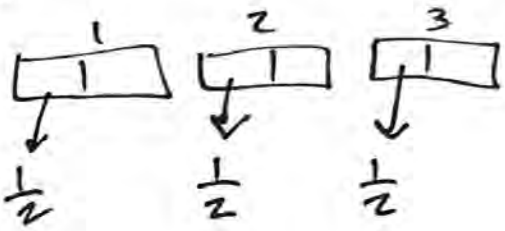
Picture:



2. Miles and his brother found 3 pan pizzas in the freezer. If the two boys split what they found evenly, how much pizza can he and his brother get?

$\frac{3}{2}$ $3 \div 2 = \frac{3}{2}$ or $1\frac{1}{2}$

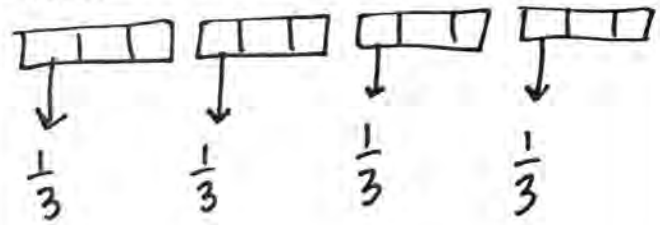
Picture:



3. Dan needs to take 4 grams of Vitamin D every day. He needs to take it with food so he plans to split it equally over 3 meals. How many grams of Vitamin D should he take with each meal?

$\frac{4}{3}$ $4 \div 3 = \frac{4}{3}$ or $1\frac{1}{3}$

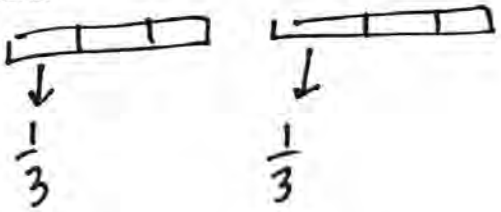
Picture:



4. The Jingle Jangle race is a relay course that must be completed by 3 people who run an equal amount. If the relay course is 2 miles long, how much must each person run?

$\frac{2}{3}$ $2 \div 3 = \frac{2}{3}$

Picture:

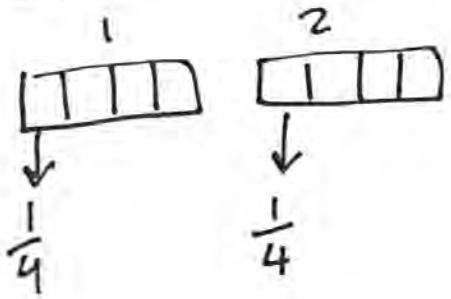


Read the story. Write the solution as a fraction and an expression and long division.

5. There are 2 donuts left in the box. 4 kids are standing around the box looking hungry. If they share the donuts fairly, how many donuts can each kid get?

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

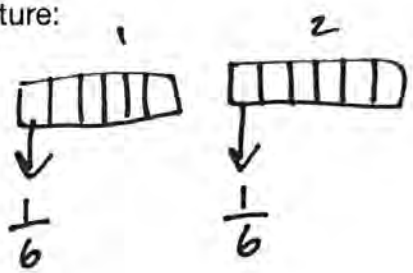
Picture:



6. At Billy's birthday party, there are 6 kids. They each want to get an equal amount of the 2 Liter soda bottle. How many liters of soda can each kid have?

$\frac{2}{6}$ $2 \div 6 = \frac{2}{6}$

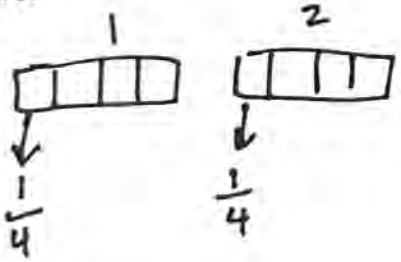
Picture:



7. Janice picked 2 kilograms of apples. She put them evenly in 4 baskets. How many kilograms of apples did she put in each basket?

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

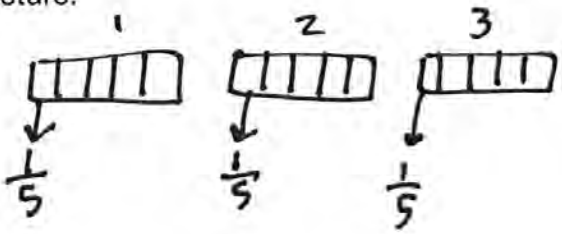
Picture:



8. For Halloween, Rachel made 3 equal bottles of slime to give to her friends. If the recipe she used made 5 cups of slime, how much slime did Rachel put in each bottle?

$\frac{3}{5}$ $3 \div 5 = \frac{3}{5}$

Picture:



G5 U4 Lesson 2

Find a fraction of a set

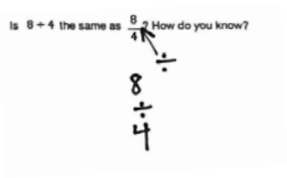
G1 U4 Lesson 2 - Today we will find a fraction of a set.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will find a fraction of a set. All of this is going to connect to what we did yesterday with division, and we are going to see how to take everything you learned in 3rd and 4th grade about division and use it to help us with fractions.

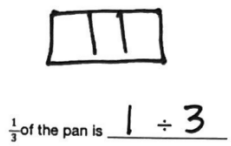
Let's Review (Slide 3): Yesterday we learned about the relationship between division and fractions. Let's review! Is 8 divided by 4 the same as 8 fourths? How do you know? Possible Student Answers, Key Points:

- The 8 is the dividend in both problems.
- The 4 is the divisor in both problems.
- The line in the fraction is like a division symbol.



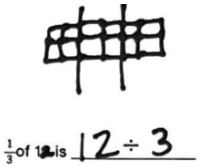
We learned that the dividend comes before the division symbol or it can be the numerator of the fraction. These are the same because the line in the fraction is like a division symbol. Today we are going to see this again. The denominator of the fraction which is the bottom of the fraction is always going to be the divisor.

Let's Talk (Slide 4): This is going to help us finding a fraction of a collection. A collection is just a set of things. Like I could have 10 cookies. That's a collection of 10. I could have 10 books. That's a collection of 10. We're going to draw a picture of both of these problems and see what we can learn about finding a fraction of a collection. Read this first one with your eyes while I read it out loud. *Read the problem while kids listen..*

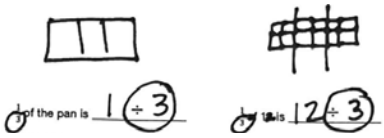


Now let's draw a picture. I am going to draw a pan of brownies. That's one pan. I want to shade one third so I will cut this into three pieces. Those are thirds. Now I shade one. Let's write this as a division problem to find one third of the pan, it was really 1 divided by 3. That's what we learned yesterday. Now let's do the next problem. *Read the problem while kids listen.*

This is a fraction of a collection problem because I want to find one third of the 12 brownies. First, I am going to draw 12 brownies. Count while I draw. *Be sure to draw the brownies so that they look the same as the pan you already drew.*



Now I want one third of the brownies - just like I wanted one third of the pan. Thirds means three equal pieces whether we're finding a fraction of a pan or a fraction of a collection. If I do 4 and 4 and 4, I'll have three groups. I will draw my lines to make 3 equal groups just like 3 equal pieces.



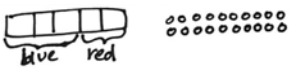
Let's write this as a division problem. To find one third of 12, we really did 12 divided by 3. How are these problems the same? Possible Student Answers, Key Points:

- They are both about brownies.
- They both ate one third.
- They both were divided by 3.

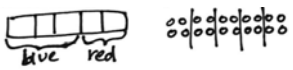
This gets us to the main idea of today, when we take a fraction of something, the denominator is still a divisor. We divide by the bottom number. *Circle the denominators and the divisors.*

Let's Think (Slide 5): Now we need to find a fraction of a collection when there isn't a 1 in the numerator. Let's read this problem. *Read the problem aloud while the kids listen.*

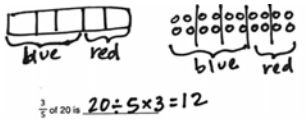
Imagine a picture of three fifths and two fifths. It would be a rectangle cut into 5 pieces for fifths. Three of the fifths would be blue and two of the fifths would be blue.



But I don't have a rectangle. I have 20 beads. I need to divide the beads between these fifths. That's 20 divided by 5. We are still dividing by the denominator! The denominator is still the divisor! 20 divided by 5 is 4 in each of these equal groups.



But the problem said that three of the fifths were blue. So we need three of these groups. That's here! *Shade three of the fifths.* That's three groups of five. That's multiplication. The denominator, which is the bottom number, of the fraction is the divisor and the numerator, that's the top, of the fraction is the multiplier.



Three fifths of 20 is the same as 20 divided by 5 times 3. 20 divided by the denominator times the numerator.

Let's Try it (Slides 6): Let's practice finding a fraction of a collection together! I will help you draw a picture and write an expression.

WARM WELCOME

Today we will find a fraction of a set.

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Let's Review:

Yesterday, we learned about the relationship between division and fractions.

Is $8 \div 4$ the same as $\frac{8}{4}$? How do you know?

Let's Talk:

Draw a picture of both problems. How are they the same?

John has a huge pan of brownies. He ate $\frac{1}{3}$ of the pan. Shade the amount that John ate.

Jim has 12 brownies. He ate $\frac{1}{3}$ of the brownies. Shade the amount that John ate.

$\frac{1}{3}$ of the pan is _____ ÷ _____

$\frac{1}{3}$ of 12 is _____ ÷ _____

Let's Think:

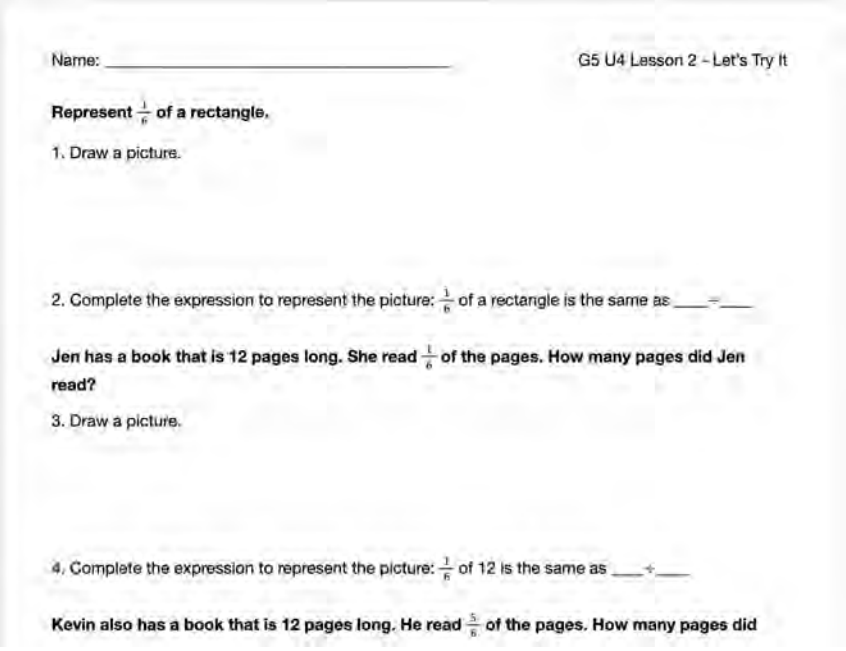
We need to find a fraction of a collection when there isn't a 1 in the numerator.

Rea is making a necklace. $\frac{3}{5}$ of the beads will be blue and $\frac{2}{5}$ of the beads will be red. Rea wants the necklace to have 20 beans. How many of the beads will be blue?

$\frac{3}{5}$ of 20 is _____

Let's Try It:

Let's practice finding a fraction of a collection together.



Name: _____ G5 U4 Lesson 2 - Let's Try It

Represent $\frac{1}{6}$ of a rectangle.

1. Draw a picture.

2. Complete the expression to represent the picture: $\frac{1}{6}$ of a rectangle is the same as ___÷___

Jen has a book that is 12 pages long. She read $\frac{1}{6}$ of the pages. How many pages did Jen read?

3. Draw a picture.

4. Complete the expression to represent the picture: $\frac{1}{6}$ of 12 is the same as ___÷___

Kevin also has a book that is 12 pages long. He read $\frac{5}{6}$ of the pages. How many pages did

On your Own:

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

Name: _____ G5 U4 Lesson 2 - Independent Work

Remember: The denominator is the divisor.

Draw a picture and write a multiplication equation to solve the problem.

1. Jason has 15 jellybeans. $\frac{1}{3}$ of them are cherry. How many of Jason's jellybeans are cherry? Draw a picture: Complete the multiplication sentence: $\frac{\square}{\square}$ of ___ = ___ ÷ ___ x ___ = ___	2. Bernie has 15 cookies. $\frac{2}{3}$ of them are chocolate chip. How many of Bernie's cookies are chocolate chip? Draw a picture: Complete the multiplication sentence: $\frac{\square}{\square}$ of ___ = ___ ÷ ___ x ___ = ___
3. Devin has read $\frac{1}{4}$ of his book. The book has 20 pages. How many pages has Devin read?	4. The Wilson family has driven $\frac{3}{4}$ of their trip. If the trip is 20 miles, how many miles has the

Represent $\frac{1}{6}$ of a rectangle.

1. Draw a picture.

2. Complete the expression to represent the picture: $\frac{1}{6}$ of a rectangle is the same as _____÷_____

Jen has a book that is 12 pages long. She read $\frac{1}{6}$ of the pages. How many pages did Jen read?

3. Draw a picture.

4. Complete the expression to represent the picture: $\frac{1}{6}$ of 12 is the same as _____÷_____

Kevin also has a book that is 12 pages long. He read $\frac{5}{6}$ of the pages. How many pages did Kevin read?

5. Draw a picture.

6. Complete the expression to represent the picture: $\frac{5}{6}$ of 12 is the same as _____÷_____×_____

Fill in the blanks:

With a fraction of a collection,

we are really _____ by the bottom number and _____ by the top number.

Name: _____ G5 U4 Lesson 2 - Independent Work

Remember: The denominator is the divisor.

Draw a picture and write a multiplication equation to solve the problem.

1. Jason has 15 jellybeans. $\frac{1}{3}$ of them are cherry. How many of Jason's jellybeans are cherry?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

2. Bernie has 15 cookies. $\frac{2}{3}$ of them are chocolate chip. How many of Bernie's cookies are chocolate chip?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

3. Devin has read $\frac{1}{4}$ of his book. The book has 20 pages. How many pages has Devin read?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

4. The Wilson family has driven $\frac{3}{4}$ of their trip. If the trip is 20 miles, how many miles has the Wilson family driven so far?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

Draw a picture and write a multiplication equation to solve the problem.

5. The third graders at Abbott Elementary are collecting cans. Their goal is to collect 27 cans. So far they have collected $\frac{2}{3}$ of their goal. How many cans have they collected?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

6. Jamie's math book is 18 pages. So far, he has done $\frac{2}{3}$ of the pages in the book. How many pages has Jamie done?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

7. The TV show is 30 minutes long. Sam has watched $\frac{3}{5}$ of his favorite show. How many minutes has Sam watched?

Draw a picture:

Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

8. Matt scored $\frac{1}{10}$ of the points in the basketball game. There were 20 points scored. How many points did Matt score?

Draw a picture:

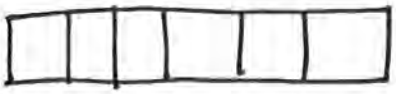
Complete the multiplication sentence:

$\frac{\square}{\square}$ of ____ = ____ ÷ ____ x ____ = ____

Name: ANSWER KEY

Represent $\frac{1}{6}$ of a rectangle.

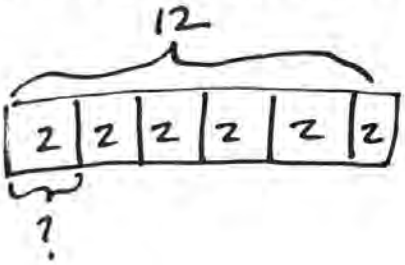
1. Draw a picture.



2. Complete the expression to represent the picture: $\frac{1}{6}$ of a rectangle is the same as 1 ÷ 6

Jen has a book that is 12 pages long. She read $\frac{1}{6}$ of the pages. How many pages did Jen read?

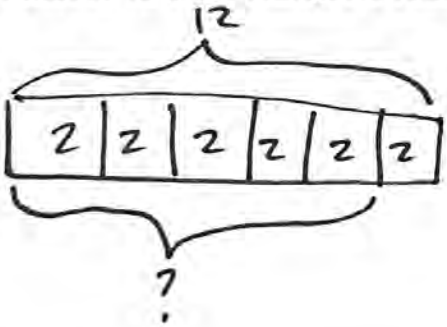
3. Draw a picture.



4. Complete the expression to represent the picture: $\frac{1}{6}$ of 12 is the same as 12 ÷ 6

Kevin also has a book that is 12 pages long. He read $\frac{5}{6}$ of the pages. How many pages did Kevin read?

5. Draw a picture.



6. Complete the expression to represent the picture: $\frac{5}{6}$ of 12 is the same as 12 ÷ 6 × 5

Fill in the blanks:

With a fraction of a collection,

we are really dividing **by the bottom number and** multiplying **by the top number.**

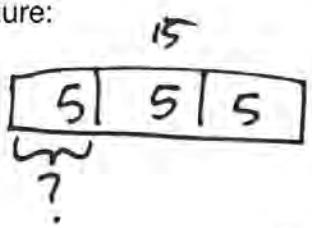
Name: ANSWER KEY

Remember: The denominator is the divisor.

Draw a picture and write a multiplication equation to solve the problem.

1. Jason has 15 jellybeans. $\frac{1}{3}$ of them are cherry. How many of Jason's jellybeans are cherry?

Draw a picture:

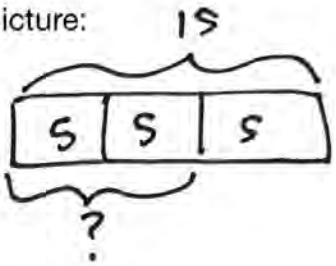


Complete the multiplication sentence:

$\frac{1}{3}$ of 15 = 15 ÷ 3 x 1 = 5

2. Bernie has 15 cookies. $\frac{2}{3}$ of them are chocolate chip. How many of Bernie's cookies are chocolate chip?

Draw a picture:

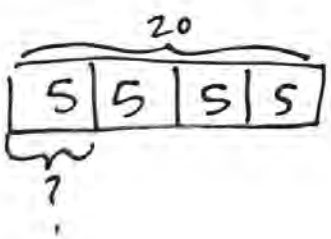


Complete the multiplication sentence:

$\frac{2}{3}$ of 15 = 15 ÷ 3 x 2 = 10

3. Devin has read $\frac{1}{4}$ of his book. The book has 20 pages. How many pages has Devin read?

Draw a picture:

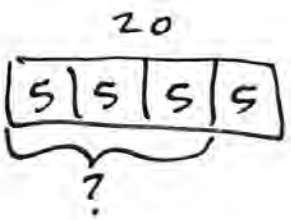


Complete the multiplication sentence:

$\frac{1}{4}$ of 20 = 20 ÷ 4 x 1 = 5

4. The Wilson family has driven $\frac{3}{4}$ of their trip. If the trip is 20 miles, how many miles has the Wilson family driven so far?

Draw a picture:



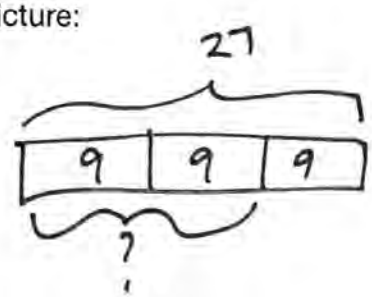
Complete the multiplication sentence:

$\frac{3}{4}$ of 20 = 20 ÷ 4 x 3 = 15

Draw a picture and write a multiplication equation to solve the problem.

5. The third graders at Abbott Elementary are collecting cans. Their goal is to collect 27 cans. So far they have collected $\frac{2}{3}$ of their goal. How many cans have they collected?

Draw a picture:

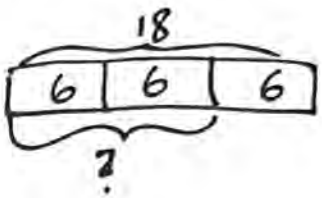


Complete the multiplication sentence:

$\frac{2}{3}$ of 27 = 27 ÷ 3 x 2 = 18

6. Jamie's math book is 18 pages. So far, he has done $\frac{2}{3}$ of the pages in the book. How many pages has Jamie done?

Draw a picture:

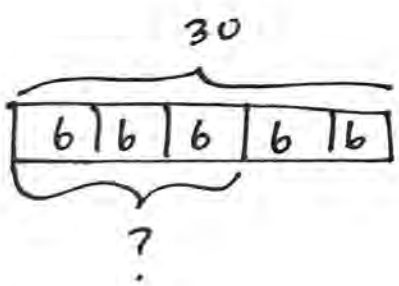


Complete the multiplication sentence:

$\frac{2}{3}$ of 18 = 18 ÷ 3 x 2 = 12

7. The TV show is 30 minutes long. Sam has watched $\frac{3}{5}$ of his favorite show. How many minutes has Sam watched?

Draw a picture:

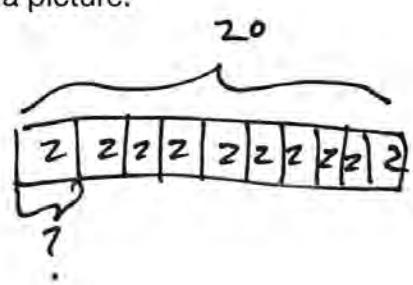


Complete the multiplication sentence:

$\frac{3}{5}$ of 30 = 30 ÷ 5 x 3 = 18

8. Matt scored $\frac{1}{10}$ of the points in the basketball game. There were 20 points scored. How many points did Matt score?

Draw a picture:



Complete the multiplication sentence:

$\frac{1}{10}$ of 20 = 20 ÷ 10 x 1 = 2

G5 U4 Lesson 3

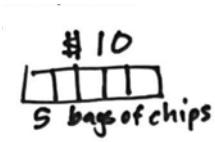
Multiply whole numbers by fractions using tape diagrams

G1 U4 Lesson 3 - Today we will multiply whole numbers by fractions using tape diagrams.

Warm Welcome (Slide 1): Tutor choice

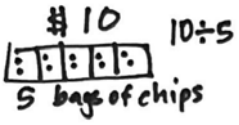
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will multiply whole numbers by fractions using tape diagrams. We did a few drawings yesterday so we are ready for this!

Let's Review (Slide 3): The key to our work today is remembering that division and multiplication work with equal groups or equal units. We have already been using division to find fractions of a collection. Let's review the meaning of division and multiplication with this word problem: At the grocery store, 5 bags of chips cost $10. How much does it cost for 1 bag of chips?

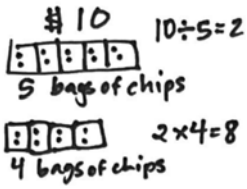


I can draw a tape diagram to show the 5 bags of chips. Altogether, these cost $10 so I will label it like this. Each bag of chips is an equal amount like an equal group or an equal piece or equal units. How would I find the cost of one unit? Possible Student Answers, Key Points:

- I know it's $2 because 5 x 2 makes 10.
- I know it's $2 because $1 each would be $5 and $2 each would be $10.
- I know it's $2 because 10 divided by 5 is 2.



If we know the total for 5 units, we can divide to find the amount for 1 unit. That's like splitting the 10 into 5 equal amounts. Division helps us find the amount of 1 unit. I am going to shade it. It looks like a fraction picture, doesn't it? It looks like one fifth! Remember from our last lesson, that cutting pieces of a fraction is like division.

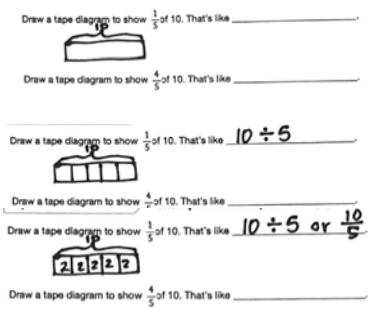


The next part of our problem asks how much does it cost for 4 bags of chips. How would I find the cost of four units? Possible Student Answers, Key Points:

- We can add 2 + 2 + 2 + 2, which is 8.
- We can do 4 x 2, which is 8.

If we know the cost of 1 unit, we can multiply to find the amount for 4 units. That's like putting 4 equal amount of 2 together. Multiplication helps us find the amount of 4 units. I am going to shade those. And again, it looks like a fraction picture. It looks like four fifths. Remember from our last lesson, that shading pieces of a fraction is like multiplication.

Let's Talk (Slide 4): Now we can see how division and multiplication help us multiply fractions! This problem says, "Draw a tape diagram to show one fifth of 10."

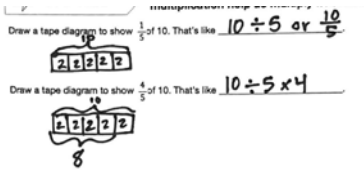


We can draw 10 squares. But to make our life simpler, I am going to draw a rectangle and label it as 10 altogether. This is a collection of 10 or a whole amount of 10.

I want one-fifth of 10. So I cut it into 5 pieces to make fifths. This helps us see that 5 pieces or 5 units are the same as 10. Just like 5 bags of chips cost $10. If I know 5 units, what operation do I use to find 1 unit? Possible Student Answers, Key Points:

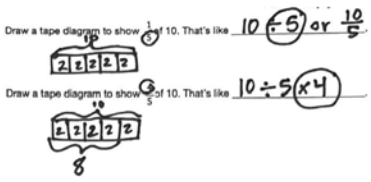
- We can think 5 times what makes 10.
- We can do 10 divided by 5 is 2.

We can write that idea like we learned in our last lesson: 10 divided by 5 and that's the same as 10 over 5. Just like our last lesson, the denominator - that's the bottom of the fraction - is the divisor, the dividing number.



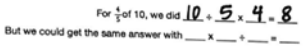
Let's look at the next part, "Draw a tape diagram to show four fifths of 10." That means we want 4 units, right? Like shading 4 parts. If I know 1 unit, what operation do I use to find 4 units? Possible Student Answers, Key Points:

- We can add 2 + 2 + 2 + 2.
- We can do 4 x 2 is 8.

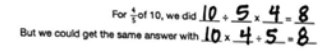


We can write that idea like we learned in our last lesson: 2 x 4. That is the same as what we learned in our last lesson. The numerator, the top number of a fraction is a multiplier, a number we multiply by. *Circle the numbers.*

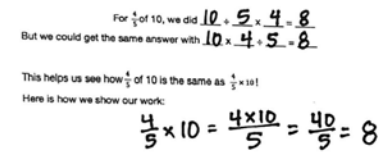
Let's Think (Slide 5): Now we have the big NEW idea for today. The commutative property let's us do these same operations in a different order! Let's fill in these blanks and you'll see what I mean.



For 4 fifths of 10, we did 10 divided by 5 times 4. 10 divided by 5 is 2 and 2 times 4 is 8. But as long as we divide by the divisor and multiply by the multiplier, the order should matter.



We could get the same answer with 10 times 4 divided by 5. 10 times 4 is 40 and 40 divided by 5 is STILL 8! We got the same answer!



This helps us see how 4 fifths of 10 is the same as 4 fifths times 10. Here is how we show our work. The OF is replaced by the multiplication symbol. Then we multiply 4 x 10. The numerator is the multiplier. We write it as 4 x 10 over 5.

That's equal to 40 over 5, which is really 40 divided by 5. That equals 8.

Let's Try it (Slides 6): Let's practice multiplying fractions now that we know multiplication is secretly taking a fraction of a collection. I will help you!

WARM WELCOME

Today we will multiply whole numbers by fractions using tape diagrams.

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Let's Review:

The key to our work today is remembering that division and multiplication work with equal groups or equal units.

At the grocery store, 5 bags of chips cost $10.

How much does it cost for 1 bag of chips?

How much does it cost for 4 bags of chips?

Let's Talk:

Now we can see how division and multiplication help us multiply fractions!

Draw a tape diagram to show $\frac{1}{5}$ of 10. That's like _____.

Draw a tape diagram to show $\frac{4}{5}$ of 10. That's like _____.

Let's Think:

The commutative property let's us do these operations in a different order!

For $\frac{4}{5}$ of 10, we did ____ ÷ ____ x ____ = ____

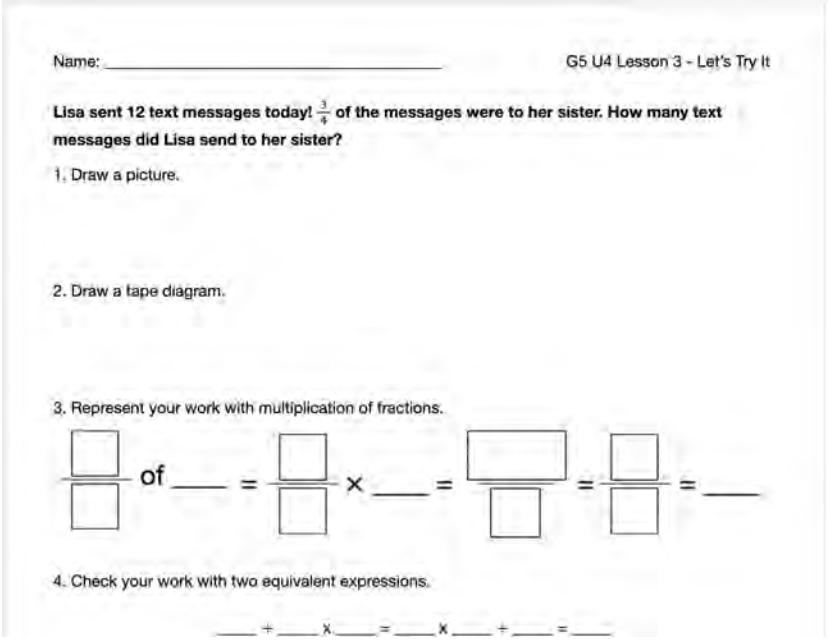
But we could get the same answer with ____ x ____ ÷ ____ = ____

This helps us see how $\frac{4}{5}$ of 10 is the same as $\frac{4}{5} \times 10$!

Here is how we show our work:

Let's Try It:

Let's practice multiplying fractions now that we know multiplication is secretly taking a fraction of a collection. I will help you!



Name: _____ G5 U4 Lesson 3 - Let's Try It

Lisa sent 12 text messages today! $\frac{3}{4}$ of the messages were to her sister. How many text messages did Lisa send to her sister?

1. Draw a picture.

2. Draw a tape diagram.

3. Represent your work with multiplication of fractions.

$\frac{\square}{\square}$ of ____ = $\frac{\square}{\square} \times$ ____ = $\frac{\square}{\square} = \frac{\square}{\square}$ = ____

4. Check your work with two equivalent expressions.

____ + ____ x ____ = ____ x ____ + ____ = ____

On your Own:

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

Name: _____ G5 U4 Lesson 3 - Independent Work

Remember: A fraction OF a number means a fraction TIMES a number.

Solve the problem below with a picture and fill in the blanks.

1. Leslie's farm is 12 acres. She planted $\frac{2}{3}$ of it with vegetables and the rest with fruit. How many acres did she plant with fruit? Draw a picture: Fill in the blanks: $\frac{\square}{\square}$ of ___ is $\frac{\square}{\square} \times$ ___ = $\frac{\square}{\square} = \frac{\square}{\square}$ = ___ Check with ___ ÷ ___ x ___ = ___	2. Miles took $\frac{1}{2}$ of his medicine with breakfast. He will take the other half with dinner. If Miles is supposed to take 20 mg of medicine, how much did he take with breakfast? Draw a picture: Fill in the blanks: $\frac{\square}{\square}$ of ___ is $\frac{\square}{\square} \times$ ___ = $\frac{\square}{\square} = \frac{\square}{\square}$ = ___ Check with ___ ÷ ___ x ___ = ___
3. Rose spent 8 hours playing at her friend's house today. They spent $\frac{3}{4}$ of the time doing art	4. Nathaniel played video games for 6 hours thi weekend. He spent $\frac{2}{3}$ of that time on Roblox.

Name: _____ G5 U4 Lesson 3 - Let's Try It

Lisa sent 12 text messages today! $\frac{3}{4}$ of the messages were to her sister. How many text messages did Lisa send to her sister?

1. Draw a picture.

2. Draw a tape diagram.

3. Represent your work with multiplication of fractions.

$\frac{\square}{\square}$ of ____ = $\frac{\square}{\square} \times$ ____ = $\frac{\square}{\square} = \frac{\square}{\square} =$ ____

4. Check your work with two equivalent expressions.

_____ ÷ _____ x _____ = _____ x _____ ÷ _____ = _____

Solve. $\frac{2}{3} \times 6$

5. Draw a tape diagram.

6. Represent your work with multiplication of fractions.

$\frac{\square}{\square}$ of ____ = $\frac{\square}{\square} \times$ ____ = $\frac{\square}{\square} = \frac{\square}{\square} =$ ____

Name: _____ G5 U4 Lesson 3 - Independent Work

Remember: A fraction OF a number means a fraction TIMES a number.

Solve the problem below with a picture and fill in the blanks.

1. Leslie's farm is 12 acres. She planted $\frac{2}{3}$ of it with vegetables and the rest with fruit. How many acres did she plant with fruit?

Draw a picture:

Fill in the blanks: ____ is

____ × ____ = ____ = ____ = ____

Check with ____ ÷ ____ x ____ = ____

2. Miles took $\frac{1}{2}$ of his medicine with breakfast. He will take the other half with dinner. If Miles is supposed to take 20 mg of medicine, how much did he take with breakfast?

Draw a picture:

Fill in the blanks: ____ is

____ × ____ = ____ = ____ = ____

Check with ____ ÷ ____ x ____ = ____

3. Rose spent 8 hours playing at her friend's house today. They spent $\frac{3}{4}$ of the time doing art projects. How long did Rose do art projects?

Draw a picture:

Fill in the blanks: ____ is

____ × ____ = ____ = ____ = ____

Check with ____ ÷ ____ x ____ = ____

4. Nathaniel played video games for 6 hours this weekend. He spent $\frac{2}{3}$ of that time on Roblox. How long did he spend on Roblox?

Draw a picture:

Fill in the blanks: ____ is

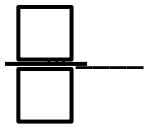
____ × ____ = ____ = ____ = ____

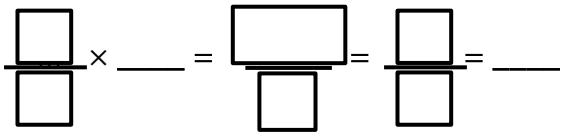
Check with ____ ÷ ____ x ____ = ____

Solve the problem below with a picture and fill in the blanks.

5. Jessie put stamps on $\frac{3}{5}$ of the cards she wanted to send for Valentine's Day. If she had 20 cards, how many were stamped?

Draw a picture:

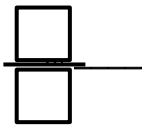
Fill in the blanks:  ____ is

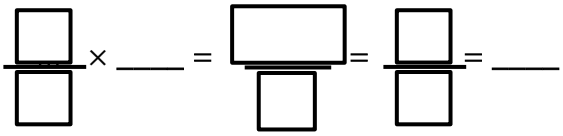
 ____ = ____

Check with ____ ÷ ____ x ____ = ____

6. I used $\frac{2}{3}$ of a bag of cheese in my taco recipe. If the bag held 12 ounces, how many ounces of cheese did I use?

Draw a picture:

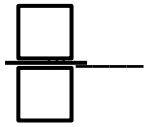
Fill in the blanks:  ____ is

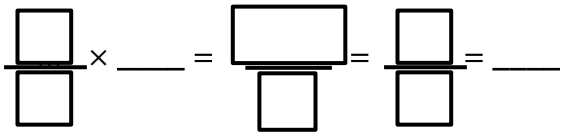
 ____ = ____

Check with ____ ÷ ____ x ____ = ____

7. Marvin picked 10 pounds of apples. $\frac{2}{5}$ of them were green and the rest were red. How many pounds of green apples did he pick?

Draw a picture:

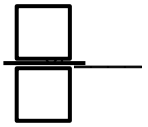
Fill in the blanks:  ____ is

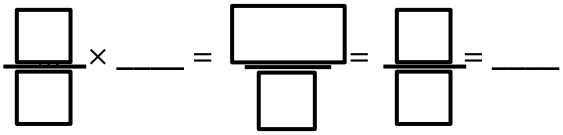
 ____ = ____

Check with ____ ÷ ____ x ____ = ____

8. Dan's phone said he used it for 8 hours this week. $\frac{3}{4}$ of that time was used for internet and the rest was used for calls. How many hours did Dan spend on the internet?

Draw a picture:

Fill in the blanks:  ____ is

 ____ = ____

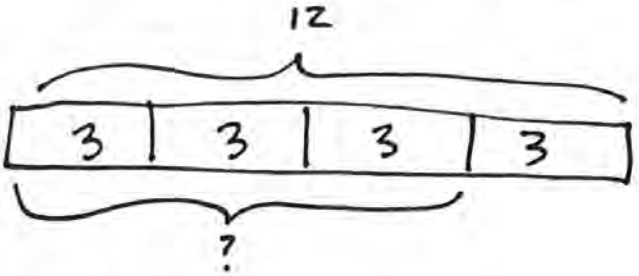
Check with ____ ÷ ____ x ____ = ____

Name: ANSWER KEY

Lisa sent 12 text messages today! $\frac{3}{4}$ of the messages were to her sister. How many text messages did Lisa send to her sister?

1. Draw a picture.

2. Draw a tape diagram.



3. Represent your work with multiplication of fractions.

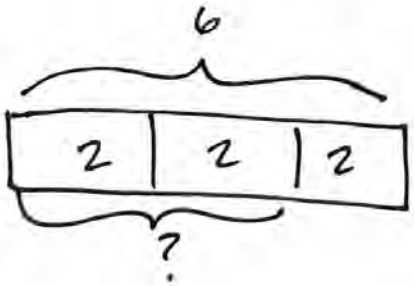
$\frac{3}{4}$ of $12 = \frac{3}{4} \times 12 = \frac{3 \times 12}{4} = \frac{36}{4} = 9$

4. Check your work with two equivalent expressions.

$12 \div 4 \times 3 = 12 \times 3 \div 4 = 9$

Solve. $\frac{2}{3} \times 6$

5. Draw a tape diagram.



6. Represent your work with multiplication of fractions.

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

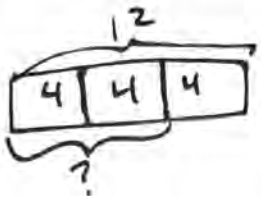
Name: ANSWER KEY

Remember: A fraction OF a number means a fraction TIMES a number.

Solve the problem below with a picture and fill in the blanks.

1. Leslie's farm is 12 acres. She planted $\frac{2}{3}$ of it with vegetables and the rest with fruit. How many acres did she plant with fruit?

Draw a picture:



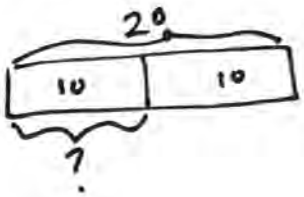
Fill in the blanks: $\frac{2}{3}$ of 12 is 8

$\frac{2}{3} \times 12 = \frac{2 \times 12}{3} = \frac{24}{3} = 8$

Check with 12 ÷ 3 x 2 = 8

2. Miles took $\frac{1}{2}$ of his medicine with breakfast. He will take the other half with dinner. If Miles is supposed to take 20 mg of medicine, how much did he take with breakfast?

Draw a picture:



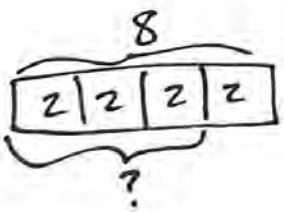
Fill in the blanks: $\frac{1}{2}$ of 20 is

$\frac{1}{2} \times 20 = \frac{1 \times 20}{2} = \frac{20}{2} = 10$

Check with 20 ÷ 2 x 1 = 10

3. Rose spent 8 hours playing at her friend's house today. They spent $\frac{3}{4}$ of the time doing art projects. How long did Rose do art projects?

Draw a picture:



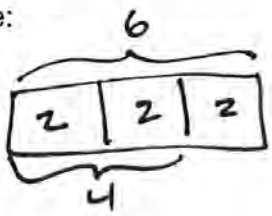
Fill in the blanks: $\frac{3}{4}$ of 8 is 6

$\frac{3}{4} \times 8 = \frac{3 \times 8}{4} = \frac{24}{4} = 6$

Check with 8 ÷ 4 x 3 = 6

4. Nathaniel played video games for 6 hours this weekend. He spent $\frac{2}{3}$ of that time on Roblox. How long did he spend on Roblox?

Draw a picture:



Fill in the blanks: $\frac{2}{3}$ of 6 is 4

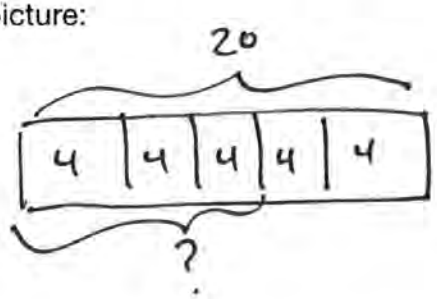
$\frac{2}{3} \times 6 = \frac{2 \times 6}{3} = \frac{12}{3} = 4$

Check with 6 ÷ 3 x 2 = 4

Solve the problem below with a picture and fill in the blanks.

5. Jessie put stamps on $\frac{3}{5}$ of the cards she wanted to send for Valentine's Day. If she had 20 cards, how many were stamped?

Draw a picture:



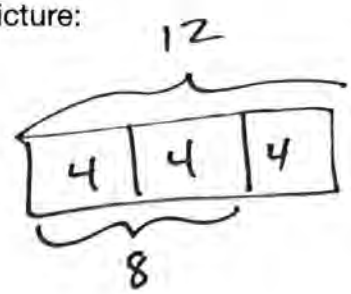
Fill in the blanks: $\frac{3}{5}$ of 20 is 12

$\frac{3}{5} \times 20 = \frac{3 \times 20}{5} = \frac{60}{5} = 12$

Check with 20 ÷ 5 x 3 = 12

6. I used $\frac{2}{3}$ of a bag of cheese in my taco recipe. If the bag held 12 ounces, how many ounces of cheese did I use?

Draw a picture:



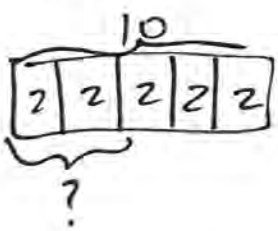
Fill in the blanks: $\frac{2}{3}$ of 12 is 8

$\frac{2}{3} \times 12 = \frac{2 \times 12}{3} = \frac{24}{3} = 8$

Check with 12 ÷ 3 x 2 = 8

7. Marvin picked 10 pounds of apples. $\frac{2}{5}$ of them were green and the rest were red. How many pounds of green apples did he pick?

Draw a picture:



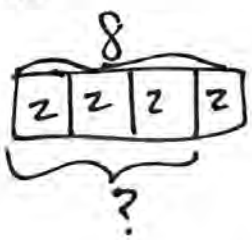
Fill in the blanks: $\frac{2}{5}$ of 10 is 4

$\frac{2}{5} \times 10 = \frac{2 \times 10}{5} = \frac{20}{5} = 4$

Check with 10 ÷ 5 x 2 = 4

8. Dan's phone said he used it for 8 hours this week. $\frac{3}{4}$ of that time was used for internet and the rest was used for calls. How many hours did Dan spend on the internet?

Draw a picture:



Fill in the blanks: $\frac{3}{4}$ of 8 is 6

$\frac{3}{4} \times 8 = \frac{3 \times 8}{4} = \frac{24}{4} = 6$

Check with 8 ÷ 4 x 3 = 6

G5 U4 Lesson 4

Relate multiplying fractions to repeated addition

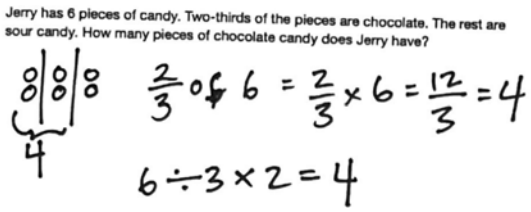
CITYTUTOR

G1 U4 Lesson 4 - Today we will relate multiplying fractions to repeated addition.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will relate multiplying fractions to repeated addition. This is going to be great at making sure that our last lesson still works with everything else we've learned about multiplication over the years. I think it is really going to make multiplying fractions stick for you.

Let's Review (Slide 3): In our last lesson, we learned how to multiply fractions. Keep your eyes on the words while I read this problem. *Read the problem while the kids read along silently.* How would you represent and solve this problem? *This is an opportunity for everyone to review all the different types of correct reasoning. If someone suggests something that is incorrect, be sure to say, "That's not exactly right. Can someone else help?" Be sure to stamp correct thinking by saying, "That is right" and write it down on the board. You will want to capture all the correct ideas including: "of" language, multiplying fractions, division with multiplication and a tape diagram.*

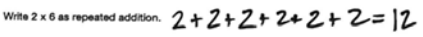


Possible Student Answers, Key Points:

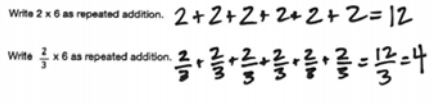
- Two thirds of 6 is two thirds times 6 so we do 2 x 6 over 3. 2 x 6 is 12 and 12 divided by 3 is 4.
- We divide by 3 and multiply by 2. 6 divided by 3 is 2 and 2 x 2 is 4.
- We multiply by 2 and divide by 3. 6 x 2 is 12 and 12 divided by 3 is 4.
- We draw a rectangle to represent 6. Then we split it into 3 pieces. There's 2 in each piece. We shade in two pieces, which is 4.

There are a lot of ways to represent this problem. We have "of" language. We can think of it as multiplying fractions. We can use division then multiplication or multiplication then division. We can draw a tape diagram. All of these are correct. All of these get the same answer - 4.

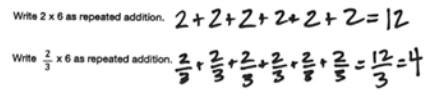
Let's Talk (Slide 4): The big idea we want to figure out today is how this relates to what we learned about multiplication in earlier grades because in earlier grades you probably learned that multiplication is the same as repeated addition.



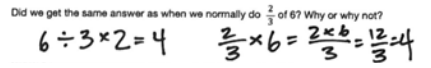
This says to write 2 x 6 as repeated addition. That would be 2 repeated 6 times. I write 2 + 2 + 2 + 2 + 2 + 2. I can count 6 twos or 6 units of 2.



Now let's write $\frac{2}{3} \times 6$ as repeated addition. That would be $\frac{2}{3}$ repeated 6 times. I write $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}$. Remember that when we add fractions, we don't add denominators. We have 2 pieces and 2 pieces and 2 pieces and 2 pieces and 2 pieces and 2 pieces. That's 12 pieces. It's really 2 + 2 + 2 + 2 + 2 + 2 over 3. That's 12 over 3, 12 thirds. 12 thirds is 12 divided by 3, which is 4. This is what we just did on the last slide with the 4 pieces of chocolate candy!



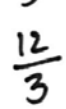
So, did we get the same answers as when we normally do $\frac{2}{3}$ of 6? Yes! Let's show the work. We said on the last slide that $\frac{2}{3}$ of 6 could be thought of as 2 x 6 over 3.

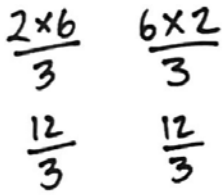


Repeated addition of the numerator is like multiplying the numerator. The bottom number of the fraction, the denominator stayed the dividing number. That means everything we've been learning works together which is one of the most important things in math. All the ideas have to agree with each other. And here we have repeated addition agreeing with taking a fraction of a number which agrees with multiplying a fraction by a number.

Let's Think (Slide 5): If all of these ideas are agreeing then that means the commutative property should also work. The commutative property means that we should be able to switch the order of our multiplication and get the same answer. This says, "Is 2 thirds times 6 equal to 6 times 2 thirds?"

We just did 2 thirds times 6. It was 2 x 6 over 3 which is 12 over 3 which is 4.





Now we can do 6 times 2 thirds. That's 6 x 2 over 3 which is still 12 over 3. It's still 4! It works either way!

Let's Try it (Slides 6): Let's practice multiplying fractions together. We will check our work with repeated addition! I will walk you through step by step.

WARM WELCOME

Today we will related multiplying fractions to repeated addition.

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Let's Review:

In our last lesson, we learned how to multiply fractions.

Jerry has 6 pieces of candy. Two-thirds of the pieces are chocolate. The rest are sour candy. How many pieces of chocolate candy does Jerry have?

Let's Talk:

Today we want to see how multiplying fractions relates to repeated addition.

Write 2 x 6 as repeated addition.

Write $\frac{2}{3}$ x 6 as repeated addition.

Did we get the same answer as when we normally do $\frac{2}{3}$ of 6? Why or why not?

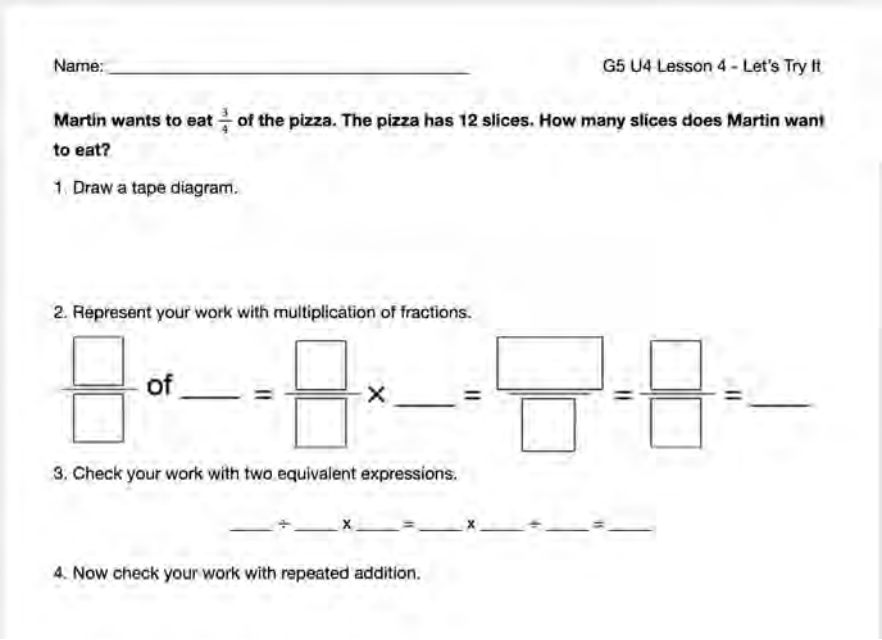
Let's Think:

The commutative property means that we should be able to switch the order of our multiplication and get the same answer.

Is $\frac{2}{3} \times 6 = 6 \times \frac{2}{3}$?

Let's Try It:

Let's practice multiplying fractions together. We will check our work with repeated addition!



Name: _____ G5 U4 Lesson 4 - Let's Try It

Martin wants to eat $\frac{3}{4}$ of the pizza. The pizza has 12 slices. How many slices does Martin want to eat?

1. Draw a tape diagram.

2. Represent your work with multiplication of fractions.

$\frac{\square}{\square}$ of ____ = $\frac{\square}{\square} \times$ ____ = $\frac{\square}{\square}$ = $\frac{\square}{\square}$ = ____

3. Check your work with two equivalent expressions.

____ ÷ ____ x ____ = ____ x ____ ÷ ____ = ____

4. Now check your work with repeated addition.

On your Own:

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

Name: _____ G5 U4 Lesson 4 - Independent Work

Remember: Multiplication is the same as repeated addition.

Solve each problem several ways by drawing a picture, showing your work and filling in the blanks.

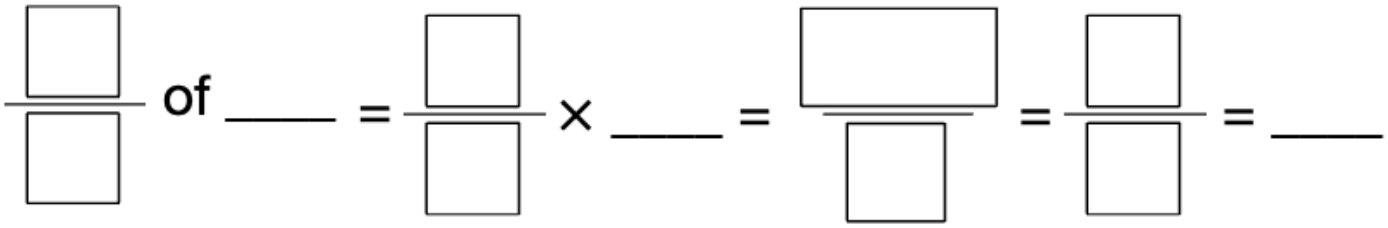
1.	2.
$\frac{4}{5} \times 5$	$8 \times \frac{3}{4}$
Draw a tape diagram:	Draw a tape diagram:
Solve with repeated addition:	Solve with repeated addition:
Fill in the blanks: ☐/☐ = ☐/☐ = ___	Fill in the blanks: ☐/☐ = ☐/☐ = ___
Check with ___ ÷ ___ x ___ = ___	Check with ___ ÷ ___ x ___ = ___
3.	4.

Name: _____ G5 U4 Lesson 4 - Let's Try It

Martin wants to eat $\frac{3}{4}$ of the pizza. The pizza has 12 slices. How many slices does Martin want to eat?

1. Draw a tape diagram.

2. Represent your work with multiplication of fractions.



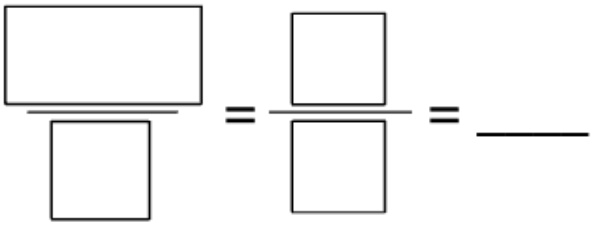
3. Check your work with two equivalent expressions.

_____ ÷ _____ x _____ = _____ x _____ ÷ _____ = _____

4. Now check your work with repeated addition.

Solve. $3 \times \frac{4}{5}$

5. Represent your work with multiplication of fractions.

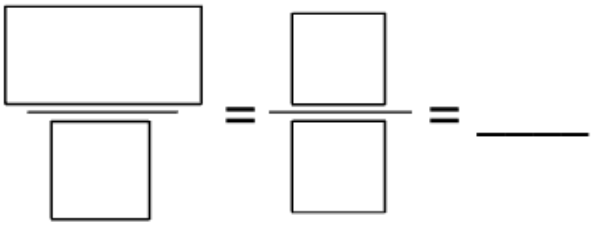


6. Represent your work with repeated addition.

Freddy has 3 dogs. Each dog gets $\frac{3}{4}$ cup of kibble in the morning. How much kibble does Freddy need in the morning?

7. Draw a tape diagram:

8. Represent your work with multiplication of fractions.



9. Represent your work with repeated addition.

Name: _____ G5 U4 Lesson 4 - Independent Work

Remember: Multiplication is the same as repeated addition.

Solve each problem several ways by drawing a picture, showing your work and filling in the blanks.

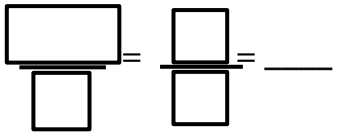
1.

$$\frac{4}{5} \times 5$$

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:



Check with ____ ÷ ____ x ____ = ____

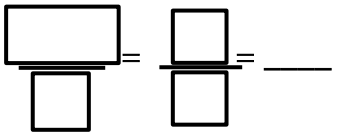
2.

$$8 \times \frac{3}{4}$$

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:



Check with ____ ÷ ____ x ____ = ____

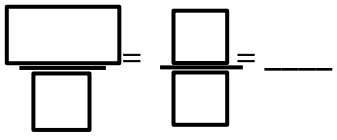
3.

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

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:



Check with ____ ÷ ____ x ____ = ____

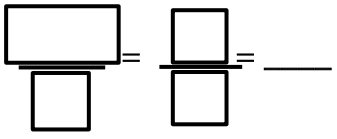
4.

$$9 \times \frac{2}{3}$$

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:



Check with ____ ÷ ____ x ____ = ____

Solve each problem several ways by drawing a picture, showing your work and filling in the blanks.

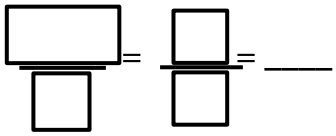
5.

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

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:



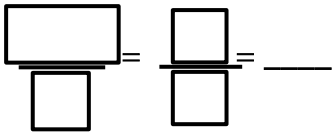
6.

$$3 \times \frac{4}{7}$$

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:

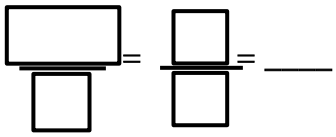


7. Gary takes $\frac{1}{4}$ ounce of medicine every day. How much medicine does he take in a week?

Draw a tape diagram:

Solve with repeated addition:

Fill in the blanks:

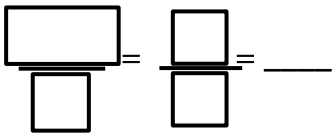


8. Lisa walks her dog three times a day. Each time, she walks her dog $\frac{2}{3}$ of a mile. How far does she walk her dog each day?

Draw a tape diagram:

Solve with repeated addition:

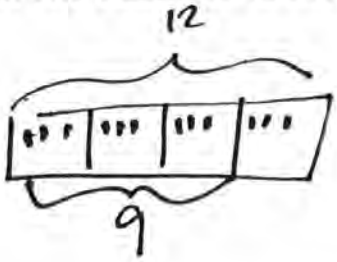
Fill in the blanks:



Name: ANSWER KEY

Martin wants to eat $\frac{3}{4}$ of the pizza. The pizza has 12 slices. How many slices does Martin want to eat?

1. Draw a tape diagram.



2. Represent your work with multiplication of fractions.

$$\frac{3}{4} \text{ of } 12 = \frac{3}{4} \times 12 = \frac{3 \times 12}{4} = \frac{36}{4} = 9$$

3. Check your work with two equivalent expressions.

$$12 \div 4 \times 3 = 12 \times 3 \div 4 = 9$$

4. Now check your work with repeated addition.

$$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{36}{4} = 9$$

Solve. $10 \times \frac{4}{5}$

5. Represent your work with multiplication of fractions.

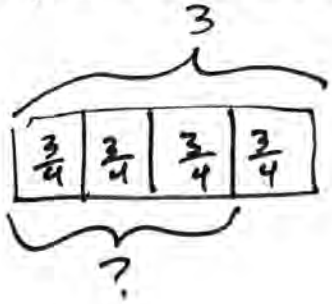
$$\frac{10 \times 4}{5} = \frac{40}{5} = 8$$

6. Represent your work with repeated addition.

$$\frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} = \frac{40}{5} = 8$$

Freddy has 3 dogs. Each dog gets $\frac{3}{4}$ cup of kibble in the morning. How much kibble does Freddy need in the morning?

7. Draw a tape diagram:



8. Represent your work with multiplication of fractions.

$$\frac{3 \times 3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

$$4\overline{)9} \quad 2, \quad -8, \quad 1$$

9. Represent your work with repeated addition.

$$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

Name: ANSWER KEY

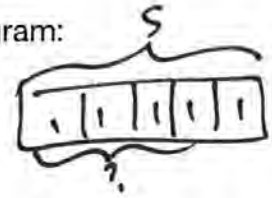
Remember: Multiplication is the same as repeated addition.

Solve each problem several ways by drawing a picture, showing your work and filling in the blanks.

1.

$$\frac{4}{5} \times 5$$

Draw a tape diagram:



Solve with repeated addition:

$\frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} = \frac{20}{5} = 4$

Fill in the blanks:

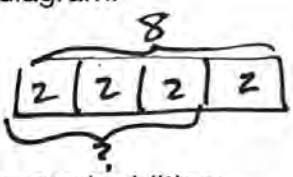
$\frac{4 \times 5}{5} = \frac{20}{5} = 4$

Check with 5 ÷ 5 x 4 = 4

2.

$$.8 \times \frac{3}{4}$$

Draw a tape diagram:



Solve with repeated addition:

$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{24}{4} = 6$

Fill in the blanks:

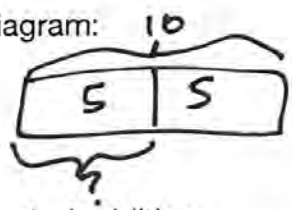
$\frac{3 \times 8}{4} = \frac{24}{4} = 6$

Check with 8 ÷ 4 x 3 = 6

3.

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

Draw a tape diagram:



Solve with repeated addition:

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

Fill in the blanks:

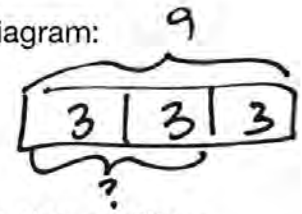
$\frac{1 \times 10}{2} = \frac{10}{2} = 5$

Check with 10 ÷ 2 x 1 = 5

4.

$$9 \times \frac{2}{3}$$

Draw a tape diagram:



Solve with repeated addition:

$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{18}{3} = 6$

Fill in the blanks:

$\frac{2 \times 9}{3} = \frac{18}{3} = 6$

Check with 9 ÷ 3 x 2 = 6

Solve each problem several ways by drawing a picture, showing your work and filling in the blanks.

5.

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

Draw a tape diagram:

Solve with repeated addition:

$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{8}{3} = 2\frac{2}{3}$

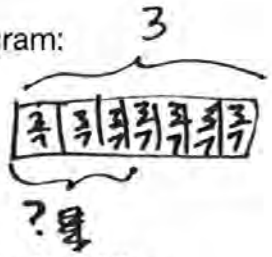
Fill in the blanks:

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

6.

$3 \times \frac{4}{7}$

Draw a tape diagram:



Solve with repeated addition:

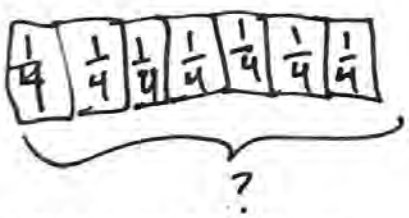
$\frac{4}{7} + \frac{4}{7} + \frac{4}{7} = \frac{12}{7} = 1\frac{5}{7}$

Fill in the blanks:

$\frac{4 \times 3}{7} = \frac{12}{7} = 1\frac{5}{7}$

7. Gary takes $\frac{1}{4}$ ounce of medicine every day. How much medicine does he take in a week?

Draw a tape diagram:



Solve with repeated addition:

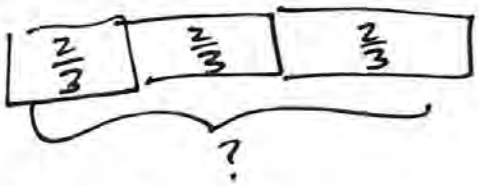
$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{7}{4} = 1\frac{3}{4}$

Fill in the blanks:

$\frac{1 \times 7}{4} = \frac{7}{4} = 1\frac{3}{4}$

8. Lisa walks her dog three times a day. Each time, she walks her dog $\frac{2}{3}$ of a mile. How far does she walk her dog each day?

Draw a tape diagram:



Solve with repeated addition:

$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{6}{3} = 2$

Fill in the blanks:

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

G5 U4 Lesson 5

Compare the size of a product to the size of its factors

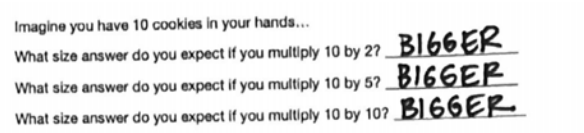
G1 U4 Lesson 5 - Today we will compare the size of a product to the size of its factors.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will compare the size of a product to the size of its factors. Let me break this down. Compare means to decide if something is bigger or smaller. Product is the answer to a multiplication problem, and the factors are the number we multiply to make the product. So, today we are going to decide if the answer to our multiplication is going to be bigger or smaller than the numbers being multiplied to get the answer.

Let's Review (Slide 3): Up until this year, the answer to multiplication was always bigger than the numbers that were being multiplied. Imagine you have 10 cookies in your hands (*put out your hands and pretend to hold a bunch of cookies).* Let's think. What size answer do you expect if you multiply 10 by 2? In other words, what if we had these 10 cookies, two times? Possible Student Answers, Key Points:

- We would get 20.
- We would have more.
- The answer would be bigger.

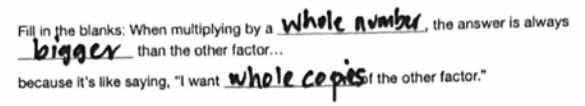


That's right, we expect that our answer is bigger because we take these cookies and get them lots of times. Like now two people are each holding 10 cookies. The answer is bigger than 10. We expect the answer to be bigger if we're multiplying it by a factor of 2.

Note: Repetition is important here, you are saying the same idea lots of different ways so the children hear all the correct language to describe the reasoning. If you need to, have two students come up and pretend to hold 10 cookies each to show the amount of cookies getting bigger.

Now, let's imagine another scenario. What if we had these 10 cookies times 5? We would get 50! We would have more! The answer would be bigger. That's right, we expect that our answer is bigger because we take these cookies and get them lots of times. Like now FIVE people are each holding 10 cookies. The answer is bigger than 10. We expect the answer to be bigger if we're multiplying it by a factor by 5. What if we had these 10 cookies times 10? We would get 100! We would have more. The answer would be bigger. That's right, we expect that our answer is bigger because we take these cookies and get them lots of times. Like now ten people are each holding 10 cookies. The answer is bigger than 10. We expect the answer to be bigger if we're multiplying it by a factor by 10.

This helps us see a pattern. Help me fill in the blanks. "When multiplying by a whole number, the answer is always BIGGER than the other factor…" We said "bigger" for each of these problems, right?



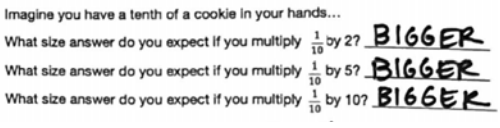
The answer is bigger because multiplying by a whole number is like saying, "I want whole copies of the other factor." Like I want lots of people to hold 10 cookies over and over and over to get lots of cookies. This is the idea that you learned in early grades.

Let's Talk (Slide 4): Now we need to think about whether expecting a bigger answer still makes sense when multiplying a fraction. Imagine you have a tenth of a cookie in your hands. That's just a little piece of a cookie. How sad! *Pretend to hold a piece of cookie between your fingers.*

Let's think. What size answer do you expect if you multiply that tenth by 2? In other words, what if we had this tenth of a cookie, two times? Possible Student Answers, Key Points:

- We would get 2 tenths.
- We would have more.
- The answer would be bigger.

We STILL expect that our answer to be bigger because we STILL take this piece of cookie and get it lots of times. Like now two people are each holding a tenth of a cookie. The answer is bigger than one tenth. We expect the answer to be bigger if we're multiplying it by a factor of 2. *If you need to, have two students come up and pretend to hold 10 cookies each to show the amount of cookies getting bigger.*



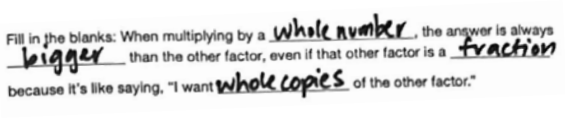
What size answer do you expect if you multiply that tenth by 5? We would get 5 tenths! We would have more! The answer would be bigger! That's right, we STILL expect that our answer to be bigger because we STILL

take this piece of cookie and get it lots of times. Like now five people are each holding a tenth of a cookie. The answer is bigger than one tenth. We expect the answer to be bigger if we're multiplying it by a factor of 5.

What size answer do you expect if you multiply that tenth by 10? Possible Student Answers, Key Points:

- We would get 10 tenths.
- We would get 1 whole cookie.
- We would have more.
- The answer would be bigger.

We STILL expect that our answer to be bigger because we STILL take this piece of cookie and get it lots of times. Like now ten people are each holding a tenth of a cookie. The answer is bigger than one tenth. We expect the answer to be bigger if we're multiplying it by a factor of 10.



It's time to write down our pattern. Think about how we should fill in these blanks. "When multiplying by a whole number…" because we're still multiplying by 2, 5 and 10, which are whole numbers. "The answer is always bigger than the other factor, even if that other factor is a fraction."

That's because multiplying by a whole number is still like saying, "I want whole copies of the other factor." Like I want lots of people to hold a tenth of a cookie over and over and over to get lots of cookies. Multiplication still gives us a bigger answer like you learned in younger grades.

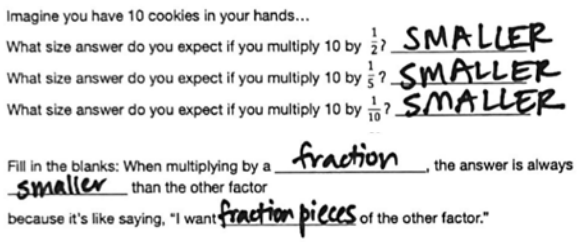
Let's Think (Slide 5): But now is when we get a surprise in the size of our answer! This says, Imagine you have 10 cookies in your hands. Okay, we're back to ten cookies. Show me ten cookies. *Put out your hands and pretend to hold a bunch of cookies.* Now, let's think. What size answer do you expect if you multiply 10 by one half? This isn't the same problem as the last time! We're not multiplying by 2; we're multiplying by one half. That's like taking half of these cookies. What size answer do you expect if you multiply 10 by one half? Possible Student Answers, Key Points:

- We would get 5.
- We would have less.
- The answer would be smaller.
-

Wow! So we're still multiplying. But this time our answer was smaller than 10. What size answer do you expect if you multiply by one fifth. We're not multiplying by 5; we're multiplying by one fifth. That's like taking a fifth of these cookies. What size answer do you expect if you multiply 10 by one fifth? Possible Student Answers, Key Points:

- We would get 2.
- We would have less.
- The answer would be smaller.

Wow! So we're still multiplying. But this time our answer was also smaller than 10. And, what size answer do you expect if you multiply by one tenth. We're not multiplying by 10; we're multiplying by one tenth. That's like taking a tenth of these cookies. What size answer do you expect if you multiply 10 by one tenth? We would get 1! We would have less. The answer would be smaller.
Wow! So we're still multiplying. But this time our answer was also smaller than 10.

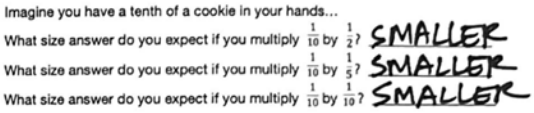


It's time to write down our pattern. Think about how we should fill in these blanks. "When multiplying by a fraction…" because we're multiplying 10 by 1/2, 1/5 and 1/10 now. "The answer is always smaller than the other factor."

That's because multiplying by a fraction is still like saying, "I want fractional pieces of the other factor." Like I want to get a fraction or a piece or a fair share of those cookies.

Whoa, multiplication DOESN't give us that bigger answer like you learned in younger grades. We don't see a bigger answer like we might be used to.

Let's Think (Slide 6): This is our last pattern to explore. We haven't learned how to get the answers to multiplying a fraction by a fraction yet. But all of this thinking we've been doing helps us make a prediction about the size answer we're going to get.



Imagine you have a tenth of a cookie in your hands. That's just a piece of a cookie. How sad! *Pretend to hold a piece of cookie between your fingers.* Let's think. What size answer do you expect if you multiply your tenth by just one half? That's like saying, "You have a piece of a cookie and I want a piece of it. I want a piece of your piece!" That's like taking half of this little cookie.

What size answer do you expect if you multiply one tenth by one half? Possible Student Answers, Key Points:

- Crumbs!
- We would have less.
- The answer would be smaller.

Our answer is smaller again! Because we started with a fraction. And then we took a fraction of that! *If necessary, you can mimic cutting a piece of a cookie. Or draw a picture of taking half of a tenth.*

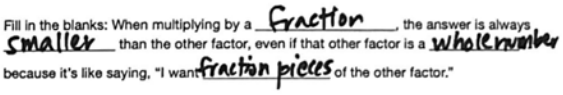
What size answer do you expect if you multiply your tenth by just one fifth? That's like saying, "You have a piece of a cookie and I want a piece of it. I want a piece of your piece!" That's like taking a fifth of this little cookie. What size answer do you expect if you multiply one tenth by one fifth? Possible Student Answers, Key Points:

- Crumbs!
- We would have less.
- The answer would be smaller.

Our answer is smaller again! Because we started with a fraction. And then we took a fraction of that!

What size answer do you expect if you multiply your tenth by just one tenth? That's like saying, "You have a piece of a cookie and I want a piece of it. I want a piece of your piece!" That's like taking a tenth of this little cookie. What size answer do you expect if you multiply one tenth by one tenth? Crumbs! We would have less!
Our answer is smaller again! Because we started with a fraction. And then we took a fraction of that!

Now, it's time to write down our pattern. Think about how we should fill in these blanks. "When multiplying by a fraction…" because we're multiplying 1/10 by 1/2, 1/5 and 1/10 now. "The answer is always smaller than the other factor,."



That's because multiplying by a fraction is still like saying, "I want fractional pieces of the other factor." Like I want to get a fraction or a piece or a fair share of those cookies. Multiplication DOESN't give us that bigger answer like you learned in younger grades. We don't see a bigger answer like we might be used to.

We just went through four slides. That means there are four possible scenarios where we have to predict the size of our answer. If we can imagine what is happening when we multiply like when we imagined holding cookies, whether we're getting whole copies or fractional pieces of the other factor, we'll be able to predict the size of the answer.

Let's Try it (Slides 7): Let's practice predicting the size of the multiplication answer together. I will take you through step by step.

WARM WELCOME

Today we will compare the size of the product to the size of the factors.

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Let's Review:

Up until this year, the answer to multiplication was always bigger than the numbers that were being multiplied.

Imagine you have 10 cookies in your hands…

What size answer do you expect if you multiply 10 by 2? _____

What size answer do you expect if you multiply 10 by 5? _____

What size answer do you expect if you multiply 10 by 10? _____

Fill in the blanks: When multiplying by a _____, the answer is always _____ than the other factor…

because it's like saying, "I want _____ of the other factor."

Let's Talk:

Now we need to think about whether expecting a bigger answer still makes sense when multiplying a fraction.

Imagine you have a tenth of a cookie in your hands…

What size answer do you expect if you multiply $\frac{1}{10}$ by 2? _____

What size answer do you expect if you multiply $\frac{1}{10}$ by 5? _____

What size answer do you expect if you multiply $\frac{1}{10}$ by 10? _____

Fill in the blanks: When multiplying by a _____, the answer is always _____ than the other factor, even if that other factor is a _____

because it's like saying, "I want _____ of the other factor."

Let's Think:

But now is when we get a surprise in the size of our answer!

Imagine you have 10 cookies in your hands…

What size answer do you expect if you multiply 10 by $\frac{1}{2}$? _____

What size answer do you expect if you multiply 10 by $\frac{1}{5}$? _____

What size answer do you expect if you multiply 10 by $\frac{1}{10}$? _____

Fill in the blanks: When multiplying by a _____, the answer is always _____ than the other factor

because it's like saying, "I want _____ of the other factor."

Let's Think:

This helps us make a prediction about multiplying a fraction by a fraction.

Imagine you have a tenth of a cookie in your hands…

What size answer do you expect if you multiply $\frac{1}{10}$ by $\frac{1}{2}$? _____

What size answer do you expect if you multiply $\frac{1}{10}$ by $\frac{1}{5}$? _____

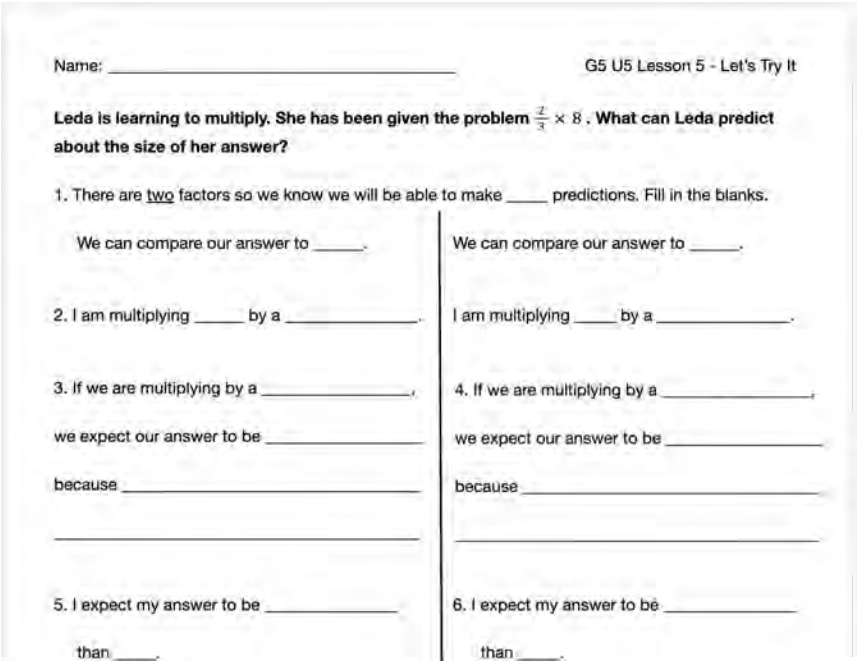
What size answer do you expect if you multiply $\frac{1}{10}$ by $\frac{1}{10}$? _____

Fill in the blanks: When multiplying by a _____, the answer is always _____ than the other factor, even if that other factor is a _____...

because it's like saying, "I want _____ of the other factor."

Let's Try It:

Let's practice predicting the size of the multiplication answer together.



Name: _____ G5 U5 Lesson 5 - Let's Try It

Leda is learning to multiply. She has been given the problem $\frac{7}{3} \times 8$. What can Leda predict about the size of her answer?

1. There are two factors so we know we will be able to make _____ predictions. Fill in the blanks.

We can compare our answer to _____.

2. I am multiplying _____ by a _____.

3. If we are multiplying by a _____,

we expect our answer to be _____

because _____

_____

5. I expect my answer to be _____

than _____.

We can compare our answer to _____.

I am multiplying _____ by a _____.

4. If we are multiplying by a _____,

we expect our answer to be _____

because _____

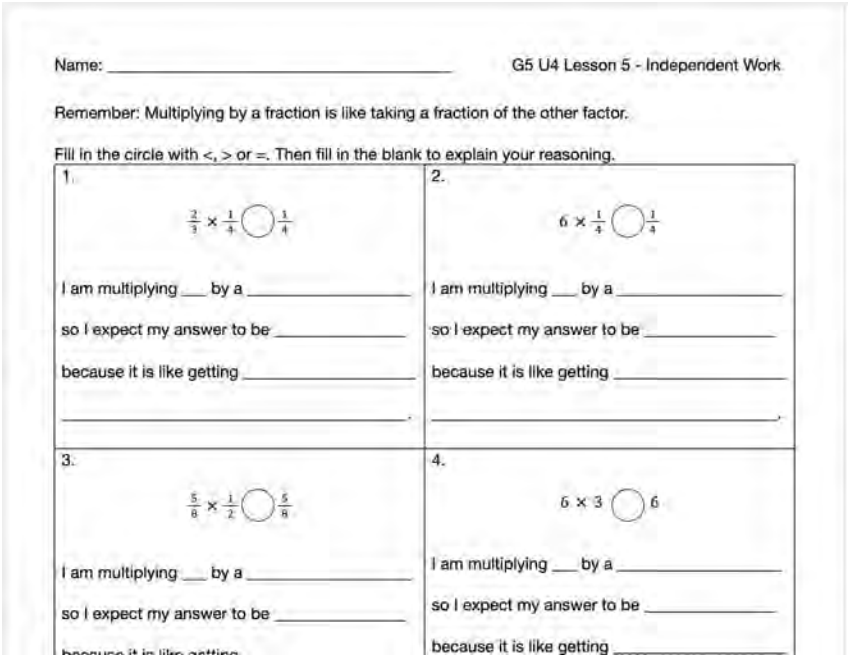
_____

6. I expect my answer to be _____

than _____.

On your Own:

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



Name: _____ G5 U4 Lesson 5 - Independent Work

Remember: Multiplying by a fraction is like taking a fraction of the other factor.

Fill in the circle with <, > or =. Then fill in the blank to explain your reasoning.

1. $\frac{2}{3} \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____.

2. $6 \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____.

3. $\frac{5}{8} \times \frac{1}{2} \bigcirc \frac{5}{8}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting

4. $6 \times 3 \bigcirc 6$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

Name: _____ G5 U4 Lesson 5 - Let's Try It

Leda is learning to multiply. She has been given the problem $\frac{2}{3} \times 8$. What can Leda predict about the size of her answer?

1. There are <u>two</u> factors so we know we will be able to make _____ predictions. Fill in the blanks.

We can compare our answer to _____.

2. I am multiplying _____ by a _____.

3. If we are multiplying by a _____,

we expect our answer to be _____

because _____

_____

5. I expect my answer to be _____

than _____.

7. Fill in the circle with <, > or =.

$\frac{2}{3} \times 8$ ◯ ___

We can compare our answer to _____.

2. I am multiplying _____ by a _____.

4. If we are multiplying by a _____,

we expect our answer to be _____

because _____

_____

6. I expect my answer to be _____

than _____.

8. Fill in the circle with <, > or =.

$\frac{2}{3} \times 8$ ◯ ___

Fill in the circle with <, > or =.

$\frac{1}{4} \times \frac{1}{2}$ ◯

9. We are comparing our answer to _____.

$\frac{1}{4} \times \frac{1}{2}$ ◯

10. We are comparing our answer to _____.

11. I am multiplying _____ by a _____.

12. I am multiplying _____ by a _____.

13. If we are multiplying by a _____,

we expect our answer to be _____

because _____

_____

14. If we are multiplying by a _____,

we expect our answer to be _____

because _____

_____

15. I expect my answer to be _____

than _____.

16. I expect my answer to be _____

than _____.

17. Fill in the circle with <, > or =.

18. Fill in the circle with <, > or =.

Name: _____ G5 U4 Lesson 5 - Independent Work

Remember: Multiplying by a fraction is like taking a fraction of the other factor.

Fill in the circle with <, > or =. Then fill in the blank to explain your reasoning.

1.

$\frac{2}{3} \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

2.

$6 \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

3.

$\frac{5}{8} \times \frac{1}{2} \bigcirc \frac{5}{8}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

4.

$6 \times 3 \bigcirc 6$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

5.

$\frac{2}{3} \times 2\frac{1}{2} \bigcirc 2\frac{1}{2}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

6.

$8 \times \frac{3}{10} \bigcirc \frac{3}{10}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____

___.

Fill in the circle with <, > or =. Then fill in the blank to explain your reasoning.

7.

$5 \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____
__.

8.

$7\frac{1}{3} \times \frac{2}{3} \bigcirc \frac{2}{3}$

I am multiplying ___ by a _____

so I expect my answer to be _____

because it is like getting _____

_____
__.

9.

$\frac{5}{8} \times \frac{3}{4} \bigcirc \frac{5}{8}$

Explain your reasoning:

_____
___

_____
___

_____
___

_____
___

10.

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

Explain your reasoning:

_____
___

_____
___

_____
___

_____
___

11.

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

Explain your reasoning:

_____
___

_____
___

_____
___

_____
___

12.

$\frac{3}{2} \times \frac{8}{5} \bigcirc \frac{3}{2}$

Explain your reasoning:

_____
___

_____
___

_____
___

_____
___

Name: ANSWER KEY

Leda is learning to multiply. She has been given the problem $\frac{2}{3} \times 8$. What can Leda predict about the size of her answer?

1. There are <u>two</u> factors so we know we will be able to make two predictions. Fill in the blanks.

We can compare our answer to $\frac{2}{3}$.

2. I am multiplying $\frac{2}{3}$ by a whole number.

3. If we are multiplying by a whole number, we expect our answer to be bigger because we will get whole copies of it.

5. I expect my answer to be bigger than $\frac{2}{3}$.

7. Fill in the circle with <, > or =.

$\frac{2}{3} \times 8$ (>) $\frac{2}{3}$

We can compare our answer to 8.

I am multiplying 8 by a fraction.

4. If we are multiplying by a fraction, we expect our answer to be smaller because we will get fractional pieces of it.

6. I expect my answer to be smaller than 8.

8. Fill in the circle with <, > or =.

$\frac{2}{3} \times 8$ (<) 8

Fill in the circle with <, > or =.

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

9. We are comparing our answer to $\frac{1}{4}$.

11. I am multiplying $\frac{1}{4}$ by a fraction.

13. If we are multiplying by a fraction, we expect our answer to be smaller because we will get fractional pieces of it

15. I expect my answer to be smaller than $\frac{1}{4}$.

17. Fill in the circle with <, > or =.

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

10. We are comparing our answer to $\frac{1}{2}$.

12. I am multiplying $\frac{1}{2}$ by a fraction

14. If we are multiplying by a fraction, we expect our answer to be smaller because we will get fractional pieces of it

16. I expect my answer to be smaller than $\frac{1}{2}$.

18. Fill in the circle with <, > or =.

Name: ANSWER KEY

Remember: Multiplying by a fraction is like taking a fraction of the other factor.

Fill in the circle with <, > or =. Then fill in the blank to explain your reasoning.

1. $\frac{2}{3} \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying $\frac{1}{4}$ by a fraction

so I expect my answer to be smaller

because it is like getting fractional pieces of it.

2. $6 \times \frac{1}{4} (>) \frac{1}{4}$

I am multiplying $\frac{1}{4}$ by a whole number

so I expect my answer to be bigger

because it is like getting whole copies of it.

3. $\frac{5}{8} \times \frac{1}{2} (<) \frac{5}{8}$

I am multiplying $\frac{5}{8}$ by a fraction

so I expect my answer to be smaller

because it is like getting fractional pieces of it.

4. $6 \times 3 (>) 6$

I am multiplying 6 by a whole number

so I expect my answer to be bigger

because it is like getting whole copies of it.

5. $\frac{2}{3} \times 2\frac{1}{2} (<) 2\frac{1}{2}$

I am multiplying $2\frac{1}{2}$ by a fraction

so I expect my answer to be smaller

because it is like getting fractional pieces of it.

6. $8 \times \frac{3}{10} (>) \frac{3}{10}$

I am multiplying $\frac{3}{10}$ by a whole number

so I expect my answer to be bigger

because it is like getting whole copies of it.

Fill in the circle with <, > or =. Then fill in the blank to explain your reasoning.

7.

$5 \times \frac{1}{4} \bigcirc \frac{1}{4}$

I am multiplying $\frac{1}{4}$ by a whole number

so I expect my answer to be bigger

because it is like getting whole copies of $\frac{1}{4}$.

8.

$7\frac{1}{3} \times \frac{2}{3} \bigcirc \frac{2}{3}$

I am multiplying $\frac{2}{3}$ by a mixed number

so I expect my answer to be bigger

because it is like getting whole copies of it.

9.

$\frac{5}{8} \times \frac{3}{4} (<) \frac{5}{8}$

Explain your reasoning:

I am multiplying $\frac{5}{8}$ by a fraction so I expect my answer to be smaller than $\frac{5}{8}$ because it is like taking a piece of $\frac{5}{8}$.

10.

$2 \times 8\frac{1}{4} (>) 8\frac{1}{4}$

Explain your reasoning:

I am multiplying $8\frac{1}{4}$ by a whole number so I expect my answer to be bigger because it is like getting whole copies of $8\frac{1}{4}$.

11.

$\frac{2}{3} \times 2 (>) \frac{2}{3}$

Explain your reasoning:

I am multiplying $\frac{2}{3}$ by a whole number so I expect my answer to be bigger because it is like getting whole copies of $\frac{2}{3}$.

12.

$\frac{3}{2} \times \frac{8}{5} \bigcirc \frac{3}{2}$

Explain your reasoning:

G5 U4 Lesson 6

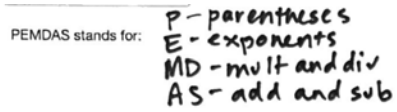
Compare expressions with fraction multiplication

G1 U4 Lesson 6 - Today we will compare expressions that have fraction multiplication.

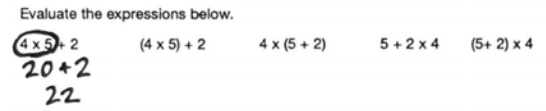
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our last class, we started to think about whether our multiplication answer will be bigger or smaller than the factors that are multiplied to make it. And we called that comparison. Today we are going to keep comparing expressions that have multiplication of fractions.

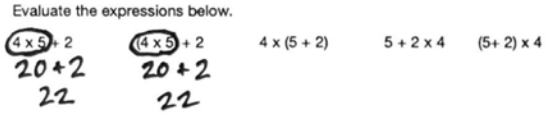
Let's Review (Slide 3): In order to understand the expressions we will need to remember to follow the order of operations, also known as PEMDAS. Raise your hand if you have heard of PEMDAS. What does PEMDAS stand for? *Simply collect a few answers to see what kids know. Then explain the correct answer as you write.*



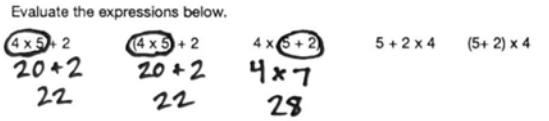
PEMDAS tells us the order to do the pieces of an expression. P stands for parentheses. E stands for exponents. MD stands for multiplication and division. We just do those from left to right. AS stands for addition and subtraction. We do those from left to right too.



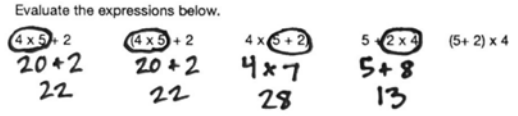
Let's use PEMDAS to evaluate the expressions below. Here I see, 4 x 5 + 2. I don't just jump in. I go through the letters. P is for parentheses. There aren't any of those. E is for exponents. There aren't any of them. MD is multiplication and division. So I do 4 x 5 is 20 and I bring down the 2. Notice I recopy the expression with the part I've done to help me see each step. 20 + 2 is 22.



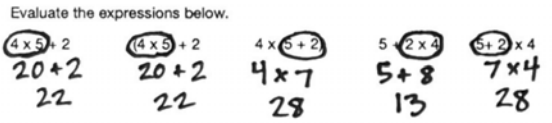
Let's do the next one. P is for parentheses. So I do 4 x 5. E is for exponents. There aren't any of them. MD is multiplication and division.We already did the multiplication. AS is addition and subtraction. 20 + 22 is 22. We get the same answer we got before. The parentheses didn't change this problem. They weren't really necessary because the multiplication would have come before the addition anyway.



Let's do the next one. P is for parentheses. Oh, look! We need to do 5 + 2 first. This is different. Again, I recopy the expression with the part I've done to help me see each step. The only step left is 4 x 7 is 28. This time we did get a different answer because the parentheses changed the order we would have done if they hadn't been there. We had the same numbers and operations but a different answer.

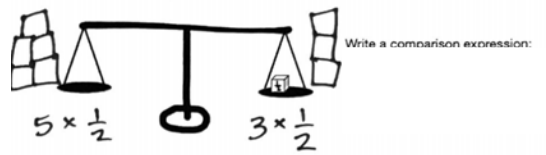


Let's do the next one. P is for parentheses. There aren't any of those. E is for exponents. There aren't any of those. MD is for multiplication and division. I have to do 2 x 4 first - even though they are later in the expression. 2 x 4 is 8. I recopy the expression with the part I did. That leaves 5 + 8 is 13.



Last one. P is for parentheses. That means I have to do the 5 + 2 first. 5 + 2 is 7. I recopy the expression. 7 x 4 is 28. This time we got a different answer because the parenthese changed the order we did things. We are going to need to remember this PEMDAS for expressions with fraction multiplication too.

Let's Talk (Slide 4): Now, even though we were just talking about how to evaluate expressions. We don't need to evaluate them in order to compare them. But PEMDAS will still help us think about where to look first in an expression. Let's talk about this. *Read the problem.*

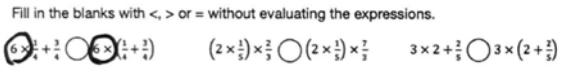


I am going to draw a picture to help us understand. Zora puts 5 weights that weighed ½ pound each. It looks like this. If I were going to write an expression, it would be 5 x ⅕.

Malcolm put 3 weights that weighed ½ pound each. It looks like this. If I were going to write an expression, it would be 3 x ⅕. Now here's the key, we could do the math and get to an answer. That is one way to decide which is heavier. But we don't have to do the math. And today, we are going to try to compare expressions without evaluating the expressions that means we are going to try to decide less than or greater than or equal to without doing the math. I can't always just look at it and know. But in this case, there is something that is the same about both sides. They both have ½ pound weights. That is the same. So I am really just comparing the 5 and the 3. I know when I multiply by a whole number it's like whole copies. So which will be bigger 5 whole copies or 3 whole copies? *Don't call on anyone. Just give the students time to think and then answer the question yourself.* 5 copies of something will be more than 3 copies of that exact same thing.

So I know 5 x ½ is bigger. Left hand is less than and right hand is greater than so I write the right hand symbol, which is the greater than symbol.

Let's Think (Slide 5): We can think of all our comparisons as a balance scale and look for what is the same and different on each side. Let me show you what I mean. This says, "Fill in the blanks with <, > or = without evaluating the expressions." That means I'm not going to do the math. Instead, I'm going to look at what is the same on both sides and then think about what the differences mean.

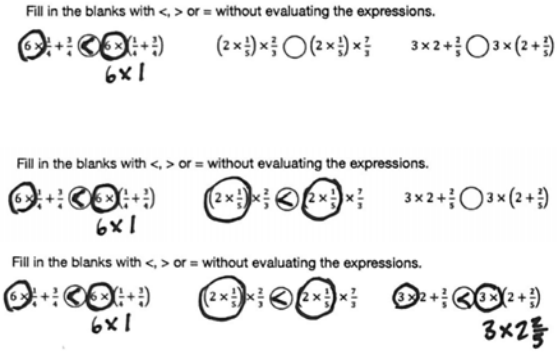


Let's look at the first one. I see 6x on both sides. *Circle the 6x on both sides.* So I'm getting 6 whole copies of whatever comes next. That will mean a bigger amount once I do the math.

The fractions getting added are the same too. But one set is NOT in parentheses and one set IS in parentheses. That's what's different. So now I need to think about what that difference means. What do you think it means? Possible Student Answers, Key Points:

- We have to do the parentheses first.
- We have to do the multiplication first on the left.
- We have to do the addition first on the right.

Since we have to do multiplication first on the left, we will have 6 copies of ¼ then add the ¾ at the end. But on the right side, we will add ¼ + ¾ and get 1. That's bigger. We're going to have 6 copies of something bigger. The right side will be bigger.



I am going to fill this in with my left hand which means less than.

Let's look at the next one. I see two times one fifth on both sides. Let me circle that. Now I can think about multiplying the same thing by two thirds or seven thirds. Seven thirds is bigger so that means more copies. That side is bigger. I use "left hand less than" again.

Let's look at the next one. I see 3x on both sides. The difference is 3 times 2 or 3 times a sum in parentheses. That would be 3 times two and two fifths. So that's going to be bigger. I use "left hand less than" again.

Let's Try it (Slides 6): Let's practice this together. I will walk you thinking through what is the same and what is different.

WARM WELCOME

Today we will compare expressions that have multiplication of fractions.

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Let's Review:

Today we will need to remember to follow order of operations, also known as PEMDAS.

PEMDAS stands for:

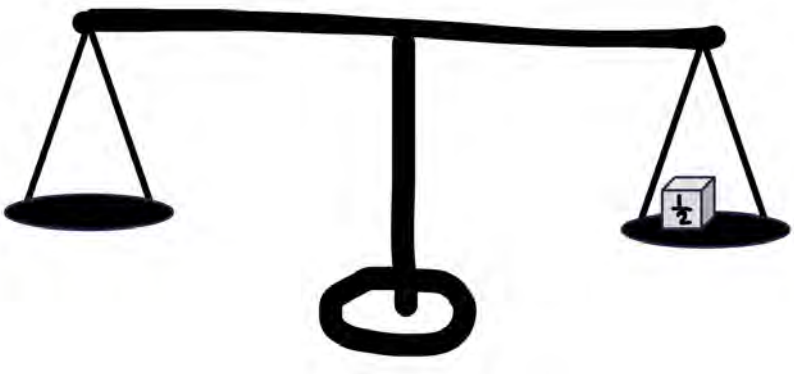
Evaluate the expressions below.

4 x 5 + 2 (4 x 5) + 2 4 x (5 + 2) 5 + 2 x 4 (5+ 2) x 4

Let's Talk:

We do not need to evaluate expressions in order to compare them.

Imagine a balance with half pound weights. Zora puts 5 weights on the left side and Malcolm puts 3 weights on the right side. Whose side is heavier?



Write a comparison expression:

Let's Think:

We can think of all our comparisons as a balance scale and look for what is the same and different on each side.

Fill in the blanks with <, > or = without evaluating the expressions.

$6 \times \frac{1}{4} + \frac{3}{4} \bigcirc 6 \times \left(\frac{1}{4} + \frac{3}{4}\right)$ $\left(2 \times \frac{1}{5}\right) \times \frac{2}{3} \bigcirc \left(2 \times \frac{1}{5}\right) \times \frac{7}{3}$ $3 \times 2 + \frac{2}{5} \bigcirc 3 \times \left(2 + \frac{2}{5}\right)$

Let's Review:

Today we will need to remember to follow order of operations, also known as PEMDAS.

PEMDAS stands for:

Evaluate the expressions below.

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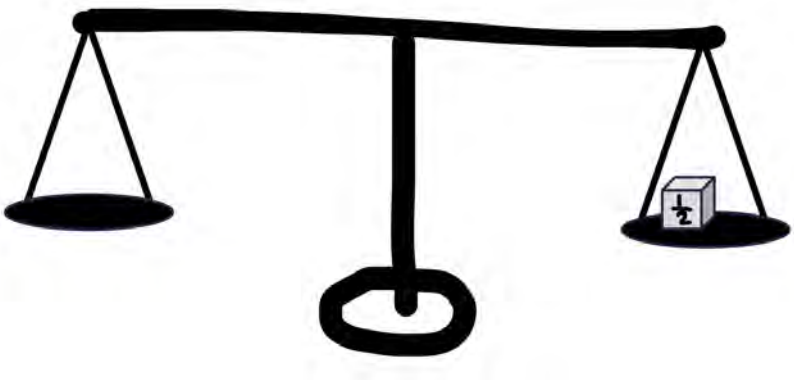
Imagine a balance with half pound weights. Zora puts 5 weights on the left side and Malcolm puts 3 weights on the right side. Whose side is heavier?



Write a comparison expression:

Let's Think:

We can think of all our comparisons as a balance scale and look for what is the same and different on each side.

Fill in the blanks with <, > or = without evaluating the expressions.

$6 \times \frac{1}{4} + \frac{3}{4} \bigcirc 6 \times \left(\frac{1}{4} + \frac{3}{4}\right)$

$\left(2 \times \frac{1}{5}\right) \times \frac{2}{3} \bigcirc \left(2 \times \frac{1}{5}\right) \times \frac{7}{3}$

$3 \times 2 + \frac{2}{5} \bigcirc 3 \times \left(2 + \frac{2}{5}\right)$

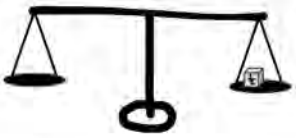
Let's Try It:

Let's practice comparing expressions together!

Name: _____ G5 U5 Lesson 6 - Let's Try It

Imagine you have a balance with half pound weights. Martin put 3 half pound weights on the scale plus a 2 pound book on the left side of the scale. Maya put 3 half pound weights and 3 books on the right side of the scale. Which side of the scale was heavier.

1. Draw a picture.



2. Write an expression for each side.

_____ ◯ _____

3. What is the same about each side? _____

4. What is different about each side? _____

5. What does the difference of each side represent?

_____

_____

On your Own:

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

Name: _____ G5 U4 Lesson 6 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Fill in the blank with <, > or =. Then explain your thinking

1. $\frac{2}{3} \times (4 + 8)$ ___ $12 \times \frac{2}{3}$

_____

_____

_____

_____

_____

2. $(\frac{2}{3} \times \frac{1}{4}) \times \frac{1}{2}$ ___ $(\frac{2}{3} \times \frac{1}{4}) \times \frac{3}{2}$

_____

_____

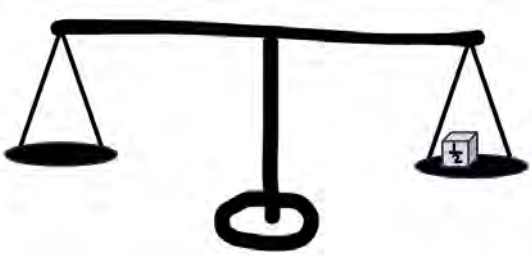
_____

_____

Name: _____ G5 U4 Lesson 6 - Let's Try It

Imagine you have a balance with half pound weights. Martin put 3 half pound weights on the scale plus a 2 pound book on the left side of the scale. Maya put 3 half pound weights and 3 books on the right side of the scale. Which side of the scale was heavier.

1. Draw a picture.



2. Write an expression for each side.

_____ ◯ _____

3. What is the same about each side? _____

4. What is different about each side? _____

5. What does the difference of each side represent?

_____

_____

_____

_____

6. Put <, > or = in the circle between the expressions you wrote.

Compare the expressions without evaluating them. Fill in the circle with <, > or =.

$\frac{2}{3} \times (\frac{1}{4} + \frac{4}{5})$ ◯ $\frac{1}{4} + \frac{4}{5}$

7. What is the same about each side? _____

8. What is different about each side? _____

9. What does the difference of each side represent?

_____

_____

_____

_____

_____

_____

10. Put <, > or = in the circle between the expressions you wrote.

Name: _____ G5 U4 Lesson 6 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Fill in the blank with <, > or =. Then explain your thinking

1. $\frac{2}{3} \times (4 + 8)$ ____ $12 \times \frac{2}{3}$

2. $(\frac{2}{3} \times \frac{1}{4}) \times \frac{1}{2}$ ____ $(\frac{2}{3} \times \frac{1}{4}) \times \frac{3}{2}$

3. $4 \times \frac{3}{5} + \frac{3}{4}$ ____ $4 \times (\frac{3}{5} + \frac{3}{4})$

4. $3 \times 4 + 3 \times \frac{1}{8} \_\_\_\_ 2 \times \frac{1}{8}$

Fill in the blank with <, > or =. Then explain your thinking

5. $\frac{1}{3} \times (4 + \frac{9}{10}) \_\_\_\_ \frac{2}{3} \times (4 + \frac{9}{10})$

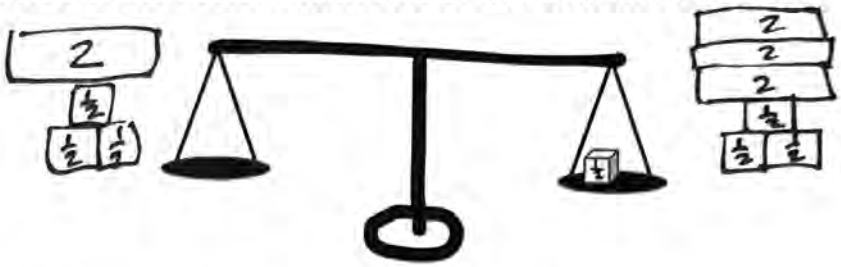
6. $8 \times (\frac{2}{3} + \frac{1}{4}) \_\_\_\_ 8 \times \frac{2}{3} + \frac{1}{4}$

7. $10 \times \frac{2}{5} + 3\frac{1}{2} \_\_\_\_ \frac{1}{10} \times \frac{2}{5} + 3\frac{1}{2}$	
8. $23 - 3 \times \frac{6}{8} \_\_\_\_ 23 - 3 \times \frac{1}{8}$	

Name: ANSWER KEY

Imagine you have a balance with half pound weights. Martin put 3 half pound weights on the scale plus a 2 pound book on the left side of the scale. Maya put 3 half pound weights and 3 books on the right side of the scale. Which side of the scale was heavier.

1. Draw a picture.



2. Write an expression for each side.

$3 \times \frac{1}{2} + 2$ $<$ $3 \times \frac{1}{2} + 3 \times 2$ or $3 \times (\frac{1}{2} + 2)$

3. What is the same about each side? $3 \times \frac{1}{2}$

4. What is different about each side? $\frac{1}{2}$ vs. $3 \times \frac{1}{2}$

5. What does the difference of each side represent?

The left side has 1 copy of 2 but the right side has 3 copies of 2. So the left side will be less than the right side.

6. Put <, > or = in the circle between the expressions you wrote.

Compare the expressions without evaluating them. Fill in the circle with <, > or =.

$\frac{2}{3} \times (\frac{1}{4} + \frac{4}{5})$ $<$ $\frac{2}{3} \times \frac{1}{4} + \frac{4}{5}$

7. What is the same about each side? $\frac{2}{3}$ of

8. What is different about each side? adding $\frac{4}{5}$ then taking fraction or just adding after

9. What does the difference of each side represent?

The left side will mean taking a fraction of both $\frac{1}{4}$ and $\frac{4}{5}$. The right side only takes a fraction of $\frac{1}{4}$. $\frac{4}{5}$ can stay the same size which will make it bigger.

10. Put <, > or = in the circle between the expressions you wrote.

Name: ANSWER KEY

G5 U4 Lesson 6 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Fill in the blank with <, > or =. Then explain your thinking

1. $\frac{2}{3} \times (4 + 8) = 12 \times \frac{2}{3}$

Both sides have $\frac{2}{3}$ x something. If I add 4+8, it is the same as the 12. So both sides are really the same.

2. $(\frac{2}{3} \times \frac{1}{4}) \times \frac{1}{2} < (\frac{2}{3} \times \frac{1}{4}) \times \frac{3}{2}$

Both sides have $(\frac{2}{3} \times \frac{1}{4})$. The left side is taking $\frac{1}{2}$ of that. The right side is taking $\frac{3}{2}$ of that. $\frac{3}{2}$ is bigger than $\frac{1}{2}$ so it will be more copies of the $(\frac{2}{3} \times \frac{1}{4})$.

3. $4 \times \frac{3}{5} + \frac{3}{4} < 4 \times (\frac{3}{5} + \frac{3}{4})$

Both sides have 4x something. The left is 4 copies of $\frac{3}{5}$ with a litte fraction added on. The right is 4 copies of $\frac{3}{5}$ and there would be 4 copies of the $\frac{3}{4}$ so it is bigger.

4. $3 \times 4 + 3 \times \frac{1}{8} > 2 \times \frac{1}{8}$

Both sides have something x $\frac{1}{8}$. The left side has more copies of $\frac{1}{8}$ plus more so it is bigger.

Fill in the blank with <, > or =. Then explain your thinking

5. $\frac{1}{3} \times (4 + \frac{9}{10}) \_\_ \frac{2}{3} \times (4 + \frac{9}{10})$

Both sides have $(4 + \frac{9}{10})$. The left side takes $\frac{1}{3}$ of that amount. The right side takes $\frac{2}{3}$, which is a larger fraction, of that amount. So the right side is bigger.

6. $8 \times (\frac{2}{3} + \frac{1}{4}) \_\_ 8 \times \frac{2}{3} + \frac{1}{4}$

Both sides have 8× something. The left side will have 8× something bigger since the paretheses mean add first. Theright side will have 8× something smaller plus a little bit.

7. $10 \times \frac{2}{5} + 3\frac{1}{2} \_\_ \frac{1}{10} \times \frac{2}{5} + 3\frac{1}{2}$

Both sides are multiplying $\frac{2}{5}$ then adding $3\frac{1}{2}$. The left side is multiplying by a whole number so it would be bigger than the right side which is multiplying by a fraction.

8. $23 - 3 \times \frac{6}{8} \_\_ 23 - 3 \times \frac{1}{8}$

Both sides are subtracting from 23. The left side is subtracting 3 copies of a bigger fraction so that side will actually be smaller.

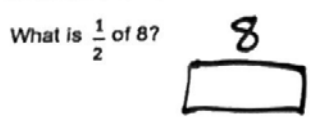
G5 U4 Lesson 7

Multiply unit fractions by unit fractions

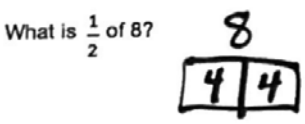
G1 U4 Lesson 7 - Today we will multiply unit fractions by unit fractions.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will multiply unit fractions by unit fractions. Unit fractions are just fractions where we have only 1 unit so the numerator is 1. Let's dive in!



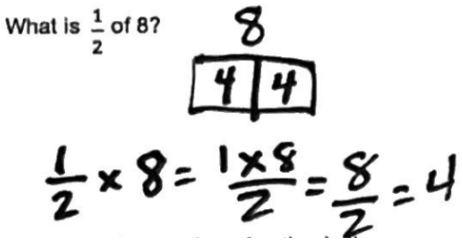
Let's Review (Slide 3): We already learned that multiplying by a fraction is the same as taking a fraction OF something. What is $\frac{1}{2}$ of 8? We can think of 8 altogether and draw it as one big block like this.



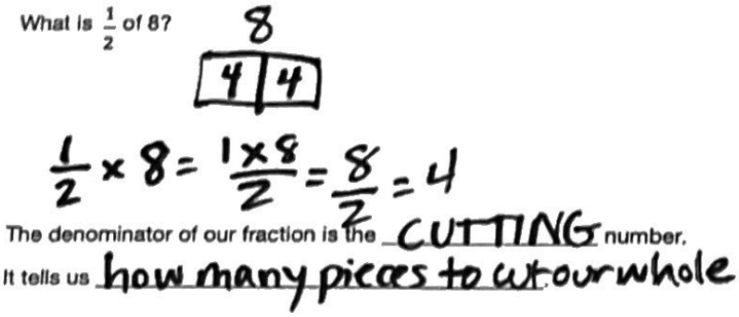
How do I take half? Possible Student Answers, Key Points:

- Cut it into 2 pieces.
- Split it down the middle.
- Divide it by 2.
- Multiply it by ½.

We can split it into 2, which is like dividing it by 2. Each piece gets 4.

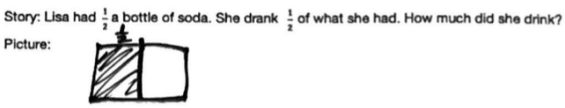


Or we can think of the "of" as a multiplication symbol. We have $\frac{1}{2}$ times 8 which is $\frac{8}{2}$ and we're still doing 8 divided by 2 which is 4. Remember, when I multiply by a fraction, what happens to the size of my answer, does it get bigger or smaller? *Give them time to think without calling on anyone. Then give the right answer.* It gets bigger!



The denominator of our fraction is the CUTTING number. It tells us how many pieces to cut our whole into.

Let's Talk (Slide 4): Now it's time to take a fraction of another fraction. I am going to read this story aloud while you follow along with your eyes. *Point to each word as you read. Read the story.*



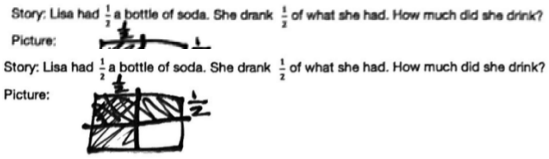
Let's draw this out to see what's happening. I am going to use this rectangle to stand for my soda bottle, and Lisa had half of a bottle. So let me shade half.

Now Lisa drank half of what she had. Did she drink half of the bottle? No! She drank half of what she had? What did she have? Possible Student Answers, Key Points:

- Half a bottle.
- That shaded part.

She had half a bottle so she drank half of the half. I am still going to use the denominator as a cutting number so I am going to cut my cuts. I will draw the half going the other way so I can see each piece like this. Notice what kind of picture we made. This is really

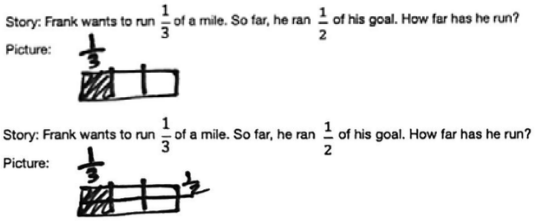
important. We made rows of equal pieces, sometimes called an array. You learned this back in third grade. It is a multiplication picture, like 2 x 2.



I only want 1 out of 2 parts of this so I am just going to shade this half. Look where the shading overlaps! That is ½ of a ½. I get ¼.

Let's write this in words. It is just $\frac{1}{2}$ of $\frac{1}{2}$ is $\frac{1}{4}$. Let's write this in numbers. We know that the "of" is multiplication so it is $\frac{1}{2}$ times $\frac{1}{2}$. We know this makes ¼ but first I want you to notice something really important. We said that our picture looked like a multiplication picture. Now we can see that it's like the numbers get multiplied. 1 x 1 in the numerator and 2 x 2 in the denominator. That makes ¼.

Let's Talk (Slide 5): Let's make sure our method works with another problem! I am going to read this story aloud while you follow along with your eyes. *Point to each word as you read. Read the story.*

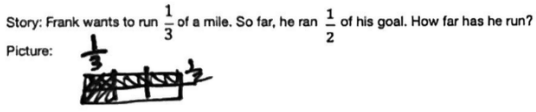


Let's draw this out to see what's happening. I am going to use this rectangle to stand for a mile. Frank wants to run ⅓ so let me shade ⅓

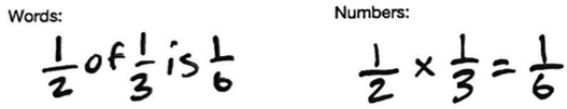
Now Miles only ran ½ of his goal. Did she run half of the mile? No! He ran half of his goal? What was his goal? Possible Student Answers, Key Points:

- One third of a mile.
- That shaded part.

His goal was to run one third of a mile so I am going to take half of the third. I am still going to use the denominator as a cutting number so I am going to cut my cuts. I will draw the half going the other way so I can see each piece like this. Notice what kind of picture we made. This is really important. We made rows of equal pieces, sometimes called an array. You learned this back in third grade. It is a multiplication picture, like 3 x 2.

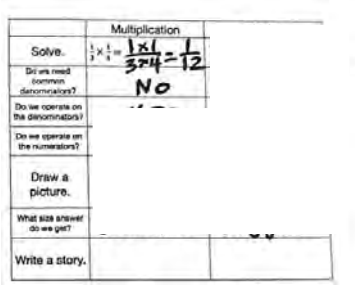


I only want 1 out of 2 parts of this so I am just going to shade this half. Look where the shading overlaps! That is ½ of a ⅓ I get ⅓

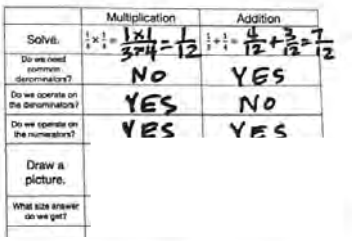


Let's write this in words. It is just $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$. Let's write this in numbers. We know that the "of" is multiplication so it is $\frac{1}{3}$ times $\frac{1}{2}$. We know this makes 1/6 but first I want you to notice something really important. We said that our picture looked like a multiplication picture. Now we can see that it's like the numbers get multiplied. 1 x 1 in the numerator and 3 x 2 in the denominator. That makes ⅙.

Let's Think (Slides 6): It is really easy to get fractions ideas mixed up with each other. It will help us remember the strategies if we explore how multiplying fractions compares to adding fractions. Let's fill out this chart together.

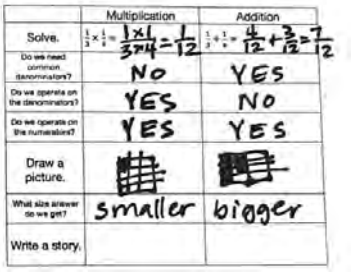


We said we multiply the numerators, 1 x 1 = 1, and we multiply the denominators, 3 x 4 = 12. Do we need common denominators? No! We just multiplied them. So, did we operate on the denominators? Yes! We multiplied them. Did we operate on the numerators? Yes! We multiplied them.



	Multiplication	Addition
Solve.	$\frac{1}{3}\times\frac{1}{4}=\frac{1\times1}{3\times4}=\frac{1}{12}$	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$
Do we need common denominators?	NO	YES
Do we operate on the denominators?	YES	NO
Do we operate on the numerators?	YES	YES
Draw a picture.		
What size answer do we get?		

Do you remember how we add? Do we just add across? No! We have to find common denominators. ⅓ is the same as 4/12 and ¼ is the same as 3/12. 4/12 plus 3/12 is 7/12. Addition is actually way harder than multiplication. Do we need common denominators? Yes! Once we found common denominators, did I operate on them? Did I add them? No! Did we operator on the numerators? Did I add them? Yes!



	Multiplication	Addition
Solve.	$\frac{1}{3}\times\frac{1}{4}=\frac{1\times1}{3\times4}=\frac{1}{12}$	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$
Do we need common denominators?	NO	YES
Do we operate on the denominators?	YES	NO
Do we operate on the numerators?	YES	YES
Draw a picture.		
What size answer do we get?	smaller	bigger
Write a story.		

Let's draw a picture. For multiplication, I have ⅓ and then I take ¼ of the ⅓. I can see that my answer gets smaller.

For addition, I have ⅓ and then I draw another ¼. To add these, I have to think of them both as twelfths and put them together. I can see that my answer gets bigger.

Who can make up a story for our multiplication problem? Remember, we're taking a fraction of a fraction. *There are many right answers. Make sure you are clear by saying "correct" or "incorrect" to students' responses. You do not need to write these down.* Who can make up a story for our addition problem? Remember, we're taking a fraction and getting more. *There are many right answers. Make sure you are clear by saying "correct" or "incorrect" to students' responses. You do not need to write these down.*

Let's Try it (Slides 7): Let's practice this together. We will draw a picture and write numbers.

WARM WELCOME

Today we will multiply unit fractions by unit fractions.

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Let's Review:

We already learned that multiplying by a fraction is the same as taking a fraction OF something.

What is $\frac{1}{2}$ of 8?

The denominator of our fraction is the _____ number.

It tells us _____.

Let's Talk:

Now it's time to take a fraction of another fraction!

Story: Lisa had $\frac{1}{2}$ a bottle of soda. She drank $\frac{1}{2}$ of what she had. How much did she drink?

Picture:

Words: Numbers:

Let's Talk:

Let's make sure our method works with another problem!

Story: Frank wants to run $\frac{1}{3}$ of a mile. So far, he ran $\frac{1}{2}$ of his goal. How far has he run?

Picture:

Words:

Numbers:

Let's Think:

It will help us remember the strategies if we explore how multiplying fractions compares to adding fractions.

	Multiplication	Addition
Solve.	$\frac{1}{3} \times \frac{1}{4} =$	$\frac{1}{3} + \frac{1}{4} =$
Do we need common denominators?		
Do we operate on the denominators?		
Do we operate on the numerators?		
Draw a picture.		
What size answer do we get?		
Write a story.		

Let's Try It:

Let's practice multiplying fractions together.

Name: _____ G5 U5 Lesson 7 - Let's Try It

Maynard is painting a wall. He wants to paint $\frac{1}{3}$ of the wall blue and $\frac{2}{3}$ of the wall green. So far, Maynard has painted $\frac{1}{4}$ of the blue part. How much of the whole wall has Maynard painted?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

On your Own:

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

Name: _____ G5 U4 Lesson 7 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

1. $\frac{1}{5} \times \frac{1}{3} =$	2. $\frac{1}{7} \times \frac{1}{10} =$
1. $\frac{1}{4} \times \frac{1}{2} =$	2. $\frac{1}{3} \times \frac{1}{5} =$

Maynard is painting a wall. He wants to paint $\frac{1}{3}$ of the wall blue and $\frac{2}{3}$ of the wall green. So far, Maynard has painted $\frac{1}{4}$ of the blue part. How much of the whole wall has Maynard painted?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

_____

Solve. $\frac{1}{8} \times \frac{1}{2} = ?$

4. Draw a picture.

5. Represent your work with numbers:

6. How are the steps for multiplying fractions the same or different from the steps for adding fractions? Why does that make sense?

_____

_____

_____

7. Write your own multiplication of fractions story to match the numbers you just used.

_____

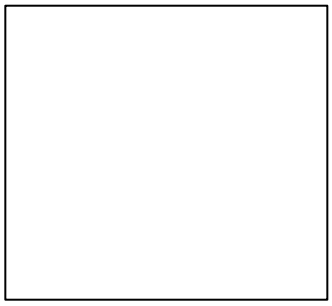
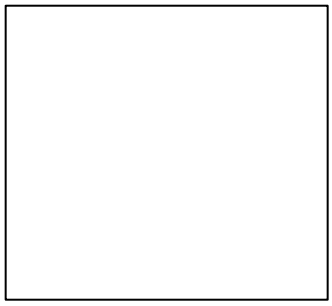
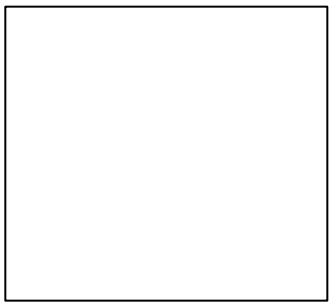
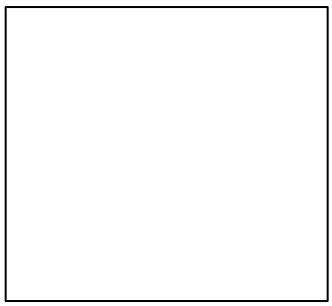
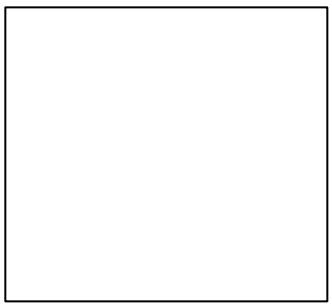
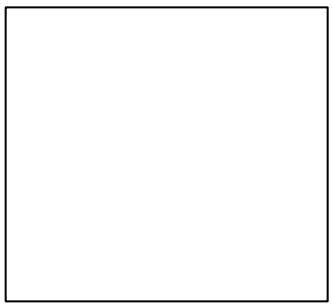
_____

_____

Name: _____ G5 U4 Lesson 7 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

1. $\frac{1}{3} \times \frac{1}{3} =$ 	2. $\frac{1}{2} \times \frac{1}{10} =$ 
1. $\frac{1}{4} \times \frac{1}{2} =$ 	2. $\frac{1}{3} \times \frac{1}{5} =$ 
1. $\frac{1}{3} \times \frac{1}{6} =$ 	2. $\frac{1}{5} \times \frac{1}{4} =$ 

Solve the story problem with numbers and by drawing a picture.

7. Martiza brought $\frac{1}{2}$ of a sandwich to school for lunch. But she wasn't very hungry so she only ate $\frac{1}{2}$ of what she brought. What fractional part of a sandwich did Maritza eat at lunch?

8. Amber Elementary School has a track that is $\frac{1}{2}$ of a mile long. Darius ran $\frac{1}{5}$ of the track. How far did Darius run?

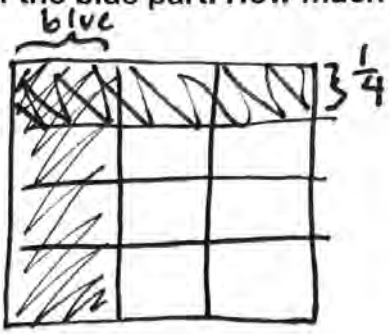
9. John is going to plant $\frac{1}{3}$ of his garden with flowers, $\frac{1}{3}$ of his garden with fruit and $\frac{1}{3}$ of his garden with vegetables. He has $\frac{1}{4}$ acres of land for his garden. How many acres will John plant with flowers?

10. Rebecca needs $\frac{1}{4}$ cup of sugar to make a cake. She has $\frac{1}{2}$ of what she needs and she will have to buy the rest. What fraction of a cup of sugar does Rebecca have?

Name: ANSWER KEY

Maynard is painting a wall. He wants to paint $\frac{1}{3}$ of the wall blue and $\frac{2}{3}$ of the wall green. So far, Maynard has painted $\frac{1}{4}$ of the blue part. How much of the whole wall has Maynard painted?

1. Draw a picture.



2. Represent your work with numbers:

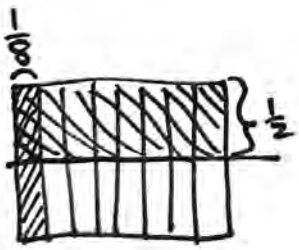
$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

Maynard has painted $\frac{1}{12}$ of the wall.

Solve. $\frac{1}{8} \times \frac{1}{2} = ?$

4. Draw a picture.



5. Represent your work with numbers:

$$\frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$$

6. How are the steps for multiplying fractions the same or different from the steps for adding fractions? Why does that make sense?

We multiply numerators just like we add numerators. But we don't add denominators and we do multiply denominators.

7. Write your own multiplication of fractions story to match the numbers you just used.

* many right answers *

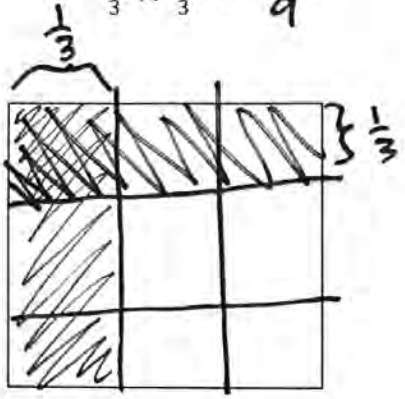
Example:
Joe had $\frac{1}{8}$ of a sandwich. He ate $\frac{1}{2}$ of it. How much did he eat?

Name: ANSWER KEY

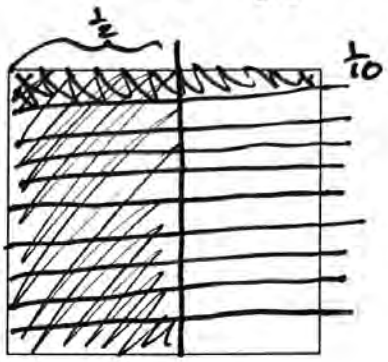
Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

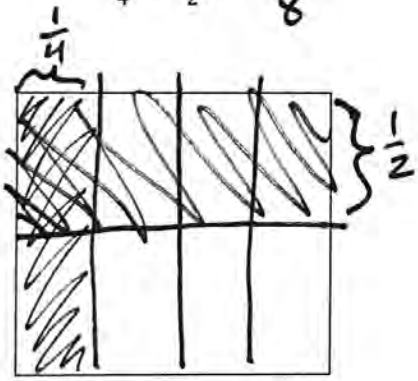
1. $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$



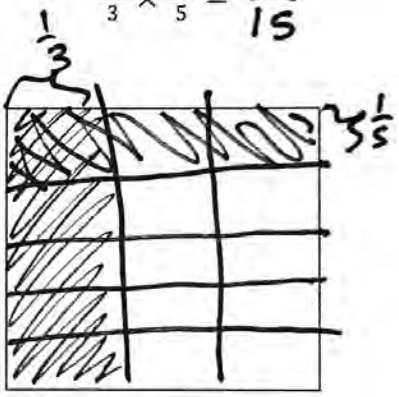
2. $\frac{1}{2} \times \frac{1}{10} = \frac{1}{20}$



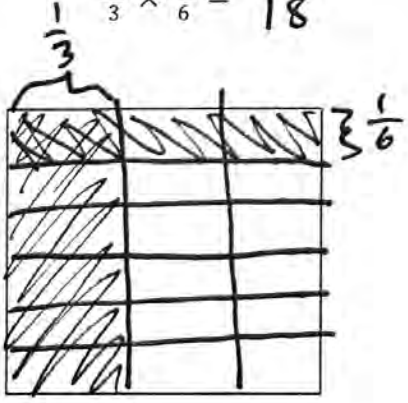
1. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$



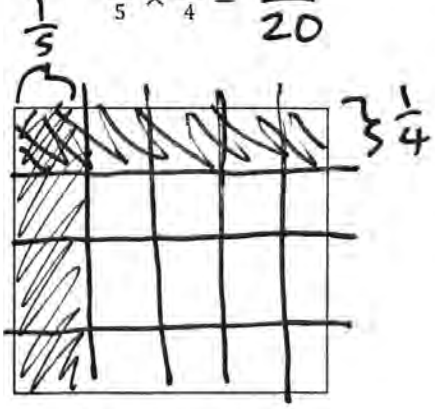
2. $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$



1. $\frac{1}{3} \times \frac{1}{6} = \frac{1}{18}$



2. $\frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$

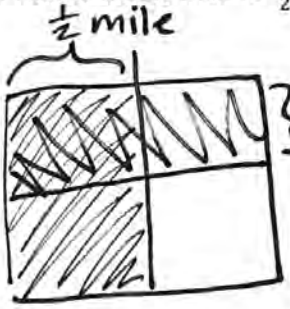


Solve the story problem with numbers and by drawing a picture.

7. Martiza brought $\frac{1}{2}$ of a sandwich to school for lunch. But she wasn't very hungry so she only ate $\frac{1}{2}$ of what she brought. What fractional part of a sandwich did Maritza eat at lunch?

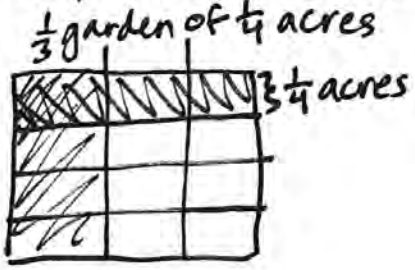
$\frac{1}{2} \times \frac{1}{2} = \boxed{\frac{1}{4} \text{ sandwich}}$

8. Amber Elementary School has a track that is $\frac{1}{2}$ of a mile long. Darius ran $\frac{1}{5}$ of the track. How far did Darius run?



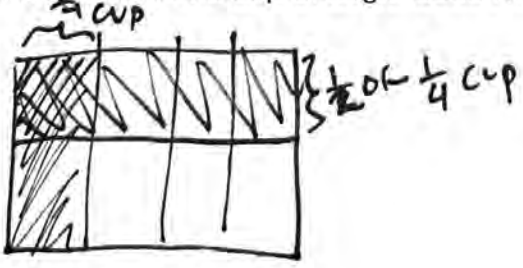
$\frac{1}{2} \times \frac{1}{2} = \boxed{\frac{1}{4} \text{ mile}}$

9. John is going to plant $\frac{1}{3}$ of his garden with flowers, $\frac{1}{3}$ of his garden with fruit and $\frac{1}{3}$ of his garden with vegetables. He has $\frac{1}{4}$ acres of land for his garden. How many acres will John plant with flowers?



$\frac{1}{3} \times \frac{1}{4} = \boxed{\frac{1}{12} \text{ acres}}$

10. Rebecca needs $\frac{1}{4}$ cup of sugar to make a cup. She has $\frac{1}{2}$ of what she needs and she will have to buy the rest. What fraction of a cup of sugar does Rebecca have?



$\frac{1}{2} \times \frac{1}{4} = \boxed{\frac{1}{8} \text{ cup}}$

G5 U4 Lesson 8

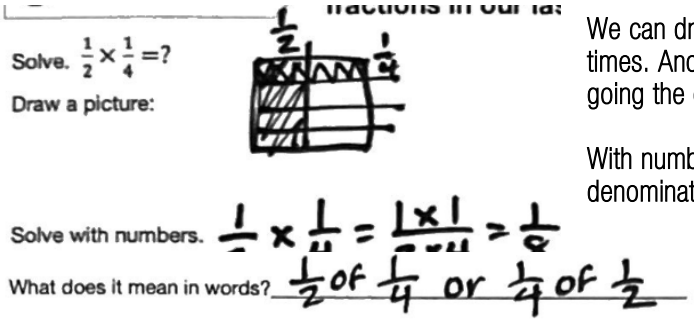
Multiply unit fractions by non-unit fractions

G1 U4 Lesson 8 - Today we will multiply unit fractions by non-unit fractions.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will multiply unit fractions by non-unit fractions. Unit fractions are just fractions where we have only 1 unit so the numerator is 1. So one of our fractions will have a one in the numerator and the other fraction will have a different digit in the numerator. It shouldn't change the way we do the math, right? Multiplying fractions is still multiplying fractions. Let's dive in!

Let's Review (Slide 3): What did you learn about multiplying fractions in our last lesson? *Solicit students ideas and record them in the correct place. Be sure to say, "That's incorrect" if a student says something that is not right. As you write correct thinking, make sure to reiterate what the student said by narrating as you write.*

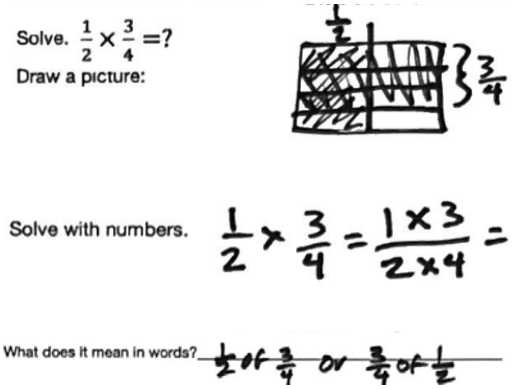


We can draw ½ by cutting a rectangle into 2 pieces. Now we want ½ only ¼ times. Another way to say it, is that we want ¼ of ½. I will need to cut 4 pieces going the other way. And I can see that the overlap is **⅛**

With numbers, we just multiply the numerators, 1 x 1 is 1, and we multiply the denominators, 2 x 4 is 8. Our answer is **⅛**

We can think of the "times symbol" as taking a fraction "of." So this problem is really ½ of ¼ or ¼ of ½.

Let's Talk (Slide 4): We will see what happens when we use the same steps for multiplying a fraction that doesn't have 1 in the numerator, a non-unit fraction.

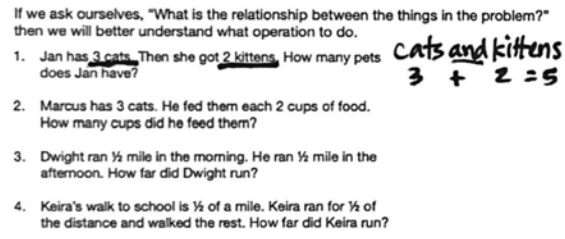


We can draw ½ by cutting a rectangle into 2 pieces. Now we want ½ only ¾ times. Another way to say it, is that we want ¾ of ½. I will need to cut 4 pieces going the other way. But this time, we don't just want one piece. We want THREE pieces. Now the overlap isn't **⅛**It's **⅛**

Remember in our last lesson, we talked about how the picture makes equal rows, which is like an array. It's a multiplication picture. So it makes sense that with numbers, we just multiply the numerators, 1 x 3 is 3, and we multiply the denominators, 2 x 4 is 8. Our answer is **⅛**

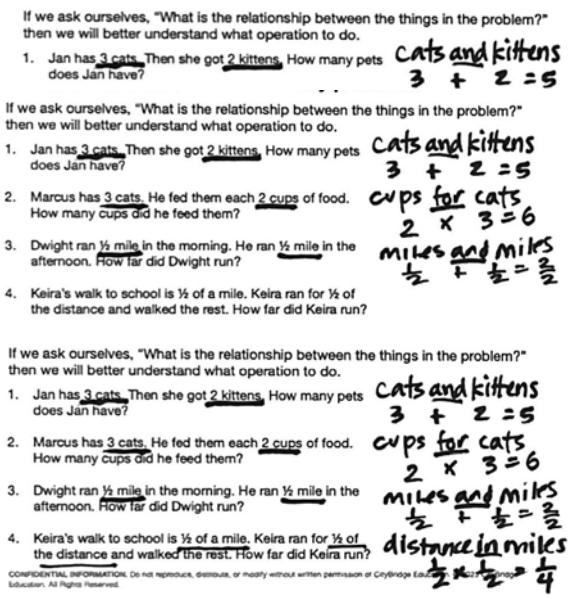
This is just the same as always. We can think of the "times symbol" as taking a fraction "of." So this problem is really ½ of ¾ or ¾ of ½.

Let's Think (Slide 5): Multiplying fractions is honestly even easier than adding fractions. The hard part comes when we are doing story problems. It is easy to mix up multiplication and addition story problems. If we ask ourselves, "What is the relationship between the things in the problem?" then we will better understand what operation to do. I'll show you what I mean. Follow along with your eyes while I read the problem. *Read the first problem.*



I can underline the number and the word after the number to see what the story is about. In this case, the problem is about 3 cats and 2 kittens. Now I ask myself, "What is the relationship between cats and kittens?" Cats AND kittens are both pets. That word "and" helps me realize I want to put these together. 3 + 2 = 5 pets.

Follow along with your eyes while I read the problem. *Read the second problem.* I can underline the number and the word after the number to see what the story is about. In this case, the problem is about 3 cats and 2 cups of food. Now I ask myself, "What is the relationship between cats and cups?" The cups are FOR the cats. Or I might think, the cats eat the



cups. I don't think cats AND cups are both anything! This is a sign to me that it's a multiplication relationship. I have 2 cups, 3 times. 2 x 3 = 6

Follow along with your eyes while I read the problem. *Read the third problem.* I can underline the number and the word after the number to see what the story is about. In this case, the problem is about ½ mile and ½ mile. Now I ask myself, "What is the relationship between miles and miles?" This almost feels silly. Miles AND miles are both miles! Even if it's silly, that word "and" is the clue that I can add these. ½ + ½ is 2 halves or 1 whole.

Last one! Follow along with your eyes while I read the problem. *Read the fourth problem.* I can underline the number and the word after the number to see what the story is about. In this case, the problem is about ½ mile and ½ of the distance. WHOA! Before I even ask my relationship question, alarm bells are going off in my mind. This is super weird phrasing! It is ½ mile. It is ½ of the distance. Now I ask myself, "What is the relationship between miles and distance?" The distance is measured in miles. I can already hear I want part of the miles. I want ½ of the ½. That's multiplication. ½ x ½ is ¼.

Let's Try it (Slides 6): Let's practice this together. We will draw a picture and write numbers to multiply fractions. Then you'll try out some story problems.

WARM WELCOME

Today we will multiply unit fractions by non-unit fractions.

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Let's Review:

What did you learn about multiplying fractions in our last lesson?

Solve. $\frac{1}{2} \times \frac{1}{4} = ?$

Draw a picture:

Solve with numbers.

What does it mean in words?_____

Let's Talk:

We will see what happens when we use the same steps for multiplying a fraction that doesn't have 1 in the numerator.

Solve. $\frac{1}{2} \times \frac{3}{4} = ?$

Draw a picture:

Solve with numbers.

What does it mean in words?_____

Let's Think:

It is easy to mix up multiplication and addition story problems!

If we ask ourselves, "What is the relationship between the things in the problem?" then we will better understand what operation to do.

1. Jan has 3 cats. Then she got 2 kittens. How many pets does Jan have?

2. Marcus has 3 cats. He fed them each 2 cups of food. How many cups did he feed them?

3. Dwight ran ½ mile in the morning. He ran ½ mile in the afternoon. How far did Dwight run?

4. Keira's walk to school is ½ of a mile. Keira ran for ½ of the distance and walked the rest. How far did Keira run?

Let's Try It:

Let's practice together.

Name: _____ G5 U5 Lesson 8 - Let's Try It

Benji is making a graphic novel. He wants $\frac{1}{2}$ of the book to be words and $\frac{1}{2}$ of the book to be comics. So far, he has drawn $\frac{3}{5}$ of the comics. How much of the book has he completed?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

On your Own:

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

Name: _____ G5 U5 Lesson 8 - Let's Try It

Benji is making a graphic novel. He wants $\frac{1}{2}$ of the book to be words and $\frac{1}{2}$ of the book to be comics. So far, he has drawn $\frac{3}{5}$ of the comics. How much of the book has he completed?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

Benji is making a graphic novel. He wants $\frac{1}{2}$ of the book to be words and $\frac{1}{2}$ of the book to be comics. So far, he has drawn $\frac{3}{5}$ of the comics. How much of the book has he completed?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

Solve. $\frac{2}{3} \times \frac{1}{3} = ?$

4. Draw a picture.

5. Represent your work with numbers:

Lea's plate is filled with $\frac{3}{4}$ cups of vegetables. $\frac{1}{2}$ of the vegetables is broccoli. How many cups of broccoli are on Lea's plate?

6. This story problem is about _____ and _____. To choose the operation, I ask, what is the relationship between those things?

7. Fill in the circle with + or x: $\frac{3}{4}$ $\frac{1}{2}$ ◯

Lea's plate is filled with $\frac{3}{4}$ cups of cauliflower. Then she put $\frac{1}{2}$ cups of broccoli on her plate. How many cups of vegetables are on Lea's plate?

8. This story problem is about _____ and _____. To choose the operation, I ask, what is the relationship between those things?

9. Fill in the circle with + or x: $\frac{3}{4}$ $\frac{1}{2}$ ◯

10. Solve.

Name: _____ G5 U4 Lesson 8 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

1. $\frac{2}{3} \times \frac{1}{3} =$	2. $\frac{1}{2} \times \frac{4}{10} =$
1. $\frac{3}{4} \times \frac{1}{2} =$	2. $\frac{1}{3} \times \frac{2}{5} =$
1. $\frac{1}{3} \times \frac{5}{6} =$	2. $\frac{3}{5} \times \frac{1}{4} =$

Solve the story problem with numbers and by drawing a picture. Be careful! One of the story problems is addition NOT multiplication!

7. Tim had $\frac{7}{10}$ of a gallon paint. He used $\frac{1}{2}$ of what he had to paint a small table. What fractional part of a gallon did he use to paint the table?

8. Sammy had $\frac{1}{3}$ of a large pizza. He ate $\frac{3}{4}$ of it for dinner. How much of the large pizza did Sammy eat for dinner?

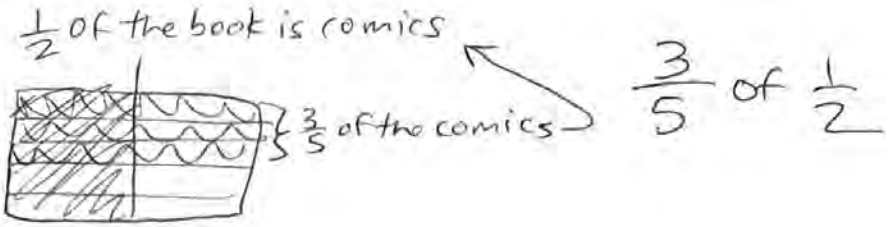
9. Mac's Tree Service delivered $\frac{3}{4}$ crate of wood chips for Alicia's garden project. Alicia had $\frac{1}{2}$ crate left over from the previous summer. How many crates of wood chips does Alicia have now?

10. Franklin used $\frac{1}{3}$ of the bread that he had in the cupboard to make some sandwiches. If Franklin had $\frac{2}{5}$ of a loaf of bread, what fraction of a loaf did Franklin use to make the sandwiches?

Name: ANSWER KEY

Benji is making a graphic novel. He wants $\frac{1}{2}$ of the book to be words and $\frac{1}{2}$ of the book to be comics. So far, he has drawn $\frac{3}{5}$ of the comics. How much of the book has he completed?

1. Draw a picture.



2. Represent your work with numbers:

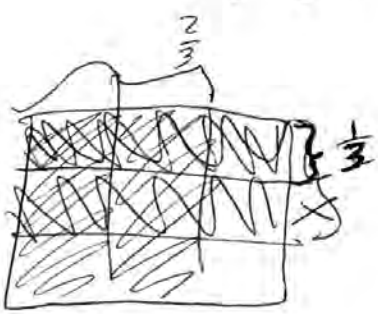
$\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$ of the book

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

Benji has completed $\frac{3}{10}$ of the book.

Solve. $\frac{2}{3} \times \frac{1}{3} = ?$

4. Draw a picture.



5. Represent your work with numbers:

$\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$

Lea's plate is filled with $\frac{3}{4}$ cups of vegetables. $\frac{1}{2}$ of the vegetables is broccoli. How many cups of broccoli are on Lea's plate?

6. This story problem is about cups of vegetable and ~~of the vegetable~~ broccoli. To choose the operation, I ask, what is the relationship between those things?

~~the cups of the vege the cups are in the~~ the broccoli is part of the cups

7. Fill in the circle with + or x: $\frac{3}{4}$ (x) $\frac{1}{2}$

Lea's plate is filled with $\frac{3}{4}$ cups of cauliflower. Then she put $\frac{1}{2}$ cups of broccoli on her plate. How many cups of vegetables are on Lea's plate?

8. This story problem is about cups and cups. To choose the operation, I ask, what is the relationship between those things?

cups and cups are both the same

9. Fill in the circle with + or x: $\frac{3}{4}$ (+) $\frac{1}{2}$

10. Solve.

$\frac{3}{4}$

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

$\frac{3}{4} + \frac{2}{4} = \frac{5}{4} =$ 1 $\frac{1}{4}$ cups

$4\overline{)5}$ quotient 1, -4, remainder 1

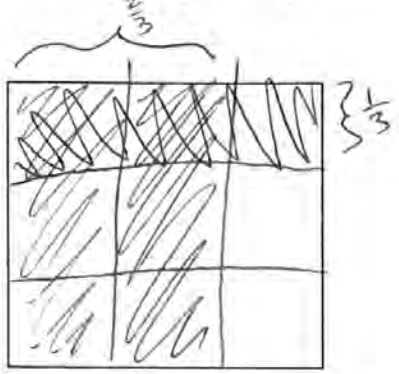
Name: ANSWER KEY

G5 U4 Lesson 8 - Independent Work

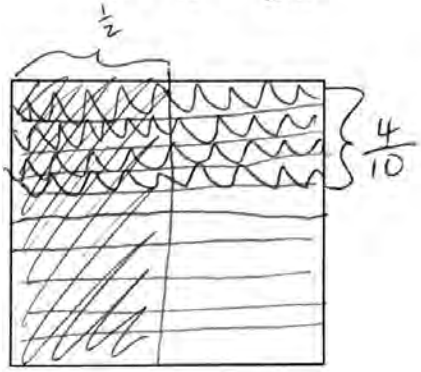
Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

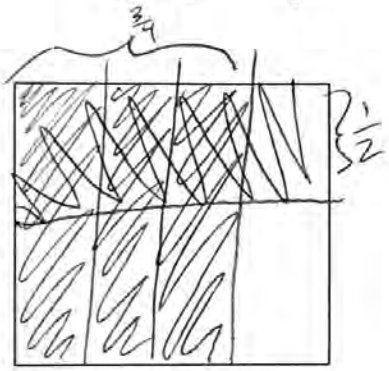
1. $\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$



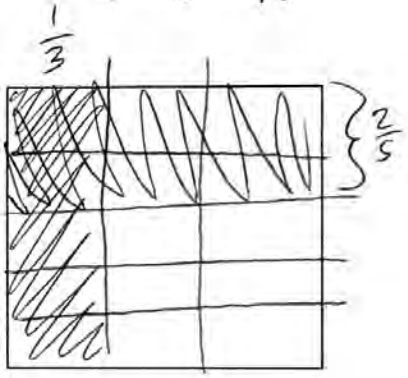
2. $\frac{1}{2} \times \frac{4}{10} = \frac{4}{20}$



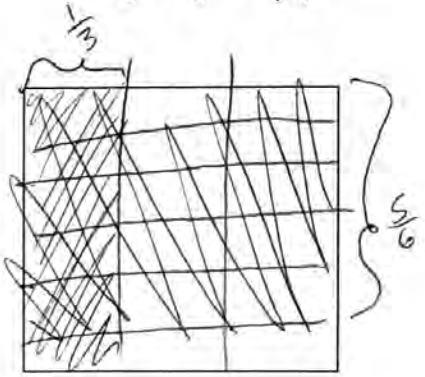
1. $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$



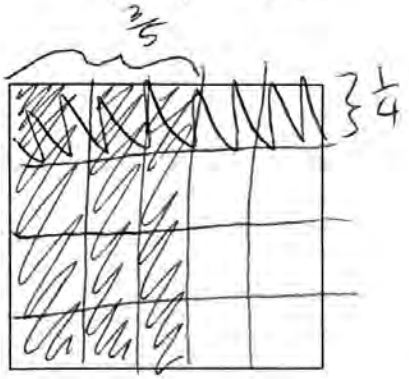
2. $\frac{1}{3} \times \frac{2}{5} = \frac{2}{15}$



1. $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$

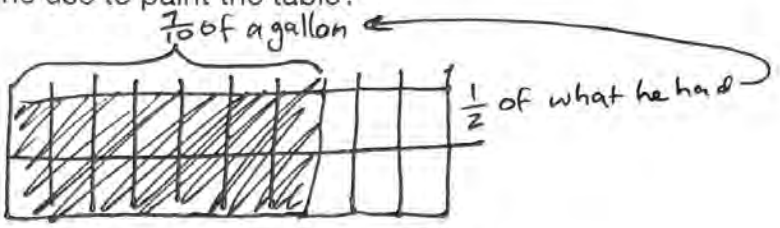


2. $\frac{3}{5} \times \frac{1}{4} = \frac{3}{20}$



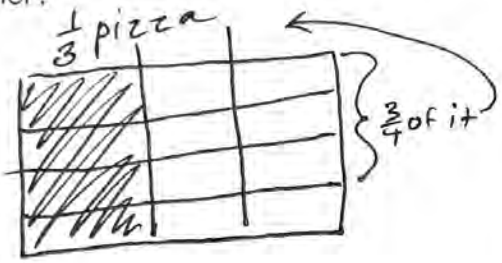
Solve the story problem with numbers and by drawing a picture. Be careful! One of the story problems is addition NOT multiplication!

7. Tim had $\frac{7}{10}$ of a gallon paint. He used $\frac{1}{2}$ of what he had to paint a small table. What fractional part of a gallon did he use to paint the table?



$\frac{1}{2}$ of $\frac{7}{10} = \frac{1}{2} \times \frac{7}{10} = \boxed{\frac{7}{20} \text{ gallon}}$

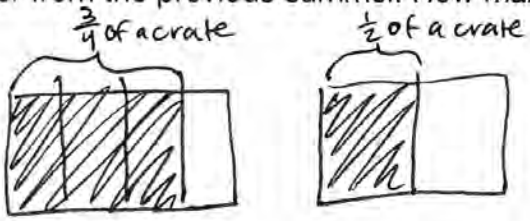
8. Sammy had $\frac{1}{3}$ of a large pizza. He ate $\frac{3}{4}$ of it for dinner. How much of the large pizza did Sammy eat for dinner?



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

$\frac{3}{4} \times \frac{1}{3} = \boxed{\frac{3}{12} \text{ pizza}}$

9. Mac's Tree Service delivered $\frac{3}{4}$ crate of wood chips for Alicia's garden project. Alicia had $\frac{1}{2}$ crate left over from the previous summer. How many crates of wood chips does Alicia have now?

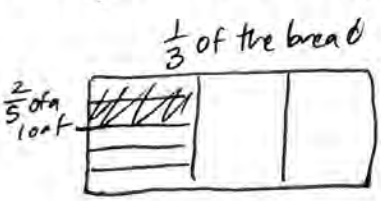


$\frac{1 \times 2}{2 \times 2} = \frac{2}{4}$

$4\overline{)5}$ $\quad -4$ $\quad 1$

$\frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} = \boxed{1\frac{1}{4} \text{ crate}}$

10. Franklin used $\frac{1}{3}$ of the bread that he had in the cupboard to make some sandwiches. If Franklin had $\frac{2}{5}$ of a loaf of bread, what fraction of a loaf did Franklin use to make the sandwiches?



$\frac{1}{3}$ of $\frac{2}{5}$

$\frac{1}{3} \times \frac{2}{5} = \boxed{\frac{2}{15} \text{ of a loaf}}$

G5 U4 Lesson 9

Multiply non-unit fractions by non-unit fractions

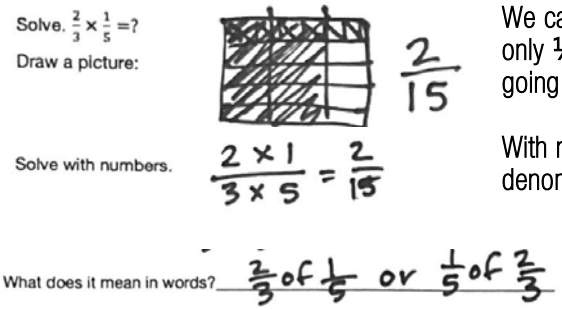
CITYTUTOR

G1 U4 Lesson 9 - Today we will multiply non-unit fractions by non-unit fractions.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will multiply unit fractions by non-unit fractions. Unit fractions are just fractions where we have only 1 unit so the numerator is 1. So today our fractions will have different digits in the numerator. No big deal! It shouldn't change the way we do the math, right? Multiplying fractions is still multiplying fractions. Let's dive in!

Let's Review (Slide 3): What did you learn about multiplying fractions in our last lesson? *Solicit students ideas and record them in the correct place. Be sure to say, "That's incorrect" if a student says something that is not right. As you write correct thinking, make sure to reiterate what the student said by narrating as you write.*

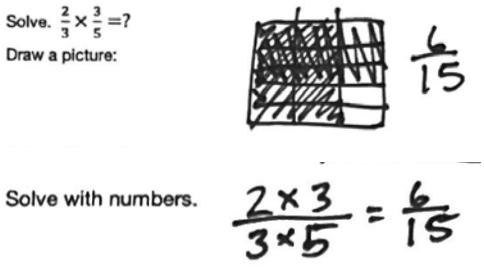


We can draw ⅔ by cutting a rectangle into 3 pieces and shading 2. Now we want that ⅔ only ⅕ times. Another way to say it, is that we want ⅕ of ⅔ I will need to cut 5 pieces going the other way. And I can see that the overlap is 2 fifteenths.

With numbers, we just multiply the numerators, 2 x 1 is 2, and we multiply the denominators, 5 x 3 is 15. Our answer is 2 fifteenths.

We can think of the "times symbol" as taking a fraction "of." So this problem is really ⅕ of ⅔ or ⅔ of ⅕

Let's Talk (Slide 4): We will see what happens when we use the same steps for multiplying fractions that don't have 1 in the numerators.



We can draw ⅔ by cutting a rectangle into 3 pieces and shading 2. Now we want ⅔ only ⅗ times. Another way to say it, is that we want ⅗ of ⅔ I will need to cut 5 pieces going the other way. But this time, we don't just want one piece. We want THREE pieces. The overlap is 6 fifteenths.

Remember in our last lesson, we talked about how the picture makes equal rows, which is like an array. It's a multiplication picture. So it makes sense that with numbers, we just multiply the numerators, 2 x 3 is 6, and we multiply the denominators, 3 x 5 is 15. Our answer is 6 fifteenths.

This is just the same as always. We can think of the "times symbol" as taking a fraction "of." So this problem is really ⅔ of ⅗ or ⅗ of ⅔

Let's Think (Slide 5): We've talked about this before - the hardest part of multiplying fractions is recognizing it in story problems. How do you know when to multiply fractions in a story problem instead of adding them? Possible Student Answers, Key Points:

- The story will be about finding a fraction of another fraction.
- We would have different words that don't go together with the word "and."
- It would be a part of a part instead of a part and a part.

Give the students time to think about a fraction multiplication story problem in their heads. Then ask them to tell it to a person near them. Have a few students share and decide a group if it is really a fraction multiplication story. You can write key language down from the problems on the board as shown.

Let's Try it (Slides 6): Let's practice this together. We will draw a picture and write numbers to multiply fractions. Then you'll try out some story problems.

WARM WELCOME

Today we will multiply non-unit fractions by non-unit fractions.

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Let's Review:

What did you learn about multiplying fractions in our last lesson?

Solve. $\frac{2}{3} \times \frac{1}{5} = ?$

Draw a picture:

Solve with numbers.

What does it mean in words?_____

Let's Talk:

We will see what happens when we use the same steps for multiplying fractions that don't have 1 in the numerators.

Solve. $\frac{2}{3} \times \frac{3}{5} = ?$

Draw a picture:

Solve with numbers.

What does it mean in words?_____

Let's Think:

The hardest part of multiplying fractions is recognizing it in story problems.

How do you know when to multiply fractions in a story problem instead of adding them? Give examples.

Let's Try It:

Let's practice together.

Name: _____ G5 U5 Lesson 9 - Let's Try It

Shelby had $\frac{3}{4}$ pounds of salt. She used $\frac{2}{3}$ of what she had to make play dough! (Did you know you can use salt to make play dough?!?!) How much salt did Shelby use to make the play dough?

1. Draw a picture.

2. Represent your work with numbers:

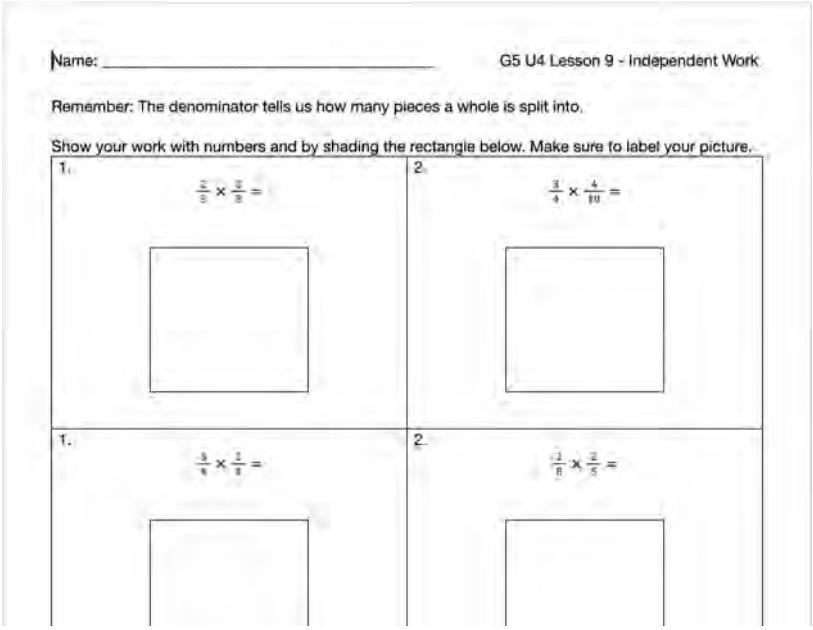
3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

On your Own:

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



Name: _____ G5 U4 Lesson 9 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

1. $\frac{2}{3} \times \frac{3}{8} =$

2. $\frac{3}{4} \times \frac{4}{10} =$

1. $\frac{5}{6} \times \frac{3}{8} =$

2. $\frac{3}{8} \times \frac{2}{5} =$

Shelby had $\frac{3}{4}$ pounds of salt. She used $\frac{2}{3}$ of what she had to make play dough! (Did you know you can use salt to make play dough?!?!) How much salt did Shelby use to make the play dough?

1. Draw a picture.

2. Represent your work with numbers:

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

_____

_____

Solve. $\frac{2}{5} \times \frac{3}{2} = ?$

4. Draw a picture.

5. Represent your work with numbers:

6. Write your own multiplication of fractions story problem.

_____

_____

_____

_____

7. Draw a picture:

8. Solve the problem with numbers:

9. Write your own addition of fractions story problem.

_____

_____

_____

_____

10. Draw a picture:

11. Solve the problem with numbers:

Name: _____ G5 U4 Lesson 9 - Independent Work

Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

1. $\frac{2}{3} \times \frac{2}{3} =$	2. $\frac{3}{4} \times \frac{4}{10} =$
1. $\frac{3}{4} \times \frac{2}{3} =$	2. $\frac{2}{8} \times \frac{2}{5} =$
1. $\frac{3}{5} \times \frac{5}{6} =$	2. $\frac{4}{5} \times \frac{3}{4} =$

Solve the story problem with numbers and by drawing a picture. Be careful! One of the story problems is addition NOT multiplication!

7. Janice had $\frac{7}{10}$ of a bag of candy that she brought to school for Valentine's Day. She passed out $\frac{3}{4}$ of what she brought to her friends. What fraction of a bag did Janice give out?

8. Latisha collected $\frac{2}{10}$ of a bucket of shells at the beach. Her brother, Lewis, collected $\frac{3}{5}$ of a bucket of shells. What fraction of a bucket did Latisha and her brother collect?

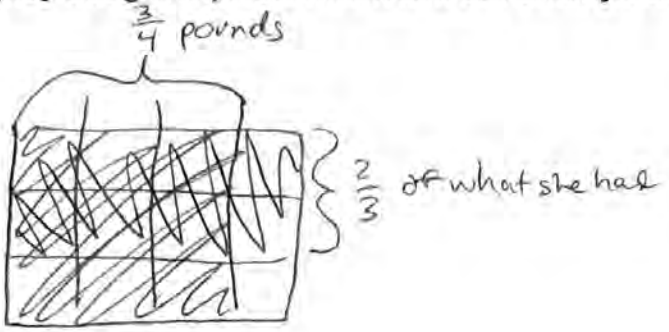
9. Tyrek got a job to mow $\frac{3}{4}$ acres of lawn for his neighbor. So far he has done $\frac{2}{3}$ of the job. How much lawn did Tyrek mow so far?

10. A house in rural West Virginia costs $\frac{2}{3}$ of a million dollars on average. To buy the house, the bank requires $\frac{2}{3}$ of the total cost as a down payment. What is the size of a down payment on an average house in rural West Virginia?

Name: ANSWER KEY

Shelby had $\frac{3}{4}$ pounds of salt. She used $\frac{2}{3}$ of what she had to make play dough! (Did you know you can use salt to make play dough?!?!) How much salt did Shelby use to make the play dough?

1. Draw a picture.



2. Represent your work with numbers:

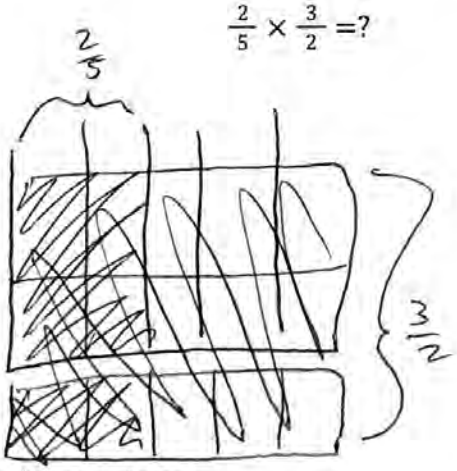
$$\frac{2}{3} \text{ of } \frac{3}{4} = \frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \boxed{\frac{1}{2}}$$

3. Write your answer in a complete sentence. Be sure to put units with your numerical answer.

Shelby used $\frac{1}{2}$ pound of salt to make play dough.

Solve. $\frac{2}{5} \times \frac{3}{2} = ?$

4. Draw a picture.



5. Represent your work with numbers:

$$\frac{2}{5} \times \frac{3}{2} = \frac{6}{10} = \boxed{\frac{3}{5}}$$

6. Write your own multiplication of fractions story problem.

* many possible answers *

7. Draw a picture:

* many possible answers *

8. Solve the problem with numbers:

9. Write your own addition of fractions story problem.

* many possible answers *

10. Draw a picture:

* many possible answers *

11. Solve the problem with numbers:

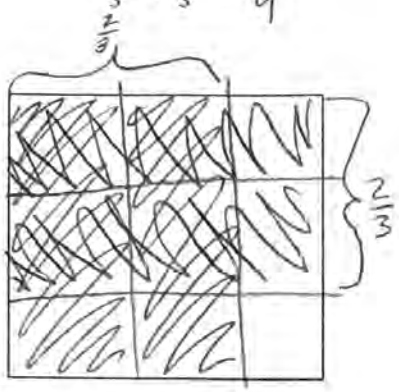
Name: ANSWER KEY

G5 U4 Lesson 9 - Independent Work

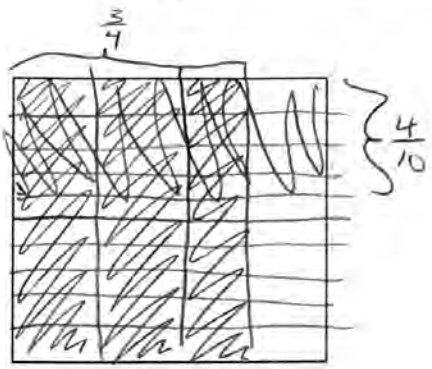
Remember: The denominator tells us how many pieces a whole is split into.

Show your work with numbers and by shading the rectangle below. Make sure to label your picture.

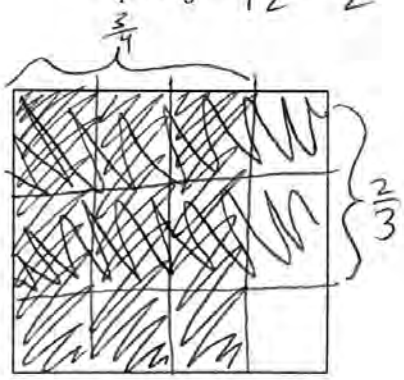
1. $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$



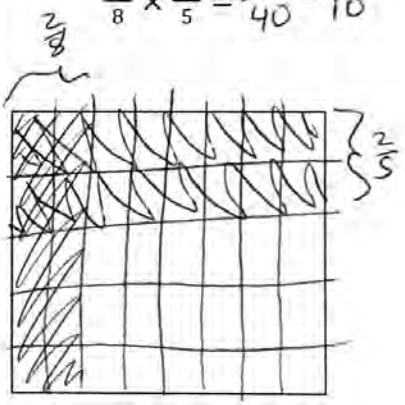
2. $\frac{3}{4} \times \frac{4}{10} = \frac{12}{40} = \frac{6}{20} = \frac{3}{10}$



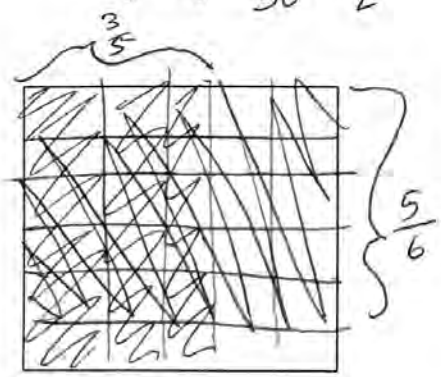
1. $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12} = \frac{1}{2}$



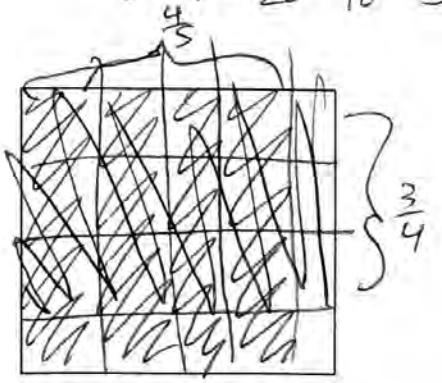
2. $\frac{2}{8} \times \frac{2}{5} = \frac{4}{40} = \frac{1}{10}$



1. $\frac{3}{5} \times \frac{5}{6} = \frac{15}{30} = \frac{1}{2}$

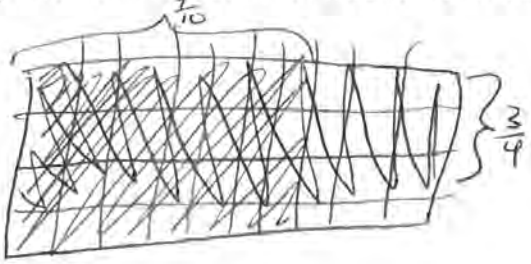


2. $\frac{4}{5} \times \frac{3}{4} = \frac{12}{20} = \frac{6}{10} = \frac{3}{5}$



Solve the story problem with numbers and by drawing a picture. Be careful! One of the story problems is addition NOT multiplication!

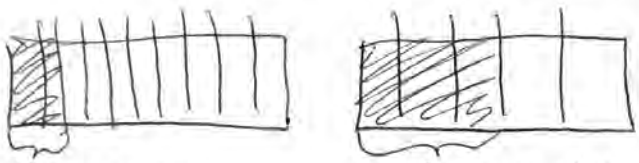
7. Janice had $\frac{7}{10}$ of a bag of candy that she brought to school for Valentine's Day. She passed out $\frac{3}{4}$ of what she brought to her friends. What fraction of a bag did Janice give out?



$\frac{3}{4}$ of $\frac{7}{10}$

$\frac{3}{4} \times \frac{7}{10} = \frac{21}{40}$ of a bag

8. Latisha collected $\frac{2}{10}$ of a bucket of shells at the beach. Her brother, Lewis, collected $\frac{3}{5}$ of a bucket of shells. What fraction of a bucket did Latisha and her brother collect?

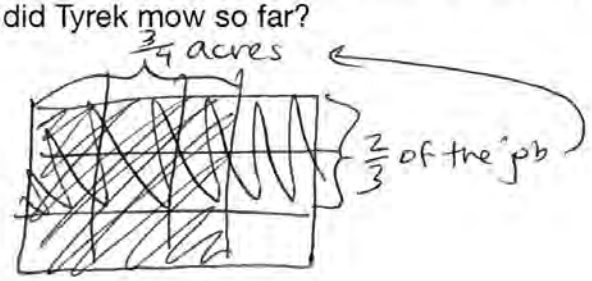


$\frac{2}{10}$ of a bucket $\frac{3}{5}$ of a bucket

$\frac{2}{10} + \frac{3}{5}$ $\frac{3 \times 2}{5 \times 2} = \frac{6}{10}$

$\frac{2}{10} + \frac{6}{10} = \frac{8}{10} = \frac{4}{5}$ of a bucket

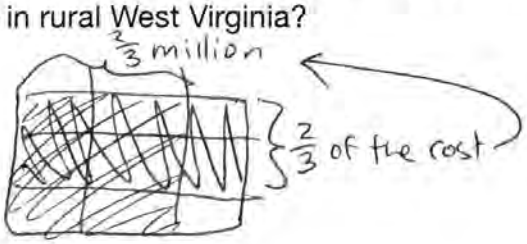
9. Tyrek got a job to mow $\frac{3}{4}$ acres of lawn for his neighbor. So far he has done $\frac{2}{3}$ of the job. How much lawn did Tyrek mow so far?



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

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

10. A house in rural West Virginia costs $\frac{2}{3}$ of a million dollars on average. To buy the house, the bank requires $\frac{2}{3}$ of the total cost as a down payment. What is the size of a down payment on an average house in rural West Virginia?



$\frac{2}{3}$ of $\frac{2}{3}$

$\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$ of a million

G5 U4 Lesson 10

Relate decimal and fraction multiplication

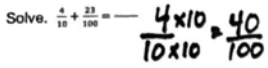
G1 U4 Lesson 10 - Today we will relate decimal and fraction multiplication.

Warm Welcome (Slide 1): Tutor choice

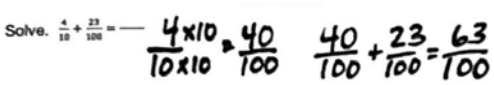
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will relate decimal and fraction multiplication. This is super helpful because you are going to be learning more and more operations. It is easy to get them confused. But everything we know about fraction multiplication is going to help with decimal multiplication. That's the great thing about math - it all works together and makes sense together. Let's go!

Let's Review (Slide 3): Earlier this year, you used fraction addition to learn about decimal addition. Who can tell me what our first step is to add $\frac{4}{10} + \frac{23}{100}$? Possible Student Answers, Key Points:

- You have to find common denominators.
- You use equivalent fractions.
- You multiply $\frac{4}{10}$ by 10 on top and 10 on the bottom.

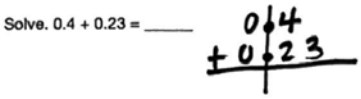


These two fractions are different units - tenths and hundredths. We can't add different units so we have to add equivalent fractions instead. I am going to multiply $\frac{4}{10}$ by $\frac{10}{10}$ and get $\frac{40}{100}$. Now I can add.



40 hundredths plus 23 hundredths is 63 hundredths. We have pieces and pieces make pieces so the denominator just stays the same.

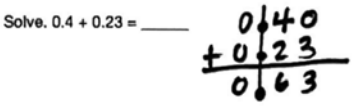
Now let's think about these same numbers as decimals. How can we set up this addition of decimals?



Possible Student Answers, Key Points:

- We line up our denominators.
- We use a place value chart.

The common way we talk about it is to say that we line up our decimals. But when we do that what we're doing is lining up tenths with tenths and hundredths with hundredths.

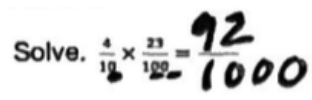


And if I put a zero next to the 4, look! It looks just like when we ended up adding the 40 and 23 above, right? But it's nice and lined up, easy to add. And here I just bring down the decimal.

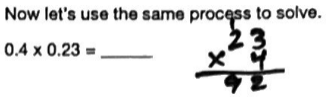
Now let's think about this question, "What does adding fractions teach us about adding decimals?" *Give students time to think but don't have them answer. Instead, give your own clear answer.* We need "like denominators" with fractions just like we need "like places" to be lined up with decimals. We don't add denominators so we don't add decimal place shifts. We just bring the decimal down.

Let's Talk (Slide 4): Now let's see what fraction multiplication has to teach us about decimal multiplication. We have to solve $\frac{4}{10} \times \frac{23}{100}$. We know this is easy peasy! We multiply the numerators and multiply the denominators. The only thing is that these are bigger numbers so I'm going to do the math to the side of my paper. 23 x 4. I multiply 4 times 3, which is 12. Put down the 2 and regroup the 1. Now 4 times 2 is 8 plus the 1 is 9. My numerator is 92.

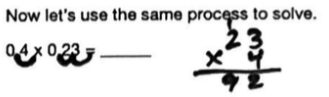
To multiply the denominators, I don't usually write out all these zeros. That will get too messy. I know these zeros are place holders that shift the digits so if I want to multiply them, I just count up all the shifts, all the place holders, all the zeros. There are 3 so I write one zero zero zero in the denominator. My answer is 92 thousandths.



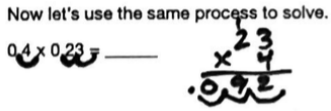
Let's just stop and look for a minute. This is NOT the same as decimal addition. The biggest difference is that we multiplied the denominators instead of keeping them the same. That is going to come back up again in a minute.



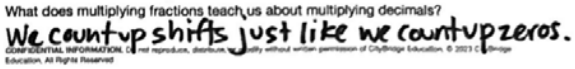
First let's think about numerators. We multiplied them without thinking about the denominators at all. So we are going to multiply these digits without thinking about the decimals points at all. You can write 0.23 x 0.4 but we are just multiplying the 23 x 4 like the decimal isn't there. We still get 92, right?



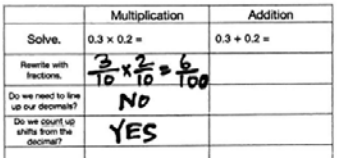
Now we know we multiplied the denominators of the fractions. The denominators are still secretly there. They are just in disguise as decimal places. This shift after the decimal shows tenths, right? These two places after the decimal show hundredths. So we are going to have to combine all those shifts just like we combined the zeros of our fractions.



I count 1 shift, 2 shifts, 3 shifts. So my answer needs 1 shift, 2 shifts, 3 shifts. I need a zero in this empty place and I put a decimal. Look! We got 92 thousandths both ways!



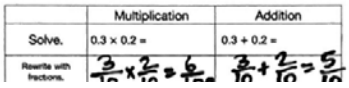
What does multiplying fractions teach us about multiplying decimals? We multiply our digit just like numerators. Then later we go back and count decimal shifts just like we would count up zeros in the denominator.



	Multiplication	Addition
Solve.	0.3 × 0.2 =	0.3 + 0.2 =
Rewrite with fractions.	$\frac{3}{10} \times \frac{2}{10} = \frac{6}{100}$	
Do we need to line up our decimals?	NO	
Do we count up shifts from the decimal?	YES	

Let's Think (Slide 5): It's really easy to get the operations mixed up so let's compare and contract them to review. 0.3 x 0.2 is $\frac{3}{10} \times \frac{2}{10}$ 3 x 2 is 6. 10 x 10 is 100. Our answer is $\frac{6}{100}$. So do we need to line up our decimals? NO! Do we count up the shifts from the decimal? YES! Just like we see two zeros, we'll have two shifts after the decimal.

Let's just do addition. As fractions, it is $\frac{3}{10} + \frac{2}{10}$. That's $\frac{5}{10}$. So do we need to line up our decimals? YES! It looks like this! Do we count up shifts from the decimal? NO! We just bring our decimal down.



	Multiplication	Addition
Solve.	0.3 × 0.2 =	0.3 + 0.2 =
Rewrite with fractions.	$\frac{3}{10} \times \frac{2}{10} = \frac{6}{100}$	$\frac{3}{10} + \frac{2}{10} = \frac{5}{10}$

	Multiplication	Addition
Solve.	0.3 × 0.2 =	0.3 + 0.2 =
Rewrite with fractions.	$\frac{3}{10} \times \frac{2}{10} = \frac{6}{100}$	$\frac{3}{10} + \frac{2}{10} = \frac{5}{10}$
Do we need to line up our decimals?	NO	YES
Do we count up shifts from the decimal?	YES	NO
Draw a picture.		
What size answer do we get?	smaller	
Write a story.		

Let's draw a picture to check. 0.3 x 0.2 is really 3 tenths of 2 tenths. I am going to draw 2 tenths with ten pieces and shade 2. Now I want 3 tenths of that. I will draw those the other way and shade 2. Wow! That's a multiplication picture! We get 6 out of 100 pieces. What size answer do we get? SMALLER! Look at our pieces. They got tiny!

	Multiplication	Addition
Solve.	0.3 × 0.2 =	0.3 + 0.2 =
Rewrite with fractions.	$\frac{3}{10} \times \frac{2}{10} = \frac{6}{100}$	$\frac{3}{10} + \frac{2}{10} = \frac{5}{10}$
Do we need to line up our decimals?	NO	YES
Do we count up shifts from the decimal?	YES	NO
Draw a picture.		
What size answer do we get?	smaller	bigger
Write a story.		

Let's draw the addition picture. I am going to draw 2 tenths with ten pieces and shade 2. Now I need another 3 pieces out of ten. I'll shade those this way. I have 5 pieces altogether. It's 5 tenths. What size answer do we get? BIGGER! Look, we shaded and then shaded more.

Who can help me make up a story for the multiplication? *See what students can offer then offer your own correct answer. You do not need to write it down.* We might say Lisa wants to trail that is 0.3 of a mile. She ran 0.2 of the trail. How far did Lisa run? Who can help me make up a story for the addition? *See what students can offer then offer your own correct answer. You do not need to write it down.* We might say Lisa ran 0.3 of a mile in the morning. She ran 0.2 of a mile in the afternoon. How far did Lisa run?

Let's Try it (Slides 6): Let's practice this together. We will multiply fractions and then multiply decimals and see how they are related.

WARM WELCOME

Today we will relate decimal and fraction multiplication.

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Let's Review:

Earlier this year, you used fraction addition to learn about decimal addition.

Solve. $\frac{4}{10} + \frac{23}{100} =$ ____

Solve. 0.4 + 0.23 = _____

What does adding fractions teach us about adding decimals?

Let's Talk:

Now let's see what fraction multiplication has to teach us about decimal multiplication.

Solve. $\frac{4}{10} \times \frac{23}{100} =$ ____

Now let's use the same process to solve.

0.4 x 0.23 = _____

What does multiplying fractions teach us about multiplying decimals?

Let's Think:

It's easy to get the operations mixed up so let's compare and contrast them.

	Multiplication	Addition
Solve.	$0.3 \times 0.2 =$	$0.3 + 0.2 =$
Rewrite with fractions.		
Do we need to line up our decimals?		
Do we count up shifts from the decimal?		
Draw a picture.		
What size answer do we get?		
Write a story.		

Let's Try It:

Let's practice together.

Name: _____ G5 U5 Lesson 10 - Let's Try It

Multiply the fractions then multiply the decimals.

1. Do the math. $\frac{2}{10} \times \frac{4}{100} =$ _____

2. Now we will multiply the same numbers as decimals and see if we get the same answer.

0.2 x 0.04 = _____

Step #1: Label the place values of your digits.

Step #2: Multiply the digits without the place value.

Step #3: Count the total amount that the digits shifted from the decimal point

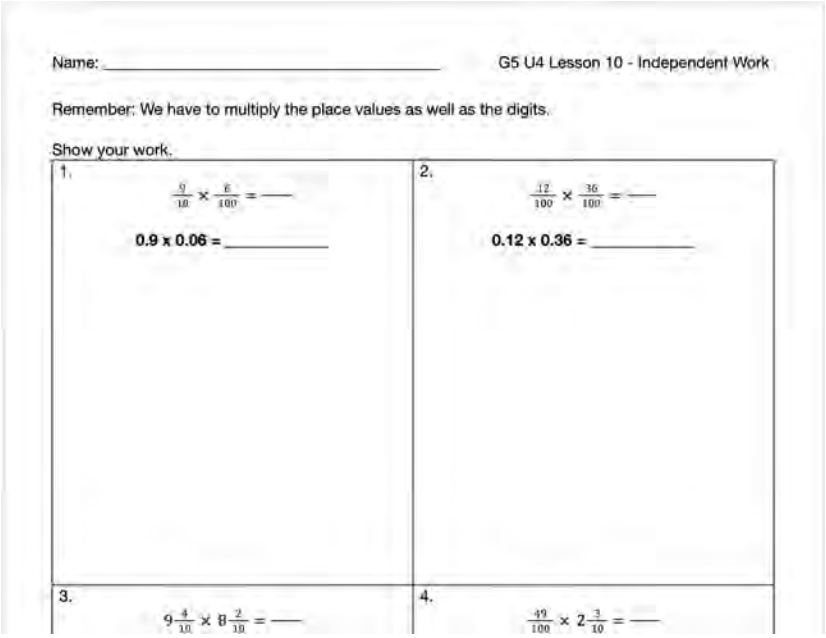
_____ shifts

Step #4: Count the same number of shifts to put the decimal point in your answer.

Step #5: Label the place values of your answer to check it with the fraction multiplication.

On your Own:

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



Name: _____ G5 U4 Lesson 10 - Independent Work

Remember: We have to multiply the place values as well as the digits.

Show your work.

1. $\frac{9}{10} \times \frac{6}{100} = \_\_\_$

0.9 x 0.06 = _____

2. $\frac{12}{100} \times \frac{36}{100} = \_\_\_$

0.12 x 0.36 = _____

3. $9\frac{4}{10} \times 8\frac{2}{10} = \_\_\_$

4. $\frac{49}{100} \times 2\frac{3}{10} = \_\_\_$

Multiply the fractions then multiply the decimals.

1. Do the math. $\frac{2}{10} \times \frac{4}{100} = \_\_\_\_$

2. Now we will multiply the same numbers as decimals and see if we get the same answer.

0.2 x 0.04 = _____

Step #1: Label the place values of your digits.

Step #2: Multiply the digits without the place value.

Step #3: Count the total amount that the digits shifted from the decimal point.

_____ shifts

Step #4: Count the same number of shifts to put the decimal point in your answer.

Step #5: Label the place values of your answer to check it with the fraction multiplication.

Multiply the fractions then multiply the decimals.

3. Rewrite the mixed numbers as improper fractions.

$5\frac{2}{10} \times 3\frac{6}{10} = \_\_\_\_$

$$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

4. Show the math you would do to multiply the numerators.

5. Rewrite your final answer as a mixed number. _____

6. Now we will multiply the same numbers as decimals and see if we get the same answer.

5.2 x 3.6 = _____

Step #1: Label the place values of your digits.

Step #2: Multiply the digits without the place value.

Step #3: Count the total amount that the digits shifted from the decimal point.

_____ shifts

Step #4: Count the same number of shifts to put the decimal point in your answer.

Step #5: Label the place values of your answer to check it with the fraction multiplication.

Name: _____ G5 U4 Lesson 10 - Independent Work

Remember: We have to multiply the place values as well as the digits.

Show your work.

1.

$\frac{9}{10} \times \frac{6}{100} = \_\_\_$

0.9 x 0.06 = _____

2.

$\frac{12}{100} \times \frac{36}{100} = \_\_\_$

0.12 x 0.36 = _____

3.

$9\frac{4}{10} \times 8\frac{2}{10} = \_\_\_$

_____ × _____ = _____

9.4 x 8.2 = _____

4.

$\frac{49}{100} \times 2\frac{3}{10} = \_\_\_$

_____ × _____ = _____

0.49 x 2.3 = _____

Show your work.

5.

$2\frac{8}{10} \times \frac{51}{100} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

2.8 x 0.51 = _____

6.

$\frac{4}{10} \times 1\frac{6}{10} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

0.4 x 1.6 = _____

7.

$58\frac{3}{10} \times \frac{42}{100} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

58.3 x 0.42 = _____

8.

$7\frac{6}{10} \times 2\frac{3}{100} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

7.6 x 2.03 = _____

Name: ANSWER KEY

Multiply the fractions then multiply the decimals.

1. Do the math. $\frac{2}{10} \times \frac{4}{100} = \frac{8}{1000}$

2. Now we will multiply the same numbers as decimals and see if we get the same answer.

0T 0TH
0.2 x 0.04 = 0 T H Th
0.008

Step #1: Label the place values of your digits.

Step #2: Multiply the digits without the place value.

2
x 4
8

.008

Step #3: Count the total amount that the digits shifted from the decimal point.

3 shifts

Step #4: Count the same number of shifts to put the decimal point in your answer.

Step #5: Label the place values of your answer to check it with the fraction multiplication.

Multiply the fractions then multiply the decimals.

3. Rewrite the mixed numbers as improper fractions.

$$5\frac{2}{10} \times 3\frac{6}{10} = \text{\_\_\_\_}$$

$$\frac{52}{10} \times \frac{36}{10} = \frac{1872}{100}$$

4. Show the math you would do to multiply the numerators.

$$\begin{array}{r} {}^{1}52 \\ \times\ 36 \\ \hline 312 \\ 1560 \\ \hline 1872 \end{array}$$

5. Rewrite your final answer as a mixed number. $18\frac{72}{100}$

6. Now we will multiply the same numbers as decimals and see if we get the same answer.

$5_{T}2_{O} \times 3_{T}6_{O} = 18.72$ (T O . T H)

Step #1: Label the place values of your digits.

Step #2: Multiply the digits without the place value.

$$\begin{array}{r} {}^{1}52 \\ \times\ 36 \\ \hline 312 \\ 1560 \\ \hline 1872 \end{array}$$

Step #3: Count the total amount that the digits shifted from the decimal point.

2 shifts

Step #4: Count the same number of shifts to put the decimal point in your answer.

Step #5: Label the place values of your answer to check it with the fraction multiplication.

Name: ANSWER KEY

G5 U4 Lesson 10 - Independent Work

Remember: We have to multiply the place values as well as the digits.

Show your work.

1.

$\frac{9}{10} \times \frac{6}{100} = \frac{54}{1000}$

$0.9 \times 0.06 = 0.054$

$$\begin{array}{r} 9 \\ \times\ 6 \\ \hline .054 \end{array}$$

2.

$\frac{12}{100} \times \frac{36}{100} = \frac{432}{1000}$

$0.12 \times 0.36 = 0.0432$

$$\begin{array}{r} {\scriptstyle 1}\ 12 \\ \times\ 36 \\ \hline 72 \\ 360 \\ \hline .0432 \end{array}$$

3.

$9\frac{4}{10} \times 8\frac{2}{10} = \text{——}$

$\frac{94}{10} \times \frac{82}{10} = \frac{7708}{100}$

$9.4 \times 8.2 = 77.08$

$$\begin{array}{r} {\scriptstyle 3}\ 94 \\ \times\ 82 \\ \hline {\scriptstyle 1}188 \\ 7520 \\ \hline 77.08 \end{array}$$

4.

$\frac{49}{100} \times 2\frac{3}{10} = \text{——}$

$\frac{49}{100} \times \frac{23}{10} = \frac{1127}{1000}$

$0.49 \times 2.3 = 1.127$

$$\begin{array}{r} {\scriptstyle 1}\ 49 \\ \times\ 23 \\ \hline {\scriptstyle 1}147 \\ 980 \\ \hline 1.127 \end{array}$$

Show your work.

5.

$2\frac{8}{10} \times \frac{51}{100} = \text{——}$

$\frac{28}{10} \times \frac{51}{100} = \frac{1428}{1000}$

$2.8 \times 0.51 = 1.428$

$$\begin{array}{r} {\scriptstyle 4}28 \\ \times\ 51 \\ \hline 28 \\ 1400 \\ \hline 1428 \end{array}$$

6.

$\frac{4}{10} \times 1\frac{6}{10} = \text{——}$

$\frac{4}{10} \times \frac{16}{10} = \frac{64}{100}$

$0.4 \times 1.6 = 0.64$

$$\begin{array}{r} {\scriptstyle 2}16 \\ \times\ 4 \\ \hline .64 \end{array}$$

7.

$58\frac{3}{10} \times \frac{42}{100} = \text{——}$

$\frac{583}{10} \times \frac{42}{100} = \frac{24486}{1000}$

$58.3 \times 0.42 = 24.486$

$$\begin{array}{r} {\scriptstyle 31}583 \\ \times\ \ 42 \\ \hline 1166 \\ 23320 \\ \hline 24486 \end{array}$$

8.

$7\frac{6}{10} \times 2\frac{3}{100} = \text{——}$

$\frac{76}{10} \times \frac{203}{100} = \frac{15428}{1000}$

$7.6 \times 2.03 = 15.428$

$$\begin{array}{r} {\scriptstyle 2}203 \\ \times\ \ 76 \\ \hline 1218 \\ 14210 \\ \hline 15428 \end{array}$$

G5 U4 Lesson 11

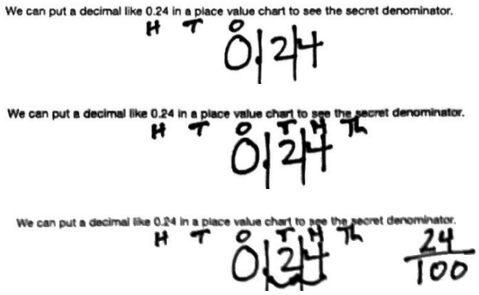
Multiply decimals fluently

G1 U4 Lesson 11 - Today we will multiply decimals fluently.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will multiply decimals fluently. That just means that we will get quicker at doing the steps we already know. We want to be able to get the right answer every time following the exact same steps.

Let's Review (Slide 3): The whole strategy that we already learned to multiply decimals rests on one big understanding: Decimals are really just secret fractions. You might not have explained it that way but I bet you kind of already knew that. Let me show you what I mean. We can put our decimal in a place value chart to see the secret denominator.

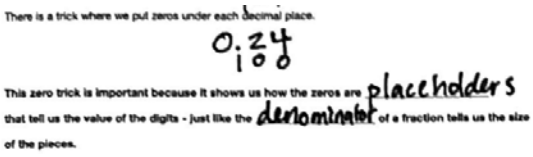


Let me copy this number with some lines between the digits. I start at the decimal and this direction I have ones, tens, hundreds.

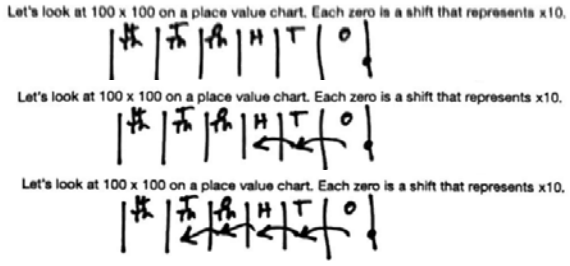
Then in the other direction I have tenths, hundredths, thousandths. So this number is secretly 24 hundredths.

Let me write that as a fraction. You see? The spaces after the decimal secretly told us the number in the denominator.

Now this part might be new for you. There is also a trick where I put a 1 under the decimal and then I put zeros under each decimal place. This zero trick is important because it shows us how the zeros are placeholders that tell us the value of the digits - just like the denominator of a fraction tells us the size of the pieces. So, when we multiply we can count up shifts after the decimal just like we can count up zeros.



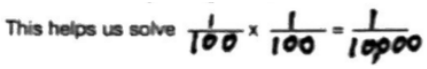
Let's Talk (Slide 4): When we multiply we count up all the zeros. In the same way, we can count up all the shifts after the decimal point. Let's look at 100 x 100 on a place value chart. Each zero is a shift that represents x 10.



Here is my chart.

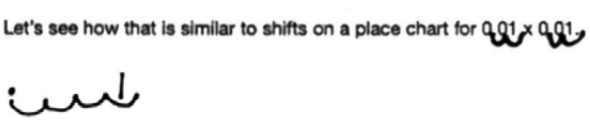
100 is 10 x 10.

Multiply that by 100 is x10 x10. We get 10,000. Each zero was a shift on the place value chart and our answer was all the shifts together.



This helps us solve 1 over 100 times 1 over 100. 1 x 1 is 1. 100 x 100 is ten thousand. 4 zeros in our denominators mean 4 zeros in our answer's denominator.

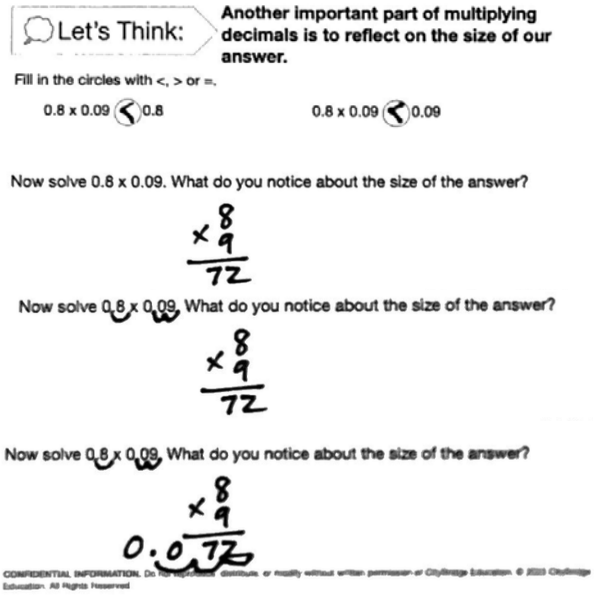
Let's see how that is similar to shifts on a place value chart for 0.01 x 0.01. This is secretly 1 hundredth times 1 hundredths. But let's just look at it as shifts. 1 x 1 is 1. Now for the values. 0.01 is one shift then two shifts. The next number is three shifts then four shifts. I put all the shifts together just like I put all the zeros together.



1 x 1 is 1. Then I need to put four shifts in my answer.

I fill in these spaces with zero and get 0.0001 and I get 1 ten thousandth! It is the same answer. None of this means you have to do anything different than you learned in the last lesson. I just want to make sure you understand that connection between multiplying fractions and multiplying decimals.

Let's Think (Slide 5): Another important part of multiplying decimals is to reflect on the size of our answer.



This says, fill in the circles with <, > or =. We know 0.8 x 0.09 is really 8 tenths of 9 hundredths or 9 hundredths or 8 tenths. Either way, it is a fraction of a fraction. We would expect our answer to be smaller than 0.8. And we'd expect the same thing for comparing to 0.09. A fraction of a fraction will be less.

So now let's solve 0.8 x 0.09. First I multiply 8 x 9 like they are just plain digits. That is 72.

Then I count up all the shifts from the decimal. There are 3.

So, I need 3 in my answer and I'll fill in the empty spots with zeros.

What do you notice about the size of the answer? It is smaller than 0.8. It is smaller than 0.09. We got the size answer we'd expect. You do not need to estimate or compare every single time but it is a great way to check your work so you can know if your answer is reasonable.

Let's Try it (Slides 6): Let's practice multiplying decimals together.

WARM WELCOME

Today we will multiply decimals fluently.

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Let's Review:

We know that decimals are really just secret fractions.

We can put a decimal like 0.24 in a place value chart to see the secret denominator.

There is a trick where we put zeros under each decimal place.

This zero trick is important because it shows us how the zeros are _____

that tell us the value of the digits - just like the _____ of a fraction tells us the size

of the pieces.

Let's Talk:

When we multiply, we count up all the zeros. In the same way, we can count up all the shifts after the decimal point.

Let's look at 100 x 100 on a place value chart. Each zero is a shift that represents x10.

This helps us solve ——— x ——— = ———

Let's see how that is similar to shifts on a place chart for 0.01 x 0.01.

Let's Think:

Another important part of multiplying decimals is to reflect on the size of our answer.

Fill in the circles with <, > or =.

0.8 x 0.09 ◯ 0.8

0.8 x 0.09 ◯ 0.09

Now solve 0.8 x 0.09. What do you notice about the size of the answer?

Let's Try It:

Let's practice together, and we'll estimate to see if our answer is reasonable.

Name: _____ G5 U5 Lesson 11 - Let's Try It

Estimate the answer.

2.25 x 1.4 = _____

1. What whole number is 2.25 close to? _____ And what whole number is 1.4 close to? _____

2. What is an estimate of their product? _____

Now solve.

3. Multiply the digits without the place value.

4. How many total shifts are there from the decimal point? _____ shifts

6. Count the same number of shifts to put the decimal point in your answer.

7. Is your answer close to your estimate? _____

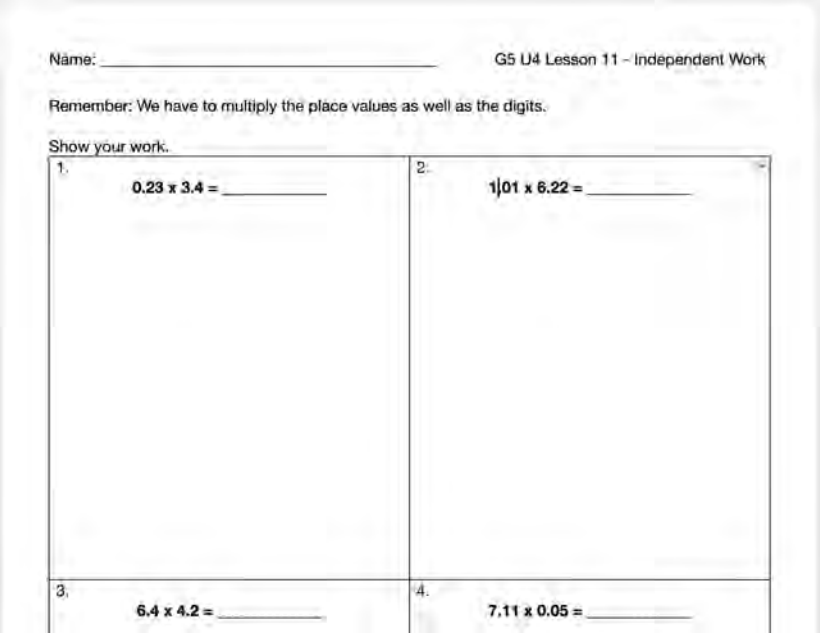
Estimate the answer.

0.2 x 9.1 = _____

8. What whole number is 0.2 close to? _____ And what whole number is 9.1 close to? _____

On your Own:

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



Name: _____ G5 U4 Lesson 11 – Independent Work

Remember: We have to multiply the place values as well as the digits.

Show your work.

1. **0.23 x 3.4 = _____**	2. **101 x 6.22 = _____**
3. **6.4 x 4.2 = _____**	4. **7.11 x 0.05 = _____**

Estimate the answer.

2.25 x 1.4 = _____

1. What whole number is 2.25 close to? _____ And what whole number is 1.4 close to? _____

2. What is an estimate of their product? _____

Now solve.

3. Multiply the digits without the place value.

4. How many total shifts are there from the decimal point? _____ shifts

6. Count the same number of shifts to put the decimal point in your answer.

7. Is your answer close to your estimate? _____

Estimate the answer.

0.2 x 9.1 = _____

8. What whole number is 0.2 close to? _____ And what whole number is 9.1 close to? _____

9. What is an estimate of their product? _____

Now solve.

10. Multiply the digits without the place value.

11. How many total shifts are there from the decimal point? _____ shifts

12. Count the same number of shifts to put the decimal point in your answer.

13. Is your answer close to your estimate? _____

Name: _____ G5 U4 Lesson 11 - Independent Work

Remember: We have to multiply the place values as well as the digits.

Show your work.

1. 0.23 x 3.4 = _____	2. 1.01 x 6.22 = _____
3. 6.4 x 4.2 = _____	4. 7.11 x 0.05 = _____

Show your work.

5. 8.4 x 2.7 = _____	6. 51.9 x 3.2 = _____
7. 7.25 x 1.64 = _____	8. 82.1 x 4.9 = _____

Name: ANSWER KEY

Estimate the answer.

2.25 x 1.4 = 3.15

1. What whole number is 2.25 close to? 2 And what whole number is 1.4 close to? 1

2. What is an estimate of their product? 2 x 1 = 2

Now solve.

3. Multiply the digits without the place value.

```
  1 2
  2 2 5
    1 4
  ---
  9 0 0
2 2 5 0
-------
3.1 5 0
```

4. How many total shifts are there from the decimal point? 3 shifts

6. Count the same number of shifts to put the decimal point in your answer.

7. Is your answer close to your estimate? yes

Estimate the answer.

0.2 x 9.1 = _____

8. What whole number is 0.2 close to? 0 And what whole number is 9.1 close to? 9

9. What is an estimate of their product? 0 x 9 = 0

Now solve.

10. Multiply the digits without the place value.

```
  9 1
    2
  ---
1.8 2
```

11. How many total shifts are there from the decimal point? 2 shifts

12. Count the same number of shifts to put the decimal point in your answer.

13. Is your answer close to your estimate? yes

Name: ANSWER KEY

Remember: We have to multiply the place values as well as the digits.

Show your work.

1.

0.23 x 3.4 = 0.782

23
34
92
690
782

2.

1.01 x 6.22 = 6.2822

101
622
202
2020
60600
6.2822

3.

6.4 x 4.2 = 26.88

64
42
128
2560
26.88

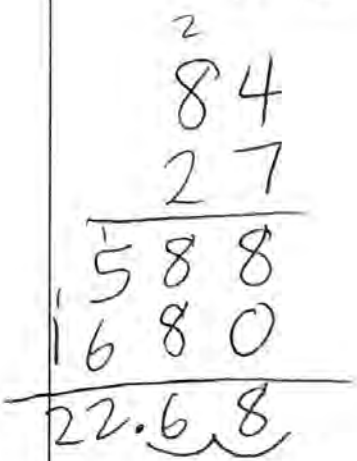
4.

7.11 x 0.05 = ~~0.35555~~ 0.3555

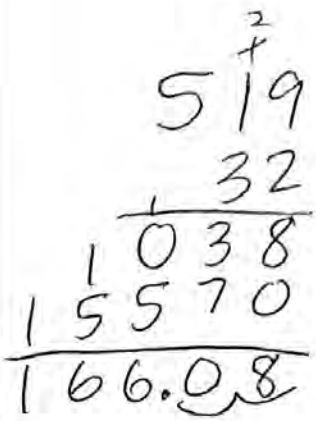
711
5
3555

Show your work.

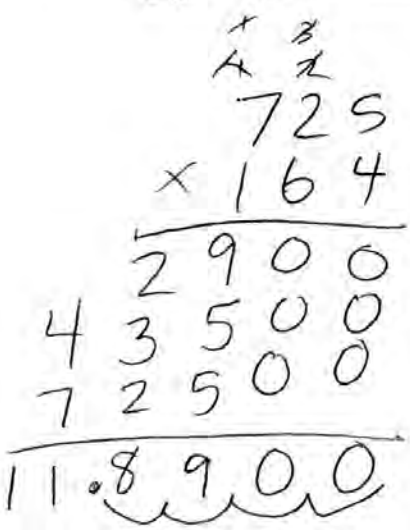
5. **8.4 x 2.7 =** 22.68



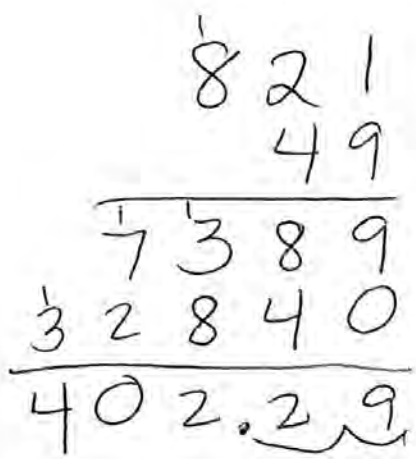
6. **51.9 x 3.2 =** 166.08



7. **7.25 x 1.64 =** 11.89



8. **82.1 x 4.9 =** 402.29



G5 U4 Lesson 12

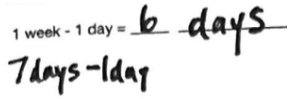
Solve word problems using fraction and decimal multiplication

G1 U4 Lesson 12 - Today we will solve word problems using fraction and decimal multiplication.

Warm Welcome (Slide 1): Tutor choice

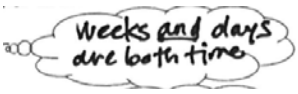
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will solve word problems using fraction and decimal multiplication. You will get to practice the things you've learned and apply them to real life situations. But there are going to be some addition and subtraction problems mixed in there so you are going to have to really be thoughtful about which operation you want to do before you start solving.

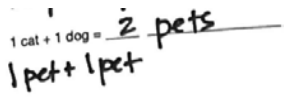
Let's Review (Slide 3): First, let's review a big idea that will help us recognize if it's even possible to add or subtract. That is, we can only add and subtract "like" things or common units. So, for example, we can add apples and apples and get apples. We can add apples and oranges and get fruit. We can't add apples and trees and get apple trees, right? Like apples grow on trees but we can't count them all up together like they're one group of something. Let's look at some examples.



Here we have 1 week - 1 day. Does anyone think they know what 1 week - 1 day makes? *Let kids raise their hands but don't call anyone or take answers. Just let them think.* If I want to figure this out, I really think to myself that 1 week is 7 days. This is really 7 days - 1 day. That's makes 6 days.

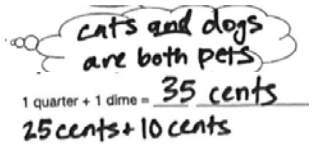
But here's the important part. There is a key question that we're asking ourselves without even realizing it. That question is, "What is the relationship between weeks and days?" In other words, what do weeks and days have to do with each other. Everyone say, "What is the relationship?" That's the key question we are going to ask, "What is the relationship?" In this case, we're thinking, "Weeks AND days are both measures of time." And in this case we changed the problem to days AND days. That "AND" tells me these are like units that I can add or subtract.



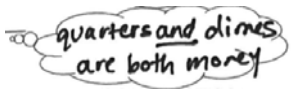


Let's look at this next one. 1 cat + 1 dog. In order to add or subtract these, I might think to myself 2 pets. I really thought of it as 1 cat is 1 pet plus 1 dog is 1 pet.

Now remember, I said there is a key question that we're asking ourselves without even realizing it. The question is, "What is the relationship?" So I think, "What is the relationship between cats and dogs?" I know cats AND dogs are both pets. They are the same unit so I can add and subtract them.



Let's look at this next one. 1 quarter + 1 dime. In order to add or subtract these, I might think to myself 25 cents + 10 cents is 35 cents.



Again, I had the secret, hidden question in my brain, "What is the relationship?" So I think, "What is the relationship between quarters and dimes?" Quarters AND dimes are both cents. That "AND" word let's me know that they are the same unit so I can add or subtract them. Now let's look at multiplication examples and see how our hidden question works.

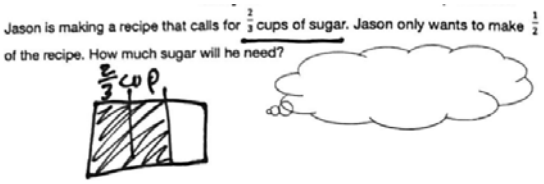
Let's Talk (Slide 4): Multiplication means putting equal groups together or making equal copies. You learned this in earlier grades. But maybe your teacher didn't spell it out. Because that's what multiplication means, the units we multiply are usually not "like" or the same because one unit is repeating or scaling because of the other. For example, if I have cookies in bags. Cookies and bags aren't the same unit. I don't say cookies AND bags. The cookies go IN the bags. They repeat if I have lots of bags repeating. Let's read these examples.

Jen has 3 dogs. They each have 2 bones. How many bones do they have? Do you remember our hidden question? I ask, "What is the relationship?" You say it! "What is the relationship?" Great! So I ask, "What is the relationship between dogs and bones?" Do we think of it as dogs AND bones as in dogs AND bones are both the same thing? NO! We think of dogs WITH bones or the bones are FOR the dogs. We can see this is not addition or subtraction. There is a repeating relationship here because for every dog, we have some bones. For the next dog, we have some bones, and so on.

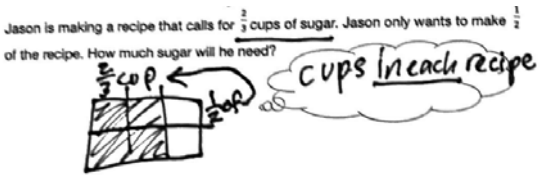
What about the next one? Lisa reads 4 pages each day. How much did she read in 3 days? Do you remember our hidden question? I ask, "What is the relationship?" You say it! "What is the relationship?" Great! So I ask, "What is the relationship between pages and days?" Do we think of it as pages AND days as in pages AND days are both the same thing? NO! We

think of pages ON the days or days OF pages. We can see this is not addition or subtraction. There is a repeating relationship here because for every day, she reads some pages. For the next day, she reads some more pages, and so on.

Let's Think (Slide 5): I have one other tip. When we draw a tape diagram of the problem BEFORE we solve it, then we are more likely to choose the correct operation. That's because to draw the tape diagram, we kind of also ask ourselves, "Well, what does this have to do with that?" or "What is the relationship between this and that?" Let's see. I am going to read the problem and I want you to read along in your head and follow along with your eyes. *Read the problem.*

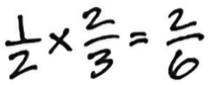


Now let's draw it. The problem starts with $\frac{2}{3}$ cup of sugar. So I will draw a rectangle and I will cut it into 3 pieces and shade 2 pieces. That's two thirds of a cup of sugar.



The next part of our problem says he only wants to make $\frac{1}{2}$ of a recipe. Before I try to draw the half, I can ask myself that question again, "What is the relationship between cups and the recipe?" Cups are IN the recipe. Cups repeat because of the recipe.

So I am already realizing these aren't like units, which means I can't add or subtract them. Instead, I can think of cut this into parts again FOR the recipe, BECAUSE OF the recipe. I will cut it this way and see I'm taking half of two thirds. That's multiplication! I can see the two sixths here. But I can also write $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6}$.



Let's Try it (Slides 6): Let's practice solving two more word problems together before you try it on your own. You are going to see that these word problems seem really similar but they require different operations to solve. I will help you ask our hidden question.

WARM WELCOME

Today we will solve word problems using fraction and decimal multiplication.

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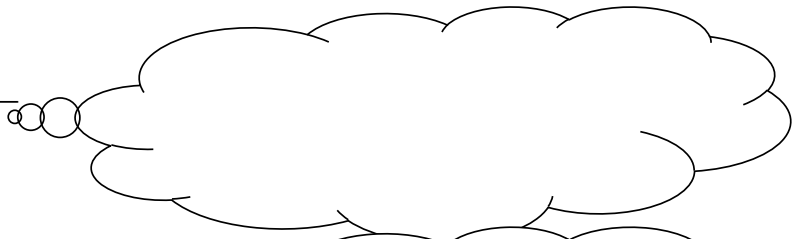
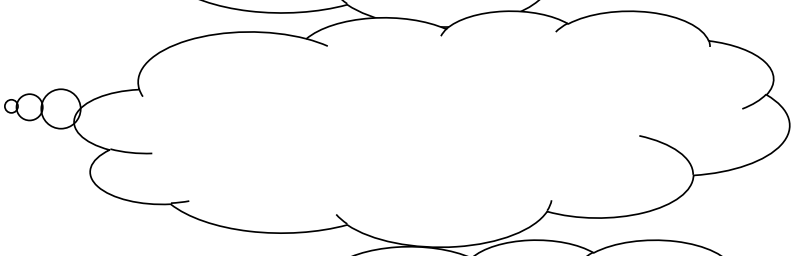
Let's Review:

We can add and subtract "like" things or common units.

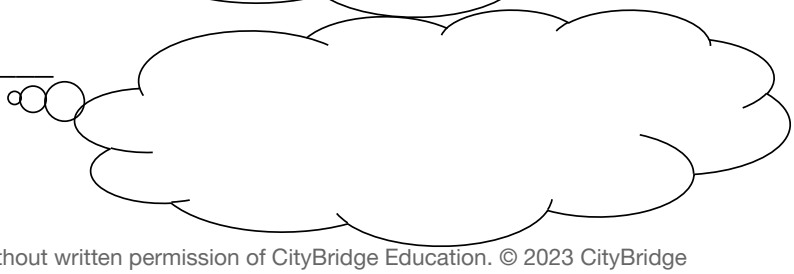
1 week - 1 day = _____ _____



1 cat + 1 dog = _____ _____



1 quarter + 1 dime = _____ _____

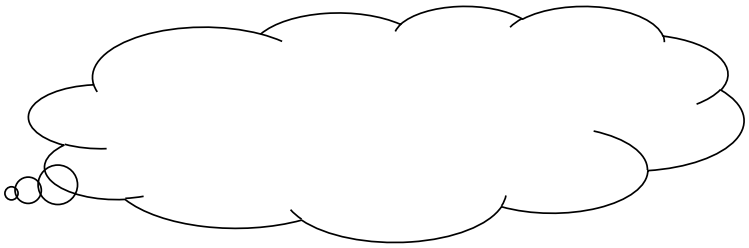


Let's Talk:

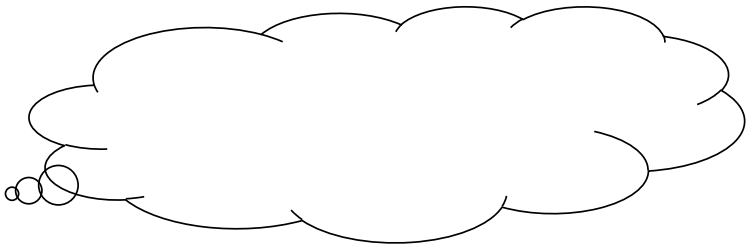
Multiplication means putting equal groups together or making equal copies.

The units we multiply are usually not "like" or the same because one unit is repeating or scaling because of the other.

Jen has 3 dogs. They each have 2 bones.
How many bones do they have?



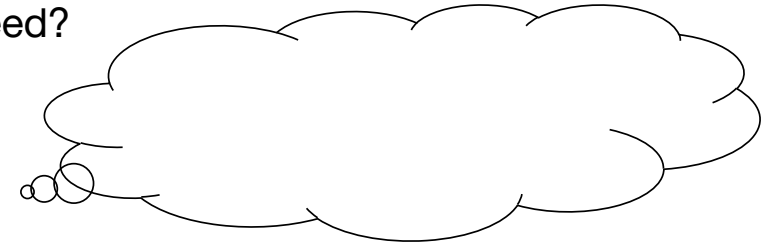
Lisa reads 4 pages each day.
How much did she read in 3 days?



Let's Think:

When we draw a tape diagram of the problem BEFORE we solve it, we are more likely to choose the correct operation.

Jason is making a recipe that calls for $\frac{2}{3}$ cups of sugar. Jason only wants to make $\frac{1}{2}$ of the recipe. How much sugar will he need?



Let's Try It:

Let's practice together.

Name: _____ G5 U5 Lesson 12 - Let's Try It

Alicia had 3/4 of a pie. She gave 1/3 of what she had to her friend. How much pie did Alicia give her friend?

1. This story problem is about _____ and _____.
2. To choose the operation, I ask, what is the relationship between those things?

_____

3. Draw a tape diagram of the story problem.

4. Fill in the circle with + or x: $\frac{3}{4}$ ◯ $\frac{1}{3}$ = _____

5. Solve.

Alicia had 3/4 of a pie. She gave 1/3 of a pie to her friend. How much pie does Alicia have left now?

On your Own:

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

Name: _____ G5 U4 Lesson 12 – Independent Work

Remember: Ask yourself, "What is the relationship?"

Draw a tape diagram then show your numbers to solve.

1. A garden hose can fill a 2.5-gallon bucket in a minute. How many gallons of water can the hose fill in 0.75 minutes?	2. Tonia spent $\frac{3}{4}$ of an hour playing basketball. Then she rode for $\frac{2}{3}$ of an hour on her bike. How many hours of exercise did Tonia get?

Alicia had 3/4 of a pie. She gave 1/3 of what she had to her friend. How much pie did Alicia give her friend?

1. This story problem is about _____ and _____.
2. To choose the operation, I ask, what is the relationship between those things?

_____

3. Draw a tape diagram of the story problem.

4. Fill in the circle with + or x: $\frac{3}{4}$ $\frac{1}{3}$ ◯ _____

5. Solve.

Alicia had 3/4 of a pie. She gave 1/3 of a pie to her friend. How much pie does Alicia have left now?

1. This story problem is about _____ and _____.
2. To choose the operation, I ask, what is the relationship between those things?

_____

3. Draw a tape diagram of the story problem.

4. Fill in the circle with + or x: $\frac{3}{4}$ $\frac{1}{3}$ ◯ _____

5. Solve.

Name: _____ G5 U4 Lesson 12 - Independent Work

Remember: Ask yourself, "What is the relationship?"

Draw a tape diagram then show your numbers to solve.

1. A garden hose can fill a 2.5-gallon bucket in a minute. How many gallons of water can the hose fill in 0.75 minutes?	2. Tonia spent $\frac{3}{4}$ of an hour playing basketball. Then she rode for $\frac{2}{3}$ of an hour on her bike. How many hours of exercise did Tonia get?
3. Hannah is planning a road trip and estimates that her car gets 28.5 miles per gallon. If she plans to use 3.4 gallons, how many miles will she drive?	4. Amy has $\frac{2}{3}$ of a pizza left over from lunch. She decides to eat $\frac{1}{2}$ of what's left as a snack. What fraction of the original pizza did Amy eat for her snack?

Show your work.

5. Maria baked a cake. The recipe called for $\frac{2}{3}$ cup of white sugar. Later, Maria read in the recipe that she also needed $\frac{2}{3}$ cup of brown sugar. How much sugar was needed for the recipe?	6. Samantha is doing a science experiment that requires 6.8 grams of salt. She wants to do the experiment three times. How much salt does Samantha need?
7. A chef made a fruit salad with 0.75 pounds of strawberries. Then the chef put in 0.5 pounds of blueberries. How many pounds of berries are in the fruit salad?	8. $\frac{2}{5}$ of Sarah's homework for this weekend is math. So far, Sarah has completed $\frac{9}{10}$ of the math homework. What fraction of the total homework has Sarah completed?

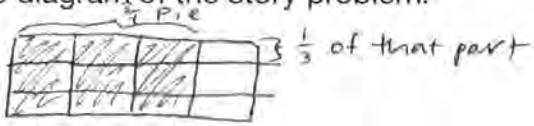
Name: ANSWER KEY

Alicia had 3/4 of a pie. She gave 1/3 of what she had to her friend. How much pie did Alicia give her friend?

1. This story problem is about pie and what she had.
2. To choose the operation, I ask, what is the relationship between those things?

she had part of the pie

3. Draw a tape diagram of the story problem.



4. Fill in the circle with + or x: $\frac{3}{4}$ (×) $\frac{1}{3}$ = $\frac{3}{12}$

5. Solve.

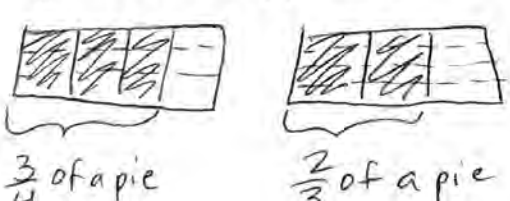
$$\frac{3}{4} \times \frac{1}{3} = \frac{3 \times 1}{4 \times 3} = \frac{3}{12}$$

Alicia had 3/4 of a pie. She gave 1/3 of a pie to her friend. How much pie does Alicia have left now?

1. This story problem is about pie and pie.
2. To choose the operation, I ask, what is the relationship between those things?

pie and pie are both the same

3. Draw a tape diagram of the story problem.



4. Fill in the circle with + or x: $\frac{3}{4}$ (+) $\frac{1}{3}$ = $\frac{17}{12} = 1\frac{5}{12}$

5. Solve. $\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$ $\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$

$$12\overline{)17} \quad 1 \text{ R } 5$$

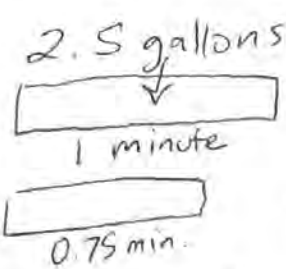
Name: ANSWER KEY

G5 U4 Lesson 12 - Independent Work

Remember: Ask yourself, "What is the relationship?"

Draw a tape diagram then show your numbers to solve.

1. A garden hose can fill a 2.5-gallon bucket in a minute. How many gallons of water can the hose fill in 0.75 minutes?

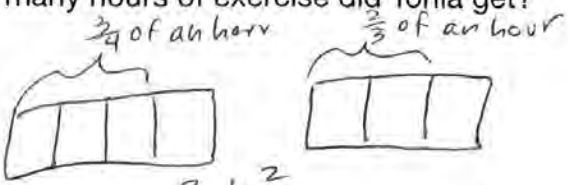


$$\begin{array}{r} 2 \\ 75 \\ 25 \\ \hline 375 \\ 1500 \\ \hline 1875 \end{array}$$

0.75 of 2.5

$0.75 \times 2.5 =$ **1.875 gallons**

2. Tonia spent $\frac{3}{4}$ of an hour playing basketball. Then she rode for $\frac{2}{3}$ of an hour on her bike. How many hours of exercise did Tonia get?



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

$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\quad \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

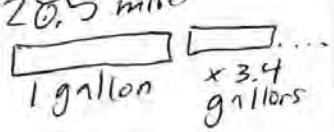
$\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$

$12\overline{)17}$ $\quad 17 - 12 = 5$

$= 1\frac{5}{12}$ **hours**

3. Hannah is planning a road trip and estimates that her car gets 28.5 miles per gallon. If she plans to ~~drive 35.5 miles, how many gallons of gas will she need for the trip?~~ use 3.4 gallons how many miles will she drive?

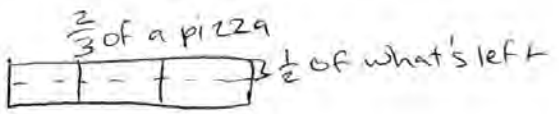
$$\begin{array}{r} 2 \\ 285 \\ 34 \\ \hline 1140 \\ 8550 \\ \hline 9690 \end{array}$$



28.5×3.4

96.9 miles

4. Amy has $\frac{2}{3}$ of a pizza left over from lunch. She decides to eat $\frac{1}{2}$ of what's left as a snack. What fraction of the original pizza did Amy eat for her snack?

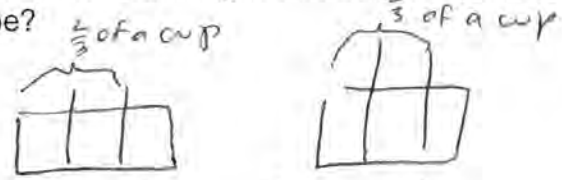


$\frac{1}{2}$ of $\frac{2}{3}$

$\frac{1}{2} \times \frac{2}{3} =$ $\frac{2}{6}$ **of a pizza**

Show your work.

5. Maria baked a cake. The recipe called for $\frac{2}{3}$ cup of white sugar. Later, Maria read in the recipe that she also needed $\frac{2}{3}$ cup of brown sugar. How much sugar was needed for the recipe?

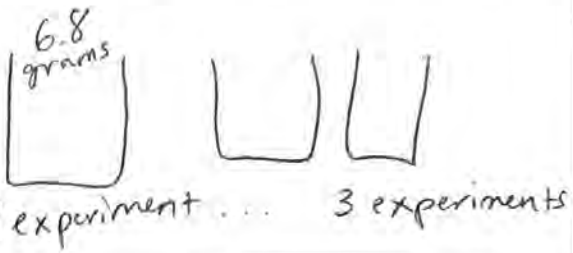


$\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$

$3\overline{)4}$ R 1

$1\frac{1}{3}$ cups

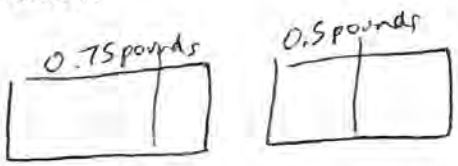
6. Samantha is doing a science experiment that requires 6.8 grams of salt. She wants to do the experiment three times. How much salt does Samantha need?



$6.8 \times 3 =$ 20.4 grams

$\begin{array}{r} 68 \\ \times\ 3 \\ \hline 20.4 \end{array}$

7. A chef made a fruit salad with 0.75 pounds of strawberries. Then the chef put in 0.5 pounds of blueberries. How many pounds of berries are in the fruit salad?

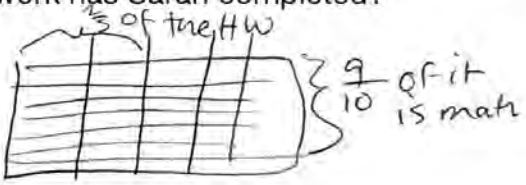


$0.75 + 0.5$

$\begin{array}{r} 0.75 \\ +\ 0.50 \\ \hline 1.25 \end{array}$

1.25 pounds

8. $\frac{2}{5}$ of Sarah's homework for this weekend is math. So far, Sarah has completed $\frac{9}{10}$ of the math homework. What fraction of the total homework has Sarah completed?



$\frac{9}{10}$ of $\frac{2}{5}$

$\frac{9}{10} \times \frac{2}{5} = \frac{18}{50} = \frac{9}{25}$ of the HW

G5 U4 Lesson 13

Divide a unit fraction by a whole number

G1 U4 Lesson 13 - Today we will divide a unit fraction by a whole number.

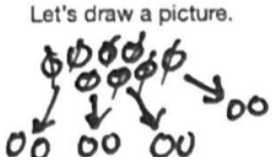
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will divide a unit fraction by a whole number. This is big leagues now! We are really getting fancy! Let's try it!

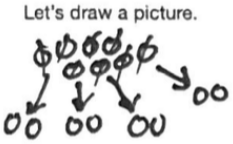
Let's Review (Slide 3): We always want to start with what we already know and build from there. So, let's start by asking, "What is the meaning of division?" What do you know about division? *Get a quick survey of students ideas without writing anything down. This question is simply to get a sense of what students remember.* Possible Student Answers, Key Points:

- Division is repeated subtraction.
- Division is the opposite of multiplication.
- Division means splitting into equal amounts.
- Division means cutting something up.
- Division means fair sharing.

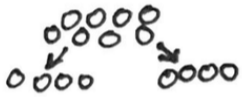
This says, "Solve *8 ÷ 2*." Let's draw a picture. I have 8 things altogether. That first number 8 is the total amount. It is the amount we are going to divide. It is called the dividend. Everyone say, "Dividend!" *The students should say, "Dividend!"*



I can always think of division two ways. I can think of it as making groups of 2. Then I would take 2 and take 2 and take 2 and take 2. Look, I made 4 groups!

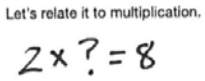


But let me draw another 8 circles. I can ALSO think of this as making two groups. Here and here. There are 4 in each group. This is called "fair sharing." We are going to focus on this meaning today. We can imagine two people coming up to a pile of 8 cookies and saying, "How can we split these fairly?"

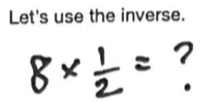


Who can help me come up with another story for fair sharing of 8 divided by 2. *Collect a few suggestions. Be sure to tell students if their story isn't quite right with a simple, "That's not exactly right." Highlight one example. You don't have to write it down.* Possible Student Answers, Key Points:

- I have 8 pieces of pizza. I want to split between 2 friends. How many pieces can we each have?
- There are 8 kids. They are going to be put onto two teams. How many kids are on each team?

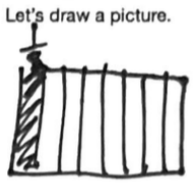


I want to quickly connect this to two other ideas you've learned because it is going to help us with our next lesson when instead of dividing fractions we divide BY fractions. First, division is the opposite of multiplication. So we can think of every division problem like a missing multiplication problem. If I am splitting 8 by 2 groups then I can also think, "Two groups of what makes eight?" I write it like this: 2 times question mark makes 8.

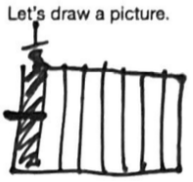


A few lessons ago, we also learned that multiplying by a fraction is like taking a fraction of something. It is the same as dividing. So I could also represent 8 divided by 2 as 8 times ½. We don't need to worry about writing all these numbers out now. But I want you to notice that to divide, we often multiply the opposite which is called the inverse since multiplication and division are opposites.

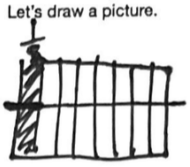
Let's Talk (Slide 4): So let's use all those ideas to divide a fraction. We will use the splitting idea to divide fractions just like we divide whole numbers. This says solve ⅛ divided by 2.



Let's draw a picture. First, I need to draw a whole split into eighths. I will shade one.

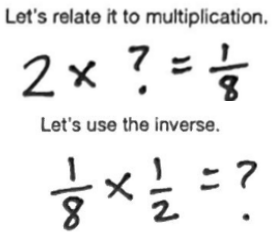


Now I want to split this into 2 groups. Imagine that I want a fair share for 2 people. I have to cut this piece! Each person would get one of these smaller pieces, right?



But in fractions we know that if we cut 1 piece, we have to cut all the pieces so they are the same size. So let me go ahead and cut the rest. Now I can write down the fraction that represents that smaller piece. Each person can get 1 out of 16.

Let's tell a story that would go with this problem. It's just fair sharing but we're sharing a fraction. So we could say, "There is ⅛ of a pan of brownies. Two friends decided to split the brownies evenly. How much do they each get?" And there's lots of different stories like that. *You don't have to write the story down.*



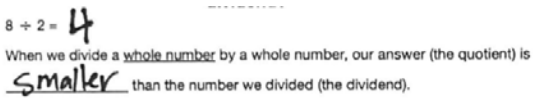
Let's relate this to multiplication. We know this is a missing multiplier. We ask 2 times what makes ⅛ I write it like this. You can see how we would have to multiply 2 times an itty bitty fraction if we just want a small answer like ⅛

And let's relate this to multiplying by the inverse also known as the opposite. Dividing by 2 is like multiplying by one half. Those two people are really splitting the brownies in half. They are talking 1 half of the 1 eighth.

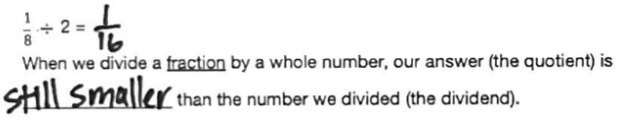
Let's Think (Slide 5): What do we notice about the size of the quotient compared to the size of the dividend? The quotient just means the answer to the division problem. The dividend just means the number we started with in the division problem. It is the number before the division symbol. It is the total amount that we start with before we start splitting or sharing.

In 8 divided by 2, 8 is the dividend. We know we get 4. 4 is the quotient. What do we notice about the size of the quotient? *Point to the answer, 4.* How does it compare to the size of the dividend? *Point to the dividend, 8. Don't let kids call out an answer. Give them time to think.* Possible Student Answers, Key Points:

- 4 is smaller than 8.
- The dividend is bigger than the quotient.
- The answer always gets smaller when we divide.



When we divide a whole number by a whole number, our answer, the quotient, is SMALLER than the number we divided, the dividend. That's because we're splitting it to share, right? And everyone who is sharing is going to get just a piece.



What about one eighth divided by 2? We just did the math on the last slide and got one sixteenth. When we divide a fraction by a whole number, our answer, the quotient, is still always SMALLER than the number we divided, the dividend. That's because we're still splitting it to share! And everyone who is sharing is going to get a piece of a piece.

Let's Try it (Slides 6): Hopefully you are seeing how dividing fractions is just using everything we've already learned. Let's practice a bit together and then you will try it on your own!

WARM WELCOME

Today we will divide a unit fraction by a whole number.

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Let's Review:

What is the meaning of division?

Solve. $8 \div 2 = ?$

Let's draw a picture.

Let's tell a story.

Let's relate it to multiplication.

Let's use the inverse.

Let's Talk:

We will use the splitting idea to divide fractions just like we divide whole numbers!

Solve. $\frac{1}{8} \div 2 = ?$

Let's draw a picture.

Let's tell a story.

Let's relate it to multiplication.

Let's use the inverse.

Let's Think:

What do we notice about the size of the quotient compared to the size of the dividend?

$8 \div 2 =$

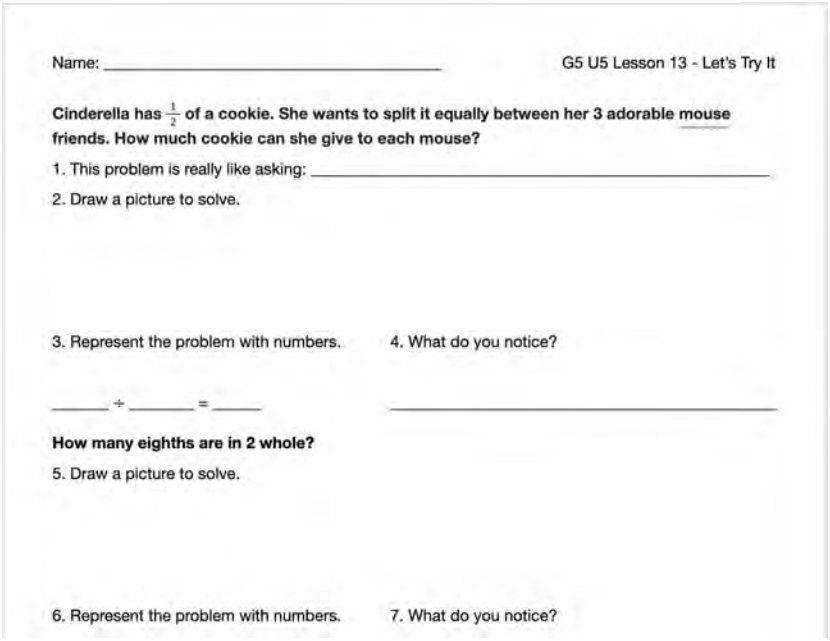
When we divide a <u>whole number</u> by a whole number, our answer (the quotient) is _____ than the number we divided (the dividend).

$\frac{1}{8} \div 2 =$

When we divide a <u>fraction</u> by a whole number, our answer (the quotient) is _____ than the number we divided (the dividend).

Let's Try It:

Let's practice together.



Name: _____ G5 U5 Lesson 13 - Let's Try It

Cinderella has $\frac{1}{2}$ of a cookie. She wants to split it equally between her 3 adorable mouse friends. How much cookie can she give to each mouse?

1. This problem is really like asking: _____

2. Draw a picture to solve.

3. Represent the problem with numbers.

_____ ÷ _____ = _____

4. What do you notice?

_____

How many eighths are in 2 whole?

5. Draw a picture to solve.

6. Represent the problem with numbers.

7. What do you notice?

On your Own:

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

Name: _____ G5 U4 Lesson 13 - Independent Work

Draw a diagram to justify your answer. Then represent it with a number.

1. Feso has a rope that is $\frac{1}{2}$ yard long. She wants to cut it into 3 equal pieces. What fractional amount of a yard can each piece be?	2. How many twos are in $\frac{1}{4}$?
3. Leo had $\frac{1}{6}$ of his cake leftover from his birthday party. He decided to split the cake	4. Solve. $\frac{1}{7} \div 5 = ?$

Cinderella has $\frac{1}{2}$ of a cookie. She wants to split it equally between her 3 adorable mouse friends. How much cookie can she give to each mouse?

1. This problem is really like asking: _____

2. Draw a picture to solve.

3. Represent the problem with numbers.

4. What do you notice?

_____ ÷ _____ = _____

_____

How many twos are in $\frac{1}{8}$?

5. Draw a picture to solve.

6. Represent the problem with numbers.

7. What do you notice?

_____ ÷ _____ = _____

_____

Solve. $3 \div \frac{1}{3} =$

8. Draw a picture to solve.

9. Represent the problem with numbers.

10. What do you notice?

_____ ÷ _____ = _____

_____

Name: _____ G5 U4 Lesson 13 - Independent Work

Draw a diagram to justify your answer. Then represent it with a number.

1. Feso has a rope that is $\frac{1}{2}$ yard long. She wants to cut it into 3 equal pieces. What fractional amount of a yard can each piece be?	2. How many twos are in $\frac{1}{4}$?
3. Leo had $\frac{1}{4}$ of his cake leftover from his birthday party. He decided to split the cake between his two brothers. How much cake with they each get?	4. Solve. $\frac{1}{3} \div 5 = ?$

Draw a diagram to justify your answer. Then represent it with a number.

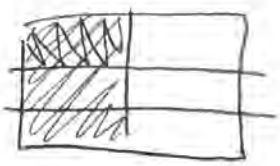
5. Sweeney's Candy Shop sells $\frac{1}{2}$ pound of candy in a box. Lisa split the box of candy between herself and two friends. How much candy does each friend get?	6. How many threes are in $\frac{1}{2}$?
7. Old MacDonald had a $\frac{1}{3}$ acre garden. He decided to plant an equal area of three different kinds of vegetables. What is the fractional number of acres he can plant with each different vegetable?	8. Solve. $\frac{1}{3} \div 6 = ?$

Name: ANSWER KEY

Cinderella has $\frac{1}{2}$ of a cookie. She wants to split it equally between her 3 adorable mouse friends. How much cookie can she give to each mouse?

1. This problem is really like asking: $\frac{1}{2}$ shared by 3

2. Draw a picture to solve.



3. Represent the problem with numbers.

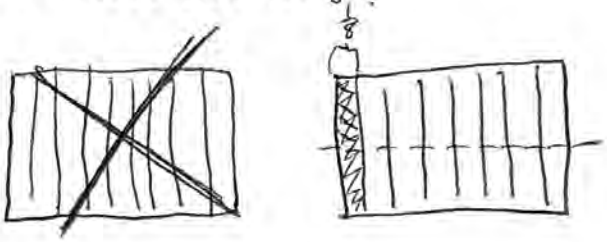
$\frac{1}{2} \div 3 = \frac{1}{6}$

4. What do you notice? Its like $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

My answer is smaller.

How many eighths are in 2 wholes? twos are in $\frac{1}{8}$?

5. Draw a picture to solve.



6. Represent the problem with numbers.

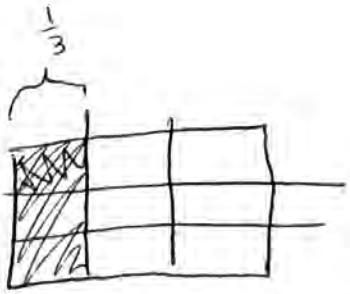
$\frac{1}{8} \div 2 = \frac{1}{16}$

7. What do you notice? Its like $\frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$

My answer is smaller.

Solve. $\frac{1}{3} \div 3 =$

8. Draw a picture to solve.



9. Represent the problem with numbers.

$\frac{1}{3} \div 3 = \frac{1}{9}$

10. What do you notice? Its like $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

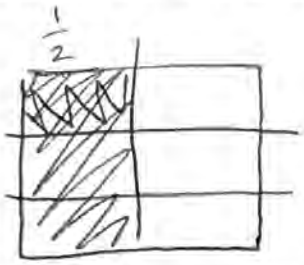
My answer is smaller.

Name: ANSWER KEY

G5 U4 Lesson 13 - Independent Work

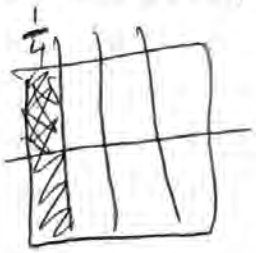
Draw a diagram to justify your answer. Then represent it with a number.

1. Feso has a rope that is $\frac{1}{2}$ yard long. She wants to cut it into 3 equal pieces. What fractional amount of a yard can each piece be?



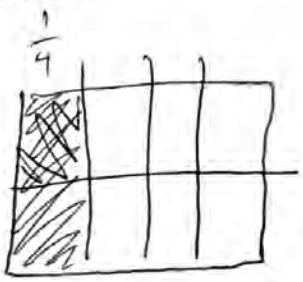
$\frac{1}{2} \div 3 = \boxed{\frac{1}{6} \text{ yard}}$

2. How many twos are in $\frac{1}{4}$?



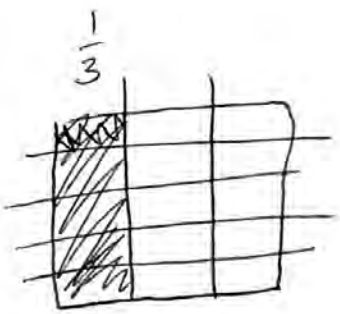
$\frac{1}{4} \div 2 = \boxed{\frac{1}{8}}$

3. Leo had $\frac{1}{4}$ of his cake leftover from his birthday party. He decided to split the cake between his two brothers. How much cake with they each get?



$\frac{1}{4} \div 2 = \boxed{\frac{1}{8} \text{ cake}}$

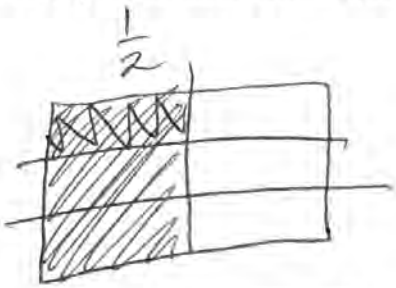
4. Solve. $\frac{1}{3} \div 5 = ?$



$\frac{1}{3} \div 5 = \boxed{\frac{1}{15}}$

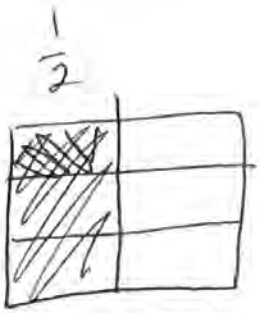
Draw a diagram to justify your answer. Then represent it with a number.

5. Sweeney's Candy Shop sells $\frac{1}{2}$ pound of candy in a box. Lisa split the box of candy between herself and two friends. How much candy does each friend get?



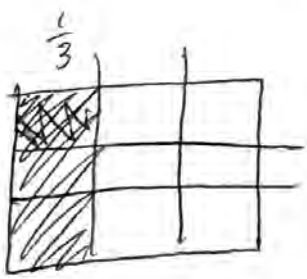
$\frac{1}{2} \div 3 = \boxed{\frac{1}{6} \text{ pound}}$

6. How many threes are in $\frac{1}{2}$?



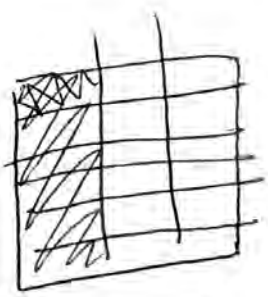
$\frac{1}{2} \div 3 = \boxed{\frac{1}{6}}$

7. Old MacDonald had a $\frac{1}{3}$ acre garden. He decided to plant an equal area of three different kinds of vegetables. What is the fractional number of acres he can plant with each different vegetable?



$\frac{1}{3} \div 3 = \boxed{\frac{1}{9} \text{ acre}}$

8. Solve. $\frac{1}{3} \div 6 = ?$



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

G5 U4 Lesson 14

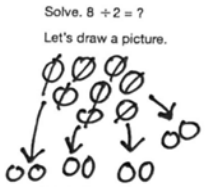
Divide a whole number by a unit fraction

G1 U4 Lesson 14 - Today we will divide a whole number by a unit fraction.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will divide a whole number by a unit fraction.

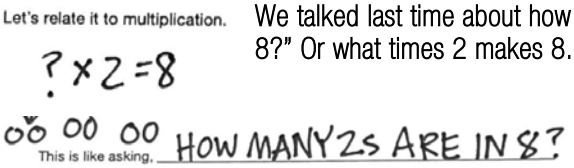
Let's Review (Slide 3): In our last lesson, we reviewed what we learned about division in earlier grades and we really focused on fair sharing. We can think of division as splitting 8 into 2 groups. But we can also think of it as splitting 8 into groups of 2.



Let's draw a picture. I am going to draw 8 circles. Now I will make a group of 2 and another group of 2 and another group of 2 and another group of 2. Let's count how many groups I made. 1 group, 2 groups, 3 groups, 4 groups! I made 4 groups.

Who can think of a story that would make sense with this picture? *Collect a few suggestions. Be sure to tell students if their story isn't quite right with a simple, "That's not exactly right." Do not accept stories where students switch to an 8 divided by 4 story. Do not accept answers where students switch the story to 8 divided by 2 groups. Choose one example to highlight; you don't have to write it down.* Possible Student Answers, Key Points:

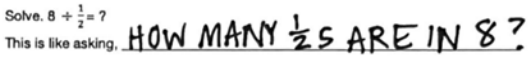
- I have 8 pieces of pizza. I want to give 2 pieces to each of my friends. How many friends can I give pizza to?
- There are 8 kids. Mrs. Brown wants to have 2 kids on each team. How many teams will she have?



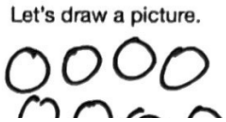
We talked last time about how to relate this to multiplication. We are really asking, "how many groups of 2 make 8?" Or what times 2 makes 8.

This is the key thing we need to keep in mind for the rest of the lesson though. This is like asking, "how many twos are in eight wholes?"

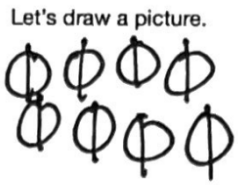
Let's Talk (Slide 4): We can use the question, "how many times is blank inside blank" to divide. This time we're not dividing a fraction. We're dividing BY a fraction.



This says, "solve 8 divided by 1 half." This is like we are making groups of 1 half can we make. Or "how many times is ½ inside 8?"

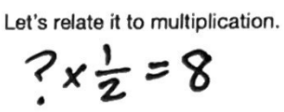


To figure that out, I am going to have to cut my 8 into halves. Am I going to get A LOT of pieces or a little bit of pieces? A lot! Let me draw 8 circles.



I want to know how many halves are in these 8. So I have to cut them in half. Watch me. Wow, I'm getting a lot! There are 2 in this circle and 2 in this circle and 2 in this circle and 2 in this circle and 2 in this circle and 2 in this circle and 2 in this circle and 2 in this circle. Let's count how many halves we made! 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16!

Let's tell a story. It could be something like this: I have 8 cookies. I want to give half a cookie to each of my friends. How many friends can I give cookies to? I can give a cookie to 16 friends! *You don't have to write this down.*



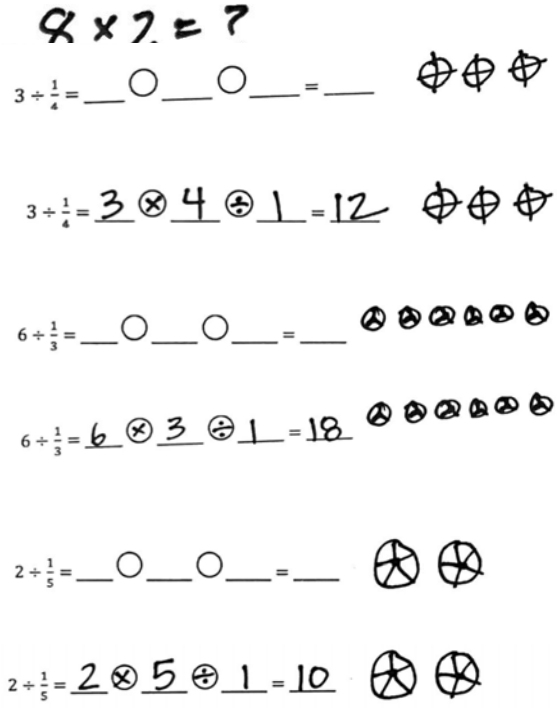
If we relate this to multiplication, remember we are saying, "how many times is 1 half in 8?" Then we can write question mark times ½ equals 8. This question mark would have to be super big to get ½ all the way up to 8, right?

But the inverse is where things get really important and interesting and this is where I really want you to think. We ended up getting 16. So really we ended up multiplying 8 x 2. We ended up multiplying by the denominator. You see, it turns out that dividing by a number that is already a cutting number, already a divisor means the opposite of dividing - multiplying. We end up with lots of pieces inside each piece - multiple pieces. Just like when we multiplied by a fraction, we divided by the denominator. When

we divide by a fraction, we end up multiplying by the denominator. This is called doing the multiplicative inverse. In other words, doing the opposite operation with the opposite fraction.

Let's use the inverse.

Let's Talk (Slide 5): Let's talk about this opposite operation thing a little more. We can represent the pattern we see with the multiplicative inverse.



I will do a quick sketch so we can remember what is happening. I have 3 so I will draw 3 circles. And I want to know how many fourths are inside so I have to turn them into fourths. So many fourths are inside! Groups of fourths.

In fact, there are 3 groups of 4 fourths. That's 3 times the denominator of 4. And in this case, we would divide by the numerator. But that's just 1 so nothing really happens there. My answer is 12.

Let's look at the next one. 6 circles are needed here and I'm wondering how many thirds are in 6. Let me cut these into thirds. So many thirds!

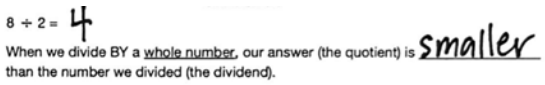
In fact, there are 6 groups of 3 thirds. That's 6 times the denominator of 3. And in this case, we would divide by the numerator. But that's just 1 so nothing really happens there. My answer is 18.

Let's look at the next one. 2 circles are needed here and I'm wondering how many fifths are in 2. Let me cut these into fifths. So many fifths!

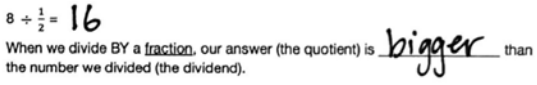
In fact, there are 2 groups of 5 fifths. That's 2 times the denominator of 5. And in this case, we would divide by the numerator. But that's just 1 so nothing really happens there. My answer is 10.

Let's Think (Slide 6): There's one other thing that is super important to think about. We answer this question in our last lesson. That is, "What do we notice about the size of the quotient compared to the size of the dividend?" Remember our quotient is the answer to a division problem. And our dividend is the number we are dividing; it is the number before the division symbol. Is it the total amount that we start with before we divide.

We have 8 divided by 2 and we know the answer is 4. That's smaller. So when we divided by a whole number, our answer, the quotient, is SMALLER than the number we divided, the dividend. That makes sense because we are splitting something. That's what we're used to. Usually when you split something, it gets smaller.



But look out for this. We did 8 divided by half on a previous slide and we got 16! ALERT! ALERT! Our division answer got bigger! Wow! This is a surprise! When we divide by a fraction, the quotient is BIGGER than the number we divided, the dividend. We always have to wonder, "Why does this make sense?" It makes sense because we are dividing by pieces not whole amount. When you split something by something that has already been split, you get lots and lots of splits! You get a big amount. Your answer is more.



Let's Try it (Slides 7): You will see a bigger answer in every problem we do today because we are always going to divide by a fraction. Let's practice together!

WARM WELCOME

Today we will divide a whole number by a unit fraction.

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Let's Review:

We can think of division as splitting 8 into 2 groups. But we can also think of it as splitting 8 into groups of 2.

Solve. $8 \div 2 = ?$

Let's draw a picture. Let's tell a story. Let's relate it to multiplication.

This is like asking, _____.

Let's Talk:

We can use the question, "how many times is __ inside __" to divide.

Solve. $8 \div \frac{1}{2} = ?$

This is like asking, _____.

Let's draw a picture. Let's tell a story. Let's relate it to multiplication.

Let's use the inverse.

Let's Talk:

We can represent the pattern we see with the multiplicative inverse.

$3 \div \frac{1}{4} =$ ____ ◯ ____ ◯ ____ = ____

$6 \div \frac{1}{3} =$ ____ ◯ ____ ◯ ____ = ____

$2 \div \frac{1}{5} =$ ____ ◯ ____ ◯ ____ = ____

Let's Think:

What do we notice about the size of the quotient compared to the size of the dividend?

$8 \div 2 =$

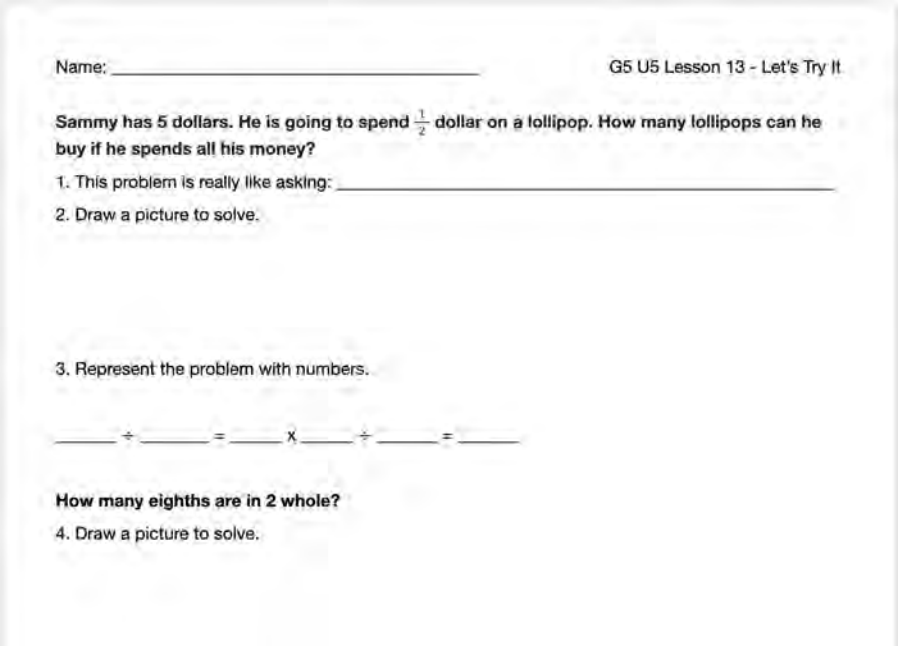
When we divide BY a <u>whole number</u>, our answer (the quotient) is _____ than the number we divided (the dividend).

$8 \div \frac{1}{2} =$

When we divide BY a <u>fraction</u>, our answer (the quotient) is _____ than the number we divided (the dividend).

Let's Try It:

Let's practice together.



Name: _____ G5 U5 Lesson 13 - Let's Try It

Sammy has 5 dollars. He is going to spend $\frac{1}{2}$ dollar on a lollipop. How many lollipops can he buy if he spends all his money?

1. This problem is really like asking: _____

2. Draw a picture to solve.

3. Represent the problem with numbers.

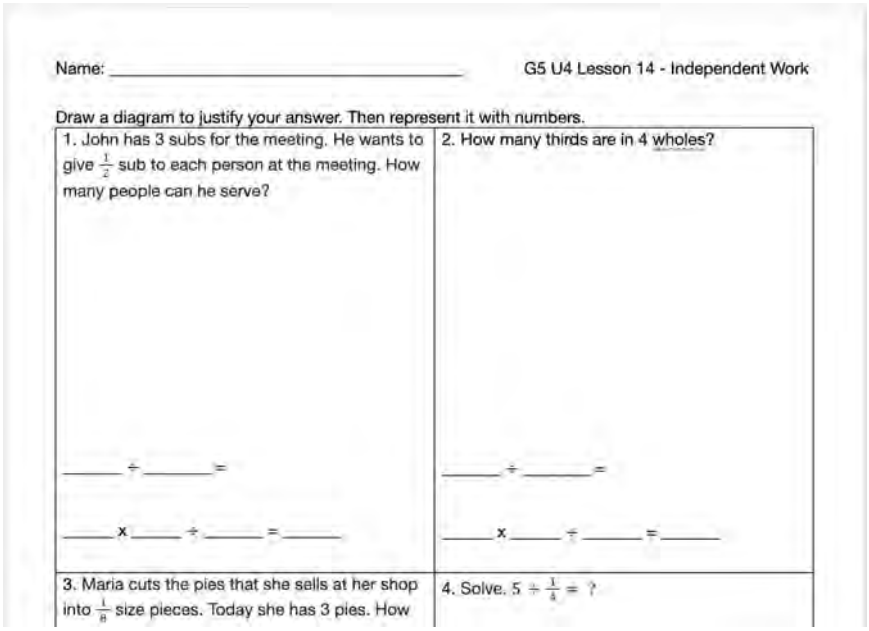
_____ ÷ _____ = _____ x _____ ÷ _____ = _____

How many eighths are in 2 whole?

4. Draw a picture to solve.

On your Own:

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



Name: _____ G5 U4 Lesson 14 - Independent Work

Draw a diagram to justify your answer. Then represent it with numbers.

1. John has 3 subs for the meeting. He wants to give $\frac{1}{2}$ sub to each person at the meeting. How many people can he serve? _____ ÷ _____ = _____ x _____ ÷ _____ = _____	2. How many thirds are in 4 wholes? _____ ÷ _____ = _____ x _____ ÷ _____ = _____
3. Maria cuts the pies that she sells at her shop into $\frac{1}{8}$ size pieces. Today she has 3 pies. How	4. Solve. $5 \div \frac{1}{4} = ?$

Sammy has 5 dollars. He is going to spend $\frac{1}{2}$ dollar on a lollipop. How many lollipops can he buy if he spends all his money?

1. This problem is really like asking: _____

2. Draw a picture to solve.

3. Represent the problem with numbers.

_____ ÷ _____ = _____ x _____ ÷ _____ = _____

How many eighths are in 2 wholes?

4. Draw a picture to solve.

5. Represent the problem with numbers.

_____ ÷ _____ = _____ x _____ ÷ _____ = _____

Solve. $3 \div \frac{1}{3} =$

6. Draw a picture to solve.

7. Represent the problem with numbers.

_____ ÷ _____ = _____ x _____ ÷ _____ = _____

Name: _____ G5 U4 Lesson 14 - Independent Work

Draw a diagram to justify your answer. Then represent it with numbers.

1. John has 3 subs for the meeting. He wants to give $\frac{1}{2}$ sub to each person at the meeting. How many people can he serve? _____ ÷ _____ = _____ x _____ ÷ _____ = _____	2. How many thirds are in 4 wholes? _____ ÷ _____ = _____ x _____ ÷ _____ = _____
3. Maria cuts the pies that she sells at her shop into $\frac{1}{8}$ size pieces. Today she has 3 pies. How many pieces of pie does she have to sell? _____ ÷ _____ = _____ x _____ ÷ _____ = _____	4. Solve. $5 \div \frac{1}{4} = ?$ _____ ÷ _____ = _____ x _____ ÷ _____ = _____

Draw a diagram to justify your answer. Then represent it with a number.

5. Pedro is going to cut a 6 foot rope into $\frac{1}{5}$ foot pieces. How many pieces can he make?

_____ ÷ _____ =

_____ x _____ ÷ _____ = _____

6. How many eighths are in 2 wholes?

_____ ÷ _____ =

_____ x _____ ÷ _____ = _____

7. Travis has 3 Liters of soda. He wants to pour it into $\frac{1}{4}$ Liter bottles. How many bottles can he fill?

_____ ÷ _____ =

_____ x _____ ÷ _____ = _____

8. Solve. $6 \div \frac{1}{3} = ?$

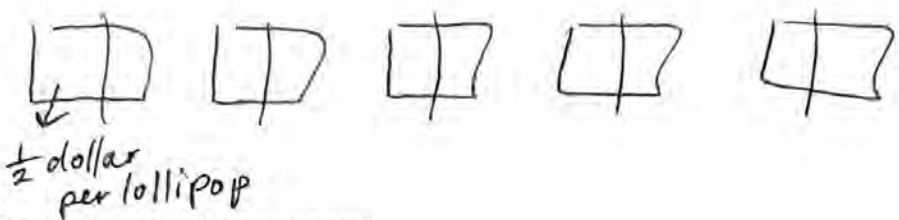
_____ ÷ _____ =

_____ x _____ ÷ _____ = _____

Sammy has 5 dollars. He is going to spend $\frac{1}{2}$ dollar on a lollipop. How many lollipops can he buy if he spends all his money?

1. This problem is really like asking: How many halves are in 5?

2. Draw a picture to solve.

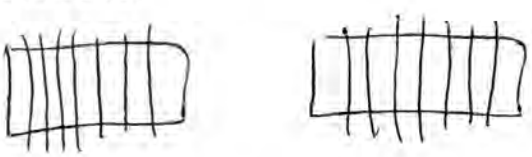


3. Represent the problem with numbers.

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

How many eighths are in 2 wholes?

4. Draw a picture to solve.

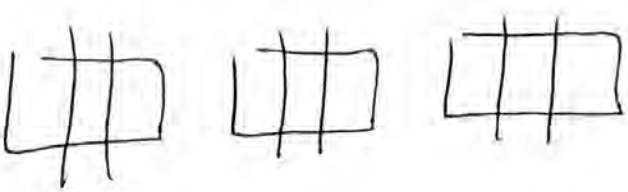


5. Represent the problem with numbers.

$2 \div \frac{1}{8} = 2 \times 8 \div 1 = 16$

Solve. $3 \div \frac{1}{3} =$

6. Draw a picture to solve.



7. Represent the problem with numbers.

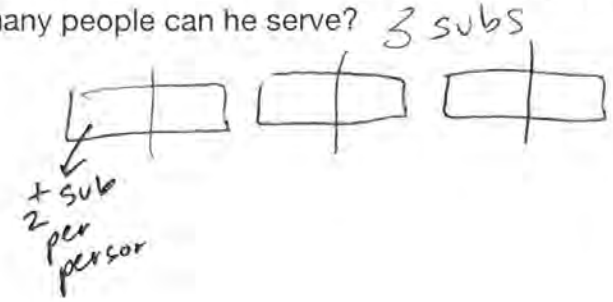
$3 \div \frac{1}{3} = 3 \times 3 \div 1 = 9$

Name: ANSWER KEY

G5 U4 Lesson 14 - Independent Work

Draw a diagram to justify your answer. Then represent it with numbers.

1. John has 3 subs for the meeting. He wants to give $\frac{1}{2}$ sub to each person at the meeting. How many people can he serve?



3 ÷ 1/2 = 6

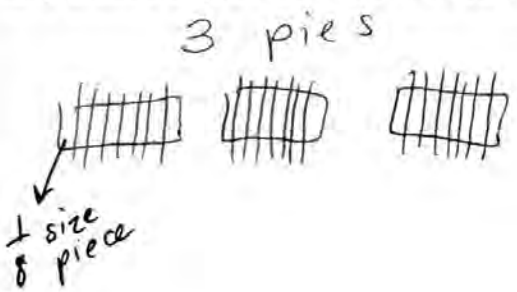
3 x 2 ÷ 1 = 6

2. How many thirds are in 4 wholes?

4 ÷ 1/3 = 12

4 x 3 ÷ 1 = 12

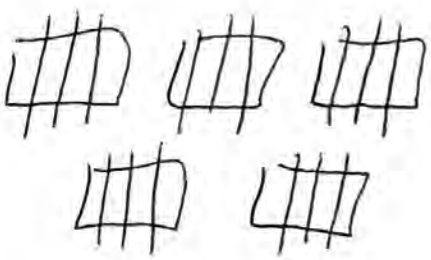
3. Maria cuts the pies that she sells at her shop into $\frac{1}{8}$ size pieces. Today she has 3 pies. How many pieces of pie does she have to sell?



3 ÷ 1/8 = 24

3 x 8 ÷ 1 = 24

4. Solve. $5 \div \frac{1}{4} = ?$

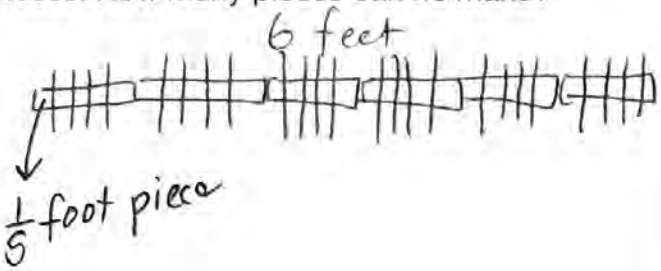


5 ÷ 1/4 = 20

5 x 4 ÷ 1 = 20

Draw a diagram to justify your answer. Then represent it with a number.

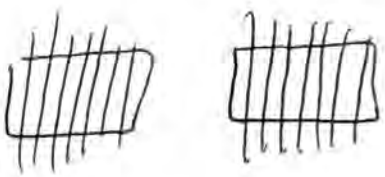
5. Pedro is going to cut a 6 foot rope into $\frac{1}{5}$ foot pieces. How many pieces can he make?



6 ÷ 1/5 = 30

6 x 5 ÷ 1 = 30

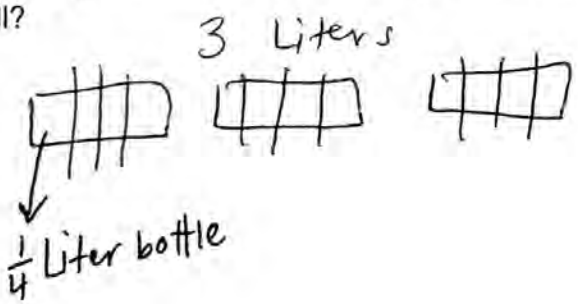
6. How many eighths are in 2 wholes?



2 ÷ 1/8 = 16

2 x 8 ÷ 1 = 16

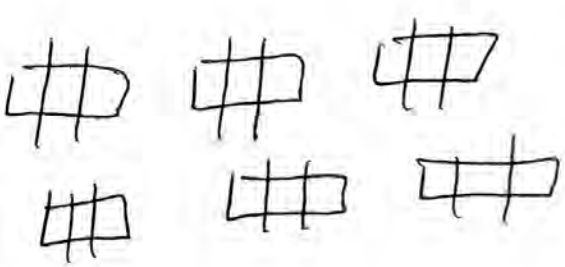
7. Travis has 3 Liters of soda. He wants to pour it into $\frac{1}{4}$ Liter bottles. How many bottles can he fill?



3 ÷ 1/4 = 12

3 x 4 ÷ 1 = 12

8. Solve. $6 \div \frac{1}{3} = ?$



6 ÷ 1/3 = 18

6 x 3 ÷ 1 = 18

G5 U4 Lesson 15

Solve problems involving fraction division

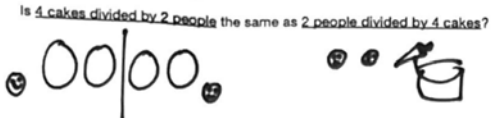
CITYTUTOR

G1 U4 Lesson 15 - Today we will solve problems involving fraction division.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will solve problems involving fraction division. We're not really learning anything new today. This is just putting together what we learned from the last two lessons.

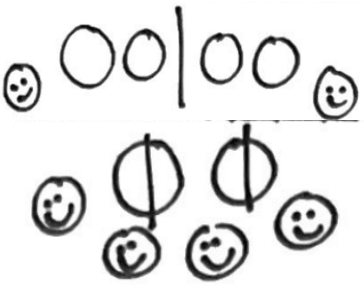
Let's Review (Slide 3): When we are doing fractions divided by whole numbers AND whole numbers divided by fractions, it is helpful to review one basic idea that you probably started learning in 3rd grade: Division is NOT commutative. That means you cannot switch the order and get the same answer. You can switch the order is addition like 1 cat plus 2 dogs is the same as 2 dogs plus 1 cat. But you can't do that in division.



Let's explore. This says, Is 4 cakes divided by 2 people the same as 2 people divided by 4 cakes? I hope you think this is a little silly. Why is it so silly?

Possible Student Answers, Key Points:
- Cakes can't divide people.
- You can't share people between cakes.

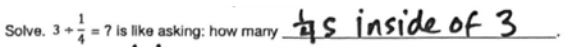
Write a big NO. Draw a very silly little picture of a cake with a serving knife. These are not the same! How silly! Cakes can be divided by people but people can't be divided by cakes. So we can pay close attention to the words and make sure we know what is being divided by what.



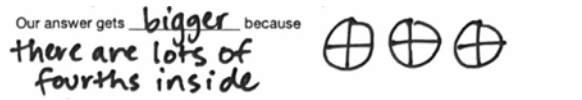
Now, is 4 cakes divided by 2 people the same as 2 cakes divided by 4 people? Here we have cakes shared by people and we just switch the order of the number. Let's imagine this with a picture. I have 4 cakes and I have two people. That would be nice! They can each get 2 cakes!

Let's imagine 2 cakes and 4 people though. Uh-oh! Look what has to happen. There isn't enough for everyone to have their own cake, is there? We'd have to cut these cakes and each person would just get a fraction. So we can't just put the words in any order we want and we can't just put the numbers in any order we want. We have to do in the order that actually matches the story being told in the problem. This is the big idea so I'm going to say it again, "we have to put the numbers in the order that matches the story being told in the problem." And just so you know, sometimes the problem might tell the story out of order so I really have to think.

Let's Talk (Slide 4): Now let's see how two problems in a different order will get different answer by thinking of them as "how many times" problems. In our class, we learned to turn each division problem into a missing multiplier question.

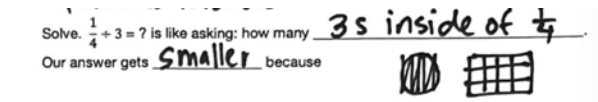


This says, "Solve three divided by one fourth." That is like asking: how many times is one fourth inside 3?



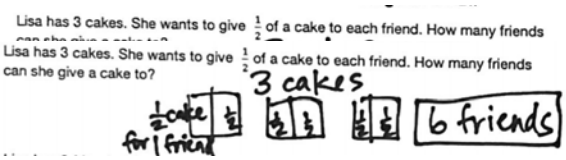
Our answer gets BIGGER because a little fraction is in our whole number lots of times. I can draw it.

But this says, "Solve one fourth divided by three." That is like asking: how many times is three inside one fourth? Three is big compare to one fourth! It isn't in there any times at all. It's too big. That's why our answer gets SMALLER because our whole number is barely in there at all. I have to split these fourths even smaller and I see I get a small answer. That will help us as we go. If I divide by a fraction, I should get the opposite of what we'd expect - a BIGGER answer. If I divide by a whole number, I should get what I usually get with division - a SMALLER answer.



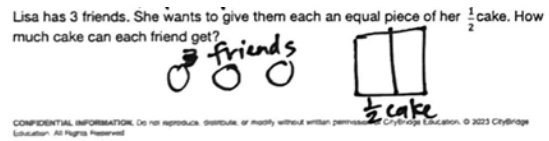
Let's Think (Slide 5): There's one final thing that can help us today. We have to use a tape diagram WITH WORDS to understand what is happening before we do the math. We have to have words because we want to think about what is getting split by what or what we are looking for inside what.

Let's try. Put your eyes on the words and read in your head while I read. *Read the first problem.* I will start by drawing 3 cakes. Let me write "3 cakes."

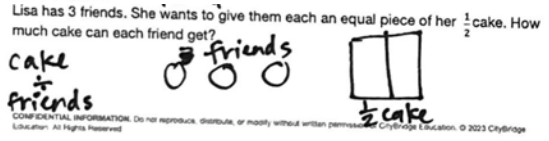


Now, Lisa wants to give half of a cake to each friend. Let me turn these into half. I will label the first one. ½ cake for 1 friend. The next one is ½ cake for 1 friend. And it would keep going. There are 6 halves for 6 friends. I am really asking, how many halves are in 3 so that is 3 divided by half, which is the same as 3 times 2 divided by 1. My answer is 6 friends.

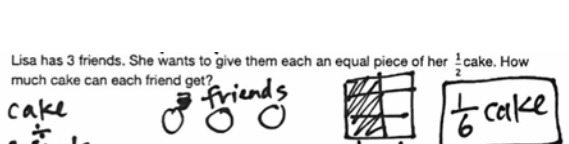
Let's do the next one. Put your eyes on the words and read in your head while I read. *Read the second problem.* Lisa has 3 friends. I will draw 3 circles and label it 3 friends. Now, the minute I write 3 friends, I already have a thought. I am not going to cut up the friends. They are people. If I cut them up, they will die! Let's draw the next piece. She wants to give them each an equal piece of her half cake. I am going to draw the half cake.



I start to see. I am sharing the cake with the friends. Let's write that down. Cake divided by friends. That's 1 half divided by 3.



Before I get an answer, let me draw it. I have to cut this half up for my friends. And to see what fraction that really is I'll cut the other side. These pieces are small. And they are still pieces. They are fractions. My answer is 1 sixth. 1 half divided by 3 is 1 sixth.



Let's Try it (Slides 6): Let's create a comparison chart together and then you will be able to try some of these problems on your own.

WARM WELCOME

Today we will solve problems involving fraction division.

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Let's Review:

Division is NOT commutative. You cannot switch the order and get the same answer.

Is 4 cakes divided by 2 people the same as 2 people divided by 4 cakes?

Is 4 cakes divided by 2 people the same as 2 cakes divided by 4 people?

Let's Talk:

In our class, we learned to turn each division problem into a missing multiplier question.

Solve. $3 \div \frac{1}{4} = ?$ is like asking: how many _____.

Our answer gets _____ because

Solve. $\frac{1}{4} \div 3 = ?$ is like asking: how many _____.

Our answer gets _____ because

Let's Think:

We have to use a tape diagram WITH WORDS to understand what is happening before we start doing the math.

Lisa has 3 cakes. She wants to give $\frac{1}{2}$ of a cake to each friend. How many friends can she give a cake to?

Lisa has 3 friends. She wants to give them each an equal piece of her $\frac{1}{2}$ cake. How much cake can each friend get?

Let's Review:

Division is NOT commutative. You cannot switch the order and get the same answer.

Is 4 cakes divided by 2 people the same as 2 people divided by 4 cakes?

Is 4 cakes divided by 2 people the same as 2 cakes divided by 4 people?

Let's Talk:

In our class, we learned to turn each division problem into a missing multiplier question.

Solve. $3 \div \frac{1}{4}$ = ? is like asking: how many _____.

Our answer gets _____ because

Solve. $\frac{1}{4} \div 3$ = ? is like asking: how many _____.

Our answer gets _____ because

Let's Think:

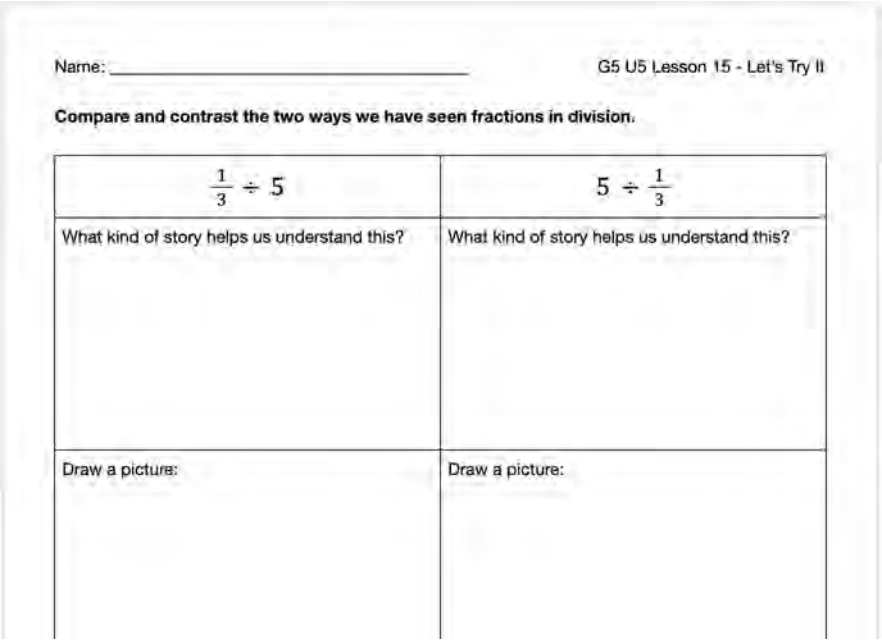
We have to use a tape diagram WITH WORDS to understand what is happening before we start doing the math.

Lisa has 3 cakes. She wants to give $\frac{1}{2}$ of a cake to each friend. How many friends can she give a cake to?

Lisa has 3 friends. She wants to give them each an equal piece of her $\frac{1}{2}$ cake. How much cake can each friend get?

Let's Try It:

Let's practice together.



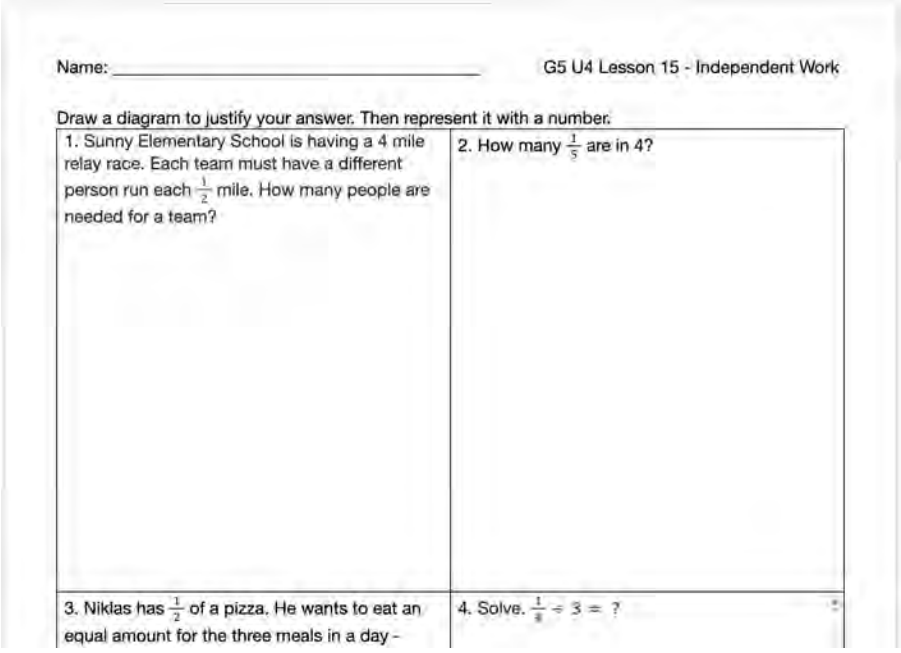
Name: _____ G5 U5 Lesson 15 - Let's Try It

Compare and contrast the two ways we have seen fractions in division.

$\frac{1}{3} \div 5$	$5 \div \frac{1}{3}$
What kind of story helps us understand this?	What kind of story helps us understand this?
Draw a picture:	Draw a picture:

On your Own:

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



Name: _____ G5 U4 Lesson 15 - Independent Work

Draw a diagram to justify your answer. Then represent it with a number.

1. Sunny Elementary School is having a 4 mile relay race. Each team must have a different person run each $\frac{1}{2}$ mile. How many people are needed for a team?	2. How many $\frac{1}{5}$ are in 4?
3. Niklas has $\frac{1}{2}$ of a pizza. He wants to eat an equal amount for the three meals in a day -	4. Solve. $\frac{1}{4} \div 3 = ?$

Name: _____ G5 U4 Lesson 15 - Let's Try It

Compare and contrast the two ways we have seen fractions in division.

$\frac{1}{3} \div 5$	$5 \div \frac{1}{3}$
What kind of story helps us understand this?	What kind of story helps us understand this?
Draw a picture:	Draw a picture:
Represent with numbers:	Represent with numbers:
How does the size of the quotient compare to the size of the dividend?	How does the size of the quotient compare to the size of the dividend?

Name: _____ G5 U4 Lesson 15 - Independent Work

Draw a diagram to justify your answer. Then represent it with a number.

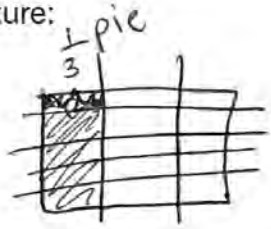
1. Sunny Elementary School is having a 4 mile relay race. Each team must have a different person run each $\frac{1}{2}$ mile. How many people are needed for a team?	2. How many $\frac{1}{5}$ are in 4?
3. Niklas has $\frac{1}{2}$ of a pizza. He wants to eat an equal amount for the three meals in a day - breakfast, lunch and dinner. How much pizza can he eat for each meal?	4. Solve. $\frac{1}{4} \div 3 = ?$

Draw a diagram to justify your answer. Then represent it with a number.

5. Jesse made a batch of 6 cupcakes. The batch used $\frac{1}{2}$ cup of sugar. How much sugar was in each batch?	6. How many threes are in $\frac{1}{4}$?
7. Wendell has 2 pounds of seed that he wants to spread across the rows in his garden. If he spreads $\frac{1}{4}$ pound across each row, how many rows can he plant?	8. Solve. $5 \div \frac{1}{2} = ?$

Name: ANSWER KEY

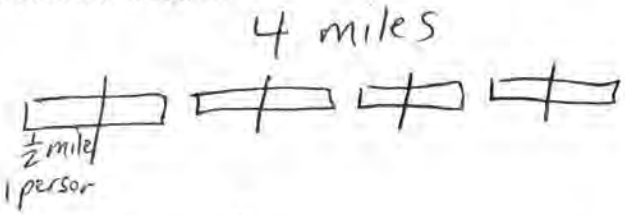
Compare and contrast the two ways we have seen fractions in division.

$\frac{1}{3} \div 5$	$5 \div \frac{1}{3}$
What kind of story helps us understand this? I have $\frac{1}{3}$ pie shared by 5 people. How much pie can each person get?	What kind of story helps us understand this? I have 5 pies. I cut each one into thirds. How many $\frac{1}{3}$ pieces do I have?
Draw a picture:  $\frac{1}{15}$	Draw a picture:  15
Represent with numbers: $\frac{1}{3} \div 5 = \frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$	Represent with numbers: $5 \div \frac{1}{3} = 5 \times 3 \div 1 = 15$
How does the size of the quotient compare to the size of the dividend? The quotient is SMALLER	How does the size of the quotient compare to the size of the dividend? The quotient is BIGGER

Name: ANSWER KEY

Draw a diagram to justify your answer. Then represent it with a number.

1. Sunny Elementary School is having a 4 mile relay race. Each team must have a different person run each $\frac{1}{2}$ mile. How many people are needed for a team?



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

$4 \times 2 \div 1 = 8$

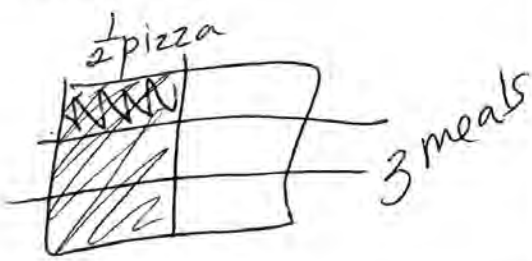
8 people

2. How many $\frac{1}{5}$ are in 4?

$4 \div \frac{1}{5} = 20$

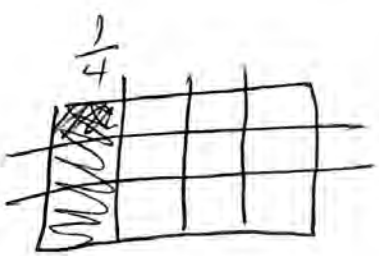
$4 \times 5 \div 1 = \boxed{20}$

3. Niklas has $\frac{1}{2}$ of a pizza. He wants to eat an equal amount for the three meals in a day - breakfast, lunch and dinner. How much pizza can he eat for each meal?



$\frac{1}{6}$ pizza per meal

4. Solve. $\frac{1}{4} \div 3 = ?$

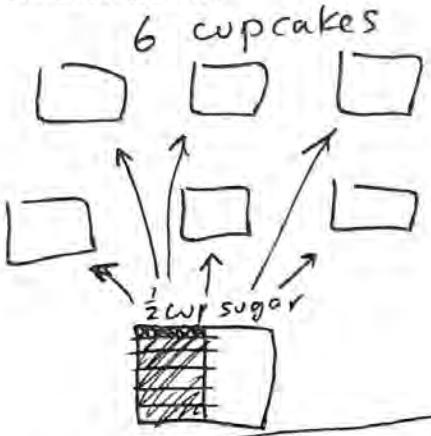


$\frac{1}{4} \div 3 = \frac{1}{12}$

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

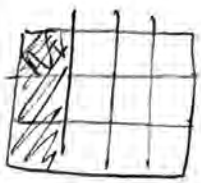
Draw a diagram to justify your answer. Then represent it with a number.

5. Jesse made a batch of 6 cupcakes. The batch used $\frac{1}{2}$ cup of sugar. How much sugar was in each batch?



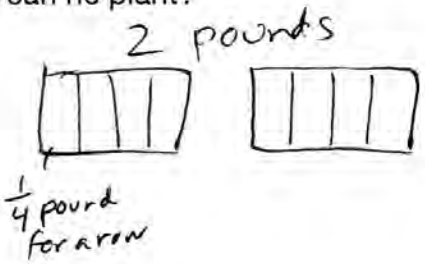
$\frac{1}{2} \div 6 = \boxed{\frac{1}{12} \text{ cup of sugar}}$

6. How many threes are in $\frac{1}{4}$?



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

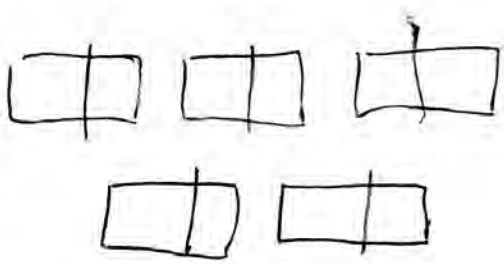
7. Wendell has 2 pounds of seed that he wants to spread across the rows in his garden. If he spreads $\frac{1}{4}$ pound across each row, how many rows can he plant?



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

$2 \times 4 \div 1 = \boxed{8 \text{ rows}}$

8. Solve. $5 \div \frac{1}{2} = ?$



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

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

G5 U4 Lesson 16

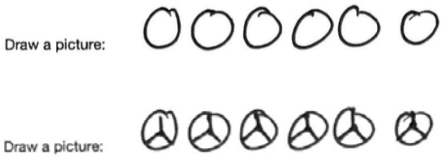
Divide by 1 tenth and 1 hundredth as a fraction and decimal

G1 U4 Lesson 16 - Today we will divide by 1 tenth and 1 hundredth as a fraction and decimal.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will divide by 1 tenth and 1 hundredth as a fraction and decimal. We are going to use what we learned about dividing by fractions, of course! Let's go!

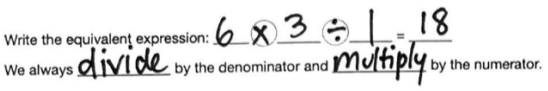
Let's Review (Slide 3): We learned to divide by a fraction using the multiplicative inverse, which means the opposite operation times the opposite thing. Let's review what I mean with this problem. It says, "Solve 6 divided by one third." First, let's draw a picture.



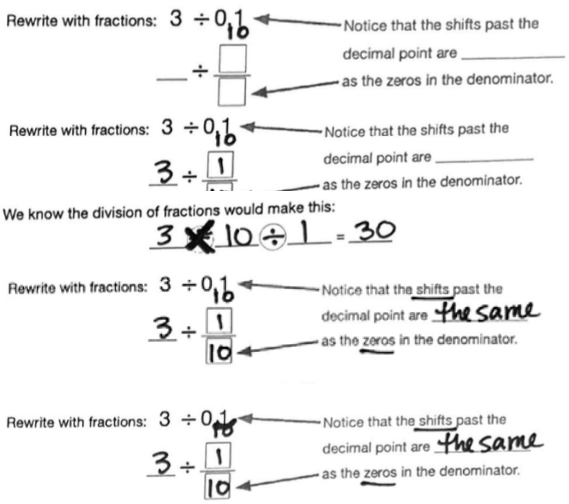
I am going to draw 6 separate wholes.

I want to know how many thirds there are so I'll cut this one into 3 thirds and then this is 3 and this is 3 and this is 3 and this is 3 and this is 3. Altogether, I have have 6 groups of 3 thirds, which is 18.

We really used multiplication there, right? We had repeated addition of the 3 in each whole. We had that "groups of" language you learned way back in 3rd grade. It was 6 times 3. That's where the multiplicative inverse comes in. Instead of dividing by the denominator, we multiplied it like a regular number. And then we would divide by 1, which is the numerator but that doesn't really change anything here. When we divide by a fraction, we always DIVIDE by the denominator and MULTIPLY by the numerator.



Let's Talk (Slide 4): How can we use that idea to divide by decimals. The first thing to remember is that decimals are really just secret fractions. That is sooooo important. If you forget that then none of the rest makes sense.



I'm going to put a little one under the decimal and a zero so we can see that secret hidden denominator.

So, this 3 divided by zero point one is really 3 divided by one tenth.

We know the division of fractions would make this 3 times 10 divided by 1 because we use the multiplication inverse that we just used on the last slide.

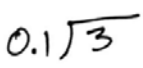
But here's the big thing we have to see. *Read this from the slide now.* Notice that the shifts past the decimal point are THE SAME as the zeros in the denominator.

Here's one shift. Here's one zero.

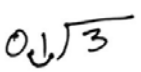
And this is the most important thing I'm going to say today: Since we use zeros to multiply, we can use this shift after the decimal point to multiply too. Then my problem becomes way easier.

Let's Think (Slide 5): What does this look like when we show our work? *Read from the slide.* We said: In the case of tenths and hundredths, multiplying by the denominator is the same as shifting the decimal.

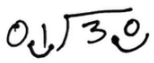
Remember this is because we already noticed that the shifts past the decimal point are THE SAME as the zeros in the denominator.



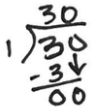
Let me show you how I will show my work for this. I will set this problem up like long division since we're going to need that in our next lesson.



There is a secret denominator here that I want to multiply by. It is shown by one shift under the decimal point.

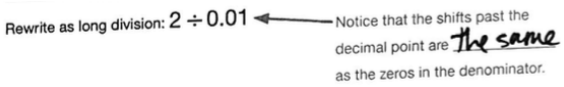


I will multiply that times my number, which means just one shift under the decimal point. Remember how on the last slide we did 3 x 10 and got 30? That's really what's happening here expect with shifts of the decimal instead of fractions.

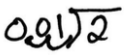


Let me rewrite this division now. It is 30 divided by 1. That's 30. It's the same as what I got on the last slide.

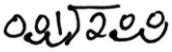
Let's Think (Slide 6): We will do the same thing for hundredths. Once again, we said, "In the case of tenths and hundredths, multiplying by the denominator is the same as shifting the decimal point."



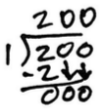
Once again, we can notice that the shifts past the decimal point are THE SAME as the zeros in the denominator.



I am going to write this problem in a division box.



Now I can see the shift after the decimal means this secretly has a denominator of 100. I am going to shift the decimal of 2 the same way. That's the same as if I was multiplying by 100 in the denominator.



Let me rewrite my new problem. I have 200 divided by 1. That's 200.

Let's Try it (Slides 7): It's time to do some of these together. I will walk you through it step by step.

WARM WELCOME

Today we will divide by 1 tenth and 1 hundredth as a fraction and decimal.

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Let's Review:

We learned to divide by a fraction using the multiplicative inverse (the opposite operation).

Solve. $6 \div \frac{1}{3}$

Draw a picture:

Write the equivalent expression: _____ ◯ _____ ◯ _____ = _____

We always _____ by the denominator and _____ by the numerator.

Let's Talk:

How can we use that idea to divide by decimals?

Rewrite with fractions: $3 \div 0.1$

$$\_\_\_ \div \frac{\square}{\square}$$

Notice that the shifts past the decimal point are _____ as the zeros in the denominator.

We know the division of fractions would make this:

_____ ◯ _____ ◯ _____ = _____

In the case of tenths and hundredths, multiplying by the denominator is the same as shifting the dividend by the same number of shifts in our divisor.

Let's Think: What does this look like when we show our work?

We said: In the case of tenths and hundredths, multiplying by the denominator is the same as shifting the decimal point.

Rewrite as long division: $3 \div 0.1$

Notice that the shifts past the decimal point are _____ as the zeros in the denominator.

Let's Think: We will do the same thing for hundredths.

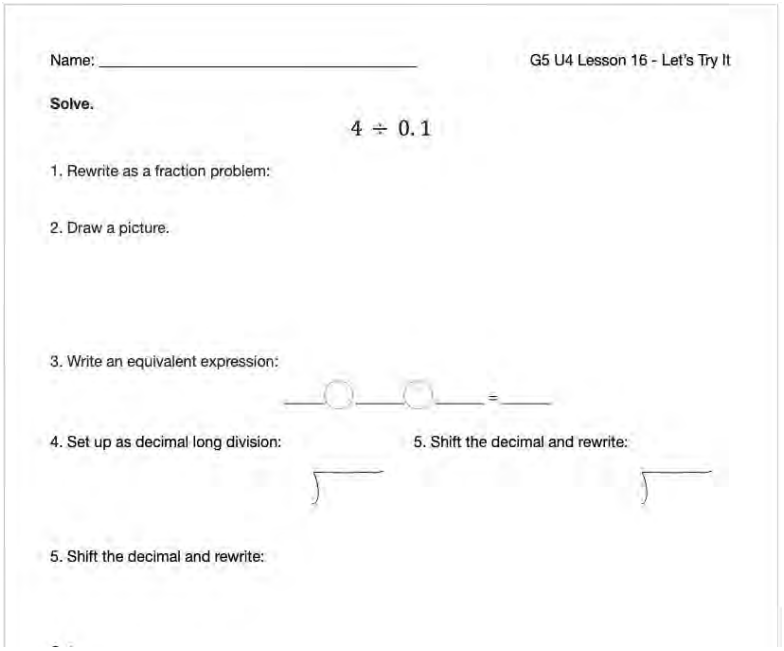
We said: In the case of tenths and hundredths, multiplying by the denominator is the same as shifting the decimal point.

Rewrite as long division: $2 \div 0.01$

Notice that the shifts past the decimal point are _____ as the zeros in the denominator.

Let's Try It:

Let's practice together.



Name: _____ G5 U4 Lesson 16 - Let's Try It

Solve.

$4 \div 0.1$

1. Rewrite as a fraction problem:

2. Draw a picture.

3. Write an equivalent expression:

_____ ◯ _____ ◯ _____ = _____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

5. Shift the decimal and rewrite:

On your Own:

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

Solve.

$4 \div 0.1$

1. Rewrite as a fraction problem:

2. Draw a picture.

3. Write an equivalent expression:

_____◯_____◯_____ = _____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

5. Shift the decimal and rewrite:

Solve.

$2 \div 0.01$

5. Rewrite as a fraction problem:

6. Write an equivalent expression:

_____◯_____◯_____ = _____

7. Set up as decimal long division:

8. Shift the decimal and rewrite:

Solve.

$3.45 \div 0.1$

9. Rewrite as a fraction problem:

10. Write an equivalent expression:

_____◯_____◯_____ = _____

11. Set up as decimal long division:

12. Shift the decimal and rewrite:

Name: _____ G5 U4 Lesson 16 - Independent Work

Remember: Shifting the decimal point of the dividend is like multiplying by the denominator of a fraction.

1. $7 \div 0.1$

Solve as a fraction:

Shift the decimal in long division and rewrite:

))

2. $3 \div 0.01$

Solve as a fraction:

Shift the decimal in long division and rewrite:

))

3. $4 \div 0.01$

Solve as a fraction:

Shift the decimal in long division and rewrite:

))

4. $5 \div 0.1$

Solve as a fraction:

Shift the decimal in long division and rewrite:

))

5. $16 \div 0.1$

Solve as a fraction:

Shift the decimal in long division and rewrite:

6. $30 \div 0.1$

Solve as a fraction:

Shift the decimal in long division and rewrite:

7. $4.1 \div 0.01$

Solve as a fraction:

Shift the decimal in long division and rewrite:

8. $3.25 \div 0.01$

Solve as a fraction:

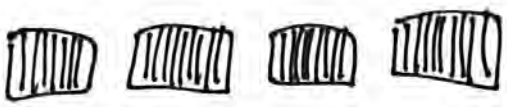
Shift the decimal in long division and rewrite:

Solve.

$$4 \div 0.1_{10}$$

1. Rewrite as a fraction problem: $4 \div \frac{1}{10}$

2. Draw a picture.



3. Write an equivalent expression:

$4 \times 10 \div 1 = 40$

4. Set up as decimal long division:

$0.1 \overline{)4.0}$

5. Shift the decimal and rewrite:

$$1 \overline{)40} \quad 40$$
$$-4$$
$$\overline{00}$$

5. Shift the decimal and rewrite:

Solve.

$$2 \div 0.01_{100}$$

5. Rewrite as a fraction problem: $2 \div \frac{1}{100}$

6. Write an equivalent expression:

$2 \times 100 \div 1 = 200$

7. Set up as decimal long division:

$0.01 \overline{)2.00}$

8. Shift the decimal and rewrite:

$$1 \overline{)200} \quad 200$$
$$-2$$
$$\overline{000}$$

Solve.

$$3.45 \div 0.1$$

9. Rewrite as a fraction problem: $3.45 \div \frac{1}{10}$

10. Write an equivalent expression:

$3.45 \times 10 \div 1 = 34.5$

11. Set up as decimal long division:

$0.1\overline{)3.45}$

12. Shift the decimal and rewrite:

$$\begin{array}{r} 34.5 \\ 1\overline{)34.5} \\ -3\downarrow \\ \hline 04\downarrow \\ -4 \\ \hline 05 \\ -5 \\ \hline 0 \end{array}$$

Name: ANSWER KEY

Remember: Shifting the decimal point of the dividend is like multiplying by the denominator of a fraction.

1. $7 \div 0.1$

Solve as a fraction:

$7 \div \frac{1}{10}$

$7 \times 10 \div 1 = 70$

Shift the decimal in long division and rewrite:

$0.1\overline{)7.0}$ $\quad 1\overline{)70}$

70

$-7\downarrow$

00

2. $3 \div 0.01$

Solve as a fraction:

$3 \div \frac{1}{100}$

$3 \times 100 \div 1 = 300$

Shift the decimal in long division and rewrite:

$0.01\overline{)3.00}$ $\quad 1\overline{)300}$

300

$-3\downarrow\downarrow$

000

3. $4 \div 0.01$

Solve as a fraction:

$4 \div \frac{1}{100}$

$4 \times 100 \div 1$

Shift the decimal in long division and rewrite:

$0.01\overline{)4.00}$ $\quad 1\overline{)400}$

400

$-4\downarrow\downarrow$

000

4. $5 \div 0.1$

Solve as a fraction:

$5 \div \frac{1}{10}$

$5 \times 10 \div 1 = 50$

Shift the decimal in long division and rewrite:

$0.1\overline{)5.0}$ $\quad 1\overline{)50}$

50

$-5\downarrow$

00

5. $16 \div 0.1$

Solve as a fraction:

$16 \div \frac{1}{10}$

$16 \times 10 \div 1 = 160$

Shift the decimal in long division and rewrite:

$0.1\overline{)160}$

$$\begin{array}{r} 160 \\ 1\overline{)160} \\ -1\downarrow \\ \hline 06 \\ -6\downarrow \\ \hline 00 \end{array}$$

6. $30 \div 0.1$

Solve as a fraction:

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

$30 \times 10 \div 1 = 300$

Shift the decimal in long division and rewrite:

$0.1\overline{)300}$

$$\begin{array}{r} 300 \\ 1\overline{)300} \\ -3\downarrow\downarrow \\ \hline 000 \end{array}$$

7. $4.1 \div 0.01$

Solve as a fraction:

$4.1 \div \frac{1}{100}$

$4.1 \times 100 \div 1 = 410$

Shift the decimal in long division and rewrite:

$0.01\overline{)4.10}$

$$\begin{array}{r} 410 \\ 1\overline{)410} \\ -4\downarrow \\ \hline 01 \\ -1\downarrow \\ \hline 00 \end{array}$$

8. $3.25 \div 0.01$

Solve as a fraction:

$3.25 \div \frac{1}{100}$

$3.25 \times 100 \div 1 = 325$

Shift the decimal in long division and rewrite:

$0.01\overline{)3.25}$

$$\begin{array}{r} 325 \\ 1\overline{)325} \\ -3\downarrow \\ \hline 02 \\ -2\downarrow \\ \hline 05 \\ -5 \\ \hline 0 \end{array}$$

G5 U4 Lesson 17

Divide decimals by decimals

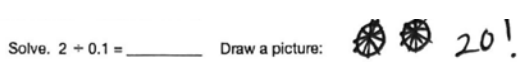
G1 U4 Lesson 17 - Today we will divide decimals by decimals.

Warm Welcome (Slide 1): Tutor choice

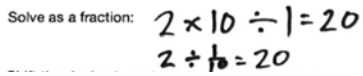
Frame the Learning/Connect to Prior Learning (Slide 2): Today we will divide decimals by decimals. We are just going to apply what we learned in the last lesson. It will be the same steps so I know you are going to do great.

Let's Review (Slide 3): We already learned to shift the decimal when we divide. Why do we do that? Before we answer that question, let's review.

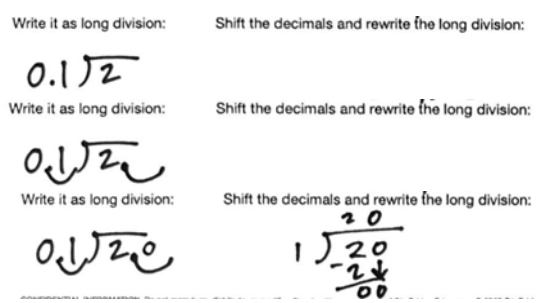
This says solve 2 divided by zero point one. If we draw a picture, we have 2 wholes.



I want to know how many tenths are inside so I cut each whole into tenths. This whole has 10. This whole has 10. I can see that's 2 groups of 10, which is 20. I can already hear the multiplication in there. It was multiplication that happened because the secret denominator of this decimal was 10.



We really thought of it as 2 times 10 divided by 1. Let's write what we did as if it was a fraction. This was secretly 2 divided by one tenth.



Let's write it as a decimal though. I draw my division symbol and put the numbers inside. 2 divided by 0.1.

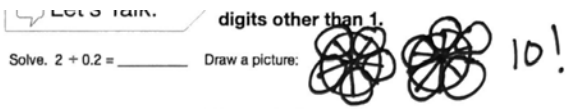
I can look at this shift after the decimal and use it to multiply my dividend. One shift here means one shift here.

Then we rewrite the problem. It's really 20 divided by 1 which is 20. So, why did we shift the decimal? *Students are very likely to give answers that are true but not correct. For example, they might say that we moved the decimal in one number to match the other number. That is technically true but it doesn't explain why.* Possible Student Answers, Key Points:

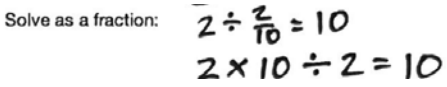
- The shifts in the decimal are like multiplying the number by the denominator.
- The decimal is a secret fraction and moving the decimal point is like multiplying by the denominator.

Let's Talk (Slide 4): This same process will continue with digits other than 1. Let's look at 2 divided by zero point two. We know it's still the same question, "How many two tenths are in 2 whole?"

I will draw two separate wholes. I start by turning them into tenths like on the last side. There are 10 tenths in this whole and 10 tenths and this whole. So we still have that "2 groups of 10 thing" happening.

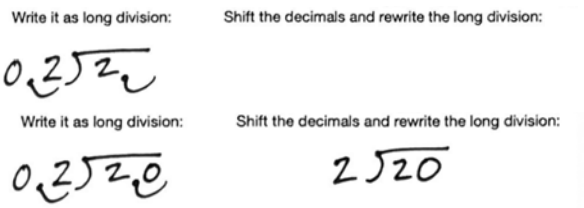


But now I want to know how many TWO tenths so I have to group them into twos. Two tenths here. Two tenths here. Two tenths here… I made 10 circles. That's like I divided the 20 by 2. My answer is 10.

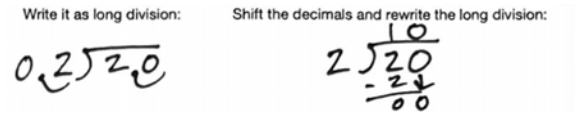


This is the same as 2 divided by 2 tenths. And we can see we did 2 x 10, which was in the denominator like last time. But this time it wasn't divided by 1; it was divided by 2. Same process as before. We just had different digits.

So the long division will look the same. I draw the symbol and write in the numbers. I still need to multiply by that secret hidden denominator so I will shift the decimals here and here. That's just the same as when I cut each whole into ten in my picture. It's like when I multiplied by the denominator of ten in my fraction.



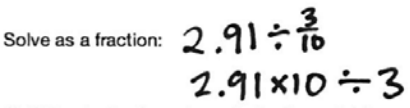
And now when we rewrite it, look what we have. It almost seems like magic but we know that it is the beauty of mathematics always making sense. We get the same division we did before with the circling 2 or the dividing by 2, right? We get 20 divided by 2.



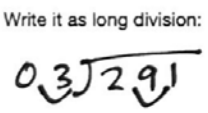
Now I can divide by 2 like regular long division. 2 goes into 2 once. I put 1 on top. I subtract 2. I have zero so I put zero on top. My answer is 10!

Let's Think (Slide 5): I'm going to do one more so you can give all your attention to watching. You will see that this same process will continue when we divide decimals as well.

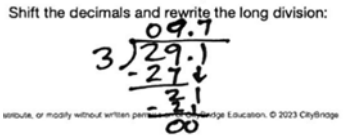
Here we have two point ninety-one divided by point three. That's two and ninety one hundredths divided by three tenths. This says, "Drawing a picture is too cumbersome at this point." As a fraction, this is just like it sounds. 2.91 divided by three over ten. We know that we would multiply by the denominator and divide by the numerator. But this is also starting to get too cumbersome. The long division is going to be soooo much easier here.



I am going to draw the division symbol and put 2.91 inside and 0.3 outside. Now I see my divisor has one shift so I am going to shift the answer in my decimal. Just like I'm multiplying by the denominator.



Let's rewrite this. It's 29.1 inside and 3 outside. We can do this! 3 doesn't go into 2 so I put a zero. 3 goes into 29, 9 times. 3 times 9 is 27. I put 9 on top and subtract 27. Borrow and I get 2. Pull down the 1. 3 goes into 21, 7 times. 3 times 7 is 21. I put 7 on top and subtract 21. Zero is left. I take the decimal in my problem and keep it in my answer. We get 9.7.



Let's Try it (Slides 6): Let's practice together! I will guide you through step by step.

WARM WELCOME

Today we will divide decimals by decimals.

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Let's Review:

How is the work we do for multiplication and division of decimals similar?

Solve. $2 \div 0.1 =$ _____

Draw a picture:

Solve as a fraction:

Write it as long division:

Shift the decimals and rewrite the long division:

Let's Talk:

This same process will continue with digits other than 1.

Solve. $2 \div 0.2 =$ _____

Draw a picture:

Solve as a fraction:

Write it as long division:

Shift the decimals and rewrite the long division:

Let's Think:

This same process will continue when we divide decimals as well.

Solve. 2.91 ÷ 0.3 = _____ Drawing a picture is too cumbersome at this point.

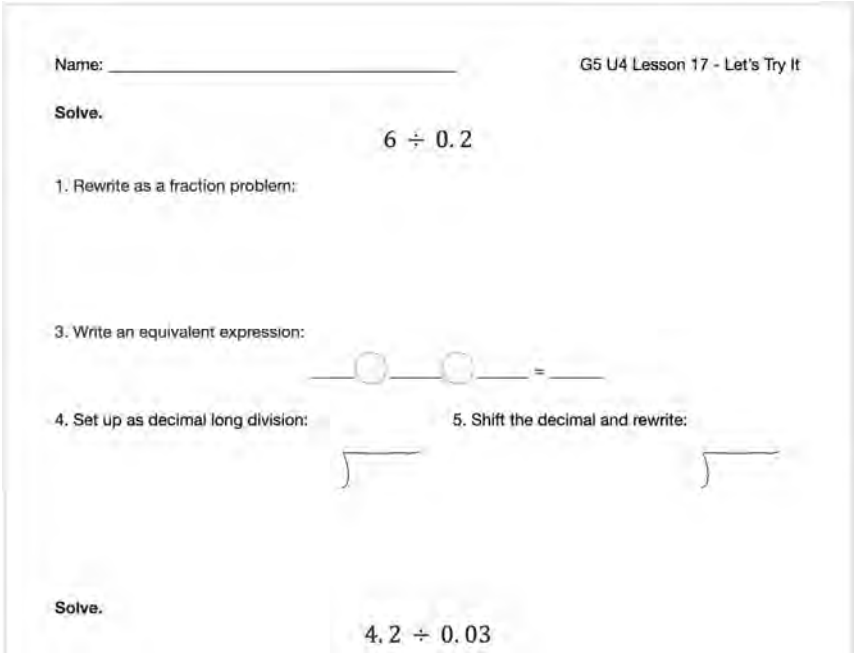
Solve as a fraction:

Write it as long division:

Shift the decimals and rewrite the long division:

Let's Try It:

Let's practice together.



Name: _____ G5 U4 Lesson 17 - Let's Try It

Solve.

$6 \div 0.2$

1. Rewrite as a fraction problem:

3. Write an equivalent expression:

____ ○ ____ ○ ____ = ____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

Solve.

$4.2 \div 0.03$

On your Own:

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

Name: _____ G5 U4 Lesson 17 - Independent Work

Remember: Shifting the decimal point of the dividend is like multiplying by the denominator of a fraction.

Set up the long division. Shift the decimal point and rewrite to solve.

1. $9 \div 0.03$	2. $0.4 \div 0.2$
3. $43.2 \div 0.06$	4. $1.352 \div 0.4$

Solve.

$$6 \div 0.2$$

1. Rewrite as a fraction problem:

3. Write an equivalent expression:

_____◯_____◯_____ = _____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

Solve.

$$4.2 \div 0.03$$

5. Rewrite as a fraction problem:

6. Write an equivalent expression:

_____◯_____◯_____ = _____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

Solve.

$$3.45 \div 0.5$$

5. Rewrite as a fraction problem:

6. Write an equivalent expression:

_____◯_____◯_____ = _____

4. Set up as decimal long division:

5. Shift the decimal and rewrite:

Name: _____ G5 U4 Lesson 17 - Independent Work

Remember: Shifting the decimal point of the dividend is like multiplying by the denominator of a fraction.

Set up the long division. Shift the decimal point and rewrite to solve.

1. $9 \div 0.03$	2. $0.4 \div 0.2$
3. $43.2 \div 0.06$	4. $1.352 \div 0.4$

Set up the long division. Shift the decimal point and rewrite to solve.

5. $16 \div 0.4$

6. $0.3 \div 0.05$

7. $4.1 \div 0.02$

8. $3.22 \div 0.7$

Solve.

$$6 \div 0.2$$

1. Rewrite as a fraction problem:

$6 \div \frac{2}{10}$

3. Write an equivalent expression:

$6 \times 10 \div 2 = 30$

4. Set up as decimal long division:

$0.3\overline{)6.0}$

5. Shift the decimal and rewrite:

$$\begin{array}{r} 30 \\ 2\overline{)60} \\ -6\downarrow \\ \hline 00 \\ -00 \\ \hline 00 \end{array}$$

Solve.

$$4.2 \div 0.03$$

5. Rewrite as a fraction problem: $4.2 \div \frac{3}{100}$

6. Write an equivalent expression:

$4.2 \times 100 \div 3 = 140$

4. Set up as decimal long division:

$0.03\overline{)4.20}$

5. Shift the decimal and rewrite:

$$\begin{array}{r} 140 \\ 3\overline{)420} \\ -3\downarrow \\ \hline 12 \\ -12\downarrow \\ \hline 000 \end{array}$$

Solve.

$$3.45 \div 0.5$$

5. Rewrite as a fraction problem: $3.45 \div \frac{5}{10}$

6. Write an equivalent expression:

$3.45 \times 10 \div 5 = 6.9$

4. Set up as decimal long division:

$0.5\overline{)3.45}$

5. Shift the decimal and rewrite:

$$\begin{array}{r} 06.9 \\ 5\overline{)34.5} \\ -30\downarrow \\ \hline 45 \\ -45 \\ \hline 00 \end{array}$$

Name: ANSWER KEY

Remember: Shifting the decimal point of the dividend is like multiplying by the denominator of a fraction.

Set up the long division. Shift the decimal point and rewrite to solve.

1. $9 \div 0.03 = 300$

$0.03\overline{)9.00}$ → $3\overline{)900}$

300

$-9\downarrow\downarrow$

000

2. $0.4 \div 0.2 = 2$

$0.2\overline{)0.4}$ → $2\overline{)4}$

2

-4

0

3. $43.2 \div 0.06 = 720$

$0.06\overline{)43.20}$ → $6\overline{)4320}$

0720

$-42\downarrow$

12

$-12\downarrow$

000

4. $1.352 \div 0.4 = 3.38$

$0.4\overline{)1.352}$ → $4\overline{)13.52}$

03.38

$-12\downarrow$

15

$-12\downarrow$

32

-32

00

Set up the long division. Shift the decimal point and rewrite to solve.

5. $16 \div 0.4 = 40$

$0.4\overline{)16.0}$ → $4\overline{)160}$

040
4)160
-16↓
000

6. $0.3 \div 0.05 = 6$

$0.05\overline{)0.30}$ → $5\overline{)30}$

06
5)30
-0↓
30
-30
00

7. $4.1 \div 0.02 = 205$

$0.02\overline{)4.10}$ → $2\overline{)410}$

205
2)410
-4↓
01
-0↓
10
-10
00

8. $3.22 \div 0.7 = 4.6$

$0.7\overline{)3.22}$ → $7\overline{)32.2}$

04.6
7)32.2
28↓
042
-42
00

G5 U4 Lesson 18

Fluently use all four decimal operations

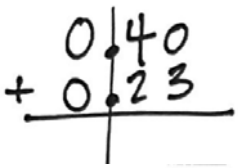
G1 U4 Lesson 18 - Today we will fluently use all four decimal operations.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will fluently use all four decimal operations. The operations are addition, subtraction, multiplication and division. So, this is just putting together all the decimal work you've already done this year!

Let's Review (Slide 3): In order to make sure we keep the steps for each operation clear, it is helpful to notice how they are the same and different. Let's start with this - how are addition and subtraction of decimals similar? Possible Student Answers, Key Points:

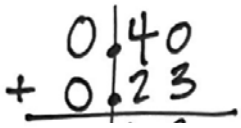
- You need to line up your decimals for both
- Addition and subtraction are opposites.
- We use a place value chart.
- One is put together and one is take apart.

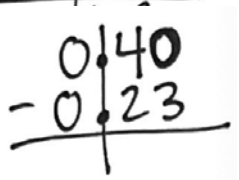


Solve. 0.4 + 0.23 = 0.63

For 0.4 + 0.23, I am going to line up my decimals. Let me draw a straight line with two decimals to start. Then I can put in my numbers, and I will fill in this empty space with a zero just to keep things lined up.

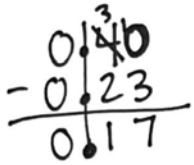
Now I can add like normal and my answer is 0 + 3 makes 3. 4 + 2 makes 6. My answer is 0.63.





Let's do the same numbers but with subtraction. I still draw a straight line with two decimals then fill in my numbers. Here it is REALLY important to put a zero in the empty spot because I am going to need somewhere to subtract from.

Solve. 0.4 - 0.23 = 0.17



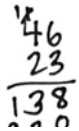
I can see 0 minus 3 and that's not enough so I have to ungroup or borrow. I scratch out the 4; it becomes 3. And I can put one on the side of the zero. Now it is 10 - 3 = 7 and 3 - 2 = 1. My answer is 0.17

Let's look back at how these operations are similar. For both operations, I had to line up my decimals. That's because I can only add "like things" such as cats plus cats or chocolate bars plus chocolate bars or, in this case, tenths plus tenths and hundredths plus hundredths. Same with subtraction! I can't take cats from dogs, right? It would make sense that the work for addition and subtraction look the same because they are just opposite operations.

Let's Talk (Slide 4): Now we're asked, "How are multiplication and division of decimals similar?" What do you think? Possible Student Answers, Key Points:

- You DON'T need to line up your decimals for both
- You scoop under the decimal places for both.
- Division is the opposite of multiplication.

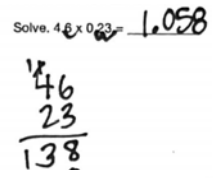
Let's do the math and then we'll ask that question again. This is 4 tenths plus 23 hundredths. I can hear the hidden fraction even when I read the problem. So I'm going to multiply just my digits like numerators.



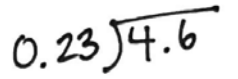
I write 46 x 23. I do 3 x 6 is 18, carry the 1. 3 x 4 is 12 plus 1 is 13. In my next row, I put a zero. Then 2 x 6 is 12, carry the 1. 2 x 4 is 8 plus 1 is 9. I add this up and get 1058.

Solve. 4.6 x 0.23 = _____

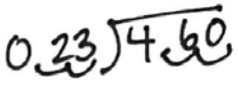
I still need to think about those tenths and hundredths places. If they were fraction denominators, I would multiply them but since they are decimals, I can just count up my scoops. Count with me - 1 - 2 - 3!



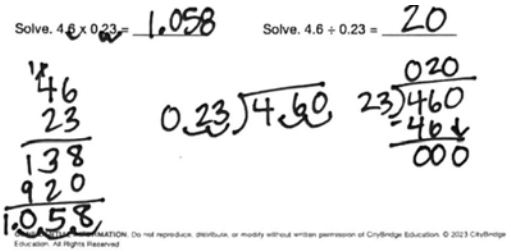
That's how many scoops I need in my answer. I get one point zero five eight or 1 and 58 thousandths.



Let's do the division. I can set it up like a long division problem.



But then I know the decimal spaces here have to get multiplied by the number in my division box. So I count the scoops here and put them in here. Fill in the empty place with a zero.

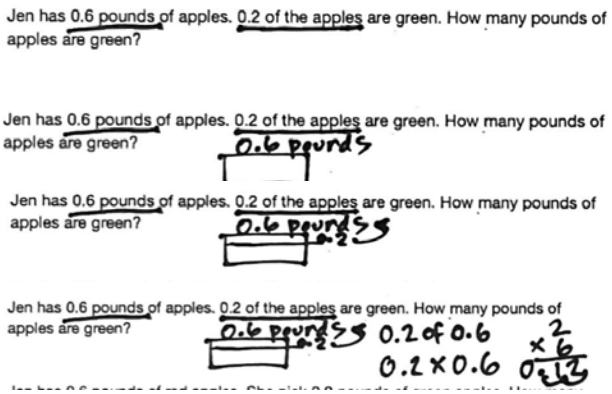


I am going to rewrite my problem. It's 460 divided by 23. I will need to figure out the repeated addition of 23 over here on the side because that's a big number to divide by. But that's okay. 23 + 23 is 46 so I got it. 23 doesn't go into 4. It goes into 46 twice. I subtract 46 and I am left with zero. Pull down the next digits and I get zero. My answer is 20.

So let's take a step back and ask again, "how are multiplication and division of decimals similar?" Do we line up our decimals for either one? No! We use scoops to find the total place values in our answer.

Let's Think (Slide 5): The last thing we want to think about before we practice is, "how will we choose operations for a story problem?" Read the steps silently with your eyes while I read. 1. We will ask, "What is the relationship between _____ and _____?" 2. We will draw a tape diagram.

Let's practice with this problem. *Read the first problem.* This problem is talking about 0.6 pounds and 0.2 of the apples. Let me underline that. The first thing I do is ask myself, "What is the relationship between pounds and "of the apples?" I can already hear that this is NOT a pounds and pounds problem. It's 0.2 of the 0.6 so I think this is going to be multiplication.

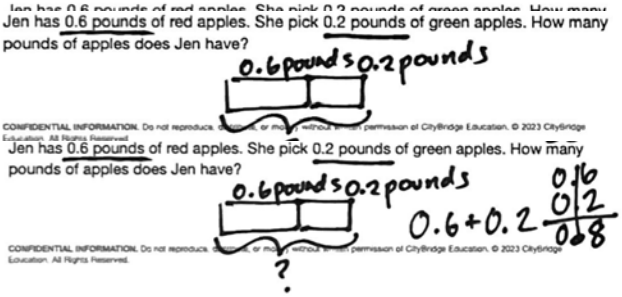


Now let's draw a tape diagram to be super sure. I will draw a rectangle and label it 0.6 pounds.

Then it say 0.2 of them with green. That's 0.2 of this rectangle that I already draw so I would draw it across this way. I am seeing that it is a multiplication problem.

I multiply my digits. Count my scoops and put the scoops in my answer. It's 0.12.

Follow along silently with your eyes while I read the next problem. *Read the next problem.* I am going to underline what we're talking about in this story - 0.6 pounds and 0.6 pounds. The first thing I do is ask myself, "What is the relationship between pounds and pounds?" They are the same thing! So I know I can add or subtract these if I want to.



Let's draw a diagram to think about it some more. I am going to draw a rectangle and call that 0.6 pounds of red. Then separate from that I have 0.2 pounds of green. So I will draw another rectangle beside it.

I want to know how much all these pounds are. My question mark is here. I can see this is an addition problem. I am going to line up my decimals and put the numbers. 6 + 2 is 8 so my answer is 0.8 pounds.

Let's Try it (Slides 6): You are going to practice this mix of addition, subtraction, multiplication and division today. But first, I will walk you through one more set of examples.

WARM WELCOME

Today we will fluently use all four decimal operations.

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Let's Review:

How are addition and subtraction of decimals similar?

Solve. 0.4 + 0.23 = _____

Solve. 0.4 - 0.23 = _____

Let's Talk:

How are multiplication and division of decimals similar?

Solve. 4.6 x 0.23 = _____

Solve. 4.6 ÷ 0.23 = _____

Let's Think: How will we choose operations for a story problem?

1. We will ask, "What is the relationship between _____ and _____?"
2. We will draw a tape diagram.

Jen has 0.6 pounds of apples. 0.2 of the apples are green. How many pounds of apples are green?

Jen has 0.6 pounds of red apples. She pick 0.2 pounds of green apples. How many pounds of apples does Jen have?

Let's Review: How are addition and subtraction of decimals similar?

Solve. 0.4 + 0.23 = _____

Solve. 0.4 - 0.23 = _____

Let's Talk: How are multiplication and division of decimals similar?

Solve. 4.6 x 0.23 = _____

Solve. 4.6 ÷ 0.23 = _____

Let's Think: How will we choose operations for a story problem?

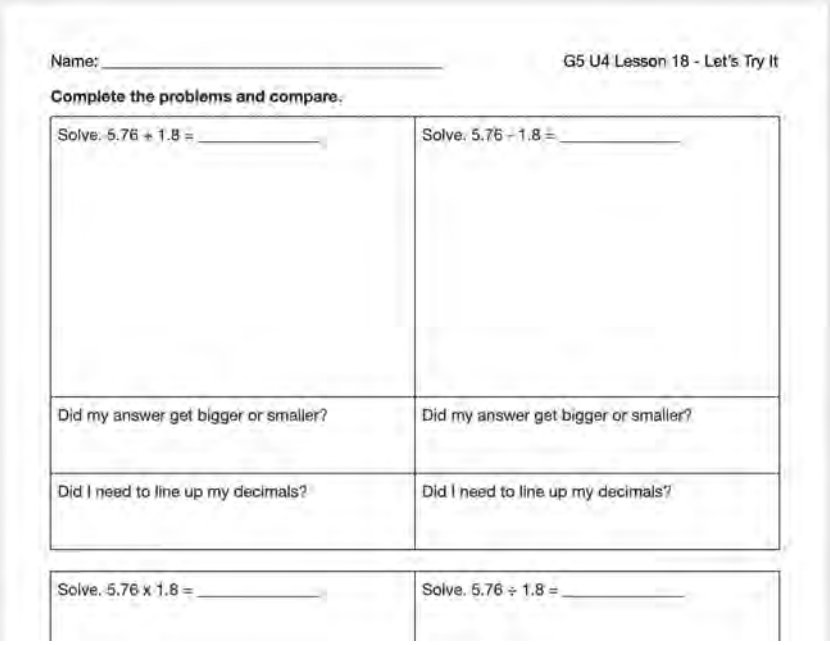
1. We will ask, "What is the relationship between _____ and _____?"
2. We will draw a tape diagram.

Jen has 0.6 pounds of apples. 0.2 of the apples are green. How many pounds of apples are green?

Jen has 0.6 pounds of red apples. She pick 0.2 pounds of green apples. How many pounds of apples does Jen have?

Let's Try It:

Let's practice together.



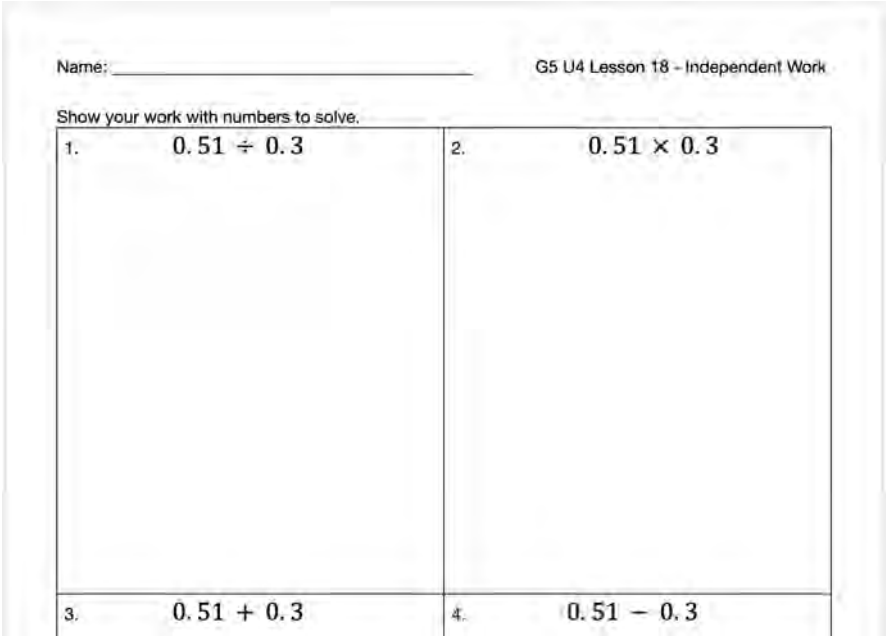
Name: _____ G5 U4 Lesson 18 - Let's Try It

Complete the problems and compare.

Solve. 5.76 + 1.8 = _____	Solve. 5.76 - 1.8 = _____
Did my answer get bigger or smaller?	Did my answer get bigger or smaller?
Did I need to line up my decimals?	Did I need to line up my decimals?
Solve. 5.76 x 1.8 = _____	Solve. 5.76 ÷ 1.8 = _____

On your Own:

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



Name: _____ G5 U4 Lesson 18 - Independent Work

Show your work with numbers to solve.

1. $0.51 \div 0.3$	2. 0.51×0.3
3. $0.51 + 0.3$	4. $0.51 - 0.3$

Name: _____ G5 U4 Lesson 18 - Let's Try It

Complete the problems and compare.

Solve. 5.76 + 1.8 = _____	Solve. 5.76 - 1.8 = _____
Did my answer get bigger or smaller?	Did my answer get bigger or smaller?
Did I need to line up my decimals?	Did I need to line up my decimals?

Solve. 5.76 x 1.8 = _____	Solve. 5.76 ÷ 1.8 = _____
Did my answer get bigger or smaller?	Did my answer get bigger or smaller?
Did I need to line up my decimals?	Did I need to line up my decimals?

Name: _____ G5 U4 Lesson 18 - Independent Work

Show your work with numbers to solve.

1. $0.51 \div 0.3$	2. 0.51×0.3
3. $0.51 + 0.3$	4. $0.51 - 0.3$

Draw a tape diagram then show your work with numbers to solve.

5. Jeffrey ran 3.5 miles in the school race. Each mile took 13.5 minutes to run. How long did it take Jeffrey to complete the race?	6. Sammy has 2.8 gallons of red paint. He used 0.76 gallons to paint his bathroom. How much paint does Sammy have left?
7. Joellen has 2.8 Liters of soda. She is pouring the soda into cups that can hold 0.4 Liters. How many cups can Joellen fill?	8. Richard used 0.6 pounds of beans to make chili. Then he used 0.25 pounds of beans to make beans and rice. How many pounds of beans did Richard use in his cooking?

Name: ANSWER KEY

Complete the problems and compare.

Solve. 5.76 + 1.8 = 7.56

$$\begin{array}{r} {\scriptstyle 1} \\ 5.76 \\ +\ 1.80 \\ \hline 7.56 \end{array}$$

Did my answer get bigger or smaller?

bigger

Did I need to line up my decimals?

yes

Solve. 5.76 - 1.8 = 3.96

$$\begin{array}{r} {\scriptstyle 4} \\ 5.76 \\ -\ 1.80 \\ \hline 3.96 \end{array}$$

Did my answer get bigger or smaller?

smaller

Did I need to line up my decimals?

yes

Solve. 5.76 x 1.8 = 10.368

$$\begin{array}{r} 576 \\ \times\ \ 18 \\ \hline 4608 \\ 5760 \\ \hline 10.368 \end{array}$$

Did my answer get bigger or smaller?

bigger

Did I need to line up my decimals?

no

Solve. 5.76 ÷ 1.8 = 3.2

$$1.8\overline{)5.76} \qquad 18\overline{)57.6}$$

$$\begin{array}{r} 3.2 \\ 18\overline{)57.6} \\ 54\downarrow \\ \hline 36 \\ -36 \\ \hline 00 \end{array}$$

18
36
54
72
90
108

Did my answer get bigger or smaller?

smaller

Did I need to line up my decimals?

no

Name: ANSWER KEY

G5 U4 Lesson 18 - Independent Work

Show your work with numbers to solve.

1. $0.51 \div 0.3 = 1.7$

$0.3\overline{)0.51}$

$$\begin{array}{r} 1.7 \\ 3\overline{)5.1} \\ -3\downarrow \\ \hline 21 \\ -21 \\ \hline 00 \end{array}$$

2. $0.51 \times 0.3 = 0.153$

$$\begin{array}{r} 51 \\ \times\ 3 \\ \hline 153 \end{array}$$

3. $0.51 + 0.3 = 0.81$

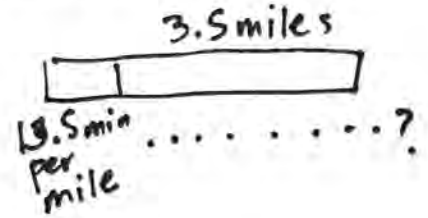
$$\begin{array}{r} 0.51 \\ +\ 0.30 \\ \hline 0.81 \end{array}$$

4. $0.51 - 0.3 = 0.21$

$$\begin{array}{r} 0.51 \\ -\ 0.3 \\ \hline 0.21 \end{array}$$

Draw a tape diagram then show your work with numbers to solve.

5. Jeffrey ran 3.5 miles in the school race. Each mile took 13.5 minutes to run. How long did it take Jeffrey to complete the race?



3.5×13.5

$\frac{1}{2}$

135

35

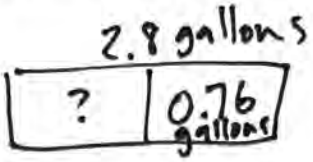
675

4050

47.25

47.25 minutes

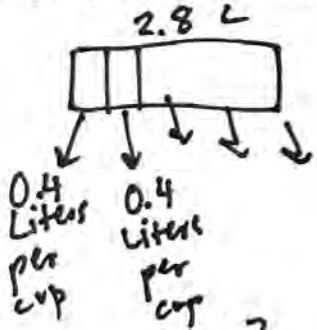
6. Sammy has 2.8 gallons of red paint. He used 0.76 gallons to paint his bathroom. How much paint does Sammy have left?



$2.80 - 0.76 = 2.04$

2.04 gallons

7. Joellen has 2.8 Liters of soda. She is pouring the soda into cups that can hold 0.4 Liters. How many cups can Joellen fill?



7 cups

$2.8 \div 0.4$

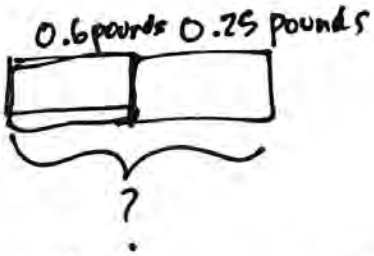
$0.4 \overline{)2.8}$

$4 \overline{)28}$

-28

00

8. Richard used 0.6 pounds of beans to make chili. Then he used 0.25 pounds of beans to make beans and rice. How many pounds of beans did Richard use in his cooking?



$0.6 + 0.25 = 0.85$

0.85 pounds