CITYTUTOR

Fifth Grade Math Lesson Materials

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G5 Unit 2:

Base Ten Operations

G5 U2 Lesson 1

Multiply multi-digit whole numbers and multiples of 10

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G5 U2 Lesson 1 - Students will multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties

Warm Welcome (Slide 1): Tutor choice

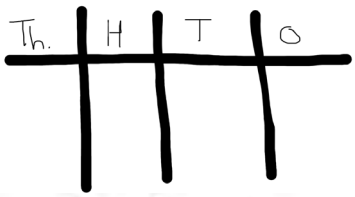
Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will explore how to multiply multi-digit whole numbers by multiples of ten. That's a fancy way of saying we're going to explore ways we can efficiently find the product of some big numbers.

Let's Talk (Slide 3): Before we talk more about our topic, take a look at the problems here. What do you notice? What's similar or different about the equations? Possible Student Answers, Key Points:

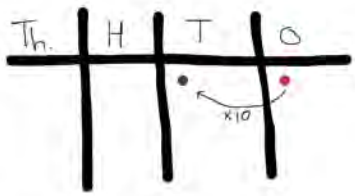
- Each involves multiplication. They all involve 3 and 4 in some way.
- The products are getting bigger. The units are different in each equation. There are more zeroes as we move along.

There is a lot to notice about these equations. I definitely notice that they all involve multiplying 3 and 4 together to make 12, but the units in each factor and product vary depending on the equation. (*point to each equation and verbally emphasize the unit*) The first one shows 3 x 4 = 12 ones. The next one is 3 x 4 tens = 12 tens. The next one is 3 x 4 hundred = 12 hundreds. The last one is 3 tens x 4 hundreds = 12 thousands. So what we'll see today is that we can use facts and the properties we know about smaller numbers to help us multiply bigger numbers quickly and with ease.

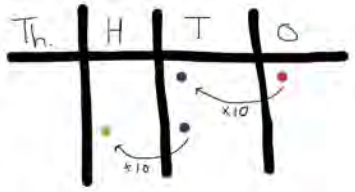
Let's Think (Slide 4): Before we talk about specific numbers, let's remember what we know about units. We know that each bigger unit is ten times as much as the unit before it.



Let's explore that using a place value chart (*sketch)*. I'm going to include ones, tens, hundreds, and thousands in this chart.



When we look at the place value chart, let's start with one one. We see that multiplying one times ten, gives us ten.

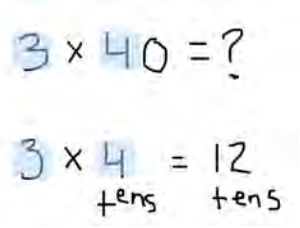


Multiplying one ten x ten, makes a hundred. *(Draw a dot for one ten in the chart. Then draw an arrow labeled "x 10" to make a new dot in the hundreds place.)*

And, finally, what unit do we get if we multiply a hundred times ten? A hundred times ten would make a thousand. It's the next unit after hundreds.

Knowing this about units, we can use unit form to help us think about multiplying by multiples of ten.

Let's consider the equations we were just looking at (*write 3 x 4 = 12)*. The most simple version that we looked at was 3 x4, which is 12.

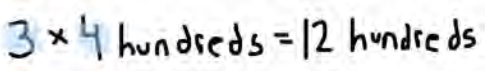


If we're asked to find 3 x 40 (*write it underneath)*, we can think of it as 3 x 4 tens.

Look, the basic fact, 3 x 4, stays the same. We are just thinking of it as 3 x 4 TENS instead of 3 x 4 ONES. And, 3 x 4 tens would be 12 tens (*write in unit form and highlight the 3 and 4 in each equation*). And, 12 tens is the same as 120.

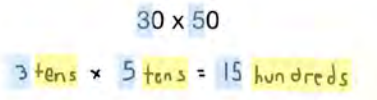
So, what do you think would be different if I asked you to find 3 x 400? Possible Student Answers, Key Points:

- We could still use 3 x 4 as our basic fact, but we'd think of it as 3 x 4 hundreds. Our answer would be 12 hundreds or 1,200.
- We could still use 3x4 but we'd just have to pay attention to the units.



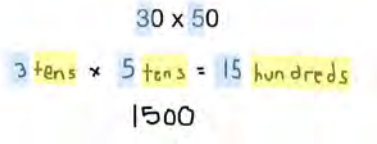
Great! (*Write 3 x 4 hundreds = 12 hundreds underneath the other equations*) 3 x 4, 3 x 40, and 3 x 400 all use the same basic fact. We can use that fact to find the answer, but we need to carefully consider the units we're multiplying to make sure we end up with the correct product.

Let's Think (Slide 5): Let's consider another example and think carefully about the units in the problem. We're going to find the product of 30 x 50 using unit form to make these bigger factors simpler to multiply.



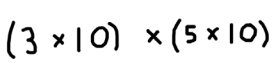
Instead of thinking of 30 as just 30, we can think of it as 3 tens. Similarly, instead of thinking of 50 as just 50, we can think of it as 5 tens.

So, 3 x 5 is a multiplication fact we know (*highlight*). We know that 3 times 5 equals 15.



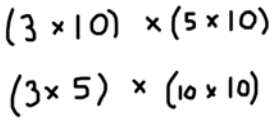
Now we have to think about the units. If we multiply (*verbally emphasize each unit and highlight each unit in the same color)* 3 TENS by 5 TENS, we know our product will be in the hundreds, because tens x tens = hundreds. So if 3 x 5 = 15, then 3 tens x 5 tens = 15 what? Hundreds! That's right, so 15 hundreds is 1,500.

Let's walk through one other similar way we can think about units when multiplying 30 x 50. We can use properties we know to rearrange the factors in a friendly way, let me show you.



We can think of 30 as 3 tens or (3 x 10). And, we can think of 50 as 5 tens or (5 x 10).

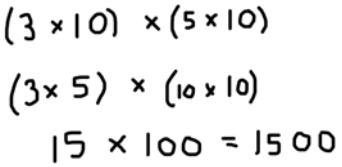
The associative property of multiplication allows us to change the order we multiply factors in without changing the product, so watch.



I'm going to rearrange and regroup my factors, so I can easily see my basic fact of 3 x 5. So, I am going to group 3 and 5 as (3x5) and then I have to group the leftover factors, which is 10 and 10 so (10x10)

What do you notice about these two expressions? Possible Student Answers, Key Points:

- They're the same factors. You just grouped them differently.
- Now the basic fact of 3 x 5 is grouped together and the units of 10s are together.
- You still get the same answer, you just have the factors in a different order



Now, we can quickly solve it. I know 3 x 5 is 15 (*write*) and 10 x 10 is 100 (*write*).

So, 15 x 100 is just 1,500. Rearranging the factors made it easy for me to isolate that simple fact and keep track of the units in my product.

How is the unit form strategy on the left and the rearranging factors strategy on the right related? How are they the same and different? Possible Student Answers, Key Points:

- They both help us use an easy fact to find the product of larger numbers.
- They both help us keep track of the units we are multiplying.
- Unit form uses words to help us track the units, but when we rearrange the factors we multiply our units together in as numbers in an expression.

Let's Think (Slide 6): Before we practice some problems together, I want you to look at 6 x 50. These two students aren't sure what the correct product should be. How could we help these two think about units so they know who has the correct answer? Possible Student Answers, Key Points:

- We can think of this as 6 x 5 tens, which would be 30 tens. 30 tens is 300.
- 30 doesn't make sense as a product, because it's way too small. That's not a reasonable answer.

Excellent! When we have a basic fact that ends in 0, like 6 x 5 = 30, we have to be extra careful about writing our product accurately. So, 30 tens is 300, not just 30. Can you think of other basic facts that end in 0 that we might want to watch out for? Possible Student Answers, Key Points:

- 2 x 5 = 10, or 4 x 5 = 20.
- Lots of fives facts end in 0.

As we work today, let's slow down when we have a basic fact that ends in 0 so that we don't get the zero in our basic fact mixed up with any zeroes we use to represent the correct unit.

Let's Try it (Slides 7 - 8): Now let's work on multiplying whole numbers and multiples of 10 together. We're going to work on this page together, step-by-step. Remember, when we multiply by multiples of 10, we can use unit form or we can rearrange our factors to make multiplying the big numbers simpler.

WARM WELCOME

Today we will multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties.

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Let's Talk:

What do you notice?

$3 \times 4 = 12$

$3 \times 40 = 120$

$3 \times 400 = 1{,}200$

$30 \times 400 = 12{,}000$

Let's Think:

What happens when we multiply with different units?

ones x tens = _____

tens x tens = _____

hundreds x tens = _____

Let's Think:

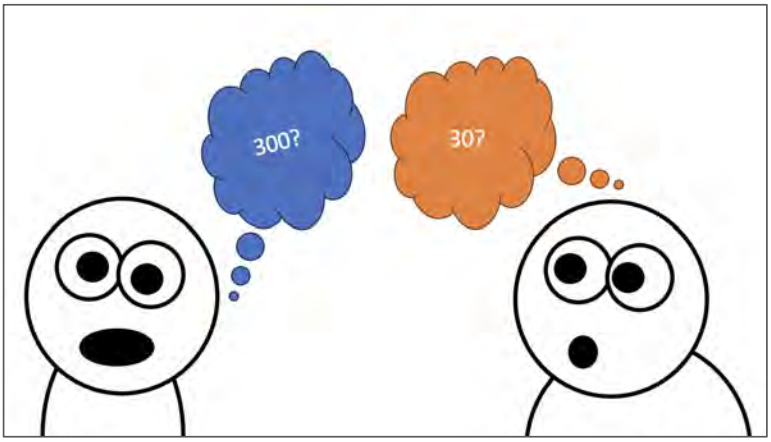
We can multiply with multiples of ten by using unit form *and* by rearranging factors.

UNIT FORM	REARRANGING FACTORS
30 x 50	30 x 50

Let's Think:

Be careful when you think about units! Who is correct?

6 x 50 = ?



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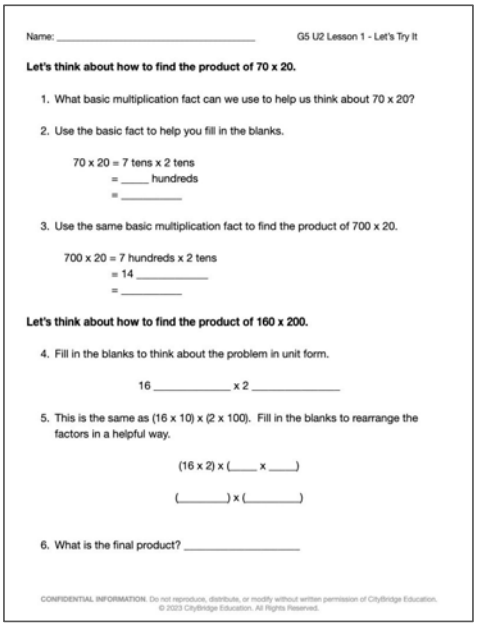
Let's Try It:

Let's explore multiplying multi-digit numbers by multiples of 10 together.



Name: _____ G5 U2 Lesson 1 - Let's Try It

Let's think about how to find the product of 70 x 20.

1. What basic multiplication fact can we use to help us think about 70 x 20?
2. Use the basic fact to help you fill in the blanks.

   70 x 20 = 7 tens x 2 tens
   = ____ hundreds
   = _____

3. Use the same basic multiplication fact to find the product of 700 x 20.

   700 x 20 = 7 hundreds x 2 tens
   = 14 _____
   = _____

Let's think about how to find the product of 160 x 200.

4. Fill in the blanks to think about the problem in unit form.

   16 _____ x 2 _____

5. This is the same as (16 x 10) x (2 x 100). Fill in the blanks to rearrange the factors in a helpful way.

   (16 x 2) x (____ x ____)

   (_____) x (_____)

6. What is the final product? _____

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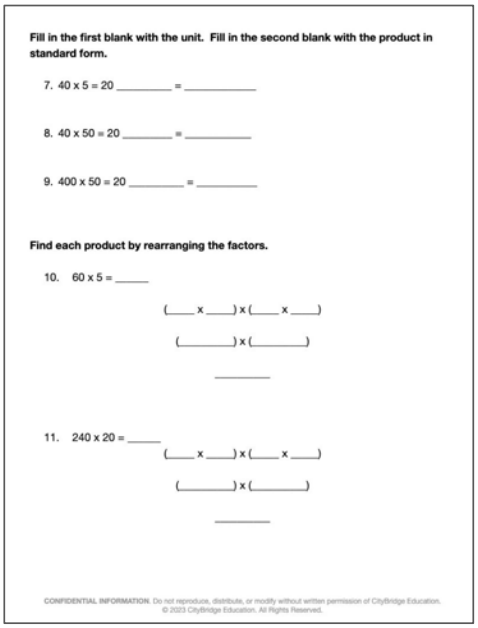

Fill in the first blank with the unit. Fill in the second blank with the product in standard form.

7. 40 x 5 = 20 _____ = _____
8. 40 x 50 = 20 _____ = _____
9. 400 x 50 = 20 _____ = _____

Find each product by rearranging the factors.

10. 60 x 5 = _____

    (____ x ____) x (____ x ____)

    (_____) x (_____)

    _____

11. 240 x 20 = _____

    (____ x ____) x (____ x ____)

    (_____) x (_____)

    _____

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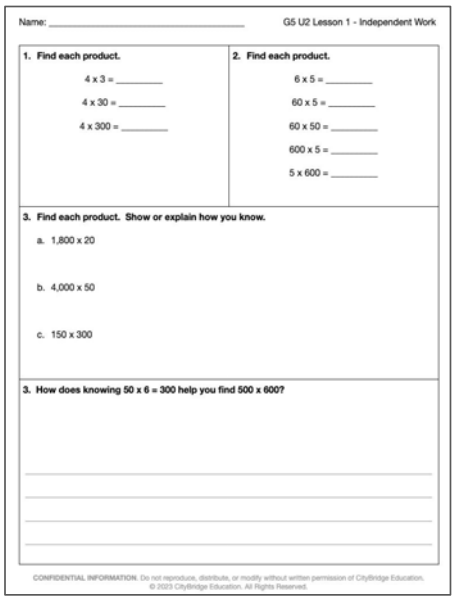
On your Own:

Now it's time to explore multiplying multi-digit numbers by multiples of 10 on your own.



Name: _____ G5 U2 Lesson 1 - Independent Work

1. Find each product.

4 x 3 = _____

4 x 30 = _____

4 x 300 = _____

2. Find each product.

6 x 5 = _____

60 x 5 = _____

60 x 50 = _____

600 x 5 = _____

5 x 600 = _____

3. Find each product. Show or explain how you know.

a. 1,800 x 20

b. 4,000 x 50

c. 150 x 300

3. How does knowing 50 x 6 = 300 help you find 500 x 600?

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Let's think about how to find the product of 70 x 20.

1. What basic multiplication fact can we use to help us think about 70 x 20?

2. Use the basic fact to help you fill in the blanks.

   70 x 20 = 7 tens x 2 tens
   = _____ hundreds
   = _____

3. Use the same basic multiplication fact to find the product of 700 x 20.

   700 x 20 = 7 hundreds x 2 tens
   = 14 _____
   = _____

Let's think about how to find the product of 160 x 200.

4. Fill in the blanks to think about the problem in unit form.

   16 _____ x 2 _____

5. This is the same as (16 x 10) x (2 x 100). Fill in the blanks to rearrange the factors in a helpful way.

   (16 x 2) x (_____ x _____)

   (_____) x (_____)

6. What is the final product? _____

Fill in the first blank with the unit. Fill in the second blank with the product in standard form.

7. 40 x 5 = 20 _____ = _____

8. 40 x 50 = 20 _____ = _____

9. 400 x 50 = 20 _____ = _____

Find each product by rearranging the factors.

10. 60 x 5 = _____

(_____ x _____) x (_____ x _____)

(_____) x (_____)

_____

11. 240 x 20 = _____

(_____ x _____) x (_____ x _____)

(_____) x (_____)

_____

Name: _____ G5 U2 Lesson 1 - Independent Work

1. Find each product.

3 x 3 = _____

3 x 30 = _____

3 x 300 = _____

2. Find each product.

6 x 5 = _____

60 x 5 = _____

60 x 50 = _____

600 x 5 = _____

5 x 600 = _____

3. Find each product. Show or explain how you know.

a. 1,800 x 20

b. 4,000 x 50

c. 150 x 300

3. How does knowing 50 x 6 = 300 help you find 500 x 600?

Name: KEY

Let's think about how to find the product of 70 x 20.

1. What basic multiplication fact can we use to help us think about 70 x 20?

   7 x 2 = 14

2. Use the basic fact to help you fill in the blanks.

   70 x 20 = 7 tens x 2 tens
   = 14 hundreds
   = 1,400

3. Use the same basic multiplication fact to find the product of 700 x 20.

   700 x 20 = 7 hundreds x 2 tens
   = 14 thousands
   = 14,000

Let's think about how to find the product of 160 x 200.

4. Fill in the blanks to think about the problem in unit form.

   16 tens x 2 hundreds

5. This is the same as (16 x 10) x (2 x 100). Fill in the blanks to rearrange the factors in a helpful way.

   (16 x 2) x (10 x 100)
   (32) x (1000)

6. What is the final product? 32,000

Fill in the first blank with the unit. Fill in the second blank with the product in standard form.

7. 40 x 5 = 20 tens = 200

8. 40 x 50 = 20 hundreds = 2,000

9. 400 x 50 = 20 thousands = 20,000

Find each product by rearranging the factors.

10. 60 x 5 = _____

(6 x 5) x (10 x 1)

(30) x (10)

300

11. 240 x 20 = _____

(24 x 2) x (10 x 10)

(48) x (100)

4,800

Name: KEY

1. Find each product.

3 x 3 = 9

3 x 30 = 90

3 x 300 = 900

2. Find each product.

6 x 5 = 30

60 x 5 = 300

60 x 50 = 3,000

600 x 5 = 3,000

5 x 600 = 3,000

3. Find each product. Show or explain how you know.

a. 1,800 x 20 $(18 \times 2) \times (100 \times 10)$ $36 \times 1{,}000 = 36{,}000$

b. 4,000 x 50 $(4 \times 5) \times (1{,}000 \times 10)$ $20 \times 10{,}000 = 200{,}000$

c. 150 x 300 $(15 \times 3) \times (10 \times 100)$ $45 \times 1{,}000 = 45{,}000$

3. How does knowing 50 x 6 = 300 help you find 500 x 600?

I can think of 500 as 50 tens and 600 as 6 hundreds. I know 50 x 6 = 300 and tens x hundreds = thousands, so the product is 300 thousands or 300,000.

G5 U2 Lesson 2

Estimate multi-digit products by rounding factors

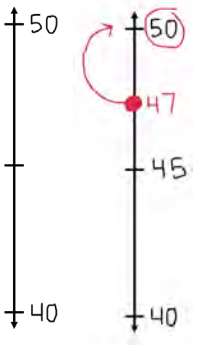
G5 U2 Lesson 2 - Students will estimate multi-digit products by rounding factors to a basic fact and using place value patterns

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will explore how to use rounding to estimate the product of multi-digit factors efficiently. We won't multiply to find the exact product for now; instead, we'll think of friendly numbers to multiply efficiently so we can make an educated guess about the size of the product.

Let's Review (Slide 3): Before we jump into estimating products, let's quickly revisit a strategy that can help us round. You may have seen this strategy used in 3rd and 4th grade. Let's start by thinking about rounding the number 47 to the nearest ten. Which two tens is the number 47 between? (*label on the vertical number line as student shares)* Possible Student Answers, Key Points:

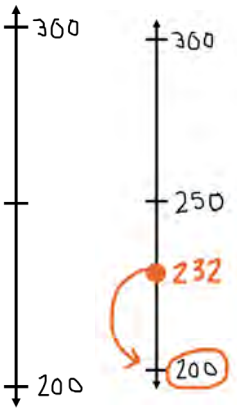
- 47 is more than 40 and less than 50. 47 is between 4 tens and 5 tens.



When we round to the nearest ten, we want to know which benchmark our number is closer to. What is the halfway point between 40 and 50? (*label on the vertical number line as student shares)* Possible Student Answers, Key Points:

- 45 is in the middle of 40 and 50. 45 is the halfway point.

Our number is 47. That's a little more than 45, so I can mark that on my number line (*plot and label 47 on the number line)*. Now I can clearly see that 47 is closer to 50 than to 40 (*draw arrow from 47 to 50)*. I can say that 47 ≈ 50. This wavy equal sign means approximately, so we can say 47 rounds to 50 or 47 is approximately 50.



I want to round one more number with some more help from you. This time I want to round 232 to the nearest hundred. I want to know which hundred 232 is closest to. How can I set up my number line? (*support student as they explain and mark up number line using similar modeling as the previous example)* Possible Student Answers, Key Points:

- 232 is in between 200 and 300. We can label the lower benchmark as 200 and the upper benchmark as 300. The halfway point is 250.
- 232 is less than the halfway mark of 250, so I know the closest hundred is 200. 232 is closer to 200 than 300.

We can say 232 rounds to 200, or we can write that as 232 ≈ 200. Sometimes you might just <u>know</u> the nearest benchmark. For example, I know 399 is really close to 400. Or I know 91 is really close to 90. If you're ever not sure, a vertical number line is a good way to round with precision. We'll use this model in some of our work today as we estimate products by rounding factors.

Let's Talk (Slide 4): Take a look at the pairs of expressions shown here. If you were asked to solve quickly using mental math strategies, which expression in each pair would you want to evaluate? Think, and give me a signal when you've made your decisions (*wait for signal)*. Possible Student Answers, Key Points:

- I'd rather think about 10 x 100. The numbers are easier to think about than 12 and 99.
- I'd rather evaluate 400 x 400, because I can use 4 x 4 and unit form to help me quickly find the product.

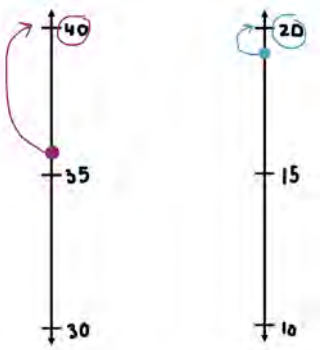
Great thinking! It's often easier to multiply basic tens and hundreds than it is to multiply multi-digit numbers with lots of different digits. If we're ever thinking about a big multiplication problem and we don't need a precise answer, we can use rounding to rewrite our multiplication problem as an easier, similar fact that we can think about without much hassle. Let's work through an example of what I mean.

Let's Think (Slide 5): (*Read the problem on the slide).* Mr. Miller is packing bags of grapes for his daycare students. He makes 36 bags, and puts 19 grapes in each bag. He wants to know about how many grapes he should buy.

Let's round to help Mr. Miller find an estimate for the number of grapes. Why do you think it is okay to round with a scenario like this? Possible Student Answers, Key Points:

- He doesn't need the <u>exact</u> number of grapes. He can be close and still be okay.

- You don't buy grapes one at a time, so he just needs a good guess for how many bunches he should buy to have enough. It doesn't need to be exact.

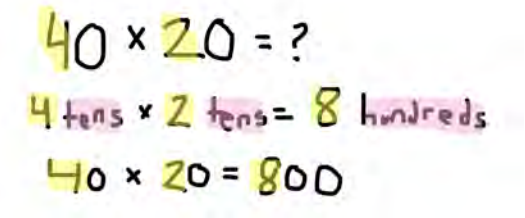


Mr. Miller needs 36 bags with 19 grapes in each. We can think of 36 x 19 as an expression we could use to find the total number of grapes. Let's round each factor to help Mr. Miller get an efficient estimate. What is 36 rounded to the nearest ten? How do you know? (*support students with sketching and labeling a vertical number line as shown here if they aren't able to clearly name what each factor rounds to and how they know)* Possible Student Answers, Key Points:

- 36 is in between 30 and 40. The halfway point between 30 and 40 is 35, and I know 36 is a little more than that. 36 round to 40.

What is 19 rounded to the nearest ten? How do you know? Possible Student Answers, Key Points:

- 19 is in between 10 and 20. The halfway point between 10 and 20 is 15, and I know 19 is more than that. 19 is really close to 20. 19 rounds to 20.



We can now use our rounded factors to find an estimate. We can think of 36 x 19 as being about 40 x 20 (*write expression)*. Just like in our previous lesson, we can use basic facts and unit form to quickly arrive at our estimate. 40 x 20 can be thought of as 4 tens x 2 tens (*write)*. Now we can think of 4 x 2 *(highlight digits)* and then think about tens x tens to consider the unit of our product. 4 tens x 2 tens = 8 hundreds or 800. (*write expression in standard form)*.

About how many grapes does Mr. Miller need? How do you know? Possible Student Answers, Key Points:

- He needs about 800 grapes. Instead of multiplying 36 bags times 19 grapes, we rounded to think about 40 x 20. This way we can use a simple fact and use place value patterns to quickly multiply.

We can use rounding to estimate factors to quickly find about how much or exact product would be. This is helpful when a precise answer isn't necessary.

Let's Think (Slide 6): Before we practice, let's pause and think about Chloe's situation. Chloe wanted to round 632 and 69 to estimate the product of the two factors. She thought of two different ways to round both factors. Both ways are correct. What do you notice about the two expressions she wrote to help her estimate? Possible Student Answers, Key Points:

- In the first example, she rounded 632 to the nearest ten and 69 to the nearest ten.
- In the second example, she rounded 632 to the nearest hundred and 69 to the nearest hundred.

Both expressions are probably easier to use than 632 x 69, and both would provide a good estimate of the product. Which expression do you think would be easiest for Chloe to solve if she was in a hurry? Possible Student Answers, Key Points:

- I think 600 x 70 is easiest, because I can think of 6 hundreds x 7 tens. 6 x 7 is an easy fact for me.
- Either could work, but 630 x 7 might be tricky. 63 tens x 7 tens would give me an estimate, but I don't know 63 x 7 off the top of my head.

There is no single correct way to round and estimate a product. As you work today, rounding to the largest place value, like Chloe did when she wrote 600 x 70, will be a quick way to arrive at a decent estimate.

Let's Try it (Slides 7 - 8): Now let's work on estimating multi-digit products by rounding factors. We're going to work on this page together, step-by-step. Remember, when we estimate a product, we want to carefully round each factor to a number that is easy to multiply with, and then we can use place value patterns and unit form to help us quickly find an accurate estimate. If at any point we need help rounding, we can always use a vertical number line to identify the closest ten or hundred.

WARM WELCOME

Today we will estimate multi-digit products by rounding factors to a basic fact and using place value patterns.

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Let's Review:

Round 47 to the nearest ten.

Round 232 to the nearest hundred.

Let's Talk:

Which would you rather solve in your head? Why?

12 x 99 **or** 10 x 100

412 x 398 **or** 400 x 400

Let's Think:

Mr. Miller is packing bags of grapes for his daycare students. He makes 36 bags, and he puts 19 grapes in each bag. He wants to know <u>about</u> how many grapes he should buy.

Let's Think:

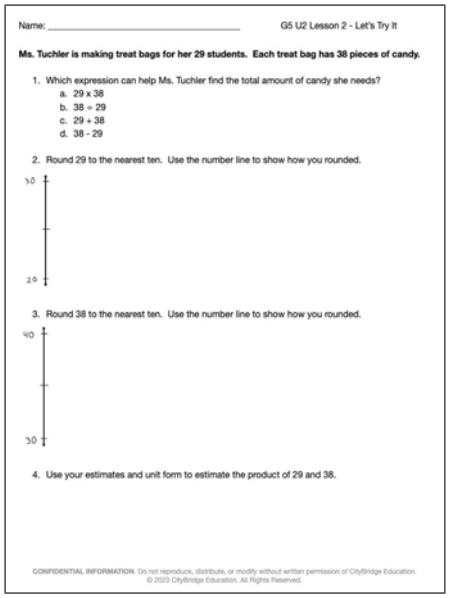
Chloe wants to estimate the product of 632 x 69. Which expression would be simplest for Chloe to estimate quickly?

630 x 70 = ?

600 x 70 = ?

Let's Try It:

Let's explore estimating multi-digit products together.



Name: _____ G5 U2 Lesson 2 - Let's Try It

Ms. Tuchler is making treat bags for her 29 students. Each treat bag has 38 pieces of candy.

1. Which expression can help Ms. Tuchler find the total amount of candy she needs?
   a. 29 x 38
   b. 38 ÷ 29
   c. 29 + 38
   d. 38 - 29

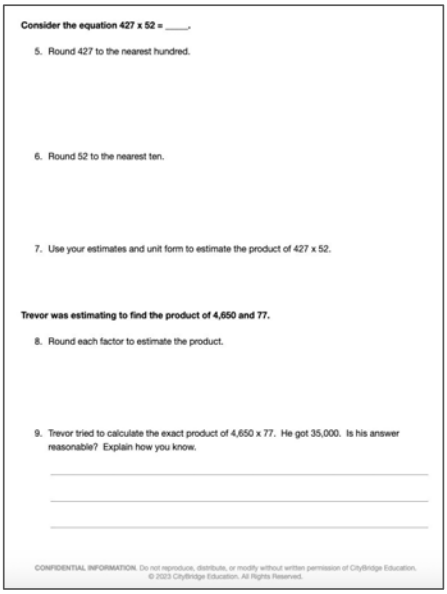
2. Round 29 to the nearest ten. Use the number line to show how you rounded.

30
20

3. Round 38 to the nearest ten. Use the number line to show how you rounded.

40
30

4. Use your estimates and unit form to estimate the product of 29 and 38.



Consider the equation 427 x 52 = ____.

5. Round 427 to the nearest hundred.

6. Round 52 to the nearest ten.

7. Use your estimates and unit form to estimate the product of 427 x 52.

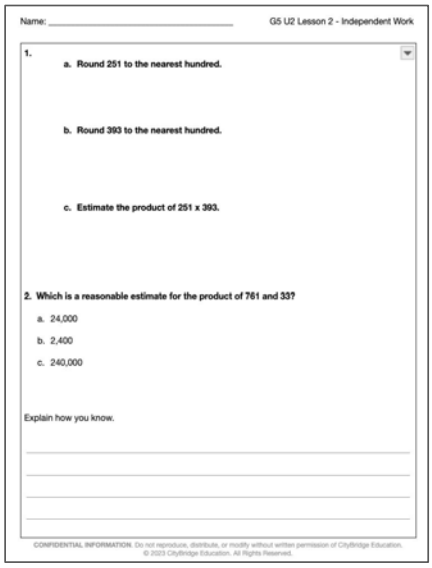
Trevor was estimating to find the product of 4,650 and 77.

8. Round each factor to estimate the product.

9. Trevor tried to calculate the exact product of 4,650 x 77. He got 35,000. Is his answer reasonable? Explain how you know.

On your Own:

Now it's time to explore estimating multi-digit products on your own.



Name: _____ G5 U2 Lesson 2 - Independent Work

1.

a. Round 251 to the nearest hundred.

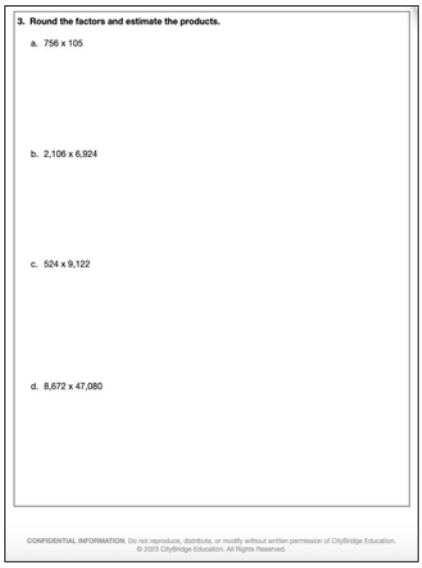
b. Round 393 to the nearest hundred.

c. Estimate the product of 251 x 393.

2. Which is a reasonable estimate for the product of 761 and 33?

a. 24,000
b. 2,400
c. 240,000

Explain how you know.



3. Round the factors and estimate the products.

a. 756 x 105

b. 2,106 x 6,924

c. 524 x 9,122

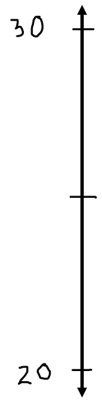
d. 8,672 x 47,080

Name: _____ G5 U2 Lesson 2 - Let's Try It

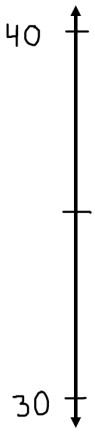
Ms. Tuchler is making treat bags for her 29 students. Each treat bag has 38 pieces of candy.

1. Which expression can help Ms. Tuchler find the total amount of candy she needs?
   a. 29 x 38
   b. 38 ÷ 29
   c. 29 + 38
   d. 38 - 29

2. Round 29 to the nearest ten. Use the number line to show how you rounded.



3. Round 38 to the nearest ten. Use the number line to show how you rounded.



4. Use your estimates and unit form to estimate the product of 29 and 38.

Consider the equation 427 x 52 = _____.

5. Round 427 to the nearest hundred.

6. Round 52 to the nearest ten.

7. Use your estimates and unit form to estimate the product of 427 x 52.

Trevor was estimating to find the product of 4,650 and 77.

8. Round each factor to estimate the product.

9. Trevor tried to calculate the exact product of 4,650 x 77. He got 35,000. Is his answer reasonable? Explain how you know.

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c. Estimate the product of 251 x 393.

2. Which is a reasonable estimate for the product of 761 and 33?

a. 24,000

b. 2,400

c. 240,000

Explain how you know.

3. Round the factors and estimate the products.

a. 756 x 105

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d. 8,672 x 47,080

Name: KEY

G5 U2 Lesson 2 - Let's Try It

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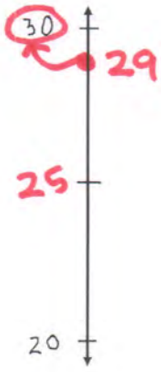
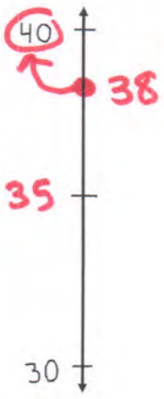


29 ≈ 30

3. Round 38 to the nearest ten. Use the number line to show how you rounded.



38 ≈ 40

4. Use your estimates and unit form to estimate the product of 29 and 38.

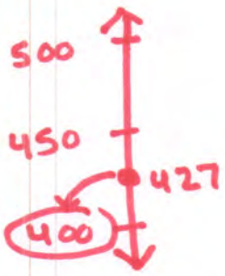
30 x 40 = ?

3 tens x 4 tens = 12 hundreds

1,200 pieces

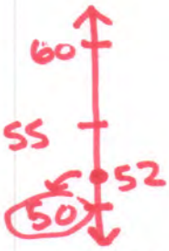
Consider the equation 427 x 52 = _____.

5. Round 427 to the nearest hundred.



427 ≈ 400

6. Round 52 to the nearest ten.



52 ≈ 50

7. Use your estimates and unit form to estimate the product of 427 x 52.

400 x 50 = ?

4 hundred x 5 tens = 20 thousand

20,000

Trevor was estimating to find the product of 4,650 and 77.

8. Round each factor to estimate the product.

4650 ≈ 5,000

77 ≈ 80

(5 x 8) x (1,000 x 10)

40 x 10,000

400,000

9. Trevor tried to calculate the exact product of 4,650 x 77. He got 35,000. Is his answer reasonable? Explain how you know.

No. The estimate I got was 400,000 and 35,000 is far too low. It is unreasonable.

Name: KEY

1.

a. Round 251 to the nearest hundred.

$251 \approx 300$

b. Round 393 to the nearest hundred.

$393 \approx 400$

c. Estimate the product of 251 x 393.

300×400

$(3 \times 4) \times (100 \times 100)$

$12 \times (10{,}000) \rightarrow 120{,}000$

2. Which is a reasonable estimate for the product of 761 and 33?

a. 24,000

b. 2,400

c. 240,000

$\approx 800 \quad \approx 30$

$(3 \times 8) \times (100 \times 10)$

24×1000

$24{,}000$

Explain how you know.

I estimated that $761 \approx 800$ and $33 \approx 30$. I know $3 \times 8 = 24$ and tens x hundreds = thousands, so 24 thousands is reasonable.

3. Round the factors and estimate the products.

a. 756 x 105

800 x 100

(8 x 1) x (100 x 100)

8 x 10,000

80,000

b. 2,106 x 6,924

2,000 x 7,000

(2 x 7) x (1,000 x 1,000)

14 x 1,000,000

14,000,000

c. 524 x 9,122

500 x 9,000

(5 x 9) x (100 x 1,000)

45 x (100,000)

4,500,000

d. 8,672 x 47,080

9,000 x 50,000

(9 x 5) x (1,000 x 10,000)

45 x 10,000,000

450,000,000

G5 U2 Lesson 3

Write and interpret numerical expressions, and compare expressions

G5 U2 Lesson 3 - Students will write and interpret numerical expressions, and compare expressions using a visual model

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will explore how to represent numerical expressions, meaning numbers as symbols, with models and with words/verbal descriptions. As we'll see, being able to reason carefully about expressions can help us compare them without always having to find their values. Let me show you what I mean!

Let's Review (Slide 3): When we talk or write about numerical expressions, we often use common math vocabulary. Here you'll see some words that you've likely seen before. (*point and read*) Sum means the answer to an addition problem. Difference means the answer to a subtraction problem. Product means the answer to a multiplication problem. Quotient means the answer to a division problem. These words will come up today, so I want to make sure they're at the top of your mind.

We also might see the words double, triple, or half when we're interpreting numerical expressions. What do you know about the meaning of these words? Possible Student Answers, Key Points:

- Double is when you have twice as much, or you multiply by 2.
- Triple is when you have three times as much, or you multiply by 3.
- Half is when you split something evenly two ways, like dividing by 2.

Nice! These words will help us as we reason about expressions today.

Let's Talk (Slide 4): Take a second to look at the three representations here. We see a tape diagram, a numerical expression, and words or a verbal description. What do you notice? What do you wonder? (*pause for think time*) Possible Student Answers, Key Points:

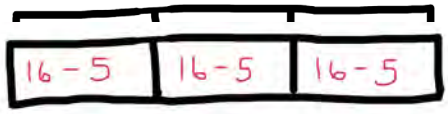
- I notice they all have 8 and 3.
- I notice the top one is a model and the other two are numbers and words.
- I notice they all have a total of 24. They're all different ways to show the same thing.

Those are all great ideas. Each of these three representations are ways we can think about "3 groups of 8". Where does each representation show "3 groups of 8"? Possible Student Answers, Key Points:

- The tape diagram shows 3 boxes with 8 in each one.
- The numerical expression in the middle show 3 times 8, which is the same as 3 groups of 8.
- Product means the answer to a multiplication problem, so it's just words that mean 3 x 8 or 3 groups of 8.

Our work today is going to involve thinking and reasoning about different ways to represent a numerical expression, just like we see here!

Let's Think (Slide 5): Let's read this numerical expression together. Then we'll draw a tape diagram and write verbal description to match. (*read 3 x (16 - 5) together*) We can think of this as 3 groups of (16 - 5). (16 - 5) is our unit, just like how 8 was our unit in the last example. We need to draw a model that shows the difference of 16 and 5 three times. Let's start by drawing three groups or boxes. (*draw three connected boxes*)

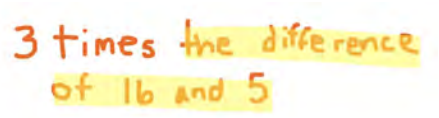


Now, we can see our 3 groups. Let's write 16 - 5 in each box, since we want 3 groups of 16 - 5. (*write 16 - 5 in each box*) This model represents the original expression. Where do we see 3 x (16 - 5) in our tape diagram? Possible Student Answers, Key Points:

- I see 3 boxes, and inside each box is 16 - 5. So we have 1, 2, 3 groups of 16 - 5.

The last thing we need to do is write our expression in words, sometimes called a verbal description. I might be tempted to write (*write as you say*) "3 times 16 minus 5", but that expression isn't really clear. That might make somebody think we took 3 groups of 16 and then subtracted 5. That's not what the model shows. (*cross out verbal expression*). I want to think carefully about how I can describe 3 groups of our unit. How can we describe our unit (*point to 16 - 5 in tape diagram*) using one of the words we reviewed earlier? Possible Student Answers, Key Points:

- The answer to a subtraction problem is called the difference, so we can say the difference of 16 - 5.



Excellent! So a better verbal description might be (*write as you say*) "3 times the difference of 16 and 5". Writing "the difference of 16 and 5" (*highlight or underline*) makes the unit crystal clear in our verbal description.

We just interpreted the expression 3 x (16 - 5) using a visual model and a verbal description. We see three ways to think about the same mathematical relationship.

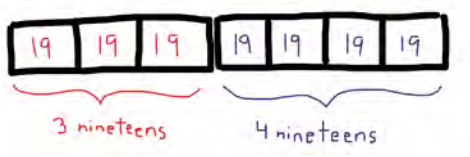
Let's Think (Slide 6): Let's look at another one. Here, we're given the verbal description, and we're being asked to interpret it using a model and a numerical expression. (*read "the sum of 3 nineteens and 4 nineteens")* What words or phrases in our expression stand out to you? Possible Student Answers, Key Points:

- I know sum means the answer to an addition problem. The word nineteen is just the number 19. 3 nineteens means 3 groups of 19. 4 nineteens means 4 groups of 19.

Let's think about how we can represent this with a model. I know I want to find the sum of 3 nineteens and 4 nineteens, so I'm combining groups of 19. Let me start by drawing a tape diagram that shows 3 groups of nineteen. (*Draw a tape diagram with three equal, connected boxes. Label each with 19 inside. Use a bracket to label the entire rectangle as 3 nineteens.)*

The verbal description wants me to find the sum of this and 4 nineteens. How could I show 4 nineteens? Possible Student Answers, Key Points:

- Draw 4 boxes with 19 in each.
- Draw what we just drew, but with another group.

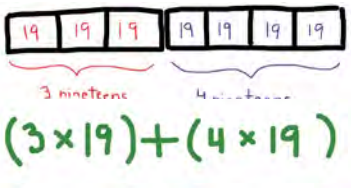


Okay, so let's draw 4 more groups of 19 attached to our 3 groups of 19. (*draw and label 4 more groups of 19).*

How does this model show "the sum of 3 nineteens and 4 nineteens"? Possible Student Answers, Key Points:

- We are adding 3 groups of 19 to 4 groups of 19. We show that in the model by drawing three equal boxes with 19 in each, then we join that with 4 more boxes of 19.

Now we just need to represent our verbal description and model using a numerical expression, or numbers and symbols. You already named that we were adding groups of 19 together, because we were finding the sum of the groups. (*write a + sign*) And since I know we were adding two quantities, I'm going to use parentheses to clearly show what we were adding (*write sets of parentheses on both sides of the plus sign, aligned with the tape diagram)*



What expressions can I use to fill in my parentheses? Think about how we can write 3 nineteens and 4 nineteens as numbers and symbols. (*write as student shares*) Possible Student Answers, Key Points:

- nineteens is 3 x 19. 4 nineteens is 4 x 19.
- see 3 boxes of 19, so that's 3 x 19. I see 4 boxes of 19, so that's 4 x 19.

We know there are many ways to write and say expressions. We could have said 19 + 19 + 19 to show 3 nineteens, for example. There are multiple numerical expressions that can work for our problems today; we just have to make sure they actually match the problem.

Let's Think (Slide 7): Before we wrap up today and jump into practicing, I want us to think about these two expressions. What do you notice about both expressions? Possible Student Answers, Key Points:

- They both have x and +. They both have 20 and 4 and 9.
- They both have (4 + 9) as a unit. The first expression is 20 groups of that, and the other is 18 groups of that.

Nice work. If we wanted to compare these expressions, we could compute the value of each. You noticed some things that each expression has in common that will actually help us compare much faster. They both show groups of 4 + 9 (*highlight 4 + 9 in each expression using the same color)*. The first expression shows 20 groups of 4 + 9 (*highlight 20 in another color)*. The second

expression shows 18 groups of 4 + 9 (*highlight 18 in a different color).* Since our unit, 4 + 9, is the same in both, we can compare without doing the computation. I know 20 groups of anything will be <u>greater</u> than 18 groups of the same unit. (*fill in > symbol).*

Sometimes pausing to think about expressions can help us interpret and compare them more efficiently than if we were to sit down and find the value of each.

Let's Try it (Slides 8 - 9): Now let's work on writing, interpreting, and comparing numerical expressions. We're going to work on this page together, step-by-step. Remember, we can represent an expression using a model, numbers and symbols, and words/verbal descriptions. Tape diagrams can help us think carefully about the relationship between the numbers. We know that sometimes we can use the relationship between the numbers to compare numerical expressions without having to do the computation.

WARM WELCOME

Today we will write and interpret numerical expressions and compare expressions using a visual model.

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Let's Review:

15 + 5 = 20	sum
15 - 5 = 10	difference
15 x 5 = 45	product
15 ÷ 5 = 3	quotient

DOUBLE

TRIPLE

HALF

Let's Talk:

What do you notice? What do you wonder?

3 x 8

the product of 3 and 8

Let's Think:

3 x (16 - 5)

MODEL	VERBAL DESCRIPTION

Let's Think:

the sum of 3 nineteens and 4 nineteens

MODEL	NUMERICAL EXPRESSION

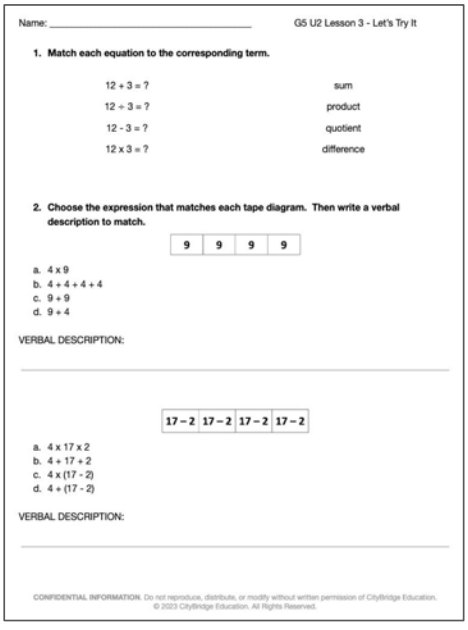
Let's Think:

Can we compare using <, >, or = without evaluating?

20 x (4 + 9) _____ (4 + 9) x 18

Let's Try It:

Let's explore estimating multi-digit products together.



Name: _____ G5 U2 Lesson 3 - Let's Try It

1. Match each equation to the corresponding term.

12 + 3 = ?	sum
12 ÷ 3 = ?	product
12 - 3 = ?	quotient
12 x 3 = ?	difference

2. Choose the expression that matches each tape diagram. Then write a verbal description to match.

9	9	9	9

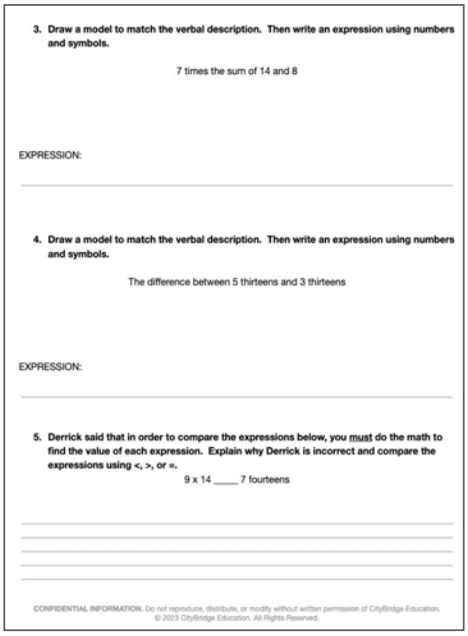
a. 4 x 9
b. 4 + 4 + 4 + 4
c. 9 + 9
d. 9 + 4

VERBAL DESCRIPTION:

17 – 2	17 – 2	17 – 2	17 – 2

a. 4 x 17 x 2
b. 4 + 17 + 2
c. 4 x (17 - 2)
d. 4 + (17 - 2)

VERBAL DESCRIPTION:



3. Draw a model to match the verbal description. Then write an expression using numbers and symbols.

7 times the sum of 14 and 8

EXPRESSION:

4. Draw a model to match the verbal description. Then write an expression using numbers and symbols.

The difference between 5 thirteens and 3 thirteens

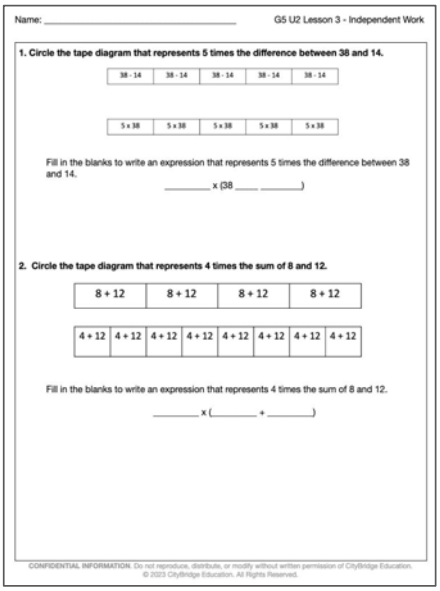
EXPRESSION:

5. Derrick said that in order to compare the expressions below, you must do the math to find the value of each expression. Explain why Derrick is incorrect and compare the expressions using <, >, or =.

9 x 14 ____ 7 fourteens

On your Own:

Now it's time to explore estimating multi-digit products on your own.



Name: _____ G5 U2 Lesson 3 - Independent Work

1. Circle the tape diagram that represents 5 times the difference between 38 and 14.

38 - 14	38 - 14	38 - 14	38 - 14	38 - 14

5 x 38	5 x 38	5 x 38	5 x 38	5 x 38

Fill in the blanks to write an expression that represents 5 times the difference between 38 and 14.

_____ x (38 ____ _____)

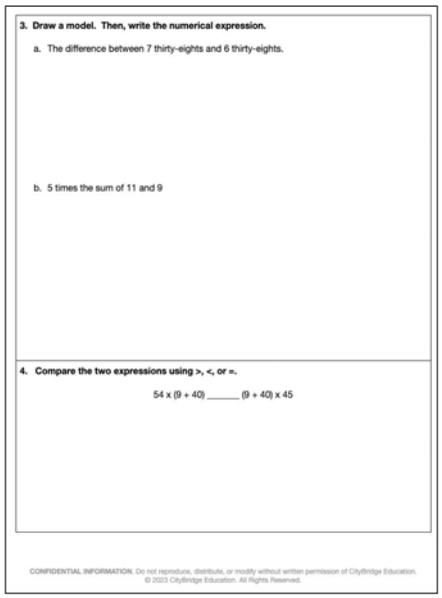
2. Circle the tape diagram that represents 4 times the sum of 8 and 12.

8 + 12	8 + 12	8 + 12	8 + 12

4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12

Fill in the blanks to write an expression that represents 4 times the sum of 8 and 12.

_____ x (_____ + _____)



3. Draw a model. Then, write the numerical expression.

a. The difference between 7 thirty-eights and 6 thirty-eights.

b. 5 times the sum of 11 and 9

4. Compare the two expressions using >, <, or =.

54 x (9 + 40) _____ (9 + 40) x 45

1. Match each equation to the corresponding term.

12 + 3 = ?	sum
12 ÷ 3 = ?	product
12 - 3 = ?	quotient
12 x 3 = ?	difference

2. Choose the expression that matches each tape diagram. Then write a verbal description to match.

9	**9**	**9**	**9**

a. 4 x 9
b. 4 + 4 + 4 + 4
c. 9 + 9
d. 9 + 4

VERBAL DESCRIPTION:

---

17 – 2	**17 – 2**	**17 – 2**	**17 – 2**

a. 4 x 17 x 2
b. 4 + 17 + 2
c. 4 x (17 - 2)
d. 4 + (17 - 2)

VERBAL DESCRIPTION:

---

3. Draw a model to match the verbal description. Then write an expression using numbers and symbols.

7 times the sum of 14 and 8

EXPRESSION:

4. Draw a model to match the verbal description. Then write an expression using numbers and symbols.

The difference between 5 thirteens and 3 thirteens

EXPRESSION:

5. Derrick said that in order to compare the expressions below, you must do the math to find the value of each expression. Explain why Derrick is incorrect and compare the expressions using <, >, or =.

9 x 14 _____ 7 fourteens

Name: _____ G5 U2 Lesson 3 - Independent Work

1. Circle the tape diagram that represents 5 times the difference between 38 and 14.

38 - 14	38 - 14	38 - 14	38 - 14	38 - 14

5 x 38	5 x 38	5 x 38	5 x 38	5 x 38

Fill in the blanks to write an expression that represents 5 times the difference between 38 and 14.

_____ x (38 _____ _____)

2. Circle the tape diagram that represents 4 times the sum of 8 and 12.

8 + 12	8 + 12	8 + 12	8 + 12

4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12

Fill in the blanks to write an expression that represents 4 times the sum of 8 and 12.

_____ x (_____ + _____)

3. Draw a model. Then, write the numerical expression.

   a. The difference between 7 thirty-eights and 6 thirty-eights.

b. 5 times the sum of 11 and 9

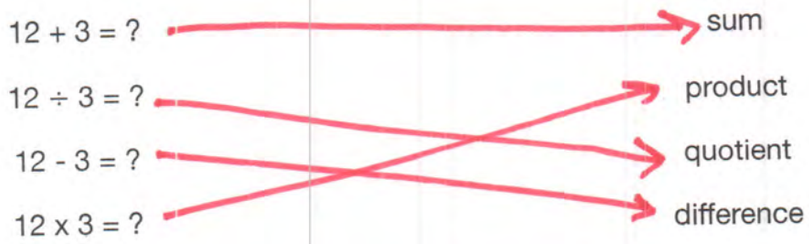
4. Compare the two expressions using >, <, or =.

54 x (9 + 40) _____ (9 + 40) x 45

Name: KEY

*expect some variety in models and expressions

1. **Match each equation to the corresponding term.**



2. **Choose the expression that matches each tape diagram. Then write a verbal description to match.**

9	9	9	9

a. 4 x 9 ← I see 4 groups of 9
b. 4 + 4 + 4 + 4
c. 9 + 9
d. 9 + 4

VERBAL DESCRIPTION:

The product of 4 nines

17 – 2	17 – 2	17 – 2	17 – 2

a. 4 x 17 x 2
b. 4 + 17 + 2
c. 4 x (17 - 2) ← I see "17-2" four times
d. 4 + (17 - 2)

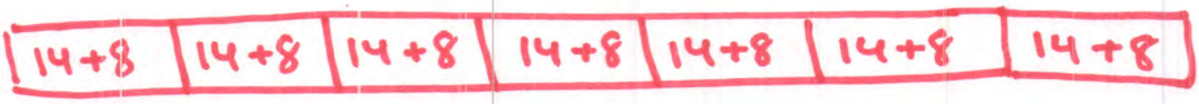
VERBAL DESCRIPTION:

Four times the difference of 17 and 2

3. **Draw a model to match the verbal description. Then write an expression using numbers and symbols.**

(14 + 8)

7 times the sum of 14 and 8



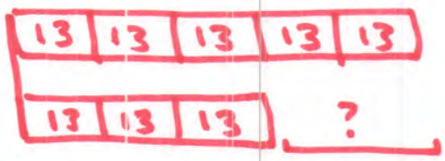
EXPRESSION:

$7 \times (14 + 8)$

4. **Draw a model to match the verbal description. Then write an expression using numbers and symbols.**

(5×13) (3×13)

The difference between 5 thirteens and 3 thirteens



EXPRESSION:

$(5 \times 13) - (3 \times 13)$

5. **Derrick said that in order to compare the expressions below, you must do the math to find the value of each expression. Explain why Derrick is incorrect and compare the expressions using <, >, or =.**

9 x 14 (>) 7 fourteens

I can think of 9×14 as "9 fourteens". I know that 9 groups of 14 is going to be more than 7 groups of 14.

Name: KEY

1. Circle the tape diagram that represents 5 times the difference between 38 and 14.

(38 - 14)

38 - 14	38 - 14	38 - 14	38 - 14	38 - 14

5 x 38	5 x 38	5 x 38	5 x 38	5 x 38

Fill in the blanks to write an expression that represents 5 times the difference between 38 and 14.

5 x (38 - 14)

2. Circle the tape diagram that represents 4 times the sum of 8 and 12.

(8 + 12)

8 + 12	8 + 12	8 + 12	8 + 12

4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12	4 + 12

Fill in the blanks to write an expression that represents 4 times the sum of 8 and 12.

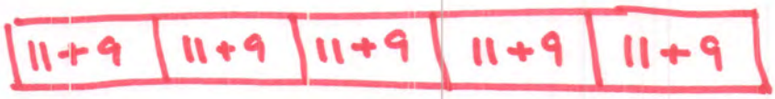
4 x (8 + 12)

3. Draw a model. Then, write the numerical expression.

a. The difference between 7 thirty-eights and 6 thirty-eights.

$(7 \times 38) - (6 \times 38)$

b. 5 times the sum of 11 and 9



$5 \times (11+9)$

4. Compare the two expressions using >, <, or =.

54 x (9 + 40) (>) (9 + 40) x 45

54 groups

45 groups

G5 U2 Lesson 4

Connect visual models and the distributive property to partial products of the standard algorithm without renaming

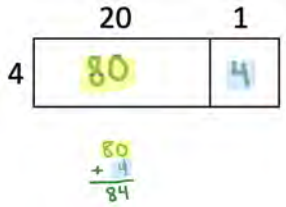
G5 U2 Lesson 4 - Students will connect visual models and the distributive property to partial products of the standard algorithm without renaming

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will revisit how to multiply factors using an area model and the distributive property. We'll use similar thinking and apply that to showing our work using the standard algorithm.

Let's Talk (Slide 3): Take a look at how a student multiplied 21 x 4. What do you notice about their representation? What do you wonder? Possible Student Answers, Key Points:

- I notice it's an area model. I notice they broke apart 21 into 20 and 1. I notice they found 20 x 4 and 1 x 4 and then added those together. I notice the answer is 84.
- I wonder why they broke apart their numbers. I wonder if their answer is correct. I wonder why they solved this way.



Thanks for sharing. I heard a lot of great things. This is called an area model. An area model helps us break apart and distribute with our factors to find partial products that are easy to work with. (*point to features as you explain them)* In this case, the student was multiplying 21 x 4. They broke the factor of 21 into 20 and 1 and distributed by multiplying each part by 4 inside the rectangles. 4 x 20 is the same as 4 x 2 tens. They got 8 tens, or 80. 4 x 1 one is 4. Then they added the partial products to get their answer of 84. *(Highlight or circle 80 in one color in the model and the addition. Do the same with the 1, but use a different color.)*

Breaking apart a factor is a quick way to make multiplying big numbers more manageable. An area model is one way to show that work; today, we'll see how we can show similar thinking using a written, vertical form called the standard algorithm.

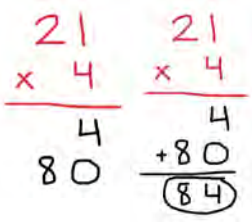
Let's Think (Slide 4): When using the standard algorithm, we start by stacking the factors vertically. It looks similar to how you might stack two addends by lining up the place value of each digit, but we're multiplying. (*set up 21 x 4 in vertical form)*.

Now, just like when we use the area model, we can think carefully about each digit and its place value to help us multiply in parts. In an area model, we broke 21 into 20 + 1. When we use the algorithm, we'll think of it in the same way, but we'll keep 21 in standard form. *(point to 4, then to 1)* What is 4 x 1 one? Possible Student Answers, Key Points:

- 4 x 1 one equals 4 ones.

(*write 4 under the line)* Great! I'll record that partial product underneath the line. Now let's think about the 2 in 21. The 2 in 21 isn't just 2, it's 2 tens. (*point to 4, then to 2*) What is 4 times 2 tens? Possible Student Answers, Key Points:

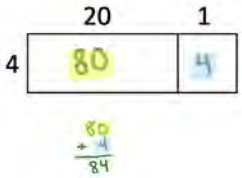
- 4 x 2 tens equals 8 tens or 80.

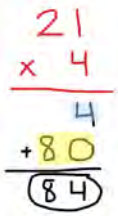


Excellent. I'll record the partial product of 80 underneath the other partial product of 4. Now all we have to do is add the two partial products. (*write as you talk)* 80 + 4 = 84. That's how you multiply using the standard algorithm.

Let's look at the area model and the standard algorithm, or vertical form, side-by-side. (*put work samples side-by-side*) What's the same? What's different? (*have student point or highlight each representation as they mention valid similarities and differences)* Possible Student Answers, Key Points:

- They both have factors of 21 and 4. They have the same product of 84. They each show partial products of 4 and 80, because we multiplied 4 x 20 and 4 x 1 in both. I see multiplication and addition in both.
- The area model actually breaks apart the 21, but in the algorithm we only really break up the 21 in our heads. The area model uses boxes to think about each partial product, but the standard algorithm just writes them beneath the line. The area model requires you to add off to the side, but the standard algorithm includes the addition at the bottom.



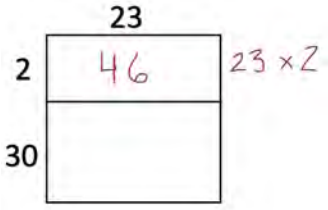


Nicely done. They're two ways to represent very similar thinking. In both cases we break apart 21 into 20 and 1, whether in the model or just by thinking about the place value of each digit. In both cases, we distribute the 4 by multiplying it by each part of 21. We get the same partial products (*highlight with corresponding colors*), and then we add to get the same final product. The two representations look different at first glance, but are very similar!

Let's Think (Slide 5): Let's try one more. This problem involves multiplying a 2-digit number by another 2-digit number. We'll see that the process for using the area model and the standard algorithm don't change; we'll just need to be a bit more careful as we multiply.

We're multiplying 32 x 23. Let's start with the area model. This model decomposed 32 into 30 and 2. How can I find the area of this top rectangle? Possible Student Answers, Key Points:

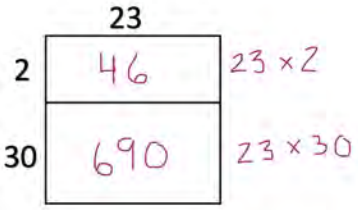
- That section has a length of 23 and a width of 2, so 23 x 2 = 46.



23 times 2 equals 46, or 23 times 2 ones equals 46 ones. (*fill 46 in the area model and write 23 x 2 outside of the area model)*

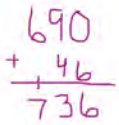
Let's carefully think about the other partial product. How can I find the area of the bottom rectangle? Use unit form for 30, if that helps you explain. Possible Student Answers, Key Points:

- I need to multiply 23 x 30. I can think of that as just 23 x 3 tens, which is 69 tens. 69 tens is 690.



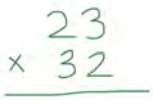
23 times 30 is the same as 23 x 3 tens. This means I just need to think about the product of 23 x 3, then I can adjust based on the place value. If I don't know 23 x 3, I could use repeated addition to add 23 + 23 + 23. No matter how I get there, the 23 x 3 = 69, so 23 x 3 = 69 tens or 690. (*fill in 690 in the area model and write 23 x 30 outside the area model)*

Now let's add the partial products. (*write addition vertically as you talk)* 690 plus 46 equals 736.

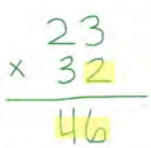


Just like with the previous problem, we used the area model to break apart a factor, multiply to find our partial products, then add the partial products together. Now let's see if we get the same answer when we use the standard algorithm.

(*draw a line to separate the area model from the standard algorithm on your workspace)*

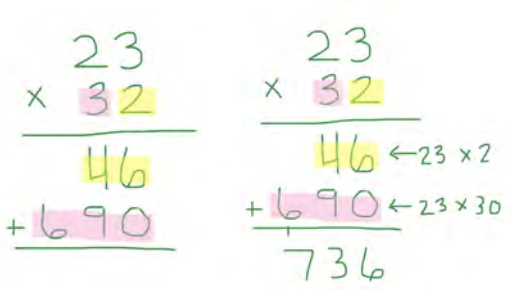


Let's begin by stacking our factors vertically. We can put them in either order, but let's put the 23 on top and the 32 on bottom for this example.



To find our first partial product, we'll multiply 23 by the 2 ones in 32. (*point to each number as you refer to it, then highlight the 2)* 23 times 2 ones is 46. *(highlight 46 in the same color as the 2)*

Now, we're not finished. We only multiplied 23 by 2, but we know we need to multiply 23 x 32, so we still need to distribute 23 to 30. 23 times 3 would be 69, but I know this 3 is really 3 tens (*highlight 3 in a different color).* So 23 times 3 tens is 69 tens. I'll write 690 as my other partial product (*write and highlight in the same color as 3).* I'll line up with 46 so



each place value is stacked; this will make it easier to add our partial products. We multiplied 23 x 2 (*write to the side of 46)* and 23 x 30 (*write to the side of 690*) and found our partial products of 46 and 690. When we add them, we end up with a product of 736.

Take a look at our two representations. Where do you see each step of the area model in our vertical form or standard algorithm? Possible Student Answers, Key Points:

- First, we broke up 32. We see that on the side of the area model, but in the algorithm we just think of 32 as being 3 tens and 2 ones in our brains.
- Then we multiplied 23 x 2 ones. I see that in the first section of the area model. In the algorithm, we wrote the partial product below the line.
- Then we multiplied 23 x 30. I see that in the second section of the area model. In the algorithm, we thought of the 3 as 3 tens, then wrote 690 beneath the other partial product.
- We added next to the area model, but in the algorithm, we add at the bottom as the last step.

As we saw in each example today, both representations break apart and distribute to find the product. The area model is a more visual way of thinking of multiplication, while the vertical form/algorithm relies more on carefully thinking about the place value of each digit as you multiply. Either works, and today we're practicing both!

Let's Try it (Slides 6 - 7): Now let's work together on connecting visual models and the distributive property to partial products with the standard algorithm. Just like we break apart factors and distribute in an area model, we can carefully think about multiplying a factor by each unit in the other factor and record our thinking in two partial products. Just like with the area model, once we find our partial products, we can add to combine them into our final answer.

WARM WELCOME

Today we will connect visual models and the distributive property to partial products of the standard algorithm without renaming.

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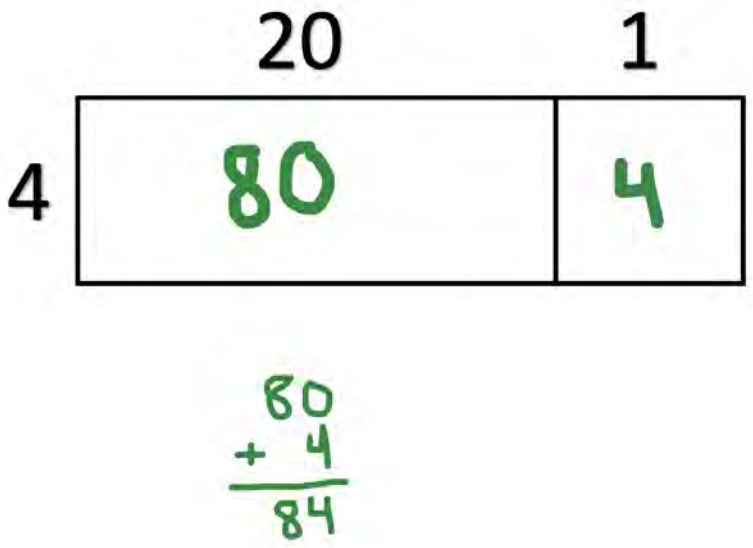
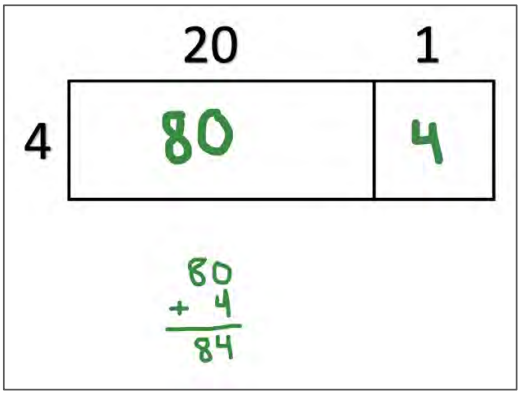
Let's Talk:

What do you notice or wonder about the work shown here?



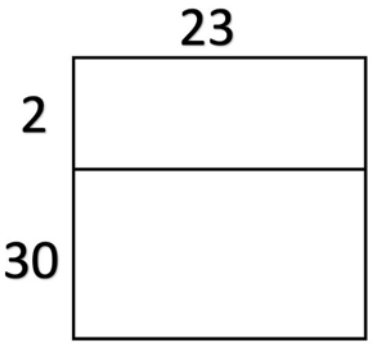
Let's Talk:

We can show similar thinking using the standard algorithm.



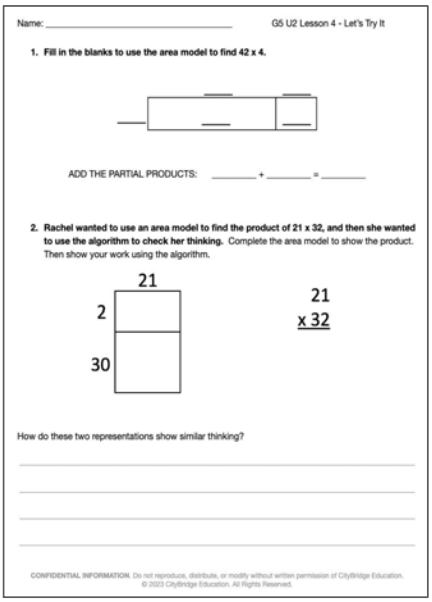
Let's Talk:

Find the product of 32 and 23 using the area model and the standard algorithm.



Let's Try It:

Let's explore connecting visual models to partial products with the standard algorithm together.



Name: _____ G5 U2 Lesson 4 - Let's Try It

1. **Fill in the blanks to use the area model to find 42 x 4.**

ADD THE PARTIAL PRODUCTS: _____ + _____ = _____

2. **Rachel wanted to use an area model to find the product of 21 x 32, and then she wanted to use the algorithm to check her thinking.** Complete the area model to show the product. Then show your work using the algorithm.

21
2
30

21
x 32

How do these two representations show similar thinking?

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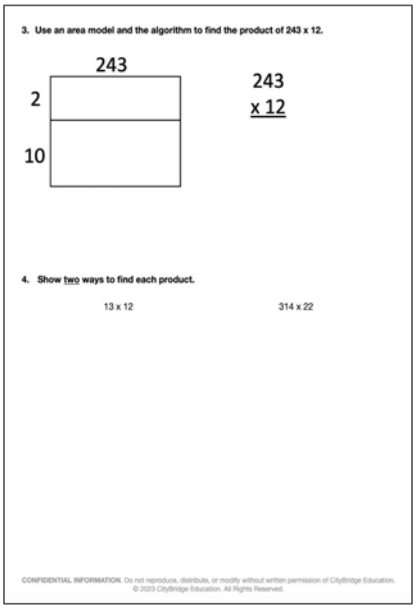

3. **Use an area model and the algorithm to find the product of 243 x 12.**

243
2
10

243
x 12

4. **Show two ways to find each product.**

13 x 12 314 x 22

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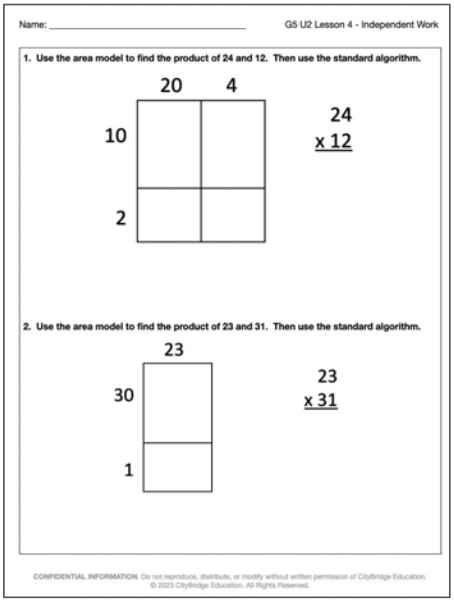
On your Own:

Now it's time to explore connecting visual models to partial products with the standard algorithm on your own.



Name: _____ G5 U2 Lesson 4 - Independent Work

1. Use the area model to find the product of 24 and 12. Then use the standard algorithm.

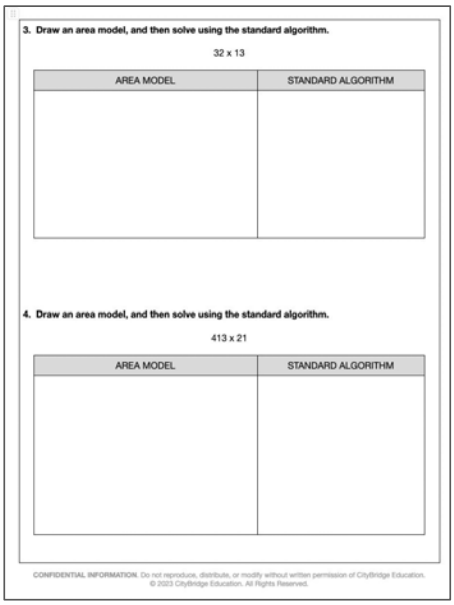
	20	4
10		
2		

24
x 12

2. Use the area model to find the product of 23 and 31. Then use the standard algorithm.

	23
30	
1	

23
x 31



3. Draw an area model, and then solve using the standard algorithm.

32 x 13

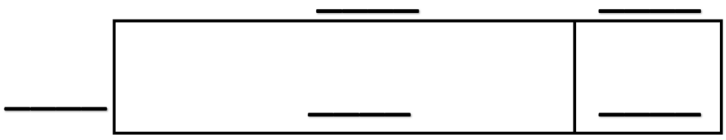
AREA MODEL	STANDARD ALGORITHM

4. Draw an area model, and then solve using the standard algorithm.

413 x 21

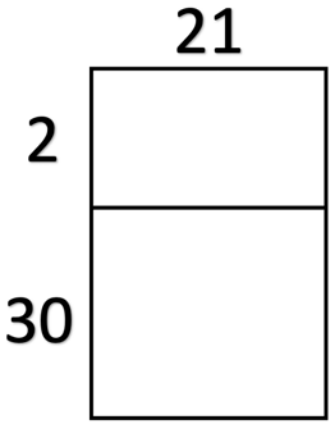
AREA MODEL	STANDARD ALGORITHM

1. Fill in the blanks to use the area model to find 42 x 4.



ADD THE PARTIAL PRODUCTS: _____ + _____ = _____

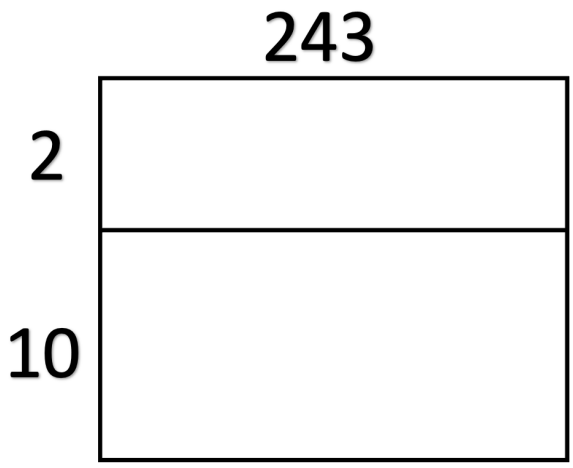
2. Rachel wanted to use an area model to find the product of 21 x 32, and then she wanted to use the algorithm to check her thinking. Complete the area model to show the product. Then show your work using the algorithm.



21
x 32

How do these two representations show similar thinking?

3. Use an area model and the algorithm to find the product of 243 x 12.



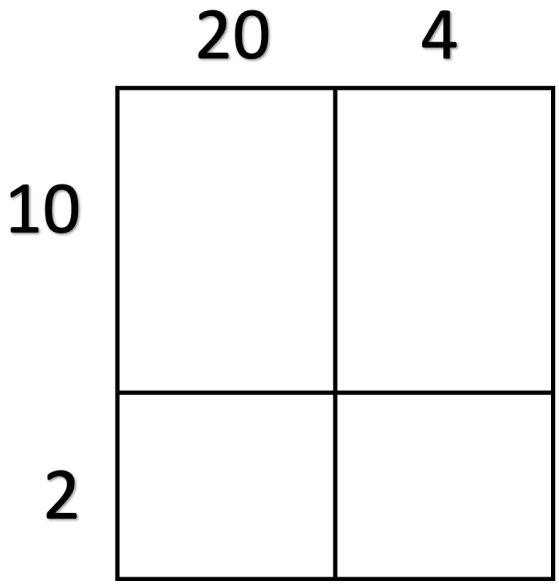
243
x 12

4. Show <u>two</u> ways to find each product.

13 x 12

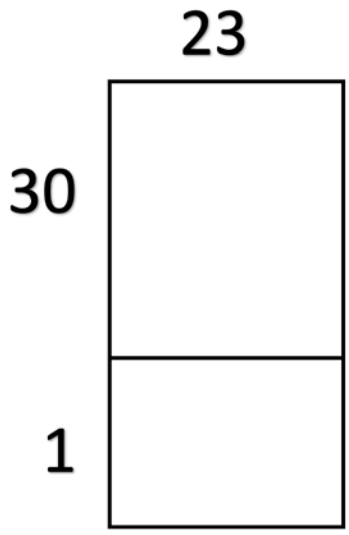
314 x 22

1. Use the area model to find the product of 24 and 12. Then use the standard algorithm.



$$\begin{array}{r} 24 \\ \times\ 12 \\ \hline \end{array}$$

2. Use the area model to find the product of 23 and 31. Then use the standard algorithm.



$$\begin{array}{r} 23 \\ \times\ 31 \\ \hline \end{array}$$

3. Draw an area model, and then solve using the standard algorithm.

32 x 13

AREA MODEL	STANDARD ALGORITHM

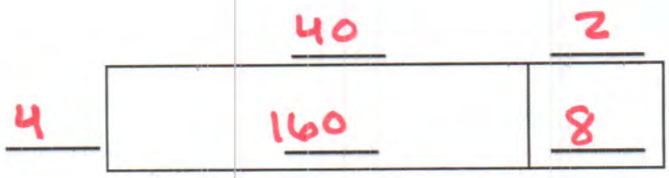
4. Draw an area model, and then solve using the standard algorithm.

413 x 21

AREA MODEL	STANDARD ALGORITHM

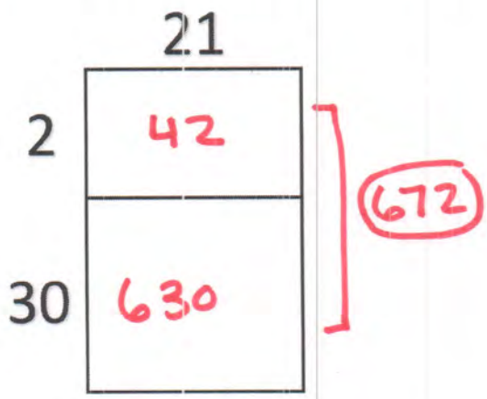
Name: KEY

1. **Fill in the blanks to use the area model to find 42 x 4.**



ADD THE PARTIAL PRODUCTS: 160 + 8 = 168

2. **Rachel wanted to use an area model to find the product of 21 x 32, and then she wanted to use the algorithm to check her thinking.** Complete the area model to show the product. Then show your work using the algorithm.



$$\begin{array}{r} 21 \\ \times\ 32 \\ \hline 42 \\ +\ 630 \\ \hline 672 \end{array}$$

How do these two representations show similar thinking?

They each show 21 x 32 multiplied to find 2 partial products (42 and 630). They both have the same final product.

3. **Use an area model and the algorithm to find the product of 243 x 12.**

	243
2	486
10	2,430

$$243 \times 12$$

$$\begin{array}{r} 486 \\ +\ 2430 \\ \hline 2,916 \end{array}$$

$$\begin{array}{r} 2430 \\ +\ 486 \\ \hline 2,916 \end{array}$$

4. **Show <u>two</u> ways to find each product.**

13 x 12

	10	3
10	100	30
2	20	6

$$\begin{array}{r} 100 \\ +\ 30 \\ 20 \\ 6 \\ \hline 156 \end{array}$$

	12
10	120
3	36

$$\begin{array}{r} 120 \\ +\ 36 \\ \hline 156 \end{array}$$

314 x 22

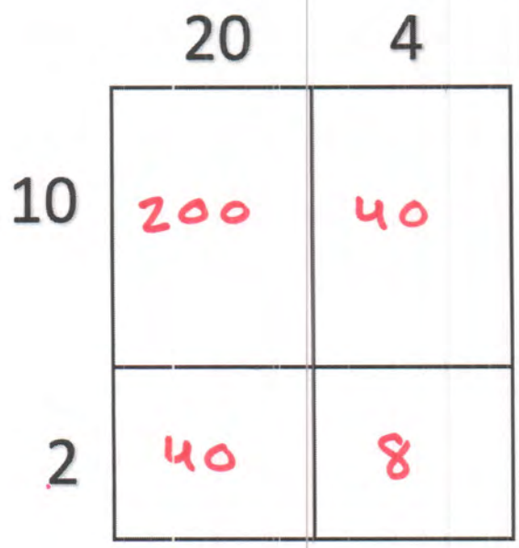
	314
20	6,280
2	628

$$\begin{array}{r} 6280 \\ +\ 628 \\ \hline 6,908 \end{array}$$

$$\begin{array}{r} 314 \\ \times\ 22 \\ \hline 628 \\ +6280 \\ \hline 6,908 \end{array}$$

Name: KEY

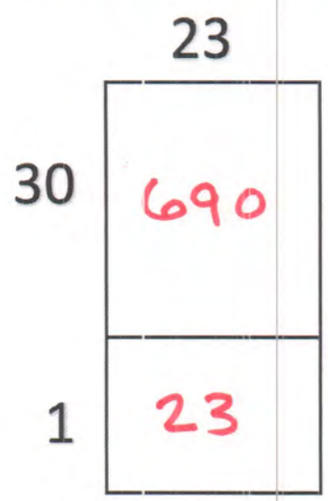
1. Use the area model to find the product of 24 and 12. Then use the standard algorithm.



200
40
40
+ 8
288

$$\begin{array}{r} 24 \\ \times\ 12 \\ \hline 48 \\ +240 \\ \hline 288 \end{array}$$

2. Use the area model to find the product of 23 and 31. Then use the standard algorithm.

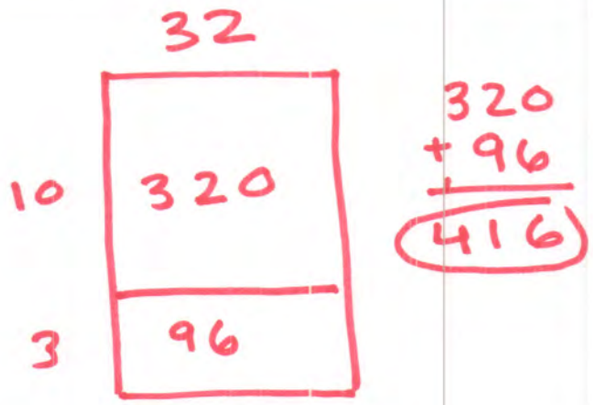
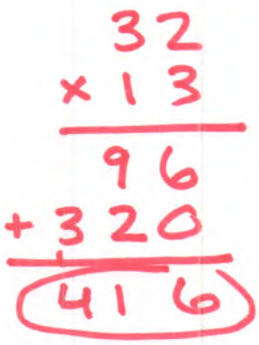


690
+ 23
713

$$\begin{array}{r} 23 \\ \times\ 31 \\ \hline 23 \\ +690 \\ \hline 713 \end{array}$$

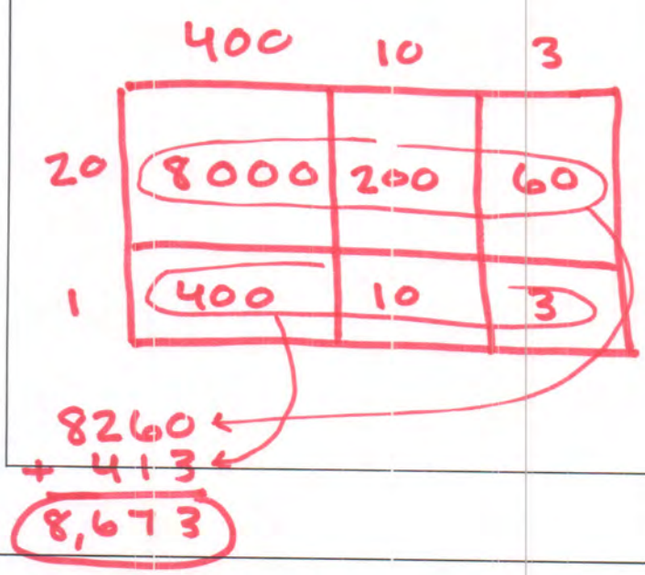
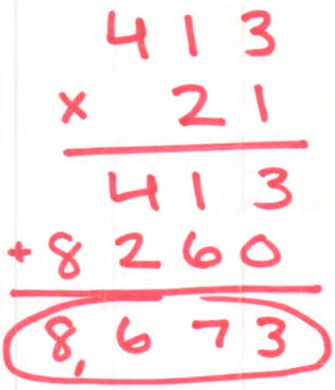
3. Draw an area model, and then solve using the standard algorithm.

32 x 13

AREA MODEL	STANDARD ALGORITHM
	

4. Draw an area model, and then solve using the standard algorithm.

413 x 21

AREA MODEL	STANDARD ALGORITHM
	

G5 U2 Lesson 5

Connect area models and the distributive property to partial products of the standard algorithm with renaming

G5 U2 Lesson 5 - Students will connect area models and the distributive property to partial products of the standard algorithm with renaming.

Warm Welcome (Slide 1): Tutor choice

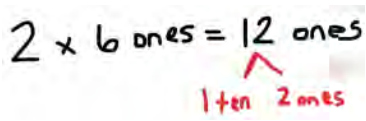
Frame the Learning/Connect to Prior Learning (Slide 2): In our last lesson, we multiplied multi-digit numbers and made connections between the area model and the standard algorithm. In this lesson, we're going to practice that some more. The only difference today is that we'll need to play extra close attention to our units, because some will need to be renamed. Let me show you what I mean.

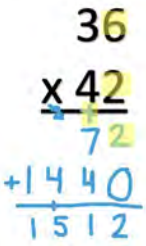
Let's Talk (Slide 3): Take a look at these two work samples. One shows how to find the product of 12 x 42, and the other shows how to find the product of 36 x 42. What do you notice or wonder about the two samples? Possible Student Answers, Key Points:

- I notice they both have 42 as a factor. I notice they both show the standard algorithm. I notice they both add partial products. I notice 36 x 42 is greater than 12 x 42.
- I wonder why they're different colors. I wonder what the area model would look like for each one. I wonder why the blue one shows regrouping on both lines.

Thanks for sharing! One big difference between these two is that the second example requires us to rename units in our standard algorithm. Last lesson, when we multiplied, we didn't need to rename our units. For example, (*write as you explain)* 2 times 2 ones equals 4 ones. Our unit stayed the same, just ones!

If we were to do 2 times 6 ones (*write as you explain)*, then we'd need to rename our unit. 2 times 6 ones is 12 ones. We can't have more than 9 of a unit in each place value when we write numbers in standard form, so we'd rename 12 ones as 1 ten and 2 ones (*write number bond underneath 12 ones to show 1 ten and 2 ones)*.

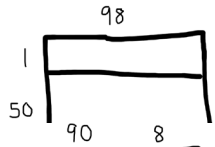


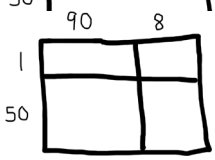


Look at the second example. They multiplied 6 times 2, and they wrote 2 in the ones place and regrouped 1 ten on the line (*highlight or point to where this shows up in the algorithm example*) We see this type of renaming or regrouping often in addition as well. Today, we'll want to think carefully when we have 10 or more of a unit so that we can rename as we move through out multiplication with the standard algorithm.

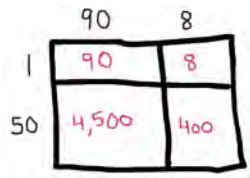
Let's Think (Slide 4): Let's consider how we could draw an area model to find the product of 98 x 51. I can break 51 into 50 and 1 (*draw area model*). Hm, this area model actually doesn't seem that helpful. Why might this area model be challenging to use? Possible Student Answers, Key Points:

- The numbers are big, so it's hard to think about the partial products in my head.
- I don't know what 98 x 50 is. I'd still have to do some calculations to figure it out.

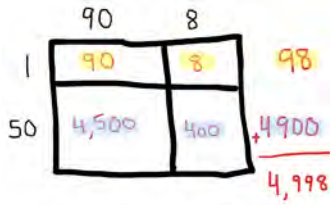




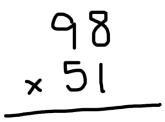
The way I've broken up only one factor could make it challenging to quickly find the partial products. To help, I'll break up the other factor. How can I break up 98 for my area model? (98 is 9 tens, 8 ones, so 90 and 8) Great, let's show that (*partition the area model vertically to show 90 and 8)*. This will be much easier to work with.



Help me out. (*fill in products as student shares*) 90 x 50 is what? (4,500) 8 x 50 is what? (400) What are my remaining two partial products? (90 x 1 = 90, and 8 x 1 = 8) Well done! Let's combine the partial products to get our answer.



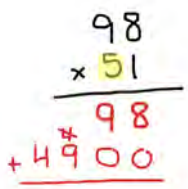
If I combine the partial products for 98 x 1 (*highlight 90 and 8 in a color)*, I get 98. (*write 98 to the side and highlight in the same color)* If I combine the partial products for 98 x 50, I get 4,900 (*write 4,900 to the side and highlight 4,500, 400 and 4,900 in a different color)*. Now we add those together to get our full product of 4,998. We broke apart each factor, found all four partial products, and added them to determine the final product. Nice work!



Let's see what's the same and different about showing this work in vertical form using the standard algorithm. Let's start by neatly stacking our factors. (*write 98 x 51 in vertical form with 98 on top and 51 on bottom)*

(*highlight or point to the 1 in 51)* Let's start by multiplying 98 x 1. 98 x 1 is pretty easy to think about, since 1 is a friendly factor to multiply with. If we were to break this step down, we could think of 8 x 1 = 8 (*point to the digits and then write 8 below the line)* and then 9 tens x 1 is 9 tens. (*point to the digits and then write 9 in the tens place next to the 8)* Where do we see this thinking in our area model? Possible Student Answers, Key Points:

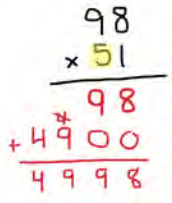
- This is like the top row of our area model where we said 90 x 1 = 90 and 8 x 1 = 8. I see we got 98 when we combined those partial products off to the side of our area model.



Now we have to think about 98 x 50 (*highlight or point to the 5 in 51*). Where do we see 98 x 50 in our area model? Possible Student Answers, Key Points:

- 98 x 50 is in the bottom part of our area model. We did 90 x 50 and 8 x 50, which gave us 4,500 and 400. 98 x 50 is 4,900.

Let's record that in our vertical form. 8 x 50 is 400. *(record 0 in the ones place, 0 in the tens place, and a small 4 above the hundreds place)* 90 x 50 is 4,500. We have to remember that we have 4 hundreds already, so 45 hundred plus 4 hundred is 49 hundred. (*record 4,900 and cross out the small 4 from 400)*



Take a second to add the partial products, and let me know when you're ready. (*wait and support as needed)* Excellent, when we add both partial products we get 4,998. (*write 4,998 in the vertical form)* What's the same about the work we just showed? What's different? Possible Student Answers, Key Points:

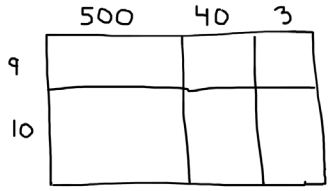
- We used the same factors, 98 and 51, and we ended up with the same answer. Instead of finding four partial products, we found two. The 98 is like when we added the partial products of 90 x 1 and 8 x 1. The 4,900 is like when we added the partial products of 90 x 50 and 8 x 50.

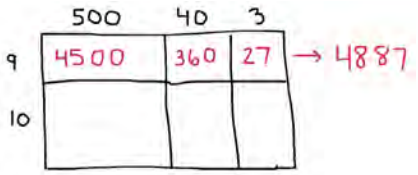
We mentally broke apart 51 into 50 and 1, and we multiplied each part by 98. When we found our partial products, we carefully renamed units when necessary.

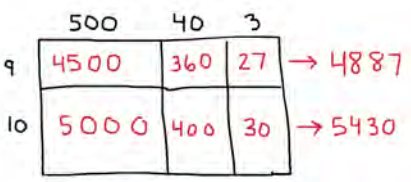
Let's Think (Slide 5): Let's look at one more problem. For this one, I want you to take a second to try to spot the error. If you're not sure at first glance, try making your own area model and compare your work to the work of this student. I'll give you a minute to think and work. Let me know when you're ready. (*wait and support as needed)*

What did you notice this student did to solve? What did they do right? What did they do wrong? (*if student needes support, build an area model following the sequence below to ground the discussion)* Possible Student Answers, Key Points:

- I think this student multiplied 543 x 9 first, and got 4,887. When I did my area model, that part was correct. When the student multiplied 543 x 10, they got 543. That doesn't make sense, because 543 x 1 is 543. 543 times 10 should be 5,430.







This student found two partial products. The first partial product, 543 x 9, is correct. When the student multiplied 543 x 10, they got a product of 543. What do you think led to this mistake? Possible Student Answers, Key Points:

- They probably 543 x 1. Maybe they didn't remember that the 1 in 19 is really 1 ten.

From the work we can see, it seems like the student just multiplied by 1 instead of 1 ten. If he got the correct partial products, we would have seen 4,887 plus 5,430 in their work. What would the correct product be? (10,317) Great!

As we multiply with the algorithm, it's so important to keep the place value of each digit we're multiplying by in mind. If we just multiply by the digit without thinking about its value, our partial products will be incorrect. Be on the lookout for that common error as we work through some more problems.

Let's Try it (Slides 6 - 7): Now let's work together on connecting area models and the distributive property to partial products with the standard algorithm. We'll make area models like we did in previous lessons by breaking apart our factors and carefully multiplying to find each partial product. We'll show that work using our standard algorithm, paying close attention to anytime we have more than ten of a unit so that we rename properly.

WARM WELCOME

Today we will connect area models and the distributive property to partial products of the standard algorithm with renaming

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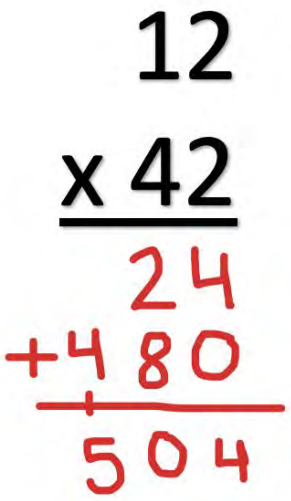
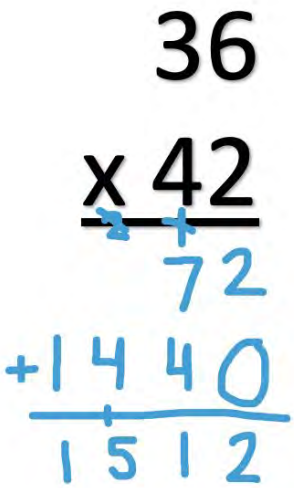
Let's Talk:

What do you notice or wonder?





Let's Think:

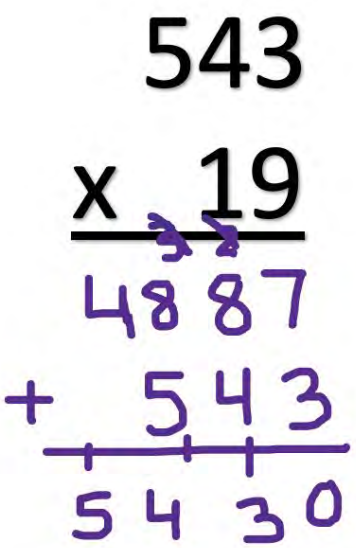
Use a model and the standard algorithm to find 98 x 51.

AREA MODEL

STANDARD ALGORITHM

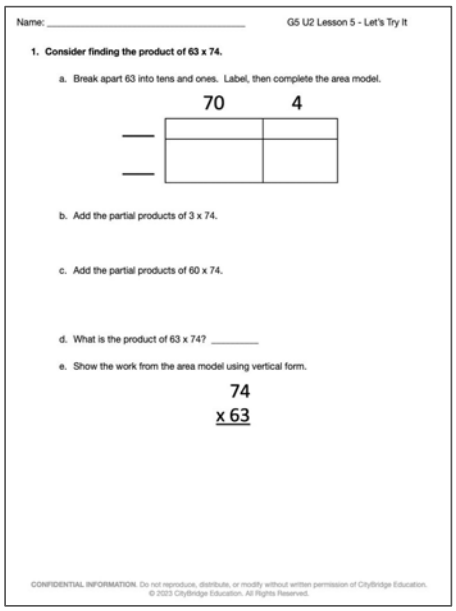
Let's Think:

What mistake did this student make?



Let's Try It:

Let's explore connecting visual models to partial products with the standard algorithm together.



Name: _____ G5 U2 Lesson 5 - Let's Try It

1. Consider finding the product of 63 x 74.

a. Break apart 63 into tens and ones. Label, then complete the area model.

70 4

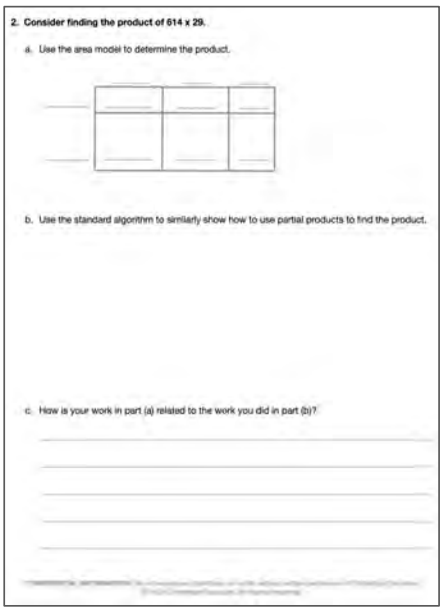
b. Add the partial products of 3 x 74.

c. Add the partial products of 60 x 74.

d. What is the product of 63 x 74? _____

e. Show the work from the area model using vertical form.

74
x 63



2. Consider finding the product of 614 x 29.

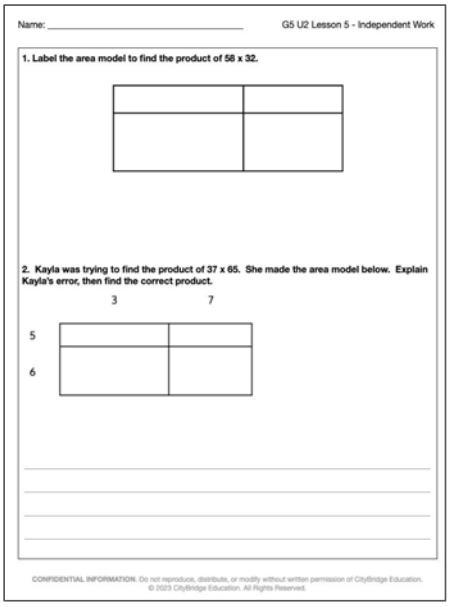
a. Use the area model to determine the product.

b. Use the standard algorithm to similarly show how to use partial products to find the product.

c. How is your work in part (a) related to the work you did in part (b)?

On your Own:

Now it's time to explore connecting visual models to partial products with the standard algorithm on your own.

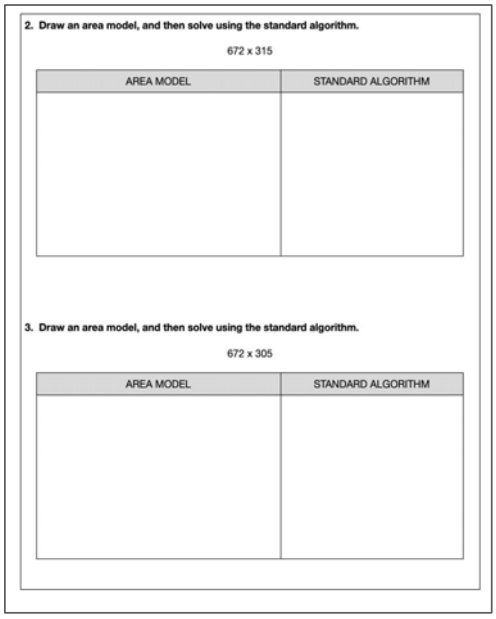


Name: _____ G5 U2 Lesson 5 - Independent Work

1. Label the area model to find the product of 58 x 32.

2. Kayla was trying to find the product of 37 x 65. She made the area model below. Explain Kayla's error, then find the correct product.

	3	7
5		
6		



2. Draw an area model, and then solve using the standard algorithm.

672 x 315

AREA MODEL	STANDARD ALGORITHM

3. Draw an area model, and then solve using the standard algorithm.

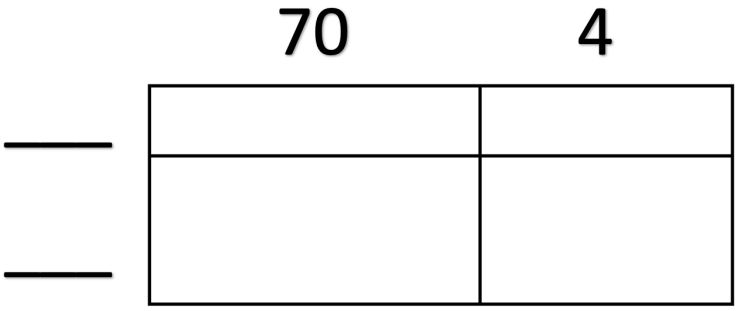
672 x 305

AREA MODEL	STANDARD ALGORITHM

Name: _____ G5 U2 Lesson 5 - Let's Try It

1. Consider finding the product of 63 x 74.

   a. Break apart 63 into tens and ones. Label, then complete the area model.



   b. Add the partial products of 3 x 74.

   c. Add the partial products of 60 x 74.

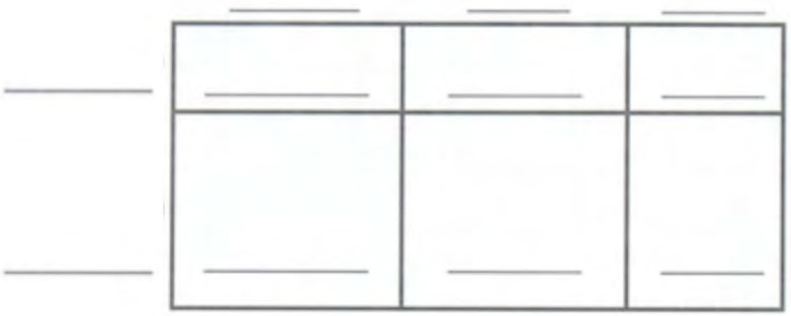
   d. What is the product of 63 x 74? _____

   e. Show the work from the area model using vertical form.

$$\begin{array}{r} 74 \\ \times\ 63 \\ \hline \end{array}$$

2. Consider finding the product of 614 x 29.

   a. Use the area model to determine the product.

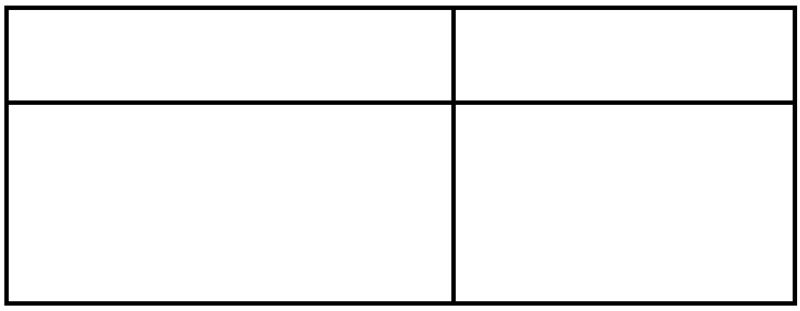


b. Use the standard algorithm to similarly show how to use partial products to find the product.

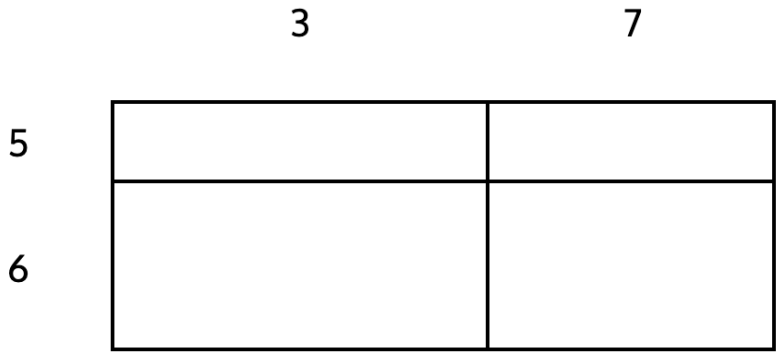
c. How is your work in part (a) related to the work you did in part (b)?

Name: _____ G5 U2 Lesson 5 - Independent Work

1. Label the area model to find the product of 58 x 32.



2. Kayla was trying to find the product of 37 x 65. She made the area model below. Explain Kayla's error, then find the correct product.



2. Draw an area model, and then solve using the standard algorithm.

672 x 315

AREA MODEL	STANDARD ALGORITHM

3. Draw an area model, and then solve using the standard algorithm.

672 x 305

AREA MODEL	STANDARD ALGORITHM

Name: KEY

1. Consider finding the product of 63 x 74.

a. Break apart 63 into tens and ones. Label, then complete the area model.

	70	4
60	4,200	240
3	210	12

b. Add the partial products of 3 x 74.

$$\begin{array}{r} 210 \\ +\ 12 \\ \hline 222 \end{array}$$

c. Add the partial products of 60 x 74.

$$\begin{array}{r} 4,200 \\ +\ 240 \\ \hline 4,440 \end{array}$$

$$\begin{array}{r} 4,440 \\ +\ 222 \\ \hline 4,662 \end{array}$$

d. What is the product of 63 x 74? 4,662

e. Show the work from the area model using vertical form.

$$\begin{array}{r} 74 \\ \times\ 63 \\ \hline 222 \\ +\ 4440 \\ \hline 4,662 \end{array}$$

2. Consider finding the product of 614 x 29.

a. Use the area model to determine the product.

	600	10	4
9	5400	90	36
20	12000	200	80

12,000
5,400
200
90
80
+ 36
17,806

b. Use the standard algorithm to similarly show how to use partial products to find the product.

614
x 29
5526
+12280
17,806

c. How is your work in part (a) related to the work you did in part (b)?

They both show the same product as a sum of partial products. The area model has 6 partial products, but the algorithm only had 2 partial products.

Name: KEY

G5 U2 Lesson 5 - Independent Work

1. Label the area model to find the product of 58 x 32.

	50	8	
2	100	16	→ 116
30	1500	240	→ 1740
			1,856

2. Kayla was trying to find the product of 37 x 65. She made the area model below. Explain Kayla's error, then find the correct product.

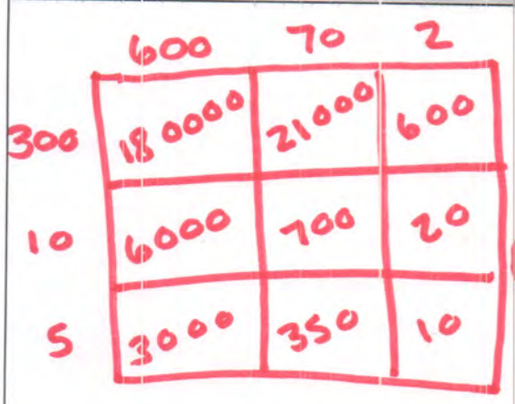
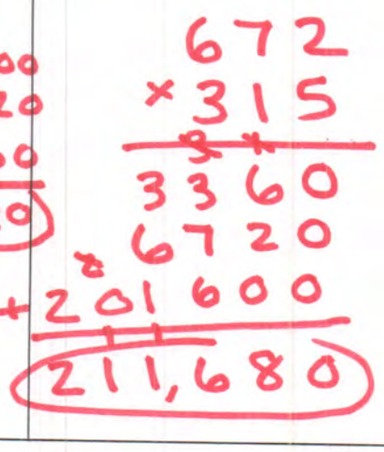
	30	7
5	150	35
60	1800	420

185
+2220
2,405

She did not decompose her factors correctly. 37 is 30 and 7. 65 is 60 and 5.

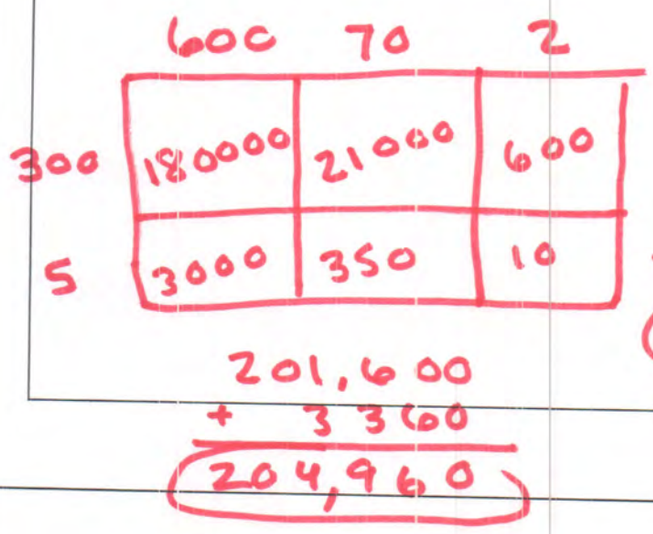
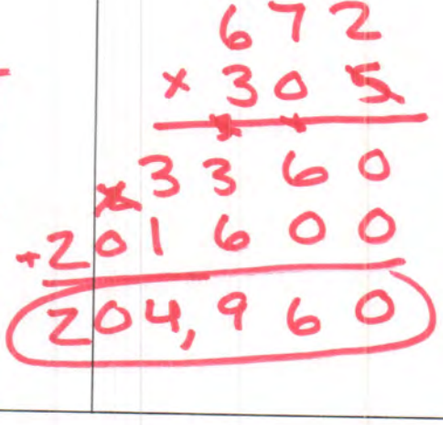
2. Draw an area model, and then solve using the standard algorithm.

672 x 315

AREA MODEL	STANDARD ALGORITHM
	

3. Draw an area model, and then solve using the standard algorithm.

672 x 305

AREA MODEL	STANDARD ALGORITHM
	

G5 U2 Lesson 6

Fluently multiply multi-digit whole numbers using the standard algorithm

G5 U2 Lesson 6 - Students will fluently multiply multi-digit whole numbers using the standard algorithm and use estimation to check for the reasonableness of the product.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will continue to use the standard algorithm to multiply multi-digit numbers like we have been doing in previous lessons. What makes today unique is that we're going to focus on estimating our products to make sure that the answers we get are reasonableness. Estimating can be very useful! It can help us get a sense of what our product should be close to, and estimating can also help us avoid common place value errors when multiplying.

Let's Talk (Slide 3): Imagine for as second that you're at the store, and you see some big screen TVs on sale for a major discount. The sign says they're on sale for $199. It's such a good deal, that you want to buy four of the TV sets. You don't have a calculator or anything to write with, but you want to know about how much that will cost. Can you think of a way that you could estimate about how much money 4 TV sets will cost? Possible Student Answers, Key Points:

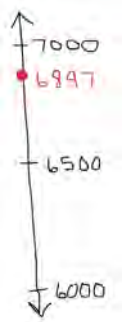
- I notice that $199 is almost $200, which is easier to think about. If you bought 4 TV sets that each cost about $200, you could think 4 x 200 = 800. You'd spend about $800.

Great thinking! We can use estimation when we're in a hurry or when we don't need to think about the exact product. If we are calculating the exact product, we can use estimation as a way to make sure our answer is reasonable. We'll use estimation today to help us think about products as we multiply multi-digit whole numbers.

Let's Think (Slide 4): Let's estimate and then find the product of 6,897 and 206. To start with, let's round each factor to its greatest place value. We could round to other place values if we wanted to, but rounding to the greatest place value will often be the most efficient way to determine a general estimate of the product. Let's round 6,897 to the nearest thousand. How can I determine which thousand 6,897 rounds to?

Possible Student Answers, Key Points:

- We can use a number line. We can think about which two thousands the number is between, so 6,000 and 7,000. Then we can think about whether 6,897 is greater than or less than the halfway point of 6,500.

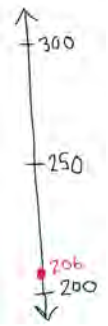


There are many ways we can think about rounding. I'm going to use a vertical number line to quickly think about which two thousands 6,897 is between (*sketch vertical number line, and label 6,000 at the bottom and 7,000 at the top*). I know our number is greater than 6,000 and less than 7,000. To determine which benchmark thousand our factor is closest to, I need to think about the halfway point. What is halfway between 6,000, and 7,000? (6,500) Great, let's label that and then roughly plot where 6,897 would go on our number line. (*label a halfway tickmark with 6,500 and label 6,897 on the number line)* Which thousand is 6,897 closest to? (7,000) We can say 6,897 rounds to 7,000, or (*write as you speak)* 6,500 ≈ 7,000.

Let's round our other factor, 206, to the nearest hundred. Why might I not need to go through the process of drawing a number line to round 206? Possible Student Answers, Key Points:

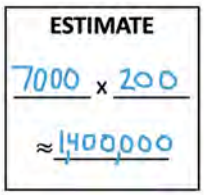
- 206 is a smaller number than 6,897 so it's easier to think about. I know 206 is *really* close to 200, so it's simpler to round in my head; it's obvious that it's closer to 200 than 300.

Nice. You don't always need to use a vertical number line to round, but it can help if you're not certain which benchmark to round to.

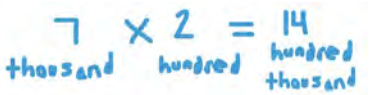


Here is what 206 rounded to the nearest hundred would look like. 206 is in between 200 and 300 (*label 200 at the bottom and 300 at the top)*. Halfway between 200 and 300 is 250, so I can label my halfway tickmark as 250. (*label halfway as 250)* I know 206 would go about here (*label 206 close to 200*), so I can clearly see that 206 rounds to 200.

From this point on, as you work, choose the rounding strategy that works best for you.

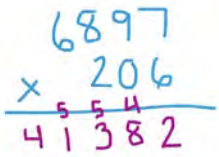


So 7,000 x 200 (*fill in 7,000 x 200)* means our estimated product would…hm, that's a lot of zeroes, and I want to be careful about the place value, so let's think about unit form. What is my expression in unit form? (7 thousand x 2 hundred)



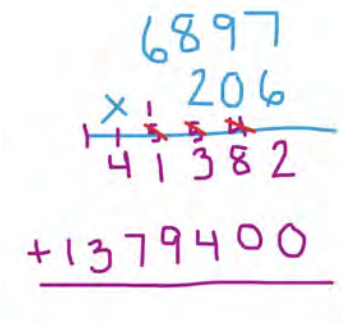
(*write the equation in unit form)* So I know my answer would be 14 hundred thousands, because 7 x 2 is 14 and thousands x hundreds is hundred thousands. I can write 14 hundred thousands as 1,400,000. (*fill in 1,400,000)* Our final product should be about 1,400,000.

Now let's calculate the actual product. Let's start by stacking our numbers vertically, so that we can use the standard algorithm. (*neatly stack 6,897 over 206 in vertical form)*

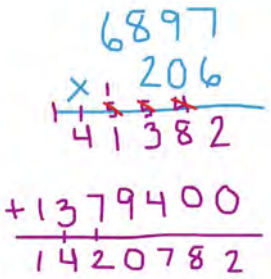


Let's start by multiplying 6,897 x 6. 7 x 6 is 42. (*write 2 beneath the line and a small 4 on the line in the tens place*) 9 tens x 6 is 54 tens, plus the 4 renamed tens is 58 tens. (*write 8 beneath the line in the tens place and a small 5 on the line in the hundreds place*) 8 hundreds x 6 is 48 hundreds plus the 5 renamed hundreds is 53 hundreds. (*write 3 beneath the line in the hundreds place and a small 5 on the line in the thousands place*) Lastly, 6 thousands x 6 is 36 thousands plus the 5 renamed thousands is 41 thousands. *(write 41 thousands beneath the line)*. So 6,897 x 6 is 41,382. We multiplied 6,897 by the ones place of 206. Do I need to multiply by the tens place in 206? Possible Student Answers, Key Points:

- No, there are zero tens in the tens place of 206.
- You can, but 6,897 x 0 tens would just be zero.



Okay, so let's multiply 6,897 x 2 hundreds. (*cross out renamed digits from previous multiplication*) 7 times 2 hundred is 14 hundred. (*write 4 in the hundreds place and a small 1 on the line in the thousands place*) 9 tens times 2 hundred is 18 thousand plus the 1 renamed thousand is 19 thousand. (*write 9 in the thousands place and a small 1 on the line in the ten thousands place*) 8 hundred times 2 hundred is 16 ten thousands, plus the 1 renamed ten thousand is 17 ten thousands. (*write 7 in the ten thousands place and a small 1 on the line in the hundred thousands place)* Lastly, 6 thousand times 2 hundred is 12 hundred thousand, plus the 1 renamed hundred thousand is 13 hundred thousand. (*write 13 hundred thousand)* 6,897 times 200 is 1,379,400.



Now we can add the partial products. Take a moment to add the two partial products. Let me know when you're ready to check. (*wait as needed*) When we added the two partial products, we got 1,420, 782. Is our answer reasonable? How do you know? Think back to your estimate to explain your reasoning. Possible Student Answers, Key Points:

- Yes, our answer is reasonable. We estimated that the answer would be close to 1,400,000. The actual product is 1,420,782 which is not far from our estimate.

Excellent! We estimated that the product would be close to 1,400,000 and it was. Our actual product seems reasonable based on the estimate we found earlier.

Let's Think (Slide 5): Let's consider one more problem. This problem says that Lily thought 30,000 was a reasonable estimate for 613 x 482. How could we assess whether her estimate is reasonable without actually solving for 613 times 482? Possible Student Answers, Key Points:

- We could round each of the factors to use mental math to multiply and find an estimate.

Let's round 613 and 482 to the greatest place value. How can we round them? Possible Student Answers, Key Points:

- We can think about which two hundreds each factor is between to figure out which one each is closest to. If we're not sure, we can use a vertical number line to visualize the rounding.

613 is in between 600 and 700. 613 is less than the halfway point of 650, so 613 rounds to 600. 482 is in between 400 and 500. 482 is more than the halfway point of 450, so 482

rounds to 500. How can we use unit form to help us estimate 600 x 500? Possible Student Answers, Key Points:

- We can think about 6 hundred x 5 hundred. I know 6 x 5 is 30, and hundreds times hundreds is ten thousands. Our estimate is 30 ten thousands.

To find 6 hundreds times 5 hundreds, we can multiply 6 times 5 and hundreds times hundreds. 6 x 5 = 30 and hundreds x hundreds = ten thousands. Our estimate is 30 ten thousands, which is 300,000. Is Lily's estimate reasonable? Possible Student Answers, Key Points:

- No, Lily said the estimate is 30,000. 30,000 is not close to 300,000 at all! She most likely didn't think about her place value carefully when she estimated.

Her estimate is not reasonable. Maybe she thought 30 ten thousands was written as 30,000. Regardless, a better estimate is 300,000. When we estimate, it's crucial that we think carefully about the units we are multiplying.

Let's Try it (Slides 6 - 7): Now let's work together on fluently multiplying multi-digit factors and estimating to assess the reasonableness of the product. We can round each factor to quickly find an estimated product, work carefully by showing our work using the standard algorithm, and then check our product against our original estimate to make sure we ended up with something reasonable.

WARM WELCOME

Today we will fluently multiply multi-digit whole numbers using the standard algorithm and using estimation to check for reasonableness of the product.

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Let's Talk:

About how much do I need to buy 4 TV sets?

Let's Think:

Estimate the product of 6,897 and 206. Then find the actual product.

ESTIMATE

_____ x _____

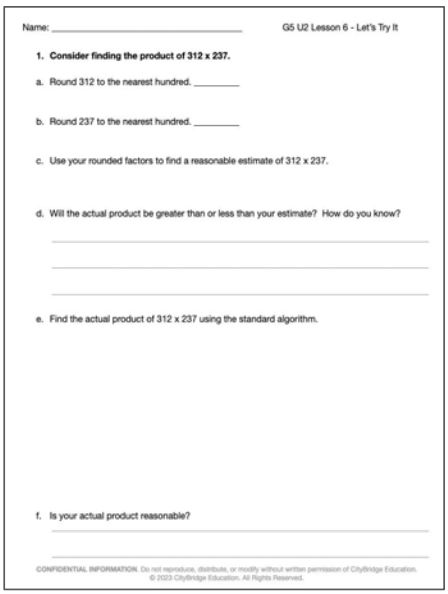
≈_____

Let's Think:

Lily says that 30,000 is a reasonable estimate for 613 x 482. Do you agree or disagree?

Let's Try It:

Let's explore using estimation to assess the reasonableness of products.



Name: _____ G5 U2 Lesson 6 - Let's Try It

1. Consider finding the product of 312 x 237.

a. Round 312 to the nearest hundred. _____

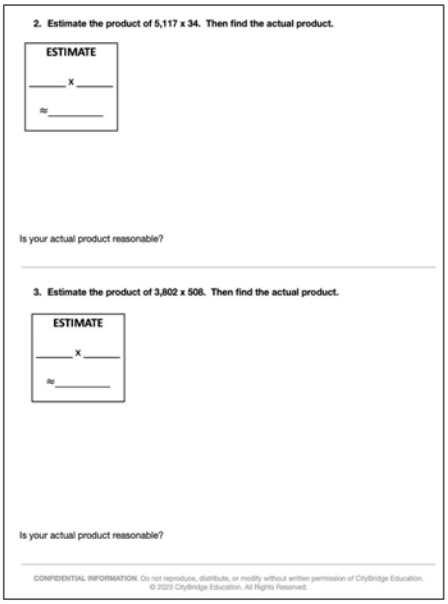
b. Round 237 to the nearest hundred. _____

c. Use your rounded factors to find a reasonable estimate of 312 x 237.

d. Will the actual product be greater than or less than your estimate? How do you know?

e. Find the actual product of 312 x 237 using the standard algorithm.

f. Is your actual product reasonable?



2. Estimate the product of 5,117 x 34. Then find the actual product.

ESTIMATE

_____ x _____

≈ _____

Is your actual product reasonable?

3. Estimate the product of 3,802 x 508. Then find the actual product.

ESTIMATE

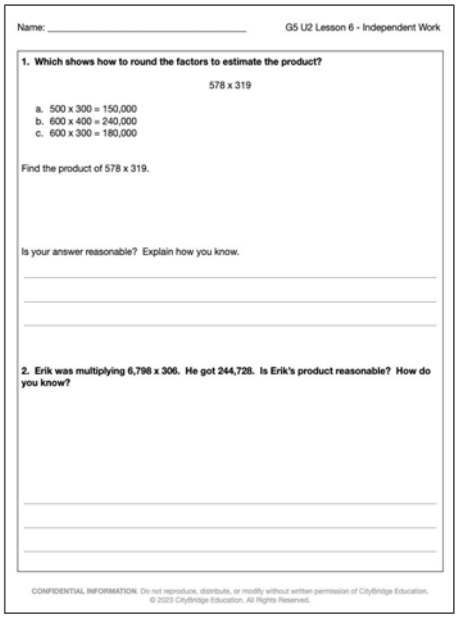
_____ x _____

≈ _____

Is your actual product reasonable?

On your Own:

Now it's time to use estimation to assess the reasonableness of products on your own.



Name: _____ G5 U2 Lesson 6 - Independent Work

1. Which shows how to round the factors to estimate the product?

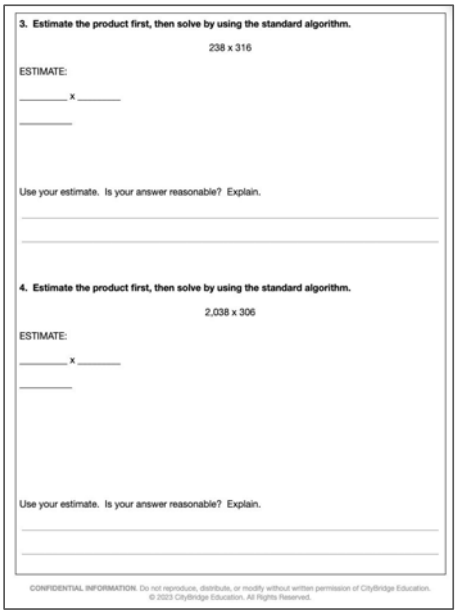
578 x 319

a. 500 x 300 = 150,000
b. 600 x 400 = 240,000
c. 600 x 300 = 180,000

Find the product of 578 x 319.

Is your answer reasonable? Explain how you know.

2. Erik was multiplying 6,798 x 306. He got 244,728. Is Erik's product reasonable? How do you know?



3. Estimate the product first, then solve by using the standard algorithm.

238 x 316

ESTIMATE:

_____ x _____

_____

Use your estimate. Is your answer reasonable? Explain.

4. Estimate the product first, then solve by using the standard algorithm.

2,038 x 306

ESTIMATE:

_____ x _____

_____

Use your estimate. Is your answer reasonable? Explain.

1. Consider finding the product of 312 x 237.

a. Round 312 to the nearest hundred. _____

b. Round 237 to the nearest hundred. _____

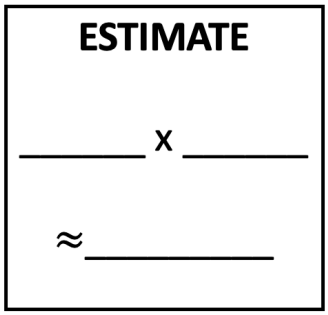
c. Use your rounded factors to find a reasonable estimate of 312 x 237.

d. Will the actual product be greater than or less than your estimate? How do you know?

e. Find the actual product of 312 x 237 using the standard algorithm.

f. Is your actual product reasonable?

2. Estimate the product of 5,117 x 34. Then find the actual product.



Is your actual product reasonable?

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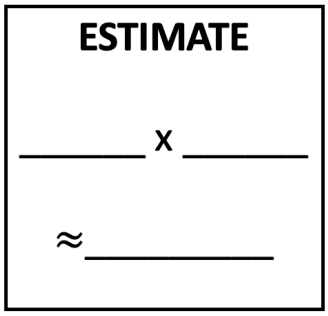
3. Estimate the product of 3,802 x 508. Then find the actual product.



Is your actual product reasonable?

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1. Which shows how to round the factors to estimate the product?

578 x 319

a. 500 x 300 = 150,000
b. 600 x 400 = 240,000
c. 600 x 300 = 180,000

Find the product of 578 x 319.

Is your answer reasonable? Explain how you know.

2. Erik was multiplying 6,798 x 306. He got 244,728. Is Erik's product reasonable? How do you know?

3. Estimate the product first, then solve by using the standard algorithm.

238 x 316

ESTIMATE:

_____ x _____

_____

Use your estimate. Is your answer reasonable? Explain.

4. Estimate the product first, then solve by using the standard algorithm.

2,038 x 306

ESTIMATE:

_____ x _____

_____

Use your estimate. Is your answer reasonable? Explain.

Name: KEY

1. **Consider finding the product of 312 x 237.**

a. Round 312 to the nearest hundred. 300

b. Round 237 to the nearest hundred. 200

c. Use your rounded factors to find a reasonable estimate of 312 x 237.

300 x 200 (3x2) x (100 x100) 6 x 10,000 60,000

d. Will the actual product be greater than or less than your estimate? How do you know?

The actual product will be greater, because I rounded both factors down.

e. Find the actual product of 312 x 237 using the standard algorithm.

```
  312
x 237
-----
 2184
 9360
+6 1400
-------
 72,944
```

f. Is your actual product reasonable?

Yes, because 72,944 is fairly close to 60,000.

2. **Estimate the product of 5,117 x 34. Then find the actual product.**

ESTIMATE

5000 x 30

≈ 150,000

```
  5117
x   34
------
 20468
+153510
------
173,978
```

Is your actual product reasonable?

Yes, because 173,978 is fairly close to 150,000.

3. **Estimate the product of 3,802 x 508. Then find the actual product.**

ESTIMATE

4000 x 500

≈ 2,000,000

```
  3802
x  508
------
 30416
+190100
------
1,931,416
```

Is your actual product reasonable?

Yes. It is a little less than my estimate.

Name: KEY

1. Which shows how to round the factors to estimate the product?

578 x 319

600 300

a. 500 x 300 = 150,000
b. 600 x 400 = 240,000
c. 600 x 300 = 180,000

Find the product of 578 x 319.

```
  578
x 319
-----
 5202
 5780
+1734
------
184382
```

Is your answer reasonable? Explain how you know.

Yes. My estimate was 180,000 which is pretty close to 184,382.

2. Erik was multiplying 6,798 x 306. He got 244,728. Is Erik's product reasonable? How do you know?

7000 x 300 ≈ 2,100,000

His answer is not reasonable. It is too small. It should be about 2,100,000.

3. Estimate the product first, then solve by using the standard algorithm.

238 x 316

ESTIMATE:

200 x 300

60,000

$$\begin{array}{r} 238 \\ \times\ 316 \\ \hline 1428 \\ 2380 \\ +\ 71400 \\ \hline 75,208 \end{array}$$

Use your estimate. Is your answer reasonable? Explain.

It's a little off, but 75,208 is still reasonable based on my estimate.

4. Estimate the product first, then solve by using the standard algorithm.

2,038 x 306

ESTIMATE:

2000 x 300

600,000

$$\begin{array}{r} 2038 \\ \times\ 306 \\ \hline 12228 \\ +\ 611400 \\ \hline 623,628 \end{array}$$

Use your estimate. Is your answer reasonable? Explain.

Yes, 623,628 is not far off of 600,000.

G5 U2 Lesson 7

Fluently multiply multi-digit whole numbers using the standard algorithm to solve multi-step word problems

CITYTUTOR

G5 U2 Lesson 7 - Students will fluently multiply multi-digit whole numbers using the standard algorithm to solve multi-step word problems.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): For the past several lessons, we've been working on multiplying multi-digit whole numbers using the standard algorithm. We've seen that we need to play close attention to the units we are multiplying, and we've seen how estimation can help make sure the product we get is reasonable. Today, we're going to tie all that hard work together to tackle multi-step word problems.

Let's Talk (Slide 3): Let's look at these two questions. As we read, I want you thinking about what is the same and different about these two questions. (*read both questions*) What did you notice? Possible Student Answers, Key Points:

- They both are about Louis. They both involve 5 bags with 6 books in each bag.
- The second question is longer and asks for the cost rather than how many books. The second question looks like it has two parts to it.

The first question here is considered a one-step problem, because it takes one step to solve. The second question is considered a multi-step problem, because it will take more than one step to solve. These are the types of questions we'll think about today. Since we'll be dealing with multiple steps, we'll want to make sure we keep our work organized so our steps don't get mixed up. We'll also want to draw models to help us think about each step of the problem and use estimation to make sure our answers are reasonable. Let's try one out!

Let's Think (Slide 4): Let's read this problem. "A school prints 1,324 copies of a 26 page newsletter. The school also prints 539 copies of a 15 page handbook. How many pages did the school print in all?" I'm going to read it one more time, and I want you to be thinking about what information we know and what information we're trying to find out. (*re-read)*

What information do we know based on this problem? (*sketch a T-chart labeled "know" and "find out" and fill in information as the student shares)* Possible Student Answers, Key Points:

- The school needs 1,324 newsletters. Each newsletter is 26 pages.
- The school needs 539 handbooks. Each handbook is 15 pages.

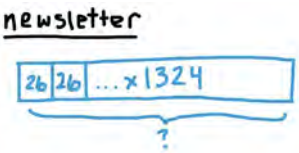
What information do we need to find out based on this problem? (*fill in information as the student shares)* Possible Student Answers, Key Points:

- We need to figure out how many pages are needed for all the newsletters. We need to figure out how many pages are needed for all the handbooks.
- We need to figure out how many pages they need copied altogether.

Based on this, we know a lot that can help us find out the information we need. Let's work systematically to figure out each piece of information we need. We'll use models and estimation along the way.

Let's Think (Slide 5): I separated my workspace into three sections. Why do you think I did that for this problem? Possible Student Answers, Key Points:

- This will keep our work organized. We need to find out three pieces of information to arrive at our answer.

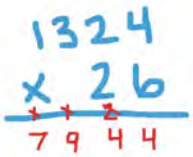


It's always important to organize your work, and especially so when we have a few steps. Let's start by thinking about the newsletter. (*label the first section "newsletter")* We know that each newsletter is 26 pages, and we need 1,324 of them. I can draw a tape diagram (*draw a long rectangle)* and cut it into pieces to represent each newsletter. (*partition one box and write 26 in it)* This box represent a newsletter that needs 26 pages. *(partition a second box and write 26 in it)* Here is another newsletter that needs 26 pages. How many do I need? (1,324 newsletters) That's a lot to draw! I'll just write "...x 1,324" in this extra space so I know how many newsletters there should be. (*write that in the tape diagram)*

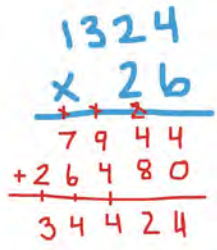
Now we're about ready to figure out how many pages the school needs to copy for the newsletter. I can multiply 1,324 x 26 to find the total, because I need 1,324 groups of 26. How could we find a reasonable estimate for the product? *(write EST: 30 x 1,000 = 30,000 underneath the tape diagram after student shares)*

Possible Student Answers, Key Points:

- We can round each factor and multiply.
- 26 rounded to the nearest ten is 30. 1,324 rounded to the nearest thousand is 1,000. So, 30 x 1,000 is 30,000. They'll need about 30,000 pages.



Now let's find the actual product. (*write 1,324 x 26 in vertical form)* Take a moment to find 1,324 x 6. When you're ready, let me know and we can check the partial product. (*wait, support student as needed, and fill in vertical form*) 1,324 times 6 is 7,944.



What is 1,324 x 20 or 2 tens? Take a moment to find 1,324 x 20. Let me know when you're ready. (*wait, support student as needed, and fill in vertical form*). 1,324 x 20 is 26,480. What is the final product, once we add the two partial products? (34,424) Excellent. Is our answer reasonable, so far? How do you know? Possible Student Answers, Key Points:

- Our estimate from earlier was 30,000. Our actual product is 34,424, which is fairly close. I think the product is reasonable.

We've found one of our pieces of information. We know the school will need 34,424 pages copied to make all the newsletters. What information should we try to find out next? Look back at our list if you need a reminder. (We need to know how many copies they need to print the handbooks)

(*label the next section of work with the word "handbooks")* We know we need 534 copies of the handbook and that each copy requires 15 pages. What could the model look like to help us think about how many pages we need for all the handbooks? (*sketch tape diagram as student explains, supporting as needed)* Possible Student Answers, Key Points:

- It can look similar to the other tape diagram we drew. We can draw a rectangle for the total, and put 15 in each partitioned box. Instead of drawing 534 boxes, we can write "...x 534" so we know how many there are.

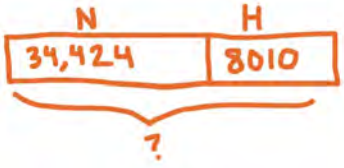
Now I see we need 534 groups of 15, or 534 x 15. Before we calculate how many pages the school needs for all handbook, what is a reasonable estimate for the product? *(write EST: 20 x 500 = 10,000 underneath the tape diagram after student shares)* Possible Student Answers, Key Points:

- 15 rounds to 20, and 534 rounds to 500. 20 x 500 means our answer should be about 10,000. I know 2 x 5 = 10 and hundreds x tens = thousands.

The school will need about 10,000 pages to make all the copies of the handbook. Let's find the actual product now. Stack each factor in vertical form. I want you to find 534 x 5 and 534 x 10, and then add the partial products. Let me know when you're ready or if you have a question, and I'll support. (*wait and provide support as needed*)

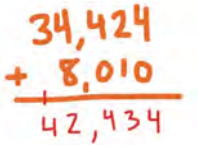
Nicely done! 534 x 5 = 2,670. 534 x 10 = 5,340. When we add both partial products together, we get a product of 8,010. Explain how you know our answer is reasonable. Possible Student Answers, Key Points:

- Our estimated product was 10,000. 8,010 is not too far off from that.



We've put in a lot of work, and we're almost done. What was the final thing we needed to figure out? (How many total pages the school needed to print.) Right! We want to combine the copies needed for the newsletter (*draw a box labeled N and write 34,424 inside*) and the copies needed for the handbook (*draw an adjacent box labeled H and write 8,010 inside*) to determine how many copies the school needs in all. Can you think of a way we could determine a reasonable estimate? Then, we'll calculate our final answer. Possible Student Answers, Key Points:

- 34,424 is close to 34,000. 8,010 is close to 8,000. If we combine those, 34,000 + 8,000 is 42,000.



Take a second to add the two actual amounts. When you're ready, what's the total number of pages the school needs copied? (42,434 pages) (*support as needed, and write out the addition in vertical form)* It looks like our actual answer, 42,434 pages is reasonable, because your estimate was 40,000 pages. Excellent work with each step.

Multi-step problems require some extra thought and attention. What did we do throughout this problem to keep ourselves on track?
Possible Student Answers, Key Points:

- We listed out what we knew and what we needed to find out.
- We organized our workspace so that our work did not get jumbled.
- We drew a model and estimated before each step we took. We checked for reasonableness at each stage.

Let's Try it (Slides 6 - 7): Now let's work together on fluently multiplying multi-digit factors to solve multi-step word problems. Before solving every problem, we pause and think about what we know and what we're trying to find out. Drawing a picture or a model can help us think about a solution pathway that makes sense to us, and estimation can make sure our final answer is reasonable and makes sense.. Once we're ready, we can carefully make our calculations to arrive at an accurate answer.

WARM WELCOME

Today we will fluently multiply multi-digit whole numbers using the standard algorithm to solve multi-step word problems.

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Let's Talk:

What do you notice and wonder about these two problems?

Louis has 5 bags with 6 books in each bag.

How many books does Louis have?

Louis has 5 bags with 6 books in each bag.

Each book cost $7. How much money did Louis spend on all the books?

Let's Think:

A school prints 1,324 copies of a 26 page newsletter. The school also prints 539 copies of a 15 page handbook. How many pages did the school print in all?

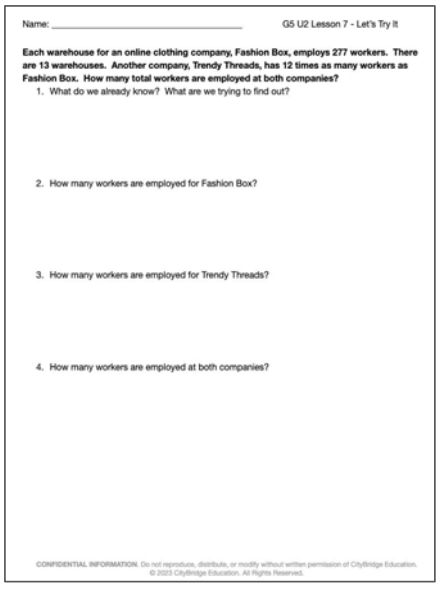
What do I know?
What am I trying to find out?

Let's Think:

A school prints 1,324 copies of a 26 page newsletter. The school also prints 539 copies of a 15 page handbook. How many pages did the school print in all?

Let's Try It:

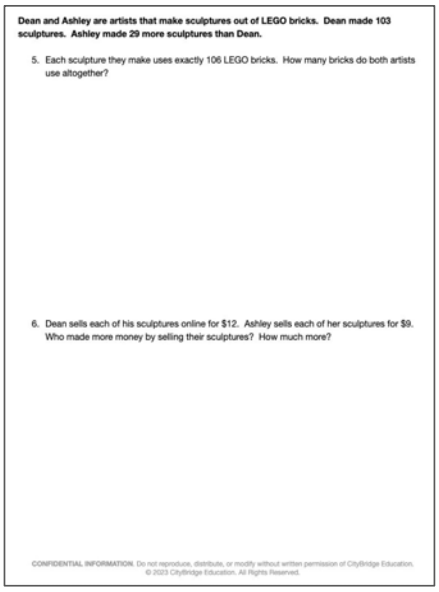
Let's explore using the standard algorithm to solve multi-step problems together.



Name: _____ G5 U2 Lesson 7 - Let's Try It

Each warehouse for an online clothing company, Fashion Box, employs 277 workers. There are 13 warehouses. Another company, Trendy Threads, has 12 times as many workers as Fashion Box. How many total workers are employed at both companies?

1. What do we already know? What are we trying to find out?
2. How many workers are employed for Fashion Box?
3. How many workers are employed for Trendy Threads?
4. How many workers are employed at both companies?

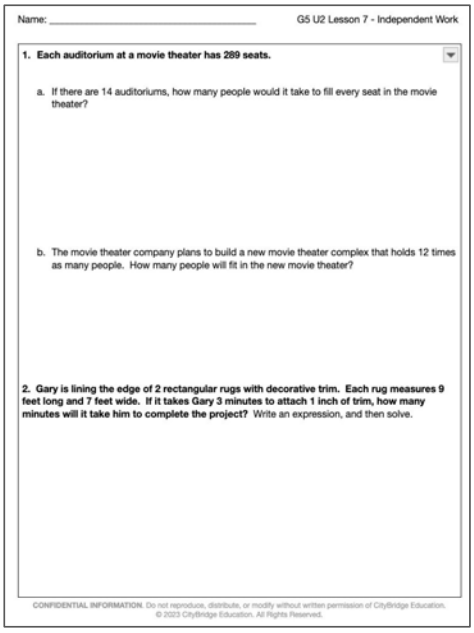


Dean and Ashley are artists that make sculptures out of LEGO bricks. Dean made 103 sculptures. Ashley made 29 more sculptures than Dean.

5. Each sculpture they make uses exactly 106 LEGO bricks. How many bricks do both artists use altogether?
6. Dean sells each of his sculptures online for $12. Ashley sells each of her sculptures for $9. Who made more money by selling their sculptures? How much more?

On your Own:

Now it's time to use the standard algorithm to solve multi-step problems on your own.



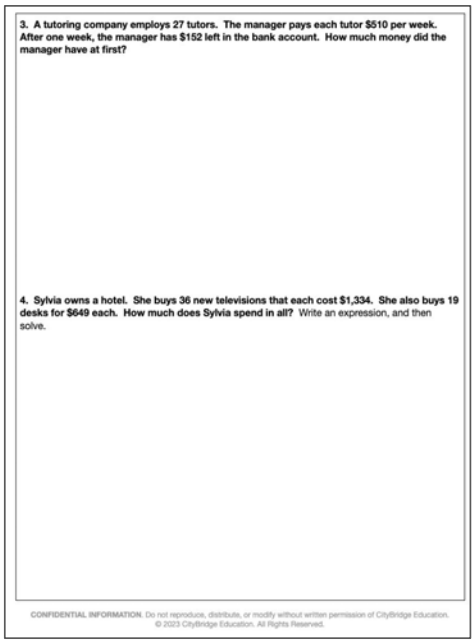
Name: _____ G5 U2 Lesson 7 - Independent Work

1. Each auditorium at a movie theater has 289 seats.

a. If there are 14 auditoriums, how many people would it take to fill every seat in the movie theater?

b. The movie theater company plans to build a new movie theater complex that holds 12 times as many people. How many people will fit in the new movie theater?

2. Gary is lining the edge of 2 rectangular rugs with decorative trim. Each rug measures 9 feet long and 7 feet wide. If it takes Gary 3 minutes to attach 1 inch of trim, how many minutes will it take him to complete the project? Write an expression, and then solve.



3. A tutoring company employs 27 tutors. The manager pays each tutor $510 per week. After one week, the manager has $152 left in the bank account. How much money did the manager have at first?

4. Sylvia owns a hotel. She buys 36 new televisions that each cost $1,334. She also buys 19 desks for $649 each. How much does Sylvia spend in all? Write an expression, and then solve.

Each warehouse for an online clothing company, Fashion Box, employs 277 workers. There are 13 warehouses. Another company, Trendy Threads, has 12 times as many workers as Fashion Box. How many total workers are employed at both companies?

1. What do we already know? What are we trying to find out?

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3. How many workers are employed for Trendy Threads?

4. How many workers are employed at both companies?

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Name: KEY

G5 U2 Lesson 7 - Let's Try It

Each warehouse for an online clothing company, Fashion Box, employs 277 workers. There are 13 warehouses. Another company, Trendy Threads, has 12 times as many workers as Fashion Box. How many total workers are employed at both companies?

1. What do we already know? What are we trying to find out?

KNOW
- FB has 13 warehouses
  ↳ 277 workers in each
- TT has 12 x as many employees

FIND OUT
- How many workers are there in all?

2. How many workers are employed for Fashion Box?

277 x 13
workers warehouses

$$\begin{array}{r} 277 \\ \times\ 13 \\ \hline 831 \\ +\ 2770 \\ \hline 3601 \end{array}$$

FB → 3,601 workers

3. How many workers are employed for Trendy Threads?

12 x 3,601

3601	10	2
	36010	7202

$$\begin{array}{r} 36010 \\ +\ 7202 \\ \hline 43212 \end{array}$$

43,212 workers
TT →

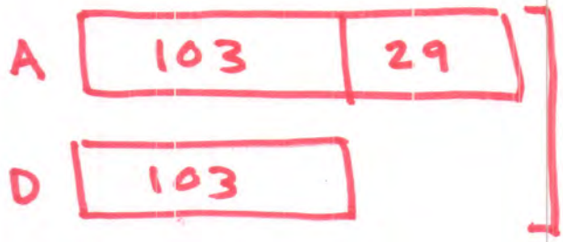
4. How many workers are employed at both companies?

$$\begin{array}{r} 43,212 \\ +\ 3,601 \\ \hline 46,813 \end{array}$$

46,813 total workers

Dean and Ashley are artists that make sculptures out of LEGO bricks. Dean made 103 sculptures. Ashley made 29 more sculptures than Dean.

5. Each sculpture they make uses exactly 106 LEGO bricks. How many bricks do both artists use altogether?



103
103
+ 29
235
sculptures

235 × 106 = ?
sculptures bricks

235
× 106
1410
+ 23500
24,910 bricks

6. Dean sells each of his sculptures online for $12. Ashley sells each of her sculptures for $9. Who made more money by selling their sculptures? How much more?

DEAN
103 × $12

103
× 12
206
+ 1030
$1,236

ASHLEY
132 × 9

132
× 9
$1188

1236 > 1188

Dean earns more money.

12
1236
- 1188
48

He earns $48 more.

Name: KEY

G5 U2 Lesson 7 - Independent Work

1. Each auditorium at a movie theater has 289 seats.

a. If there are 14 auditoriums, how many people would it take to fill every seat in the movie theater?

289 × 14 = ?
seats aud.

$$\begin{array}{r} 289 \\ \times\ 14 \\ \hline 1156 \\ +\ 2890 \\ \hline 4,046 \end{array}$$ people

b. The movie theater company plans to build a new movie theater complex that holds 12 times as many people. How many people will fit in the new movie theater?

4046 × 12 = ?

$$\begin{array}{r} 4046 \\ \times\ 12 \\ \hline 8092 \\ +\ 40460 \\ \hline 48,552 \end{array}$$ people

2. Gary is lining the edge of 2 rectangular rugs with decorative trim. Each rug measures 9 feet long and 7 feet wide. If it takes Gary 3 minutes to attach 1 inch of trim, how many minutes will it take him to complete the project? Write an expression, and then solve.

3 min = 1 inch (×12)
36 min = 1 foot (×12)

$2 \times (9+9+7+7) \times 36$

perimeter of 2 rugs; time per foot

$2 \times 32 \times 36$

64×36

	60	4
30	1800	120
6	360	24

$$\begin{array}{r} 1920 \\ +\ 384 \\ \hline 2304 \end{array}$$

2,304 minutes

3. A tutoring company employs 27 tutors. The manager pays each tutor $510 per week. After one week, the manager has $152 left in the bank account. How much money did the manager have at first?

? − (27 × 510) = 152

TOTAL — TUTOR PAY

510
× 27
3570
+10200
$13,770
tutor pay

? − 13,770 = 152

13770
+ 152
$13,922

4. Sylvia owns a hotel. She buys 36 new televisions that each cost $1,334. She also buys 19 desks for $649 each. How much does Sylvia spend in all? Write an expression, and then solve.

TV	DESK
36 × 1334	19 × 649

?

(36 × 1334) + (19 × 649)

1334
× 36
8004
+10020
$48,024
TV

649
× 19
5841
+6490
$12,331
DESKS

48,024
+ 12,331
$60,355

G5 U2 Lesson 8

Multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products

G5 U2 Lesson 8 - Students will multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working to multiply multi-digit whole numbers for the past several lessons. Have you ever wondered: What happens if one of our factors is a decimal? Today, you'll be able to answer that question! We're going to find out how to multiply multi-digit whole numbers by decimal fractions with tenths.

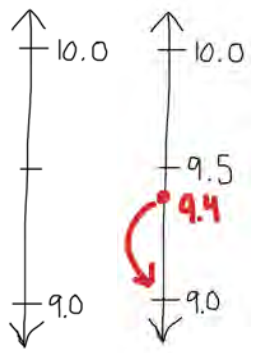
Let's Talk (Slide 3): Take a look at the pairs of equations you see here. I'll give a minute to look over them, and I want you to think about what you notice or wonder about the pairs of equations. (*wait*) Possible Student Answers, Key Points:

- I notice each pair uses the same digits, but one of the equations has decimals in it.
- I notice the first equation in each pair uses whole numbers, and the second equation has whole numbers and decimals in the tenths place.
- I notice the first product is always a whole number, and the second product ends in the tenths place.

When we multiply a whole number by a decimal fraction, or decimal number,in the tenth place, we'll see that the only thing that we have to consider differently is the place value. Let's learn what that looks like and why it works.

Let's Think (Slide 4): Let's think about the problem 52 x 9.4. Before we multiply, let's estimate. How could we round these factors to find a reasonable estimate of the product? Possible Student Answers, Key Points:

- We could round each number to the nearest ten or whole number, and multiply them together.

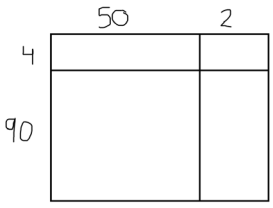


Sure! How would you round 52? (It's close to 50) 50 will work. Now let's think about 9.4. We'll round it to the nearest whole number, or to the one's place. If you're not sure what it rounds to right away, know that we can round 9.4 the same way we'd round whole numbers on a vertical number line. I know 9.4 is in between 9 wholes and 10 wholes. (*label 9.0 and 10.0 on a vertical number line*) Halfway between 9.0 and 10.0 is 9.5 or 9 and 5 tenths. (*label 9.5*) Where would we place 9.4 on the vertical number line, and what would it round to? Possible Student Answers, Key Points:

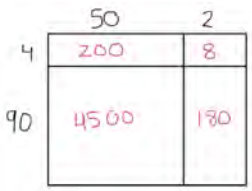
- 9.4 is a little less than 9.5, so I'd label it right below 9.5 9.4 is closer to 9 than to 10, so 9.4 rounds to 9.

Based on our rounding, we could think of a reasonable estimate for 52 x 9.4 as being 50 x 9. Our actual product should be about 450.

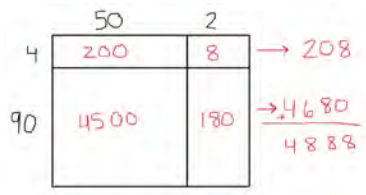
Now let's actually multiply 52 x 9.4. To do that, let's think of 9.4 as only tenths. How can we write 9.4 as just tenths? (94 tenths) So we can think about this problem as 52 x 94 tenths.



Let's set up an area model as if we're multiplying 52 x 94, and we'll keep in the back of our mind that the 94 is actually tenths. Don't forget that, we'll come back to it, I promise! (*sketch a 2x2 area model decomposed with 50 and 2 on top and 4 and 90 along the side)* When you're ready, take a moment to find each partial product like we've done in previous area models. Let me know when you're ready to check our answers. (*wait, and support as needed)*

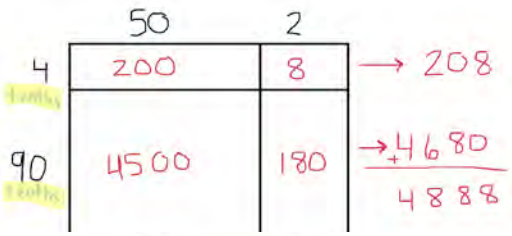


50 x 4 is 200, 2 x 4 is 8, 50 x 90 is 4,500, and 2 x 90 is 180. Combine the partial products for 52 x 4 and for 52 x 90, and let me know when you're ready to check. (*wait, and support as needed*) Let's check! (*write out 208 and 4,680 to the side of the area model, and then write the sum of 4,888)*

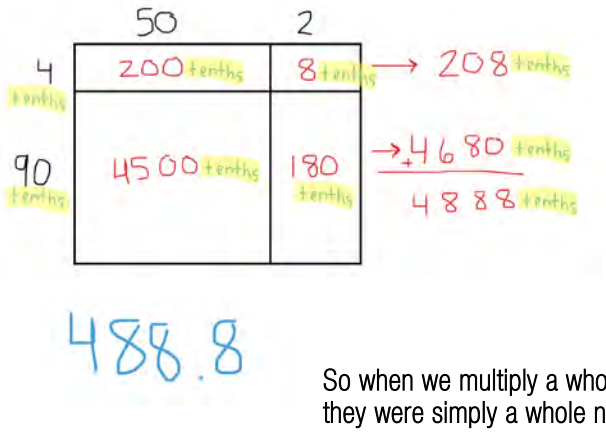


When we combine 208 and 4,680 we end up with a product of 4,888. So 52 x 94 = 4,888. Is 4,888 a reasonable product for 52 x 9.4? Possible Student Answers, Key Points:

- No! Our estimate was 450, so 4,888 is way too big. Maybe it has something to do with the decimal.



Remember when we started our area model, I told you to keep in mind that the 90 and 4 actually represented 90 tenths and 4 tenths from 94 tenths. Let's keep our work, and think about tenths. (*label tenths under 90 and 4*)



We were multiplying by 94 tenths, not 94. So our partial products, should also be tenths. Think about it! 50 x 4 tenths isn't 200, it's 200 tenths. 2 x 4 tenths isn't 8, it's 8 tenths. 50 x 90 tenths isn't 4,500, it's 4,500 tenths. 2 x 90 tenths isn't 180, it's 180 tenths. (*label each partial product as tenths, including the final product)*

So, if we've been dealing with tenths this whole time, what is 4,888 tenths? (488.8) 488.8 is a much more reasonable product based on our estimate, than 4,888. (*write 488.8)*

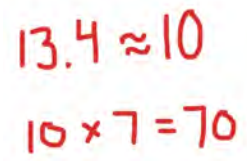
So when we multiply a whole number by a decimal fraction in the tenths, we can think of the digits as if they were simply a whole number, then multiply, then think of our partial products as tenths to make sure the digits in our answer are in the proper place value. Our estimate is also a great way to make sure the place value of the digits in the product make sense.

Let's Think (Slide 5): Before we jump into practicing, let's look at Janiya's sample work. She used the standard algorithm to multiply 13.4 times 7 instead of using an area model. Janiya did a lot of really strong work, and she also made one common error. Take 1 minute to look at Janiya's work. While you review her work, I want you to start thinking about what Janiya did correctly. (*wait*) What do you notice Janiya did well? Possible Student Answers, Key Points:

- She lined up her numbers, stacking them according to place value. She multiplied each digit correctly, and renamed units when necessary. Her product is correct had she been multiplying 134 x 7.

Nearly all of her computation is correct, which brings me back to the original questions being asked. What mistake did she make? What is the correct answer?
Possible Student Answers, Key Points:

- She wrote tenths next to 134 to remember that she was multiplying by 13.4, but she forgot to write her product as tenths. 134 tenths x 7 would not be 938 ones; it would be 938 tenths.
- The correct product is 9.38.



Nice work! Another tool we have to make sure our answer is reasonable is estimation. 13.4 is about 10 (*write 13.4 is approximately 10)*, so 10 x 7 means our answer should be about 70. (*write 10 x 7 = 70)* That alone tells me 938 is definitely too big. We always want to make sure we keep track of the place value of our factors, so that the place value of digits in our product is accurate.

At the beginning of our lesson, I said you'd be able to answer the question: "What happens if one of our factors is a decimal?" Having seen a couple examples so far, how would you answer that question? Possible Student Answers, Key Points:

- It's fairly similar, just the place value is different.
- The process of multiplying by a decimal fraction isn't too different from multiplying with whole numbers. We can actually treat the decimal fraction as if it was a whole number to multiply the digits like we usually do; we just have to remember that, if we're multiplying a whole number by tenths, the answer we get needs to be in the tenths place.

Let's Try it (Slides 6 - 7): Now let's work together to multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding. We've seen already that multiplying with decimal fractions has a lot in common with multiplying with whole numbers. One major difference that we'll keep an eye out for is keeping track of the place value of our factors and the final product.

WARM WELCOME

Today we will multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products

Let's Talk:

What do you notice and wonder about the equations shown here?

3 x 17 = 51

3 x 1.7 = 5.1

50 x 3 = 150

5.0 x 3 = 15.0

123 x 6,987 = 859,401

123 x 698.7 = 85,940.1

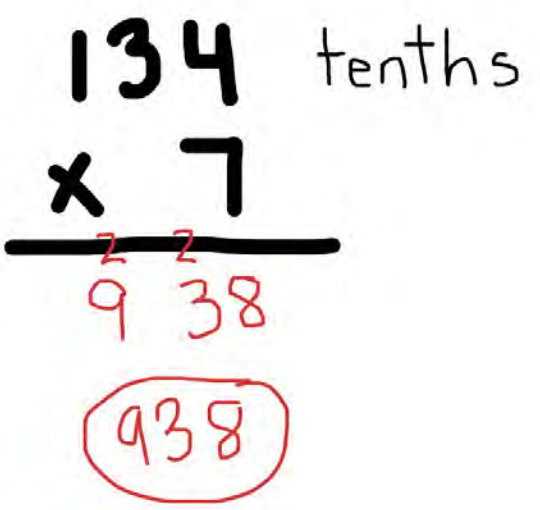
Let's Think:

What is 52 x 9.4?

ESTIMATE

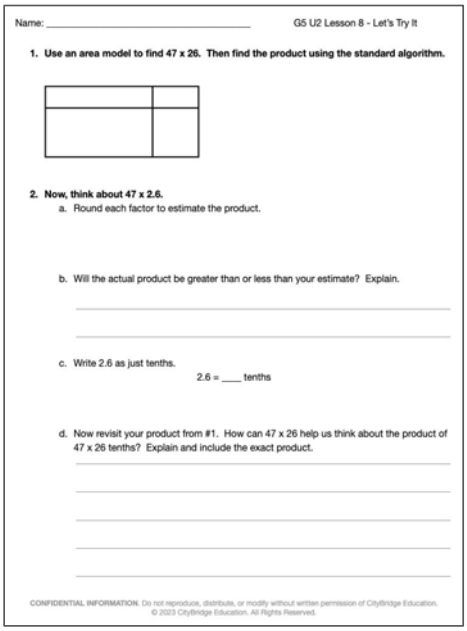
Let's Think:

Janiya multiplied 13.4 x 7. What mistake did she make? What is the correct answer?



Let's Try It:

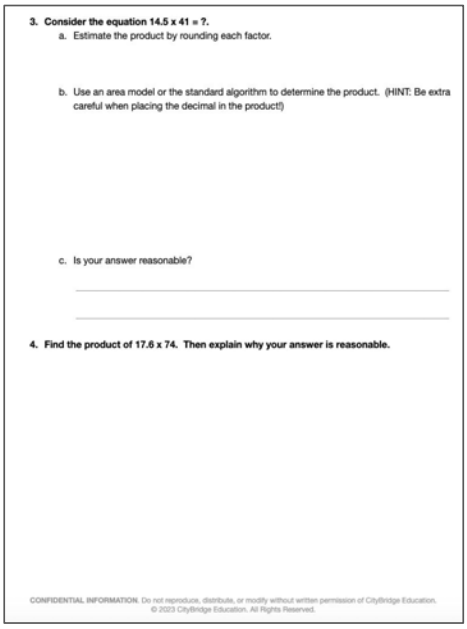
Let's explore multiplying decimal fractions with tenths by multi-digit whole numbers together.



Name: _____ G5 U2 Lesson 8 - Let's Try It

1. **Use an area model to find 47 x 26. Then find the product using the standard algorithm.**

2. **Now, think about 47 x 2.6.**
   a. Round each factor to estimate the product.
   b. Will the actual product be greater than or less than your estimate? Explain.
   c. Write 2.6 as just tenths.
   2.6 = ____ tenths
   d. Now revisit your product from #1. How can 47 x 26 help us think about the product of 47 x 26 tenths? Explain and include the exact product.

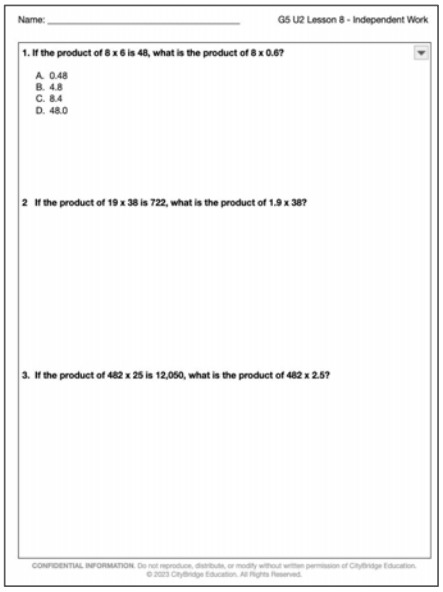


3. **Consider the equation 14.5 x 41 = ?.**
   a. Estimate the product by rounding each factor.
   b. Use an area model or the standard algorithm to determine the product. (HINT: Be extra careful when placing the decimal in the product!)
   c. Is your answer reasonable?

4. **Find the product of 17.6 x 74. Then explain why your answer is reasonable.**

On your Own:

Now it's time to multiply decimal fractions with tenths by multi-digit whole numbers on your own.



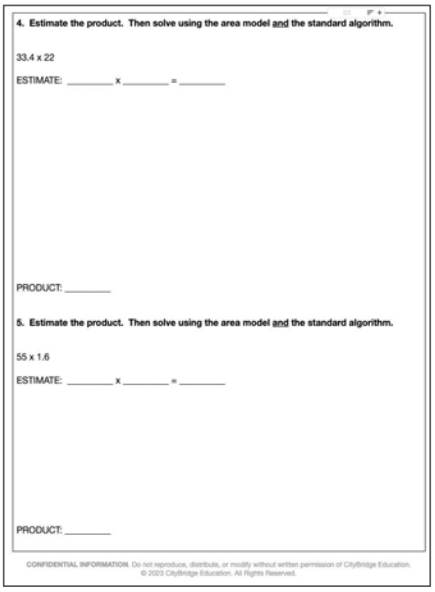
Name: _____ G5 U2 Lesson 8 - Independent Work

1. If the product of 8 x 6 is 48, what is the product of 8 x 0.6?

A. 0.48
B. 4.8
C. 8.4
D. 48.0

2 If the product of 19 x 38 is 722, what is the product of 1.9 x 38?

3. If the product of 482 x 25 is 12,050, what is the product of 482 x 2.5?



4. Estimate the product. Then solve using the area model and the standard algorithm.

33.4 x 22

ESTIMATE: _____ x _____ = _____

PRODUCT: _____

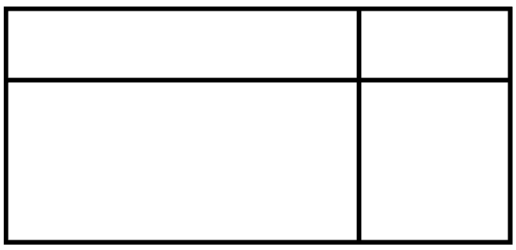
5. Estimate the product. Then solve using the area model and the standard algorithm.

55 x 1.6

ESTIMATE: _____ x _____ = _____

PRODUCT: _____

1. Use an area model to find 47 x 26. Then find the product using the standard algorithm.



2. Now, think about 47 x 2.6.

a. Round each factor to estimate the product.

b. Will the actual product be greater than or less than your estimate? Explain.

c. Write 2.6 as just tenths.

2.6 = ____ tenths

d. Now revisit your product from #1. How can 47 x 26 help us think about the product of 47 x 26 tenths? Explain and include the exact product.

3. Consider the equation 14.5 x 41 = ?.

a. Estimate the product by rounding each factor.

b. Use an area model or the standard algorithm to determine the product. (HINT: Be extra careful when placing the decimal in the product!)

c. Is your answer reasonable?

4. Find the product of 17.6 x 74. Then explain why your answer is reasonable.

1. If the product of 8 x 6 is 48, what is the product of 8 x 0.6?

   A. 0.48
   B. 4.8
   C. 8.4
   D. 48.0

2 If the product of 19 x 38 is 722, what is the product of 1.9 x 38?

3. If the product of 482 x 25 is 12,050, what is the product of 482 x 2.5?

4. Estimate the product. Then solve using the area model and the standard algorithm.

33.4 x 22

ESTIMATE: _____ x _____ = _____

PRODUCT: _____

5. Estimate the product. Then solve using the area model and the standard algorithm.

55 x 1.6

ESTIMATE: _____ x _____ = _____

PRODUCT: _____

Name: KEY

G5 U2 Lesson 8 - Let's Try It

1. **Use an area model to find 47 x 26. Then find the product using the standard algorithm.**

	40	7
6	240	42
20	800	140

$$282 + 940 = 1{,}222$$

$$\begin{array}{r} 47 \\ \times\ 26 \\ \hline 282 \\ +940 \\ \hline 1{,}222 \end{array}$$

2. **Now, think about 47 x 2.6.**

   a. Round each factor to estimate the product.

   $47 \approx 50$

   $2.6 \approx 3$

   $50 \times 3 = 150$

   b. Will the actual product be greater than or less than your estimate? Explain.

   It will be less since I rounded each factor up.

   c. Write 2.6 as just tenths.

   2.6 = 26 tenths

   d. Now revisit your product from #1. How can 47 x 26 help us think about the product of 47 x 26 tenths? Explain and include the exact product.

   47 x 26 is 1,222. So, I know 47 x 26 tenths is 1,222 tenths. The product is 122.2.

3. **Consider the equation 14.5 x 41 = ?.**

a. Estimate the product by rounding each factor.

$15 \times 40 = ?$ ≈ 600

b. Use an area model or the standard algorithm to determine the product. (HINT: Be extra careful when placing the decimal in the product!)

$$\begin{array}{r} 145 \\ \times\ 41 \\ \hline 145 \\ +5800 \\ \hline 5945 \end{array}$$

145 tenths x 41 = 5945 tenths

594.5

c. Is your answer reasonable?

Yes. 594.5 is close to 600.

4. **Find the product of 17.6 x 74. Then explain why your answer is reasonable.**

EST.

18 x 70

(10 x 70) + (8 x 70)

700 + 560

1260

$$\begin{array}{r} 176 \\ \times\ 74 \\ \hline 704 \\ +12320 \\ \hline 13024 \end{array}$$

176 tenths x 74 = 13024 tenths

1,302.4

My product is close to my estimate of 1,260.

Name: KEY

1. If the product of 8 x 6 is 48, what is the product of 8 x 0.6?

A. 0.48
B. 4.8
C. 8.4
D. 48.0

8 x 6 = 48
tenths tenths

2 If the product of 19 x 38 is 722, what is the product of 1.9 x 38?

19 x 38 = 722
tenths tenths

72.2

3. If the product of 482 x 25 is 12,050, what is the product of 482 x 2.5?

482 x 25 = 12050
tenths tenths

1205.0
OR
1,205

4. Estimate the product. Then solve using the area model and the standard algorithm.

33.4 x 22

ESTIMATE: 30 x 20 = 600

	30	3	0.4
20	600	60	8
2	60	6	0.8

668
+ 66.8
734.8

334 tenths
x 22
668
+6680
7348 tenths
↓
734.8

PRODUCT: 734.8

5. Estimate the product. Then solve using the area model and the standard algorithm.

55 x 1.6

ESTIMATE: 60 x 2 = 120

	50	5
1	50	5
0.6	30	3

50
55
+ 33
88

55
x 16
330
+550
880 tenths
↓
88.0

PRODUCT: 88

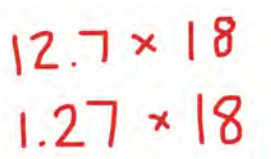
G5 U2 Lesson 9

Multiply decimal fractions by multi-digit whole numbers through conversion to a whole number problem

G5 U2 Lesson 9 - Students will multiply decimal fractions by multi-digit whole numbers through conversion to a whole number problem and reasoning about the placement of the decimal

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson we started to learn about what happens when we're multiplying, but one of our factors is a decimal in the tenths place (*write 12.7 x 18 as an example)*. We noticed how we can multiply our factors as if they were both whole numbers, and then we could reason about the factor in the tenths once we finished multiplying. Today, we're going to see problems where one factor is in the hundredths (*write 1.27 x 18 as an example)*. Before we see an example, what do you predict might be the same or different about multiplying with decimal factors in the hundredths place? Possible Student Answers, Key Points:



- We might still multiply the numbers like they were whole numbers.
- Maybe our answer will be in the hundredths place.
- Maybe the work looks same.

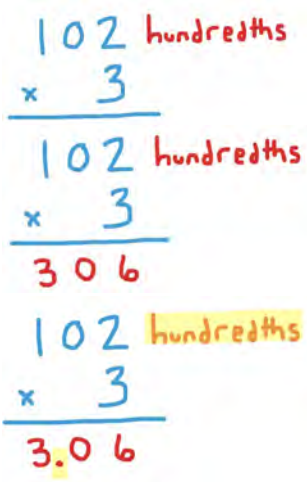
Let's find out if any of your predictions come true!

Let's Talk (Slide 3): Imagine you and your friend are at the store. Your friend wants to buy some pens, and says this (*read from slide*): "I want to buy 3 pens that each cost $1.02. I multiplied 3 x 1.02 and got 306. Yikes! The pens cost $306?" What is your initial reaction to your friend? Possible Student Answers, Key Points:

- That does seem pretty expensive. Maybe their math is wrong.
- I think they forgot about the decimal. Their place value is incorrect in the product.

Could an estimate help your friend think about the total cost of the pens? How could you estimate the product? Possible Student Answers, Key Points:

- $1.02 is really close to $1, so they can think about the easier fact of 1 x 3. The total for the pens should be close to $3. $306 is nowhere near $3.



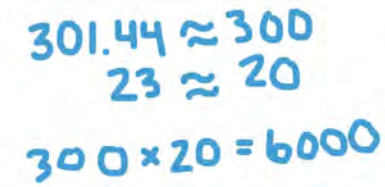
Let's use vertical form to think about $1.02 x 3. Kind of similar to the previous lesson with tenths, I'm going to think of $1.02 as 102 hundredths times 3. This way I can multiply like I normally do, and then worry about the place value later. (*write 102 hundredths x 3 in vertical form)*

When we multiply, (*fill in product below the line as you explain, one digit at a time*) 2 x 3 is 6, 0 x 3 is 0, and 1 x 3 is 3. 102 x 3 = 306. But what is important to remember at this point? (the place value of 102, or hundredths) Right, I can't forget about the fact that we were multiplying by hundredths.

So if 102 x 3 = 306, then I know 102 hundredths x 3 = 306 hundredths. I can write that as 306 in the hundredths place, or 3.06. (*highlight or circle the word hundredths, and dramatically insert a decimal into the product)*

The correct product of $3.06 not only makes sense in terms of the cost of pens, but it also is more in line with the estimate we made a few moments ago.

Let's Think (Slide 4): Let's look at one more problem before we get a chance to practice some together. This problem wants us to estimate 301.44 x 23, and then find the actual product. We'll want to pay close attention to the place value of our factors and our product so that we end up with a reasonable answer.

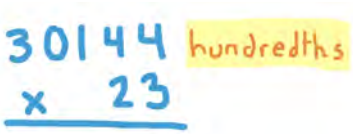


Let's start by estimating. We've done a lot of estimating, so I'll let you help me out. How would you estimate the product of 301.44 x 23? (*write as student shares, supporting as needed)* Possible Student Answers, Key Points:

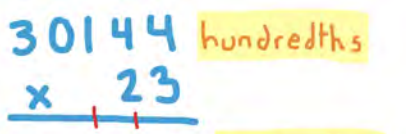
- 301.44 is really close to 300. 23 is in between 20 and 30, but it's closer to 20. I can estimate by thinking about 300 x 20. A reasonable product should be about 6,000.

I'll keep that in the back of my head for when I arrive at the actual product. Our actual product should be about 6,000.

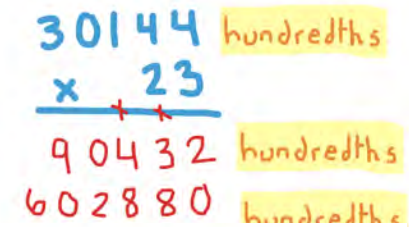
Now let's multiply. I can use an area model or the standard algorithm, depending on what I find more efficient in the moment. I'm going to stack my numbers vertically and use the algorithm for this problem. (*write 30144 x 23 in vertical form)* What do you notice I did with the first factor? (You removed the decimal and wrote it as a whole number) Great! But simply removing the decimal will change the value of the number, which I certainly don't want to do. I'm going to write hundredths off to the side, so I know this 30,144 actually means 30,144 hundredths. (*write hundredths next to 30,144)* Let's start multiplying. I'm going to start by finding 30,144 hundredths times 3.



(*write each digit in the partial product below the line as you explain)* 4 x 3 is 12, so I will write a 2 in the ones place and regroup 1 ten on the line. 4 tens x 3 is 12 tens, plus 1 ten makes 13 tens. I'll write 3 in the tens place and regroup 1 hundred on the line. 1 hundred x 3 is 3 hundreds, plus 1 hundred makes 4 hundreds. 0 thousands x 3 makes 0 thousands. 3 ten thousands x 3 makes 9 ten thousands. So, 30,144 times 3 is equal to 90,432. We were actually multiplying 30,144 hundredths times 3, so I'm going to make sure I note that this partial product is actually 90,432 hundredths. (*write hundredths to the side*)

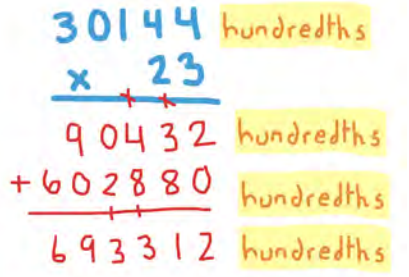


Now we can multiply 30,144 x 20. (*write each digit in the partial product below the first partial product as you explain)* 4 x 2 tens is 8 tens. I'll write an 8 in the tens place and 0 in the ones place. 4 tens x 2 tens is 8 hundreds. 1 hundred x 2 tens is 2 thousand. 0 thousands x 2 tens is 0 ten thousands. 3 ten thousands x 2 tens is 6 hundred thousands. Let's remember to label this partial product as hundredths since we were multiplying 30,144 hundredths by 20. (*label hundredths)*



Take a moment to add the partial products. Let me know what you get. *(wait and validate or support as needed)* When I add 90,432 and 602,880, I get 693,312. Why would that not be a reasonable product? Possible Student Answers, Key Points:

- When we estimated, we noted that our answer should be about 6,000. 693,312 is far too big to be a reasonable product.
- We didn't factor in the fact that our product should end in the hundredths place.



If 30,144 x 23 = 693,312, then I know 30,144 hundredths x 23 = 693,312 hundredths. 693,312 hundredths would be the same digits, ending in the hundredths place. Our final product is 6,933.12, (*write it)* which is much more reasonable given our estimate.

Let's Try it (Slides 5 - 6): Now let's work together to multiply decimal fractions by multi-digit whole numbers through conversion to a whole number problem. We know from our previous lesson and today's lesson that multiplying with decimal factors has a lot in common with multiplying with whole numbers. We will want to make an estimate before we multiply and carefully keep track of the place value of factors so that the final product is reasonable for the given factors.

WARM WELCOME

Today we will multiply decimal fractions by multi-digit whole numbers through conversion to a whole number problem and reasoning about the placement of the decimal

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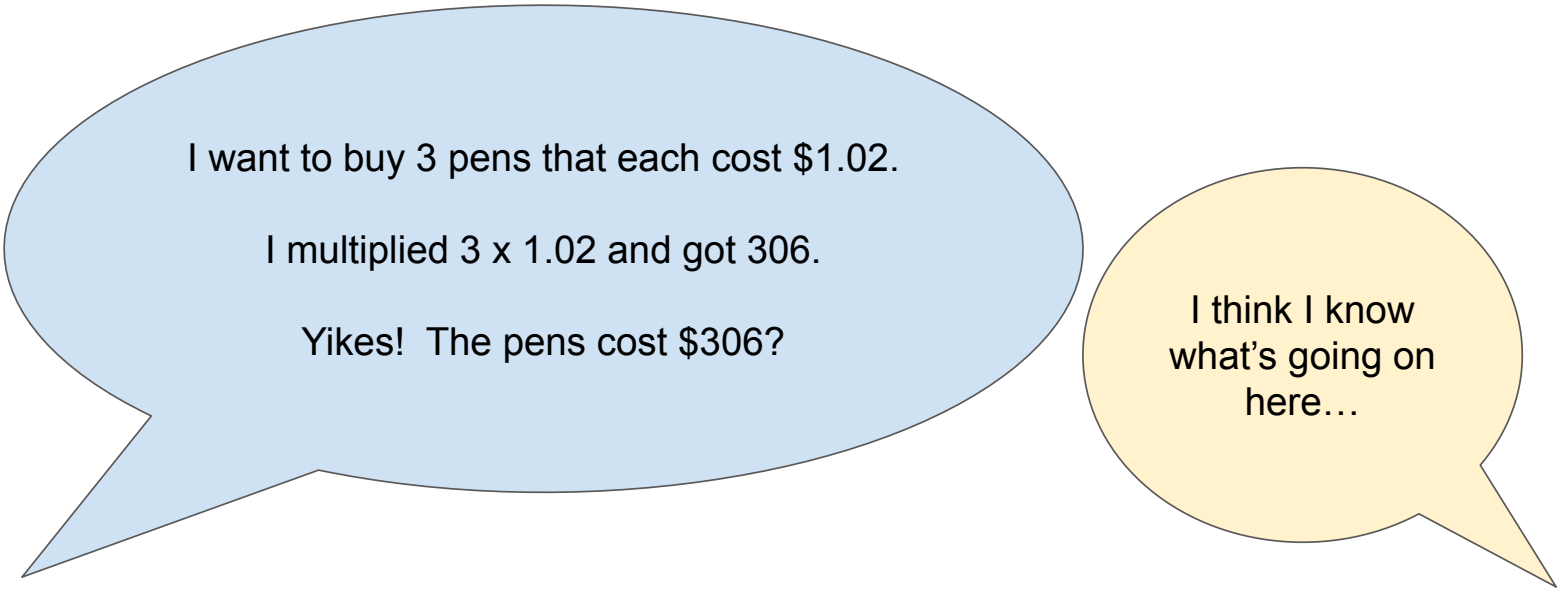
Let's Talk:



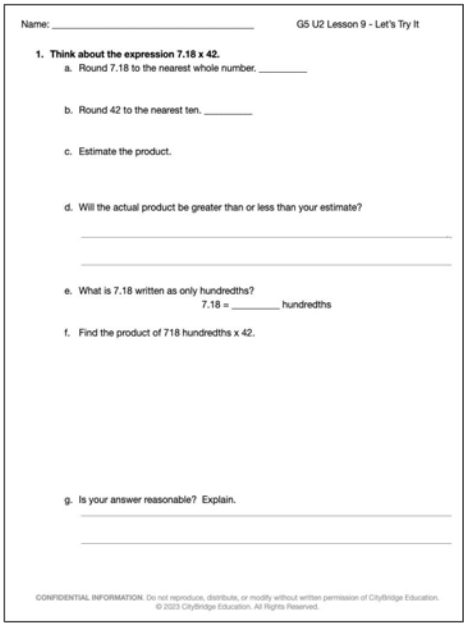
Let's Think:

What is 301.44 x 23?

ESTIMATE

Let's Try It:

Let's explore multiplying decimal fractions by multi-digit whole numbers together.



Name: _____ G5 U2 Lesson 9 - Let's Try It

1. Think about the expression 7.18 x 42.

a. Round 7.18 to the nearest whole number. _____

b. Round 42 to the nearest ten. _____

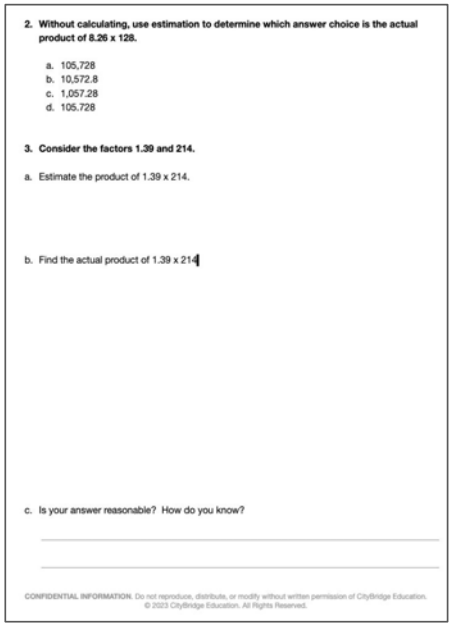
c. Estimate the product.

d. Will the actual product be greater than or less than your estimate?

e. What is 7.18 written as only hundredths?
7.18 = _____ hundredths

f. Find the product of 718 hundredths x 42.

g. Is your answer reasonable? Explain.



2. Without calculating, use estimation to determine which answer choice is the actual product of 8.26 x 128.

a. 105,728
b. 10,572.8
c. 1,057.28
d. 105.728

3. Consider the factors 1.39 and 214.

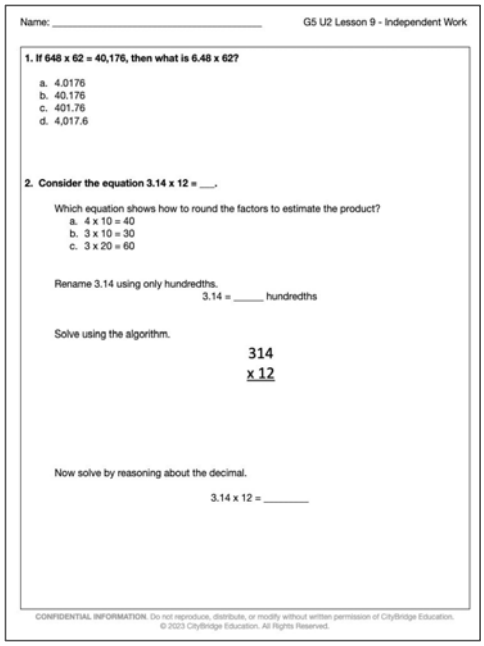
a. Estimate the product of 1.39 x 214.

b. Find the actual product of 1.39 x 214

c. Is your answer reasonable? How do you know?

On your Own:

Now it's time to multiply decimal fractions by multi-digit whole numbers on your own.



Name: _____ G5 U2 Lesson 9 - Independent Work

1. If 648 x 62 = 40,176, then what is 6.48 x 62?

a. 4.0176
b. 40.176
c. 401.76
d. 4,017.6

2. Consider the equation 3.14 x 12 = ___.

Which equation shows how to round the factors to estimate the product?
a. 4 x 10 = 40
b. 3 x 10 = 30
c. 3 x 20 = 60

Rename 3.14 using only hundredths.
3.14 = _____ hundredths

Solve using the algorithm.

314
x 12

Now solve by reasoning about the decimal.

3.14 x 12 = _____

3. Estimate. Solve using the standard algorithm.
6.16 x 14

4. Estimate. Solve using the standard algorithm.
124.05 x 43

Name: _____ G5 U2 Lesson 9 - Let's Try It

1. Think about the expression 7.18 x 42.
   a. Round 7.18 to the nearest whole number. _____

   b. Round 42 to the nearest ten. _____

   c. Estimate the product.

   d. Will the actual product be greater than or less than your estimate?

   _____

   _____

   e. What is 7.18 written as only hundredths?

   7.18 = _____ hundredths

   f. Find the product of 718 hundredths x 42.

   g. Is your answer reasonable? Explain.

   _____

   _____

2. Without calculating, use estimation to determine which answer choice is the actual product of 8.26 x 128.

   a. 105,728
   b. 10,572.8
   c. 1,057.28
   d. 105.728

3. Consider the factors 1.39 and 214.

a. Estimate the product of 1.39 x 214.

b. Find the actual product of 1.39 x 214.

c. Is your answer reasonable? How do you know?

1. If 648 x 62 = 40,176, then what is 6.48 x 62?

   a. 4.0176
   b. 40.176
   c. 401.76
   d. 4,017.6

2. Consider the equation 3.14 x 12 = ___.

   Which equation shows how to round the factors to estimate the product?
   a. 4 x 10 = 40
   b. 3 x 10 = 30
   c. 3 x 20 = 60

   Rename 3.14 using only hundredths.

   3.14 = _____ hundredths

   Solve using the algorithm.

   $$\begin{array}{r} 314 \\ \times\ 12 \\ \hline \end{array}$$

   Now solve by reasoning about the decimal.

   3.14 x 12 = _____

3. Estimate. Solve using the standard algorithm.

   6.16 x 14

4. Estimate. Solve using the standard algorithm.

124.05 x 43

Name: KEY

1. **Think about the expression 7.18 x 42.**

   a. Round 7.18 to the nearest whole number. 7

   $7.18 \approx 7$

   b. Round 42 to the nearest ten. 40

   $42 \approx 40$

   c. Estimate the product.

   $7 \times 40 = 280$

   d. Will the actual product be greater than or less than your estimate?

   I rounded to smaller numbers, so I can expect the actual product to be greater.

   e. What is 7.18 written as only hundredths?

   7.18 = 718 hundredths

   f. Find the product of 718 hundredths x 42.

   718 hundredths

   x 42

   1436

   + 28720

   30156 hundredths → 301.56

   g. Is your answer reasonable? Explain. Yes, my answer is a bit more than 280.

2. **Without calculating, use estimation to determine which answer choice is the actual product of 8.26 x 128.**

8 x 100 = 800

a. 105,728
b. 10,572.8
c. 1,057.28 ← a little more than 800
d. 105.728

3. **Consider the factors 1.39 and 214.**

a. Estimate the product of 1.39 x 214.

1 x 200 = 200

b. Find the actual product of 1.39 x 214.

139 hundredths

× 214

556

1390

+ 27800

29746 hundredths

297.46

c. Is your answer reasonable? How do you know?

Yes, my answer is a little more than 200.

Name: KEY

1. If 648 x 62 = 40,176, then what is 6.48 x 62?

a. 4.0176
b. 40.176
c. 401.76
d. 4,017.6

648 x 62 = 40176
hundredths hundredths

2. Consider the equation 3.14 x 12 = ___.

Which equation shows how to round the factors to estimate the product?

a. 4 x 10 = 40
b. 3 x 10 = 30
c. 3 x 20 = 60

≈3 ≈10

Rename 3.14 using only hundredths.

3.14 = 314 hundredths

Solve using the algorithm.

$$\begin{array}{r} 314 \\ \times\ 12 \\ \hline 628 \\ 3140 \\ \hline 3768 \end{array}$$

Now solve by reasoning about the decimal.

3.14 x 12 = 37.68

314 x 12 = 3768
hundredths hundredths

3. **Estimate. Solve using the standard algorithm.**

6.16 x 14

EST

6 x 10 = 60

616 hundredths

× 14

2464

+ 6160

8624 hundredths

86.24

4. **Estimate. Solve using the standard algorithm.**

124.05 x 43

EST

100 x 40 = 4,000

12405 hundredths

× 43

37215

+ 496200

533415 hundredths

5,334.15

G5 U2 Lesson 10

Reason about the product of a whole number and a decimal with hundredths

G5 U2 Lesson 10 - Students will reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson we used what we know about multiplying with whole numbers to help us multiply with decimals. We multiplied decimal factors as if they were whole numbers, and then carefully reasoned about the placement of the decimal in each product. We used estimation and unit form to help us. Today, we're going to practice a lot of similar thinking and apply what we know in story problems. Let's get started!

Let's Talk (Slide 3): Read this problem with me. We're not going to solve this right away (*read problem*). In your own words, retell the story. What is happening? Possible Student Answers, Key Points:

- He is eating oranges for three weeks to get Vitamin C. We are trying to figure out how much Vitamin C he gets over that time.

Before we dive into solving this problem, take a look at the three possible estimates. Take a second to think and reason, but don't calculate anything precisely. Which estimate makes the most sense based on the story, and what makes you think that? Possible Student Answers, Key Points:

- 1.4 grams is closer to what he'd consume in 2 or 3 days, not 21 days.
- 140 is way too much. He's eating less than 1 gram each day, so the answer should be less than 21 grams.
- Three weeks is about 20 days. 0.65 grams is about 0.7 or 7 tenths. So 20 x 7 tenths is 140 tenths.

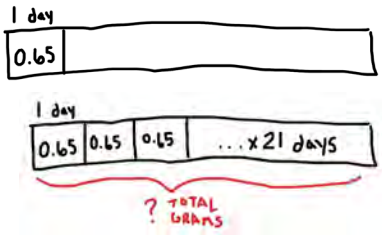
Nice thinking! We can use what we know about operations, estimation, and place value to help us solve real-world story problems involving multiplication with decimals. Reasoning about a story and using estimation before solving the problem is a really helpful way to process what is happening in a given story, and it helps make sure our final answer makes sense.

Now that we have an idea of where we're headed, let's actually work to solve this problem.

Let's Think (Slide 4): What information from the story is important in order for us to find how many grams of Vitamin C Seth consumes? Possible Student Answers, Key Points:

- Each serving is 0.65 grams of Vitamin C. He eats one serving every day, and he does this for 3 weeks.
- 3 weeks is 21 days, because every week has 7 days.

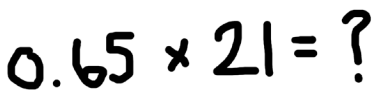
Let's picture what is happening. You told me we're trying to find all the Vitamin C Seth consumes over a 3 week period. Let's draw a big rectangle to represent that whole amount (*draw rectangle).* You also told me that every day, Seth gets 0.65 grams of Vitamin C from his serving of oranges (*partition one small rectangle, write 0.65 inside, and label it with 1 day at the top).*



We're not trying to find just 1 day though, we want to find the total after 21 days, or 3 weeks. It would take a long time to show all 21 days in our tape diagram, so I'll draw a couple more days and then make a note that we're finding 21 days (*partition and label two or three more boxes, then write …x 21 days in the portion).* And since we were trying to find the total grams, I'll use a bracket and a question mark to show that on our diagram (*draw and label bracket).*

Now, looking at our tape diagram, what might we do to approach finding the total number of grams of Vitamin C that Seth consumes? Possible Student Answers, Key Points:

- We could add 0.65 over and over until we find 21 days worth of Vitamin C. That might take a while…
- I see we're trying to find 21 equal groups of 0.65 grams. We can multiply 21 x 0.65 to find the total.



Let's use a multiplication strategy. We can use the equation 0.65 x 21 = ? to find the total number of grams of Vitamin C Seth gets over 21 days (*write equation).*

65 hundredths x 21 will require some careful calculation. Let's estimate first. What can we round our factors to that would be easier to think about? Possible Student Answers, Key Points:

- 0.65 is pretty close to 0.7. We can think of it as 7 tenths, which would be pretty easy to consider.
- 21 is really close to 20.

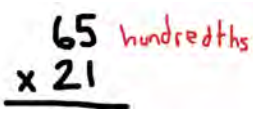
0.7 × 20 = ?

7 tenths × 20 = 140 tenths = 14.0 grams

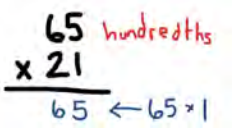
Great, let's think of 0.65 as being about 0.7. Let's think of 21 days as being about 20 days (*write equation*). If we think of our factors in unit form, we can do this math in our heads (*write 7 tenths x 20 = ____*). What is 7 tenths x 20 equal to in unit form (140 tenths). So, we know our answer is close to 140 tenths or 14.0. Let's calculate the exact product, keeping our estimate in mind.

We are multiplying 0.65, or 65 hundredths, by 21. What strategies have we learned to multiply decimals? Possible Student Answers, Key Points:

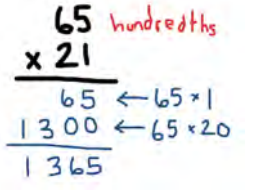
- We can use an area model. We can use vertical form. We can multiply the numbers like they're whole numbers, but use unit form to keep track of the place value.



Let's think of our decimals in unit form, and then use vertical form to help us multiply. What is 0.65 in unit form? (65 hundredths) Let's set up our multiplication in vertical form (*write 65 hundredths x 21 in vertical form).* Now we can multiply as if we're dealing with whole numbers, and we'll worry about the place value once we arrive at the product of 65 and 21.



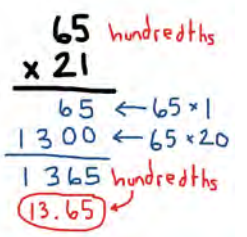
Let's find our first partial product. What is 65 x 1? (65) Let's write that below the line (*write it, label 65 x 1 next to it).*



Now, what is 65 x 20? If it helps, we can think about 5 x 20 and 60 x 20 in parts. (65 x 20 is 1,300) Let's write 1,300 as our other partial product (*write partial product and label with 65 x 20).* What is the sum of the two partial products we found? (1,365) Excellent, but we know that 1,365 cannot be the exact product, because we estimated that our answer should be about 14 grams.

How can we use place value reasoning and unit form to make sure our answer is correct? Possible Student Answers, Key Points:

- We found 65 x 21 is 1,365. If we use unit form, we can think of 65 *hundredths* x 21, so our answer will just be 1,365 *hundredths*. That's 13.65.
- 1,365 is way too big. If our estimate was that our answer should be close to 14, it makes sense to put the decimal in between the 3 and 6 in our product. 13.65 is close to 14.



Great thinking. 65 hundredths times 21 is 1,365 hundredths. We can think of that as 13.65, which is in line with our estimate from earlier (*write hundredths next to 1,365, then write 13.65).* Seth consumed 13.65 grams of Vitamin C over the course of 3 weeks.

We reasoned about the story by retelling what is happening and drawing a tape diagram to help us consider a solution pathway, we estimated a product by rounding each factor, and we used what we know about place value reasoning to arrive at an exact answer.

Before we practice applying what we know, let's look at two student work samples and give them some feedback. These two students are both on the student council at their school, and they want to buy notebooks for everyone in their grade. They need to buy 305 notebooks, and each one costs $2.44. How might you go about solving this? Possible Student Answers, Key Points:

- We could multiply 305 by $2.44. We could use an area model or vertical form to carefully multiply with the decimal value.

Can you think of a reasonable estimate for the total amount of money the student council would spend? Possible Student Answers, Key Points:

- 305 notebooks is about 300 notebooks. And each notebook costs between 2 and 3 dollars. I know 300 x 2 would be $600. I know 300 x 3 would be $900. So the total amount should be between 600 and 900 dollars, most likely.

Interesting! Let's look at their work and see how the two students went about it (*click to next slide).*

Let's Think (Slide 5): Here we see how two students attempted to multiply 305 x 2.44. Take a second to look at the work, and when you're ready share with me what you notice each student doing (*pause to allow think time*). Possible Student Answers, Key Points:

- The student writing in blue used vertical form and thought of the numbers as if they were whole numbers. They found two partial products and added them together.
- The student writing in green drew an area model. They found six partial products and added them together. They didn't convert 2.44 to a whole number though, they just wrote it in expanded form along the area model.

Excellent things to notice. The first student used vertical form, kind of like we did earlier. The second student still multiplied in parts, but they used an area model. We've seen that before in previous lessons. Both strategies can work to find a product.

You probably noticed that they have different answers. Take a second and think about which student's work shows an error. Once you spot it, share out and tell me how you might go about correcting it. Possible Student Answers, Key Points:

- The first work sample is incorrect. A lot of the multiplication is correct in terms of digits, but the student ignored place value altogether.
- I would think of 2.44 as 244 hundredths. We could multiply 244 by 305, and get 74,420 just like they did in the example. Except, I would want to remember that 244 was actually 244 *hundredths*, so my answer would be 74,420 *hundredths*. The actual product is 744.20, which is much closer to our estimate.

We know many strategies that we can use to help us multiply carefully with decimals. Whether we use vertical form or area models, we have to keep the place value of our factors in mind. The place value of our factors impacts the place value of the final product.

Let's Try it (Slides 6 - 7): Now let's work together to reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation. Rounding each factor will help make sure the product we end up with is reasonable. We will use what we know about multiplying whole numbers to help us, and we will want to carefully keep track of the place value in each factor so that the placement of digits in our product makes sense.

WARM WELCOME

Today we will reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation

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Let's Talk:

Seth eats a serving of oranges every day for 3 weeks to get Vitamin C. If each serving contains 0.65 grams of Vitamin C, how many grams does Seth consume over 3 weeks?

Without calculating, which estimate seems most appropriate? Why?

about 1.4 grams

about 14 grams

about 140 grams

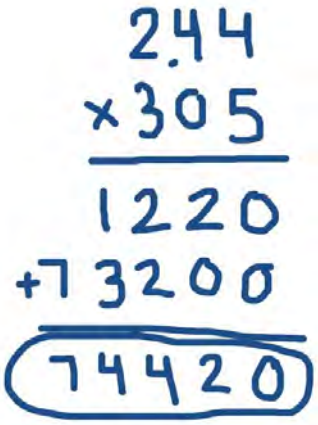
Let's Think:

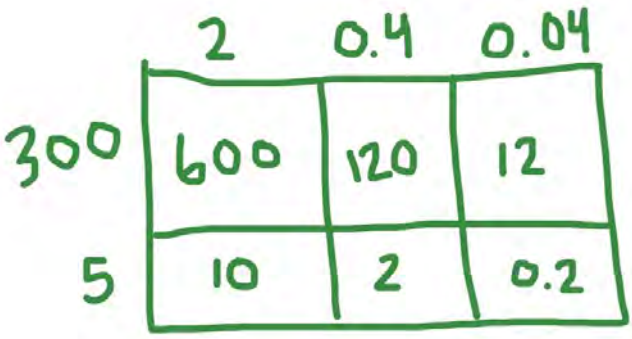
Seth eats a serving of oranges every day for 3 weeks to get Vitamin C. If each serving contains 0.65 grams of Vitamin C, how many grams does Seth consume over 3 weeks?

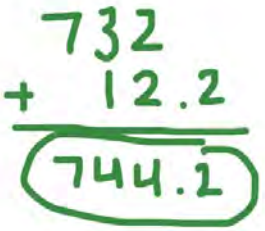
ESTIMATE

Let's Think:

Two students worked to find the product of 2.44 and 305. Explain the steps each student takes and help correct the work shows an error.

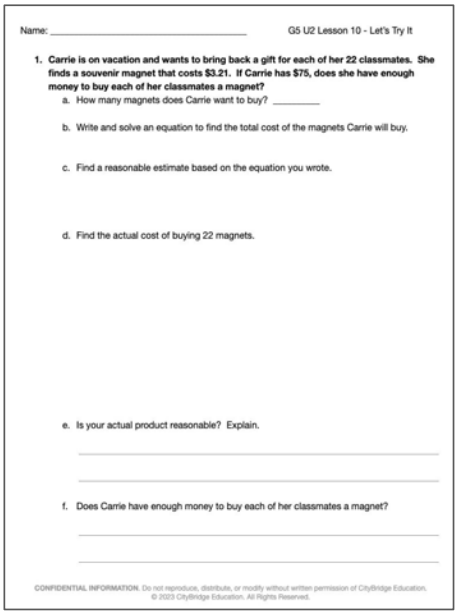






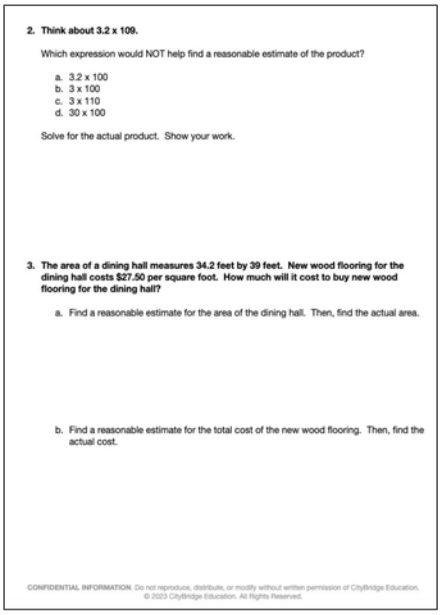
Let's Try It:

Let's reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation.



Name: _____ G5 U2 Lesson 10 - Let's Try It

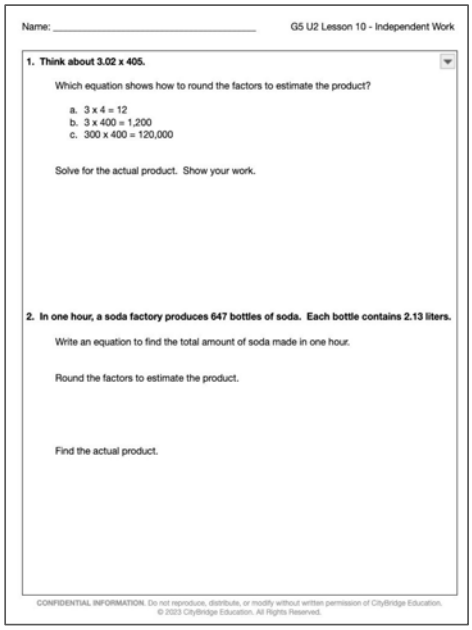
1. **Carrie is on vacation and wants to bring back a gift for each of her 22 classmates. She finds a souvenir magnet that costs $3.21. If Carrie has $75, does she have enough money to buy each of her classmates a magnet?**
   a. How many magnets does Carrie want to buy? _____
   b. Write and solve an equation to find the total cost of the magnets Carrie will buy.
   c. Find a reasonable estimate based on the equation you wrote.
   d. Find the actual cost of buying 22 magnets.
   e. Is your actual product reasonable? Explain.
   f. Does Carrie have enough money to buy each of her classmates a magnet?



2. **Think about 3.2 x 109.**
   Which expression would NOT help find a reasonable estimate of the product?
   a. 3.2 x 100
   b. 3 x 100
   c. 3 x 110
   d. 30 x 100
   Solve for the actual product. Show your work.
3. **The area of a dining hall measures 34.2 feet by 39 feet. New wood flooring for the dining hall costs $27.50 per square foot. How much will it cost to buy new wood flooring for the dining hall?**
   a. Find a reasonable estimate for the area of the dining hall. Then, find the actual area.
   b. Find a reasonable estimate for the total cost of the new wood flooring. Then, find the actual cost.

On your Own:

Now it's time to multiply decimal fractions by multi-digit whole numbers on your own.



Name: _____ G5 U2 Lesson 10 - Independent Work

1. Think about 3.02 x 405.

Which equation shows how to round the factors to estimate the product?

a. 3 x 4 = 12
b. 3 x 400 = 1,200
c. 300 x 400 = 120,000

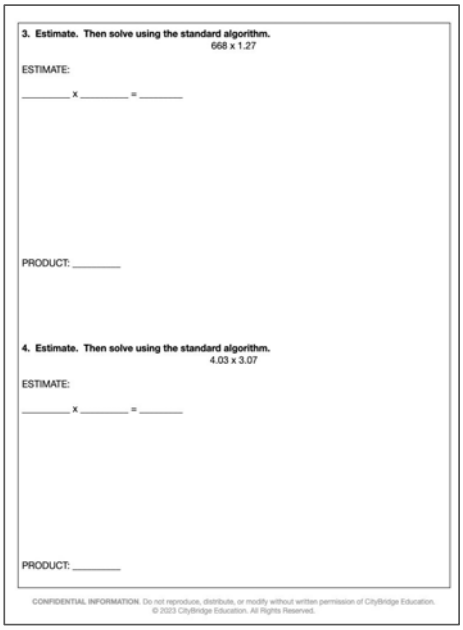
Solve for the actual product. Show your work.

2. In one hour, a soda factory produces 647 bottles of soda. Each bottle contains 2.13 liters.

Write an equation to find the total amount of soda made in one hour.

Round the factors to estimate the product.

Find the actual product.



3. Estimate. Then solve using the standard algorithm.
668 x 1.27

ESTIMATE:

_____ x _____ = _____

PRODUCT: _____

4. Estimate. Then solve using the standard algorithm.
4.03 x 3.07

ESTIMATE:

_____ x _____ = _____

PRODUCT: _____

1. Carrie is on vacation and wants to bring back a gift for each of her 22 classmates. She finds a souvenir magnet that costs $3.21. If Carrie has $75, does she have enough money to buy each of her classmates a magnet?
   a. How many magnets does Carrie want to buy? _____

   b. Write an equation that can be used to find the total cost of the magnets Carrie will buy.

   c. Find a reasonable estimate based on the equation you wrote.

   d. Find the actual cost of buying 22 magnets.

   e. Is your actual product reasonable? Explain.

   f. Does Carrie have enough money to buy each of her classmates a magnet?

2. Think about 3.2 x 109.

   Which expression would NOT help find a reasonable estimate of the product?

   a. 3.2 x 100
   b. 3 x 100
   c. 3 x 110
   d. 30 x 100

Solve for the actual product. Show your work.

3. The area of a dining hall measures 34.2 feet by 39 feet. New wood flooring for the dining hall costs $27.50 per square foot. How much will it cost to buy new wood flooring for the dining hall?

    a. Find a reasonable estimate for the area of the dining hall. Then, find the actual area.

    b. Find a reasonable estimate for the total cost of the new wood flooring. Then, find the actual cost.

1. Think about 3.02 x 405.

   Which equation shows how to round the factors to estimate the product?

   a. 3 x 4 = 12
   b. 3 x 400 = 1,200
   c. 300 x 400 = 120,000

   Solve for the actual product. Show your work.

2. In one hour, a soda factory produces 647 bottles of soda. Each bottle contains 2.13 liters.

   Write an equation to find the total amount of soda made in one hour.

   Round the factors to estimate the product.

   Find the actual product.

3. Estimate. Then solve using the standard algorithm.

   668 x 1.27

ESTIMATE:

_____ x _____ = _____

PRODUCT: _____

4. Estimate. Then solve using the standard algorithm.

4.03 x 3.07

ESTIMATE:

_____ x _____ = _____

PRODUCT: _____

Name: KEY

1. **Carrie is on vacation and wants to bring back a gift for each of her 22 classmates. She finds a souvenir magnet that costs $3.21. If Carrie has $75, does she have enough money to buy each of her classmates a magnet?**

   a. How many magnets does Carrie want to buy? 22

   b. Write and solve an equation to find the total cost of the magnets Carrie will buy.

   $22 \times 3.21 = ?$

   c. Find a reasonable estimate based on the equation you wrote.

   $20 \times 3 = 60$

   d. Find the actual cost of buying 22 magnets.

   321 hundredths
   × 22
   642
   + 6420
   7062 hundredths

   $70.62

   e. Is your actual product reasonable? Explain.

   My estimate is 60 and my actual product is 70.62, so they are pretty close. Yes!

   f. Does Carrie have enough money to buy each of her classmates a magnet?

   Yes! She has $75 and only needs $70.62

2. **Think about 3.2 x 109.**

Which expression would NOT help find a reasonable estimate of the product?

a. 3.2 x 100
b. 3 x 100
c. 3 x 110
d. 30 x 100 ← neither factor is close to 30 in the problem

Solve for the actual product. Show your work.

$$\begin{array}{r} 109 \\ \times\ 32 \\ \hline 218 \\ +3270 \\ \hline 3488 \end{array}$$ tenths → 348.8

3. **The area of a dining hall measures 34.2 feet by 39 feet. New wood flooring for the dining hall costs $27.50 per square foot. How much will it cost to buy new wood flooring for the dining hall?**

a. Find a reasonable estimate for the area of the dining hall. Then, find the actual area.

$A = L \times W$

$A \approx 30 \times 40$

≈ 1200 sq. ft

estimate

$$\begin{array}{r} 342 \text{ tenths} \\ \times\ 39 \\ \hline 3078 \\ +10260 \\ \hline 13338 \text{ tenths} \end{array}$$ → 1,333.8 sq. ft

b. Find a reasonable estimate for the total cost of the new wood flooring. Then, find the actual cost.

$1{,}333.8 \times 27.5 \approx$ cost

$1000 \times 28 \approx$ cost

$28{,}000 \approx$ cost

estimate

$$\begin{array}{r} 13338 \text{ tenths} \\ \times\ 275 \text{ tenths} \\ \hline 66690 \\ 93366 \\ +266760 \\ \hline 3667950 \text{ hundredths} \end{array}$$

$36,679.50

Name: KEY

1. Think about 3.02 x 405.

Which equation shows how to round the factors to estimate the product?

a. ~~3 x 4 = 12~~
b. 3 x 400 = 1,200
c. ~~300 x 400 = 120,000~~

Solve for the actual product. Show your work.

```
  302   hundredths
x 405
------
 1510
+12080
------
122310   hundredths
```

1,223.1

2. In one hour, a soda factory produces 647 bottles of soda. Each bottle contains 2.13 liters.

Write an equation to find the total amount of soda made in one hour.

647 x 2.13 = ?

Round the factors to estimate the product.

600 x 2 = 1,200 L

Find the actual product.

```
  647
x 213   hundredths
------
 1941
 6470
+129400
------
137811   hundredths
```

1,378.11 L

3. Estimate. Then solve using the standard algorithm.

668 x 1.27

ESTIMATE:

700 x 1 = 700

```
   668
 x 127   hundredths
 -----
  4676
 1336
+6680
 -----
 84836   hundredths
```

PRODUCT: 848.36

4. Estimate. Then solve using the standard algorithm.

4.03 x 3.07

ESTIMATE:

4 x 3 = 12

```
   403   hundredths
 x 307   hundredths
 -----
  2821
+12090
 -----
123721   ten thousandths
```

PRODUCT: 12.3721

G5 U2 Lesson 11

Use whole number multiplication to express equivalent measurements

G5 U2 Lesson 11 - Students will use whole number multiplication to express equivalent measurements

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working on multiplication skills, particularly involving decimals, for the past several lessons. Today, we get a chance to apply those skills to convert measurements. Conversions are everywhere in our lives if you think about it. You might need to convert pints into cups when you're cooking. You might need to convert dollars to euros when you're traveling and need money. You might need to convert yards to inches when you're renovating your house. Let's give it a try, and we'll see how our multiplication skills come in handy!

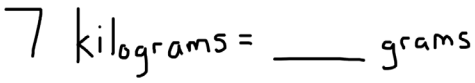
Let's Talk (Slide 3): Take a second and look at these pairings (*pause*). What do you notice? What do you wonder? Possible Student Answers, Key Points:

- I notice some pairs are time units and some pairs are length units. I notice each one has a "1" in it somewhere.
- I wonder if each pair is equal, since I know 1 hour is 60 minutes. I wonder if there are other pairs I could come up with.

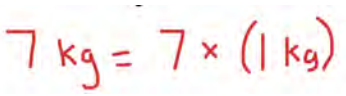
Interesting ideas. Each pairing here shows a larger unit and an equivalent amount of a smaller unit. For example, 1 hour is the same as 60 minutes; minutes are smaller units of time than hours. 1 week is equivalent to 7 days; days are just a smaller unit. 1 meter is the same as 100 centimeters, and 1 foot is the same as 12 inches. Today, we're going to convert from a larger unit, like hours, to a smaller unit, like minutes.

Let's Think (Slide 4): This first problem wants us to think about how many grams are in 7 kilograms. What do you know or notice about the relationship between grams and kilograms? Possible Student Answers, Key Points:

- I know kilograms and grams are weight units. I know kilograms are heavier than grams. I know they are metric units.
- The problem notes that 1 kilogram is equal to 1,000 grams.

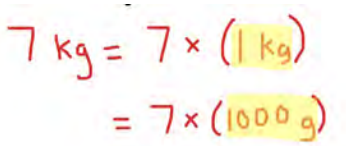


Good. 1 kilogram is the same as 1,000 grams, or we can say that there are 1,000 grams in 1 kilogram. We are trying to find how many grams are in 7 kilograms. We can write that as an equation (*write 7 kilograms = ____ grams).* If it helps you be efficient, you can use the abbreviations for units instead of writing the entire word. In this case, the abbreviation for kilograms is kg, and the abbreviation for grams is g.

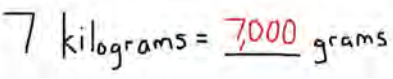


Now let's think (*write 7 kg = 7 x (1 kg)).* Think about this equation, and tell me why it's true. Possible Student Answers, Key Points:

- 7 kilograms is the same as 7 units of 1 kilogram. 7 kilograms is like 7 groups of 1 kilogram, or 7 x 1 kg.



So if I know 7 kilograms can be thought of as 7 x (1 kg), I can use what I know about 1 kilogram to help me convert. You named that 1 kilogram is equal to 1,000 grams. So I'm going to rewrite the equation, but I'll write 1,000 grams where we wrote 1 kg (*write it, and highlight 1 kg and 1,000 g).* I can replace 1 kg with 1,000 g, because we know they are the same amount. Now, all we have to do is multiply 7 x 1,000 grams. What is 7 x 1,000 grams? (7,000 grams) Correct! So we know 7 kilograms is equal to 7,000 grams (*write answer).*



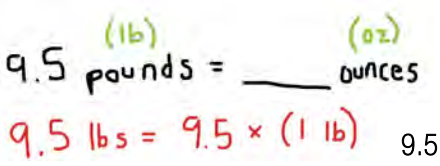
To convert from a larger unit to a smaller unit, we thought about how many groups of 1 larger unit we had. We replaced that larger unit with the equivalent amount of smaller units. Then, we were able to use multiplication to find how many smaller units were equivalent to the larger unit we started with.

Let's try one more using similar thinking.

Let's Think (Slide 5): What do you notice is the same and different about this problem compared to the one we just worked on? Possible Student Answers, Key Points:

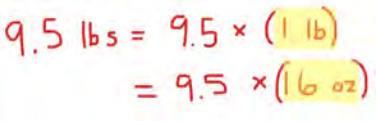
- This problem has a decimal value.
- This problem isn't about kilograms and grams; it's about pounds and ounces.

Even though this problem has some differences on the surface, we'll notice that the big ideas and strategies we use remain constant. Let's start by writing an equation to represent what we are trying to figure out. In this case, we want to know how many ounces are



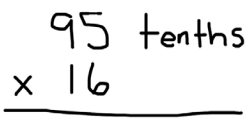
equivalent to 9.5 pounds (*write 9.5 pounds = ____ ounces)*. The abbreviation for pounds is lb (*note that above pounds)*, and the abbreviation for ounces is oz (*note that above ounces).*

I know 9.5 pounds is the same as 9.5 groups of 1 pound. I can write that as 9.5 pounds = 9.5 x (1 pound) *(write as you say the equation)*.



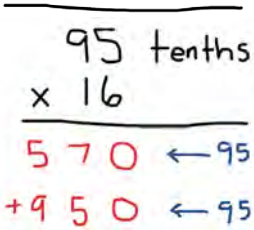
Since I'm trying to convert pounds into ounces, I can replace 1 pound with what I know about a pound's relationship to ounces. What can I replace "1 lb" with in my equation? (16 ounces) Correct, let's substitute 16 ounces in place of 1 pound since we know they are the same (*write new equation and highlight 1 lb and 16 oz)*.

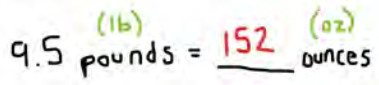
At this point in our previous problem, we were able to use mental math to quickly find how many grams were in 7 kilograms. In this problem, we have factors that might require us to perform calculations. That's okay! We've been practicing multiplying with whole numbers and decimals for several lessons, so we're prepared. Let's multiply 9.5 x 16. We can use an area model or vertical form to do this. Let's use vertical form this time, and we'll think about our decimal factor in unit form to help us. What is 9.5 in unit form? (95 tenths) Let's write 95 tenths x 16 vertically (*write it)*.



Let's find the partial products. Take a second to think and calculate. What is 95 x 6? (570) *(write 570 with an arrow to show that it is the product of 95 x 6)* What is 95 x 10? (950) (*write 950 and an arrow to show that it is the product of 95 x 10)* When we multiply 95 x 16, the two partial products are 570 and 950. We have to remember that we weren't actually multiplying with 95; we were multiplying with 95 <u>tenths</u>. Take a moment to find the sum of the partial products. What is the product of 95 tenths x 16, and how do you know? Possible Student Answers, Key Points:

- When I add the partial products of 570 and 950, I get 1520. Since 95 x 16 is 1,520, I know that 95 *tenths* x 16 is 1,520 *tenths*. I can write that as 152.0 or 152.





Excellent. So we know that 9.5 pounds is equivalent to 152 ounces (*fill in 152 ounces in blank)*.

Even though this problem involved different units and decimals, what did you notice? Possible Student Answers, Key Points:

- The process we used didn't really change. We could still write an equation thinking of how many groups of the larger unit, and replace the larger unit with the equivalent amount of smaller units.
- When dealing with a decimal factor, the math might take a little bit longer since we might not be able to do all the calculation in our head. We want to keep careful track of the place value when we multiply with decimals.

Nice work!

Let's Try it (Slides 6 - 7): Now let's work together to use whole number multiplication to find equivalent measurements . As we work, we'll want to play close attention to how many smaller units are equivalent to the larger unit we are given. We can use that equivalence and the associative property to write a multiplication expression that can take us from a larger unit to an equivalent amount of a smaller unit.

WARM WELCOME

Today we will use whole number multiplication to express equivalent measurements.

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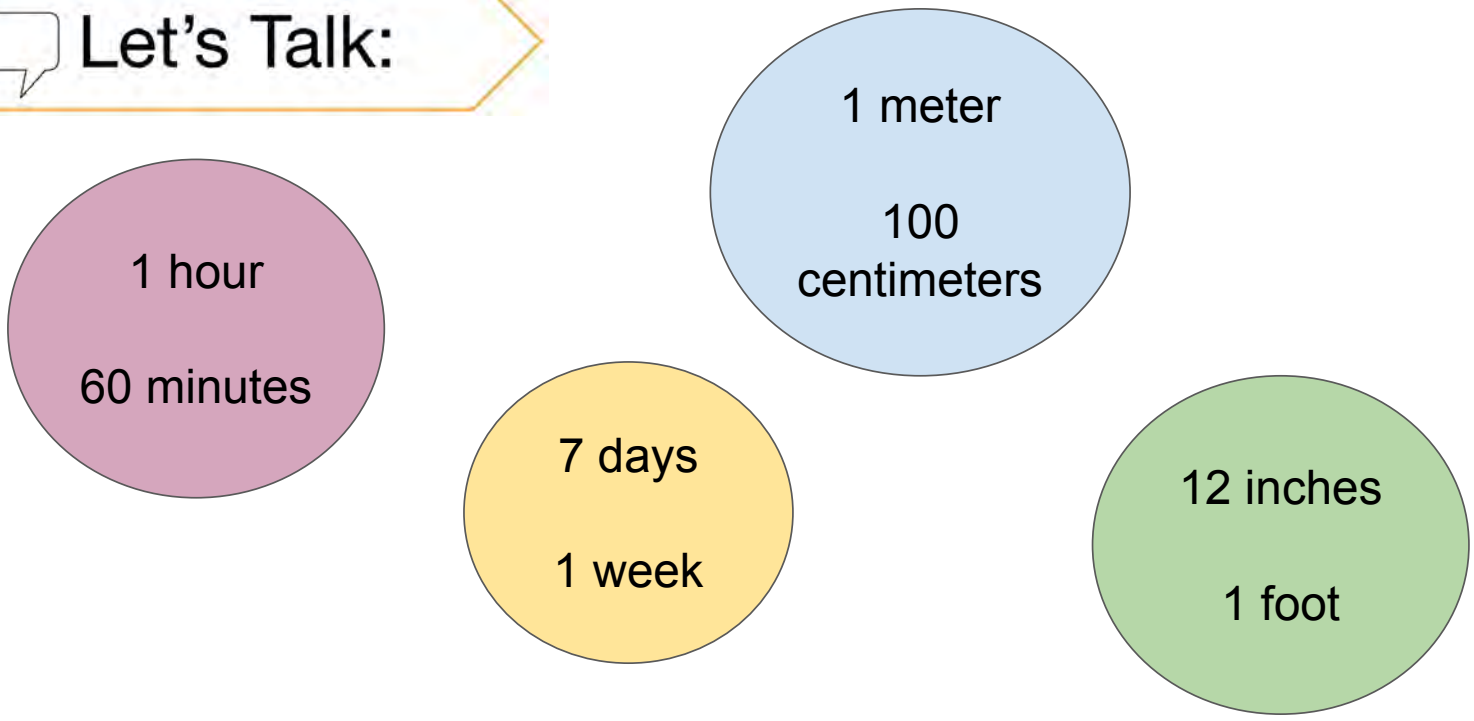
Let's Talk:



Let's Think:

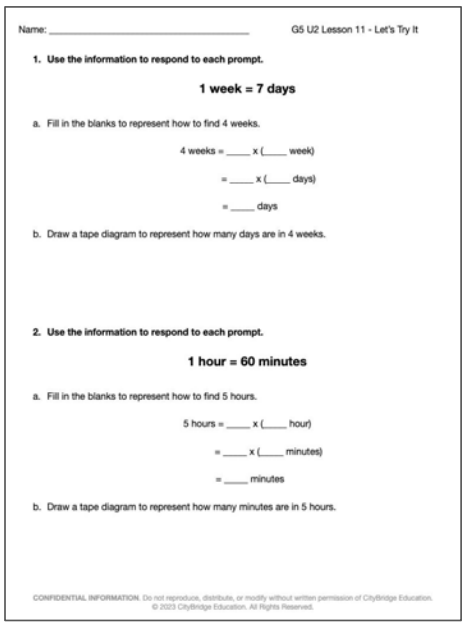
How many grams are in 7 kilograms?
(1 kilogram = 1,000 grams)

Let's Think:

9.5 pounds is equivalent to how many ounces?
(1 pound = 16 ounces)

Let's Try It:

Let's explore using whole number multiplication to express equivalent measurements together.



Name: _____ G5 U2 Lesson 11 - Let's Try It

1. Use the information to respond to each prompt.

1 week = 7 days

a. Fill in the blanks to represent how to find 4 weeks.

4 weeks = ____ x (____ week)

= ____ x (____ days)

= ____ days

b. Draw a tape diagram to represent how many days are in 4 weeks.

2. Use the information to respond to each prompt.

1 hour = 60 minutes

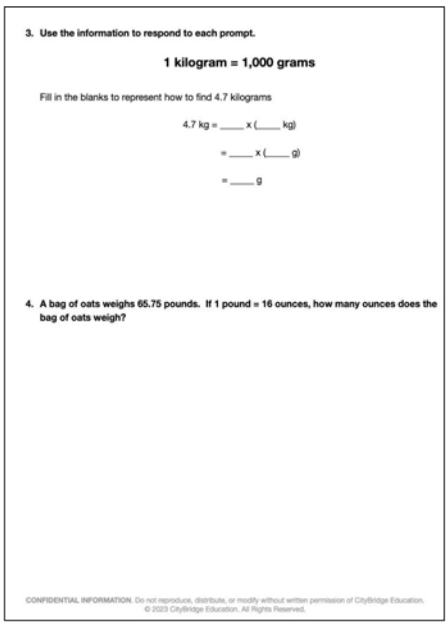
a. Fill in the blanks to represent how to find 5 hours.

5 hours = ____ x (____ hour)

= ____ x (____ minutes)

= ____ minutes

b. Draw a tape diagram to represent how many minutes are in 5 hours.



3. Use the information to respond to each prompt.

1 kilogram = 1,000 grams

Fill in the blanks to represent how to find 4.7 kilograms

4.7 kg = ____ x (____ kg)

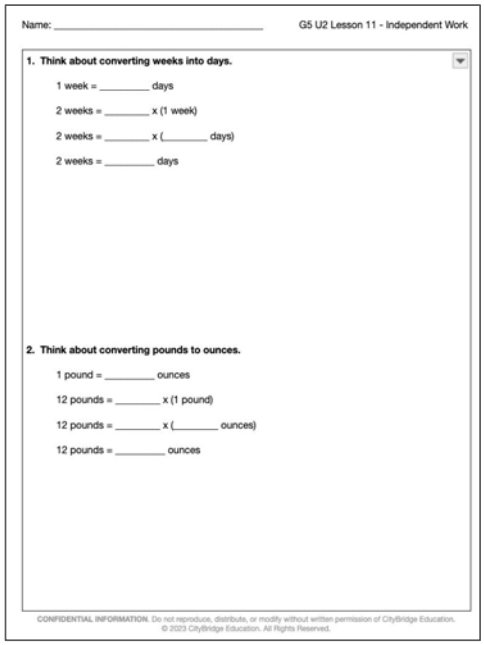
= ____ x (____ g)

= ____ g

4. A bag of oats weighs 65.75 pounds. If 1 pound = 16 ounces, how many ounces does the bag of oats weigh?

On your Own:

Now it's time to use whole number multiplication to express equivalent measurements on your own.



Name: _____ G5 U2 Lesson 11 - Independent Work

1. Think about converting weeks into days.

1 week = _____ days

2 weeks = _____ x (1 week)

2 weeks = _____ x (_____ days)

2 weeks = _____ days

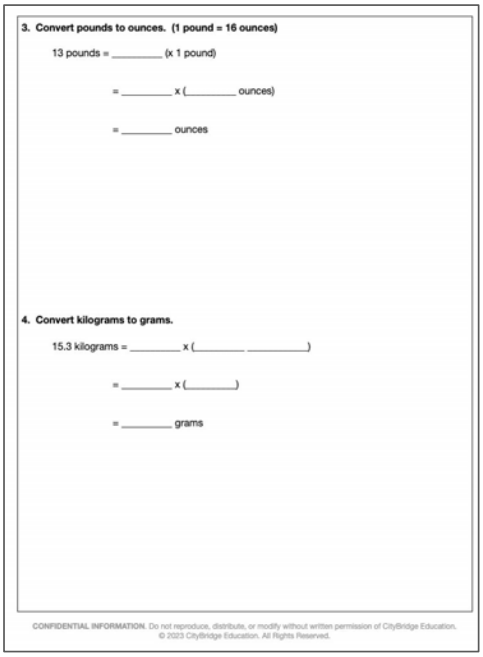
2. Think about converting pounds to ounces.

1 pound = _____ ounces

12 pounds = _____ x (1 pound)

12 pounds = _____ x (_____ ounces)

12 pounds = _____ ounces



3. Convert pounds to ounces. (1 pound = 16 ounces)

13 pounds = _____ (x 1 pound)

= _____ x (_____ ounces)

= _____ ounces

4. Convert kilograms to grams.

15.3 kilograms = _____ x (_____ _____)

= _____ x (_____)

= _____ grams

1. Use the information to respond to each prompt.

1 week = 7 days

a. Fill in the blanks to represent how to find 4 weeks.

4 weeks = _____ x (_____ week)

= _____ x (_____ days)

= _____ days

b. Draw a tape diagram to represent how many days are in 4 weeks.

2. Use the information to respond to each prompt.

1 hour = 60 minutes

a. Fill in the blanks to represent how to find 5 hours.

5 hours = _____ x (_____ hour)

= _____ x (_____ minutes)

= _____ minutes

b. Draw a tape diagram to represent how many minutes are in 5 hours.

3. Use the information to respond to each prompt.

1 kilogram = 1,000 grams

Fill in the blanks to represent how to find 4.7 kilograms

4.7 kg = _____ x (_____ kg)

= _____ x (_____ g)

= _____ g

4. A bag of oats weighs 65.75 pounds. If 1 pound = 16 ounces, how many ounces does the bag of oats weigh?

1. Think about converting weeks into days.

   1 week = _____ days

   2 weeks = _____ x (1 week)

   2 weeks = _____ x (_____ days)

   2 weeks = _____ days

2. Think about converting pounds to ounces.

   1 pound = _____ ounces

   12 pounds = _____ x (1 pound)

   12 pounds = _____ x (_____ ounces)

   12 pounds = _____ ounces

3. Convert pounds to ounces. (1 pound = 16 ounces)

   13 pounds = _____ (x 1 pound)

   = _____ x (_____ ounces)

= _____ ounces

4. Convert kilograms to grams.

15.3 kilograms = _____ x (_____ _____)

= _____ x (_____)

= _____ grams

Name: KEY

1. **Use the information to respond to each prompt.**

1 week = 7 days

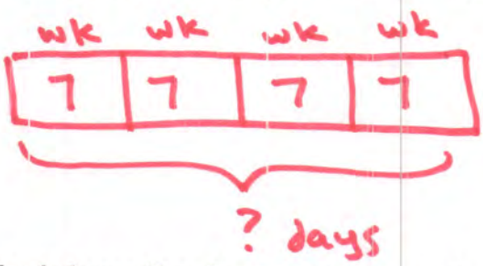
a. Fill in the blanks to represent how to find 4 weeks.

4 weeks = 4 x (1 week)

= 4 x (7 days)

= 28 days

b. Draw a tape diagram to represent how many days are in 4 weeks.



2. **Use the information to respond to each prompt.**

1 hour = 60 minutes

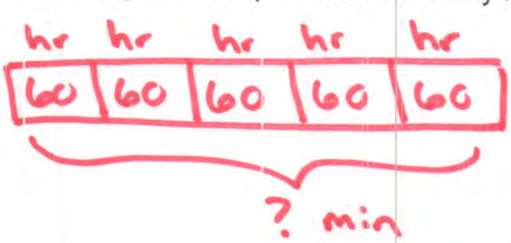
a. Fill in the blanks to represent how to find 5 hours.

5 hours = 5 x (1 hour)

= 5 x (60 minutes)

= 300 minutes

b. Draw a tape diagram to represent how many minutes are in 5 hours.



3. **Use the information to respond to each prompt.**

1 kilogram = 1,000 grams

Fill in the blanks to represent how to find 4.7 kilograms

4.7 kg = 4.7 x (1 kg)

= 4.7 x (1000 g)

= 4,700 g
or
4,700.0

47 x 1000 = 47,000
tenths tenths

4. **A bag of oats weighs 65.75 pounds. If 1 pound = 16 ounces, how many ounces does the bag of oats weigh?**

EST.
70 x 20 = 1400

65.75 lbs = 65.75 x (1 lb)
65.75 x (16 oz)

6575 hundredths
x 16
39450
+65750
1052 00 hundredths

1,052.00
or
1,052 oz

Name: KEY

1. Think about converting weeks into days.

1 week = 7 days

2 weeks = 2 x (1 week)

2 weeks = 2 x (7 days)

2 weeks = 14 days

2. Think about converting pounds to ounces.

1 pound = 16 ounces

12 pounds = 12 x (1 pound)

12 pounds = 12 x (16 ounces)

12 pounds = 192 ounces

$$\begin{array}{r} 12 \\ \times\ 16 \\ \hline 72 \\ +120 \\ \hline 192 \end{array}$$

3. Convert pounds to ounces. (1 pound = 16 ounces)

13 pounds = 13 (x 1 pound)

= 13 x (16 ounces)

= 208 ounces

$$\begin{array}{r} 13 \\ \times\ 16 \\ \hline 78 \\ +130 \\ \hline 208 \end{array}$$

4. Convert kilograms to grams.

15.3 kilograms = 15.3 x (1 kg)

= 15.3 x (1000 g)

= 15,300 grams

153 tenths x 1000 = 153,000 tenths

G5 U2 Lesson 12

Use fraction and decimal multiplication to express equivalent measurements

G5 U2 Lesson 12 - Students will use fraction and decimal multiplication to express equivalent measurements

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson we converted from a larger unit to a smaller unit using what we know about multiplication. For example, we could use multiplication to help us figure out how many days are in 3 weeks. Or we could figure out how many meters are equivalent 78 kilometers. Our work today will be related to our previous lesson, except we'll be converting from a smaller unit to a larger unit. Instead of converting weeks into days, we'll convert days into weeks. Or instead of figuring out how many meters are equivalent to a given number of kilometers, we'll figure out how many kilometers are equivalent to a given number of meters. Let's get started!

Let's Talk (Slide 3): I wanted to share a problem my friend ran into recently, but before I do that, I want you to take a second and look at the information here. What do you notice? What do you wonder? Possible Student Answers, Key Points:

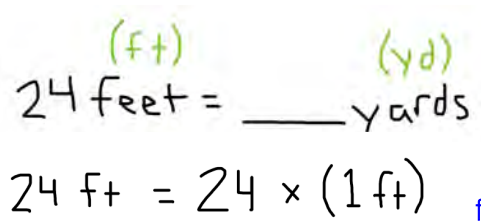
- I notice fabric costs $5 per yard. A person needs 24 feet of fabric.
- I wonder why the fabric is sold in yards, but the person needs 24 feet. Yards are different than feet.
- I wonder why they need the fabric.
- I wonder how much it will cost them to buy the fabric.

Great thinking! The other day, my friend was at the fabric store and needed to buy some fabric. But she noticed that the fabric store sold fabric by the yard, but she needed 24 feet of fabric. She called me to help her figure out how much her 24 feet of fabric would cost, even though the store sells by the yard. What ideas do you have that could potentially help her solve her problem? Possible Student Answers, Key Points:

- We know 1 yard is equal to 3 feet. We can use that relationship to help us.
- Maybe we can use multiplication to help us like we did in the last lesson.

Let's use what we did in the previous lesson to help us figure out how many yards are equivalent to 24 feet.

Let's Think (Slide 4): You named that 3 feet is equivalent to 1 yard.

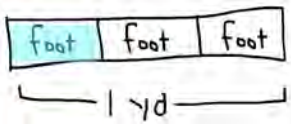


Let's keep that in mind as we figure out how many yards are equivalent to 24 feet (*write 24 feet = _____ yards)*. We can use the abbreviations of ft and yd if that's helpful (*write abbreviations over corresponding unit*).

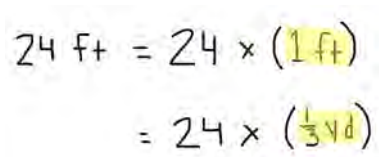
We know from our last lesson that we can think of 24 feet as 24 groups of 1 foot. How can I write that as a multiplication equation? (We can write 24 feet = 24 x (1 foot)) Let's write that (*write it)*.

Now here is where we have to pause and think for a second. If this were our previous lesson, we'd be converting yards into feet, so we could substitute 1 yard for 3 feet and multiply. Now, we have to think about how many yards are equivalent to 1 foot. What do you notice, or what is different about that? Possible Student Answers, Key Points:

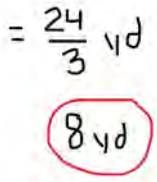
- A foot is smaller than a yard. A yard is bigger than a foot.
- A yard can't fit into a foot, because it's a bigger unit.



If there are 3 feet in one yard, (*draw rectangle partitioned into 3 equal sections, labeling the sections as feet and the whole as 1 yard)* then we can say 1 foot is equal to a fraction of yard (*shade 1 foot)*. What fraction of a yard is 1 foot equal to? (⅓)



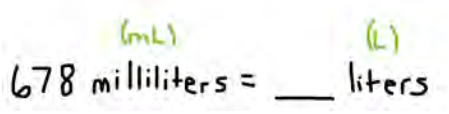
Just like yesterday, we can replace our known unit with the equivalent of the other unit. We can replace 1 foot with ⅓ yard. Let's do that in our equation. (*rewrite equation substituting ⅓ yd in place of 1 foot, highlight each to point out equivalence)* 1 foot is the same as ⅓ yard, so we rewrote the equation. Now we can multiply. What is 24 x ⅓ (24/3 or 8 wholes)



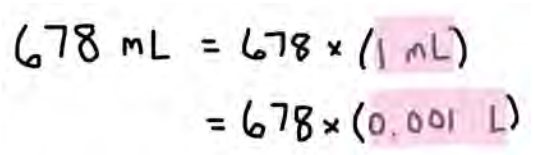
24 feet is equal to 24/3 yards or 8 yards. (*write 24/3 yd and 8 yd)* Even though we were converting from a smaller unit, feet, to a larger unit, yards, we still used multiplication to help us convert. Our conversion factor, ⅓ in this case, was a fraction. This makes sense because a smaller unit will always be a fraction or a part of a larger unit. Let's try another one.

Let's Think (Slide 5): This problem wants us to convert 678 milliliters into liters. What do you notice is the same or different about this problem? Possible Student Answers, Key Points:

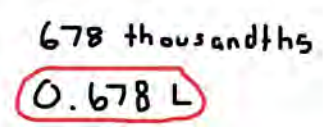
- The units are different. This one involves milliliters and liters.
- It's similar because we're converting a smaller unit into a larger unit. Milliliters are smaller than liters.



Let's use what we know to help us. What is the relationship between milliliters and liters? (1 liter is the same as 1,000 milliliters) Right, we know 1 liter is the same as 1,000 milliliters. We're trying to find out how many liters is the same as 678 milliliters. Let's write that as an equation. *(write 678 milliliters = _____ liters)* We can use the abbreviations of mL and L if we want. *(write abbreviations over corresponding units)*



We can think of 678 milliliters as 678 groups of 1 milliliter. *(write 678 mL = 678 x (1 mL))* Now, we have to think about how many liters is equivalent to 1 milliliter. We know a milliliter is smaller than a liter, so our conversion factor will be a fraction or part of a liter. One milliliter is equal to what fraction of a liter? (1 thousandth of a liter) How do we write 1 thousandth in decimal form? (0.001) We can replace 1 mL with 0.001 L, or 1 thousandth of a liter. *(substitute 1 mL with 0.001 L and highlight 1 mL and 0.001 L to highlight equivalence)*



We can multiply 678 x 0.001 L in many ways, but thinking about unit form can be helpful and efficient. What is 0.001 in unit form? (1 thousandth) I know 678 x 1 is 678. So I know 678 x 1 thousandth is 678 thousandths *(write it)*, or 0.678 *(write it and label with L)*. 678 milliliters is equivalent to 0.678 liters. We wrote an equation, substituted the given unit with a conversion factor based on the relationship between milliliters and liters, and then multiplied to find th equivalent number of liters. Well done!

What was different about this problem compared to one we did before this? Possible Student Answers, Key Points:

- This problem involved metric units of volume. The last one involved customary units of length.
- This problem involved multiplying by a decimal, because the conversion factor was a power of 10. The other problem involved multiplying by a decimal, because the conversion factor was ~~⅓~~ which is probably easier to think about as a fraction than a decimal.

Let's Try it (Slides 6 - 7): Now let's work together to use fraction and decimal multiplication to express equivalent measurements. When we convert from smaller units to larger units, our conversion factor is a decimal or a fraction. We can use that decimal or fraction and what we know about properties of multiplication to write equations to find equivalent measurements. Depending on the relationship between units, it may be easier to use a fraction in some problems and a decimal in others.

WARM WELCOME

Today we will use use fraction and decimal multiplication to express equivalent measurements.

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Let's Talk:

Let's Think:

How many yards is equivalent to 24 feet of fabric?

(1 yard = 3 feet)

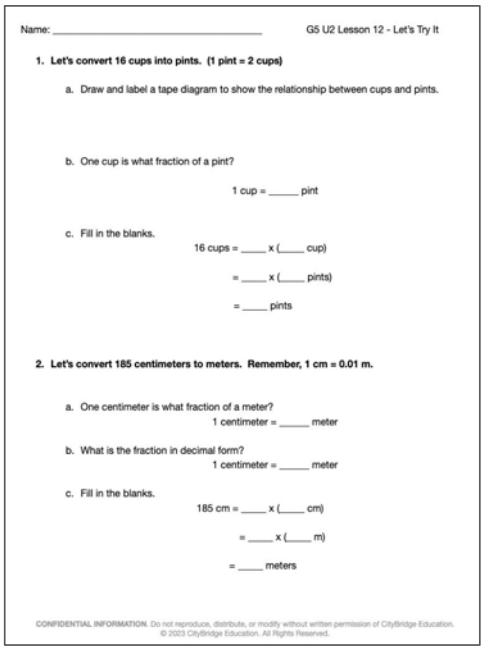
Let's Think:

678 milliliters is equivalent to how many liters?

(1 liter = 1,000 milliliters)

Let's Try It:

Let's explore using decimal and fraction multiplication to express equivalent measurements together.



Name: _____ G5 U2 Lesson 12 - Let's Try It

1. Let's convert 16 cups into pints. (1 pint = 2 cups)

a. Draw and label a tape diagram to show the relationship between cups and pints.

b. One cup is what fraction of a pint?

1 cup = _____ pint

c. Fill in the blanks.

16 cups = _____ x (_____ cup)

= _____ x (_____ pints)

= _____ pints

2. Let's convert 185 centimeters to meters. Remember, 1 cm = 0.01 m.

a. One centimeter is what fraction of a meter?

1 centimeter = _____ meter

b. What is the fraction in decimal form?

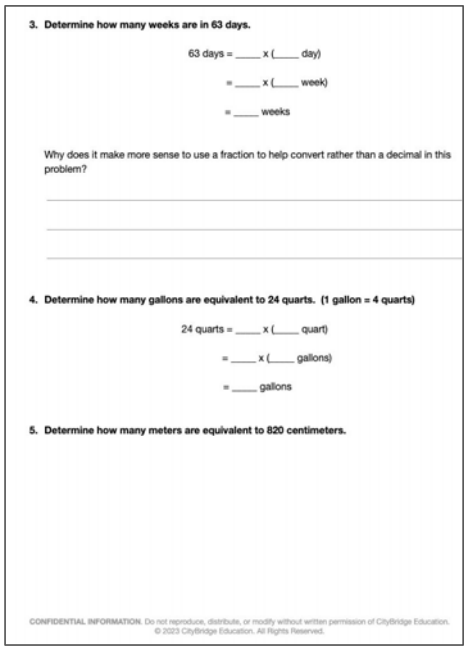
1 centimeter = _____ meter

c. Fill in the blanks.

185 cm = _____ x (_____ cm)

= _____ x (_____ m)

= _____ meters



3. Determine how many weeks are in 63 days.

63 days = _____ x (_____ day)

= _____ x (_____ week)

= _____ weeks

Why does it make more sense to use a fraction to help convert rather than a decimal in this problem?

4. Determine how many gallons are equivalent to 24 quarts. (1 gallon = 4 quarts)

24 quarts = _____ x (_____ quart)

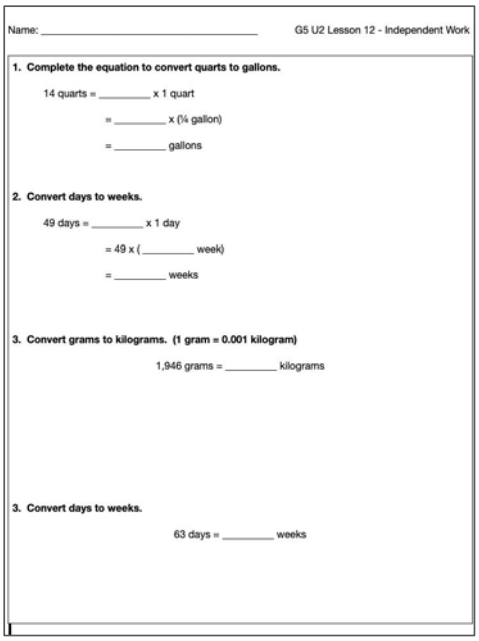
= _____ x (_____ gallons)

= _____ gallons

5. Determine how many meters are equivalent to 820 centimeters.

On your Own:

Now it's time to use whole number multiplication to express equivalent measurements on your own.



Name: _____ G5 U2 Lesson 12 - Independent Work

1. Complete the equation to convert quarts to gallons.

14 quarts = _____ x 1 quart

= _____ x (¼ gallon)

= _____ gallons

2. Convert days to weeks.

49 days = _____ x 1 day

= 49 x (_____ week)

= _____ weeks

3. Convert grams to kilograms. (1 gram = 0.001 kilogram)

1,946 grams = _____ kilograms

3. Convert days to weeks.

63 days = _____ weeks

1. Let's convert 16 cups into pints. (1 pint = 2 cups)

   a. Draw and label a tape diagram to show the relationship between cups and pints.

   b. One cup is what fraction of a pint?

   1 cup = _____ pint

   c. Fill in the blanks.

   16 cups = _____ x (_____ cup)

   = _____ x (_____ pints)

   = _____ pints

2. Let's convert 185 centimeters to meters. Remember, 1 cm = 0.01 m.

   a. One centimeter is what fraction of a meter?

   1 centimeter = _____ meter

   b. What is the fraction in decimal form?

   1 centimeter = _____ meter

   c. Fill in the blanks.

   185 cm = _____ x (_____ cm)

   = _____ x (_____ m)

   = _____ meters

3. Determine how many weeks are in 63 days.

   63 days = _____ x (_____ day)

   = _____ x (_____ week)

= _____ weeks

Why does it make more sense to use a fraction to help convert rather than a decimal in this problem?

4. Determine how many gallons are equivalent to 24 quarts. (1 gallon = 4 quarts)

24 quarts = _____ x (_____ quart)

= _____ x (_____ gallons)

= _____ gallons

5. Determine how many meters are equivalent to 820 centimeters.

1. Complete the equation to convert quarts to gallons.

   14 quarts = _____ x 1 quart

   = _____ x (¼ gallon)

   = _____ gallons

2. Convert days to weeks.

   49 days = _____ x 1 day

   = 49 x (_____ week)

   = _____ weeks

3. Convert grams to kilograms. (1 gram = 0.001 kilogram)

   1,946 grams = _____ kilograms

4. Convert days to weeks.

   63 days = _____ weeks

Name: KEY

1. Let's convert 16 cups into pints. (1 pint = 2 cups)

a. Draw and label a tape diagram to show the relationship between cups and pints.

b. One cup is what fraction of a pint?

1 cup = $\frac{1}{2}$ pint

c. Fill in the blanks.

16 cups = 16 x (1 cup)

= 16 x ($\frac{1}{2}$ pints) → $\frac{16}{2} = 8$

= 8 pints

2. Let's convert 185 centimeters to meters. Remember, 1 cm = 0.01 m.

a. One centimeter is what fraction of a meter?

1 centimeter = $\frac{1}{100}$ meter

b. What is the fraction in decimal form?

1 centimeter = 0.01 meter

c. Fill in the blanks.

185 cm = 185 x (1 cm)

= 185 x (0.01 m)

= 1.85 meters

185 x 1 = ?
hundredth

185 hundredths

3. **Determine how many weeks are in 63 days.**

63 days = 63 x (1 day)

= 63 x ($\frac{1}{7}$ week) $\frac{63}{7} = 9$

= 9 weeks

Why does it make more sense to use a fraction to help convert rather than a decimal in this problem?

A day is $\frac{1}{7}$ of a week. I'm not sure what $\frac{1}{7}$ is as a decimal, so leaving it as a fraction is ideal here.

4. **Determine how many gallons are equivalent to 24 quarts. (1 gallon = 4 quarts)**

24 quarts = 24 x (1 quart)

= 24 x ($\frac{1}{4}$ gallons) $\frac{24}{4} = 6$

= 6 gallons

5. **Determine how many meters are equivalent to 820 centimeters.**

820 cm = 820 x (1 cm)

820 x (0.01 m)

820 x 1 hundredth

820 hundredths

8.20 or 8.2 m

Name: KEY

1. Complete the equation to convert quarts to gallons.

14 quarts = 14 x 1 quart

= 14 x (¼ gallon)

= $3\frac{2}{4}$ gallons

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

$\frac{14}{4} = 3\frac{2}{4}$

2. Convert days to weeks.

49 days = 49 x 1 day

= 49 x ($\frac{1}{7}$ week)

= 7 weeks

$\frac{49}{7} = 7$

3. Convert grams to kilograms. (1 gram = 0.001 kilogram)

1,946 grams = 1.946 kilograms

1946 g = 1946 x (1 g)

1946 x (0.001 kg)

1946 x 1 thousandth

1946 thousandths

4. Convert days to weeks.

63 days = 9 weeks

63 days = 63 x (1 day)

63 x ($\frac{1}{7}$ wk)

$\frac{63}{7} = 9$

G5 U2 Lesson 13

Use basic facts to approximate quotients with two-digit divisors

G5 U2 Lesson 13 - Students will use basic facts to approximate quotients with two-digit divisors

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've spent several lessons working on multiplication. On many occasions we've used estimation when we've multiplied by rounding one or both of our factors to friendly numbers. Why is estimation helpful when multiplying? Possible Student Answers, Key Points:

- It helps us efficiently determine what the actual factor is close to.
- It can help us make sure the actual product is reasonable after we calculate

Today, we are going to switch gears and focus on division. Just like we used estimation to get a quick idea of products when we multiplied, we will use estimation to help us think about division answers. We will use basic, friendly facts to approximate quotients, or the answer to a division problem, when we divide with two-digit divisors. Let's get started.

Let's Talk (Slide 3): Take a look here. What do you notice about the scene? What do you wonder? Possible Student Answers, Key Points:

- I notice there are six identical cans of soup and a receipt. I notice the receipt is torn, so I can't see the price of each can. I notice the total is $11.88 in all. I notice the total is about $12.
- I wonder how the receipt got torn. I wonder how much each can of soup costs.

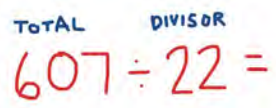
Good thinking. We know the total for six cans of soup is $11.88, but because the receipt is ripped, we don't know the what this person paid for each can of soup. If this person didn't have a calculator or pen/paper nearby, could they use estimation to help them get a sense of about how much they spent on each can of soup? Possible Student Answers, Key Points:

- They could guess and check. For example, $5 for each can would be too high. $1 per can would be too low.
- The total amount is about $12. $11.88 is tricky to divide by 6, but $12 divided by 6 is easy to do in my head.

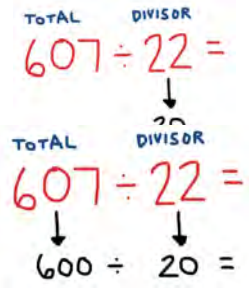
The total is about $12, which is easy to think about if we have 6 cans of soup because 12 is divisible by 6. So since 12 divided by 6 is 2, we know this person spent *about* $2 per can of soup. We rounded to find friendly numbers that were easy to divide with. Let's keep this story in mind as we try a couple more problems.

Let's Think (Slide 4): This problem wants us to estimate the quotient of 607 divided by 22. We are just going to estimate today, not find the exact answer. Would this problem be easy to do in our head as is? Why or why not? Possible Student Answers, Key Points:

- Probably not. I don't know many multiples of 22, and 607 is a pretty big total. I'm not even sure if 22 goes into 607 evenly.

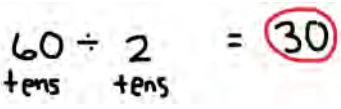


Since this problem isn't particularly friendly, let's estimate so we can use mental math to get an idea of the quotient. Which number is the total, and which number is the divisor in this problem? (607 is the total, and 22 is the divisor) (*write 607 ÷ 22, and label each)*



Let's start by rounding our divisor first. What is 22 rounded to the nearest ten? *(20)* We'll think of the divisor as being about 20. That's easier to think about than 22. *(write 20 underneath 22)* If we were to stop here, our equation would be 607 ÷ 20, which still seems tricky to work with.

Given that, we need to round the total to a number that can be easily divided by 20. Let's use 600, since we can use mental math to divide 600 by 20. *(write 600 under 607)* Now we have an equation that is much easier to think about.

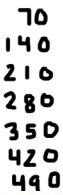


What is 600 divided by 20? (30) You may use facts and patterns you know to help you find the estimated quotient. If you weren't sure about 600 divided by 20, it can help to think of it in unit form too. *(write as you talk)* 600 is 60 tens. 20 is 2 tens. So 60 divided by 2 is 30.

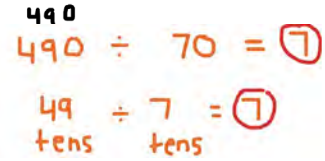
We know the quotient of 607 and 22 should be about 30. We rounded our divisor to a simpler multiple of ten, then we rounded the total to a number that we knew would be divisible by our rounded divisor. This made an easier problem that we could use mental math to think about. Let's try another one!

Let's Think (Slide 5): This problem wants us to divide 483 by 66.

(write equation and label "total" above 483 and "divisor" above 66) Neither of these numbers is particularly easy to think about, so let's find easier numbers to work with. Start with the divisor. What is 66 rounded to the nearest ten? (70)



If we think of the divisor as being about 70, we now need to round the total to a number that is easily divisible by 70. If we're not sure, we can list out some multiples like this. *(list a few multiples of 70)* I see 420 and 490 are close to 483. Let's use 490, since it's a little closer to 483 than the other multiples of 70.



(write new equation with rounded numbers) What is 490 divided by 70? (7) If it helps, you can think of it as 49 tens divided by 7 tens. *(write equation in unit form as shown)*

Our estimated quotient is 7. That means that 483 divided by 66 will be about 7 if we took the time to calculate the exact quotient.

Another student I know, estimated their quotient to this problem a bit differently. This is what they did. Take a look, and tell me what you notice is the same and different about their approach. *(write 483 divided by 66 again, showing estimated values of 480 and 60 and an estimated quotient of 8)*
Possible Student Answers, Key Points:

- They used different values when they estimated, and they got a different estimated quotient.
- Even though they used different numbers, the estimated quotient is only one away from our estimated quotient.
- Maybe these numbers were easier for them to think about then the ones we used. They are still reasonable.

There is not one right way to estimate. Of course we want to be as precise as possible, so we want to use numbers that are *close* to the actual numbers. Keep that in mind as you work and think about the "friendly" numbers you'll use to help you tackle today's approximations.

Nice work with these problems! We've just approximated the quotients of problems involving two-digit divisors. If you were to describe the thinking we've used to a student who was new to this, what would you say? Possible Student Answers, Key Points:

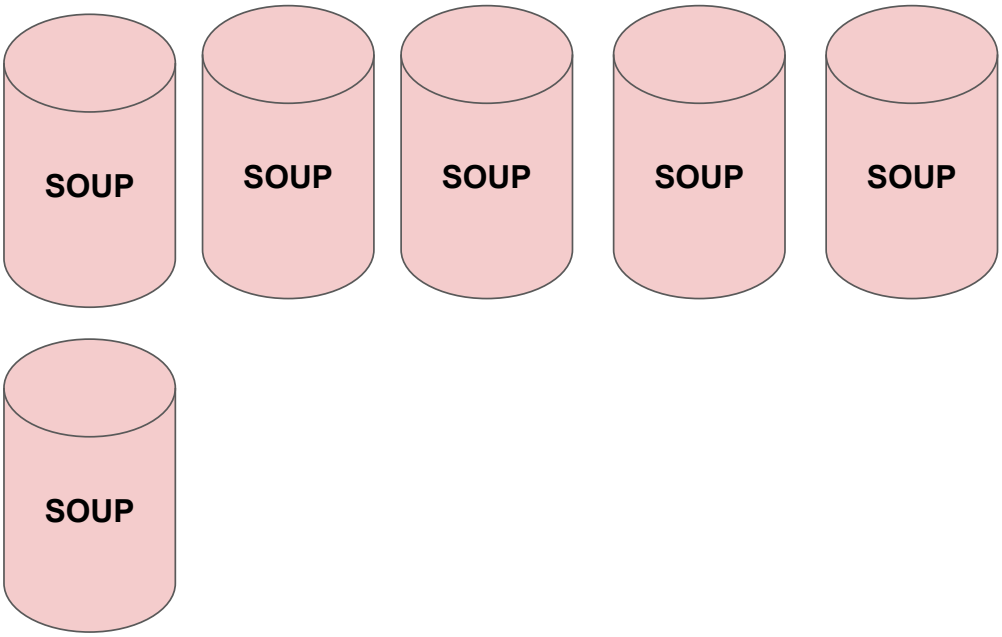
- You can round the divisor to an easy number to think about, then round the total to a number that is compatible with that divisor. Rounding the numbers means we can efficiently approximate the quotient without having to calculate an exact answer.

Let's Try it (Slides 6 - 7): Now let's work together to use facts we know to approximate quotients with two-digit divisors. As we've seen, it's helpful to round the divisor first, and then use skip-counting, mental math, or multiplication to help us find a total that can be easily divided by the divisor. Let's keep in mind that there are often many ways to think about estimation, and your pathway will depend on how you consider the numbers in the problem and the ways in which you round them. As long as the numbers we use are reasonable in the given problem, our estimate will be accurate and therefore useful.

WARM WELCOME

Today we will use basic facts to approximate quotients with two-digit divisors

Let's Talk:



RECEIPT

Can of soup
Can of soup
Can of soup
Can of soup
Can of soup
Can of soup

Total: $11.88

Let's Think:

Estimate the quotient.

607 ÷ 22

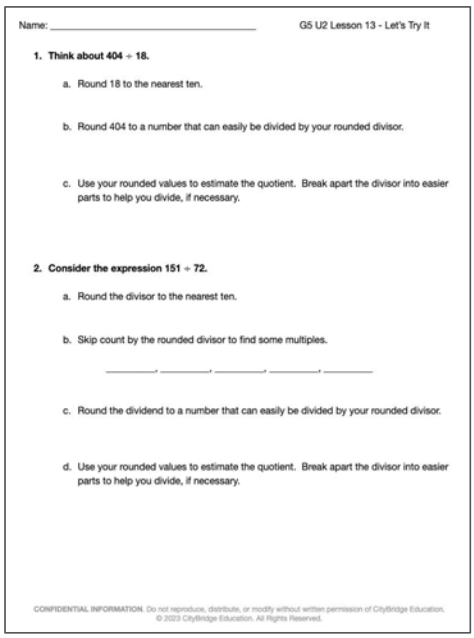
Let's Think:

Estimate the quotient.

483 ÷ 66

Let's Try It:

Let's explore using basic facts to approximate quotients with two-digit divisors together.



Name: _____ G5 U2 Lesson 13 - Let's Try It

1. Think about 404 ÷ 18.

a. Round 18 to the nearest ten.

b. Round 404 to a number that can easily be divided by your rounded divisor.

c. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

2. Consider the expression 151 ÷ 72.

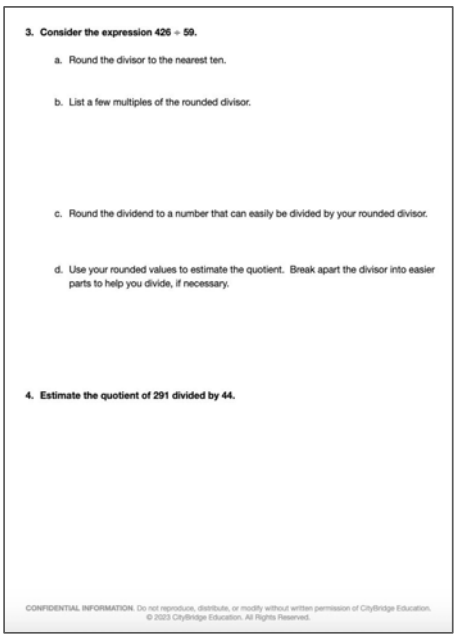
a. Round the divisor to the nearest ten.

b. Skip count by the rounded divisor to find some multiples.

_____, _____, _____, _____, _____

c. Round the dividend to a number that can easily be divided by your rounded divisor.

d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.



3. Consider the expression 426 ÷ 59.

a. Round the divisor to the nearest ten.

b. List a few multiples of the rounded divisor.

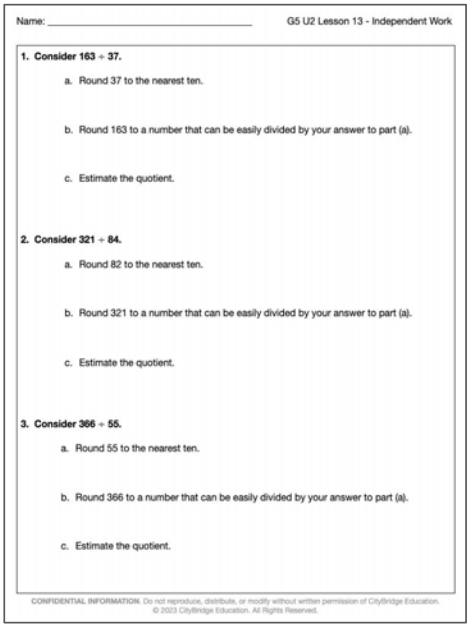
c. Round the dividend to a number that can easily be divided by your rounded divisor.

d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

4. Estimate the quotient of 291 divided by 44.

On your Own:

Now it's time to use basic facts to approximate quotients of two-digit divisors on your own.



Name: _____ G5 U2 Lesson 13 - Independent Work

1. Consider 163 ÷ 37.

a. Round 37 to the nearest ten.

b. Round 163 to a number that can be easily divided by your answer to part (a).

c. Estimate the quotient.

2. Consider 321 ÷ 84.

a. Round 82 to the nearest ten.

b. Round 321 to a number that can be easily divided by your answer to part (a).

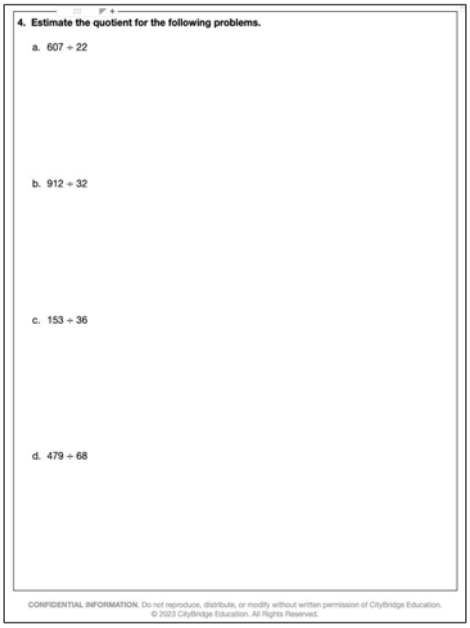
c. Estimate the quotient.

3. Consider 366 ÷ 55.

a. Round 55 to the nearest ten.

b. Round 366 to a number that can be easily divided by your answer to part (a).

c. Estimate the quotient.



4. Estimate the quotient for the following problems.

a. 607 ÷ 22

b. 912 ÷ 32

c. 153 ÷ 36

d. 479 ÷ 68

1. Think about 404 ÷ 18.

   a. Round 18 to the nearest ten.

   b. Round 404 to a number that can easily be divided by your rounded divisor.

   c. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

2. Consider the expression 151 ÷ 72.

   a. Round the divisor to the nearest ten.

   b. Skip count by the rounded divisor to find some multiples.

      _____, _____, _____, _____, _____

   c. Round the dividend to a number that can easily be divided by your rounded divisor.

   d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

3. Consider the expression 426 ÷ 59.

   a. Round the divisor to the nearest ten.

   b. List a few multiples of the rounded divisor.

c. Round the dividend to a number that can easily be divided by your rounded divisor.

d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

4. Estimate the quotient of 291 divided by 44.

1. Consider 163 ÷ 37.

   a. Round 37 to the nearest ten.

   b. Round 163 to a number that can be easily divided by your answer to part (a).

   c. Estimate the quotient.

2. Consider 321 ÷ 84.

   a. Round 82 to the nearest ten.

   b. Round 321 to a number that can be easily divided by your answer to part (a).

   c. Estimate the quotient.

3. Consider 366 ÷ 55.

   a. Round 55 to the nearest ten.

   b. Round 366 to a number that can be easily divided by your answer to part (a).

   c. Estimate the quotient.

4. Estimate the quotient for the following problems.

   a. 607 ÷ 22

b. $912 \div 32$

c. $153 \div 36$

d. $479 \div 68$

Name: KEY

1. **Think about 404 ÷ 18.**

   a. Round 18 to the nearest ten.

   $18 \approx 20$

   b. Round 404 to a number that can easily be divided by your rounded divisor.

   $404 \approx 400$

   c. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

   40 tens ÷ 2 tens = 20

2. **Consider the expression 151 ÷ 72.**

   a. Round the divisor to the nearest ten.

   $72 \approx 70$

   b. Skip count by the rounded divisor to find some multiples.

   70, 140, 210, 280, 350

   c. Round the dividend to a number that can easily be divided by your rounded divisor.

   $151 \approx 140$

   d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

   $140 \div 70 = 2$

3. **Consider the expression 426 ÷ 59.**

a. Round the divisor to the nearest ten.

$59 \approx 60$

close!

b. List a few multiples of the rounded divisor.

60, 120, 180, 240, 300, 360, 420

c. Round the dividend to a number that can easily be divided by your rounded divisor.

$420 \div 60 = ?$

d. Use your rounded values to estimate the quotient. Break apart the divisor into easier parts to help you divide, if necessary.

42 tens ÷ 6 tens = 7

4. **Estimate the quotient of 291 divided by 44.**

$44 \approx 40$

$291 \approx 280$

$280 \div 40 = ?$

28 tens ÷ 4 tens = 7

Name: KEY

1. Consider 163 ÷ 37.

a. Round 37 to the nearest ten.

$37 \approx 40$

b. Round 163 to a number that can be easily divided by your answer to part (a).

$163 \approx 160$

c. Estimate the quotient.

16 tens ÷ 4 tens = (4)

2. Consider 321 ÷ 84.

a. Round 82 to the nearest ten.

$82 \approx 80$

b. Round 321 to a number that can be easily divided by your answer to part (a).

$321 \approx 320$

c. Estimate the quotient.

32 tens ÷ 8 tens = (4)

3. Consider 366 ÷ 55.

a. Round 55 to the nearest ten.

$55 \approx 60$

b. Round 366 to a number that can be easily divided by your answer to part (a).

$366 \approx 360$

c. Estimate the quotient.

36 tens ÷ 6 tens = (6)

4. Estimate the quotient for the following problems.

a. 607 ÷ 22

$22 \approx 20$

$607 \approx 600$

$600 \div 20 = ?$

$60 \div 2 = 30$

60 tens ÷ 2 tens = 30

b. 912 ÷ 32

$32 \approx 30$

$912 \approx 900$

$900 \div 30 = ?$

$90 \div 3 = 30$

90 tens ÷ 3 tens = 30

c. 153 ÷ 36

$36 \approx 40$

$153 \approx 160$

$160 \div 40 = ?$

$16 \div 4 = 4$

16 tens ÷ 4 tens = 4

d. 479 ÷ 68

$68 \approx 70$

$479 \approx 490$

$490 \div 70 = ?$

$49 \div 7 = 7$

49 tens ÷ 7 tens = 7

G5 U2 Lesson 14

Divide two- and three-digit dividends by multiples of 10 with single-digit quotients

G5 U2 Lesson 14 - Students will divide two- and three-digit dividends by multiples of 10 with single digit quotients, and make connections to a written method

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson, we spent some time estimating quotients by rounding numbers in a division problem. We rounded the divisor, and then found a number close to the total that we knew was divisible by the divisor. Today, we'll use those same estimation skills while also using what we know to calculate the actual quotient. Let's get going!

Let's Talk (Slide 3): Today, we'll be dividing by multiples of 10. Before we get into that, let's reflect on some things we already know about division. Take a look at this student's work. They correctly divided 73 by 8. What do you notice and wonder about this work sample? Possible Student Answers, Key Points:

- I notice they showed their work in vertical form.
- I notice the quotient is 9, because I see that at the top. I notice there is a remainder of 1 at the bottom.
- I notice they checked their work by multiplying 8 x 9, then adding the remainder of 1.

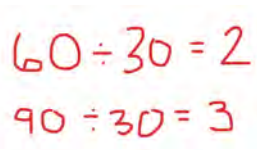
Very observant. *(point as you describe)* This student used vertical form to show their division using a division bar with their total underneath. The divisor of 8 is on the left. I see the student knew 9 groups of 8 make 72, so they wrote 9 as part of their quotient. They subtracted out the 72 they had distributed and were left with a remainder of 1. 73 divided by 8 is 9 with a remainder of 1.

They checked their work by multiplying 9 x 8 to confirm that 9 groups of 8 is 72. Once they added the remainder of 1, they were back at the original total of 73. So, they knew their answer was correct.

Let's see how this type of work can help us think about dividing two- and three-digit numbers by multiples of 10.

Let's Think (Slide 4): This problem is asking us to divide 72 by 30. All of today's problems will involve dividing by a multiple of 10. In this case, 30 is the multiple of 10 that we are dividing by. Before we calculate, let's think about an estimate so we can make sure our actual quotient is reasonable. Thinking back to our previous lesson, how could we use estimation to help us find the approximate quotient? Possible Student Answers, Key Points:

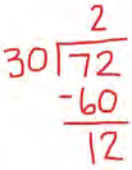
- We usually round the divisor first, but our divisor is already 30. We can just round the total to estimate.
- I can skip-count or use mental math to think of multiples of 30 that are close to 72. We can use 60 or 90.



Either 60 or 90 would be good estimates to use as our total. Let's use both! *(write 60 ÷ 3 = and 90 ÷ 3 =, and fill in answers as student shares)* What is 60 divided by 30? (2) What is 90 divided by 30? (3) So, no matter how we chose to estimate, we know our actual quotient should be around 2 or 3. Let's solve and see if we're correct.

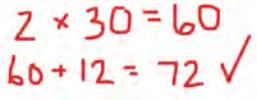
We can start by writing our division problem in vertical form. We write the total inside our division bar, and the divisor goes on the outside. *(set up vertical form)* I can now think about how many groups of 30 can go into the total of 72. If I'm not sure, my estimated quotient can give me a good starting point. What do you think? Possible Student Answers, Key Points:

- I know 2 groups of 30 is 60, so we can put 2 in our quotient.
- If I used 3 groups of 30, that's 90. 90 is bigger than the total, so that won't help us.

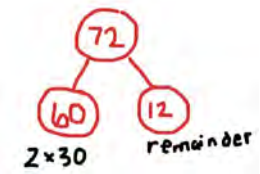


Okay, let's use 2. *(write 2 above the 2 in 72)* 2 groups of 30 is 60, so we can take that out of the total. *(write -60 under the 72, and then write 12 as the remaining total)* We now only have 12 left in the total. What do you notice? Possible Student Answers, Key Points:

- 2 is less than 30. We can't take any more groups of 30 out of the total.
- 2 is our remainder, because we can't take 30 out of 12.



Excellent, so the quotient is 2 with a remainder of 12. Does our answer seem reasonable? (Yes, it's close to both our estimates) Just to be safe, let's check our work like the student did in the problem at the beginning of our lesson. *(write as you narrate)* I know 2 x 30 is 60. If I add the remainder of 12, 60 + 12 = 72.



This makes sense. *(draw number bond as you narrate)* We started with a total of 72. We made 2 groups of 30, which is 60. Then we had 12 leftover as a remainder. We just estimated, found an exact quotient using vertical form, and checked our work. Well done! Let's look at another example.

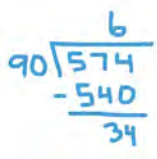
Let's Think (Slide 5): Now we're dividing 574 by 90. These numbers are a little bigger, but we're still dividing by a multiple of 10, so let's lean on the same thinking we just used. What should we always do before we start calculating a quotient? (We should find an estimated or approximate quotient) Sure, let's find an estimate. We don't need to round our divisor, since it's already 90. Let's think of a total that would be divisible by 90 and close to 574. If you're not sure, you can always list out or skip-count by 90. *(wait for student to work)*

When I thought about multiples of 90, I found 540 and 630 were the closest to our total. Which one makes the most sense in this case, and why? Possible Student Answers, Key Points:

- 540 makes the most sense. It's way closer 574 than 630 is.
- It's okay to have a higher estimate like 630, but in this case, 630 is too far off from our total to be the best choice.

Great idea, we'll use 540 as our estimated total. *(write as you narrate)* What is 540 divided by 90? (6) Our actual quotient should be about 6. Let's use vertical form to calculate the exact quotient and see if we're close to 6. How should I set up vertical form for this problem? Possible Student Answers, Key Points:

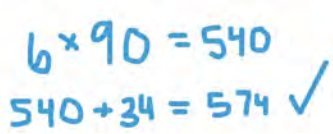
- The total goes inside the division bar symbol, and the divisor goes to the left. We'll put the quotient above the line as we work.



(set up vertical form) How many groups of 90 can go into 574? (6) Right! When we were estimating, we figured out that 6 groups of 90 is 540. *(write 6 in quotient, then continue filling in vertical form as you narrate)* That means we can subtract 540 from our total, leaving us with 34. Looking at our vertical form now, what does this tell us? Possible Student Answers, Key Points:

- The quotient is 6; we see that at the top.
- There is a remainder of 34, because we can't take any more groups of 90 from a total of 34. We can think of the actual quotient as 6 with a remainder of 34.

A quotient of 6 with a remainder of 34 makes sense with our original estimate. Nice work!



Let's double-check by using multiplication. How could we do that? *(write as student explains)* Possible Student Answers, Key Points:

- We know 6 groups of 90 is 540. We can write 6 x 90 = 540. Then we add the remainder of 34. 540 + 34 = 574. Our equal groups and the remainder total back up to 574, so our work checks out.

(draw the number bond shown here) How does this number bond represent our quotient? Possible Student Answers, Key Points:

- The number bond shows the total is 574.
- The 540 represents the 6 groups of 90 that we found. The 34 is the leftover part, or the reminder.

Once again, we found the quotient of a two- or three-digit total divided by a multiple of ten. We estimated first, used vertical form to calculate the exact quotient, and then checked our work using multiplication.

Let's Try it (Slides 6 - 7): Now let's work together to divide by multiples of ten. With most problems, we'll want to think about an estimated quotient first, then solve for the actual quotient, and then check our answer. We also saw how we can represent quotients and remainders using a number bond, so keep that in mind as we think through some more problems.

WARM WELCOME

Today we will divide two- and three-digit dividends by multiples of ten with single digit quotients and make connections to a written method

Let's Talk:

$73 \div 8$

$$8\overline{)73}\quad 9,\ -72,\ 1$$

CHECK

$8 \times 9 = 72$

$72 + 1 = 73$ ✓

Let's Think:

72 ÷ 30 = ?

ESTIMATE

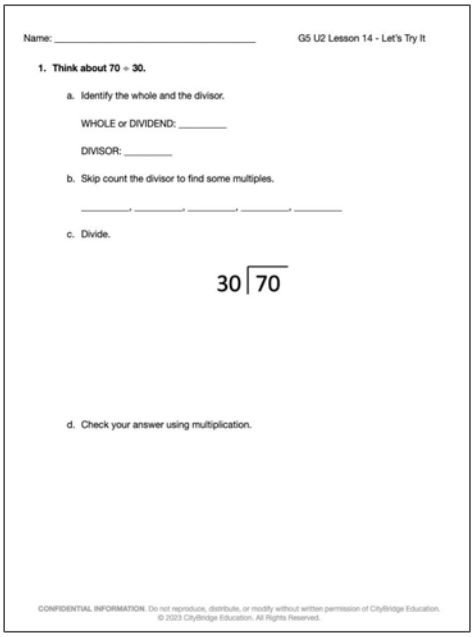
Let's Think:

574 ÷ 90 = ?

ESTIMATE

Let's Try It:

Let's explore dividing by multiples of ten together.



Name: _____ G5 U2 Lesson 14 - Let's Try It

1. Think about 70 ÷ 30.

a. Identify the whole and the divisor.

WHOLE or DIVIDEND: _____

DIVISOR: _____

b. Skip count the divisor to find some multiples.

_____, _____, _____, _____, _____, _____

c. Divide.

$30\overline{)70}$

d. Check your answer using multiplication.

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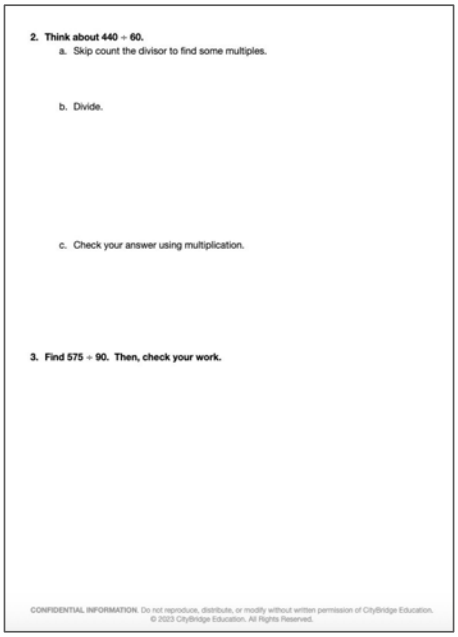

2. Think about 440 ÷ 60.

a. Skip count the divisor to find some multiples.

b. Divide.

c. Check your answer using multiplication.

3. Find 575 ÷ 90. Then, check your work.

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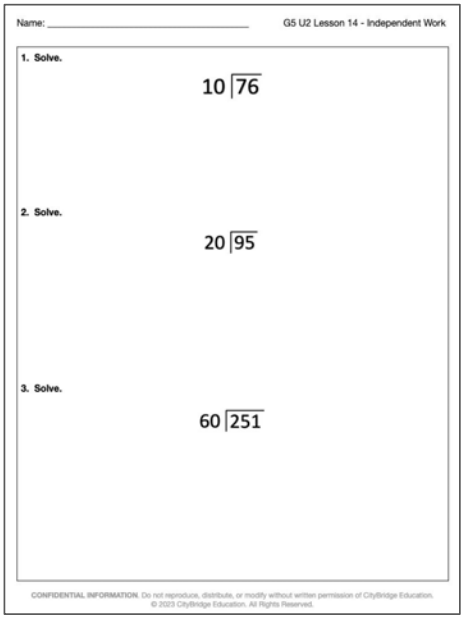
On your Own:

Now it's time to divide by multiples of ten on your own.



Name: _____ G5 U2 Lesson 14 - Independent Work

1. Solve.

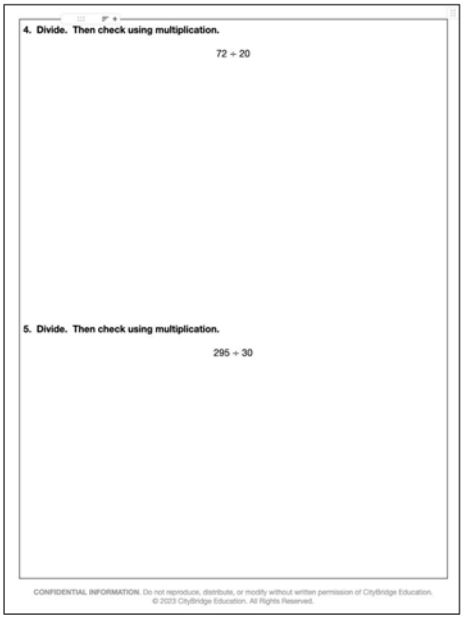
$10\overline{)76}$

2. Solve.

$20\overline{)95}$

3. Solve.

$60\overline{)251}$



4. Divide. Then check using multiplication.

72 ÷ 20

5. Divide. Then check using multiplication.

295 ÷ 30

1. Think about 70 ÷ 30.

   a. Identify the whole and the divisor.

      WHOLE or DIVIDEND: _____

      DIVISOR: _____

   b. Skip count the divisor to find some multiples.

      _____, _____, _____, _____, _____

   c. Divide.

$$30\overline{)70}$$

   d. Check your answer using multiplication.

2. Think about 440 ÷ 60.

   a. Skip count the divisor to find some multiples.

   b. Divide.

c. Check your answer using multiplication.

3. Find 575 ÷ 90. Then, check your work.

1. Solve.

$$10 \overline{)76}$$

2. Solve.

$$20 \overline{)95}$$

3. Solve.

$$60 \overline{)251}$$

4. Divide. Then check using multiplication.

$72 \div 20$

5. Divide. Then check using multiplication.

$295 \div 30$

Name: KEY

1. **Think about 70 ÷ 30.**

   a. Identify the whole and the divisor.

   WHOLE or DIVIDEND: 70

   DIVISOR: 30

   b. Skip count the divisor to find some multiples.

   30, *60, *90, 120, 150

   c. Divide.

$$\begin{array}{r|l} & 2 \\ \hline 30 & 70 \\ -\,60 & \\ \hline 10 & \end{array}$$

QUOTIENT: 2
REMAINDER: 10

   d. Check your answer using multiplication.

$(2 \times 30) + 10$

$60 + 10$

70 ✓

2. **Think about 440 ÷ 60.**

a. Skip count the divisor to find some multiples.

60, 120, 180, 240, 300, 360, *420, *480

b. Divide.

$$\begin{array}{r} 7 \\ 60\overline{)440} \\ -420 \\ \hline 20 \end{array}$$

Q: 7
R: 20

c. Check your answer using multiplication.

$(60 \times 7) + 20$
$420 + 20$
440 ✓

3. **Find 575 ÷ 90. Then, check your work.**

90, 180, 270, 360, 450, *540, *630

$$\begin{array}{r} 6 \\ 90\overline{)575} \\ -540 \\ \hline 35 \end{array}$$

Q: 6
R: 35

$(6 \times 90) + 35$
$540 + 35$
575 ✓

Name: KEY

1. Solve.

$$10 \overline{)76}$$

7

-70

6

Q: 7
R: 6

2. Solve.

$$20 \overline{)95}$$

4

-80

15

Q: 4
R: 15

3. Solve.

$$60 \overline{)251}$$

4

-240

11

Q: 4
R: 11

4. Divide. Then check using multiplication.

$72 \div 20$

$$\begin{array}{r} 3 \\ 20\overline{)72} \\ -60 \\ \hline 12 \end{array}$$

Q: 3
R: 12

$(3 \times 20) + 12$
$60 + 12$
72 ✓

5. Divide. Then check using multiplication.

$295 \div 30$

$$\begin{array}{r} 9 \\ 30\overline{)295} \\ -270 \\ \hline 25 \end{array}$$

Q: 9
R: 25

$(9 \times 30) + 25$
$270 + 25$
295 ✓

G5 U2 Lesson 15

Divide two- and three-digit dividends by two-digit divisors with single-digit quotients

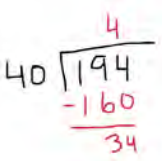
G5 U2 Lesson 15 - Students will divide two- and three-digit dividends by two-digit divisors with single digit quotients, and make connections to a written method

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Last time we worked together, we divided with multi-digit numbers. Each division problem involved dividing by a divisor that was a multiple of 10, like 20 or 30 or 40. Today, we'll use similar thinking, but you'll notice our divisors won't always be multiples of ten. We will work to divide by two-digit divisors with single-digit quotients and make connections to a written method.

Let's Talk (Slide 3): Take a look at these two equations. What do you notice? What do you wonder? Possible Student Answers, Key Points:

- I notice they are both division. I notice they both have a total of 194. I notice they are different colors. I notice their divisors are different, but close to each other.
- I wonder what the quotients are. I wonder if the quotients are the same. I wonder if one is an equation to help estimate the other.



Those are excellent noticings and wonderings. These two equations both have a total of 194. The first one is being divided by a multiple of ten, 40. That is similar to the problems we saw in our last lesson. How would you go about finding the quotient of 194 divided by 40? Feel free to write anything down if that helps. *(write 194 divided by 40 in vertical form as student shares out, if student does not use vertical form)* Possible Student Answers, Key Points:

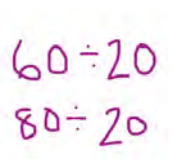
- I know 4 groups of 40 go into 194, because 4 x 40 = 160. So the quotient would be 4. Since 4 x 40 is 160, that leaves us with 34 in our total. I can't take another group of 40 from 34, so the quotient is 4 with a remainder of 34.

Excellent work. Now, look at the second equation that shows 194 divided by 43. How could you use your work from the first equation to help you think about the second equation? Possible Student Answers, Key Points:

- 43 is very close to 40, so I imagine the quotient would be pretty close.
- Maybe I can use the first equation to help me think about how many groups of 43 can go into 194, since 40 is easier to think about than 43.

You'll see in a moment that the work we do with divisors that are multiples of ten is not too different from the work we'll do when our divisors are *not* multiples of 10. Keep this problem in mind. We'll come back to it!

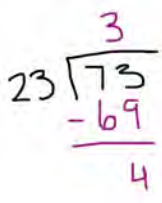
Let's Think (Slide 4): Let's find the quotient of 73 divided by 23. You'll notice 23 is not a multiple of ten. What is the total in this problem? (73) Let's start by estimating a quotient. What multiple of ten is closest to our divisor of 23? (20) Since our total is 73, we can find the approximate quotient a couple ways. *(write 60 ÷ 20 and 80 ÷ 20).* Which estimate would you choose, and why? Possible Student Answers, Key Points:



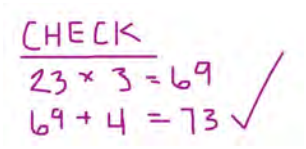
- I would choose 60 divided by 20, because 80 divided by 20 is too big. I don't want to go over the total.
- I would choose 80 divided by 20, because 72 is closer to 80 than it is to 60.

Either estimate would be close to the actual quotient, but let's go with 60 divided by 20. This will help us think about how many groups of 23 can go into 73 without going over the total. When we divide, we can't take out more groups than the total allows. What is 60 divided by 20? *(3)* The actual quotient should be about 3. This also tells us that there should be about 3 groups of 23 in 73. Let's calculate and see for ourselves.

Let's set up our problem in vertical form. *(write in vertical form)* The total goes underneath the division bar, and the divisor goes outside the division bar. We'll leave room above to write the quotient, and we'll leave room below to subtract from the total.



We said, based on the estimate, that about 3 groups of 23 go into 73. What is 23 x 3? (69) That works! *(write as you narrate)* 3 groups of 23 go into 73. You named that 23 x 3 is 69, so we can subtract and see that we have 4 left in the total. Is 4 enough to make another group of 23? (No.) No, so we know the quotient is 3 with a remainder of 4.



Think back to our previous lesson. What can we do to check our work? *(write as student shares if student does not write out their thinking)* Possible Student Answers, Key Points:

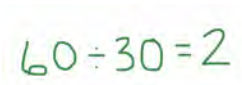
- I notice they are both division. I notice they both have a total of 94. I notice they are different colors. I notice their divisors are different, but close to each other.

We can use multiplication to check our work. 3 groups of 23, or 3 x 23, is 69. When we add the remaining 4, we end up with the original total of 73. Excellent thinking.

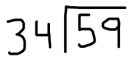
Let's Think (Slide 5): Let's do one more. This problem wants us to divide 59 by 34. Note that the divisor is once again not a multiple of 10.

Let's start by making an estimate. This will help make sure the actual quotient is reasonable, and it will help us start our calculation by considering how many groups of our divisor go into the total. How would you estimate with these numbers? Possible Student Answers, Key Points:

- 34 is close to 30, and 59 is close to 60. So 60 divided by 30, means the quotient should be close to 2.

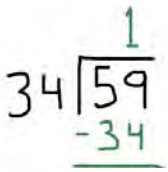


Yes, 34 is closest to 30 if we think about multiples of ten. 59 is really close to 60. So an easy estimated quotient to think about would be 60 divided by 30. *(write 60 ÷ 30 = 2)* The answer we get when we calculate in vertical form should be close to 2.

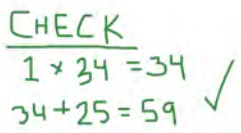


Now, we'll calculate the exact quotient. Start by writing the problem in vertical form. *(write 59 inside a division bar with 34 on the outside)* How many groups of 34 go into 59? Possible Student Answers, Key Points:

- Our estimate makes me think 2 groups of 34 should go into 59, but that won't work.
- 2 groups of 34 would be too big, so it's just 1 group.



Yes, two groups of 34 would be 68. That's too much. So we can only take 1 group of 34 out of 59. That's okay. Sometimes the estimated quotient will be too high, which means we might have to think carefully about how many groups of the divisor can go into the total. *(write 1 in quotient and subtract 34 from 59)* What is the quotient of 59 divided by 34? (The quotient is 1 with a remainder of 25)



We can use multiplication to check the answer we got. *(write as you narrate)* I know 1 group of 34, or 1 x 34, is 34. I add the remainder of 25, and 34 + 25 = 59. Our answer checks out, because we ended up back at the original total.

Now, think back to the original equations we looked at. *(return to Slide 3, if helpful)* You already solved the red equation, 194 divided by 40. Now that we've practiced some, how would you go about determining the quotient of the blue equation, 194 divided by 43? Possible Student Answers, Key Points:

- Since I know 40 goes into 94 four times, I can see if 43 also goes into 94 four times. 43 x 4 is 172, so it does. The quotient would also be 4, just with a different remainder. 194 minus 172 is 22. The quotient is 4 with 22 remaining.

Well done!

Let's Try it (Slides 6 - 7): Now let's work together to divide by two-digit divisors. With most problems, we'll want to estimate the quotient first, then solve for the actual quotient, and then check our answer. Our estimation and checking our work with multiplication help us make sure we are dividing accurately. Let's go for it!

WARM WELCOME

Today we will divide two- and three-digit dividends by two-digit divisors with single-digit quotients, and make connections to a written method

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Let's Talk:

$194 \div 40 = ?$

$194 \div 43 = ?$

Let's Think:

$73 \div 23 = ?$

ESTIMATE

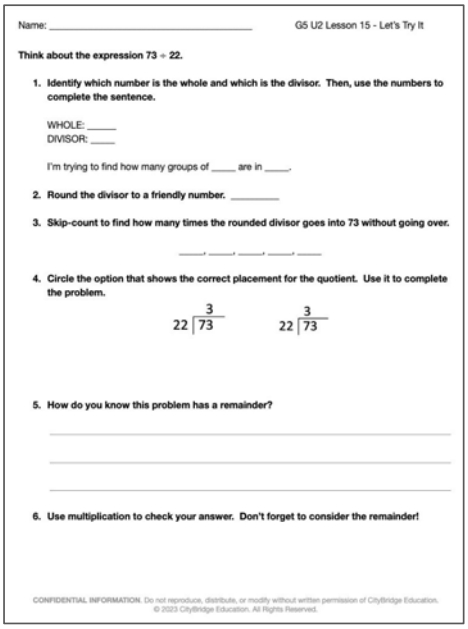
Let's Think:

59 ÷ 34 = ?

ESTIMATE

Let's Try It:

Let's explore dividing by two-digit divisors with single-digit quotients together.



Name: _____ G5 U2 Lesson 15 - Let's Try It

Think about the expression 73 ÷ 22.

1. **Identify which number is the whole and which is the divisor. Then, use the numbers to complete the sentence.**

   WHOLE: ____
   DIVISOR: ____

   I'm trying to find how many groups of ____ are in ____.

2. **Round the divisor to a friendly number.** _____

3. **Skip-count to find how many times the rounded divisor goes into 73 without going over.**

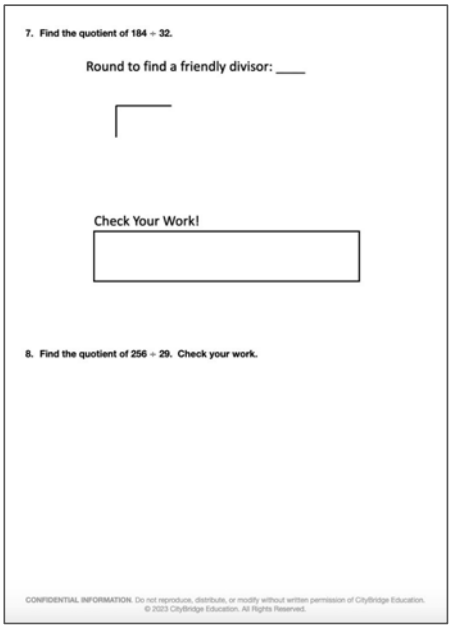
   ____, ____, ____, ____, ____

4. **Circle the option that shows the correct placement for the quotient. Use it to complete the problem.**

   $22\overline{)73}$ $\quad$ $22\overline{)73}$

5. **How do you know this problem has a remainder?**

6. **Use multiplication to check your answer. Don't forget to consider the remainder!**



7. **Find the quotient of 184 ÷ 32.**

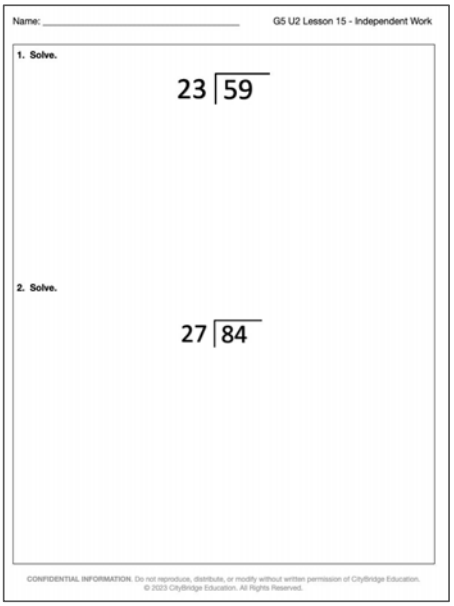
   Round to find a friendly divisor: ____

   Check Your Work!

8. **Find the quotient of 256 ÷ 29. Check your work.**

On your Own:

Now it's time to divide by two-digit divisors with single-digit quotients on your own.



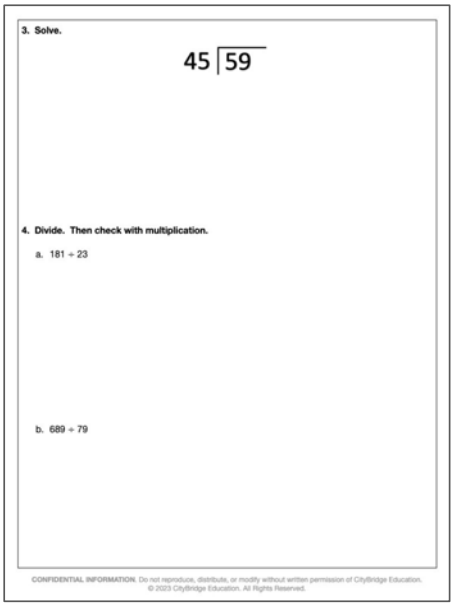
Name: _____ G5 U2 Lesson 15 - Independent Work

1. Solve.

$23\overline{)59}$

2. Solve.

$27\overline{)84}$



3. Solve.

$45\overline{)59}$

4. Divide. Then check with multiplication.

a. 181 ÷ 23

b. 689 ÷ 79

Think about the expression 73 ÷ 22.

1. Identify which number is the whole and which is the divisor. Then, use the numbers to complete the sentence.

   WHOLE: _______
   DIVISOR: ______

   I’m trying to find how many groups of ______ are in ______.

2. Round the divisor to a friendly number. ___________

3. Skip-count to find how many times the rounded divisor goes into 73 without going over.

   _____, _____, _____, _____, _____

4. Circle the option that shows the correct placement for the quotient. Use it to complete the problem.

$$\begin{array}{r} 3 \\ 22\overline{)73} \end{array} \qquad \begin{array}{r} 3 \\ 22\overline{)73} \end{array}$$

5. How do you know this problem has a remainder?

   ____
   ____
   ____

6. Use multiplication to check your answer. Don’t forget to consider the remainder!

7. Find the quotient of 184 ÷ 32.

Round to find a friendly divisor: ____

Check Your Work!

8. Find the quotient of 256 ÷ 29. Check your work.

1. Solve.

$$23 \overline{)59}$$

2. Solve.

$$27 \overline{)84}$$

3. Solve.

$$45 \overline{)59}$$

4. Divide. Then check with multiplication.

a. $181 \div 23$

b. $689 \div 79$

Name: KEY

G5 U2 Lesson 15 - Let's Try It

Think about the expression 73 ÷ 22.

1. **Identify which number is the whole and which is the divisor. Then, use the numbers to complete the sentence.**

   WHOLE: 73
   DIVISOR: 22

   I'm trying to find how many groups of 22 are in 73.

2. **Round the divisor to a friendly number.** 20

3. **Skip-count to find how many times the rounded divisor goes into 73 without going over.**

   20, 40, 60, 80, 100

4. **Circle the option that shows the correct placement for the quotient. Use it to complete the problem.**

$$\begin{array}{r} 22 \\ \times\ 3 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 3 \\ 22\overline{)73} \\ -66 \\ \hline 7 \end{array}$$

~~$\begin{array}{r} 3 \\ 22\overline{)73} \end{array}$~~

5. **How do you know this problem has a remainder?**

There is 7 left in the total. I can't make another group of 22 from 7.

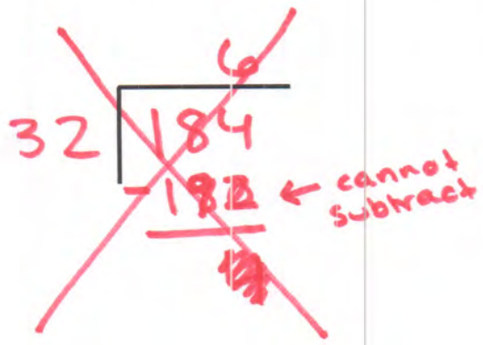
6. **Use multiplication to check your answer. Don't forget to consider the remainder!**

$(3 \times 22) + 7$
$66 + 7$
73

7. **Find the quotient of 184 ÷ 32.**

30, 60, 90, 120, 150, 180 ✓

Round to find a friendly divisor: 30



$$\begin{array}{r} 5 \\ 32\overline{)184} \\ -160 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 32 \\ \times\ 5 \\ \hline 160 \end{array}$$

Check Your Work!

$(5 \times 32) + 24$

$160 + 24$

184 ✓

8. **Find the quotient of 256 ÷ 29. Check your work.**

$29 \approx 30$

$30 \times 8 = 240$

$$\begin{array}{r} 29 \\ \times\ 8 \\ \hline 232 \end{array}$$

$$\begin{array}{r} 8 \\ 29\overline{)256} \\ -232 \\ \hline 24 \end{array}$$

$(29 \times 8) + 24$

$232 + 24$

256 ✓

Name: KEY

G5 U2 Lesson 15 - Independent Work

1. Solve.

$$23 \overline{)59} \quad 2$$

$$-46$$

$$13$$

2. Solve.

$27 \approx 30$

$$27 \times 3 = 81$$

$$27 \overline{)84} \quad 3$$

$$-81$$

$$3$$

3. Solve.

$$45 \overline{)59}$$

1

-45

14

4. Divide. Then check with multiplication.

a. 181 ÷ 23

$23 \approx 20$

23 × 9 = 207 ↑ too big

23 × 8 = 184 ↑ too big

23 × 7 = 161

$$23 \overline{)181}$$

7

-161

20

$(7 \times 23) + 20$

$161 + 20$

181 ✓

b. 689 ÷ 79

$79 \approx 80$

$80 \times 8 = 640$

79 × 8 = 632

$$79 \overline{)689}$$

8

-632

57

$(8 \times 79) + 57$

$632 + 57$

689 ✓

G5 U2 Lesson 16

Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point

G5 U2 Lesson 16 - Students will divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method

Warm Welcome (Slide 1): Tutor choice

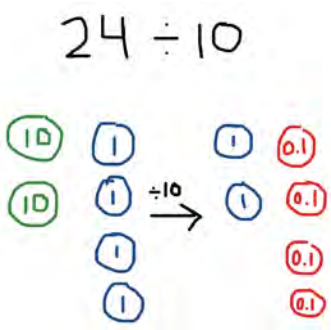
Frame the Learning/Connect to Prior Learning (Slide 2): Last time we worked together, we divided with multi-digit numbers. Each division problem involved dividing by a divisor that was a multiple of 10, like 20 or 30 or 40. Today, we'll use similar thinking, but you'll notice our divisors won't always be multiples of ten. We will work to divide by two-digit divisors with single-digit quotients and make connections to a written method.

Let's Talk (Slide 3): Take a second and look at these equations. What is the same and what is different about each? Possible Student Answers, Key Points:

- They all involve division. They all use the fact 12 divided by 6 in some way. They all have a divisor of 2.
- They each have a different total and a different answer. Some have decimal numbers and some do not. Each quotient has a 6 in a different place value.

I noticed that there are similar digits in each problem. I see 12, 6 and 2 in each one, but the place value of the digits is different depending on the equation. The place patterns we see here will show up in some of our work today. We can use what we know about whole number division, place value units, and patterns to help us divide with decimal dividends. Let's work on some problems, and I'll show you what I mean.

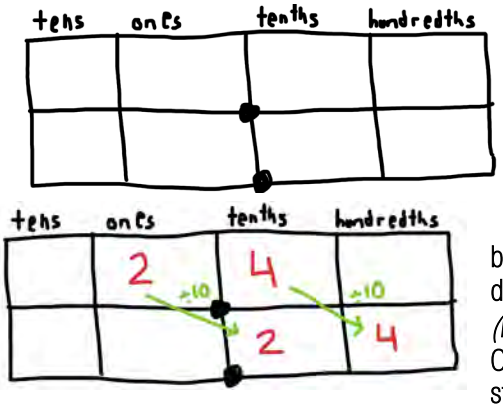
Let's Think (Slide 4): This problem wants us to find three quotients. Let's start by thinking about 24 divided by 10. *(write 24 ÷ 10 horizontally)*



We'll solve this one by thinking about place value disks. I'm going to draw 2 tens and 4 ones to represent 24. *(draw 2 tens and 4 ones)* We are going to divide this value by 10. *(draw an arrow labeled ÷ 10)* If I think about 1 ten, what is 1 ten divided by 10? (1) So, I know 2 tens divided by 10 would be 2 ones. *(draw 2 ones on the other side of the arrow)* If I think about 1 one, what is 1 one divided by 10? (1 tenth or 0.1 or 1/10) So, 4 ones divided by 10 would be 4 tenths. *(draw 4 tenths next to the 2 ones)* Based on the place value disks we drew, we can see that 24 divided by 10 is 2 ones and 4 tenths, which is 2.4.

Look at the next equation we are asked to solve. What do you notice? Possible Student Answers, Key Points:

- It has a different total, but we're still dividing by 10. Instead of 24 it's 24 tenths.
- I see the same digits, but in different place values in the total.



We can think about this one in a similar way. We could model 2 ones and 4 tenths using disks and divide that by 10. Another way we can show this thinking is with a place value chart. *(sketch a place value chart as shown, labeling tens, ones, tenths, and hundredths)*

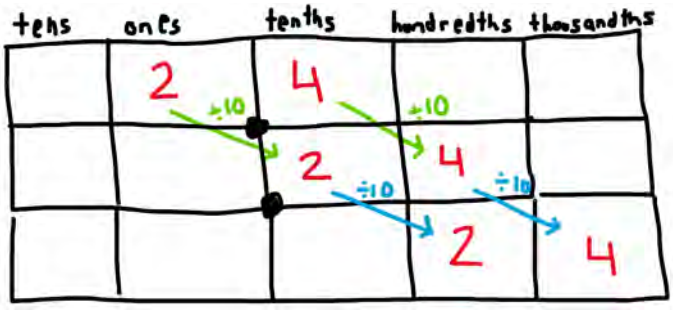
Our total, or dividend, in this equation is 2 ones and 4 tenths. *(write 2 in ones and 4 in tenths in the first row)* If I divide 1 one by 10, I get 1 tenth. What is 2 ones divided by 10? (2 tenths) *(write 2 tenths in the bottom row and draw an arrow labeled ÷ 10)* If I divide 1 tenth by 10, I get 1 hundredth. What is 4 tenths divided by 10? (4 hundredths) *(write 4 hundredths in the bottom row and draw an arrow labeled ÷ 10)* Our place value chart shows us that 2.4 divided by 10 is equal to 0.24. How is this strategy the alike or different compared to using place value disks? Possible Student Answers, Key Points:

- Both strategies show dividing by 10. Both strategies show dividing by each unit separately.
- The place value disks require more drawing/writing, since you have to draw all the disks both times. The place value chart seems a little more efficient.

Both methods work, but let's keep using the place value chart to find this last quotient. The last equation wants us to divide 0.24 by 10. Let's add a row and a column to our place value chart so we have room to work. *(draw an additional row along the bottom of the place value chart and draw/label a thousandths column)* We already have 0.24 in the second row of the chart. How can I show that I am

dividing that value by 10 in our updated place value chart? *(draw arrows and digits as student shares)* Possible Student Answers, Key Points:

- 2 tenths divided by 10 would be 2 hundredths. We can draw an arrow and write 2 in the hundredths place. 4 hundredths divided by 10 would be 4 thousandths. We can draw another arrow and write 4 in the thousandths place.



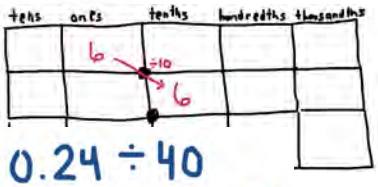
Nice work! So 0.24 divided by 10 is 0.024, or 24 thousandths. What patterns do you notice as we divided 24, 2.4, and 0.24 by 10? Possible Student Answers, Key Points:

- We used the same digits, they just were in different place values.
- Each time we divided by 10, our digits shifted to the right. Each larger place value unit can be broken into 10 of a smaller unit.

Let's Think (Slide 5): Let's try a few more. This time, you'll notice the divisor isn't ten. Instead, it's a multiple of 10. As we work, think about what is similar and what is different compared to the work we just did.

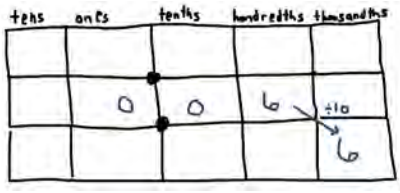
$24 \div 40$
$= 24 \div 4 \div 10$
$= 6 \div 10$
$= 0.6$

The first equation is asking us to divide 24 by 40. *(write equation horizontally)* Instead of dividing by 40 all at once, let's divide by 4…then divide by 10. *(write 24 ÷ 4 ÷ 10)* What is 24 divided by 4? (6) Now all we have to think about is 6 divided by 10. Use disks or a place value chart. What is 6 divided by 10? (6 tenths, or 0.6) *(show 6 divided by 10 in a place value chart, as needed)* We divided 24 by 40 in parts, dividing by 4 first, and then 10. We see that 24 divided by 40 is 0.6.



$0.24 \div 40$
$= 0.24 \div 4 \div 10$
$= 0.06 \div 10$
$= 0.006$

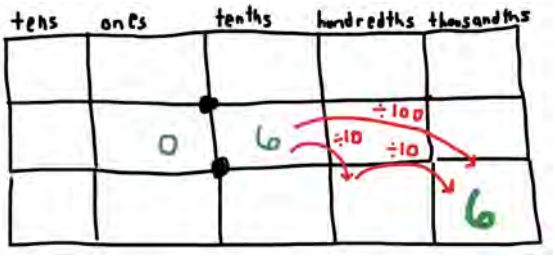
The second equation wants us to divide 0.24 by 40. *(write equation horizontally)* Dividing by 40 all at once could be confusing, so we'll break it into pieces. We'll divide by 4 and then by 10. *(write 0.24 ÷ 4 ÷ 10)* What is 24 hundredths divided by 4? (6 hundredths or 0.06) Now all we have to think about is 0.06 divided by 10. Use disks or a place value chart. What is 0.06 divided by 10? *(write equation)* (0.006 or 6 thousandths)



(show 0.06 divided by 10 in a place value chart, as needed) We divided 24 hundredths by 4, then by 10. We see that 0.24 divided by 40 is 0.006.

Let's wrap this up with the last equation. What do you see that is a bit different here? (We're dividing by 400 instead of just 40) Not to worry, we can still divide in parts. Instead of dividing by 400 all at once, we can divide by 4 then 100. Or if you'd prefer, we can divide by 4, then 10, then 10 again. Either option will work. *(write 2.4 divided by 400 horizontally, then write 2.4 ÷ 4 ÷ 100 underneath it)* What is 2.4, or 24 tenths, divided by 4? (6 tenths or 0.6) *(write 0.6 divided by 100 underneath)*

$2.4 \div 400$
$= 2.4 \div 4 \div 100$
$= 0.6 \div 100$
$= 0.006$



Now, we just have to divide 0.6 by 100. Each place value unit is 10 times as much as the next smallest unit, so if we are dividing by 10, we can shift our digit one place value. In this case, we're dividing by 100, so we will shift the 6 two place values. *(write 0.6 in a place value chart, draw an arrow labeled with ÷100, and another 6 in the thousandths place in the row below like shown)* If dividing by 100 all at once seems like a lot, we can think of dividing 0.6 by 10, to get 0.06, then by 10 again to get 0.006. *(show this with two labeled arrows as shown)*

So 2.4 divided by 400 is what? (0.006) Correct!

Think back to the first set of colorful equations we looked at. *(show slide 2 again)* Now that we know what we know about dividing with decimal dividends, how would you explain what we see in these equations? Possible Student Answers, Key Points:

- I could explain what is happening in these equations by using unit form. Each shows 12 of a unit divided by 2. The first equation shows 12 hundreds divided by 2, which is 6 hundreds. 12 tens divided by 2 is 6 tens. 12 ones divided by 2 is 6 ones. 12 tenths divided by 2 is 6 tenths. 12 hundredths divided by 2 is 6 hundredths. We can think of the fact 12 ÷ 6, just with different place value units.

Let's Try it (Slides 6 - 7): Now let's work together to divide decimal dividends by multiples of 10. We can use place value disks or place value charts to help us think about dividing by 10. If we're dividing by a multiple of 10 other than ten, we can decompose and divide in parts to help us make sense of the problem and keep track of our units. Let's give it a try with some more problems.

WARM WELCOME

Today we will divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method

Let's Talk:

$1{,}200 \div 2 = 600$

$120 \div 2 = 60$

$12 \div 2 = 6$

$1.2 \div 2 = 0.6$

$0.12 \div 2 = 0.06$

Let's Think:

Find each quotient.

$24 \div 10 = ?$

$2.4 \div 10 = ?$

$0.24 \div 10 = ?$

Let's Think:

Find each quotient.

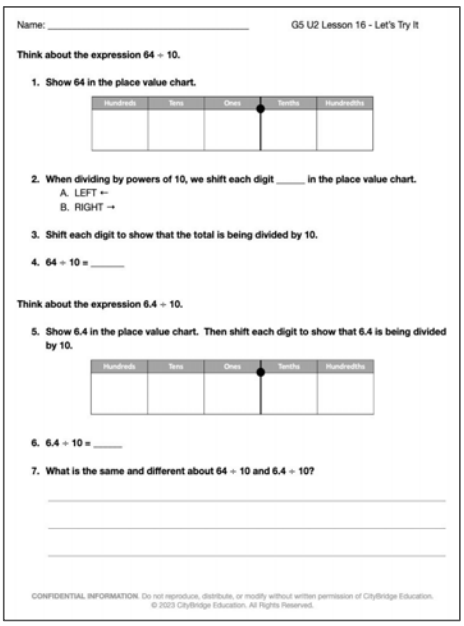
24 ÷ 40 = ?

0.24 ÷ 40 = ?

2.4 ÷ 400 = ?

Let's Try It:

Let's explore dividing decimal dividends by multiples of 10 together.



Name: _____ G5 U2 Lesson 16 - Let's Try It

Think about the expression 64 ÷ 10.

1. **Show 64 in the place value chart.**

Hundreds	Tens	Ones	Tenths	Hundredths

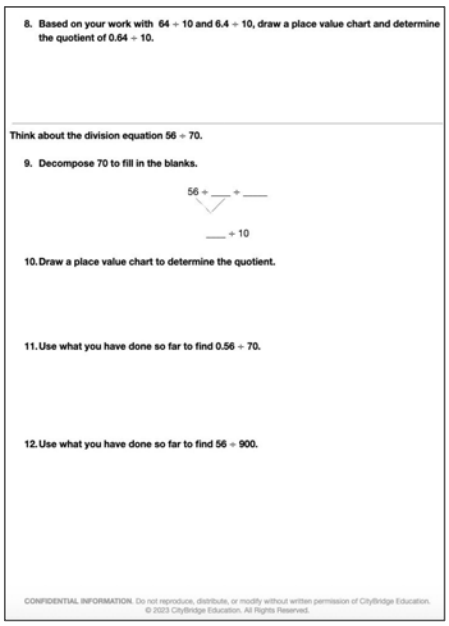
2. **When dividing by powers of 10, we shift each digit _____ in the place value chart.**
   A. LEFT ←
   B. RIGHT →
3. **Shift each digit to show that the total is being divided by 10.**
4. **64 ÷ 10 = _____**

Think about the expression 6.4 ÷ 10.

5. **Show 6.4 in the place value chart. Then shift each digit to show that 6.4 is being divided by 10.**

Hundreds	Tens	Ones	Tenths	Hundredths

6. **6.4 ÷ 10 = _____**
7. **What is the same and different about 64 ÷ 10 and 6.4 ÷ 10?**



8. **Based on your work with 64 ÷ 10 and 6.4 ÷ 10, draw a place value chart and determine the quotient of 0.64 ÷ 10.**

Think about the division equation 56 ÷ 70.

9. **Decompose 70 to fill in the blanks.**

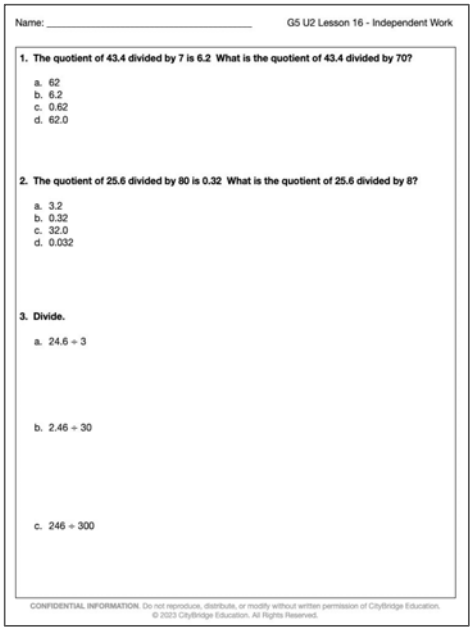
56 ÷ ___ ÷ ___

___ ÷ 10

10. **Draw a place value chart to determine the quotient.**
11. **Use what you have done so far to find 0.56 ÷ 70.**
12. **Use what you have done so far to find 56 ÷ 900.**

On your Own:

Now it's time to divide decimal dividends by multiples of 10 on your own.



Name: _____ G5 U2 Lesson 16 - Independent Work

1. The quotient of 43.4 divided by 7 is 6.2 What is the quotient of 43.4 divided by 70?

a. 62
b. 6.2
c. 0.62
d. 62.0

2. The quotient of 25.6 divided by 80 is 0.32 What is the quotient of 25.6 divided by 8?

a. 3.2
b. 0.32
c. 32.0
d. 0.032

3. Divide.

a. 24.6 ÷ 3

b. 2.46 ÷ 30

c. 246 ÷ 300

4. If 7.38 ÷ 9 = 0.82, then what is the quotient of 7.38 ÷ 90? Explain.

Name: _____ G5 U2 Lesson 16 - Let's Try It

Think about the expression 64 ÷ 10.

1. Show 64 in the place value chart.

Hundreds	Tens	Ones	Tenths	Hundredths

2. When dividing by powers of 10, we shift each digit _____ in the place value chart.
   A. LEFT ←
   B. RIGHT →

3. Shift each digit to show that the total is being divided by 10.

4. 64 ÷ 10 = _____

Think about the expression 6.4 ÷ 10.

5. Show 6.4 in the place value chart. Then shift each digit to show that 6.4 is being divided by 10.

Hundreds	Tens	Ones	Tenths	Hundredths

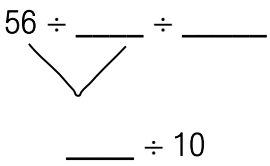
6. 6.4 ÷ 10 = _____

7. What is the same and different about 64 ÷ 10 and 6.4 ÷ 10?

8. Based on your work with 64 ÷ 10 and 6.4 ÷ 10, draw a place value chart and determine the quotient of 0.64 ÷ 10.

Think about the division equation 56 ÷ 70.

9. Decompose 70 to fill in the blanks.



10. Draw a place value chart to determine the quotient.

11. Use what you have done so far to find 0.56 ÷ 70.

12. Use what you have done so far to find 56 ÷ 700.

1. The quotient of 43.4 divided by 7 is 6.2 What is the quotient of 43.4 divided by 70?

   a. 62
   b. 6.2
   c. 0.62
   d. 62.0

2. The quotient of 25.6 divided by 80 is 0.32 What is the quotient of 25.6 divided by 8?

   a. 3.2
   b. 0.32
   c. 32.0
   d. 0.032

3. Divide.

   a. $24.6 \div 3$

   b. $2.46 \div 30$

   c. $246 \div 300$

4. If $7.38 \div 9 = 0.82$, then what is the quotient of $7.38 \div 90$? Explain.

Name: KEY

Think about the expression 64 ÷ 10.

1. **Show 64 in the place value chart.**

Hundreds	Tens	Ones	Tenths	Hundredths
	6	4	4	

2. **When dividing by powers of 10, we shift each digit _____ in the place value chart.**
   A. LEFT ←
   B. RIGHT →

3. **Shift each digit to show that the total is being divided by 10.**

4. **64 ÷ 10 =** 6.4

Think about the expression 6.4 ÷ 10.

5. **Show 6.4 in the place value chart. Then shift each digit to show that 6.4 is being divided by 10.**

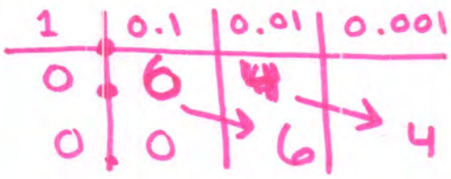
Hundreds	Tens	Ones	Tenths	Hundredths
		6 ÷10	4	÷10 4

6. **6.4 ÷ 10 =** 0.64

7. **What is the same and different about 64 ÷ 10 and 6.4 ÷ 10?**

They both use the same digits and divide by 10. The place value of the digits in each quotient are different.

8. Based on your work with 64 ÷ 10 and 6.4 ÷ 10, draw a place value chart and determine the quotient of 0.64 ÷ 10.



0.064

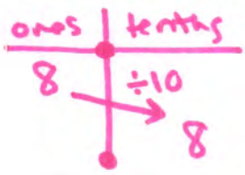
Think about the division equation 56 ÷ 70.

9. Decompose 70 to fill in the blanks.

56 ÷ 7 ÷ 10

8 ÷ 10

10. Draw a place value chart to determine the quotient.



0.8

11. Use what you have done so far to find 0.56 ÷ 70.

0.56 ÷ 7 ÷ 10

0.08 ÷ 10

0.008

12. Use what you have done so far to find 56 ÷ ~~900~~ 700

56 ÷ 7 ÷ 10 ÷ 10

8 ÷ 10 ÷ 10

0.8 ÷ 10

0.08

Name: KEY

1. **The quotient of 43.4 divided by 7 is 6.2 What is the quotient of 43.4 divided by 70?**

   a. 62
   b. 6.2
   c. 0.62
   d. 62.0

43.4 ÷ 7 ÷ 10
6.2 ÷ 10
0.62

2. **The quotient of 25.6 divided by 80 is 0.32 What is the quotient of 25.6 divided by 8?**

   a. 3.2
   ~~b. 0.32~~
   c. 32.0
   d. 0.032

these digits are one place value farther right

3. **Divide.**

   a. 24.6 ÷ 3

24 ÷ 3 = 8 → 8.2
0.6 ÷ 3 = 0.2

   b. 2.46 ÷ 30

2.46 ÷ 30
2.46 ÷ 3 ÷ 10
0.82 ÷ 10
0.082

   c. 246 ÷ 300

246 ÷ 3 ÷ 100
82 ÷ 100
0.82

4. If 7.38 ÷ 9 = 0.82, then what is the quotient of 7.38 ÷ 90? Explain.

$7.38 \div 9 \div 10$

$0.82 \div 10$

$\boxed{0.082}$

I can decompose 90 into factors of 9 and 10. I already know $7.38 \div 9 = 0.82$, so I can just divide that by 10. I can shift each digit in 0.82 to the right.

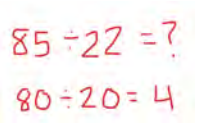
G5 U2 Lesson 17

Use basic facts to approximate decimal quotients with two-digit divisors

G5 U2 Lesson 17 - Students will use basic facts to approximate decimal quotients with two-digit divisors, reasoning about the placement of the decimal point

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've spent time in previous lessons thinking about division. One thing we know can help us when dividing is estimation. For example, if I'm trying to find the quotient of 85 divided by 22 *(write 85 ÷ 12)*, I can first estimate by thinking about 80 divided by 20 *(write that equation underneath)*. This tells me that the quotient should be about 4. Estimating a quotient helps make sure our answer is reasonable, and it helps us think about the relationship between the divisor and the total, or the dividend. Today, we'll use estimation to help us think about decimal quotients specifically.



Let's Talk (Slide 3): Take a second and look at the work in the green box on the left. What do you notice this student doing? Possible Student Answers, Key Points:

- It looks like they're estimating the quotient of 635 divided by 23.
- They rounded 23 to 20. They rounded 635 to 640, so it was easy to think about with a divisor of 20. Their quotient should be about 32.

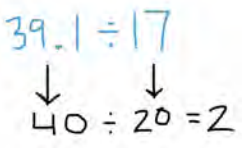
This student rounded their divisor to something a bit easier to think about than 23. They then rounded their divisor to be a number close to 635 that they know 20 goes into neatly. This helped them see that their actual quotient should be something around 32.

Now look at the incomplete work in the red box on the right. How do you think the work shown in the green box could help this student estimate the quotient of 63.5 divided by 23? Possible Student Answers, Key Points:

- I notice they're the same digits, but the total's digits are in different place value positions. Maybe the estimate would still be 4, but in a different place value.
- They can probably still round the divisor to 20. They'd need to round the dividend to something different, though, since 63.5 isn't close to 640; it's close to 64.

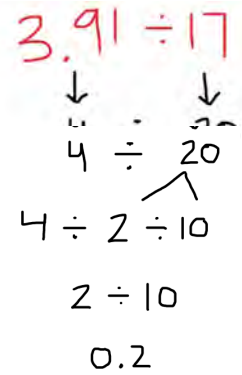
Interesting thoughts! Keep all that in mind, because we'll circle back to this question in a few minutes.

Let's Think (Slide 4): This problem wants us to estimate the quotient of 39.1 divided by 17. *(write expression horizontally)* Neither of these numbers is particularly easy to work with using mental math, so estimation makes a lot of sense here.



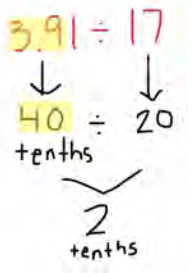
We'll start by rounding the divisor. What is 17 rounded to the nearest ten? (20) *(write 20 underneath 17)* Now we need to round the total, or the dividend, to a number that can be easily divided by 20. What do you recommend? (40) Sure, 40 will work well. *(write 40 underneath 39.1)* From here, we can reason that the quotient of 39.1 divided by 17 should be about 2, since 40 divided by 20 is 2.

Estimating with decimal dividends doesn't feel all that different from estimating with whole number dividends, does it? Let's take this one step further. What if I told you that our total was 3.91 instead of 39.1? *(write 3.91 ÷ 17 next to the original equation)*



We can still think of 17 as being close to 20. *(write 20 underneath 17)* I can't round 3.91 to 40 though, since 3.91 isn't really close to 40. We can think of it as being about 4, though. *(write 4 underneath 3.91)*

4 divided by 20 maybe isn't a mental math fact we know, because 20 is bigger than 4. That's okay, we can divide in parts. I know we can divide 4 by 2 quickly, and then we can divide that by 10. *(write each step underneath the previous as you narrate)* What is 4 divided by 2? (2) What is 2 divided by 10? (0.2 or 2 tenths) Right, 1 divided by 10 is 1 tenth, so 2 divided by ten is 2 tenths. We can see now that the estimated quotient of 3.91 divided by 17 would be about 2 tenths, or 0.2



We can also think about this same estimation by thinking about unit form. Let me show you what I mean. *(rewrite 3.91 ÷ 17 with an arrow from 17 to 20 underneath it)* Instead of rounding 3.91 to 4 wholes, since dividing 4 by 20 might feel tricky, I can think of 3.91 as being close to 40 tenths, since 3.91 has 39 tenths. 40 tenths is really close to 39 tenths. *(write 40 tenths underneath 3.91)* What is 40 *tenths* divided by 20? (2 tenths) Correct, 40 tenths divided by 20 is 2 tenths or 0.2! *(write it)* Renaming numbers in unit form can make them easier to think about when dividing.

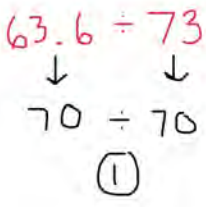
How are the two ways we divided 3.91 by 17 the same or different? Possible Student Answers, Key Points:

- We rounded the divisor to 20 both times. We got 0.2 or 2 tenths as our estimated answer both times.
- The first way, we divided by 20 in pieces that were easy to think about. The second way, we renamed the estimated total in unit form so we could use mental math to divide all at once.

After we round the divisor to something easy to work with, we can use either strategy to think about the dividend and help us find the estimated quotient.

Let's Think (Slide 5): Let's try one more set, so we can be even more confident in our understanding. We'll start by estimating the quotient of 63.6 divided by 73. How would you round these numbers to help us divide and why? Possible Student Answers, Key Points:

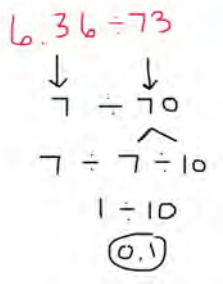
- 73 is really close to 70. 63.6 is really close to 60, but I think 70 will be a better estimate since it works well with the estimated divisor.



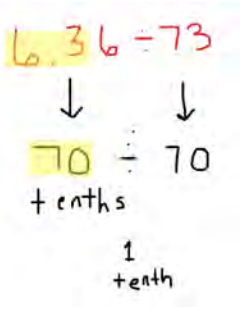
Let's round the divisor to 70. In this case, 63.6 could round to 60, but rounding to 70 will be more efficient in terms of using mental math. *(write 70 ÷ 70 underneath the original equation)* What is 70 divided by 70? (1) The estimated quotient of 63.6 divided by 73 is 1. *(write and circle 1)* Now let's use this problem to help us do one that is a little similar and a little different.

Look at the problem on the right. This wants us to now find the estimated quotient of 6.36 divided by 73. How do you think this estimated quotient will be similar or different compared to the estimated quotient we just found? Possible Student Answers, Key Points:

- It should be smaller since our total is smaller. 6.36 is less than 63.6.
- It will probably have the same digit, 1, but in a different place value. The digits in this problem are the same digits as in the previous problem.



Let's work on it. I'll still round 73 to 70. What compatible or friendly whole number can we round 6.36 to? (7) *(write 7 ÷ 70 underneath original equation)* 7 divided by 70 can be tricky to think about, since 70 is bigger than 7. Let's divide in parts. I can divide 7 by 7 and then by 10 instead of dividing by 70 all at once. What is 7 divided by 7? (1) And 1 divided by 10 is what? (1 tenth or 0.1) The estimated quotient of 6.36 divided by 73 is 0.1. That aligns with some of what you predicted. It's the same estimate we got in our first problem on this slide, just in a different place value.



Before we close out this part, let's think about this problem using the unit form strategy. *(write 6.36 ÷ 73 with an arrow rounding 73 to 70 underneath)* We'll still think of 73 as being about 70, but now let's rename the dividend using unit form in a way that will help us estimate efficiently. Looking at just the ones place isn't super helpful, since we're dividing by 70 and 6.36 only has 6 ones. Let's think about 6.36 in terms of tenths. It has 63 tenths in the number, which is really close to 70 tenths. 70 tenths is easily divisible by 70. *(write 70 tenths ÷ 70 underneath)* What is 70 tenths divided by 70? (1 tenth or 0.1) So by using unit form, we see another way to arrive at the same estimated quotient.

We can consider both strategies as we work more today.

Think back to the work we saw from earlier in the red box on the right. *(return to Slide 3)* Now that we know what we know, how could you help this student use the work they already did to arrive at an estimate for 63.5 divided by 24? Possible Student Answers, Key Points:

- They can use the same steps they used in the green box, with the decimal numbers. They'd just have to be more careful about the place value of their digits when working with decimals.
- If I know 640 divided by 20 gives me an estimate of 32 wholes, then I know 640 tenths divided by 20 gives me an estimate of 320 tenths or 3.2 The answer will have the same digits in a smaller place value.

Let's Try it (Slides 6 - 7): Now let's practice finding approximate decimal quotients. As we've seen, the work we do to estimate decimal quotients is similar to the work we do to estimate whole number quotients. We'll reason about a friendly divisor to work with, then do the same with the dividend in each problem. From there, we just have to carefully divide with decimals by thinking about unit form or dividing in parts. Let's go for it.

WARM WELCOME

Today we will use basic facts to approximate decimal quotients with two-digit divisors, reasoning about the placement of the decimal point

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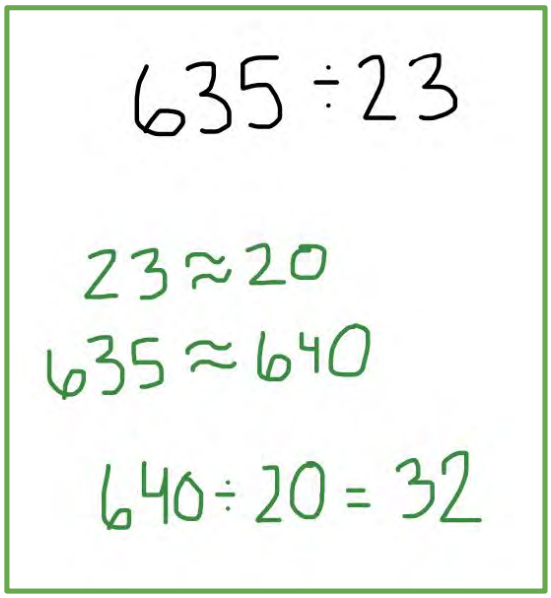
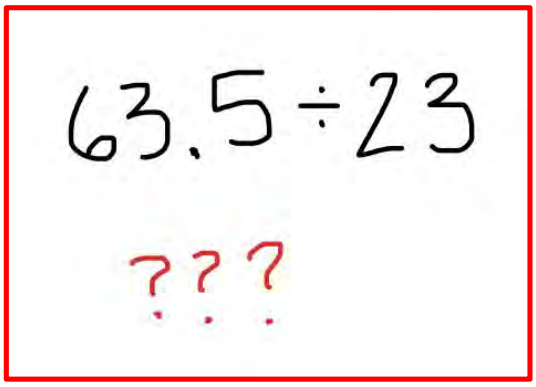
Let's Talk:





Let's Think:

Estimate the quotient.

39.1 ➗ 17 = ?

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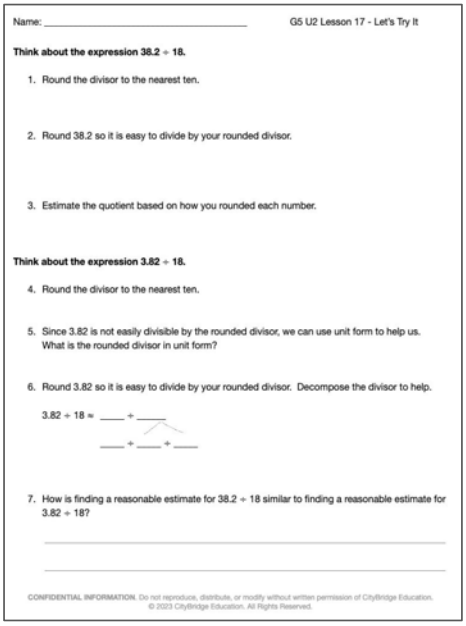
Let's Think:

Estimate each quotient.

$63.6 \div 73 = ?$	$6.36 \div 73 = ?$

Let's Try It:

Let's explore approximating decimal quotients with two-digit divisors together.



Name: _____ G5 U2 Lesson 17 - Let's Try It

Think about the expression 38.2 ÷ 18.

1. Round the divisor to the nearest ten.
2. Round 38.2 so it is easy to divide by your rounded divisor.
3. Estimate the quotient based on how you rounded each number.

Think about the expression 3.82 ÷ 18.

4. Round the divisor to the nearest ten.
5. Since 3.82 is not easily divisible by the rounded divisor, we can use unit form to help us. What is the rounded divisor in unit form?
6. Round 3.82 so it is easy to divide by your rounded divisor. Decompose the divisor to help.

   3.82 ÷ 18 ≈ ____ ÷ ____

   ____ + ____ + ____
7. How is finding a reasonable estimate for 38.2 ÷ 18 similar to finding a reasonable estimate for 3.82 ÷ 18?

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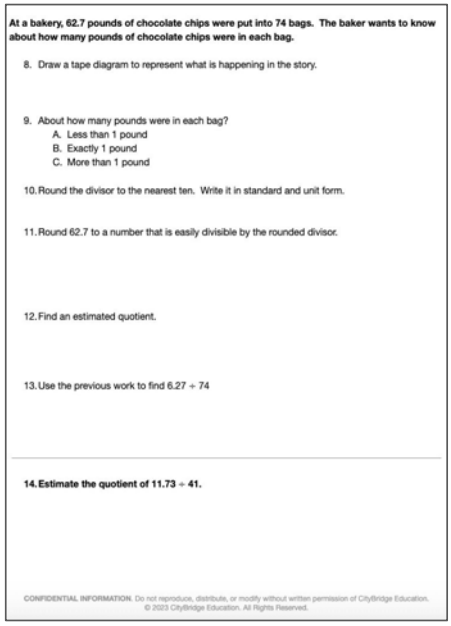

At a bakery, 62.7 pounds of chocolate chips were put into 74 bags. The baker wants to know about how many pounds of chocolate chips were in each bag.

8. Draw a tape diagram to represent what is happening in the story.
9. About how many pounds were in each bag?
   A. Less than 1 pound
   B. Exactly 1 pound
   C. More than 1 pound
10. Round the divisor to the nearest ten. Write it in standard and unit form.
11. Round 62.7 to a number that is easily divisible by the rounded divisor.
12. Find an estimated quotient.
13. Use the previous work to find 6.27 ÷ 74

14. Estimate the quotient of 11.73 ÷ 41.

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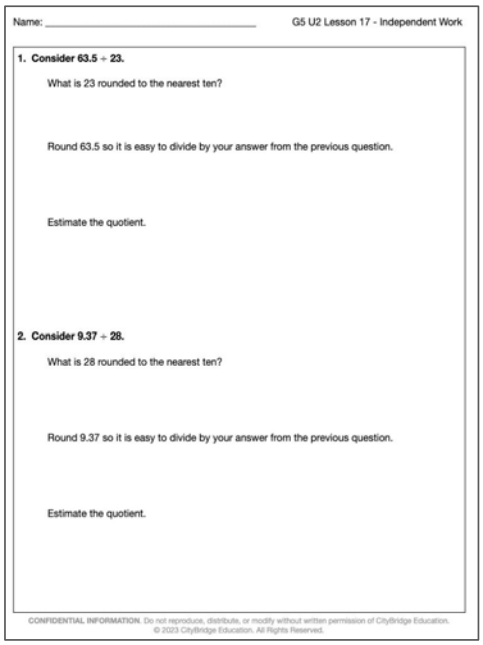
On your Own:

Now it's time to approximate decimal quotients with two-digit divisors on your own.



Name: _____ G5 U2 Lesson 17 - Independent Work

1. Consider 63.5 ÷ 23.

What is 23 rounded to the nearest ten?

Round 63.5 so it is easy to divide by your answer from the previous question.

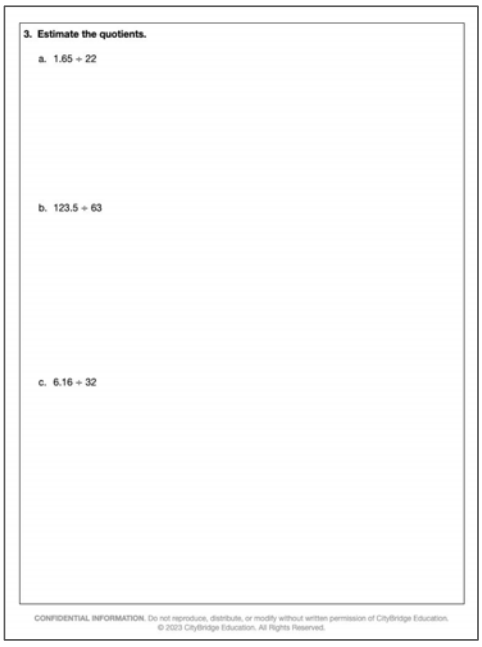
Estimate the quotient.

2. Consider 9.37 ÷ 28.

What is 28 rounded to the nearest ten?

Round 9.37 so it is easy to divide by your answer from the previous question.

Estimate the quotient.



3. Estimate the quotients.

a. 1.65 ÷ 22

b. 123.5 ÷ 63

c. 6.16 ÷ 32

Think about the expression 38.2 ÷ 18.

1. Round the divisor to the nearest ten.

2. Round 38.2 so it is easy to divide by your rounded divisor.

3. Estimate the quotient based on how you rounded each number.

Think about the expression 3.82 ÷ 18.

4. Round the divisor to the nearest ten.

5. Since 3.82 is not easily divisible by the rounded divisor, we can use unit form to help us. What is the rounded divisor in unit form?

6. Round 3.82 so it is easy to divide by your rounded divisor. Decompose the divisor to help.

   3.82 ÷ 18 ≈ _____ ÷ _____

   _____ ÷ _____ ÷ _____

7. How is finding a reasonable estimate for 38.2 ÷ 18 similar to finding a reasonable estimate for 3.82 ÷ 18?

At a bakery, 62.7 pounds of chocolate chips were put into 74 bags. The baker wants to know about how many pounds of chocolate chips were in each bag.

8. Draw a tape diagram to represent what is happening in the story.

9. About how many pounds were in each bag?
    A. Less than 1 pound
    B. Exactly 1 pound
    C. More than 1 pound

10. Round the divisor to the nearest ten. Write it in standard and unit form.

11. Round 62.7 to a number that is easily divisible by the rounded divisor.

12. Find an estimated quotient.

13. Use the previous work to find 6.27 ÷ 74

---

14. Estimate the quotient of 11.73 ÷ 41.

1. Consider 63.5 ÷ 23.

   What is 23 rounded to the nearest ten?

   Round 63.5 so it is easy to divide by your answer from the previous question.

   Estimate the quotient.

2. Consider 9.37 ÷ 28.

   What is 28 rounded to the nearest ten?

   Round 9.37 so it is easy to divide by your answer from the previous question.

   Estimate the quotient.

3. Estimate the quotients.

   a. 1.65 ÷ 22

b. $123.5 \div 63$

c. $6.16 \div 32$

Name: KEY

Think about the expression 38.2 ÷ 18.

1. Round the divisor to the nearest ten.

   18 ≈ 20

2. Round 38.2 so it is easy to divide by your rounded divisor.

   38.2 ≈ 40

3. Estimate the quotient based on how you rounded each number.

   40 ÷ 20 ≈ 2

Think about the expression 3.82 ÷ 18.

4. Round the divisor to the nearest ten.

   18 ≈ 20

5. Since 3.82 is not easily divisible by the rounded divisor, we can use unit form to help us. What is the rounded divisor in unit form?

   20 = 2 tens

6. Round 3.82 so it is easy to divide by your rounded divisor. Decompose the divisor to help.

   3.82 ÷ 18 ≈ 4 ÷ 20

   4 ÷ 2 ÷ 10

   2 ÷ 10 = 0.2

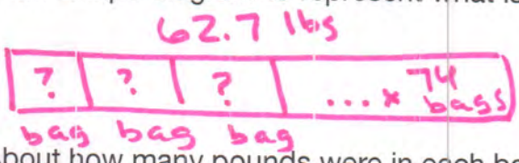
7. How is finding a reasonable estimate for 38.2 ÷ 18 similar to finding a reasonable estimate for 3.82 ÷ 18?

   I could still round 18 to 20. The place value of digits in the dividend would be different.

   38.2 ≈ 40

At a bakery, 62.7 pounds of chocolate chips were put into 74 bags. The baker wants to know about how many pounds of chocolate chips were in each bag.

8. Draw a tape diagram to represent what is happening in the story.



9. About how many pounds were in each bag?
   - (A.) Less than 1 pound
   - B. Exactly 1 pound
   - C. More than 1 pound

62.7 ÷ 74 bags

10. Round the divisor to the nearest ten. Write it in standard and unit form.

74 ≈ 80 or 8 tens

11. Round 62.7 to a number that is easily divisible by the rounded divisor.

62.7 ≈ 64

12. Find an estimated quotient.

64 ÷ 80
64 ÷ 8 ÷ 10
8 ÷ 10

(0.8)

13. Use the previous work to find 6.27 ÷ 74

6.27 ≈ 6.4
6.4 ÷ 8 ÷ 10
0.8 ÷ 10

(0.08)

---

14. Estimate the quotient of 11.73 ÷ 41.

41 ≈ 40
11.73 ≈ 12

12 ÷ 4 ÷ 10
3 ÷ 10
(0.3)

Name: KEY

1. Consider 63.5 ÷ 23.

What is 23 rounded to the nearest ten?

$23 \approx 20$

Round 63.5 so it is easy to divide by your answer from the previous question.

$63.5 \approx 60$

Estimate the quotient.

$60 \div 20 = 3$

2. Consider 9.37 ÷ 28.

What is 28 rounded to the nearest ten?

$28 \approx 30$

Round 9.37 so it is easy to divide by your answer from the previous question.

$9.37 \approx 9$

Estimate the quotient.

$9 \div 30$

$9 \div 3 \div 10$

$3 \div 10$

0.3

3. Estimate the quotients.

a. $1.65 \div 22$

$22 \approx 20$

$1.65 \approx 2$

$2 \div 20$

$2 \div 2 \div 10$

$1 \div 10$

0.1

b. $123.5 \div 63$

$63 \approx 60$

$123.5 \approx 120$

$120 \div 60$

2

c. $6.16 \div 32$

$32 \approx 30$

$6.16 \approx 6$

$6 \div 30$

$6 \div 3 \div 10$

$2 \div 10$

0.2

G5 U2 Lesson 18

Divide decimal dividends by two-digit divisors

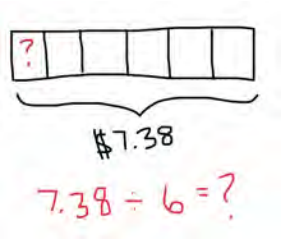
G5 U2 Lesson 18 - Students will divide decimal dividends by two-digit divisors, estimate quotients, reasoning about the placement of the decimal point, and making connections to a written method

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We have spent the last several lessons thinking about division. More recently, we've been thinking about division with decimal dividends. In our previous lesson, we reasoned about the dividend and divisor to find an approximate quotient. Today, we'll use that same thinking to estimate, but we'll also calculate to find the exact quotient.

Let's Talk (Slide 3): The other day I saw a sign at the store that said 6 apples cost $7.38. They looked delicious! I wanted to try them, but there was no way I could eat 6 apples. I wanted to buy just one, but I wasn't immediately sure how much 1 would cost. What do you think I could do to find the cost of 1 apple? Possible Student Answers, Key Points:

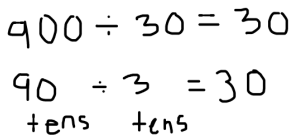
- You could use division. You could divide the total by 6.
- You could estimate to get an idea of the cost. I know if 6 apples cost $1 each, the total would be $6. So, each apple in this case is going to cost a little more than $1 since $7.38 is a little more than $6.



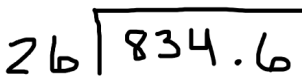
Great thinking. I know 6 apples *(draw a rectangle partitioned into 6 parts)* cost $7.38 in all. *(draw a bracket and label the entire rectangle $7.38)* If I wanted to find the cost of just 1 apple *(write ? in one of the partitioned rectangles)*, I could use division to help me figure that out. I can take the total cost, $7.38, and divide it by 6 apples. *(write $7.38 ÷ 6)* Estimation could help us get a close idea of what the price would be, but if I wanted to find the exact cost, I would have to calculate it. That's what we're going to be doing today!

Let's Think (Slide 4): This first problem wants us to divide 834.6 by 26. Let's estimate a quotient. What numbers could we round the divisor and dividend to to give us an idea of the quotient? Possible Student Answers, Key Points:

- 26 is close to 30. We can think of the divisor as 30.
- 834.6 is close to 900, so we can think of the dividend as 900.

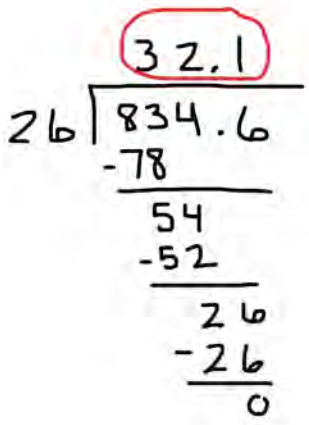


If we think of the divisor as being close to 30, and the dividend as being close to 900, we can find a reasonable estimate of the quotient. *(write 900 ÷ 30 and 90 tens ÷ 3 tens)* What is 900 divided by 30? If you're not sure, you can think of 90 tens divided by 3 tens. (30) When we calculate the exact quotient, our answer should be somewhere close to 30.



To calculate the exact quotient, let's set up our division in vertical form. *(write 834.6 inside a division bar, and write 26 outside the division bar)* Can 8 hundreds be divided by 26 without regrouping? (No.) Let's look at the next place value after hundreds. 834.6 has 83 tens. How many groups of 26 can go into 83 tens, and how do you know? Possible Student Answers, Key Points:

- I know my estimate has 3 tens in it, so I can start by seeing if 3 groups of 26 goes into 83 tens.
- I can find multiples of 26 that get me close to 83. 2 x 26 = 52. 3 x 26 = 78. So 83 tens divided by 26 is 3 tens.

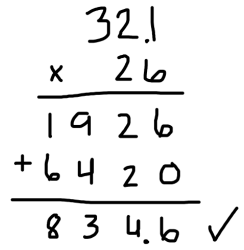


(Record 3 in the tens place of the quotient) 83 tens divided by 26 is 3 tens. When we subtract 78 tens from 83 tens, we are left with 5 tens. *(Subtract, then record 5 tens in the algorithm)* We can't divide 5 tens by 26, so let's rename it as 50 ones and bring down the 4 ones from our total. What is 54 ones divided by 26, and how do you know? Possible Student Answers, Key Points:

- 54 ones divided by 26 is 2 ones, because 26 x 2 = 52.
- One group of 26 is 26. Two groups of 26 is 52, so 52 ones divided by 26 is 2 ones.

Let's record 2 ones in our quotient and subtract 52 ones from the total. *(write 2 in the ones place of the quotient, then subtract 52 from 54)* We can't divide 2 ones by 26, so let's rename it as 20 tenths and bring down the 6 tenths from our total. What is 26 tenths divided by 26? (1 tenth) So we can put 1 tenth in the quotient. *(Record 1 in the tenths place, then subtract 26 tenths from 26 tenths)* There is no remainder. We just calculated the exact quotient of 834.6 divided by 26. What is it? (32.1) The quotient is 32.1. *(circle it)*

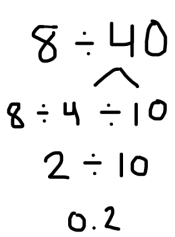
32.1 seems reasonable, because our estimate was 30. If we want to double-check our work, we can always use multiplication. Multiply 32.1 x 26, and see if you get the same total as we started with. If it helps, you can just multiply 321 x 26 as if they were both whole numbers, then adjust your answer knowing that 321 is actually 321 *tenths*. Let me know when you're ready to check your thinking, and I'll share what I did. *(wait for student to multiply)*



(write as you narrate) I know 321 x 6 is 1926. I wrote that as one partial product. I know 321 x 20 is 6420. I wrote that as the second partial product. When I added them together, I got 8,346, but since the first factor is 321 tenths, I know many answer should be 8,346 tenths. That's 834.6, which is the total we started with. Our answer checks out!

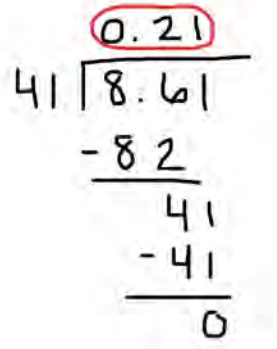
Let's Think (Slide 5): Let's do one more for some additional practice. This problem wants us to divide 8.61 by 41. As always, let's start with an estimate. How would you round these two numbers? Possible Student Answers, Key Points:

- We can think of the divisor as 40.
- The dividend is closer to 9 than 8, but 8 might be better to think about if we're using 40 as the divisor.



We can estimate by thinking of 8 divided by 40. *(write expression)* Let's divide in parts, so we can use mental math. We can divide by 4, then by 10. *(write 8 ÷ 4 ÷ 10)* What is 8 divided by 4? (2) What is 2 divided by 10? (0.2 or 2 tenths) A good estimate for the quotient in this problem is 0.2, or 2 tenths. Let's calculate to see if we get an exact quotient close to 0.2.

Let's write the problem in vertical form. *(write 41 outside the division bar and 8.61 inside the division bar)*



Can 8 ones be divided by 41 without regrouping? (No.) Let's look at the next place value. Can 86 tenths be divided by 41 without regrouping? (Yes.) What is 86 tenths divided by 41? You can skip count, use mental math, or use our estimate to help you think about it. Possible Student Answers, Key Points:

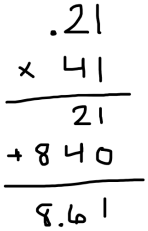
- Two groups of 41 is 82, which is close to 86.
- 86 tenths divided by 41 is 2 tenths, because 41 x 2 = 82.

Since 2 groups of 41 is 82, we know that 86 tenths divided by 41 is 2 tenths. Let's write that in our quotient, and subtract 82 tenths from the total. *(write 0.2 in the quotient, then subtract 82 tenths from 86 tenths)* We now have 4 tenths. Let's rename that as 41 hundredths by bringing down the 1 hundredth left in the total. What is 41 hundredths divided by 41? (0.01 or 1 hundredth) We can put 1 hundredth in our answer *(record 1 in the hundredths place)*, and we are left without a remainder. What is 8.61 divided by 41? (0.21 or 21 hundredths) We did it!

How can we check to make sure our exact quotient makes sense? Possible Student Answers, Key Points:

- It makes sense because our estimate was 0.2, and 0.21 is close to that.
- We can multiply 0.21 x 41 to see if we end up with 8.61 as the product.

Take a few moments to multiply 21 hundredths x 41, and see if you end up with the original total. When you're ready, let me know, and we can compare our thinking. *(wait, as needed review the multiplication shown below)*



I multiplied 21 hundredths x 41. I know 21 x 1 is 21, so I wrote that as a partial product. I know 21 x 40 is 840, so that was my other partial product. I added those together and got 861, but I remembered that the factor of 21 was actually 21 *hundredths*. My answer was 861 hundredths of 8.61. That means we did our division correctly, because we ended up with the total from our division problem.

Let's Try it (Slides 6 - 7): Now that we've practiced calculating quotients of decimal dividends, I think you're ready to take the lead on practicing. As we work, let's remember to estimate first. Not only will this help to make sure our quotients are reasonable, but it will also help us think about numbers we can use as we calculate the quotient. When we arrive at the final quotient, we can cross-check our answer with the estimate, and we can use multiplication to make sure our work is precise. Let's go for it!

WARM WELCOME

Today we will divide decimal dividends by two-digit divisors, estimating quotients, reasoning about the placement of the decimal point, and making connections to a written method

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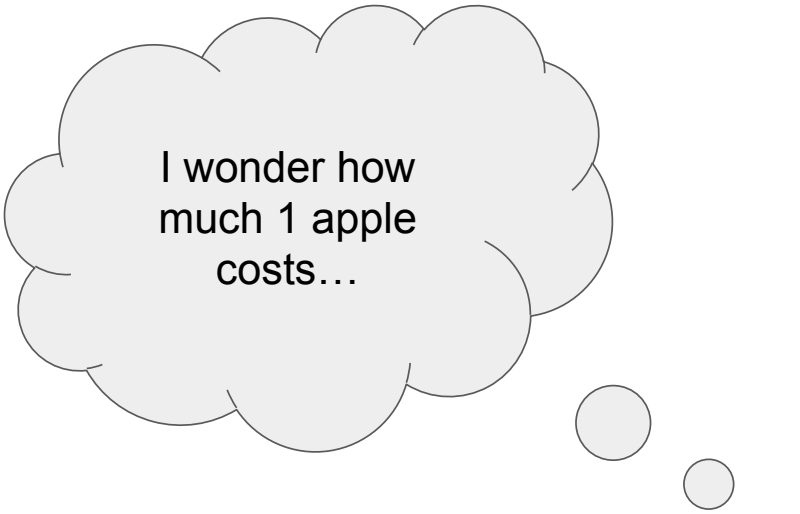
Let's Talk:

6 apples

$7.38



Let's Think:

834.6 ÷ 26 = ?

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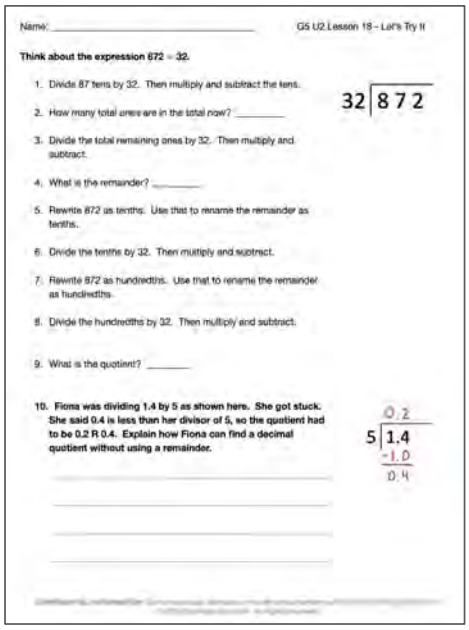
Let's Think:

8.61 ÷ 41 = ?

Let's Try It:

Let's explore dividing decimal dividends by two-digit divisors together.



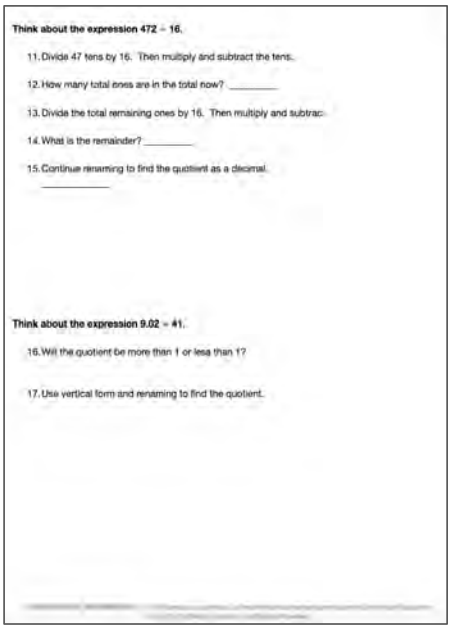
Name: _____ G5 U2 Lesson 18 – Let's Try It

Think about the expression 872 ÷ 32.

1. Divide 87 tens by 32. Then multiply and subtract the tens.
2. How many total ones are in the total now? _____
3. Divide the total remaining ones by 32. Then multiply and subtract.
4. What is the remainder? _____
5. Rewrite 872 as tenths. Use that to rename the remainder as tenths.
6. Divide the tenths by 32. Then multiply and subtract.
7. Rewrite 872 as hundredths. Use that to rename the remainder as hundredths.
8. Divide the hundredths by 32. Then multiply and subtract.
9. What is the quotient? _____
10. **Fiona was dividing 1.4 by 5 as shown here. She got stuck. She said 0.4 is less than her divisor of 5, so the quotient had to be 0.2 R 0.4. Explain how Fiona can find a decimal quotient without using a remainder.**

32 | 872

5 | 1.4
0.2
-1.0
0.4



Think about the expression 472 ÷ 16.

11. Divide 47 tens by 16. Then multiply and subtract the tens.
12. How many total ones are in the total now? _____
13. Divide the total remaining ones by 16. Then multiply and subtract.
14. What is the remainder? _____
15. Continue renaming to find the quotient as a decimal.

Think about the expression 9.02 ÷ 41.

16. Will the quotient be more than 1 or less than 1?
17. Use vertical form and renaming to find the quotient.

On your Own:

Now it's time to divide decimal dividends by two-digit divisors on your own.

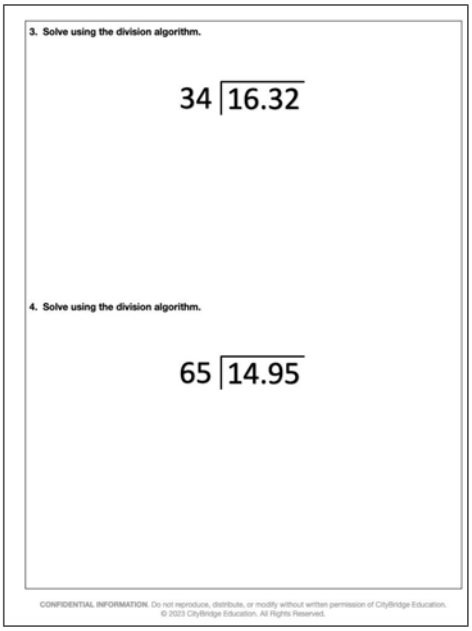
Name: _____ G5 U2 Lesson 18 - Independent Work

1. Solve using the division algorithm.

$23 \overline{)38.87}$

2. Solve using the division algorithm.

$61 \overline{)225.7}$



3. Solve using the division algorithm.

$34 \overline{)16.32}$

4. Solve using the division algorithm.

$65 \overline{)14.95}$

Name: _____ G5 U2 Lesson 18 - Let's Try It

Think about the expression 872 ÷ 32.

1. Divide 87 tens by 32. Then multiply and subtract the tens.
2. How many total ones are in the total now? _____
3. Divide the total remaining ones by 32. Then multiply and subtract.
4. What is the remainder? _____
5. Rewrite 872 as tenths. Use that to rename the remainder as tenths.
6. Divide the tenths by 32. Then multiply and subtract.
7. Rewrite 872 as hundredths. Use that to rename the remainder as hundredths.
8. Divide the hundredths by 32. Then multiply and subtract.
9. What is the quotient? _____
10. Fiona was dividing 1.4 by 5 as shown here. She got stuck. She said 0.4 is less than her divisor of 5, so the quotient had to be 0.2 R 0.4. Explain how Fiona can find a decimal quotient without using a remainder.

_____

_____

_____

_____

Think about the expression 472 ÷ 16.

11. Divide 47 tens by 16. Then multiply and subtract the tens.
12. How many total ones are in the total now? _____
13. Divide the total remaining ones by 16. Then multiply and subtract.
14. What is the remainder? _____

15. Continue renaming to find the quotient as a decimal.

Think about the expression 9.02 ÷ 41.

16. Will the quotient be more than 1 or less than 1?

17. Use vertical form and renaming to find the quotient.

1. Solve using the division algorithm.

$$23 \overline{)38.87}$$

2. Solve using the division algorithm.

$$61 \overline{)225.7}$$

3. Solve using the division algorithm.

$$34 \overline{)16.32}$$

4. Solve using the division algorithm.

$$65 \overline{)14.95}$$

Name: KEY

Think about the expression 872 ÷ 32.

1. Divide 87 tens by 32. Then multiply and subtract the tens.

2. How many total ones are in the total now? 232

32 × 7 = 224

3. Divide the total remaining ones by 32. Then multiply and subtract.

4. What is the remainder? 8

5. Rewrite 872 as tenths. Use that to rename the remainder as tenths.

6. Divide the tenths by 32. Then multiply and subtract.

7. Rewrite 872 as hundredths. Use that to rename the remainder as hundredths.

8. Divide the hundredths by 32. Then multiply and subtract.

9. What is the quotient? 27.25

```
   27.25
32|872.00
 -64
  232
 -224
   80
  -64
  160
 -160
    0
```

10. **Fiona was dividing 1.4 by 5 as shown here. She got stuck. She said 0.4 is less than her divisor of 5, so the quotient had to be 0.2 R 0.4. Explain how Fiona can find a decimal quotient without using a remainder.**

She can rewrite 1.4 as hundredths to continue dividing. The 0.4 left in the total can be 0.40 which means she can put 8 hundredths in the quotient.

```
  0.28
5|1.40
 -1.0
  0.40
 -0.40
     0
```

Think about the expression 472 ÷ 16.

11. Divide 47 tens by 16. Then multiply and subtract the tens.

12. How many total ones are in the total now? 152

13. Divide the total remaining ones by 16. Then multiply and subtract.

14. What is the remainder? 8 or 8.0

15. Continue renaming to find the quotient as a decimal.
29.5

```
   29.5
16|472.0
 -32
  152
 -144
    80
   -80
     0
```

Think about the expression 9.02 ÷ 41.

16. Will the quotient be more than 1 or less than 1?
Less than 1.

17. Use vertical form and renaming to find the quotient.

```
  0.22
41|9.02
 -8.2
   82
  -82
    0
```

0.22

Name: KEY

G5 U2 Lesson 18 - Independent Work

1. Solve using the division algorithm.

$$23 \times 6 = 138 \qquad 23 \times 9 = 207$$

$$23 \overline{)38.87} = 1.69$$

$$\begin{array}{r} 1.69 \\ 23\overline{)38.87} \\ -23 \\ \hline 158 \\ -138 \\ \hline 207 \\ -207 \\ \hline 0 \end{array}$$

2. Solve using the division algorithm.

$$61 \times 3 = 183 \qquad 61 \times 7 = 427$$

$$61 \overline{)225.7} = 3.7$$

$$\begin{array}{r} 003.7 \\ 61\overline{)225.7} \\ -183 \\ \hline 427 \\ -427 \\ \hline 0 \end{array}$$

3. Solve using the division algorithm.

$$\begin{array}{r} 34 \\ \times\ 4 \\ \hline 136 \end{array} \qquad \begin{array}{r} 34 \\ \times\ 8 \\ \hline 272 \end{array}$$

$$\begin{array}{r} 00.48 \\ 34\overline{)16.32} \\ -136 \\ \hline 272 \\ -272 \\ \hline 0 \end{array}$$

0.48

4. Solve using the division algorithm.

$$\begin{array}{r} 65 \\ *\ 3 \\ \hline 195 \end{array}$$

$$\begin{array}{r} 00.23 \\ 65\overline{)14.95} \\ -130 \\ \hline 195 \\ -195 \\ \hline 0 \end{array}$$

0.23