G5-M2-Lesson 1

1. Fill in the blanks using your knowledge of place value units and basic facts.

   a. 34×20

      Think: 34 ones $\times$ 2 tens = __68 tens__

      $34 \times 20 =$ __680__

      > 34 ones $\times$ 2 tens = $(34 \times 1) \times (2 \times 10)$.
      > First, I did the mental math: $34 \times 2 = 68$.
      > Then I thought about the units. *Ones times tens is tens.*
      > 68 tens is the same as 680 ones or 680.

   b. 420×20

      Think: 42 tens $\times$ 2 tens = __84 hundreds__

      $420 \times 20 =$ __8,400__

      > First, I'll multiply 42 times 2 in my head because that's a basic fact: 84.
      > Next, I have to think about the units. *Tens times tens is hundreds.*
      > Therefore, my answer is 84 hundreds or 8,400.

      > Another way to think about this is $42 \times 10 \times 2 \times 10$.
      > I can use the associative property to switch the order of the factors: $42 \times 2 \times 10 \times 10$.

   c. 400×500

      4 hundreds $\times$ 5 hundreds = __20 ten thousands__

      $400 \times 500 =$ __200,000__

      > I have to be careful because the basic fact, $4 \times 5 = 20$, ends in a zero.

      > Another way to think about this is $4 \times 100 \times 5 \times 100$
      > $\qquad = 4 \times 5 \times 100 \times 100$
      > $\qquad = 20 \times 100 \times 100$
      > $\qquad = 20 \times 10,000$
      > $\qquad = 200,000$

EUREKA MATH   Lesson 1:   Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties.   1

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2. Determine if these equations are true or false. Defend your answer using knowledge of place value and the commutative, associate, and/or distributive properties.

   a. 9 tens = 3 tens × 3 tens

   False. The basic fact is correct: $3 \times 3 = 9$.

   However, the units are not correct: 10×10 *is* 100.

> Correct answers could be 9 tens = 3 tens × 3 ones, or 9 hundreds = 3 tens × 3 tens.

   b. $93 \times 7 \times 100 = 930 \times 7 \times 10$

   True. I can rewrite the problem. $93 \times 7 \times (10 \times 10) = (93 \times 10) \times 7 \times 10$

> The associative property tells me that I can group the factors in any order without changing the product.

3. Find the products. Show your thinking.

> I use the distributive property to decompose the factors.

60×5	60×50	$6{,}000 \times 5{,}000$
$= (6 \times 10) \times 5$	$= (6 \times 10) \times (5 \times 10)$	$= (6 \times 1{,}000) \times (5 \times 1{,}000)$
$= (6 \times 5) \times 10$	$= (6 \times 5) \times (10 \times 10)$	$= (6 \times 5) \times (1{,}000 \times 1{,}000)$
$= 30 \times 10$	$= 30 \times 100$	$= 30 \times 1{,}000{,}000$
$= 300$	$= 3{,}000$	$= 30{,}000{,}000$

> Then, I use the associative property to regroup the factors.

> I multiply the basic fact first. Then I think about the units.

> I have to be careful because the basic fact, 6 × 5, has a zero in the product. I multiply the basic fact and then think about the units.
>
> 6 tens times 5 is 30 tens. 30 tens is the same as 300. I could get the wrong answer if I just counted zeros.

> I can think of this in unit form: 6 thousands times 5 thousands. 6 × 5 = 30. The units are thousands times thousands. I can picture a place value chart in my head to solve a thousand times a thousand. A thousand times a thousand is a million. The answer is 30 million, or 30,000,000.

Lesson 1:   Multiply multi-digit whole numbers and multiples of 10 using place value patterns and the distributive and associative properties.

EUREKA MATH

G5-M2-Lesson 2

1. Round the factors to estimate the products.

> I round each factor to the largest unit. For example, 387 rounds to 400.

> The largest unit in 51 is tens. So, I round 51 to the nearest 10, which is 50.

a. $387 \times 51 \approx \underline{\ \ 400\ \ } \times \underline{\ \ 50\ \ } = \underline{\ 20,000\ }$

> Now that I have 2 rounded factors, I can use the distributive property to decompose the numbers. $400 \times 50 = (4 \times 100) \times (5 \times 10)$

> I can use the associative property to regroup the factors.
> $(4 \times 5) \times (100 \times 10) = 20 \times 1,000 = 20,000$

b. $6,286 \times 26 \approx \underline{\ 6,000\ } \times \underline{\ \ 25\ \ } = \underline{\ 150,000\ }$

> I could have chosen to round 25 to 30. However, multiplying by 25 is mental math for me. If I round 26 to 25, I know my estimated product will be closer to the actual product than if I round 26 to 30.

EUREKA MATH   Lesson 2:   Estimate multi-digit products by rounding factors to a basic fact and using place value patterns.

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2. There are 6,015 seats available for each of the Radio City Rockettes Spring Spectacular dance shows. If there are a total of 68 shows, about how many tickets are available in all?

> The problem says "about," so I know to estimate.

> The unknown is the total number of tickets.

?

| 6,000 | 6,000 | . . . | 6,000 |

1 show   70 shows
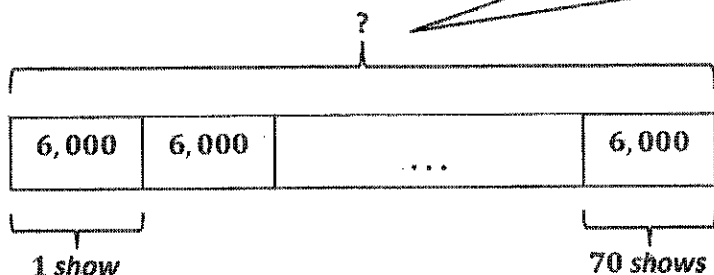
> The long bar of the tape diagram indicates the total amount. There are about 70 shows and about 6,000 tickets for each show.

$6,000 \times 70$

$= 6 \text{ thousands} \times 7 \text{ tens} = 42 \text{ ten thousands} = 420,000$

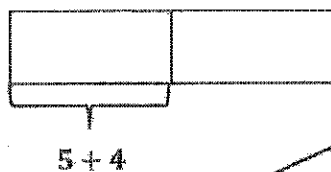$= (6 \times 7) \times (1,000 \times 10) = 42 \times 10,000 = 420,000$

About $420,000$ tickets are available for the shows.

> I can think about the problem in more than one way.

Lesson 2:   Estimate multi-digit products by rounding factors to a basic fact and
              using place value patterns.

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G5-M2-Lesson 3

1. Draw a model. Then write the numerical expression.

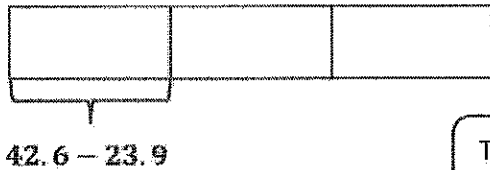   a. The sum of 5 and 4, doubled

   > The directions don't ask me to solve, or evaluate, so I don't have to find the answers.

   $5 + 4$

   > I can show doubling by multiplying by 2 or by adding the two sums together. The tape diagram represents both expressions.

   $(5 + 4) \times 2$ or $(5 + 4) + (5 + 4)$

   > "The sum of 5 and 4" means 5 and 4 are being added.

   b. 3 times the difference between 42.6 and 23.9

   $42.6 - 23.9$

   > The word difference tells me the expression involves subtraction.

   $(42.6 - 23.9) \times 3$

   c. The sum of 4 twelves and 3 sixes
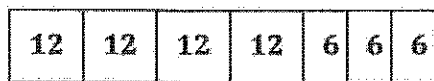
   > Another way to say 4 *twelves* is to say 4 *groups of twelve*.

   | 12 | 12 | 12 | 12 | 6 | 6 | 6 |

   > I can write the value of each unit inside the tape diagram.

   $(4 \times 12) + (3 \times 6)$ or $12 + 12 + 12 + 12 + 6 + 6 + 6$

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

a. $(2 \times 3) + (5 \times 3)$ $\;\boxed{=}\;$ $3 \times (2 + 5)$

> Using the commutative property, I know that 7 threes is equal to 3 sevens.

> I can think of $(2 \times 3) + (5 \times 3)$ in unit form.
> 2 threes + 5 threes = 7 threes = 21.

b. $28 \times (3 + 50)$ $\;\boxed{<}\;$ $(3 + 50) \times 82$

> 82 units of fifty-three is more than 28 units of fifty-three.

Lesson 3:   Write and interpret numerical expressions, and compare expressions using a visual model.

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G5-M2-Lesson 4

1. Circle each expression that is not equivalent to the expression in **bold**.

14 × 31

I think of this as 14 units of thirty-one.
It's like counting by 31's: $31, 62, 93, 124, ..., 434$.

14 thirty-ones   31 fourteens $(13 - 1) \times 31$ $(10 \times 31) - (4 \times 31)$

The commutative property says
$14 \times 31 = 31 \times 14$, or
14 thirty-ones = 31 fourteens.

This would be equivalent if it were $13 + 1$ instead.

I think of this as 10 thirty-ones minus 4 thirty-ones. This expression is equal to 6 thirty-ones not 14 thirty-ones.

2. Solve using mental math. Draw a tape diagram and fill in the blanks to show your thinking.
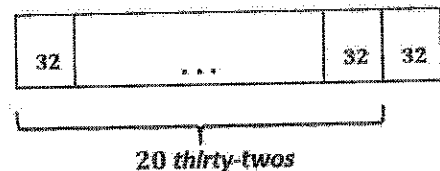
a. $19 \times 25 = \underline{\text{19}}$ twenty-fives

25	25	25	...	25	25
1	2	3	...	19	20

b. $21 \times 32 = \underline{\text{21}}$ thirty-twos

32	...	32	32

20 *thirty-twos*

Think: 20 twenty-fives − 1 twenty-five

$= (\underline{\text{20}} \times 25) - (\underline{\text{1}} \times 25)$

$= \underline{\text{500}} - \underline{\text{25}} = \underline{\text{475}}$

Think: $\underline{\text{20}}$ thirty-twos $+ \underline{\text{1}}$ thirty-two

$= (\underline{\text{20}} \times 32) + (\underline{\text{1}} \times 32)$

$= \underline{\text{640}} + \underline{\text{32}} = \underline{\text{672}}$

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Lesson 4: Convert numerical expressions into unit form as a mental strategy for multi-digit multiplication.

3. The pet store has 99 fish tanks with 44 fish in each tank. How many fish does the pet store have? Use mental math to solve. Explain your thinking.

    I need to find 99 forty-fours.

    I know that 99 forty-fours is 1 unit of forty-four less than 100 forty-fours.

    I multiplied 100 × 44, which is 4,400.

    I need to subtract one group of 44.

    4,400 − 44. The pet store has 4,356 fish.

Lesson 4:   Convert numerical expressions into unit form as a mental strategy for multi-digit multiplication.

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G5-M2-Lesson 5

1. Draw an area model, and then solve using the standard algorithm. Use arrows to match the partial products from the area model to the partial products in the algorithm.

   a. 33×21

> I put the ones on top in the area model so the partial products are in the same order as in the algorithm.

```
    33
  × 21
    33
 +660
  693
```

> 33 and 660 are both *partial products*. I can add them together to find the final *product*.

   b. 433×21


```
    433
  ×  21
    433
 +8,660
   1
  9,093
```

> When I add the hundreds in the two partial products, the sum is 10 hundreds, or 1,000. I record the 1 thousand below the partial products, rather than above.

2. Elizabeth pays $123 each month for her cell phone service. How much does she spend in a year?

> I can draw an area model to help me see where the 2 partial products come from.
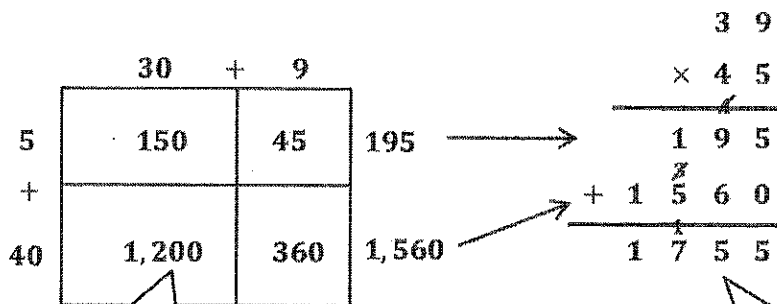
```
    123
  ×  12
    246
 +1,230
  1,476
```

Elizabeth spends $1,476 in a year for cell phone service.

G5-M2-Lesson 6

1. Draw an area model. Then, solve using the standard algorithm. Use arrows to match the partial products from your area model to the partial products in the algorithm.

   a. 39×45

> I can use unit form to find these partial products. For example, 3 tens × 4 tens is 12 hundreds or 1,200.

> There are 2 partial products in the standard algorithm because I multiplied by 45, a 2-digit factor.

   b. 339×45

> The area model shows the factors expanded. If I wanted to, I could put the + between the units.

Lesson 6:   Connect area diagrams and the distributive property to partial products of the standard algorithm without renaming.

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2. Desmond bought a car and paid monthly installments. Each installment was $452 per month. After 36 months, Desmond still owes $1,567. What was the total price of the car?

> I'll find out how much Desmond would pay in 36 months.

$$
\begin{array}{r}
4\ 5\ 2 \\
\times\quad 3\ 6 \\
\hline
2\ 7\ 1\ 2 \\
+\ 1\ 3\ 5\ 6\ 0 \\
\hline
1\ 6,\ 2\ 7\ 2
\end{array}
$$

$$
\begin{array}{r}
1\ 6,\ 2\ 7\ 2 \\
+\quad 1,\ 5\ 6\ 7 \\
\hline
1\ 7,\ 8\ 3\ 9
\end{array}
$$

> I'll add what he paid after 36 months to what Desmond still owes.

The total price of the car was $17,839.

> I remembered to write a sentence that answers the question.

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Lesson 6:   Connect area diagrams and the distributive property to partial products of the
standard algorithm without renaming.

G5-M2-Lesson 7

1. Draw an area model. Then, solve using the standard algorithm. Use arrows to match the partial products from the area model to the partial products in the algorithm.

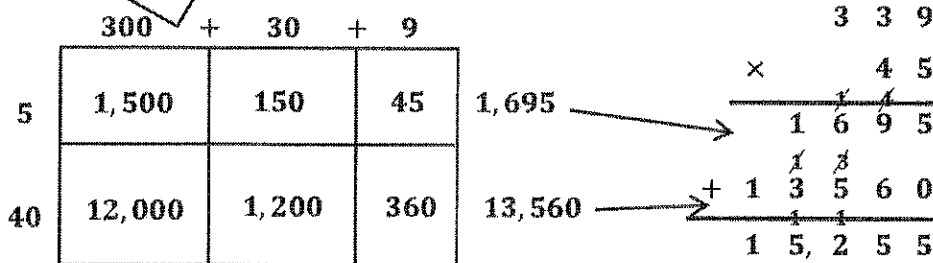$431 \times 246 = \underline{106,026}$

I can decompose both factors:
$431 = 400 + 30 + 1$
$246 = 200 + 40 + 6$.
Now I can multiply to find the partial products.

I can add to find 6×431.
$2,400 + 180 + 6 = 2,586$

I'll line up the two factors vertically and multiply using the standard algorithm.

	400 +	30 +	1	
6	2,400	180	6	2,586
+				
40	16,000	1,200	40	17,240
+				
200	80,000	6,000	200	86,200

```
        4 3 1
    ×   2 4 6
    ─────────
        2 5 8 6
      1 7 2 4 0
  +   8 6 2 0 0
    ─────────
    1 0 6, 0 2 6
```

The partial products I found using the area model are the same as using the standard algorithm.

The total product is 106,026.

Lesson 7:   Connect area models and the distributive property to partial products of the standard algorithm with renaming.

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2. Solve by drawing the area model and using the standard algorithm.

$2,451 \times 107 = \underline{262,257}$

I can decompose 2,451 and use it as the length.
$2,451 = 2,000 + 400 + 50 + 1$

I multiply to find the partial products.

	2,000 +	400 +	50 +	1	
7	14,000	2,800	350	7	17,157
+					
100	200,000	40,000	5,000	100	245,100

```
      2, 4 5 1
   ×    1 0 7
   ─────────────
      1 7 1 5 7
 + 2 4 5 1 0 0
 ─────────────
   2 6 2, 2 5 7
```

I decompose the width, 107.
$107 = 100 + 7$
Since there's a 0 in the tens place, there are 0 tens in the width of the area model.

3. Solve using the standard algorithm.

$7,302 \times 408 = \underline{2,979,216}$

8 ones × 3 hundreds = 24 hundreds = 2 thousands 4 hundreds. I'll record 2 in the thousands place and write 4 in the hundreds place.

8 ones × 2 ones = 16 ones = 1 ten 6 ones. I'll record 1 in the tens place and write 6 in the ones place.

4 hundreds × 3 hundreds = 12 ten thousands. I'll record 1 in the hundred thousands place and write 2 in the ten thousands place.

```
      7, 3 0 2
   ×      4 0 8
   ─────────────
      5 8 4 1 6
 + 2 9 2 0 8 0 0
 ─────────────
   2, 9 7 9, 2 1 6
```

4 hundreds + 8 hundreds = 12 hundreds = 1 thousand 2 hundreds. I'll record 1 in the thousands place and write 2 in the hundreds place.

Lesson 7:   Connect area models and the distributive property to partial products of the standard algorithm with renaming.

G5-M2-Lesson 8

1. Estimate the products first. Solve by using the standard algorithm. Use your estimate to check the reasonableness of the product.

    a. 795×248

    $\approx 800 \times 200$

    $= 160,000$

    > I could have rounded 248 to 250 in order to have an estimate that is closer to the actual product. Another reasonable estimate is $800 \times 250 = 200,000$.

    ```
          7  9  5
       ×  2  4  8
      ─────────────
       6  3  6  0
    ```

    > $8 \times 5 = 40$, which I record as 4 tens 0 ones. 8×9 tens $= 72$ tens plus 4 tens, makes 76 tens. I record 76 tens as 7 hundreds 6 tens.

    ```
       3  1  8  0  0
    + 1  5  9  0  0  0
      ───────────────────
      1  9  7, 1  6  0
    ```

    > This product is reasonable because $197,160$ is close to $160,000$. My other estimate is also reasonable because $197,000$ is very close to $200,000$.

    b. $4,308 \times 505$

    $\approx 4,000 \times 500$

    $= 2,000,000$

    > I have to be careful to estimate accurately. 4 thousands $\times$ 5 hundreds is 20 hundred thousands. That's the same as 2 million. If I just count zeros I might get a wrong estimate.

    ```
         4, 3  0  8
       ×    5  0  5
      ─────────────────
         2  1  5  4  0
    ```

    > This partial product is the result of $5 \times 4,308$.

    ```
    + 2  1  5  4  0  0  0
      ─────────────────────
      2, 1  7  5, 5  4  0
    ```

    > This partial product is the result of $500 \times 4,308$. It makes sense that it is 100 times greater than the first partial product.

2. When multiplying 809 times 528, Isaac got a product of 42,715. Without calculating, does his product seem reasonable? Explain your thinking.
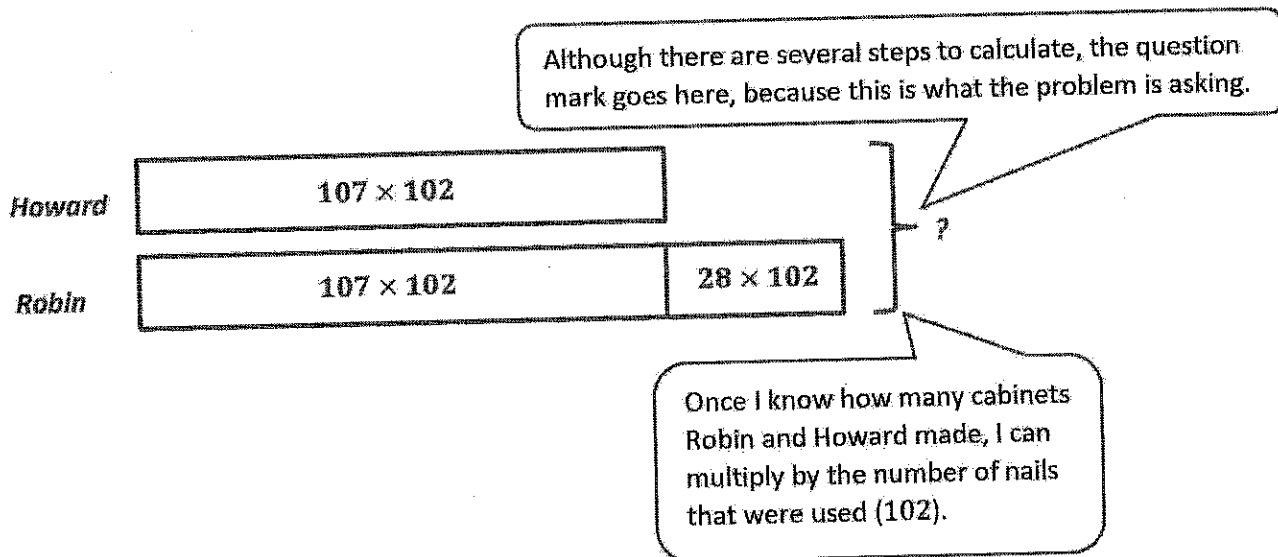
    Isaac's product of about 40 thousands is not reasonable. A correct estimate is 8 hundreds times 5 hundreds, which is 40 ten thousands. That's the same as $400,000$ not $40,000$.

    > I think Isaac rounded 809 to 800 and 528 to 500. Then, I think he multiplied 8 times 5 to get 40. From there, I think he miscounted the zeros.

Lesson 8:   Fluently multiply multi-digit whole numbers using the standard algorithm and using estimation to check for reasonableness of the product.   **EUREKA MATH**

G5-M2-Lesson 9

Solve.

1. Howard and Robin are both cabinet makers. Over the last year, Howard made 107 cabinets. Robin made 28 more cabinets than Howard. Each cabinet they make has exactly 102 nails in it. How many nails did they use altogether while making the cabinets?

> Although there are several steps to calculate, the question mark goes here, because this is what the problem is asking.

Howard | 107×102 |

Robin | 107×102 | 28×102 | ?

> Once I know how many cabinets Robin and Howard made, I can multiply by the number of nails that were used (102).

Howard:

```
        1 0 7
    ×   1 0 2
    ---------
        2 1 4
 +  1 0 7 0 0
 ------------
    1 0, 9 1 4
```

Robin: $107 + 28 = 135$

```
        1 3 5
    ×   1 0 2
    ---------
        2 7 0
 +  1 3 5 0 0
 ------------
    1 3, 7 7 0
```

```
    1 0, 9 1 4
 +  1 3, 7 7 0
 ------------
    2 4, 6 8 4
```

> 9 hundreds plus 7 hundreds is equal to 16 hundreds. I'll record 1 in the thousands place and write 6 in the hundreds place.

Together they used 24, 684 nails.

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Lesson 9:   Fluently multiply multi-digit whole numbers using the standard algorithm to solve multi-step word problems.

2. Mrs. Peterson made 32 car payments at $533 each. She still owes $8,530 on her car. How much did the car cost?

```
        ?
┌──────────────────┬──────────┐
│   32 × $533      │  $8,530  │
└──────────────────┴──────────┘
```
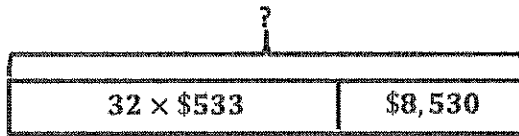
My tape diagram shows two parts: 32 payments at $533 and the $8,530 she still owes. All I have to do is find both parts and then add!

```
          5  3  3
     ×       3  2
     ─────────────
       1  0  6  6
  + 1  5  9  9  0
  ───────────────
    1  7,  0  5  6
```

```
    1  7,  0  5  6
  +     8,  5  3  0
  ─────────────────
    2  5,  5  8  6
```

Mrs. Peterson's car cost $25,586.

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G5-M2-Lesson 10

1. Estimate the product. Solve using an area model and the standard algorithm. Remember to express your products in standard form.

> I round 23 to the nearest ten, 2 tens, and 4.1 to the nearest one, 4 ones.

> I rename 4.1 as 41 tenths and then multiply.

$$23 \times 4.1 \approx \underline{\ 20\ } \times \underline{\ 4\ } = \underline{\ 80\ }$$

```
      2  3
  ×   4  1   (tenths)
  ───────────
      2  3
+   9  2  0
  ───────────
    9  4  3   (tenths) = 94.3
```

> 2 tens × 4 ones = 8 tens, or 80. This is the estimated product.

> 943 tenths, or 94.3, is the actual product, which is close to my estimated product of 80.

> I decompose 23 to 20 + 3, and 41 tenths to 40 tenths + 1 tenth.

	40	+	1	(tenths)
3	120		3	123 tenths
+				
20	800		20	820 tenths

> 120 tenths + 3 tenths = 123 tenths.

> 800 tenths + 20 tenths = 820 tenths.

> 123 tenths + 820 tenths = 943 tenths, or 94.3.

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Lesson 10:   Multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products.

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2. Estimate. Then, use the standard algorithm to solve. Express your products in standard form.

I round 7.1 to the nearest one, 7 ones, and 29 to the nearest ten, 3 tens.

a. $7.1 \times 29 \approx$ __7__ $\times$ __30__ $=$ __210__

7 ones $\times$ 3 tens $= 21$ tens, or 210. This is the estimated product.

$$
\begin{array}{r}
7 \ 1 \ \text{(tenths)} \\
\times \ 2 \ 9 \\
\hline
6 \ 3 \ 9 \\
+ \ 1 \ 4 \ 2 \ 0 \\
\hline
2, 0 \ 5 \ 9 \ \text{(tenths)} = 205.9
\end{array}
$$

2,059 tenths, or 205.9, is the actual product, which is close to my estimated product of 210.

I round 182.4 to the nearest hundreds, 2 hundreds, and 32 to the nearest tens, 3 tens.

b. $182.4 \times 32 \approx$ __200__ $\times$ __30__ $=$ __6,000__

2 hundreds $\times$ 3 tens $= 6$ thousandths, or 6,000. This is the estimated product.

$$
\begin{array}{r}
1 \ 8 \ 2 \ 4 \ \text{(tenths)} \\
\times \quad \ 3 \ 2 \\
\hline
3 \ 6 \ 4 \ 8 \\
+ \ 5 \ 4 \ 7 \ 2 \ 0 \\
\hline
5 \ 8, 3 \ 6 \ 8 \ \text{(tenths)} = 5,836.8
\end{array}
$$

58,368 tenths, or 5,836.8, is the actual product, which is close to my estimated product of 6,000.

Lesson 10:   Multiply decimal fractions with tenths by multi-digit whole numbers using place value understanding to record partial products.

EUREKA MATH

G5-M2-Lesson 11

1. Estimate the product. Solve using the standard algorithm. Use the thought bubbles to show your thinking.

> $1.24 \approx 1$
> $32 \approx 30$
> The estimated product is 30.

> The actual product is 39.68.

$$1.24 \times 32 \approx \underline{\ 1\ } \times \underline{\ 30\ } = \underline{\ 30\ }$$

$$1.24 \times 32 = \underline{\ 39.68\ }$$

> **Think!**
> $1.24 \times 100 = 124.$

$$
\begin{array}{r}
1\ 2\ 4 \\
\times\quad\ 3\ 2 \\
\hline
2\ 4\ 8 \\
+\ 3\ 7\ 2\ 0 \\
\hline
3,\ 9\ 6\ 8
\end{array}
$$

> **Think!**
> $3,968$ *is* 100 *times too large. The real product is*
> $3,968 \div 100 = 39.68.$

> If I multiply 1.24 times 100, I get 124. Now, I can multiply whole numbers, 124×32.

> Since I multiplied the factor 1.24 times 100, then I have to divide the product by 100. The answer is 39.68.

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Lesson 11: 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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2. Solve using the standard algorithm.

2.46×132

$= 324.72$

```
        2  4  6
    ×   1  3  2
    ─────────────
        4  9  2
      x  x
      7  3  8  0
  +  2  4  6  0  0
  ─────────────────
     3  2  4  7  2
```

> 2.46 times 100 is equal to 246. Now, I can multiply 246 times 132.

> I have to remember to divide the product by 100.
> $32,472 \div 100 = 324.72$

3. Use the whole number product and place value reasoning to place the decimal point in the second product. Explain how you know.

If $54 \times 736 = 39,744$,   then $54 \times 7.36 = \underline{\quad 397.44 \quad}$.

> I can compare the factors in both number sentences. Since $736 \div 100 = 7.36$, then I can divide the product by 100.

7.36 is 736 hundredths, so I can just divide $39,744$ by 100.

$39,744 \div 100 = 397.44$

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G5-M2-Lesson 12

1. Estimate. Then solve using the standard algorithm. You may draw an area model if it helps you.

$14 \times 3.12 \approx \underline{\quad 10 \quad} \times \underline{\quad 3 \quad} = \underline{\quad 30 \quad}$

> $14 \approx 10$
> $3.12 \approx 3$
> The estimated product is 30.

$$\begin{array}{r} 3.\ 1\ 2 \\ \times \quad 1\ 4 \\ \hline 1\ 2\ 4\ 8 \\ +\ 3\ 1\ 2\ 0 \\ \hline 4\ 3.\ 6\ 8 \end{array}$$

> I have to remember to write the product as a number of hundredths.

> I'll decompose 14 as 10 + 4, and 312 hundredths as 300 hundredths + 10 hundredths + 2 hundredths.

> 1,200 hundredths + 40 hundredths + 8 hundredths = 1,248 hundredths.

> 3,000 hundredths + 100 hundredths + 20 hundredths = 3,120 hundredths.

	300	+	10	+	2	(hundredths)
4	1,200		40		8	1,248 *hundredths*
+						
10	3,000		100		20	3,120 *hundredths*

> 1,248 hundredths + 3,120 hundredths = 4,368 hundredths, or 43.68.

2. Estimate. Then solve using the standard algorithm.

a. $0.47 \times 32 \approx$ ___0.5___ $\times$ ___30___ $=$ ___15___

> $0.47 \approx 0.5$
> $32 \approx 30$
> Multiplying 0.5 times 30 is the same as taking half of 30. The estimated product is 15.

> I'll think of multiplying $0.47 \times 100 = 47$. Now, I'll think of multiplying 47 times 32.

$$
\begin{array}{r}
0.\ 4\ \ 7 \\
\times \quad 3\ \ 2 \\
\hline
9\ \ 4 \\
+\ 1\ \ 4\ \ 1\ \ 0 \\
\hline
1\ \ 5.\ 0\ \ 4
\end{array}
$$

> I have to remember to write the product as a number of hundredths. $1{,}504 \div 100 = 15.04$.

b. $6.04 \times 307 \approx$ ___6___ $\times$ ___300___ $=$ ___1,800___

> $6.04 \approx 6$
> $307 \approx 300$
> 6 ones times 3 hundreds is equal to 18 hundreds, or 1,800.

$$
\begin{array}{r}
6.\ 0\ \ 4 \\
\times\ 3\ \ 0\ \ 7 \\
\hline
4\ \ 2\ \ 2\ \ 8 \\
+\ 1\ \ 8\ \ 1\ \ 2\ \ 0\ \ 0 \\
\hline
1,\ 8\ \ 5\ \ 4.\ 2\ \ 8
\end{array}
$$

> The actual product is 1,854.28, which is very close to my estimated product of 1,800.

3. Tatiana walks to the park every afternoon. In the month of August, she walked 2.35 miles each day. How far did Tatiana walk during the month of August?

There are 31 days in August.

Tatiana walked 72.85 miles in August.

> I'll multiply 2.35 times 31 days to find the total distance Tatiana walks during the month of August.

$$
\begin{array}{r}
2.\ 3\ \ 5 \\
\times \quad 3\ \ 1 \\
\hline
2\ \ 3\ \ 5 \\
+\ 7\ \ 0\ \ 5\ \ 0 \\
\hline
7\ \ 2.\ 8\ \ 5
\end{array}
$$

Lesson 12: Reason about the product of a whole number and a decimal with hundredths using place value understanding and estimation.

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G5-M2-Lesson 13

1. Solve.

    a. Convert years to days.

    $5 \text{ years} = 5 \times (1 \text{ year})$

    $= 5 \times (365 \text{ days})$

    $= 1,825 \text{ days}$

    $$\begin{array}{r} 3\ 6\ 5 \\ \times \qquad 5 \\ \hline 1,\ 8\ 2\ 5 \end{array}$$

    > 1 year is equal to 365 days. I can multiply 5 times 365 days to find 1,825 days in 5 years.

    b. Convert pounds to ounces.

    $13.5 \text{ lb.} = 13.5 \times (1 \text{ lb.})$

    $= 13.5 \times (16 \text{ oz.})$

    $= 216 \text{ oz.}$

    $$\begin{array}{r} 1\ 3.\ 5 \\ \times \quad 1\ 6 \\ \hline 8\ 1\ 0 \\ +\ 1\ 3\ 5\ 0 \\ \hline 2\ 1\ 6.\ 0 \end{array}$$

    > 1 pound is equal to 16 ounces. I can multiply 13.5 times 16 ounces to find that there are 216 ounces in 13.5 pounds.

2. After solving, write a statement to express each conversion.

    a. The height of a male ostrich is 7.3 meters. What is his height in centimeters?

    $7.3 \text{ m} = 7.3 \times (1 \text{ m})$

    $= 7.3 \times (100 \text{ cm})$

    $= 730 \text{ cm}$

    > 1 meter is equal to 100 centimeters. I multiply 7.3 times 100 centimeters to get 730 centimeters.

    His height is 730 centimeters.

b. The capacity of a container is 0.3 liter. Convert this to milliliters.

$0.3 \text{ L} = 0.3 \times (1 \text{ L})$

$\qquad = 0.3 \times (1,000 \text{ ml})$

$\qquad = 300 \text{ ml}$

> 1 liter is equal to 1,000 milliliters. I multiply 0.3 times 1,000 milliliters to get 300 milliliters.

The capacity of the container is 300 milliliters.

Lesson 13:   Use whole number multiplication to express equivalent measurements.

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G5-M2-Lesson 14

1. Solve.

   a. Convert quarts to gallons.

   $$28 \text{ quarts} = 28 \times (1 \text{ quart})$$
   $$= 28 \times \left(\tfrac{1}{4} \text{ gallon}\right)$$
   $$= \tfrac{28}{4} \text{ gallons}$$
   $$= 7 \text{ gallons}$$

   > 1 quart is equal to $\tfrac{1}{4}$ gallon. I multiply 28 times $\tfrac{1}{4}$ gallon to find 7 gallons is equal to 28 quarts.

   b. Convert grams to kilograms.

   $$5{,}030 \text{ g} = 5{,}030 \times (1 \text{ g})$$
   $$= 5{,}030 \times (0.001 \text{ kg})$$
   $$= 5.030 \text{ kg}$$

   > 1 gram is equal to 0.001 kilogram. I multiply 5,030 times 0.001 kilogram to get 5.030 kilograms.

2. After solving, write a statement to express each conversion.

   a. A jug of milk holds 16 cups. Convert 16 cups to pints.

   $$16 \text{ cups} = 16 \times (1 \text{ cup})$$
   $$= 16 \times \left(\tfrac{1}{2} \text{ pint}\right)$$
   $$= \tfrac{16}{2} \text{ pints}$$
   $$= 8 \text{ pints}$$

   > 1 cup is equal to $\tfrac{1}{2}$ pint. I multiply 16 times $\tfrac{1}{2}$ pint to find that 8 pints is equal to 16 cups.

   16 cups is equal to 8 pints.

   b. The length of a table is 305 centimeters. What is its length in meters?

   $$305 \text{ cm} = 305 \times (1 \text{ cm})$$
   $$= 305 \times (0.01 \text{ m})$$
   $$= 3.05 \text{ m}$$

   > 1 centimeter is equal to 0.01 meter. I multiply 305 times 0.01 meter to get 3.05 meters.

   The table's length is 3.05 meters.

G5-M2-Lesson 15

1. A bag of peanuts is 5 times as heavy as a bag of sunflower seeds. The bag of peanuts also weighs 920 grams more than the bag of sunflower seeds.

    a. What is the total weight in grams for the bag of peanuts and the bag of sunflower seeds?

> I need to draw 5 units for the peanuts and 1 unit for the sunflower seeds.

> I label the total weight of the peanuts and the sunflower seeds with a question mark. This is what I'm trying to find out.

Peanuts

Sunflower seeds
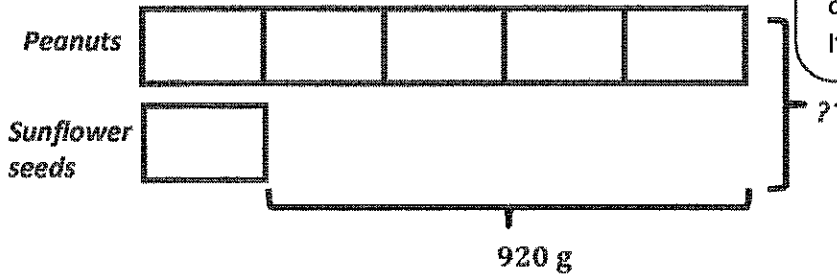
920 g

> Since I know 4 units is equal to 920 grams, I'll divide 920 grams by 4 to find the value of 1 unit, which is equal to 230 grams.

4 units = 920 g

1 unit = 920 g ÷ 4

= 230 g

$$
\begin{array}{r}
2\ 3\ 0 \\
4\overline{\smash{)}9\ 2\ 0} \\
-\ 8 \\
\hline
1\ 2 \\
-\ 1\ 2 \\
\hline
0\ 0 \\
-\ \ \ 0 \\
\hline
0
\end{array}
$$

> There are a total of 6 units between the peanuts and the sunflower seeds. I multiply 6 times 230 grams to get a total of 1,380 grams.

6 units = 6 × 230 g

= 1,380 g

$$
\begin{array}{r}
2\ 3\ 0 \\
\times\qquad 6 \\
\hline
1,\ 3\ 8\ 0
\end{array}
$$

The total weight for the bag of peanuts and the bag of sunflower seeds is 1,380 grams.

Lesson 15:   Solve two-step word problems involving measurement conversions.

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b. Express the total weight of the bag of peanuts and the bag of sunflower seeds in kilograms.

$$1,380 \text{ g} = 1,380 \times (1 \text{ g})$$
$$= 1,380 \times (0.001 \text{ kg})$$
$$= 1.380 \text{ kg}$$

> 1 gram is equal to 0.001 kilogram. I multiply 1,380 times 0.001 kilogram to find that 1.38 kilograms is equal to 1,380 grams.

The total weight of the bag of peanuts and the bag of sunflower seeds is 1.38 kilograms.

> 4 meters 50 centimeters is equal to 450 centimeters.

2. Gabriel cut a 4 meter 50 centimeter string into 9 equal pieces. Michael cut a 508 centimeter string into 10 equal pieces. How much longer is one of Michael's strings than one of Gabriel's?

Gabriel: $450 \text{ cm} \div 9 = 50 \text{ cm}$

> Each piece of Gabriel's string is 50 centimeters long.

Michael: $508 \text{ cm} \div 10 = 50.8 \text{ cm}$

> Each piece of Michael's string is 50.8 centimeters long.

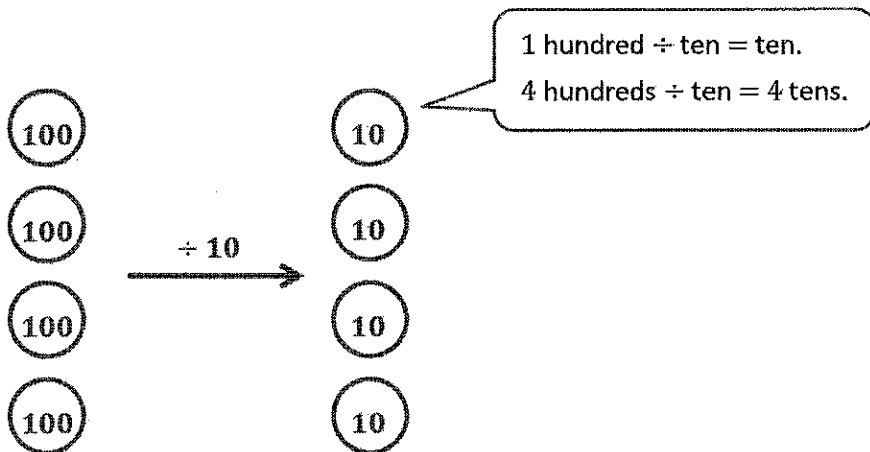$50.8 \text{ cm} - 50 \text{ cm} = 0.8 \text{ cm}$

> I'll subtract to find the difference between Michael and Gabriel's strings.

One of Michael's strings is 0.8 centimeters longer than one of Gabriel's.

G5-M2-Lesson 16

1. Divide. Draw place value disks to show your thinking for (a).

   a. $400 \div 10 = 40$

   1 hundred ÷ ten = ten.

   4 hundreds ÷ ten = 4 tens.

   b. $650,000 \div 100$

   $= 6,500 \div 1$

   $= 6,500$

   I can divide both the dividend and the divisor by 100, so I can rewrite the division sentence as $6,500 \div 1$. The answer is 6,500.

   Dividing by 40 is the same thing as dividing by 10 and then dividing by 4.

2. Divide.

   a. $240,000 \div 40$

   $= 240,000 \div 10 \div 4$

   $= 24,000 \div 4$

   $= 6,000$

   I can solve $240,000 \div 10 = 24,000$. Then I can find that $24,000 \div 4 = 6,000$.

   In unit form, this is 24 thousands ÷ 4 = 6 thousands.

Lesson 16:   Use divide by 10 patterns for multi-digit whole number division.

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b. $240,000 \div 400$

> Dividing by 400 is the same thing as dividing by 100 and then dividing by 4.

$= 240,000 \div 100 \div 4$

$= 2,400 \div 4$

$= 600$

> I can solve $240,000 \div 100 = 2,400$. Then I can solve $2,400 \div 4 = 600$.

> Dividing by 4,000 is the same thing as dividing by 1,000 and then dividing by 4.

c. $240,000 \div 4,000$

$= 240,000 \div 1,000 \div 4$

$= 240 \div 4$

$= 60$

> I can solve $240,000 \div 1,000 = 240$. Then I can solve $240 \div 4 = 60$.

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Lesson 16:   Use divide by 10 patterns for multi-digit whole number division.

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G5-M2-Lesson 17

1. Estimate the quotient for the following problems.

a. $612 \div 33$

> I look at the divisor, 33, and round it to the nearest ten. $33 \approx 30$

$\approx 600 \div 30$

> I need to think of a multiple of 30 that's closest to 612. 600 works.

$= 20$

> I use the simple fact, $6 \div 3 = 2$, to help me solve $600 \div 30 = 20$.

b. $735 \div 78$

> I look at the divisor, 78, and round it to the nearest ten. $78 \approx 80$

$\approx 720 \div 80$

> I'll think of a multiple of 80 that is close to 735. 720 is the closest multiple.

$= 9$

> I use the simple fact, $72 \div 8 = 9$, to help me solve $720 \div 80 = 9$.

c. $821 \div 99$

> I look at the divisor, 99, and round to the nearest ten. $99 \approx 100$

$\approx 800 \div 100$

> I can think of a multiple of 100 that is close to 821. 800 is the closest multiple.

$= 8$

> I can use the simple fact, $8 \div 1 = 8$, to help solve $800 \div 100 = 8$.

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2. A baker spent $989 buying 48 pounds of nuts. About how much does each pound of nuts cost?

> To find the cost of 1 pound of nuts, I'll use division. $989 \div 48$

$989 \div 48$

> I look at the divisor, 48, and round it to the nearest ten. $48 \approx 50$

$\approx 1{,}000 \div 50$

> I need to think of a multiple of 50 that's close to 989. 1,000 is closest.

$= 20$

> I can use the simple fact, $10 \div 5 = 2$, to help me solve $1{,}000 \div 50 = 20$.

Each pound of nuts costs about $20.

G5-M2-Lesson 18

1. Estimate the quotients for the following problems.

I look at the divisor, 23, and round it to the nearest ten. $23 \approx 20$

a. $3,782 \div 23$

$\approx 4,000 \div 20$

I need to think of a multiple of 20 that's closest to 3,782. 4,000 is closest.

$= 200$

I use the simple fact, $4 \div 2 = 2$, and unit form to help me solve.

4 thousands ÷ 2 tens = 2 hundreds

I look at the divisor, 43, and round to the nearest ten. $43 \approx 40$

b. $2,519 \div 43$

$\approx 2,400 \div 40$

I need to think of a multiple of 40 that's close to 2,519. 2,400 is closest.

$= 60$

I can use the simple fact, $24 \div 4 = 6$, to help me solve $2,400 \div 40 = 60$.

I look at the divisor, 94, and round it to the nearest ten. $94 \approx 90$

c. $4,621 \div 94$

$\approx 4,500 \div 90$

4,500 is close to 4,621 and is a multiple of 90.

$= 50$

I can use the simple fact, $45 \div 9 = 5$, to help me solve $4,500 \div 90 = 50$.

Lesson 18:   Use basic facts to approximate quotients with two-digit divisors.

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2. Meilin has saved \$4,825. If she is paid \$68 an hour, about how many hours did she work?

> I'll use division to find the number of hours that Meilin worked to save \$4,825.

$$4,825 \div 68$$

> The divisor, 68, rounds to 70. $68 \approx 70$

$$\approx 4,900 \div 70$$

> I need to find a multiple of 70 that's closest to 4,825. 4,900 is closest.

$$= 70$$

> I can use the basic fact, $49 \div 7 = 7$, to help me solve $4,900 \div 70 = 70$.

Meilin worked about 70 hours.

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Lesson 18:   Use basic facts to approximate quotients with two-digit divisors.

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G5-M2-Lesson 19

1. Divide, and then check.

a. $87 \div 40$

> I use the estimation strategy from the previous lesson to help me solve. $80 \div 40 = 2$. The estimated quotient is 2.

> I write the remainder of 7 here next to the quotient of 2.

> I check my answer by multiplying the divisor of 40 by the quotient of 2 and then add the remainder of 7.

```
      2  R 7
40 | 8 7
 -   8 0
       7
```

> 2 groups of 40 is equal to 80.

> The difference between 87 and 80 is 7.

Check:

$40 \times 2 = 80$

$80 + 7 = 87$

> This 87 matches the original dividend in the problem, which means I divided correctly. The quotient is 2 with a remainder of 7.

b. $451 \div 70$

> I estimate to find the quotient. $420 \div 70 = 6$

> The quotient is 6 with a remainder of 31.

```
        6  R 31
70 | 4 5 1
 -   4 2 0
       3 1
```

> After checking, I see that 451 does match the original dividend in the problem.

Check:

$70 \times 6 = 420$

$420 + 31 = 451$

> The quotient is 6 with a remainder of 31.

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2. How many groups of thirty are in two hundred twenty-four?

> I use division to find how many 30's are in 224. But first, I estimate to find the quotient. $210 \div 30 = 7$

> There are 7 groups of thirty in 224 with a remainder of 14.

$$
\begin{array}{r}
7 \quad R\,14 \\
30\,\overline{\smash{\big)}\,2\ 2\ 4} \\
-\ \underline{2\ 1\ 0} \\
1\ 4
\end{array}
$$

> 14 is remaining. In order to make another group of 30, there would need to be 16 more in the dividend, 224.

There are 7 groups of thirty in two hundred twenty-four.

EUREKA MATH   Lesson 19:   Divide two- and three-digit dividends by multiples of 10 with single-digit quotients, and make connections to a written method.   35

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G5-M2-Lesson 20

1. Divide. Then check with multiplication.

a. $48 \div 21$

> I do a quick mental estimation to find the quotient.
> $40 \div 20 = 2$

> The actual quotient is 2 with a remainder of 6.

> I'll check my answer by multiplying the divisor and the quotient, 21×2. Then, I'll add the remainder of 6.

$$\begin{array}{r} 2 \ \ R\,6 \\ 21\overline{)4\ 8} \\ -\underline{4\ 2} \\ 6 \end{array}$$

Check:

$$\begin{array}{r} 2\ 1 \\ \times\quad 2 \\ \hline 4\ 2 \end{array} \qquad \begin{array}{r} 4\ 2 \\ +\quad 6 \\ \hline 4\ 8 \end{array}$$

> This 48 matches the original dividend in the problem, which means I divided correctly. The quotient is 2 with a remainder of 6.

b. $79 \div 38$

> I do a quick mental estimation to find the quotient.
> $80 \div 40 = 2$

> The actual quotient is 2 with a remainder of 3.

$$\begin{array}{r} 2 \ \ R\,3 \\ 38\overline{)7\ 9} \\ -\underline{7\ 6} \\ 3 \end{array}$$

Check:

$$\begin{array}{r} 3\ 8 \\ \times\quad 2 \\ \hline 7\ 6 \end{array} \qquad \begin{array}{r} 7\ 6 \\ +\quad 3 \\ \hline 7\ 9 \end{array}$$

> After checking, I see that 79 does match the original dividend.

Lesson 20: Divide two- and three-digit dividends by two-digit divisors with single-digit quotients, and make connections to a written method.

EUREKA MATH

Area is equal to length times width. So, I can use the area divided by the length to find the width.

$A = l \times w$ and $A \div l = w$

2. A rectangular 95-square-foot vegetable garden has a length of 19 feet. What is the width of the vegetable garden?

$95 \div 19 = 5$

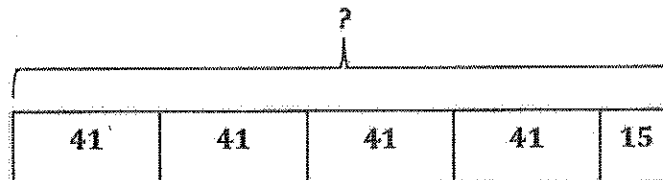I'll do a quick mental estimation to help me solve.

$100 \div 20 = 5$

$$19 \overline{) \begin{array}{c} 5 \\ 9\ 5 \end{array}}$$
$$-\ \ 9\ 5$$
$$\overline{0}$$

The quotient of 5 means the width is 5 feet, with 0 feet remaining.

The width of the vegetable garden is 5 feet.

3. A number divided by 41 has a quotient of 4 with 15 as a remainder. Find the number.

In other words, 4 units of 41, plus 15 more, is equal to what number?

?

| 41 | 41 | 41 | 41 | 15 |

$$41 \overline{) \begin{array}{c} 4 \quad R\ 15 \\ ? \end{array}}$$

I know I have to find the missing dividend.

I can multiply the divisor of 41 and the quotient of 4 to get 164.

I need to add 164 and the remainder of 15 to get a total of 179. The dividend is 179.

$$\begin{array}{r} 4\ 1 \\ \times \quad 4 \\ \hline 1\ 6\ 4 \end{array} \qquad \begin{array}{r} 1\ 6\ 4 \\ +\quad 1\ 5 \\ \hline 1\ 7\ 9 \end{array}$$

The number is 179.

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Lesson 20:   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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G5-M2-Lesson 21

1. Divide. Then check using multiplication.

   a. $235 \div 68$

   > I can find the estimated quotient and then divide using the long division algorithm.

   > I can estimate to find the quotient. $210 \div 70 = 3$

   > I'll use the quotient of 3. 3 groups of 68 is 204, and the difference between 235 and 204 is 31. The remainder is 31.

```
        3   R 31
 68 | 2  3  5
   -   2  0  4
         3  1
```

   Check:

```
      6  8              2  0  4
   ×     3           +      3  1
     2  0  4             2  3  5
```

   > After checking, I see that 235 does match the original dividend in the problem.

   b. $125 \div 32$

   > I estimate to find the quotient. $120 \div 30 = 4$. Therefore, there should be about 4 units of 32 in 125.

   > When I use the estimated quotient of 4, I see that 4 groups of 32 is 128. 128 is more than the original dividend of 125. That means I over estimated. The quotient of 4 is too high.

```
          4                      3   R 29
 32 | 1  2  5           32 | 1  2  5
   -   1  2  8             -    9  6
            ?                   2  9
```
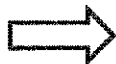
   > Since the quotient of 4 is too much, I'll try 3 as the quotient. 3 groups of 32 is 96. The difference between 125 and 96 is 29. The remainder is 29.

   > The actual quotient is 3 with a remainder of 29.

Lesson 21:   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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Check: — To check, I'll multiply the divisor and the quotient and then add the remainder.

```
    3  2              9  6
  ×    3          +     2  9
  ─────────       ───────────
    9  6              1  2  5
```

— I can use division to find how many 49's are in 159. First, I should estimate to find the quotient.
$150 \div 50 = 3$

2. How many forty-nines are in one hundred fifty-nine?

```
          3    R 12
   49 | 1  5  9
     -  1  4  7
   ──────────────
          1  2
```

— There are 3 groups of forty-nine in 159, with a remainder of 12.

— 12 is the remainder, and it will need 37 more to make another group of 49.

There are 3 groups of forty-nine in 159.

EUREKA MATH   Lesson 21:   Divide two- and three-digit dividends by two-digit divisors with single-digit quotients, and make connections to a written method.

G5-M2-Lesson 22

1. Divide. Then check using multiplication.

   a. $874 \div 41$

   > I look at the dividend of 874 and estimate 80 tens ÷ 40 = 2 tens, or 800 ÷ 40 = 20. I'll record 2 in the tens place. 5 tens remain.

   > I look at 54 and estimate 40 ones ÷ 40 = 1 one, or 40 ÷ 40 = 1. I'll record 1 in the ones place. There's a remainder of 13.

   ```
        2                          2 1  R 13
   41 | 8 7 4                 41 | 8 7 4
    -   8 2                      -  8 2
   ─────────                    ─────────
        5                            5 4
                                  -  4 1
                                 ─────────
                                     1 3
   ```

   > 5 tens plus 4 in the dividend makes 54.

   > The quotient is 21 with a remainder of 13.

   > I check my answer by multiplying the quotient and the divisor, 21 × 41, and then add the remainder of 13.

   Check:

   ```
        2 1
      ×  4 1                        8 6 1
   ─────────                    +     1 3
        2 1                     ───────────
   +  8 4 0                         8 7 4
   ─────────
        8 6 1
   ```

   > After checking, I get 874, which does match the original dividend. So, I know I solved correctly.

   b. $703 \div 29$

   > I look at the dividend of 703 and estimate 60 tens ÷ 30 = 2 tens, or 600 ÷ 30 = 20. I'll record 2 in the tens place. There's a remainder of 12 tens.

   ```
        2                          2 4  R 7
   29 | 7 0 3                 29 | 7 0 3
    -   5 8                      -  5 8
   ─────────                    ─────────
        1 2                          1 2 3
                                  -  1 1 6
                                 ─────────
                                       7
   ```

   > I can estimate. 12 tens ÷ 30 = 4 ones, or 120 ÷ 30 = 4. I'll record 4 in the ones place. 4 units of 29 is 116.

   > 12 tens plus 3 in the dividend makes 123.

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Check: I check my answer by multiplying the quotient and the divisor, and then I add the remainder.

$$
\begin{array}{r}
2\ 4 \\
\times\ 2\ 9 \\
\hline
2\ 1\ 6 \\
+\ 4\ 8\ 0 \\
\hline
6\ 9\ 6
\end{array}
\qquad
\begin{array}{r}
6\ 9\ 6 \\
+\ \ \ 0\ 7 \\
\hline
7\ 0\ 3
\end{array}
$$

2. 31 students are selling cupcakes. There are 167 cupcakes to be shared equally among students.

   a. How many cupcakes are left over after sharing them equally?

$$
\begin{array}{r}
5\ \ R\ 12 \\
31\overline{\smash{)}1\ 6\ 7} \\
-\ 1\ 5\ 5 \\
\hline
1\ 2
\end{array}
$$

167 cupcakes shared equally among 31 students: each student gets 5 cupcakes, with 12 cupcakes left over.

There are 12 cupcakes left over after sharing them equally.

   b. If each student needs 6 cupcakes to sell, how many more cupcakes are needed?

$$
\begin{array}{r}
3\ 1 \\
\times\ \ \ 6 \\
\hline
1\ 8\ 6
\end{array}
\qquad
\begin{array}{r}
7\ \ 16 \\
1\ \cancel{8}\ \cancel{6} \\
-\ 1\ 6\ 7 \\
\hline
1\ 9
\end{array}
$$

Since each student needs 6 cupcakes, then 31 students will need a total of 186 cupcakes.

The difference between 167 and 186 is 19.

19 more cupcakes are needed.

My solution makes sense. The remainder of 12 cupcakes, in part (a), tells me that if there were 19 more cupcakes, there would be enough for each student to have 6 cupcakes.

$12 + 19 = 31$

G5-M2-Lesson 23

1. Divide. Then check using multiplication.

   a. $4,753 \div 22$

> I look at the dividend of 4,753 and estimate. 40 hundreds $\div$ 20 = 2 hundreds, or 4,000 $\div$ 20 = 200. I record 2 in the hundreds place. There's a remainder of 3 hundreds.

> I look at 35 tens and estimate 20 tens $\div$ 20 = 1 ten, or 200 $\div$ 20 = 10. I record 1 in the tens place. There's a remainder of 13 tens.

> I look at 133 ones and estimate 120 ones $\div$ 20 = 6 ones, or 120 $\div$ 20 = 6. I record 6 in the ones place. There's a remainder of 1 one.

```
        2                        2  1                      2  1  6  R 1
  22 | 4, 7  5  3          22 | 4, 7  5  3          22 | 4, 7  5  3
   -   4  4                 -   4  4                 -   4  4
      ---------                ---------                ---------
         3                        3  5                      3  5
                              -   2  2                  -   2  2
                                 ------                    ------
                                    1  3                      1  3  3
                                                          -   1  3  2
                                                             ------
                                                                  1
```

> I check my answer by multiplying the quotient and the divisor, 216×22, and then add the remainder of 1.

Check:

```
      2  1  6              4, 7  5  2
   ×     2  2           +            1
   -----------          -------------
      4  3  2              4, 7  5  3
   + 4  3  2  0
   -----------
      4, 7  5  2
```

> After checking, I get 4,753, which does match the original dividend. So I know I solved it correctly.

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I look at the dividend of 3,795 and estimate 360 tens ÷ 60 = 6 tens, or 3600 ÷ 60 = 60. I record 6 in the tens place. There's a remainder of 7 tens.

b. 3,795 ÷ 62

```
          6                              6  1   R 13
   62 | 3, 7  9  5              62 | 3, 7  9  5
    -   3  7  2                   -   3  7  2
   ─────────────                  ─────────────
              7                             7  5
                                     -      6  2
                                     ─────────────
                                             1  3
```

I look at 75 and estimate 60 ones ÷ 60 = 1 one, or 60 ÷ 60 = 1. I record 1 in the ones place. The quotient is 61 with a remainder of 13.

Check:

I check my answer by first multiplying the quotient and the divisor, and then I add the remainder.

```
        6  1                    3,  7  8  2
     ×  6  2                 +         1  3
   ────────────             ──────────────────
        1  2  2                3,  7  9  5
   + 3  6  6  0
   ────────────
     3,  7  8  2
```

2. 1,292 balloons were shared equally among 38 students. How many balloons did each student receive?

I use division, 1,292 ÷ 38, to find how many balloons each student receives.

```
            3  4
   38 | 1,  2  9  2
    -   1  1  4
   ────────────────
           1  5  2
        -  1  5  2
        ────────────
                  0
```

Each student received 34 balloons with 0 balloons left over.

Each student received 34 balloons.

EUREKA MATH   Lesson 23:   Divide three- and four-digit dividends by two-digit divisors resulting in two- and three-digit quotients, reasoning about the decomposition of successive remainders in each place value.   43

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G5-M2-Lesson 24

1. Divide.

   a. $3.5 \div 7 = 0.5$

   > I can use the basic fact of $35 \div 7 = 5$ to help me solve this problem. 3.5 is 35 tenths. 35 tenths $\div 7 = 5$ tenths, or 0.5.

   > Dividing by 70 is the same as dividing by 10 and then dividing by 7.

   b. $3.5 \div 70 = 3.5 \div 10 \div 7$
   $$= 0.35 \div 7$$
   $$= 0.05$$

   > 35 tenths $\div 10 = 35$ hundredths, or 0.35.

   > 35 hundredths $\div 7 = 5$ hundredths, or 0.05.

   c. $4.84 \div 2 = 2.42$

   > $4.84 = 4$ ones $+ 8$ tenths $+ 4$ hundredths.
   > 4 ones $\div 2 = 2$ ones, or 2.
   > 8 tenths $\div 2 = 4$ tenths, or 0.4.
   > 4 hundredths $\div 2 = 2$ hundredths, or 0.02.
   > The answer is $2 + 0.4 + 0.02 = 2.42$.

   > Dividing by 200 is equal to dividing by 100 and then dividing by 2.
   > Or I can think of it as dividing by 2 and then dividing by 100.

   d. $48.4 \div 200 = 48.4 \div 2 \div 100$
   $$= 24.2 \div 100$$
   $$= 0.242$$

   > $48 \div 2 = 24$
   > 4 tenths $\div 2 = 2$ tenths or 0.2.
   > So, $48.4 \div 2 = 24.2$.

   > I can visualize a place value chart. When I divide by 100, each digit shifts 2 places to the right.

Lesson 24:   Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

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2. Use place value reasoning and the first quotient to compute the second quotient. Use place value to explain how you placed the decimal point.

> The dividend, 15.6, is the same in both number sentences.

a. $15.6 \div 60 = 0.26$

> I look at the divisors in both number sentences. They are 60 and 6, respectively. 60 is 10 times as large as 6.

$15.6 \div 6 = 2.6$

> I know the quotient in this problem must be 10 times as large as 0.26, from the problem above. The answer is 26 hundredths $\times$ 10 = 26 tenths, or 2.6.

There are 10 times fewer groups, so there has to be 10 times more in each group.

> The dividend, 0.72, is the same in both number sentences.

b. $0.72 \div 4 = 0.18$

> I look at the divisors in both number sentences. They are 4 and 40, respectively. 4 is 10 times smaller than 40.

$0.72 \div 40 = 0.018$

> I know the quotient in this problem must be 10 times smaller than 0.18, from the problem above. The answer is 18 hundredths $\div$ 10 = 18 thousandths, or 0.018.

Instead of 4 groups, there are 40 groups. That's 10 times more groups, so there must be 10 times less in each group.

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Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

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G5-M2-Lesson 25

1. Estimate the quotients.

> I look at the divisor, 72, and round it to the nearest ten. $72 \approx 70$

a. $5.68 \div 72$

> I can think of the dividend as 568 hundredths. 560 is close to 568 and a multiple of 70, so I can round 568 hundredths to 560 hundredths.

$\approx 560 \text{ hundredths} \div 70$

$= 560 \text{ hundredths} \div 10 \div 7$

$= 56 \text{ hundredths} \div 7$

> Dividing by 70 is the same as dividing by 10 and then dividing by 7.

$= 8 \text{ hundredths}$

$= 0.08$

> The basic fact $56 \div 7 = 8$ helps me solve this problem.

> I look at the divisor, 41, and round it to the nearest ten. $41 \approx 40$

b. $9.14 \div 41$

> I'll approximate the dividend, 9.14, to be 8. I'll use the basic fact, $8 \div 4 = 2$, to help me solve this problem.

$\approx 8 \div 40$

$= 8 \div 4 \div 10$

> Dividing by 40 is the same as dividing by 4 and then dividing by 10.

$= 2 \div 10$

$= 0.2$

> I can visualize a place value chart. Dividing by 10 moves the digit, 2, one place to the right.

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2. Estimate the quotient in (a). Use your estimated quotient to estimate (b) and (c).

$18 \approx 20$

a. $5.29 \div 18$

$\approx 6 \div 20$

> $5.29 \approx 6$. I can use the basic fact, $6 \div 2 = 3$, to help me solve this problem.

$= 6 \div 2 \div 10$

$= 3 \div 10$

> Dividing by 20 is the same as dividing by 2 and then dividing by 10.

$= 0.3$

> Since the digits in this expression are the same as (a), I can use place value understanding to help me solve.

> I can use the same basic fact, $6 \div 2 = 3$, to help me solve.

b. $529 \div 18$

$\approx 600 \div 20$

> $18 \approx 20$ and $529 \approx 600$

$= 60 \div 2$

$= 30$

> $600 \div 20$ is equal to $60 \div 2$ because I divided both the dividend and the divisor by 10.

> My quotient makes sense! When I compare (b) to (a), I see that 529 is 100 times greater than 5.29. Therefore, the quotient should be 100 times greater as well. 30 is 100 times greater than 0.3.

> Again, I can use the same basic fact, $6 \div 2 = 3$, to help me solve this problem.

c. $52.9 \div 18$

$\approx 60 \div 20$

> I'll round 18 to 20 and approximate 52.9 to 60.

$= 6 \div 2$

$= 3$

> $60 \div 20$ is equal to $6 \div 2$ because I divided both the dividend and the divisor by 10.

EUREKA MATH   Lesson 25:   Use basic facts to approximate decimal quotients with two-digit divisors, reasoning about the placement of the decimal point.   47

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G5-M2-Lesson 26

1. Divide. Then check your work with multiplication.

   a. $48.07 \div 19 = 2.53$

I can estimate.
40 ones $\div$ 20 = 2 ones.
I record a 2 in the ones place.

I can estimate again.
100 tenths $\div$ 20 = 5 tenths.
I record a 5 in the tenths place.

I can estimate again.
60 hundredths $\div$ 20 = 3 hundredths.
I record a 3 in the hundredths place.

```
        2.
  19 | 4  8.  0  7
   -  3  8
     ———————
      1  0
```

$\Rightarrow$

```
        2.  5
  19 | 4  8.  0  7
   -  3  8
     ——————————
      1  0  0
   -     9  5
     ——————————
            5
```

$\Rightarrow$

```
        2.  5  3
  19 | 4  8.  0  7
   -  3  8
     ——————————
      1  0  0
   -     9  5
     ——————————
            5  7
   -        5  7
     ——————————
               0
```

Check: I'll check my answer by multiplying the quotient and the divisor, 2.53×19.

```
      2. 5  3
   ×     1  9
   ——————————
      2  2  7  7
 +  2  5  3  0
   ——————————
      4  8. 0  7
```

After checking, I get 48.07, which does match the original dividend. So I know I solved it correctly.

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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b. $122.4 \div 51$

```
           2.                              2. 4
   51 | 1  2  2. 4              51 | 1  2  2. 4
    −   1  0  2                  −   1  0  2
      ─────────                    ─────────
         2  0                        2  0  4
                                  −   2  0  4
                                    ─────────
                                          0
```

⇨

> I can estimate.
> 200 tenths ÷ 50 = 4 tenths.
> I record a 4 in the tenths place.

Check:

> I check my division by multiplying.

```
        5  1
   ×    2. 4
   ──────────
      2  0  4
 + 1  0  2  0
 ───────────
   1  2  2. 4
```

2.   The weight of 42 identical mini toy soldiers is 109.2 grams. What is the weight of each toy soldier?

```
          2. 6
   42 | 1  0  9. 2
    −    8  4
      ──────────
         2  5  2
    −    2  5  2
      ──────────
               0
```

> I can use division, 109.2 ÷ 42, to find the weight of each toy soldier.

> 109.2 grams divided by 42 is equal to 2.6 grams with 0 grams remaining.

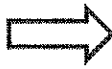*The weight of each toy soldier is 2. 6 grams.*

EUREKA MATH   Lesson 26:   Divide decimal dividends by two-digit divisors, estimating quotients, reasoning about the placement of the decimal point, and making connections to a written method.   49

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G5-M2-Lesson 27

1. Divide. Check your work with multiplication.

    $6.3 \div 18$

> I can estimate. 60 tenths ÷ 20 = 3 tenths.

```
      0.  3
18 | 6.  3   0
 -    5   4
 ----------
          9
```

⟹

```
      0.  3   5
18 | 6.  3   0
 -    5   4
 ----------
          9   0
 -        9   0
       -------
              0
```

> I can estimate again.
> 100 hundredths ÷ 20 = 5 hundredths.

> I still need to check my work. But since the dividend, 6.3, is less than the divisor, 18, a quotient of less than 1 is reasonable.

Check:

```
      0.  3   5
 ×        1   8
 ----------
      2   8   0
 +    3   5   0
 ----------
      6.  3   0
```

> After checking, I get 6.30, which does match the original dividend. So I know I divided correctly.

Lesson 27:   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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MATH™

2. 43.4 kilograms of raisins was placed into 31 packages of equal weight. What is the weight of one package of raisins?

> I can use division, $43.4 \div 31$, to find the weight of one package.

```
        1.  4
   ┌──────────
31 │ 4  3.  4
 - │ 3  1
   ────────
     1  2  4
 -   1  2  4
   ────────
           0
```

> 43.4 kilograms divided by 31 is equal to 1.4 kilograms.

The weight of one package of raisins is 1. 4 kilograms.

> The quotient is reasonable. Since the dividend, 43.4, is just a little bit more than the divisor, 31, a quotient of 1.4 makes sense.

EUREKA MATH   Lesson 27:   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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G5-M2-Lesson 28

1. Juanita is saving for a new television that costs $931. She has already saved half of the money. Juanita earns $19.00 per hour. How many hours must Juanita work to save the rest of the money?

$931
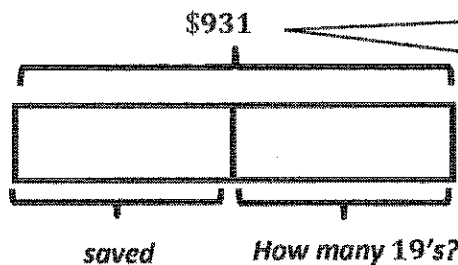
> I draw a tape diagram and label the whole as $931. Since she has already saved half, I cut it into 2 equal units.

> I have to find how many 19's are in the other half.

saved   *How many 19's?*

$931 \div 2 = \$465.5$

$$\begin{array}{r} 4\ \ 6\ \ 5.\ \ 5 \\ 2\overline{)9\ \ 3\ \ 1.\ \ 0} \\ -8 \\ \hline 1\ \ 3 \\ -1\ \ 2 \\ \hline 1\ \ 1 \\ -1\ \ 0 \\ \hline 1\ \ 0 \\ -1\ \ 0 \\ \hline 0 \end{array}$$

> Juanita already saved $465.50 and will need to save $465.50 more.

> Since Juanita already saved half of the money, then I'll use $931 divided by 2 to find how much she still needs to save.

$465.5 \div \$19 = 24.5$

> Juanita will need to work 24.5 more hours.

$$\begin{array}{r} 2\ \ 4.\ \ 5 \\ 19\overline{)4\ \ 6\ \ 5.\ \ 5} \\ -3\ \ 8 \\ \hline 8\ \ 5 \\ -7\ \ 6 \\ \hline 9\ \ 5 \\ -9\ \ 5 \\ \hline 0 \end{array}$$

> I can estimate to help me find the quotient. $465.5 \approx 400$.
> 40 tens ÷ 20 = 2 tens.

> Since Juanita makes $19 an hour, then I'll use $465.50 divided by $19 to find how many more hours she will need to work.

> I estimate again.
> 80 ones ÷ 20 = 4 ones.

> I estimate a 3rd time.
> 100 tenths ÷ 20 = 5 tenths.

Juanita needs to work 24.5 more hours.

Lesson 28:   Solve division word problems involving multi-digit division with group size unknown and the number of groups unknown.

EUREKA MATH

2. Timmy has a collection of 1,008 baseball cards. He hopes to sell the collection in packs of 48 cards and make $178.50 when all the packs are sold. If each pack is priced the same, how much should Timmy charge per pack?

> I need to find out how many packs of baseball cards Timmy has by dividing 1,008 ÷ 48. Then I can find out how much Timmy should charge per pack.

$1,008 \div 48 = 21$

> Timmy will have 21 packs of baseball cards.

> I can estimate.
> 100 tens ÷ 50 = 2 tens.

```
            2   1
48 | 1  0   0   8
   -    9   6
            4   8
       -    4   8
                0
```

> I estimate again.
> 40 ones ÷ 40 = 1 one.

$\$178.50 \div 21 = \$8.50$

> The price of each pack of cards needs to be $8.50.

```
                8.  5
21 | 1   7   8.  5
   - 1   6   8
             1   0   5
          -  1   0   5
                     0
```

Timmy should charge $8.50 per pack.

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Lesson 28:   Solve division word problems involving multi-digit division with group
             size unknown and the number of groups unknown.

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G5-M2-Lesson 29

1. Alonzo has 2,580.2 kilograms of apples to deliver in equal amounts to 19 stores. Eleven of the stores are in Philadelphia. How many kilograms of apples will be delivered to stores in Philadelphia?

$2,580.2 \div 19 = 135.8$

> I can use division to find out how many kilograms of apples are delivered to each store. Each store receives 135.8 kilograms of apples.

```
            1  3  5. 8
    19 | 2  5  8  0. 2
       -  1  9
          ─────────
             6  8
          -  5  7
          ─────────
             1  1  0
          -     9  5
          ─────────
                1  5  2
             -  1  5  2
             ─────────
                      0
```

$135.8 \times 11 = 1,493.8$

> Since I know each store receives 135.8 kilograms of apples, then I use multiplication to find the total kilograms of apples that will be delivered to 11 stores in Philadelphia.

```
        1  3  5. 8
    ×         1  1
    ─────────────
        1  3  5  8
  + 1  3  5  8  0
  ─────────────
    1  4  9  3. 8
```

1493.8 kilograms of apples will be delivered to stores in Philadelphia.

EUREKA
MATH

2. The area of a rectangle is 88.4 m². If the length is 13 m, what is its perimeter?

> In order to find the perimeter, I need to know the width of the rectangle.

$$area = length \times width$$

$$width = area \div length$$

$$= 88.4 \ m^2 \div 13 \ m$$

$$= 6.8 \ m$$

```
          6.  8
   13 | 8  8.  4
     -  7  8
        _____
        1  0  4
     -  1  0  4
        _____
              0
```

> I know the width is equal to the area divided by the length. The width of the rectangle is 6.8 meters.

Perimeter of a rectangle = length + length + width + width

$$= 13 \ m + 13 \ m + 6.8 \ m + 6.8 \ m$$

$$= 26 \ m + 13.6 \ m$$

$$= 39.6 \ m$$

```
      1 3.  0
      1 3.  0
         6.  8
   +     6.  8
      _____
      3 9.  6
```

> I can add up all four sides of the rectangle to find the perimeter.

The perimeter of the rectangle is 39.6 meters.

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Lesson 29:   Solve division word problems involving multi-digit division with group
              size unknown and the number of groups unknown.

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