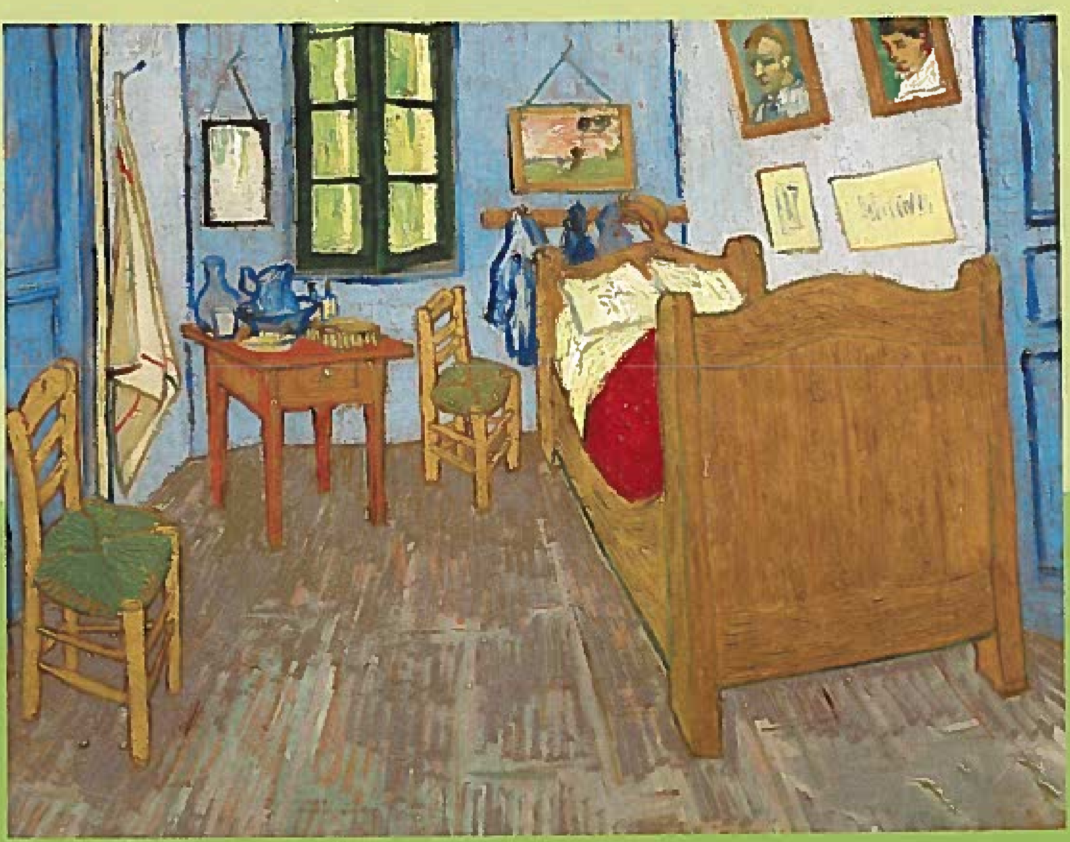
Grade 5

EUREKA MATH™

Homework Helpers



What does this painting have to do with math? Turn this book over to find out.

EUREKA MATH™

From the non-profit Great Minds®

Homework Helpers

Eureka Math
Grade 5

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Homework Helpers

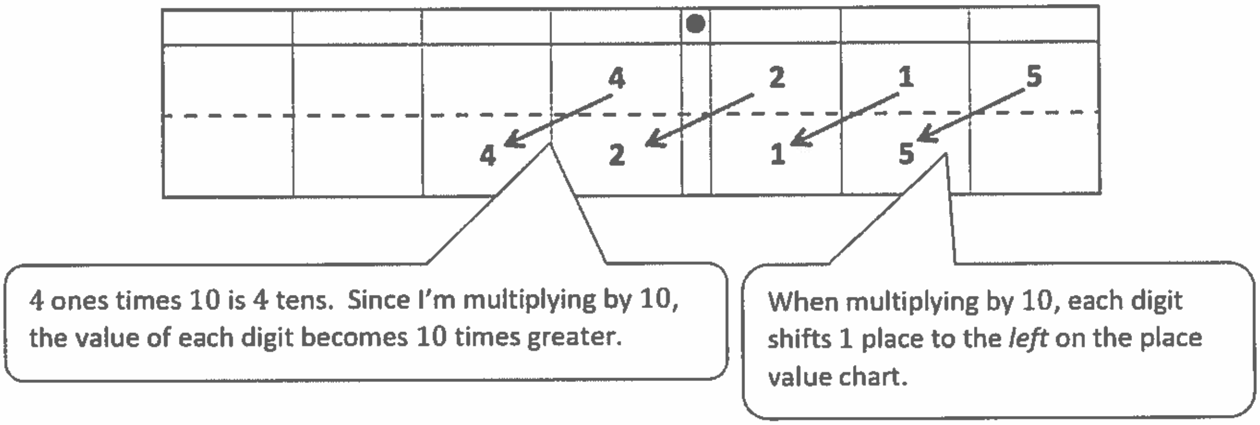
Grade 5
Module 1

G5-M1-Lesson 1

Note: It is common to encourage students to simply "move the decimal point" a number of places when multiplying or dividing by powers of 10. Instead, encourage students to understand that the decimal point lives between the ones place and the tenths place. The decimal point does not move. Rather, the digits shift along the place value chart when multiplying and dividing by powers of ten.

Use the place value chart and arrows to show how the value of the each digit changes.

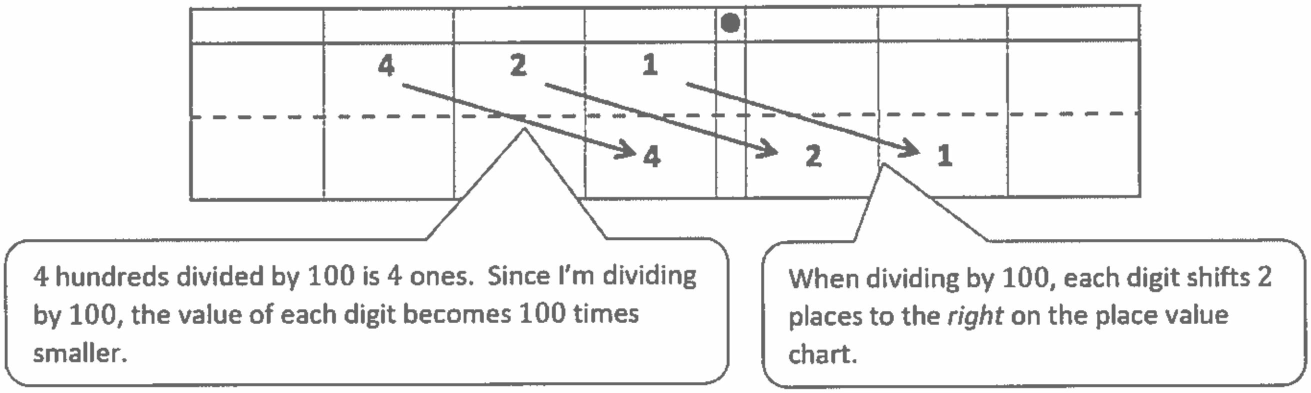
1. $4.215 \times 10 = 42.15$



4 ones times 10 is 4 tens. Since I'm multiplying by 10, the value of each digit becomes 10 times greater.

When multiplying by 10, each digit shifts 1 place to the *left* on the place value chart.

2. $421 \div 100 = 4.21$



4 hundreds divided by 100 is 4 ones. Since I'm dividing by 100, the value of each digit becomes 100 times smaller.

When dividing by 100, each digit shifts 2 places to the *right* on the place value chart.

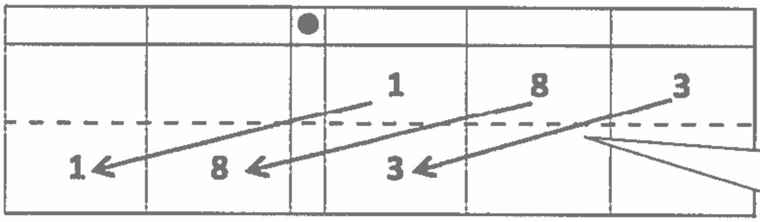
3. A student used his place value chart to show a number. After the teacher instructed him to multiply his number by 10, the chart showed 3,200.4. Draw a picture of what the place value chart looked like at first.

3 hundreds times 10 is 3 thousands. The original number must have had a 3 in the hundreds place.

thousands	hundreds	tens	ones	●	tenths	hundredths	thousandths
	3	2	0	.	0	4	

I used the place value chart to help me visualize what the original number was. When multiplying by 10, each digit must have shifted 1 place to the left, so I shifted each digit 1 place back to the right to show the original number.

4. A microscope has a setting that magnifies an object so that it appears 100 times as large when viewed through the eyepiece. If a small bug is 0.183 cm long, how long will the insect appear in centimeters through the microscope? Explain how you know.



When multiplying by 100, each digit shifts 2 places to the *left* on the place value chart.

The bug will appear to be 18.3 cm *long through the microscope.*

Since the microscope magnifies objects 100 *times, the bug will appear to be* 100 *times larger. I used a place value chart to show what happens to the value of each digit when it is multiplied by* 100. *Each digit shifts* 2 *places to the left.*

G5-M1-Lesson 2

1. Solve.

   a. $4{,}258 \times 10 =$ $\underline{42{,}580}$

   I visualized a place value chart. 8 ones times 10 is 8 tens. When multiplying by 10, each digit shifts 1 place to the *left*.

   c. $3.9 \times 100 =$ $\underline{390}$

   The factor 100, has 2 zeros, so I can visualize each digit shifting 2 places to the *left*.

   b. $4{,}258 \div 10 =$ $\underline{425.8}$

   When dividing by 10, each digit shifts 1 place to the *right*.

   d. $3.9 \div 100 =$ $\underline{0.039}$

   The divisor, 100, has 2 zeros, so each digit shifts 2 places to the *right*.

2. Solve.

   7×1 hundred $= 7$ hundreds $= 700$

   a. $9{,}647 \times 100 =$ $\underline{964{,}700}$

   $7 \div 1$ thousand $= 7$ thousandths $= 0.007$

   b. $9{,}647 \div 1{,}000 =$ $\underline{9.647}$

   c. Explain how you decided on the number of zeros in the product for part (a).

   I visualized a place value chart. Multiplying by 100 *shifts each digit in the factor* $9{,}647$ *two places to the left, so there were* 2 *additional zeros in the product.*

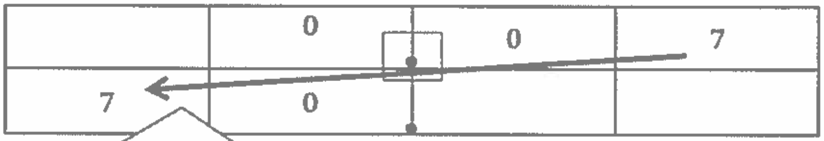
   d. Explain how you decided where to place the decimal in the quotient for part (b).

   The divisor, $1{,}000$*, has* 3 *zeros, so each digit in* $9{,}647$ *shifts* 3 *places to the right. When the digit* 9 *shifts* 3 *places to the right, it moves to the ones places, so I knew the decimal point needed to go between the ones place and the tenths place. I put the decimal between the* 9 *and the* 6*.*

3. Jasmine says that 7 hundredths multiplied by 1,000 equals 7 thousands. Is she correct? Use a place value chart to explain your answer.

Jasmine is not correct. 7 *ones* $\times 1,000$ *would be* 7 *thousands.*

But $0.07 \times 1,000 = 70$. *Look at my place value chart.*

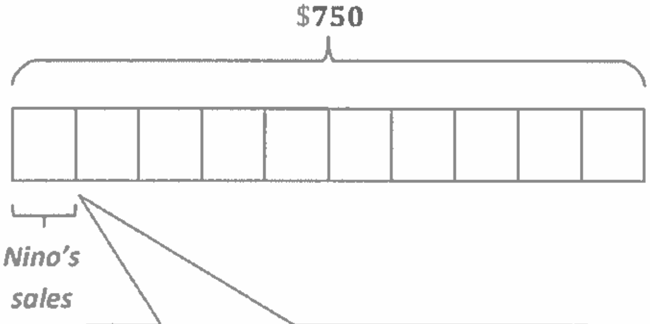


The factor 1,000 has 3 zeros, so the digit 7 shifts 3 places to the left on the place value chart.

4. Nino's class earned $750 selling candy bars for a fundraiser. $\frac{1}{10}$ of all the money collected was from sales made by Nino. How much money did Nino raise?

The whole tape represents all of the money earned by Nino's class.

Nino collected $\frac{1}{10}$ of all the money, so I partition the tape diagram into 10 equal



The value of this 1 unit will tell me how much money Nino earned for his class.

$10 \text{ units} = \$750$

$1 \text{ unit} = \$750 \div 10$

$1 \text{ unit} = \$75$

Nino raised $75.

G5-M1-Lesson 3

1. Write the following in exponential form.

a. $10 \times 10 \times 10 = \underline{10^3}$

10 is a factor 3 times, so the exponent is 3. I can read this as, "ten to the third power."

c. $100{,}000 = \underline{10^5}$

b. $1{,}000 \times 10 = \underline{10^4}$

d. $100 = \underline{10^2}$

$1{,}000 = 10 \times 10 \times 10$, so this expression uses 10 as a factor 4 times. The exponent is 4.

I recognize a pattern. 100 has 2 zeros. Therefore, the exponent is 2. One hundred equals 10 to the 2nd power.

2. Write the following in standard form.

a. $6 \times 10^3 = \underline{6{,}000}$

10^3 is equal to 1,000. 6 times 1 thousand is 6 thousand.

c. $643 \div 10^3 = \underline{0.643}$

b. $60.43 \times 10^4 = \underline{604{,}300}$

d. $6.4 \div 10^2 = \underline{0.064}$

The exponent 4 tells me how many places each digit will shift to the left.

The exponent 2 tells me how many places each digit will shift to the right.

3. Complete the patterns.

a. 0.06 0.6 $\underline{6}$ 60 $\underline{600}$ $\underline{6{,}000}$

6 tenths is larger than 6 hundredths. Each number in the pattern is 10 times larger than the previous number.

b. $\underline{92{,}100}$ 9,210 $\underline{921}$ 92.1 9.21 $\underline{0.921}$

The numbers are getting smaller in this pattern.

The digits have each shifted 1 place to the right. The pattern in this sequence is "divide by 10^1."

G5-M1-Lesson 4

In the first 2 problems, I am converting a *larger* unit to a *smaller* unit. Therefore, I need to multiply to find the equivalent length.

1. Convert and write an equation with an exponent.

1 meter is equal to 100 centimeters.

a. 4 meters to centimeters 4 m = 400 cm $4 \times 10^2 = 400$

1 meter is equal to 1,000 millimeters.

b. 2.8 meters to millimeters 2.8 m = $2,800$ mm $2.8 \times 10^3 = 2,800$

In these 2 problems, I am converting a *smaller* unit to a *larger* unit. Therefore, I need to divide to find the equivalent length.

2. Convert using an equation with an exponent.

There are 100 centimeters in 1 meter.

a. 87 centimeters to meters 87 cm = 0.87 m $87 \div 10^2 = 0.87$

There are 1,000 millimeters in 1 meter.

b. 9 millimeters to meters 9 mm = 0.009 m $9 \div 10^3 = 0.009$

3. The height of a cellphone is 13 cm. Express this measurement in meters. Explain your thinking. Include an equation with an exponent in your explanation.

$13 \text{ cm} = 0.13 \text{ m}$

In order to rename smaller units as larger units, I'll need to divide.

Since 1 *meter is equal to* 100 *centimeters, I divided the number of centimeters by* 100.

$13 \div 10^2 = 0.13$

I need to include an equation with an exponent, so I'll express 100 as 10^2.

G5-M1-Lesson 5

1. Express as decimal numerals.

   a. Eight and three hundred fifty-two thousandths

   8.352

   The word *and* separates the whole numbers from the decimal numbers.

   b. $\frac{6}{100}$

   0.06

   I can rewrite this fraction as a decimal. There are zero ones and zero tenths in the fraction 6 *hundredths*.

   c. $5\frac{132}{1000}$

   5.132

2. Express in words.

   a. 0.034

   Thirty-four thousandths

   b. 73.29

   Seventy-three and twenty-nine hundredths

   The word *and* separates the whole numbers from the decimal numbers.

3. Write the number in expanded form using decimals and fractions.

   303.084

   $3 \times 100 + 3 \times 1 + 8 \times 0.01 + 4 \times 0.001$

   $3 \times 100 + 3 \times 1 + 8 \times \frac{1}{100} + 4 \times \frac{1}{1000}$

   This expanded form uses decimals. 8 hundredths is the same as 8 units of 1 hundredth or (8×0.01).

   This expanded form uses fractions. $\frac{1}{1000} = 0.001$. Both are read as

4. Write a decimal for each of the following.

   a. $4 \times 100 + 5 \times 1 + 2 \times \frac{1}{10} + 8 \times \frac{1}{1000}$

      405.208

   b. $9 \times 1 + 9 \times 0.1 + 3 \times 0.01 + 6 \times 0.001$

      9.936

There are 0 tens and 0 hundredths in expanded form, so I wrote 0 tens and 0 hundredths in standard form too.

3×0.01 is 3 units of 1 hundredth, which I can write as a 3 in the hundredths place.

G5-M1-Lesson 6

1. Show the numbers on the place value chart using digits. Use >, <, or = to compare.

43.554 __>__ 43.545

	4	3	5	5	4
	4	3	5	4	5

I put each digit of both numbers in the place value chart. Now I can easily compare the values.

5 hundredths is greater than 4 hundredths. Therefore, 43.554 > 43.545.

2. Use the >, <, or = to compare the following.

a. 7.4 __=__ 74 tenths

10 tenths = 1 one 20 tenths = 2 ones 70 tenths = 7 ones

Therefore, 74 tenths = 7 ones and 4 tenths.

b. 2.7 __>__ Twenty-seven hundredths

1 one = 10 tenths 2 ones = 20 tenths 2.7 = 27 tenths

Tenths are a larger unit that hundredths, therefore 27 tenths is *greater* than 27 hundredths.

c. 3.12 __<__ 312 tenths

I can think of both numbers in unit form: 312 hundredths < 312 tenths. Hundredths are a smaller unit than tenths.

I can also think of both numbers in decimal notation: 3.12 < 31.2.

d. 1.17 __>__ 1.165

Both of these numbers have 1 one and 1 tenth. But 7 hundredths is *greater* than 6 hundredths. I know that 1.17 is *greater* than 1.165.

I need to be careful! Although 1.165 has more digits than 1.17, it doesn't always mean it has a greater value.

I also know that 1.17 = 1.170. When both numbers have the same number of digits, I can clearly see that 1.170 > 1.165.

3. Arrange the numbers in *increasing* order.

8.719 8.79 8.7 8.179

8.179, 8.7, 8.719, 8.79

Increasing order means I need to list the numbers from *least* to *greatest*.

8	7	1	9
8	7	9	
8	7		
8	1	7	9

To make comparing easier, I'm going to use a place value chart.

The 9 hundredths is greater than all of the other digits in the hundredths place. 8.79 is the largest number.

All of the numbers have 8 ones. 1 tenth is less than 7 tenths, so 8.179 is the smallest number.

Decreasing order means I need to list the numbers from *greatest* to *least*.

4. Arrange the numbers in *decreasing* order.

56.128 56.12 56.19 56.182

This time I'll just visualize the place value chart in my head.

56.19, 56.182, 56.128, 56.12

I'll begin by comparing the largest units, tens, first. All of the numbers have 5 tens, 6 ones, and 1 tenth. I'll look to the hundredths place next to compare.

Even though this number has only 4 digits, it's actually the largest number. The 9 in the hundredths place is the largest of all the digits in the hundredths places.

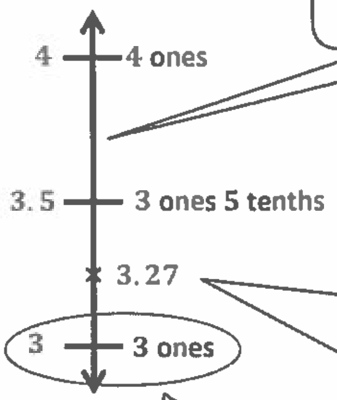
When I compare 56.12 and 56.128 to the other numbers, I see that they both have the fewest number of hundredths. However, I know that 56.128 is larger because it has 8 thousandths more than 56.12.

G5-M1-Lesson 7

Round to the given place value. Label the number lines to show your work. Circle the rounded number. Use a place value chart to show your decompositions for each.

1. 3.27

a. ones

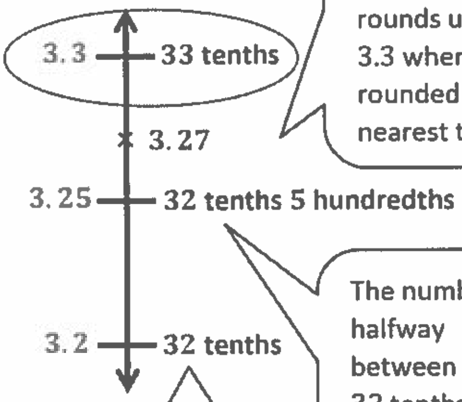


The number halfway between 3 ones and 4 ones is 3.5.

3.27 is less than the halfway mark and is closer to 3 ones. 3.27 rounds down to 3 when rounded to the nearest one.

I know that 3.27 lies somewhere between 3 ones and 4 ones on the number line. When rounding to the nearest one, I need to identify if it's closer to 3 ones or 4 ones.

b. tenths



3.27 is more than the halfway mark and is closer to 33 tenths. 3.27 rounds up to 3.3 when rounded to the nearest tenth.

The number halfway between 32 tenths and 33 tenths is 3.25.

In order to round 3.27 to the nearest tenth, I need to know how many tenths are in 3.27. The chart below tells me that there are 32 tenths in 3.27.

ones	*tenths*	*hundredths*
3	2	7
	32	7
		327

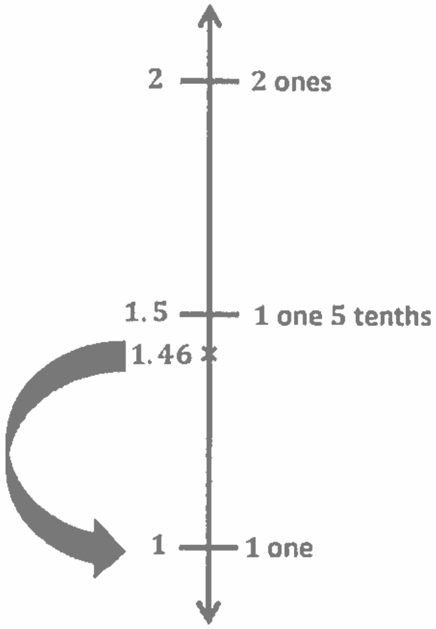
I can think of 3.27 in several ways. I can say it is 3 ones +2 tenths +7 hundredths. I can also think of it as 32 tenths +7 hundredths or 327 hundredths.

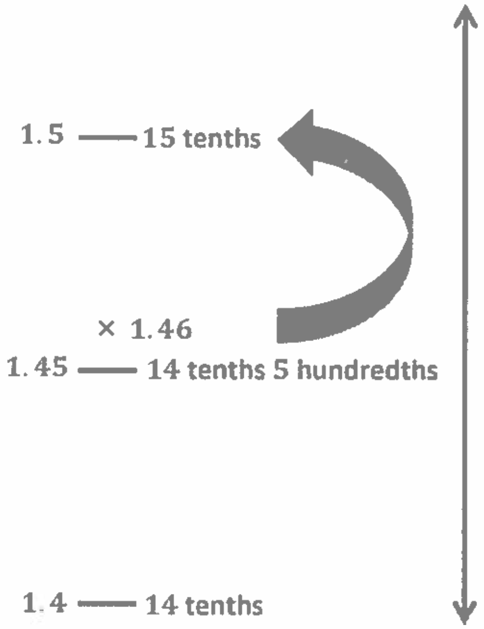
2. Rosie's pedometer said she walked 1.46 miles. She rounded her distance to 1 mile, and her brother, Isaac, rounded her distance to 1.5 miles. They are both right. Why?

Rosie rounded the distance to the nearest mile, and Isaac rounded the distance to the nearest tenth of a mile.

1.46 *rounded to the nearest one is* 1.

1.46 *rounded to the nearest tenth is* 15 *tenths or* 1.5.





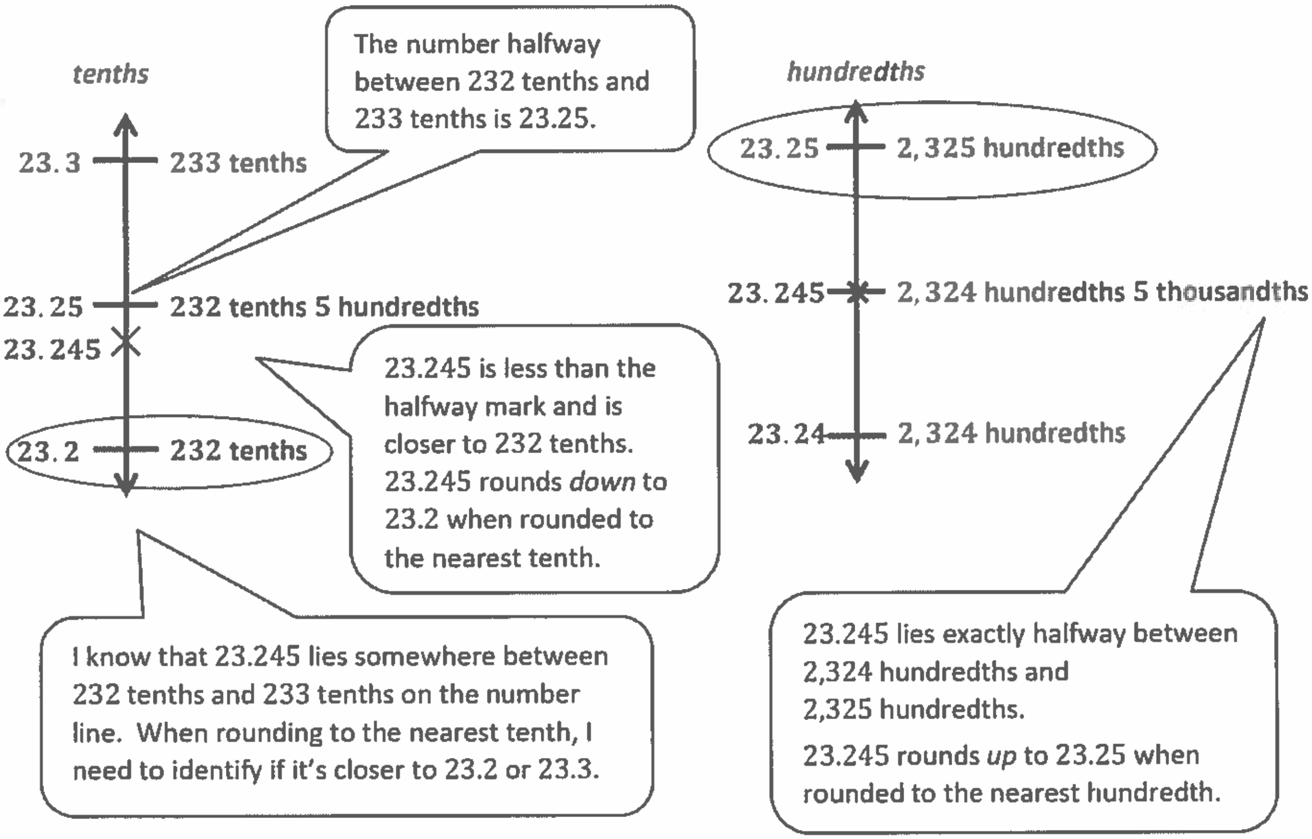
G5-M1-Lesson 8

1. Round the quantity to the given place value. Draw number lines to explain your thinking. Circle the rounded value on the number line.

Round 23.245 to the nearest tenth and hundredth.

2 tens = 200 tenths
3 ones = 30 tenths
There are 232 tenths
4 hundredths 5 thousandths in the number 23.245.

2 tens = 2,000 hundredths
3 ones = 300 hundredths
2 tenths = 20 hundredths
There are 2,324 hundredths
5 thousandths in the number 23.245.



The number halfway between 232 tenths and 233 tenths is 23.25.

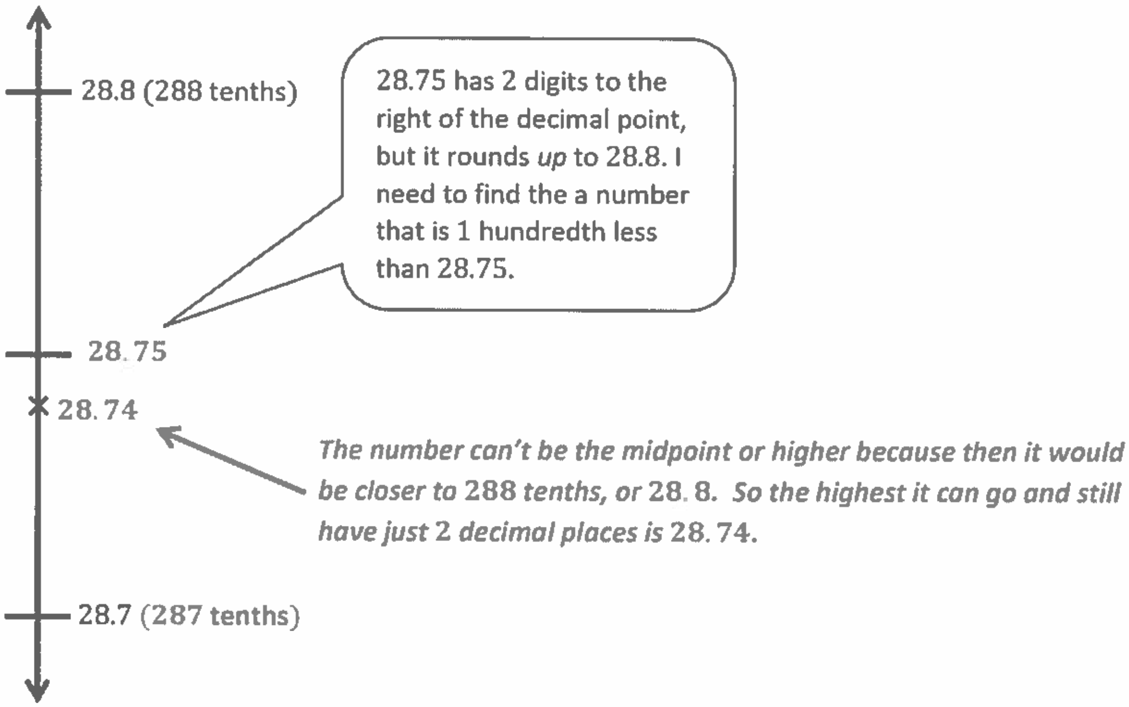
23.245 is less than the halfway mark and is closer to 232 tenths. 23.245 rounds *down* to 23.2 when rounded to the nearest tenth.

I know that 23.245 lies somewhere between 232 tenths and 233 tenths on the number line. When rounding to the nearest tenth, I need to identify if it's closer to 23.2 or 23.3.

23.245 lies exactly halfway between 2,324 hundredths and 2,325 hundredths.

23.245 rounds *up* to 23.25 when rounded to the nearest hundredth.

2. A decimal number has two digits to the right of its decimal point. If we round it to the nearest tenth, the result is 28.7. What is the maximum possible value of this decimal? Use words and the number line to explain your reasoning.



28.75 has 2 digits to the right of the decimal point, but it rounds *up* to 28.8. I need to find the a number that is 1 hundredth less than 28.75.

The number can't be the midpoint or higher because then it would be closer to 288 tenths, or 28.8. So the highest it can go and still have just 2 decimal places is 28.74.

G5-M1-Lesson 9

Note: Adding decimals is just like adding whole numbers—combine like units. Study the examples below:

2 apples + 3 apples = 5 apples
2 ones + 3 ones = 5 ones
2 tens + 3 tens = 5 tens = 50
2 hundredths + 3 hundredths = 5 hundredths = 0.05

I'll combine the like units, tenths, to get 5 tenths.

1. Solve.

a. 2 tenths + 3 tenths = ____5____ tenths

The standard form is 0.2 + 0.3 = 0.5.

I'll combine the like units, hundredths, and get 31 hundredths.

b. 26 hundredths + 5 hundredths = ___31___ hundredths = ___3___ tenths ___1___ hundredths

The standard form is 0.26 + 0.05 = 0.31.

10 hundredths = 1 tenth
20 hundredths = 2 tenths
30 hundredths = 3 tenths

I'll combine the like units and get 5 ones 6 tenths, which is the same as 56 tenths.

c. 5 ones 2 tenths + 4 tenths = ____56____ tenths

1 one = 10 tenths
5 ones = 50 tenths

The standard form is 5.2 + 0.4 = 5.6.

2. Solve using the standard algorithm.

a. $0.3 + 0.91 = \underline{1.21}$

3 tenths + 9 tenths is 12 tenths. I'll record 12 tenths as 1 one and 2 tenths.

b. $75.604 + 12.087 = \underline{87.691}$

$$\begin{array}{r} 75.604 \\ +\ 12.087 \\ \hline 1\, \\ 87.691 \end{array}$$

When setting up the algorithm, I need to be sure to add like units. Therefore I'll line up the tens with the tens, the ones with the ones et cetera.

4 thousandths + 7 thousandths is 11 thousandths. I'll record 11 thousandths as 1 hundredth 1 thousandth.

3. Anthony spends $6.49 on a book. He also buys a pencil for $2.87 and an eraser for $1.15. How much money does he spend altogether?

$\$6.49 + \$2.87 + \$1.15 = \$10.51$

I'll add all three items together to find the total price.

$$\begin{array}{r} 6.49 \\ 2.87 \\ +1.15 \\ \hline 1\ 2\ \, \\ 10.51 \end{array}$$

9 hundredths + 7 hundredths + 5 hundredths is 21 hundredths. I'll record 21 hundredths as 2 tenths 1 hundredth.

4 tenths + 8 tenths + 1 tenth + 2 tenths is 15 tenths. I'll record 15 tenths as 1 one and 5 tenths.

Anthony spends $\$10.51$.

G5-M1-Lesson 10

Note: Subtracting decimals is just like subtracting whole numbers—subtract like units. Study the examples below.

5 apples −1 apple = 4 apples
5 ones −1 one = 4 ones
5 tens −1 ten = 4 tens
5 hundredths −1 hundredth = 4 hundredths

1. Subtract.

   a. 7 tenths −4 tenths = 3 tenths

   I'll subtract the like units, tenths, to get 3 tenths.

   The standard form is 0.7 − 0.4 = 0.3.

   I'll look at the units carefully.
   A *hundred* is different than a *hundredth*.

   I'll subtract 3 hundredths from 8 hundredths, and get 5 hundredths.

   b. 4 hundreds 8 hundredths −3 hundredths = 4 hundreds 5 hundredths

   The standard form is 400.08 − 0.03 = 400.05.

1.7 is the same as 1.70.

2. Solve 1.7 − 0.09 using the standard algorithm.

When setting up the algorithm, I need to be sure to subtract like units. Therefore, I'll line up the ones with the ones, the tenths with the tenths, etc.

$$\begin{array}{rrr} & 6 & 10 \\ 1. & \cancel{7} & \cancel{0} \\ -\ 0. & 0 & 9 \\ \hline 1. & 6 & 1 \end{array}$$

There are 0 hundredths, so I can't subtract 9 hundredths. I'll rename 7 tenths as 6 tenths 10 hundredths.

10 hundredths minus 9 hundredths is equal to 1 hundredth.

6 ones 3 tenths = 6.3 = 6.30
58 hundredths = 0.58

3. Solve 6 ones 3 tenths −58 hundredths.

I'll rename 6 ones as 5 ones 10 tenths. 10 tenths, plus the 2 tenths already there, makes 12 tenths.

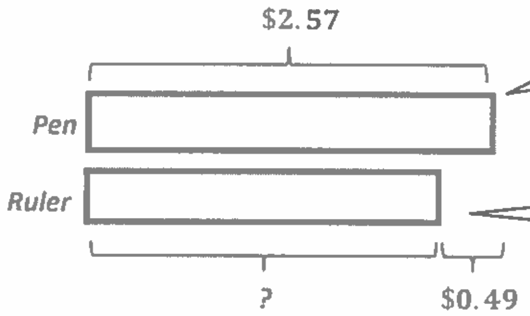
There are 0 hundredths, so I can't subtract 8 hundredths. I'll rename 3 tenths as 2 tenths 10 hundredths.

$$\begin{array}{rrrr} & 5 & 12 & 10 \\ & \cancel{6}. & \cancel{3} & \cancel{0} \\ - & 0. & 5 & 8 \\ \hline & 5. & 7 & 2 \end{array}$$

10 hundredths minus 8 hundredths is equal to 2 hundredths.

Students can solve using a variety of methods. This problem may not require the standard algorithm as some students can compute mentally.

4. A pen costs \$2.57. It costs \$0.49 more than a ruler. Kayla bought two pens and one ruler. She paid with a ten-dollar bill. How much change does Kayla get? Use a tape diagram to show your thinking.



I'll draw a tape diagram to represent the pen and label it \$2.57.

Since the pen costs more than the ruler, I'll draw a shorter tape for the ruler.

The difference between the pen and the ruler is \$0.49.

I'll find the price of the ruler. It's \$2.08.

$$\begin{array}{rrrr} & & 4 & 17 \\ & \$2. & \cancel{5} & \cancel{7} \\ - & \$0. & 4 & 9 \\ \hline & \$2. & 0 & 8 \end{array}$$

$\$2.57 + \$2.57 + \$2.08 = \$7.22$

$$\begin{array}{rrrr} & \$2. & 5 & 7 \\ & \$2. & 5 & 7 \\ + & \$2. & 0 & 8 \\ & & 1 & 2 \\ \hline & \$7. & 2 & 2 \end{array}$$

I'll add the price of two pens and one ruler together. It's \$7.22.

$$\begin{array}{rrrrr} & 0 & 9 & 9 & 10 \\ & \$\cancel{1} & \cancel{0}. & \cancel{0} & \cancel{0} \\ - & & \$7. & 2 & 2 \\ \hline & & \$2. & 7 & 8 \end{array}$$

Kayla's change is \$2.78.

I'll subtract the total cost from \$10. Kayla's change will be \$2.78.

Note: Encourage your child to use a variety of strategies when solving. The standard algorithm may not always be necessary for some students. Ask them about different ways to solve the problem. Below you'll find some alternate solution strategies that could be applied.

$\$2.57 + \$2.57 + \$2.08 = \$7.22$

When finding the total cost of the 3 items, I can think of adding \$2.50 + \$2.50 + \$2, which is equal to \$7. Then I'll add the remaining 7¢ + 7¢ + 8¢, which is 22¢. The total then, is \$7 + \$0.22 = \$7.22. I can do all of this mentally!

Then when finding the amount of change Kayla gets, I can use another strategy to solve.

Instead of finding the difference of \$10 and \$7.22 using the subtraction algorithm, I can count up from \$7.22.

$$\$7.22 \xrightarrow{+\,3\text{¢}} \$7.25 \xrightarrow{+\,75\text{¢}} \$8.00 \xrightarrow{+\,\$2} \$10.00$$

3¢ more makes \$7.25.

3 quarters, or 75 cents, more makes \$8.

\$2 more makes \$10.

2 dollars, 3 quarters, and 3 pennies is \$2.78. That's what Kayla gets back.

Kayla gets $\$2.78$ *back in change.*

G5-M1-Lesson 11

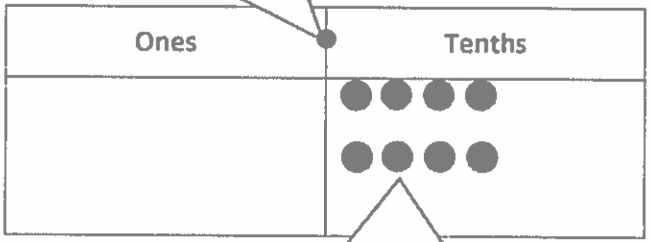
1. Solve by drawing disks on a place value chart. Write an equation, and express the product in standard form.

a. 2 copies of 4 tenths

$$= 2 \times 0.4$$
$$= 0.8$$

2 copies means 2 groups. So, I'll multiply 2 times 4 tenths. The answer is 8 tenths, or 0.8.

I'll draw a place value chart to help me solve, and this dot is the decimal point.



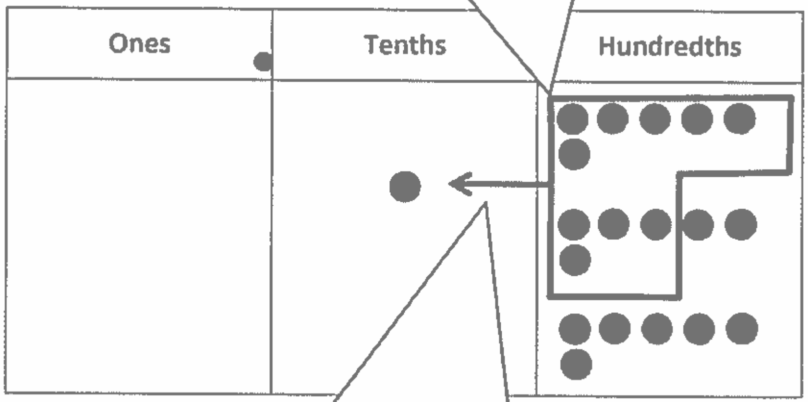
Each dot represents 1 tenth, so I'll draw 2 groups of 4 tenths.

b. 3 times as much as 6 hundredths

$$= 3 \times 0.06$$
$$= 0.18$$

I'll multiply 3 times 6 hundredths. The answer is 18 hundredths, or 0.18.

I'll draw 3 groups of 6 hundredths.



I'll bundle 10 hundredths and exchange them for 1 tenth.

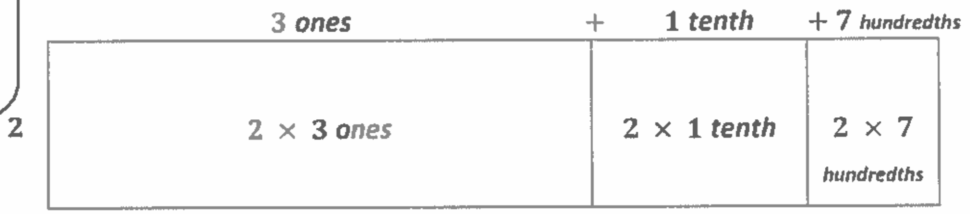
2. Draw an area model, and find the sum of the partial products to evaluate each expression.

a. 2 × 3.17

3.17 is the same as 3 ones 1 tenth 7 hundredths.

The factor 3.17 represents the length of the area model.

The factor 2 represents the width of the area model.



6 + 0.2 + 0.14 = 6.34

I'll multiply 2 times each place value unit.

2 × 3 ones = 6 ones = 6

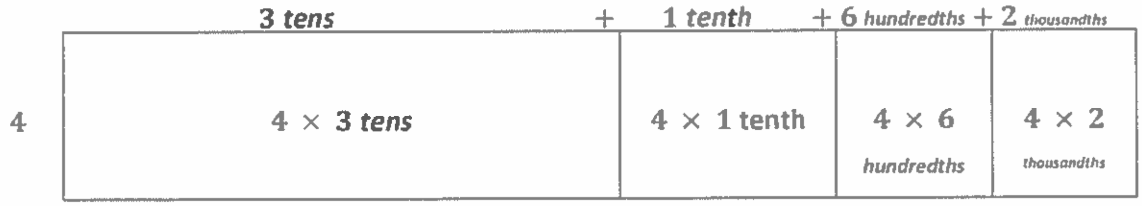
2 × 1 tenth = 2 tenths = 0.2

2 × 7 hundredths = 14 hundredths = 0.14

The product of 2 and 3.17 is 6.34.

b. 4 times as much as 30.162

There are 0 ones in 30.162, so my area model does not include the ones.



120 + 0.4 + 0.24 + 0.008 = 120.648

I'll multiply 4 times each place value unit.

4 × 3 tens = 12 tens = 120

4 × 1 tenth = 4 tenths = 0.4

4 × 6 hundredths = 24 hundredths = 0.24

4 × 2 thousandths = 8 thousandths = 0.008

The product of 4 and 30.162 is 120.648.

G5-M1-Lesson 12

1. Choose the reasonable product for each expression. Explain your thinking in the spaces below using words, pictures, or numbers.

   a. 3.1×3 930 93 [✓ 9.3] 0.93

   3.1 is just a little more than 3. A reasonable product would be just a little more than 9.

   $3 \times 3 = 9$. *I looked for a product that was close to* 9.

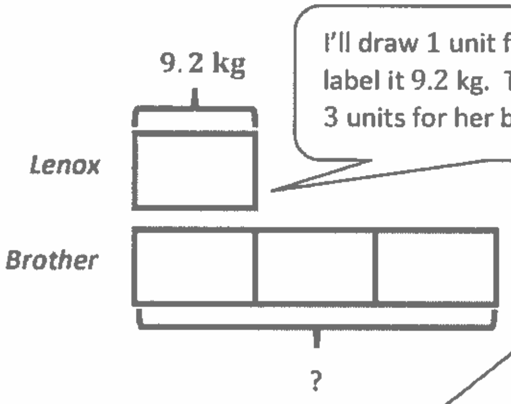
   b. 8×7.036 5.6288 [✓ 56.288] 562.88 5,628.8

   This product is not reasonable. How could 8×7.036 be less than both factors?

   These 2 products are much too large.

   $8 \times 7 = 56$. *I looked for a product that was close to* 56.

2. Lenox weighs 9.2 kg. Her older brother is 3 times as heavy as Lenox. How much does her older brother weigh in kilograms?



I'll draw 1 unit for Lenox and label it 9.2 kg. Then I'll draw 3 units for her brother.

I can visualize an area model to solve 3×9.2.

3×9 ones $= 27$ ones $= 27$

3×2 tenths $= 6$ tenths $= 0.6$

$27 + 0.6 = 27.6$

$1 \text{ unit} = 9.2 \text{ kg}$

$3 \text{ units} = 3 \times 9.2 \text{ kg}$

$= 27.6 \text{ kg}$

To find her brother's weight, I'll multiply Lenox's weight by 3. The answer is 27.6 kilograms.

Lenox's older brother weighs 27.6 *kilograms.*

G5-M1-Lesson 13

Note: The use of unit language (e.g., 21 hundredths rather than 0.21) allows students to use knowledge of basic facts to compute easily with decimals.

1. Complete the sentence with the correct number of units, and then complete the equation.

$0.21 = 21$ hundredths

3 groups of __7__ hundredths is 0.21.

I know the basic fact $3 \times 7 = 21$. This is similar.
3×7 hundredths $= 21$ hundredths

$0.21 \div 3 =$ __0.07__

Since $21 \div 3 = 7$, then
21 hundredths $\div 3 = 7$ hundredths

2. Complete the number sentence. Express the quotient in units and then in standard form.

Since the divisor is 4, I'll decompose 8.16 into 8 ones and 16 hundredths. Both 8 and 16 are multiples of 4.

a. $8.16 \div 4 =$ __8__ ones $\div 4 +$ __16__ hundredths $\div 4$

$=$ __2__ ones $+$ __4__ hundredths

$=$ __2.04__

8 ones $\div 4 = 2$ ones $= 2$

16 hundredths $\div 4 = 4$ hundredths $= 0.04$

$2 + 0.04 = 2.04$

Since the divisor is 6, I'll decompose 1.242 into 12 tenths and 42 thousandths. Both 12 and 42 are multiples of 6.

b. $1.242 \div 6 =$ __(12 *tenths* $\div$ 6) + (42 *thousandths* $\div$ 6)__

$=$ __2 *tenths* + 7 *thousandths*__

$=$ __0.207__

12 tenths $\div 6 = 2$ tenths $= 0.2$

42 thousandths $\div 6 = 7$ thousandths $= 0.007$

3. Find the quotients. Then, use words, numbers, or pictures to describe any relationships you notice between the pair of problems and their quotients.

a. $35 \div 5 =$ 7

I know this basic fact!

b. $3.5 \div 5 =$ 0.7

I can use that basic fact to help me solve this one.

35 tenths ÷ 5 = 7 tenths = 0.7

Both problems are dividing by 5, but the quotient for part (a) is 10 *times larger than the quotient for (b). That makes sense because the number we started with in part (a) is also* 10 *times larger than the number we started with in part (b).*

4. Is the quotient below reasonable? Explain your answer.

a. $0.56 \div 7 = 8$

56 hundredths ÷ 7 = 8 hundredths

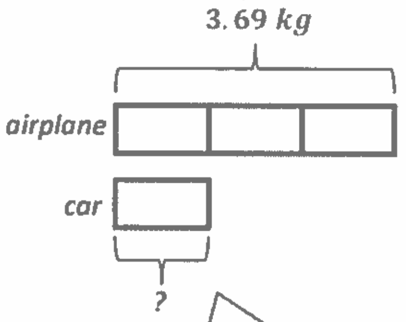
0.56 = 56 hundredths

No, the quotient is not reasonable.

$56 \div 7 = 8$, *so* 56 *hundredths* $\div$ 7 *must be* 8 *hundredths.*

5. A toy airplane weighs 3.69 kg. It weighs 3 times as much as a toy car. What is the weight of the toy car?

I draw 1 tape diagram to show the weight of the airplane.



The airplane weighs 3 times as much as the car, so I partition the tape diagram, into 3 equal units.

The car is equal to the weight of 1 unit.

I can use unit language and basic facts to solve.

3 ones ÷ 3 = 1 one

6 tenths ÷ 3 = 2 tenths = 0.2

9 hundredths ÷ 3 = 3 hundredths = 0.03

$3 \text{ units} = 3.69$

$1 \text{ unit} = 3.69 \div 3$

$1 \text{ unit} = 1.23$

The toy car weighs .23 kg.

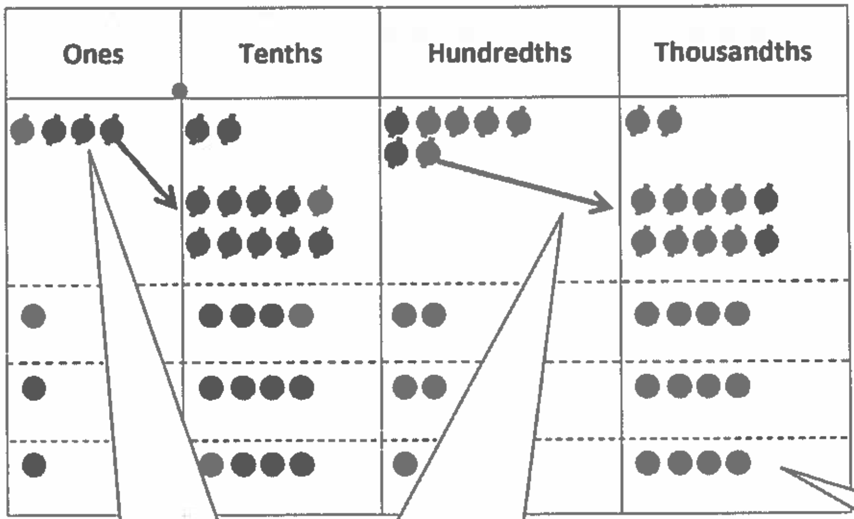
G5-M1-Lesson 14

1. Draw place value disks on the place value chart to solve. Show each step using the standard algorithm.

$4.272 \div 3 =$ 1.424

4.272 is divided into 3 equal groups. There is 1.424 in each group.

$$\begin{array}{rrrrr}
 & 1. & 4 & 2 & 4 \\ \cline{2-5}
3 \big) & 4. & 2 & 7 & 2 \\
- & 3 & & & \\ \cline{2-3}
 & 1 & 2 & & \\
- & 1 & 2 & & \\ \cline{2-4}
 & & 0 & 7 & \\
 & - & & 6 & \\ \cline{3-5}
 & & & 1 & 2 \\
 & & - & 1 & 2 \\ \cline{4-5}
 & & & & 0
\end{array}$$



When I share 4 ones equally with 3 groups, there is 1 one in each group and 1 one remaining.

In order to continue sharing, or dividing, I'll exchange the 1 remaining hundredth for 10 thousandths.

In each group, there is 1 one 4 tenths 2 hundredths 4 thousandths, or 1.424.

2. Solve $15.704 \div 4$ using the standard algorithm.

15.704 is divided into 4 equal groups. There is 3.926 in each group.

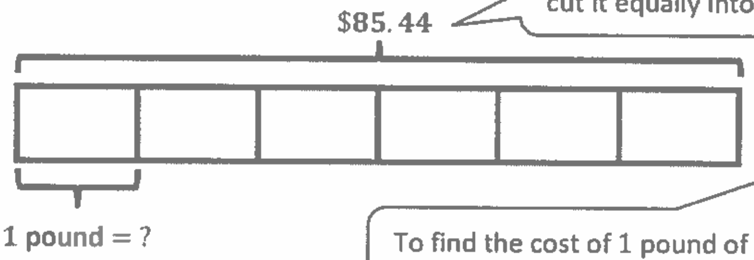
$$\begin{array}{rrrrrr}
 & & 3. & 9 & 2 & 6 \\ \cline{2-6}
4 \big) & 1 & 5. & 7 & 0 & 4 \\
- & 1 & 2 & & & \\ \cline{2-4}
 & & 3 & 7 & & \\
 & - & 3 & 6 & & \\ \cline{3-5}
 & & & 1 & 0 & \\
 & & - & & 8 & \\ \cline{4-6}
 & & & & 2 & 4 \\
 & & & - & 2 & 4 \\ \cline{5-6}
 & & & & & 0
\end{array}$$

When completing the division, I need to be sure to line up the place value units carefully—the tens with the tens, the ones with the ones, etc.

As I work, I'm visualizing the place value chart and thinking out loud. "We had 15 ones and shared 12 of them. 3 ones remain. I can change those 3 ones for 30 tenths, which combined with the 7 tenths in the whole, makes 37 tenths. Now I need to share 37 tenths equally with 4 groups. Each group gets 9 tenths."

3. Mr. Huynh paid \$85.44 for 6 pounds of cashews. What's the cost of 1 pound of cashews?

I'll draw a tape diagram and label it \$85.44. Then I'll cut it equally into 6 units.



$6 \text{ units} = \$85.44$

$1 \text{ unit} = \$85.44 \div 6$

$= \$14.24$

To find the cost of 1 pound of cashews, I'll divide \$85.44 by 6.

$$
\begin{array}{rrrrr}
 & 1 & 4. & 2 & 4 \\ \cline{2-5}
6 & \big)\,8 & 5. & 4 & 4 \\
- & 6 & & & \\ \cline{2-3}
 & 2 & 5 & & \\
- & 2 & 4 & & \\ \cline{2-4}
 & & 1 & 4 & \\
 & - & 1 & 2 & \\ \cline{3-5}
 & & & 2 & 4 \\
 & & - & 2 & 4 \\ \cline{4-5}
 & & & & 0
\end{array}
$$

I'll solve using the long division algorithm.

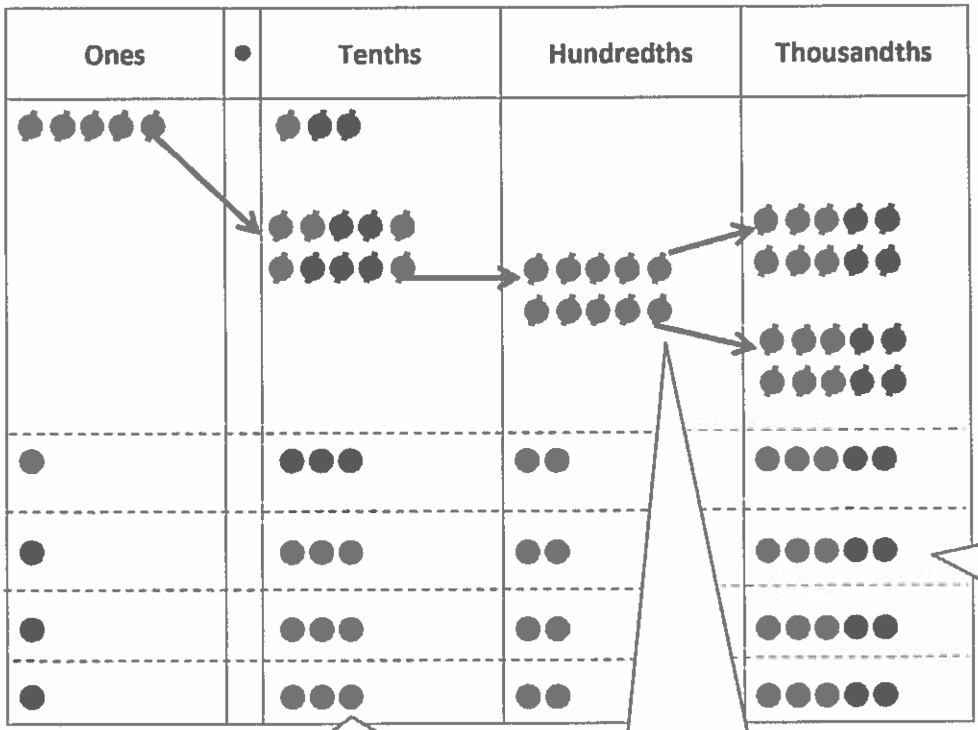
The cost of 1 *pound of cashews is* $\$14.24$.

G5-M1-Lesson 15

1. Draw place value disks on the place value chart to solve. Show each step in the standard algorithm.

$5.3 \div 4 =$ 1.325

5.3 is divided into 4 equal groups There is 1.325 in each group.



$$\begin{array}{rrrrr}
 & 1. & 3 & 2 & 5 \\ \hline
4\big) & 5. & 3 & 0 & 0 \\
- & 4 & & & \\ \hline
 & 1 & 3 & & \\
- & 1 & 2 & & \\ \hline
 & & 1 & 0 & \\
 & - & & 8 & \\ \hline
 & & & 2 & 0 \\
 & & - & 2 & 0 \\ \hline
 & & & & 0
\end{array}$$

In each group,
there is 1 one
3 tenths
2 hundredths
5 thousandths,
or 1.325.

When I share 13 tenths equally with 4 groups, there are 3 tenths in each group, and 1 tenth remains.

In order to continue sharing, or dividing, I'll exchange the 2 remaining hundredths for 20 thousandths.

2. Solve using the standard algorithm.

$9 \div 5 =$ 1.8

9 is divided into 5 equal groups. There is 1.8 in each group.

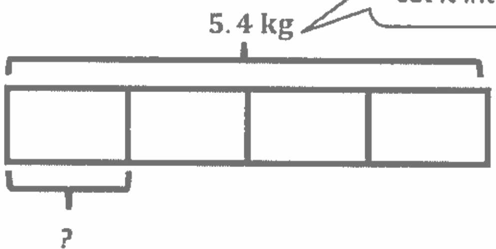
$$\begin{array}{rrr}
 & 1. & 8 \\ \hline
5\big) & 9. & 0 \\
- & 5 & \\ \hline
 & 4 & 0 \\
- & 4 & 0 \\ \hline
 & & 0
\end{array}$$

In order to continue dividing, I'll rename the 4 remaining ones as 40 tenths.

40 tenths ÷ 5 = 8 tenths

3. Four bakers shared 5.4 kilograms of sugar equally. How much sugar did they each receive?

I'll draw a tape diagram and label it 5.4 kg. Then I'll cut it into 4 equal units.



$4 \text{ units} = 5.4 \text{ kg}$

$1 \text{ unit} = 5.4 \text{ kg} \div 4$

$= 1.35 \text{ kg}$

To find the amount of sugar each baker will receive, I'll divided 5.4 kg by 4.

$$\begin{array}{rccc} & 1. & 3 & 5 \\ 4 & \overline{)5.} & \overline{4} & \overline{0} \\ - & 4 & & \\ \hline & 1 & 4 & \\ - & 1 & 2 & \\ \hline & & 2 & 0 \\ & - & 2 & 0 \\ \hline & & & 0 \end{array}$$

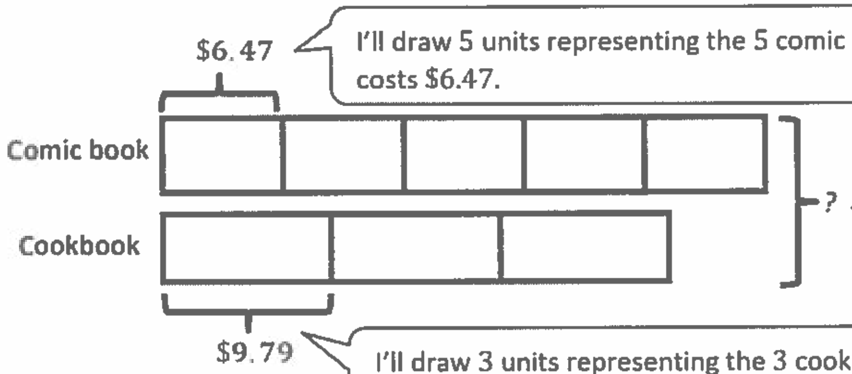
I'll solve using the long division algorithm.

Each baker received 1.35 *kilograms of sugar.*

G5-M1-Lesson 16

1. A comic book costs $6.47, and a cookbook costs $9.79.

   a. Zion buys 5 comic books and 3 cookbooks. What is the total cost for all of the books?



I'll draw 5 units representing the 5 comic books, and each unit/book costs $6.47.

I'll label the question mark here because I have to find the total cost for all of the books.

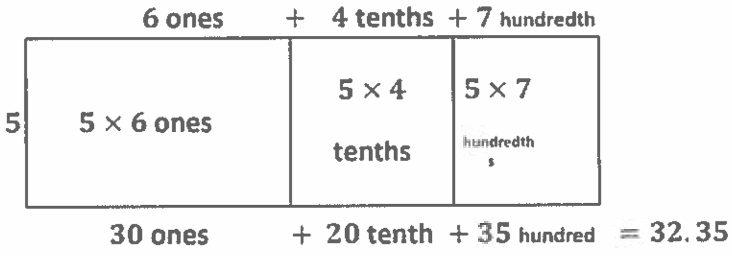
I'll draw 3 units representing the 3 cookbooks and each unit/book costs $9.79.

Comic book:

1 unit = $6.47

5 units = 5 × $6.47 = $32.35

I'll find the total cost of the 5 comic books by multiplying 5 times $6.47.

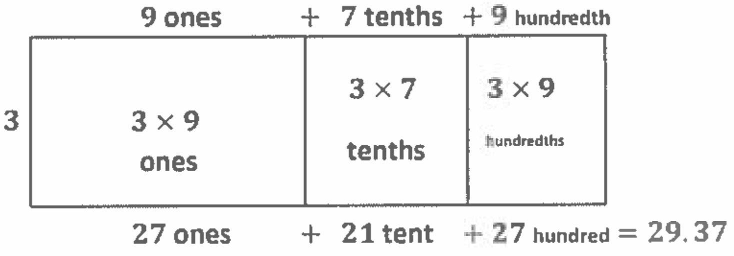


Cookbook:

1 unit = $9.79

3 units = 3 × $9.79 = $29.37

I'll find the total cost of the 3 cookbooks by multiplying 3 times $9.79.

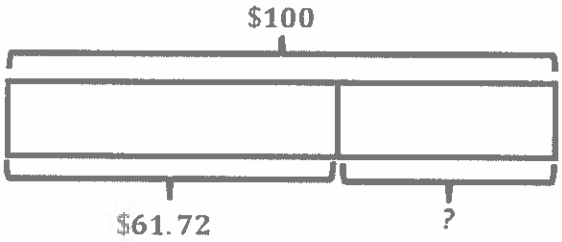


$$\begin{array}{r} 3\ 2.\ 3\ 5 \\ +\ 2\ 9.\ 3\ 7 \\ \hline \overset{1}{6}\ 1.\ \overset{1}{7}\ 2 \end{array}$$

I'll add the total cost of 5 comic books and the total cost of 3 cookbooks together to find the total cost of all 8 books.

The total cost of all the books is $61.72.

b. Zion wants to pay for the all the books with a $100 bill. How much change will he get back?



$\$100 - \$61.72 = \$38.28$

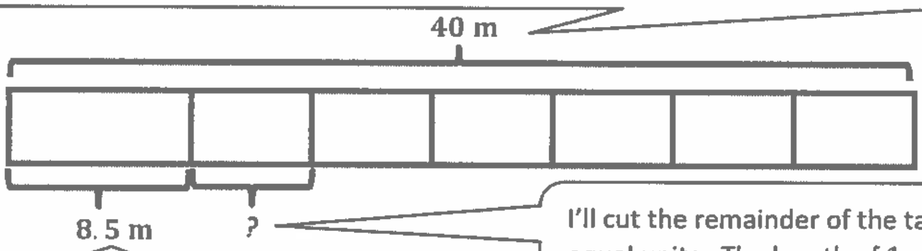
Zion will get $38.28 *back in change.*

I'll subtract $61.72 from $100 to find Zion's change.

$$\begin{array}{rrrrrr} & 0 & 9 & 9 & 9 & 10 \\ & \cancel{1} & \cancel{0} & \cancel{0}. & \cancel{0} & \cancel{0} \\ - & & 6 & 1. & 7 & 2 \\ \hline & & 3 & 8. & 2 & 8 \end{array}$$

2. Ms. Porter bought 40 meters of string. She used 8.5 meters to tie a package. Then she cuts the remainder into 6 equal pieces. Find the length of each piece. Give the answer in meters.

I'll draw a tape diagram to represent the string Ms. Porter bought and label the whole as 40 m.



I'll cut out a small part representing the string needed for tying the package and label it 8.5 m.

I'll cut the remainder of the tape into 6 equal units. The length of 1 unit represents the length of each piece of string.

$40\text{ m} - 8.5\text{ m} = 31.5\text{ m}$

$$\begin{array}{rrrr} & 3 & 9 & 10 \\ & \cancel{4} & \cancel{0}. & \cancel{0} \\ - & & 8. & 5 \\ \hline & 3 & 1. & 5 \end{array}$$

I can subtract 8.5 from 40 to find the length of the remaining string.

$6\text{ units} = 31.5\text{ m}$

$1\text{ unit} = 31.5\text{ m} \div 6 = 5.25\text{ m}$

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

I can divide 31.5 by 6 to find the length of each piece of string.

Each piece of string is 5.25 *meters.*

Homework Helpers

Grade 5
Module 2

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 × 2 tens = ***68 tens***

34 × 20 = **680**

34 ones × 2 tens = (34 × 1) × (2 × 10).
First, I did the mental math: 34 × 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 × 2 tens = ***84 hundreds***

420 × 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 × 10 × 2 × 10.
I can use the associative property to switch the order of the factors: 42 × 2 × 10 × 10.

c. 400 × 500

4 hundreds × 5 hundreds = ***20 ten thousands***

400 × 500 = **200,000**

I have to be careful because the basic fact, 4 × 5 = 20, ends in a zero.

Another way to think about this is 4 × 100 × 5 × 100
= 4 × 5 × 100 × 100
= 20 × 100 × 100
= 20 × 10,000
= 200,000

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 $\times 3$ 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 $\times$ 3 ones, or 9 hundreds $= 3$ tens $\times 3$ 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.

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

I use the distributive property to decompose the factors.

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. $6 \times 5 = 30$. 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.

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

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

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

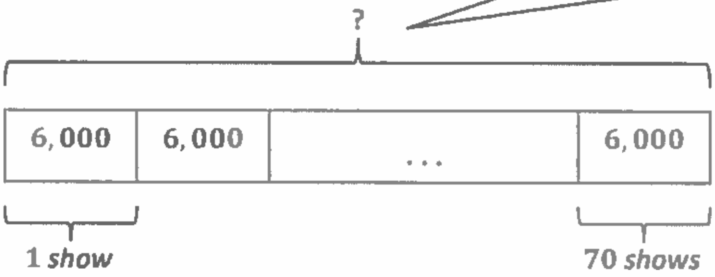
b. $6{,}286 \times 26 \approx \underline{\quad 6,000 \quad} \times \underline{\quad 25 \quad} = \underline{150,000}$

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.

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.



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.*

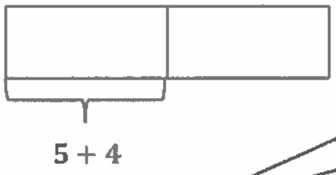
I can think about the problem in more than one way.

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.

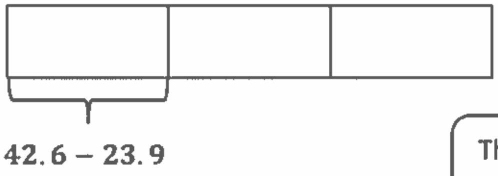


I can show doubling by multiplying by 2 or by adding the two sums together. The tape diagram represents both expressions.

$(5 + 4) \times 2$ *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

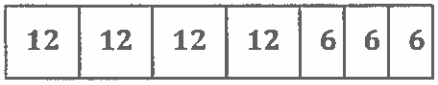


The word difference tells me the expression involves subtraction.

$(42.6 - 23.9) \times 3$

   c. The sum of 4 twelves and 3 sixes

Another way to say 4 *twelves* is to say 4 *groups of twelve.*



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. $(2 \times 3) + (5 \times 3) \quad = \quad 3 \times (2 + 5)$

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. $28 \times (3 + 50) \quad < \quad (3 + 50) \times 82$

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

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.

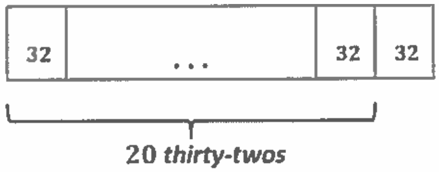
a. $19 \times 25 =$ __19__ twenty-fives

Think: 20 twenty-fives − 1 twenty-five

= (__20__ × 25) − (__1__ × 25)

= __500__ − __25__ = __475__

b. $21 \times 32 =$ __21__ thirty-twos



Think: __20__ thirty-twos + __1__ thirty-two

= (__20__ × 32) + (__1__ × 32)

= __640__ + __32__ = __672__

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.

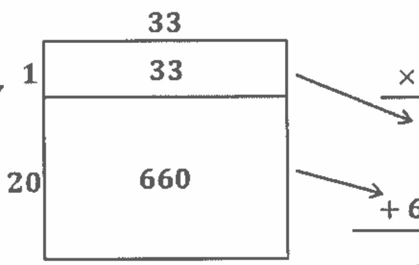
   $4,400 - 44$. *The pet store has* 4,356 *fish.*

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

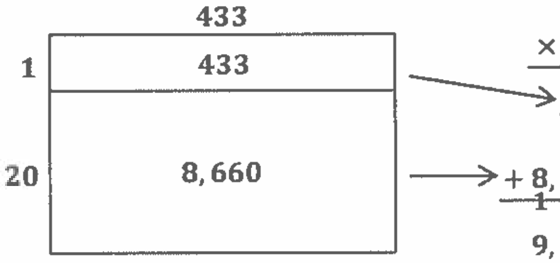
I put the ones on top in the area model so the partial products are in the same order as in the algorithm.



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

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

   b. 433 × 21

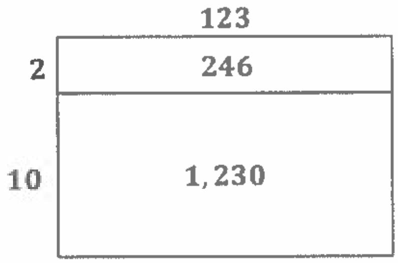


$$\begin{array}{r} 4\,3\,3\\ \times\ 2\,1\\ \hline 4\,3\,3\\ +\,8{,}6\,6\,0\\ 1\\ \hline 9{,}0\,9\,3\end{array}$$

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.



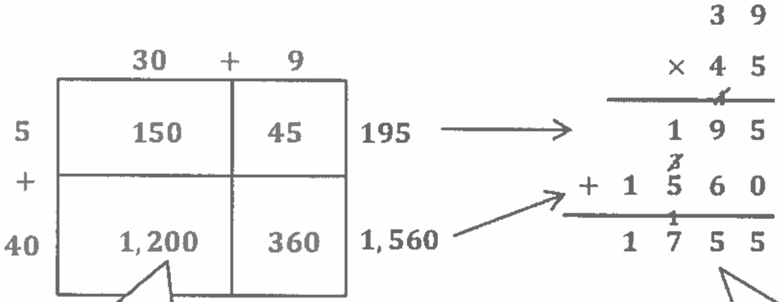
$$\begin{array}{r} 1\,2\,3\\ \times\ 1\,2\\ \hline 2\,4\,6\\ +\,1{,}2\,3\,0\\ \hline 1{,}4\,7\,6\end{array}$$

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

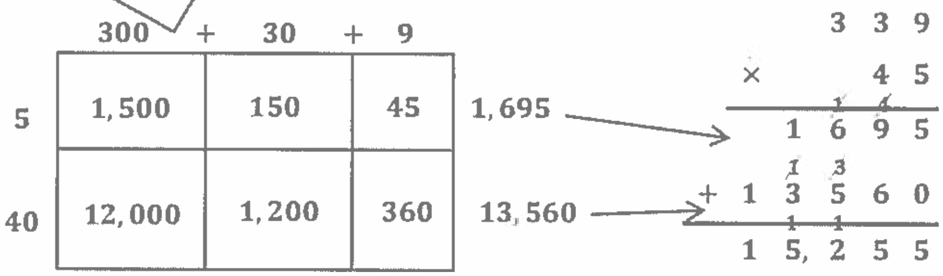


I can use unit form to find these partial products. For example, 3 tens × 4 tens is 12 hundreds or 1,200.

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.



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.

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

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

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

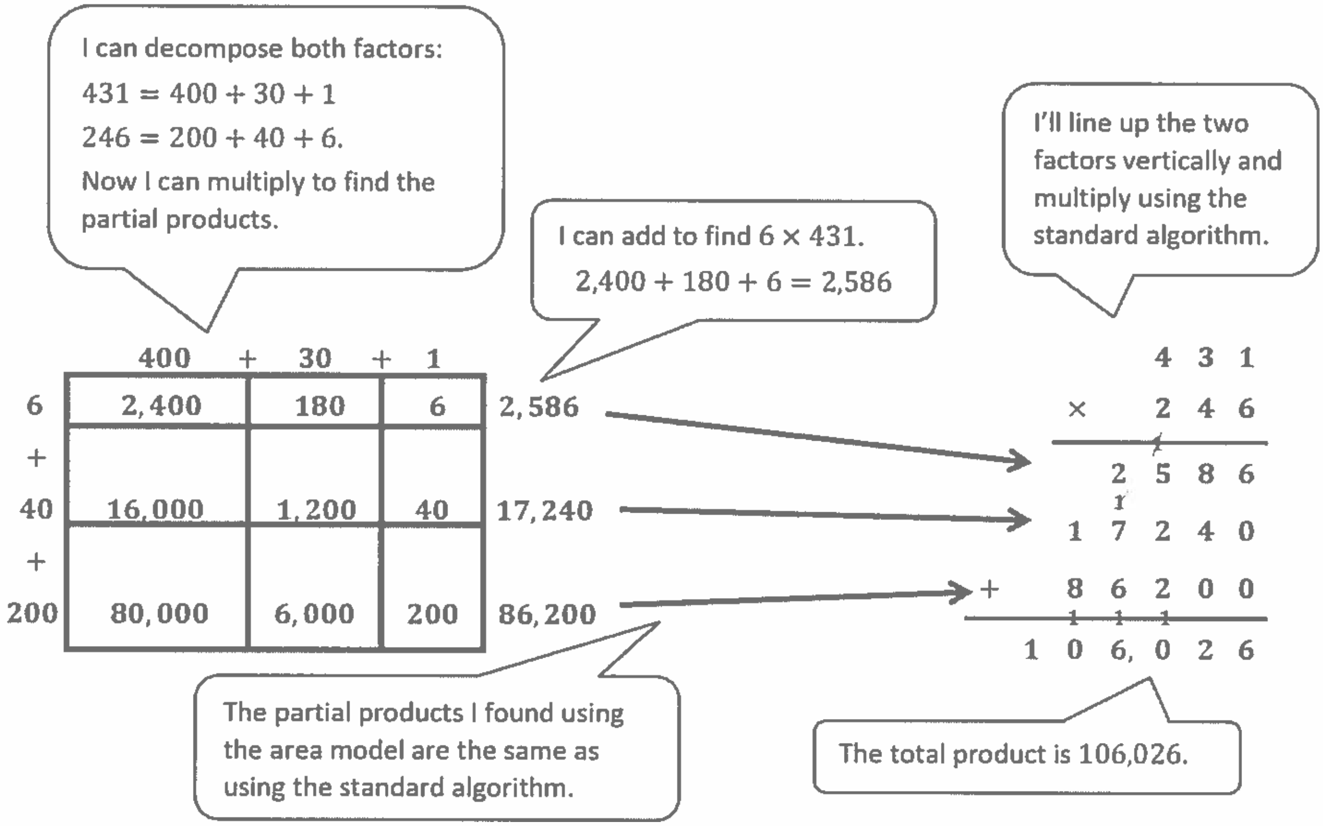
The total price of the car was $17,839.

I remembered to write a sentence that answers the question.

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.

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

The total product is 106,026.

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

2,451 × 107 = <u>262, 257</u>

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

$$\begin{array}{ccccccc}
 & & & 2, & 4 & 5 & 1 \\
 & & \times & & 1 & 0 & 7 \\
 & & & \cancel{3} & \cancel{3} & & \\
\hline
 & & 1 & 7 & 1 & 5 & 7 \\
+ & 2 & 4 & 5 & 1 & 0 & 0 \\
 & & 1 & & & & \\
\hline
 & 2 & 6 & 2, & 2 & 5 & 7
\end{array}$$

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 × 408 = <u>2, 979, 216</u>

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.

$$\begin{array}{cccccccc}
 & & & & 7, & 3 & 0 & 2 \\
 & & & \times & & 4 & 0 & 8 \\
 & & & & \cancel{2} & & \cancel{1} & \\
\hline
 & & & 5 & 8 & 4 & 1 & 6 \\
 & & \cancel{1} & & & & & \\
+ & 2 & 9 & 2 & 0 & 8 & 0 & 0 \\
 & & & & 1 & & & \\
\hline
 & 2, & 9 & 7 & 9, & 2 & 1 & 6
\end{array}$$

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.

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.

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

   $\approx \mathbf{800 \times 200}$

   $= \mathbf{160,000}$

   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 × 250 = 200,000.

$$\begin{array}{ccccccc}
 & & & & 7 & 9 & 5 \\
 & & & \times & 2 & 4 & 8 \\
 & & & & \cancel{7} & \cancel{4} & \\
\hline
 & & & 6 & 3 & 6 & 0 \\
 & & & \cancel{3} & \cancel{2} & & \\
 & & 3 & 1 & 8 & 0 & 0 \\
 & & \cancel{1} & \cancel{1} & & & \\
+ & 1 & 5 & 9 & 0 & 0 & 0 \\
 & & \cancel{1} & \cancel{1} & & & \\
\hline
 & 1 & 9 & 7, & 1 & 6 & 0
\end{array}$$

8 × 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.

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 × 505

   $\approx \mathbf{4,000 \times 500}$

   $= \mathbf{2,000,000}$

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

$$\begin{array}{cccccccc}
 & & & & 4, & 3 & 0 & 8 \\
 & & & \times & & 5 & 0 & 5 \\
 & & & & \cancel{1} & & \cancel{4} & \\
\hline
 & & & 2 & 1 & 5 & 4 & 0 \\
 & & \cancel{1} & & \cancel{4} & & & \\
+ & 2 & 1 & 5 & 4 & 0 & 0 & 0 \\
\hline
 & 2, & 1 & 7 & 5, & 5 & 4 & 0
\end{array}$$

This partial product is the result of 5 × 4,308.

This partial product is the result of 500 × 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.**

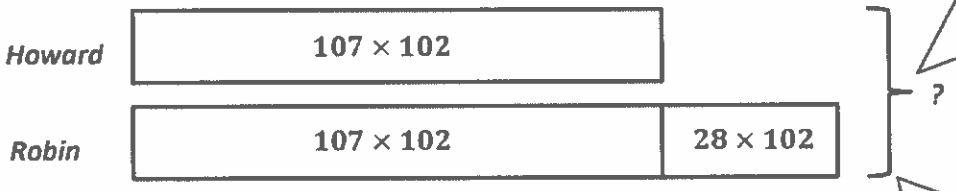
   I think Isaac rounded 809 to 800 and 528 to 500. Then, I think he multiplied 8 times 5 to get 40. From there, I think he miscounted the zeros.

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.



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

Howard:

$$\begin{array}{r} 107 \\ \times\ 102 \\ \hline {\scriptstyle 1} \\ 214 \\ +\ 10700 \\ \hline 10{,}914 \end{array}$$

Robin: $107 + 28 = 135$

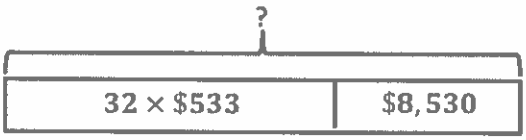
$$\begin{array}{r} 135 \\ \times\ 102 \\ \hline {\scriptstyle 1} \\ 270 \\ +\ 13500 \\ \hline 13{,}770 \end{array}$$

$$\begin{array}{r} 10{,}914 \\ +\ 13{,}770 \\ \hline {\scriptstyle 1}\quad\quad \\ 24{,}684 \end{array}$$

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.*

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



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!

$$\begin{array}{cccccc} & & & 5 & 3 & 3 \\ & & \times & & 3 & 2 \\ \hline & & 1 & 0 & 6 & 6 \\ + & 1 & 5 & 9 & 9 & 0 \\ & & {\scriptstyle 1} & {\scriptstyle 1} & & \\ \hline & 1 & 7, & 0 & 5 & 6 \end{array}$$

$$\begin{array}{cccccc} & 1 & 7, & 0 & 5 & 6 \\ + & & 8, & 5 & 3 & 0 \\ & {\scriptstyle 1} & & & & \\ \hline & 2 & 5, & 5 & 8 & 6 \end{array}$$

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

G5-M1-HWH-1.3.0-07.2015

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 rename 4.1 as 41 tenths and then multiply.

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

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

$$\begin{array}{ccccl}
 & & 2 & 3 & \\
\times & & 4 & 1 & \text{(tenths)} \\ \hline
 & & 2 & 3 & \\
+ & \overset{\cancel{1}}{9} & 2 & 0 & \\ \hline
 & 9 & 4 & 3 & \textit{(tenths)} = 94.3
\end{array}$$

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.

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. $7.1 \times 29 \approx \underline{\ 7\ } \times \underline{\ 30\ } = \underline{\ 210\ }$

7 ones × 3 tens = 21 tens, or 210. This is the estimated product.

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

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. $182.4 \times 32 \approx \underline{\ 200\ } \times \underline{\ 30\ } = \underline{\ 6,000\ }$

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

$$\begin{array}{rrrrrrl} & & 1 & 8 & 2 & 4 & \text{(tenths)} \\ & \times & & & 3 & 2 & \\ \hline & & \overset{\cancel{1}}{3} & 6 & 4 & 8 & \\ + & \overset{\cancel{2}}{5} & 4 & \overset{\cancel{1}}{7} & 2 & 0 & \\ \hline & 5 & \overset{1}{8,} & 3 & 6 & 8 & \textit{(tenths)} \ = 5.836.8 \end{array}$$

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

G5-M2-Lesson 11

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

1.24 ≈ 1
32 ≈ 30
The estimated product is 30.

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

The actual product is 39.68.

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

Think!
$1.24 \times 100 = 124.$

$$\begin{array}{rrrrr} & & 1 & 2 & 4 \\ \times & & & 3 & 2 \\ \hline & & 2 & 4 & 8 \\ & & \overset{\cancel{1}}{} & & \\ + & 3 & 7 & 2 & 0 \\ \hline & 3, & 9 & 6 & 8 \end{array}$$

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.

2. Solve using the standard algorithm.

2.46 × 132

= 324.72

$$\begin{array}{cccccc}
 & & & 2 & 4 & 6 \\
\times & & & 1 & 3 & 2 \\
\hline
 & & & & \cancel{1} & \\
 & & & 4 & 9 & 2 \\
 & & \cancel{1} & \cancel{1} & & \\
 & & 7 & 3 & 8 & 0 \\
+ & 2 & 4 & 6 & 0 & 0 \\
\hline
 & 1 & 1 & 1 & & \\
 & 3 & 2 & 4 & 7 & 2
\end{array}$$

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 ÷ 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 × 736 = 39,744, then 54 × 7.36 = 397.44.

I can compare the factors in both number sentences. Since 736 ÷ 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 ÷ 100 = 397.44

G5-M2-Lesson 12

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

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

14 ≈ 10
3.12 ≈ 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.

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

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

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

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

2. Estimate. Then solve using the standard algorithm.

a. $0.47 \times 32 \approx \underline{\ 0.5\ } \times \underline{\ 30\ } = \underline{\ 15\ }$

$0.47 \approx 0.5$
$32 \approx 30$
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.

$$\begin{array}{ccccc} & & 0. & 4 & 7 \\ & \times & & 3 & 2 \\ \hline & & & \cancel{1} & \\ & & & 9 & 4 \\ & & \cancel{2} & & \\ + & 1 & 4 & 1 & 0 \\ & & 1 & & \\ \hline & 1 & 5. & 0 & 4 \end{array}$$

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

b. $6.04 \times 307 \approx \underline{\ 6\ } \times \underline{\ 300\ } = \underline{\ 1{,}800\ }$

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

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

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.

$$\begin{array}{ccccc} & & 2. & 3 & 5 \\ & \times & & 3 & 1 \\ \hline & & 2 & 3 & 5 \\ & \cancel{1} & \cancel{1} & & \\ + & 7 & 0 & 5 & 0 \\ \hline & 7 & 2. & 8 & 5 \end{array}$$

G5-M2-Lesson 13

1. Solve.

   a. Convert years to days.

$$\begin{aligned} 5 \text{ years} &= 5 \times (1 \text{ year}) \\ &= 5 \times (365 \text{ days}) \\ &= 1{,}825 \text{ days} \end{aligned}$$

$$\begin{array}{rrrr} & 3 & 6 & 5 \\ \times & & & 5 \\ & \cancel{3} & \cancel{2} & \\ \hline 1, & 8 & 2 & 5 \end{array}$$

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.

$$\begin{aligned} 13.5 \text{ lb.} &= 13.5 \times (1 \text{ lb.}) \\ &= 13.5 \times (16 \text{ oz.}) \\ &= 216 \text{ oz.} \end{aligned}$$

$$\begin{array}{rrrrr} & & 1 & 3. & 5 \\ \times & & & 1 & 6 \\ & & \cancel{2} & \cancel{3} & \\ \hline & & 8 & 1 & 0 \\ + & 1 & 3 & 5 & 0 \\ & \cancel{1} & & & \\ \hline & 2 & 1 & 6. & 0 \end{array}$$

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?

$$\begin{aligned} 7.3 \text{ m} &= 7.3 \times (1 \text{ m}) \\ &= 7.3 \times (100 \text{ cm}) \\ &= 730 \text{ cm} \end{aligned}$$

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.

$$
\begin{aligned}
0.3\ \mathrm{L} &= 0.3 \times (1\ \mathrm{L}) \\
&= 0.3 \times (1{,}000\ \mathrm{ml}) \\
&= 300\ \mathrm{ml}
\end{aligned}
$$

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.*

G5-M2-Lesson 14

1. Solve.

   a. Convert quarts to gallons.

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

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

   b. Convert grams to kilograms.

$$\begin{aligned} 5{,}030 \text{ g} &= \mathbf{5,030 \times (1\ g)} \\ &= \mathbf{5,030 \times (0.001\ kg)} \\ &= \mathbf{5.030\ kg} \end{aligned}$$

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.

$$\begin{aligned} \mathbf{16\ cups} &= \mathbf{16 \times (1\ cup)} \\ &= \mathbf{16 \times \left(\tfrac{1}{2}\ pint\right)} \\ &= \mathbf{\tfrac{16}{2}\ pints} \\ &= \mathbf{8\ pints} \end{aligned}$$

1 cup is equal to $\frac{1}{2}$ pint. I multiply 16 times $\frac{1}{2}$ 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?

$$\begin{aligned} \mathbf{305\ cm} &= \mathbf{305 \times (1\ cm)} \\ &= \mathbf{305 \times (0.01\ m)} \\ &= \mathbf{3.05\ m} \end{aligned}$$

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

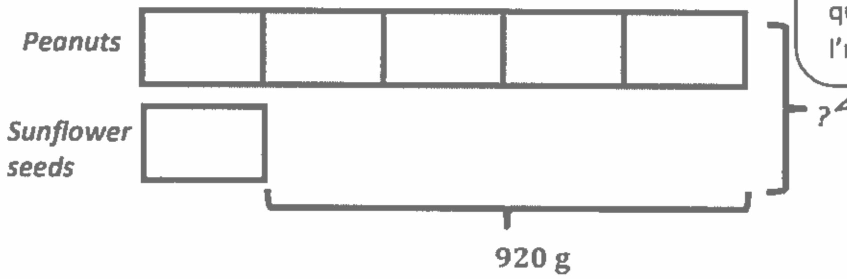
The table's length is* 3.05 *meters.

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.



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

$$\begin{array}{r|rrr}
 & 2 & 3 & 0 \\ \cline{2-4}
4 & 9 & 2 & 0 \\
- & 8 & & \\ \hline
 & 1 & 2 & \\
- & 1 & 2 & \\ \hline
 & & 0 & 0 \\
 & & - & 0 \\ \hline
 & & & 0
\end{array}$$

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

$$\begin{array}{rrrr}
 & 2 & 3 & 0 \\
\times & & & 6 \\
 & \cancel{1} & & \\ \hline
1, & 3 & 8 & 0
\end{array}$$

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

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

$$\begin{aligned} 1{,}380\ \mathrm{g} &= 1{,}380 \times (1\ \mathrm{g}) \\ &= 1{,}380 \times (0.001\ \mathrm{kg}) \\ &= 1.380\ \mathrm{kg} \end{aligned}$$

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: $450\ \mathrm{cm} \div 9 = 50\ \mathrm{cm}$

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

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

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

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

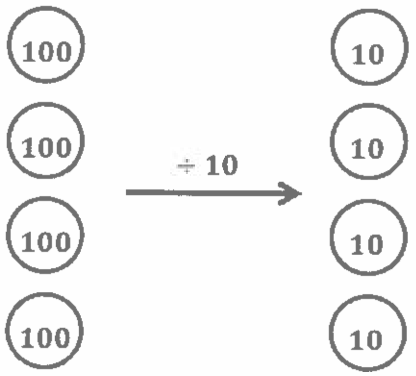
I'll subtract to find the difference between Michael and Gabriel's strings.

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 ÷ 1. The answer is 6,500.

2. Divide.

   a. $240{,}000 \div 40$

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

   $= 24{,}000 \div 4$

   $= 6{,}000$

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

I can solve 240,000 ÷ 10 = 24,000. Then I can find that 24,000 ÷ 4 = 6,000.

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

b. $240{,}000 \div 400$

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

$= 2{,}400 \div 4$

$= 600$

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

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

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

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

$= 240 \div 4$

$= 60$

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

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

G5-M2-Lesson 17

1. Estimate the quotient for the following problems.

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

a. $612 \div 33$

$\approx \mathbf{600 \div 30}$

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

$= \mathbf{20}$

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

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

b. $735 \div 78$

$\approx \mathbf{720 \div 80}$

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

$= \mathbf{9}$

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

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

c. $821 \div 99$

$\approx \mathbf{800 \div 100}$

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

$= \mathbf{8}$

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

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 ÷ 48

I look at the divisor, 48, and round it to the nearest ten. 48 ≈ 50

$989 \div 48$

$\approx 1,000 \div 50$

$= 20$

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

I can use the simple fact, 10 ÷ 5 = 2, to help me solve 1,000 ÷ 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. $3{,}782 \div 23$

$\approx \mathbf{4{,}000 \div 20}$

$= \mathbf{200}$

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

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. $2{,}519 \div 43$

$\approx \mathbf{2{,}400 \div 40}$

$= \mathbf{60}$

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

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. $4{,}621 \div 94$

$\approx \mathbf{4{,}500 \div 90}$

$= \mathbf{50}$

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

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

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.

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

$4,825 \div 68$

$\approx 4,900 \div 70$

$= 70$

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

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

Meilin worked about 70 *hours.*

G5-M2-Lesson 19

1. Divide, and then check.

a. 87 ÷ 40

I use the estimation strategy from the previous lesson to help me solve. 80 ÷ 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.

$$\begin{array}{r|l} & \;2 \;\; R\,7 \\ \hline 40 & 87 \\ - & 80 \\ \hline & \;\;7 \end{array}$$

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 ÷ 70

I estimate to find the quotient. 420 ÷ 70 = 6

The quotient is 6 with a remainder of 31.

$$\begin{array}{r|l} & \;\;\;6 \;\; R\,31 \\ \hline 70 & 451 \\ - & 420 \\ \hline & \;\;31 \end{array}$$

The quotient is 6 with a remainder of 31.

Check:

$70 \times 6 = 420$

$420 + 31 = 451$

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

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 ÷ 30 = 7

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

$$\begin{array}{rrrrl} & & & 7 & R\,14 \\ \cline{2-4} 30 \big) & 2 & 2 & 4 & \\ - & 2 & 1 & 0 & \\ \cline{2-4} & & 1 & 4 & \end{array}$$

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.

G5-M2-Lesson 20

1. Divide. Then check with multiplication.

a. 48 ÷ 21

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

$$\begin{array}{rl} & 2 \;\; R\,6 \\ 21 & \big)\overline{4\,8} \\ - & 4\,2 \\ \hline & 6 \end{array}$$

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.

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 ÷ 38

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

$$\begin{array}{rl} & 2 \;\; R\,3 \\ 38 & \big)\overline{7\,9} \\ - & 7\,6 \\ \hline & 3 \end{array}$$

The actual quotient is 2 with a remainder of 3.

Check:

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

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

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.

$100 \div 20 = 5$

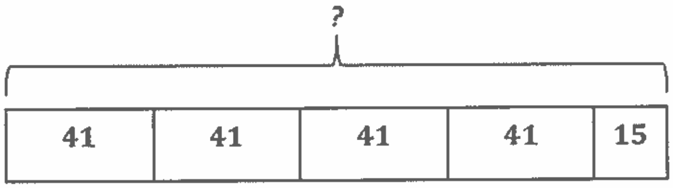
$$\begin{array}{rr} & 5 \\ 19 & \overline{)\,9\ 5} \\ - & 9\ 5 \\ \hline & 0 \end{array}$$

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?



$$\begin{array}{rl} & 4\quad R\,15 \\ 41 & \overline{)\,?\quad} \end{array}$$

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.

G5-M2-Lesson 21

1. Divide. Then check using multiplication.

a. 235 ÷ 68

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

I can estimate to find the quotient. 210 ÷ 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.

$$\begin{array}{r|l} & \quad\ \ 3 \quad R\,31 \\ \cline{2-2} 68 & 2\ 3\ 5 \\ - & 2\ 0\ 4 \\ \cline{2-2} & \quad 3\ 1 \end{array}$$

Check:

$$\begin{array}{r} 6\ 8 \\ \times \quad\ 3 \\ \hline 2\ \overset{2}{0}\ 4 \end{array} \qquad \begin{array}{r} 2\ 0\ 4 \\ +\ \ 3\ 1 \\ \hline 2\ 3\ 5 \end{array}$$

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

b. 125 ÷ 32

I estimate to find the quotient. 120 ÷ 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.

$$\begin{array}{r|l} & \qquad 4 \\ \cline{2-2} 32 & 1\ 2\ 5 \\ - & 1\ 2\ 8 \\ \cline{2-2} & \qquad ? \end{array} \Rightarrow \begin{array}{r|l} & \qquad 3 \quad R\,29 \\ \cline{2-2} 32 & 1\ 2\ 5 \\ - & \quad 9\ 6 \\ \cline{2-2} & \quad 2\ 9 \end{array}$$

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.

Check:

To check, I'll multiply the divisor and the quotient and then add the remainder.

$$\begin{array}{r} 3\ 2 \\ \times\quad 3 \\ \hline 9\ 6 \end{array} \qquad \begin{array}{r} 9\ 6 \\ +\quad 2\ 9 \\ \hline {}^{1}1\ {}^{1}2\ 5 \end{array}$$

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

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

$$\begin{array}{rl} & 3 \quad \text{R } 12 \\ 49 & \overline{)\,1\ 5\ 9} \\ - & 1\ 4\ 7 \\ \hline & 1\ 2 \end{array}$$

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.

G5-M2-Lesson 22

1. Divide. Then check using multiplication.

a. 874 ÷ 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.

$$\begin{array}{r} 2 \\ 41\,\overline{)\,874} \\ -\;82 \\ \hline 5 \end{array} \quad \Rightarrow \quad \begin{array}{r} 21 \;\; R\,13 \\ 41\,\overline{)\,874} \\ -\;82 \\ \hline 54 \\ -\;41 \\ \hline 13 \end{array}$$

5 tens plus 4 in the dividend makes 54.

The quotient is 21 with a remainder of 13.

Check:

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

$$\begin{array}{r} 21 \\ \times\;41 \\ \hline 21 \\ +\;840 \\ \hline 861 \end{array} \qquad \begin{array}{r} 861 \\ +\;\;13 \\ \hline 874 \end{array}$$

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

b. 703 ÷ 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.

$$\begin{array}{r} 2 \\ 29\,\overline{)\,703} \\ -\;58 \\ \hline 12 \end{array} \quad \Rightarrow \quad \begin{array}{r} 24 \;\; R\,7 \\ 29\,\overline{)\,703} \\ -\;58 \\ \hline 123 \\ -\;116 \\ \hline 7 \end{array}$$

12 tens plus 3 in the dividend makes 123.

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.

Check:

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

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

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?

$$\begin{array}{r|rrr} & & & 5 \;\; R\,12 \\ \hline 31 & 1 & 6 & 7 \\ - & 1 & 5 & 5 \\ \hline & & 1 & 2 \end{array}$$

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?

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

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 ÷ 22

I look at the dividend of 4,753 and estimate. 40 hundreds ÷ 20 = 2 hundreds, or 4,000 ÷ 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 ÷ 20 = 1 ten, or 200 ÷ 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 ÷ 20 = 6 ones, or 120 ÷ 20 = 6. I record 6 in the ones place. There's a remainder of 1 one.

$$\begin{array}{rrrrr} & & 2 & & \\ \cline{2-5} 22 & \multicolumn{1}{|r}{4,} & 7 & 5 & 3 \\ - & 4 & 4 & & \\ \cline{2-3} & & 3 & & \end{array} \quad \Rightarrow \quad \begin{array}{rrrrr} & & 2 & 1 & \\ \cline{2-5} 22 & \multicolumn{1}{|r}{4,} & 7 & 5 & 3 \\ - & 4 & 4 & & \\ \cline{2-4} & & 3 & 5 & \\ & - & 2 & 2 & \\ \cline{3-5} & & 1 & 3 & \end{array} \quad \Rightarrow \quad \begin{array}{rrrrrl} & & 2 & 1 & 6 & R\,1 \\ \cline{2-5} 22 & \multicolumn{1}{|r}{4,} & 7 & 5 & 3 & \\ - & 4 & 4 & & & \\ \cline{2-4} & & 3 & 5 & & \\ & - & 2 & 2 & & \\ \cline{3-5} & & 1 & 3 & 3 & \\ & - & 1 & 3 & 2 & \\ \cline{3-5} & & & & 1 & \end{array}$$

Check:

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

$$\begin{array}{rrrrr} & & 2 & 1 & 6 \\ \times & & & 2 & 2 \\ \hline & & 4 & \overset{\cancel{1}}{3} & 2 \\ & & \overset{\cancel{1}}{} & & \\ + & 4 & 3 & 2 & 0 \\ \hline & 4, & 7 & 5 & 2 \end{array} \qquad \begin{array}{rrrrr} & 4, & 7 & 5 & 2 \\ + & & & & 1 \\ \hline & 4, & 7 & 5 & 3 \end{array}$$

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

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

$$\begin{array}{r} 6 \\ 62\,\overline{)\,3,\ 7\ 9\ 5} \\ -\ 3\ \ 7\ \ 2 \\ \hline 7 \end{array} \quad \Rightarrow \quad \begin{array}{r} 6\ \ 1\ \ R\,13 \\ 62\,\overline{)\,3,\ 7\ 9\ 5} \\ -\ 3\ \ 7\ \ 2 \\ \hline 7\ \ 5 \\ -\ 6\ \ 2 \\ \hline 1\ \ 3 \end{array}$$

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.

$$\begin{array}{r} 6\ 1 \\ \times\ \ 6\ 2 \\ \hline 1\ 2\ 2 \\ +\ 3\ 6\ 6\ 0 \\ \hline 3,\ 7\ 8\ 2 \end{array} \qquad \begin{array}{r} 3,\ 7\ 8\ 2 \\ +\ \ \ 1\ 3 \\ \hline 3,\ 7\ 9\ 5 \end{array}$$

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.

$$\begin{array}{r} 3\ \ 4 \\ 38\,\overline{)\,1,\ 2\ 9\ 2} \\ -\ 1\ \ 1\ \ 4 \\ \hline 1\ \ 5\ \ 2 \\ -\ 1\ \ 5\ \ 2 \\ \hline 0 \end{array}$$

Each student received 34 balloons with 0 balloons left over.

Each student received 34 balloons.

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. $48.4 \div 200 = 48.4 \div 2 \div 100$

$= 24.2 \div 100$

$= 0.242$

$48 \div 2 = 24$

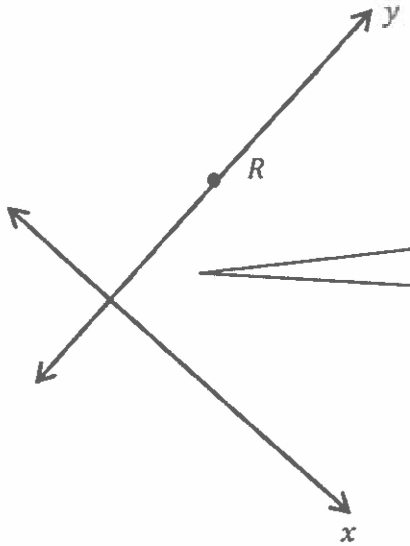
4 tenths $\div 2 = 2$ tenths or 0.2.

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.

G5-M6-Lesson 2

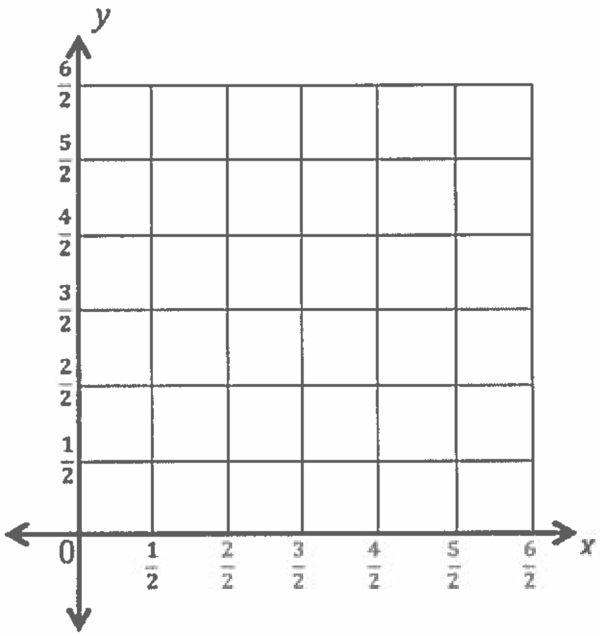
1. Use a set square to draw a line perpendicular to the x-axis through point R. Label the new line as the y-axis.



I align the base of my set square with the x-axis and then trace a line along the perpendicular edge to draw the y-axis.

2. Use the perpendicular lines below to create a coordinate plane. Mark 6 units on each axis, and label them as fractions.

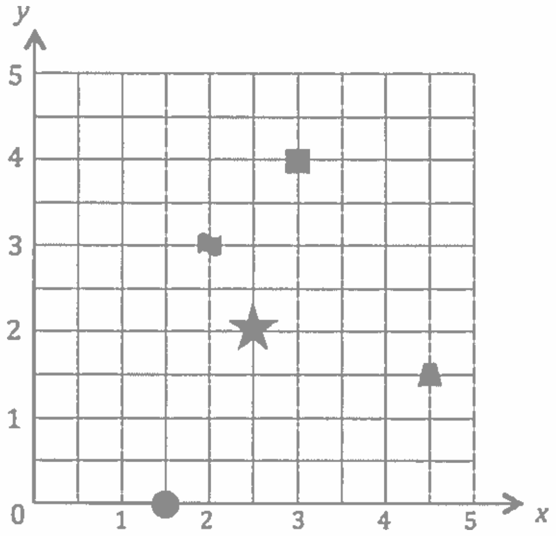
I chose fractional units of $\frac{1}{2}$, but I could have chosen any fractional unit.



3. Use the coordinate plane to answer the following.

x-coordinate	y-coordinate	Shape
$1\frac{1}{2}$	0	*circle*
4.5	1.5	*trapezoid*
2	3	*flag*
3	4	*square*

$1\frac{1}{2}$ is not one of the numbers on the x-axis, but I know that $1\frac{1}{2}$ falls halfway between 1 and 2.



a. Name the shape at each location.

b. What shape is 3 units from the x-axis?

The flag is 3 units from the x-axis.

c. Which shape has a y-coordinate of 3?

The flag has a y-coordinate of 3.

Problems 3(b) and 3(c) are asking the same question in different ways.

d. Draw a star at $\left(2\frac{1}{2}, 2\right)$.

The numbers in the parentheses are *coordinate pairs.* Coordinate pairs are written in parentheses with a comma separating the two coordinates. The *x-coordinate* is given first.

EUREKA MATH

G5-M6-Lesson 3

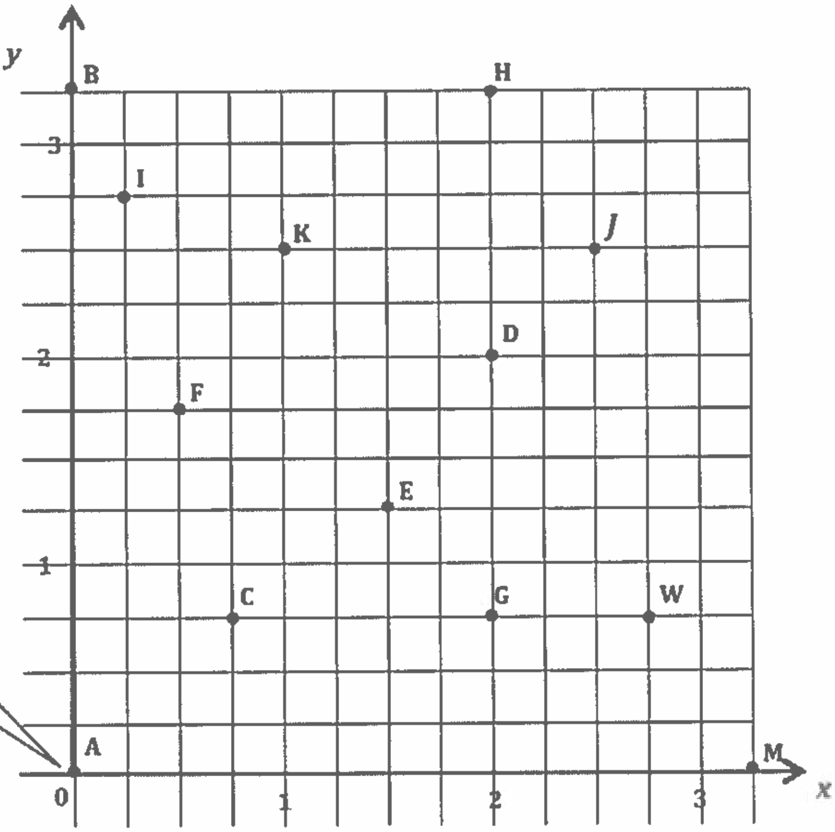
The y-axis is a vertical line. The x-axis is a horizontal line.

The origin, or $(0, 0)$, is where the x- and y-axes meet.

1. Use the grid below to complete the following tasks.
   a. Construct a y-axis that passes through points A and B. Label this axis.
   b. Construct an x-axis that is perpendicular to the y-axis that passes through points A and M.
   c. Label the origin.
   d. The x-coordinate of point W is $2\frac{3}{4}$. Label the whole numbers along the x-axis.
   e. Label the whole numbers along the y-axis.

The y-axis must be labeled the same way as the x-axis. On the x-axis, the distance between grid lines is $\frac{1}{4}$. I can use the same units for the y-axis.

I find point W on the coordinate plane. I can trace down with my finger to locate this spot on the x-axis. I count back to 0 and see that each line on the grid is $\frac{1}{4}$ more than the previous line.



This is the origin.

2. For the following problems, consider all the points on the previous page.

   a. Identify all the points that have a y-coordinate of $\frac{3}{4}$.

   C, G, and W

   I look for all of the points that are $\frac{3}{4}$ units from the x-axis.

   b. Identify all the points that have an x-coordinate of 2.

   G, D, and H

   I look for points that are 2 units from the y-axis.

   c. Name the point, and write the coordinate pair that is $2\frac{1}{2}$ units above the x-axis and 1 unit to the right of the y-axis.

   $K\left(1, 2\frac{1}{2}\right)$

   d. Which point is located $1\frac{1}{4}$ units from the x-axis? Give its coordinates.

   $E\left(1\frac{1}{2}, 1\frac{1}{4}\right)$

   e. Which point is located $\frac{1}{4}$ units from the y-axis? Give its coordinates.

   $I\left(\frac{1}{4}, 2\frac{3}{4}\right)$

   f. Give the coordinates for point C.

   $\left(\frac{3}{4}, \frac{3}{4}\right)$

   g. Plot a point where both coordinates are the same. Label the point J, and give its coordinates.

   $\left(2\frac{1}{2}, 2\frac{1}{2}\right)$

   There are infinite correct answers to this question. I could name coordinates that are not on the grid lines. For example, $(1.88, 1.88)$ would be correct.

   h. Name the point where the two axes intersect. Write the coordinates for this point.

   $A\,(0, 0)$

   This point is also known as the origin. The axes meet at the origin.

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i. What is the distance between points W and G, or WG?

$\frac{3}{4}$ unit

I count the units between the points. The distance between each grid line is $\frac{1}{4}$.

j. Is the length of $\overline{HG}$ greater than, less than, or equal to $CG + KJ$?

$HG = 2\frac{1}{2}$ *units* $CG = 1\frac{1}{4}$ *units* $KJ = 1\frac{1}{2}$ *units* $CG + KJ = 2\frac{3}{4}$ *units* $HG < CG + KJ$

k. Janice described how to plot points on the coordinate plane. She said, "If you want to plot $(1, 3)$, go 1, and then go 3. Put a point where these lines intersect." Is Janice correct?

Janice is not correct. She should give a starting point and a direction. She should say, "Start at the origin. Along the x-axis, go 1 unit to the right, and then go up 3 units parallel to the y-axis."

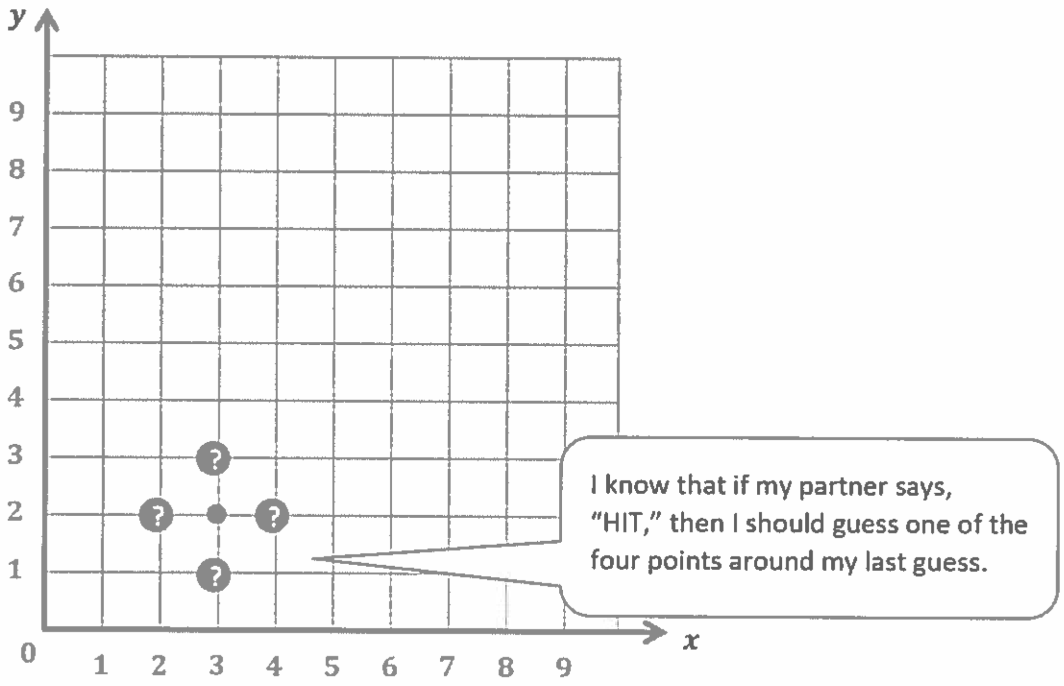
G5-M6-Lesson 4

Lesson Notes

The rules for playing *Battleship*, a popular game, are at the end of this Homework Helper.

1. While playing *Battleship*, your friend says, "Hit!" when you guess point $(3, 2)$. How do you decide which points to guess next?

   If I get a hit at point $(3, 2)$*, then I know I should try to guess one of the four points around* $(3, 2)$ *because the ship has to lie either vertically or horizontally according to the rules. I would guess one of these points:* $(2, 2)$, $(3, 1)$, $(4, 2)$, *or* $(3, 3)$.



I know that if my partner says, "HIT," then I should guess one of the four points around my last guess.

2. What changes to the game could make it more challenging?

   The game is easiest when I count by ones on the coordinate grid's axes. If I changed the axes to count by another number like 7's or 9's on each grid line, the game would be more challenging. It would also be more challenging if I skip-count on the axes by fractions such as $\frac{1}{2}$ *or* $2\frac{1}{2}$.

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Battleship Rules

Goal: To sink all of your opponent's ships by correctly guessing their coordinates.

Materials

- 1 My Ships grid sheet (per person/per game)
- 1 Enemy Ships grid sheet (per person/per game)
- Red crayon/marker for hits
- Black crayon/marker for misses
- Folder to place between players

Ships

- Each player must mark 5 ships on the grid.
  - Aircraft Carrier—Plot 5 points
  - Battleship—Plot 4 points
  - Cruiser—Plot 3 points
  - Submarine—Plot 3 points
  - Patrol Boat—Plot 2 points

Setup

- With your opponent, choose a unit length and fractional unit for the coordinate plane.
- Label chosen units on both grid sheets.
- Secretly select locations for each of the 5 ships on your My Ships grid.
  - All ships must be placed horizontally or vertically on the coordinate plane.
  - Ships can touch each other, but they may not occupy the same coordinate.

Play

- Players take turns firing one shot to attack enemy ships.
- On your turn, call out the coordinates of your attacking shot. Record the coordinates of each attack shot.
- Your opponent checks his My Ships grid. If that coordinate is unoccupied, your opponent says, "Miss." If you named a coordinate occupied by a ship, your opponent says, "Hit."
- Mark each attempted shot on your Enemy Ships grid. Mark a black ✖ on the coordinate if your opponent says, "Miss." Mark a red ✓ on the coordinate if your opponent says, "Hit."
- On your opponent's turn, if he hits one of your ships, mark a red ✓ on that coordinate of your My Ships grid. When one of your ships has every coordinate marked with a ✓, say, "You've sunk my [name of ship]."

Victory

- The first player to sink all (or the most) opposing ships wins.

G5-M6-Lesson 5

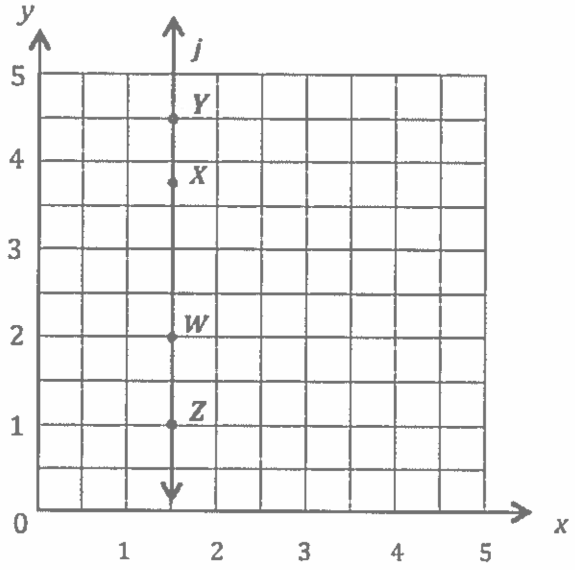
1. Use the coordinate plane to answer the questions.

   a. Use a straight edge to construct a line that goes through points Z and Y. Label this line j.

   b. Line j is perpendicular to the __x__-axis, and is parallel to the __y__-axis.

   Parallel lines will never cross.

   Perpendicular lines form 90° angles.



   c. Draw two more points on line j. Name these points X and W.

   d. Give the coordinates of each point below.

2.

   a. W: $\left(1\frac{1}{2}, 2\right)$ X: $\left(1\frac{1}{2}, 3\frac{3}{4}\right)$ Y: $\left(1\frac{1}{2}, 4\frac{1}{2}\right)$ Z: $\left(1\frac{1}{2}, 1\right)$

   b. What do all these points on line j have in common?

   The x-coordinate is always $1\frac{1}{2}$.

   This line is perpendicular to the x-axis and parallel to the y-axis because the x-coordinate is the same in every coordinate pair.

   c. Give the coordinate pair of another point that falls on line j with a y-coordinate greater than 10.

   $\left(1\frac{1}{2}, 12\right)$

   As long as the x-coordinate is $1\frac{1}{2}$, the point will fall on line j.

3. For each pair of points below, think about the line that joins them. Will the line be parallel to the x-axis or y-axis? Without plotting them, explain how you know.

   a. $(1.45, 2)$ and $(66, 2)$

   Since these coordinate pairs have the same y-coordinate, the line that joins them will be a horizontal line and parallel to the x-axis.

   b. $\left(\frac{1}{2}, 19\right)$ and $\left(\frac{1}{2}, 82\right)$

   Since these coordinate pairs have the same x-coordinate, the line that joins them will be a vertical line and parallel to the y-axis.

4. Write the coordinate pairs of 3 points that can be connected to construct a line that is $3\frac{1}{8}$ units above and parallel to the x-axis.

   $\left(7, 3\frac{1}{8}\right)$ $\left(6\frac{1}{8}, 3\frac{1}{8}\right)$ $\left(79, 3\frac{1}{8}\right)$

In order for the line to be $3\frac{1}{8}$ units above the x-axis, the coordinate pairs must have a y-coordinate of $3\frac{1}{8}$. I can use any x-coordinate.

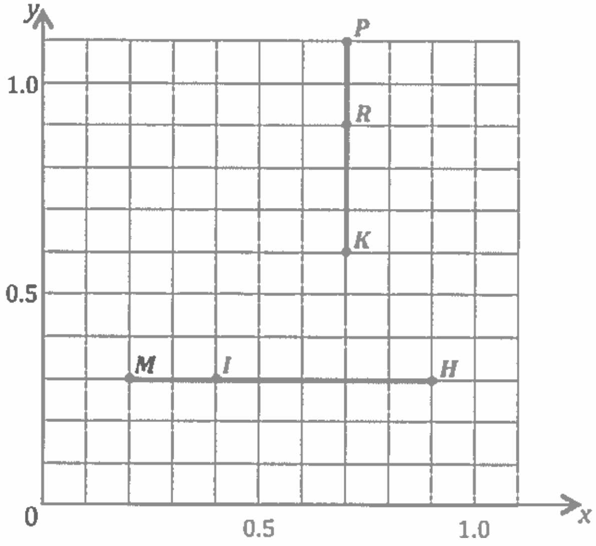
5. Write the coordinate pairs of 3 points that lie on the x-axis.

   $(7, 0)$ $(11.1, 0)$ $(100, 0)$

G5-M6-Lesson 6

1. Plot and label the following points on the coordinate plane.

$K\ (0.7, 0.6)$	$P\ (0.7, 1.1)$	$M\ (0.2, 0.3)$	$H\ (0.9, 0.3)$



a. Use a straightedge to construct line segments KP and MH.

b. Name the line segment that is perpendicular to the x-axis and parallel to the y-axis.

$\overline{KP}$

Because the x-coordinates of K and P are the same, segment KP is parallel to the y-axis.

c. Name the line segment that is parallel to the x-axis and perpendicular to the y-axis.

$\overline{MH}$

Because the y-coordinates of M and H are the same, segment MH is perpendicular to the y-axis.

d. Plot a point on $\overline{KP}$, and name it R.

e. Plot a point on $\overline{MH}$, and name it I.

f. Write the coordinates for points R and I.

$R\ (0.7, 0.9)$ $I\ (0.4, 0.3)$

2. Construct line j such that the y-coordinate of every point is $2\frac{1}{4}$, and construct line k such that the x-coordinate of every point is $1\frac{3}{4}$.

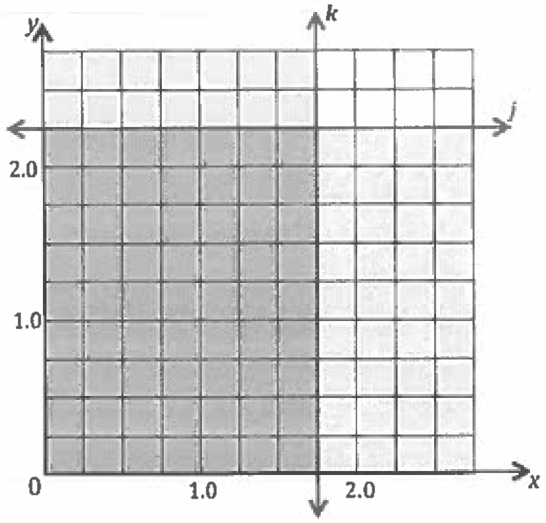
Since all the y-coordinates are the same, line j will be a horizontal line. Since all the x-coordinates are the same, line k will be a vertical line.

a. Line j is $2\frac{1}{4}$ units from the x-axis.

b. Give the coordinates of the point on line j that is 1 unit from the y-axis.

$\left(1, 2\frac{1}{4}\right)$

"1 unit from the y-axis" gives the value of the x-coordinate.



c. With a colored pencil, shade the portion of the grid that is less than $2\frac{1}{4}$ units from the x-axis.

I use blue to shade the grid below line j.

d. Line k is $1\frac{3}{4}$ units from the y-axis.

e. Give the coordinates of the point on line k that is $1\frac{1}{2}$ units from the x-axis.

$\left(1\frac{3}{4}, 1\frac{1}{2}\right)$

"$1\frac{1}{2}$ units from the x-axis" gives the value of the y-coordinate.

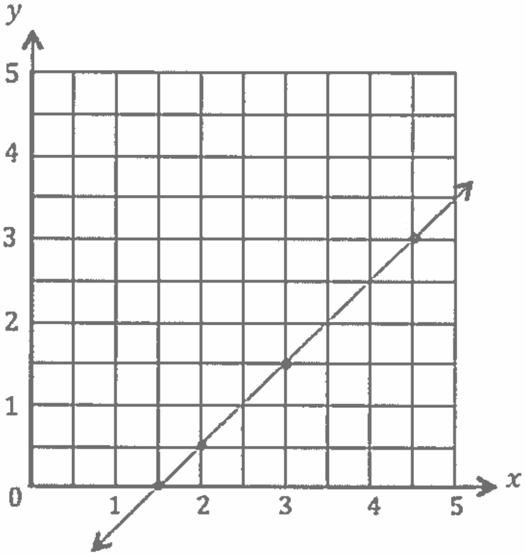
f. With another colored pencil, shade the portion of the grid that is less than $1\frac{3}{4}$ units from the y-axis.

I use pink to shade the grid to the left of line k. The area of the grid that is below line j and to the left of line k now looks purple.

G5-M6-Lesson 7

1. Complete the chart. Then, plot the points on the coordinate plane.

x	y	(x, y)
3	$1\frac{1}{2}$	$\left(3, 1\frac{1}{2}\right)$
$1\frac{1}{2}$	0	$\left(1\frac{1}{2}, 0\right)$
2	$\frac{1}{2}$	$\left(2, \frac{1}{2}\right)$
$4\frac{1}{2}$	3	$\left(4\frac{1}{2}, 3\right)$



a. Use a straightedge to draw a line connecting these points.

b. Write a rule showing the relationship between the x-coordinates and y-coordinates of points on this line.

I could have also said that the y-coordinates are $1\frac{1}{2}$ less than the corresponding x-coordinates.

Each x-coordinate is $1\frac{1}{2}$ more than its corresponding y-coordinate.

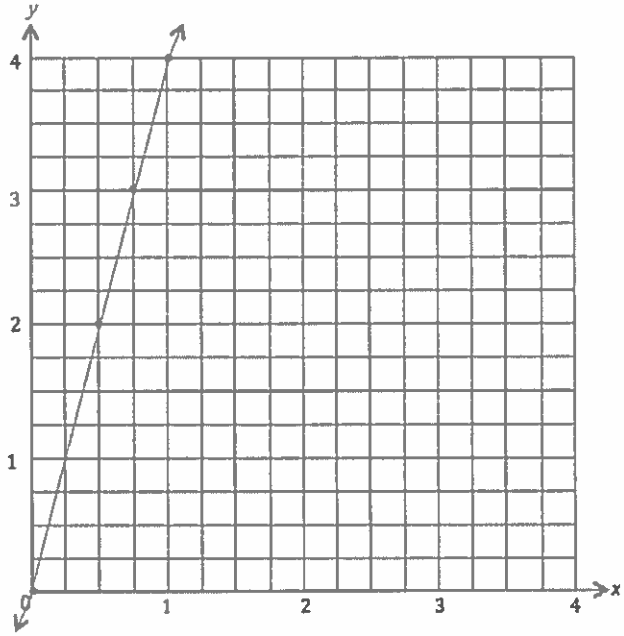
c. Name the coordinates of two other points that are also on this line.

$\left(2\frac{1}{2}, 1\right)$ *and* $\left(5, 3\frac{1}{2}\right)$

As long as the x-coordinate is $1\frac{1}{2}$ more than the y-coordinate, the point will fall on this line.

2. Complete the chart. Then, plot the points on the coordinate plane.

x	y	(x, y)
$\frac{3}{4}$	3	$\left(\frac{3}{4}, 3\right)$
1	4	$(1, 4)$
$\frac{1}{2}$	2	$\left(\frac{1}{2}, 2\right)$
0	0	$(0, 0)$



a. Use a straightedge to draw a line connecting these points.

b. Write a rule showing the relationship between the x-coordinates and y-coordinates for points on the line.

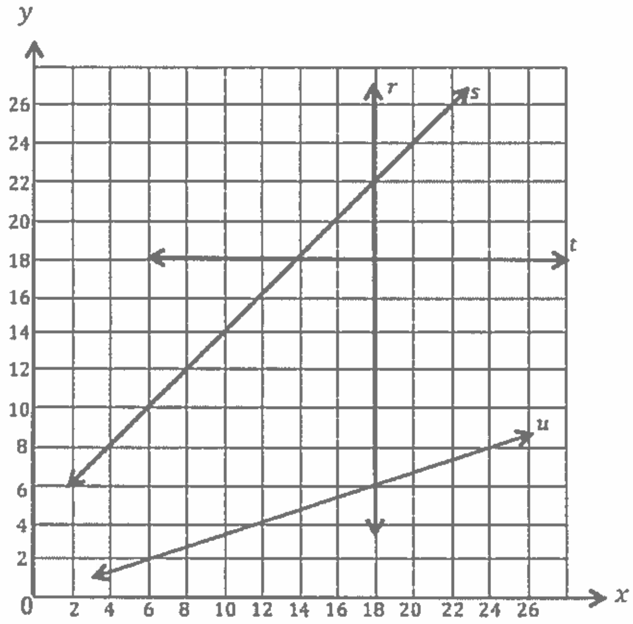
Each y-coordinate is four times as much as its corresponding x-coordinate.

c. Name two other points that are also on this line.

$(2, 8)$ *and* $\left(\frac{5}{8}, 2\frac{1}{2}\right)$

This rule is also correct: Each x-coordinate is 1 fourth as much as its corresponding y-coordinate.

3. Use the coordinate plane to answer the following questions.



a. For any point on line r, the x-coordinate is 18.

The x-coordinate tells the distance from the y-axis.

b. Give the coordinates for 3 points that are on line s.

$(4, 8)$ $(10, 14)$ $(20, 24)$

c. Write a rule that describes the relationship between the x-coordinates and y-coordinates on line s.

Each y-coordinate is 4 more than its corresponding x-coordinate.

I could also say, "Each x-coordinate is 4 less than the y-coordinate."

d. Give the coordinates for 3 points that are on line u.

$(6, 2)$ $(12, 4)$ $(24, 8)$

e. Write a rule that describes the relationship between the x-coordinates and y-coordinates on line u.

Each x-coordinate is 3 times as much as the y-coordinate.

I could also say, "Each y-coordinate is $\frac{1}{3}$ the value of the x-coordinate."

f. Each of these points lies on at least 1 of the lines shown in the plane above. Identify a line that contains the following points.

$(18, 16.3)$ r $(9.5, 13.5)$ s $\left(16, 5\frac{1}{3}\right)$ u $(22.3, 18)$ t

All of the points on line r have an x-coordinate of 18.

All of the points on line t have a y-coordinate of 18.

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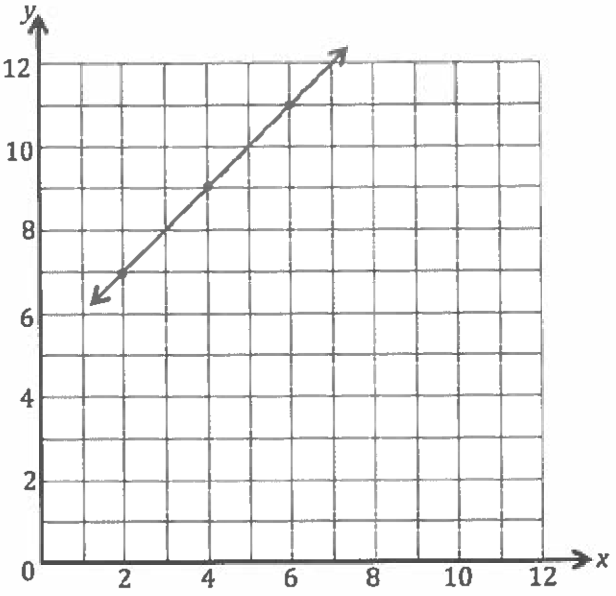
G5-M6-Lesson 8

Complete this table such that each y-coordinate is 5 more than the corresponding x-coordinate.

x	y	(x, y)
2	7	$(2, 7)$
4	9	$(4, 9)$
6	11	$(6, 11)$

I choose coordinate pairs that satisfy the rule and will fit on the coordinate plane.



a. Plot each point on the coordinate plane.

b. Use a straightedge to construct a line connecting these points.

c. Give the coordinate of 3 other points that fall on this line with x-coordinates greater than 15.

$(17, 22)$ $\left(20\frac{1}{2}, 25\frac{1}{2}\right)$ $(100, 105)$

Although I can't see these points on the plane, I know they will fall on the line because each y-coordinate is 5 more than the x-coordinate.

G5-M6-Lesson 9

In order to find the y-coordinates, I just follow the rule, "y is 2 less than x."

So when x is 5, I find the number that is 2 less than 5. $5 - 2 = 3$.

So when x is 5, y is 3.

1. Complete the table with the given rules.

Line a

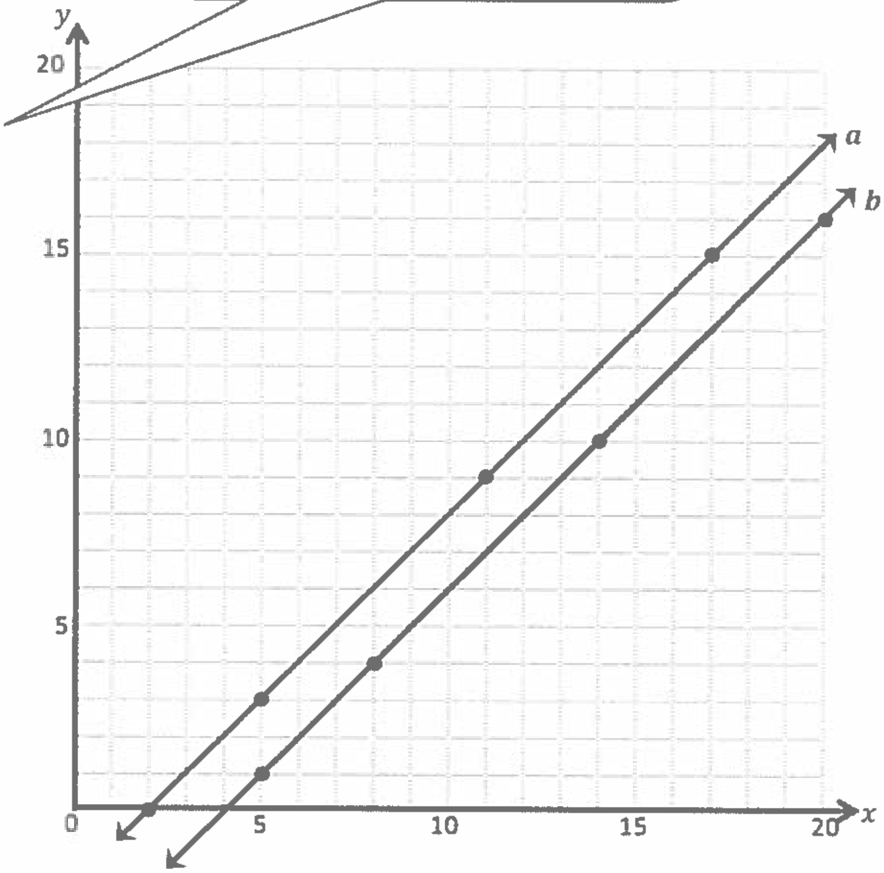
Rule: y is 2 less than x.

x	y	(x, y)
2	0	$(2, 0)$
5	3	$(5, 3)$
10	8	$(10, 8)$
17	15	$(17, 15)$

Line b

Rule: y is 4 less than x.

x	y	(x, y)
5	1	$(5, 1)$
8	4	$(8, 4)$
14	10	$(14, 10)$
20	16	$(20, 16)$



a. Construct each line on the coordinate plane.

b. Compare and contrast these lines.

The lines are parallel. Neither line passes through the origin. Line b looks like it is closer to the x-axis or farther down and to the right. Line a is closer to the y-axis and farther up and to the left.

c. Based on the patterns you see, predict what line c, whose rule is y *is 6 less than* x, would look like.

Since the rule for line c is also a subtraction rule, I think it will also be parallel to lines a and b. But, since the rule is "y is 6 less than x," I think it will be even farther to the right than line b.

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In order to find the y-coordinates, I just follow the rule, "y is 2 times as much as x."

So when x is 4, I find the number that is 2 times as much as 4: $4 \times 2 = 8$.

So when x is 4, y is 8.

2. Complete the table for the given rules.

Line *e*

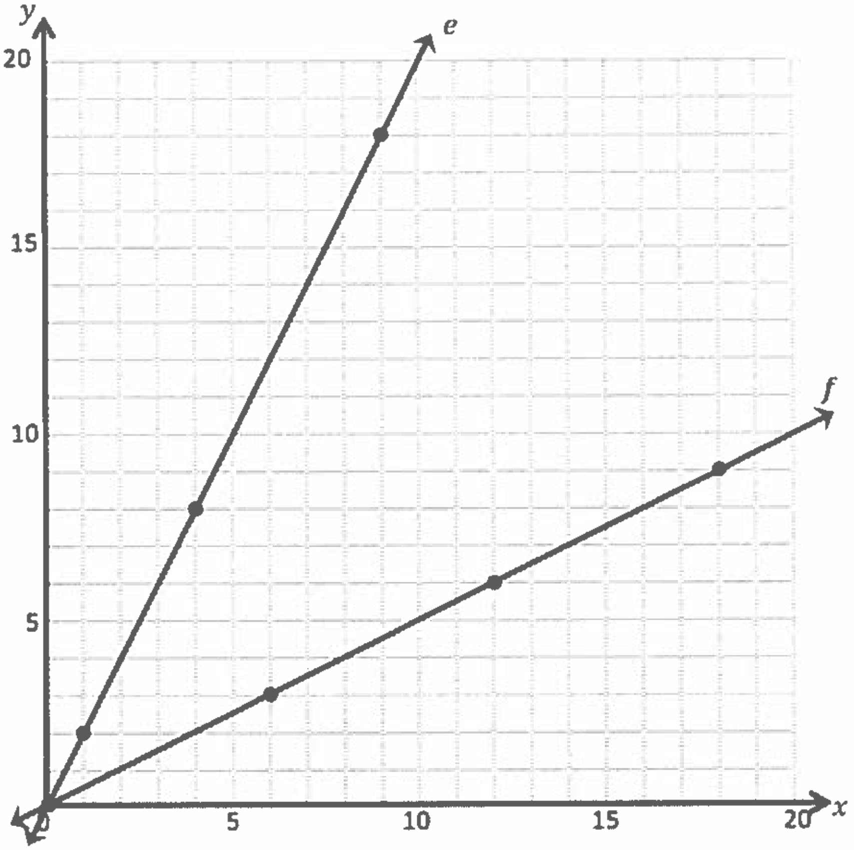
Rule: y is 2 times as much as x.

x	y	(x, y)
0	0	(0, 0)
1	2	(1, 2)
4	8	(4, 8)
9	18	(9, 18)

Line *f*

Rule: y is half as much as x.

x	y	(x, y)
0	0	(0, 0)
6	3	(6, 3)
12	6	(12, 6)
18	9	(18, 9)



a. Construct each line on the coordinate plane.

b. Compare and contrast these lines.

Both lines go through the origin, and they are not parallel. Line e is steeper than line f.

c. Based on the patterns you see, predict what line g, whose rule is y *is 3 times as much as* x, and line h, whose rule is y *is a third as much as* x, would look like.

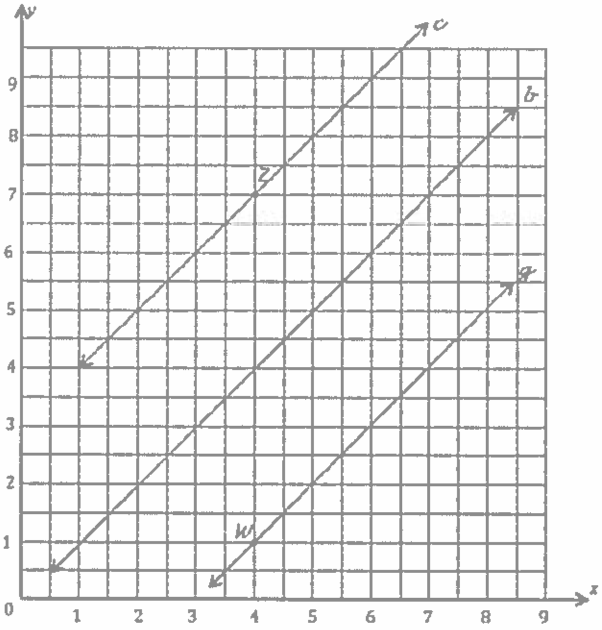
Since the rule for line g is also a multiplication rule, I think it will also pass through the origin. But, since the rule is "y is 3 times as much as x," I think it will be even steeper than lines e and f.

G5-M6-Lesson 10

1. Use the coordinate plane to complete the following tasks.

   a. The rule for line b is "x and y are equal." Construct line b.

Some coordinate pairs that follow this rule are $(1,1)$ $(3,3)$ $(6.5,6.5)$



   b. Construct a line, c, that is parallel to line b and contains point Z.

Since line c needs to be parallel to line b, the rule for line c must be an addition or subtraction rule. The coordinate pair for Z is $(4,7)$, so I can draw line c along other coordinate pairs that have a y-coordinate that is 3 *more* than the x-coordinate.

   c. Name 3 coordinate pairs on line c.

   $(2,5)$ $(3,6)$ $(6,9)$

   d. Identify a rule to describe line c.

   x is 3 less than y.

Another way to describe this rule is: y is 3 more than x.

   e. Construct a line, g, that is parallel to line b and contains point W.

Again, since line g needs to be parallel to line b, the rule for line g must be an addition or subtraction rule. The coordinate pair for W is $(4,1)$, so I can draw line g along other coordinate pairs that have a y-coordinate that is 3 *less* than the x-coordinate.

   f. Name 3 points on line g.

   $(3.5,0.5)$ $(6,3)$ $(7,4)$

   g. Identify a rule to describe line g.

   x is 3 more than y.

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h. Compare and contrast lines c and g in terms of their relationship to line b.

Lines c and g are both parallel to line b.
Line c is above line b because the points on line c have y-coordinates greater than the x-coordinates.
Line g is below line b because the points on line g have y-coordinates less than the x-coordinates.

2. Write a rule for a fourth line that would be parallel to those in Problem 1 and that would contain the point $(5, 6)$.

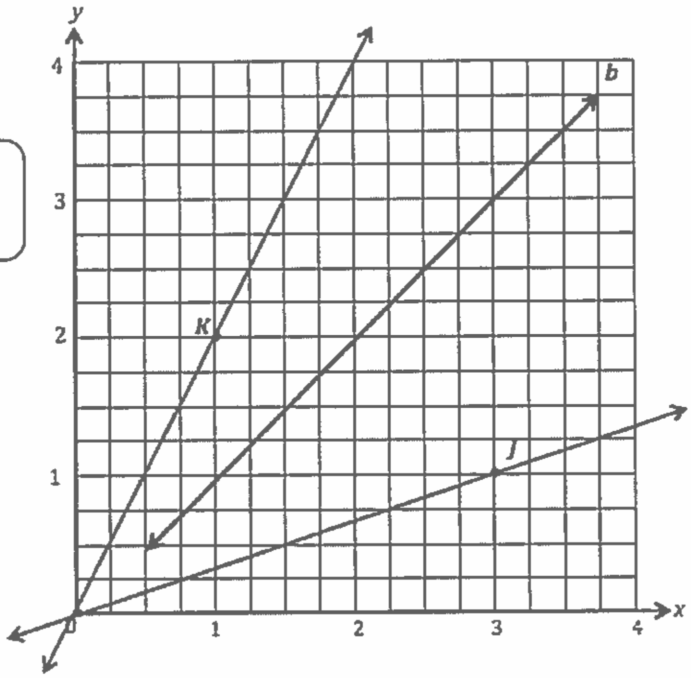
y is 1 more than x.

Because this line is parallel to the others, I know it has to be an addition rule. In the given coordinate pair, the y-coordinate is 1 more than the x-coordinate.

3. Use the coordinate plane below to complete the following tasks.

a. Line b represents the rule "x and y are equal."

I can also think of this as a multiplication rule. "x times 1 is equal to y."



b. Construct a line, j, that contains the origin and point J.

c. Name 3 points on line j.

$(3, 1)$ $\left(1\frac{1}{2}, \frac{1}{2}\right)$ $\left(\frac{3}{4}, \frac{1}{4}\right)$

d. Identify a rule to describe line j.

x is 3 times as much as y.

As I analyze the relationship between the x- and y-coordinates on line j, I can see that each y-coordinate is $\frac{1}{3}$ the value of its corresponding x-coordinate.

e. Construct a line, k, that contains the origin and point K.

f. Name 3 points on line k.

$\left(\frac{1}{2}, 1\right)$ $\left(1\frac{1}{2}, 3\right)$ $(2, 4)$

As I analyze the relationship between the x-coordinates and y-coordinates on line k, I can see that each y-coordinate is twice the value of its corresponding x-coordinate.

g. Identify a rule to describe line k.

x is half of y.

G5-M6-Lesson 11

1. Complete the tables for the given rules.

Line p

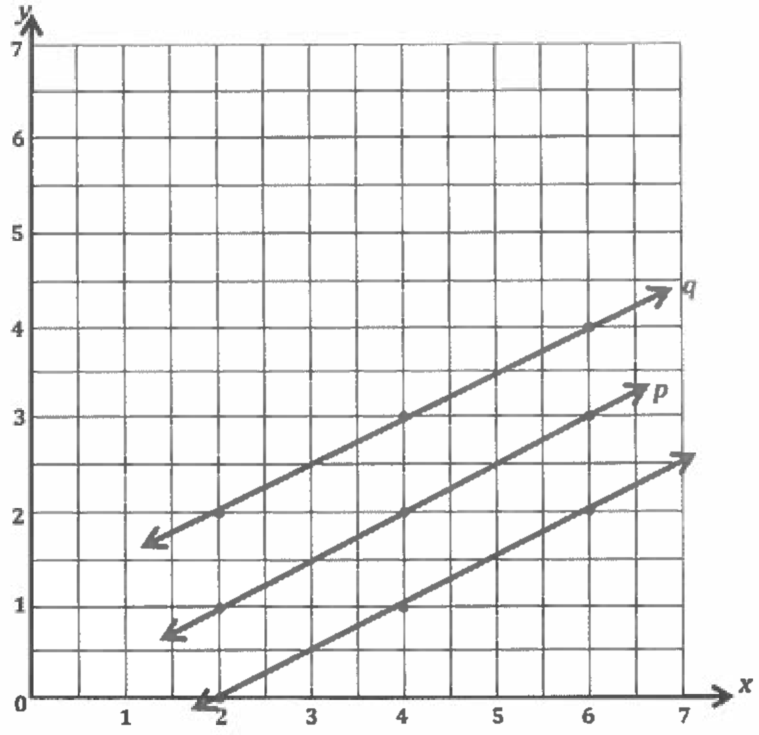
Rule: *Halve* x.

x	y	(x, y)
2	1	$(2, 1)$
4	2	$(4, 2)$
6	3	$(6, 3)$

Line q

Rule: *Halve* x*, and then add* 1.

x	y	(x, y)
2	2	$(2, 2)$
4	3	$(4, 3)$
6	4	$(6, 4)$



a. Draw each line on the coordinate plane above.

b. Compare and contrast these lines.

Line q is *above* line p because the rule says, "*then add* 1."

They are parallel lines. Line q *is above line* p*. The distance between the two lines is* 1 *unit.*

c. Based on the patterns you see, predict what the line for the rule "halve x, and then subtract 1" would look like. Draw your prediction on the plane above.

I predict the line will be parallel to lines p *and* q.

It will be 1 *unit below line* p *because the rule says, "then subtract* 1*."*

I need to look for coordinate pairs that follow the rule, "*double* x, *and then add* $\frac{1}{2}$."

2. Circle the point(s) that the line for the rule "*double* x, *and then add* $\frac{1}{2}$" would contain.

$(0, 1)$ [✓ $\left(3, 6\frac{1}{2}\right)$] $\left(2, \frac{1}{2}\right)$ [✓ $\left(\frac{3}{4}, 2\right)$] [✓ $\left(0, \frac{1}{2}\right)$] $\left(2, 4\frac{1}{4}\right)$

$3 \times 2 = 6$

$6 + \frac{1}{2} = 6\frac{1}{2}$

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

$= 1\frac{1}{\;}$

$0 \times 2 = 0$

$0 + \frac{1}{2} = \frac{1}{2}$

3. Give two other points that fall on this line.

$\left(\frac{1}{2}, 1\frac{1}{2}\right)$ $\left(1, 2\frac{1}{2}\right)$

I choose values for the x-coordinates. Then I doubled them and added $\frac{1}{2}$ to get the y-coordinates.

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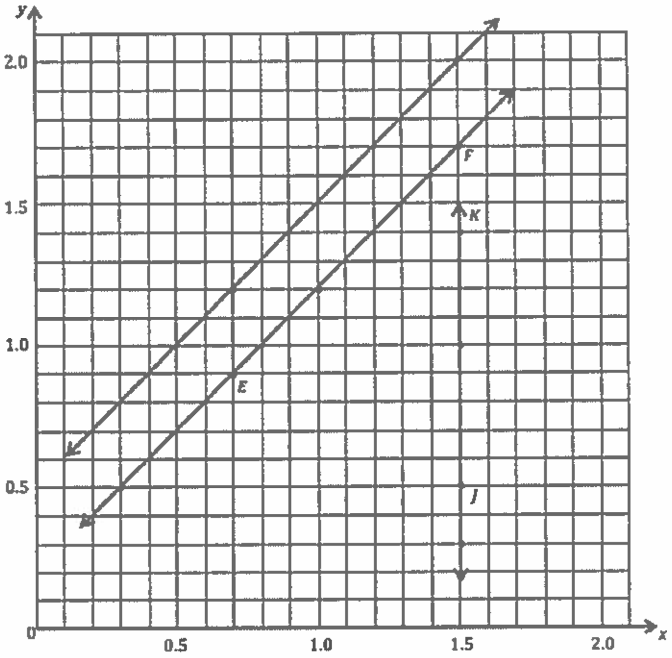
G5-M6-Lesson 12

1. Write a rule for the line that contains the points $(0.3, 0.5)$ and $(1.0, 1.2)$.

   y is 0.2 more than x.

   a. Identify 2 more points on this line. Then draw it on the grid below.

Point	x	y	(x, y)
E	0.7	0.9	$(0.7, 0.9)$
F	1.5	1.7	$(1.5, 1.7)$



   b. Write a rule for a line that is parallel to $\overleftrightarrow{EF}$ and goes through point $(0.7, 1.2)$. Then draw the line on the grid.

   y is 0.5 more than x.

Since this line needs to be parallel to $\overleftrightarrow{EF}$, it must be an addition rule. In the coordinate pair $(0.7, 1.2)$, I can see that the y-coordinate is 0.5 more than the x-coordinate.

2. Give the rule for the line that contains the points $(1.5, 0.3)$ and $(1.5, 1.0)$.

   x is always 1.5.

   a. Identify 2 more points on this line. Draw the line on the grid above.

Point	x	y	(x, y)
J	1.5	0.5	$(1.5, 0.5)$
K	1.5	1.4	$(1.5, 1.4)$

   b. Write a rule for a line that is parallel to $\overleftrightarrow{JK}$.

   x is always 1.8.

Since this line must be parallel to $\overleftrightarrow{JK}$, it must be another vertical line where the x-coordinate is always the same.

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3. Give the rule for a line that contains the point (0.3, 0.9) using the operation or description below. Then, name 2 other points that would fall on each line.

a. Addition: *y is* 0.6 *more than* x.

Point	x	y	(x, y)
T	0.4	1	$(0.4, 1)$
U	1	1.6	$(1, 1.6)$

b. A line parallel to the x-axis: *y is always* 0.9.

Point	x	y	(x, y)
G	0.4	0.9	$(0.4, 0.9)$
H	1	0.9	$(1, 0.9)$

A line parallel to the x-axis is a horizontal line. Horizontal lines have y-coordinates that do not change.

c. Multiplication: *y is x tripled.*

Point	x	y	(x, y)
A	0.2	0.6	$(0.2, 0.6)$
B	0.5	1.5	$(0.5, 1.5)$

d. A line parallel to the y-axis: *x is always* 0.3.

Point	x	y	(x, y)
V	0.3	1.3	$(0.3, 1.3)$
W	0.3	2	$(0.3, 2)$

A line parallel to the y-axis is a vertical line. Vertical lines have x-coordinates that do not change.

e. Multiplication with addition: *Double x, and then add* 0.3.

Point	x	y	(x, y)
R	0.4	1.1	$(0.4, 1.1)$
S	0.5	1.3	$(0.5, 1.3)$

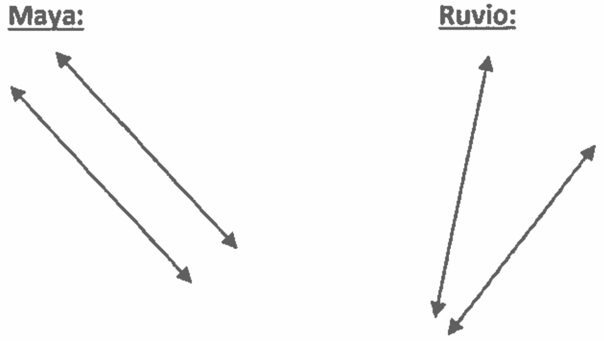
I can use the original coordinate pair, (0.3, 0.9), to help me generate a multiplication with addition rule.

$0.3 \times 2 = 0.6$ (This is the "*Double x*" part of the rule.)

$0.6 + 0.3 = 0.9$ (This is the "*then add* 0.3" part of the rule.)

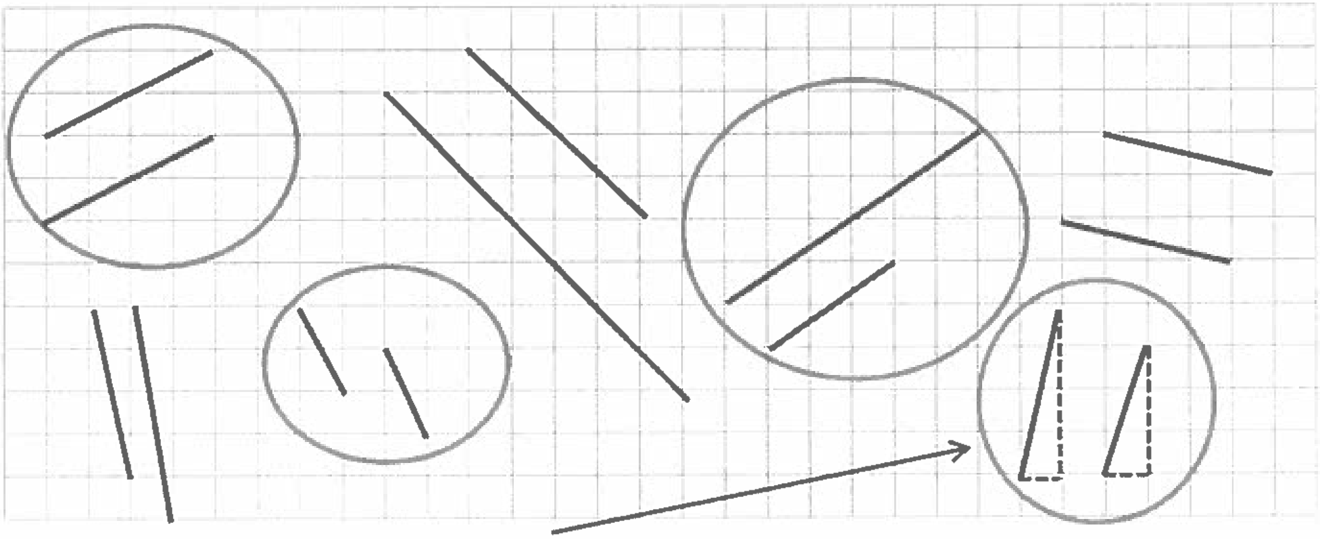
G5-M6-Lesson 13

1. Maya and Ruvio used their right angle templates and straightedges to draw sets of parallel lines. Who drew a correct set of parallel lines and why?



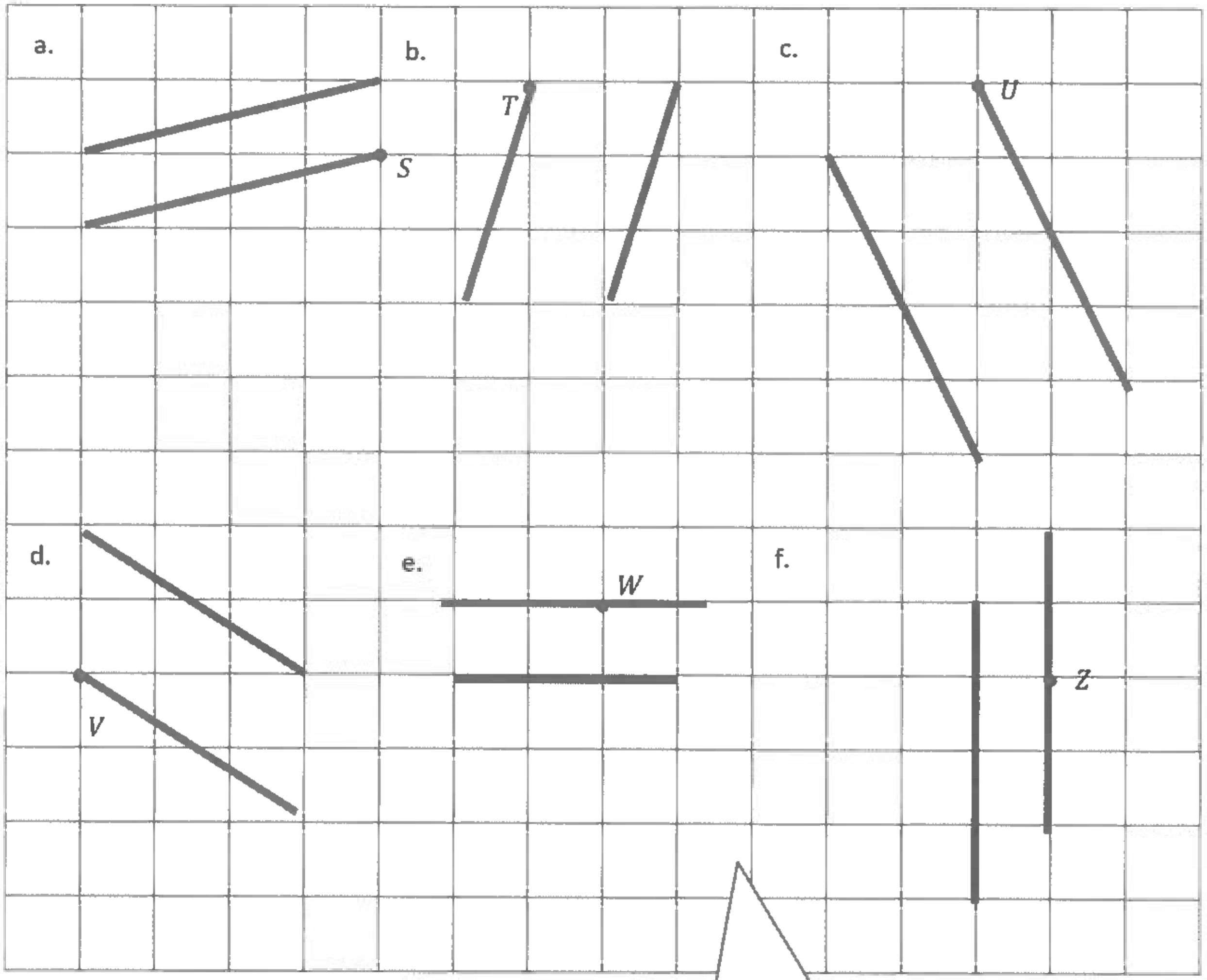
Maya drew a correct set of parallel lines because if you extend her lines, they will never intersect (cross). If you extend Ruvio's lines, they will intersect.

2. On the grid below, Maya circled all the sets of segments that she thought were parallel. Is she correct? Why or why not?



Maya is not completely correct. This set is not parallel. I drew a horizontal and vertical dotted line near each segment to complete a triangle. Even though both triangles have a base of 1, the left triangle is taller. I can see that if I were to extend these segments, they would eventually intersect. These segments are not parallel. Also, Maya did not circle all of the parallel sets of segments.

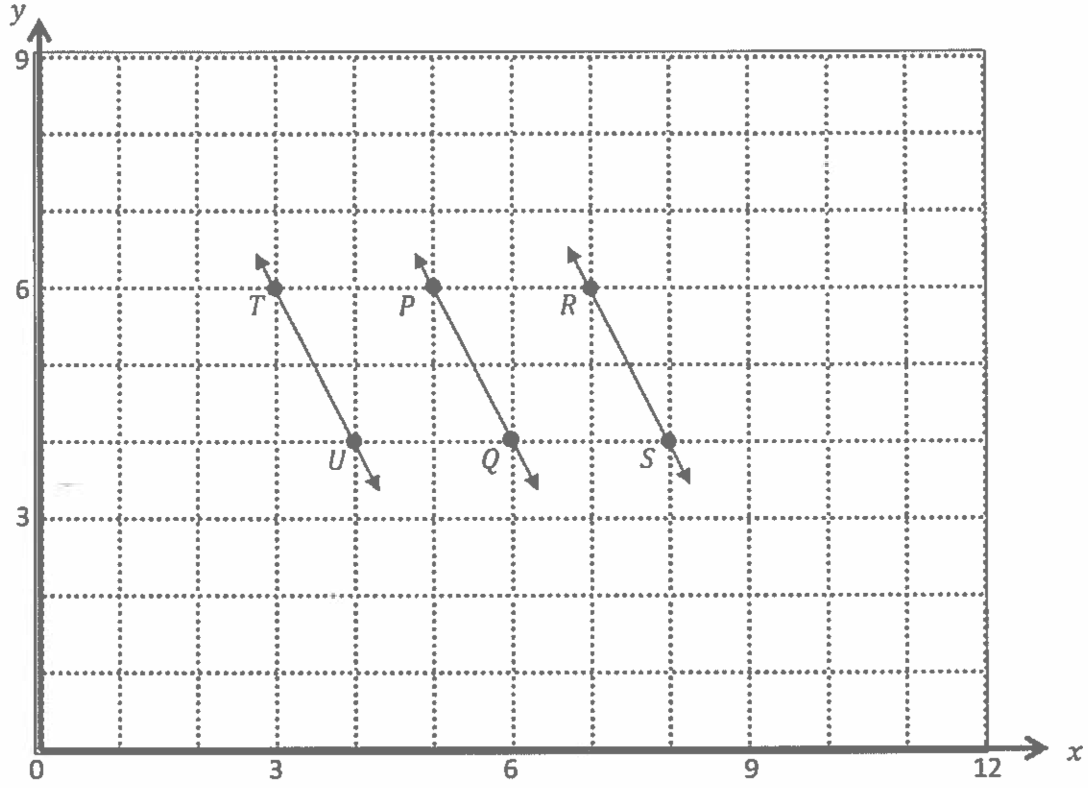
3. Use your straightedge to draw a segment parallel to each segment through the given point.



I know that the lines do not have to be exactly the same length as long as they are always the same distance apart at every point.

G5-M6-Lesson 14

1. Use the coordinate plane below to complete the following tasks.



a. Identify the locations of P and Q. P (5 , 6) Q (6 , 4)

The symbol ⊥ means perpendicular.
The symbol ∥ means parallel.

b. Draw $\overleftrightarrow{PQ}$.

c. Plot the following coordinate pairs on the plane: R $(7, 6)$ S $(8, 4)$

d. Draw $\overleftrightarrow{RS}$.

e. Circle the relationship between $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$. $\overleftrightarrow{PQ} \perp \overleftrightarrow{RS}$ [✓ $\overleftrightarrow{PQ} \parallel \overleftrightarrow{RS}$]

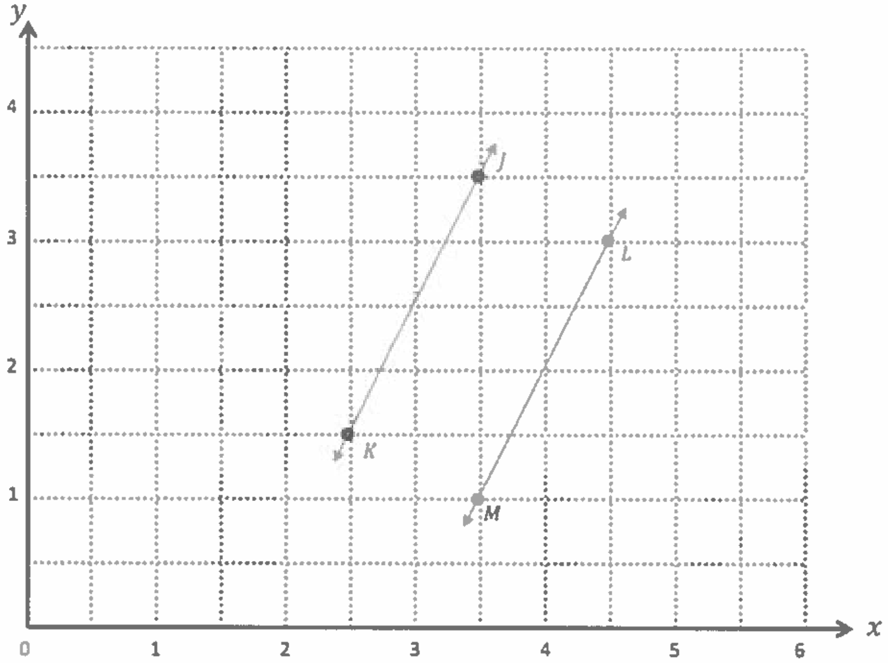
f. Give the coordinates of a pair of points, T and U, such that $\overleftrightarrow{TU} \parallel \overleftrightarrow{PQ}$.

T (3 , 6) U (4 , 4)

There are many possible sets of coordinates that would make $\overleftrightarrow{TU}$ parallel to $\overleftrightarrow{PQ}$. I can keep the y-coordinates the same and move the x-coordinates 2 units to the left.

g. Draw $\overleftrightarrow{TU}$.

2. Use the coordinate plane below to complete the following tasks.



a. Identify the locations of J and K. J $\left(3\frac{1}{2}, 3\frac{1}{2}\right)$ K $\left(2\frac{1}{2}, 1\frac{1}{2}\right)$

b. Draw $\overleftrightarrow{JK}$.

c. Generate coordinate pairs for L and M such that $\overleftrightarrow{JK} \parallel \overleftrightarrow{LM}$. L $\left(4\frac{1}{2}, 3\right)$ M $\left(3\frac{1}{2}, 1\right)$

d. Draw $\overleftrightarrow{LM}$.

e. Explain the pattern you used when generating coordinate pairs for L and M.

I visualized shifting points J and K one unit to the right, which is two grid lines. As a result, the x-coordinates of L and M are 1 greater than those of J and K.

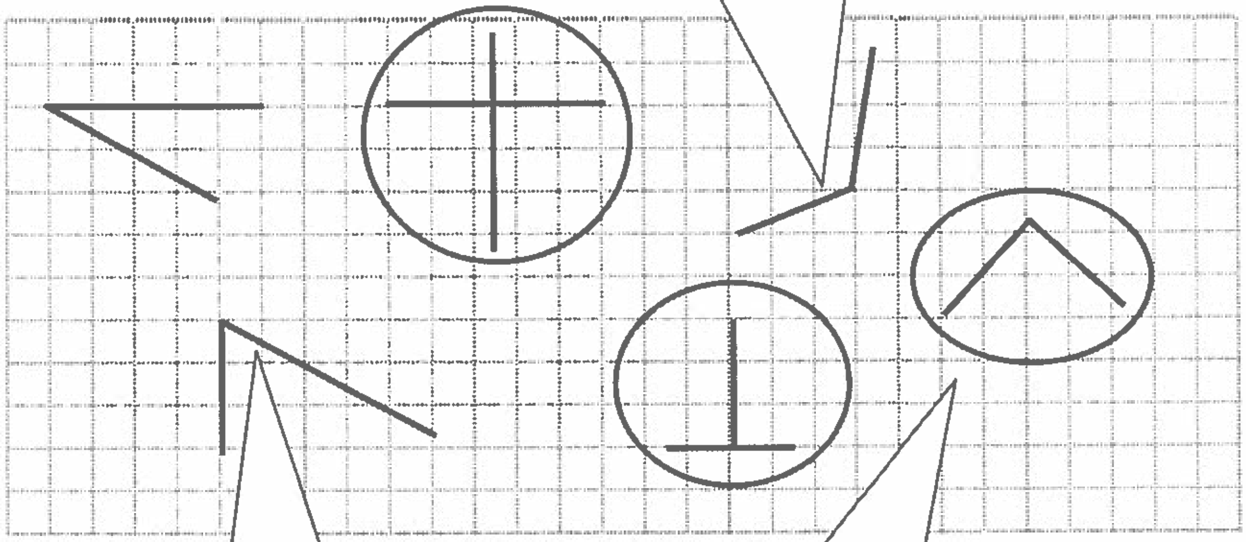
Then I visualized shifting both points down one-half unit, which is one grid line. As a result, the y-coordinates of L and M are $\frac{1}{2}$ less than those of J and K.

G5-M6-Lesson 15

Perpendicular segments intersect and form 90°, or right, angles.

1. Circle the pairs of segments that are perpendicular.

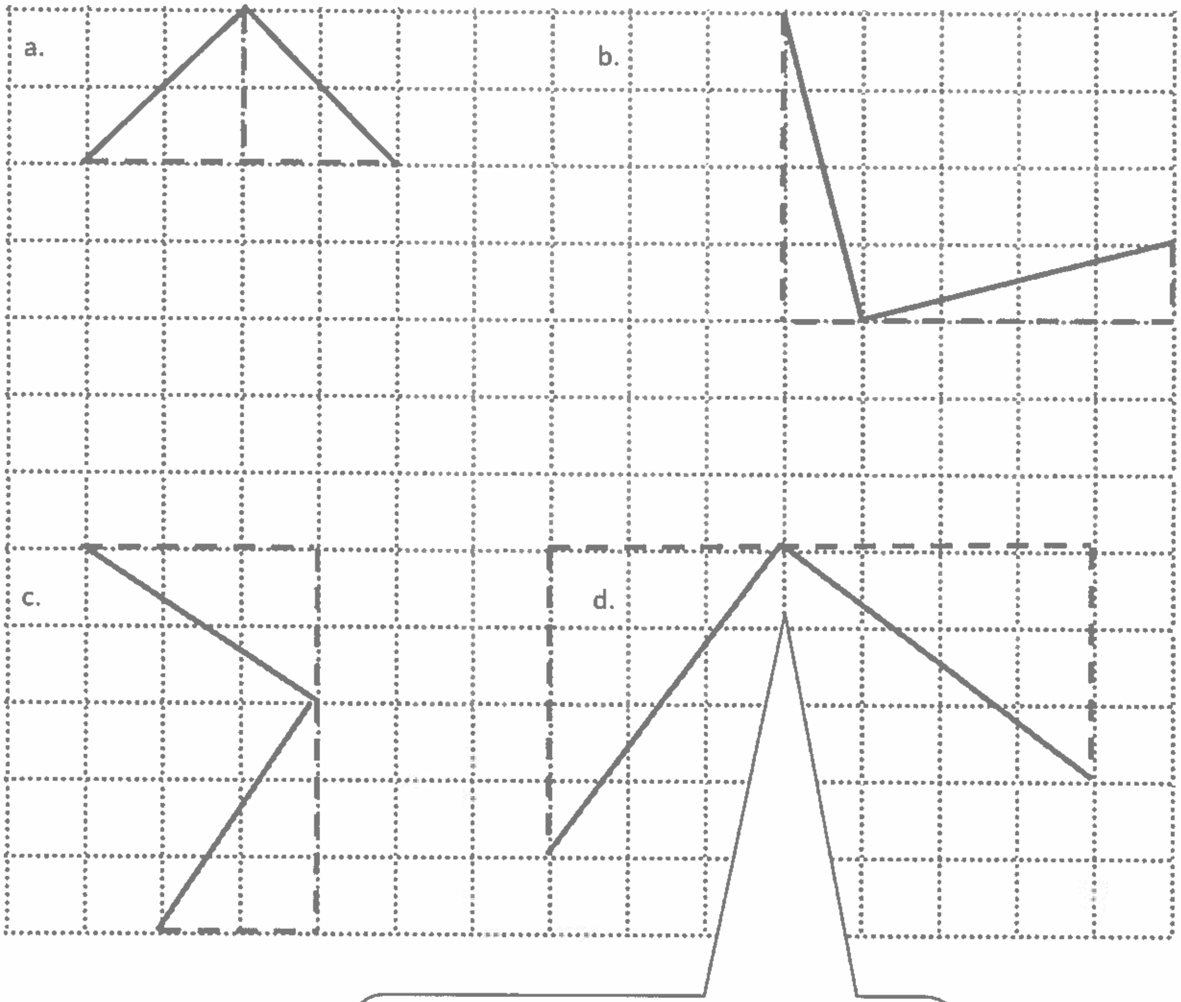
The angle formed by these segments is greater than 90°. These segments are *not* perpendicular.



The angle formed by these segments is less than 90°. These segments are *not* perpendicular.

I can use anything that is a right angle, such as the corner of a paper, to see if it fits in the angle where the lines intersect. If it fits perfectly, then I know that the lines are perpendicular.

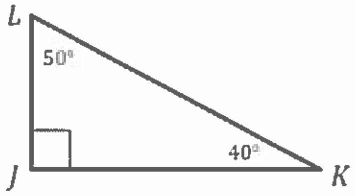
2. Draw a segment perpendicular to each given segment. Show your thinking by sketching triangles as needed.



I can sketch 2 missing sides to create a triangle. Then if I visualize rotating it and sliding it, I can draw a perpendicular segment by sketching the longest side of the triangle.

G5-M6-Lesson 16

1. In the right triangle below, the measure of angle L is 50°. What is the measure of angle K?



$\angle K = 40°$

The sum of the interior angles of *all* triangles is 180°. Triangle JKL is a right triangle. Since $\angle J$ is 90°, and $\angle L$ is 50°, $\angle K$ must be 40°.

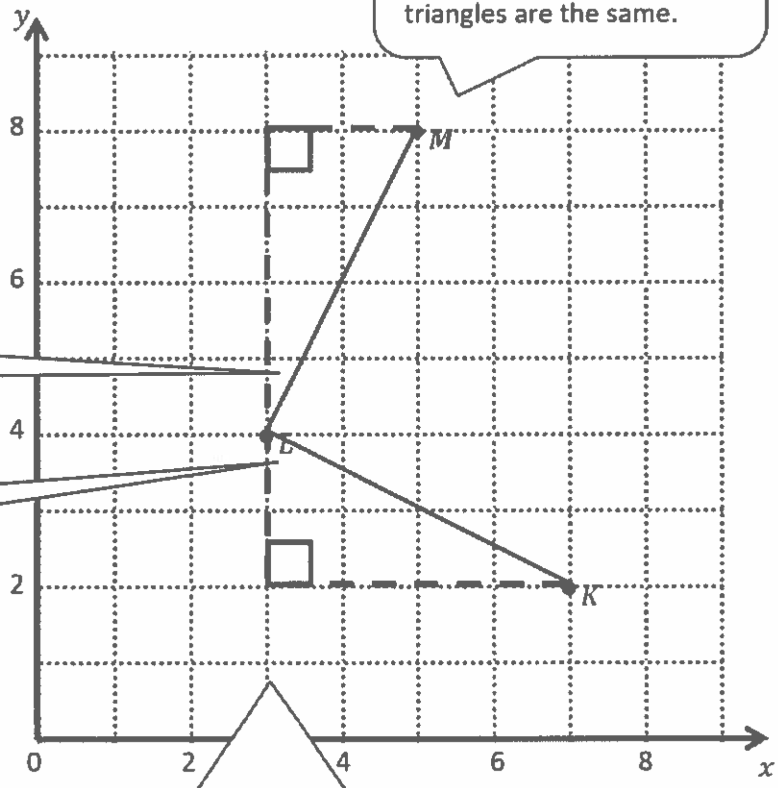
$180° - 90° - 50° = 40°$

2. Use the coordinate plane below to complete the following tasks.

   a. Draw $\overline{KL}$.

   b. Plot point $(5, 8)$.

   c. Draw $\overline{LM}$.



After I sketch the right triangle, I can visualize it sliding and rotating. These triangles are the same.

This is an acute angle, like $\angle K$, in Problem 1.

This is an acute angle, like $\angle L$, in Problem 1.

The two triangles I sketched are aligned to create a 180°, or straight angle, along the vertical grid line. So if the two acute angles of the triangles add up to 90°, the angle in between them, $\angle MLK$, must also be 90°.

d. Explain how you know $\angle MLK$ is a right angle without measuring it.

I used the grid lines to sketch a right triangle with side $\overline{LK}$, just like in Problem 1. Then I visualized sliding and rotating the triangle so side $\overline{LK}$ matched up with side $\overline{LM}$.

I know that the measures of the 2 acute angles of a right triangle add up to 90°. So when the long side of the triangle and the short side of the triangle form a straight angle, 180°, the angle in between them, $\angle MLK$, is also 90°.

e. Compare the coordinates of points L and K. What is the difference of the x-coordinates? The y-coordinates?

L $(3, 4)$ and K $(7, 2)$

The difference of the x-coordinates is 4.

The difference of the y-coordinates is 2.

f. Compare the coordinates of points L and M. What is the difference of the x-coordinates? The y-coordinates?

L $(3, 4)$ and M $(5, 8)$

The difference of the x-coordinates is 2.

The difference of the y-coordinates is 4.

g. What is the relationship of the differences you found in parts (e) and (f) to the triangles of which these two segments are a part?

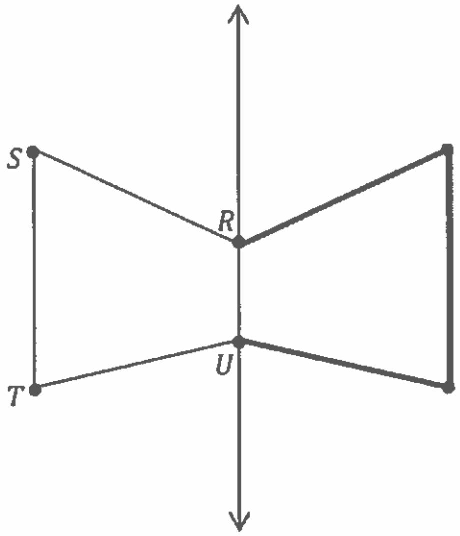
The difference in the value of the coordinates is either 2 or 4. That makes sense to me because the triangles that these two segments are part of have a height of either 2 or 4 and a base of either 2 or 4.

When I visualize the triangle sliding and rotating, it makes sense that the x-coordinates and y-coordinates will change by a value of 2 or 4 because that's the length of the triangle's height and base.

G5-M6-Lesson 17

1. Draw to create a figure that is symmetric about $\overleftrightarrow{UR}$.

In order to create a figure that is symmetric about $\overleftrightarrow{UR}$, I need to find points that are drawn using a line *perpendicular to* and *equidistant from* (the same distance from) the line of symmetry, $\overleftrightarrow{UR}$.



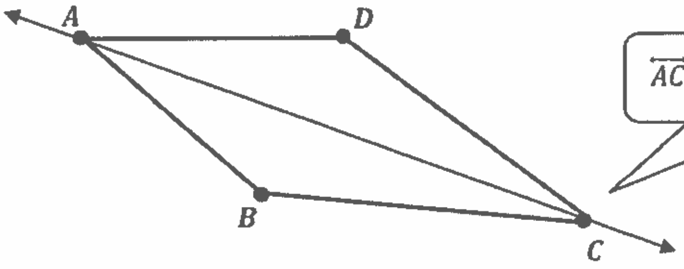
The distance from this point to the line of symmetry is the same as the distance from the line of symmetry to point S, when measured on a line perpendicular to the line of symmetry.

2. Complete the following construction in the space below.
   a. Plot 3 non-collinear points, A, B, and C.

I know that collinear means that the points are "lying on the same straight line," so non-collinear must mean that the three points are *not* on the same straight line.

   b. Draw $\overline{AB}$, $\overline{BC}$, and $\overleftrightarrow{AC}$.

   c. Plot point D, and draw the remaining sides, such that quadrilateral $ABCD$ is symmetric about $\overleftrightarrow{AC}$.



$\overleftrightarrow{AC}$ is the line of symmetry.

G5-M6-Lesson 18

Use the plane to the right to complete the following tasks.

This will be a vertical line.

a. Draw a line h whose rule is x is always 7.

b. Plot the points from Table A on the grid in order. Then, draw line segments to connect the points in order.

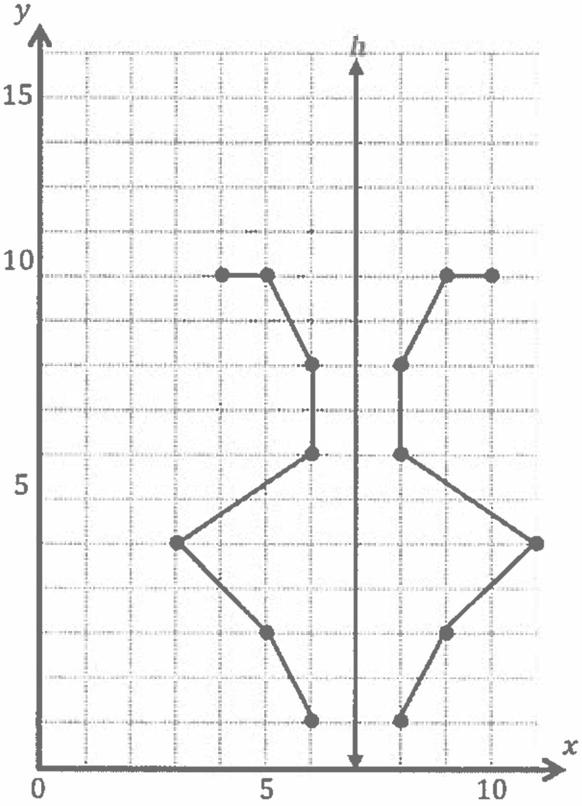


Table A

(x, y)
$(6, 1)$
$(5, 3)$
$(3, 5)$
$(6, 7)$
$(6, 9)$
$(5, 11)$
$(4, 11)$

Table B

(x, y)
$(8, 1)$
$(9, 3)$
$(11, 5)$
$(8, 7)$
$(8, 9)$
$(9, 11)$
$(10, 11)$

c. Complete the drawing to create a figure that is symmetric about line h. For each point in Table A, record the symmetric point on the other side of h.

d. Compare the y-coordinates in Table A with those in Table B. What do you notice?

The y-coordinates in Table A are the same as in Table B. Because the line of symmetry is a vertical line, only the x-coordinates will change.

e. Compare the x-coordinates in Table A with those in Table B. What do you notice?

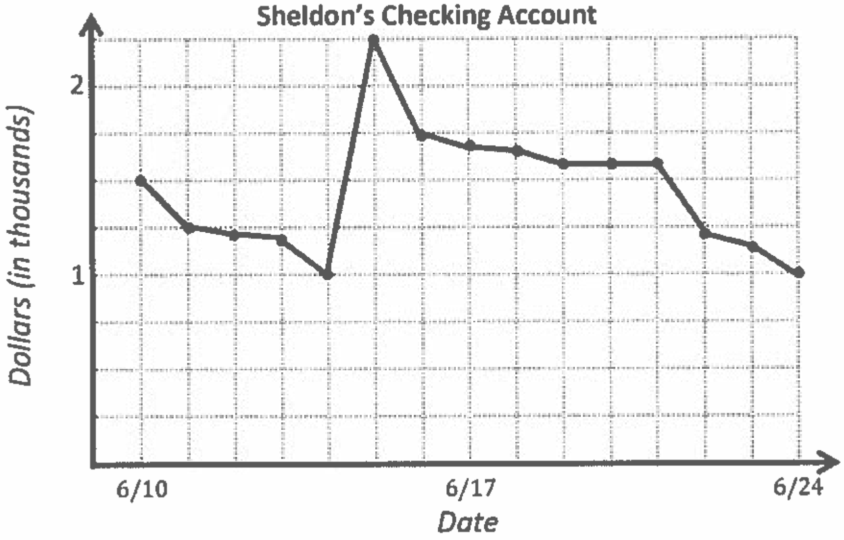
I notice that the difference in the x-coordinates is always an even number because the distance that a point is from line h has to double.

EUREKA MATH

G5-M6-Lesson 19

The line graph below tracks the balance of Sheldon's checking account at the end of each day between June 10 and June 24. Use the information in the graph to answer the questions that follow.

I know that it is important to read the scale on the vertical axis so that I know what units the data is referring to. In this graph, the 1 means $1,000, and the 2 means $2,000. I can tell that each grid line skip-counts by $250.



a. About how much money does Sheldon have in his checking account on June 10?

Sheldon has $1,500 *in his account on June 10. I can tell because the point is on the line exactly between* $1,000 *and* $2,000.

b. If Sheldon spends $250 from his checking account on June 24, about how much money will he have left in his account?

Sheldon will have $750 *left.*

$1,000 – $250 = $750

c. Sheldon received a payment from his job that went directly into his checking account. On which day did this most likely occur? Explain how you know.

The amount of money in his account increased by $1,250 *on June 15. This is most likely the day he was paid by his job.*

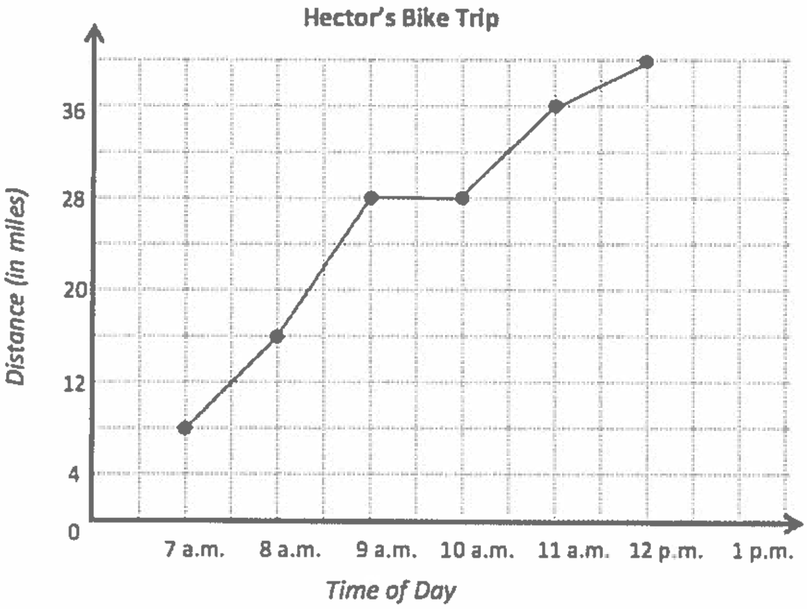
d. Sheldon paid rent for his apartment during the time shown in the graph. On which day did this most likely occur? Explain how you know.

Sheldon might have paid his rent on either June 15 or June 21. These are the two days where Sheldon's account went down most quickly.

G5-M6-Lesson 20

Use the graph to answer the questions.

Hector left his home at 6:00 a.m. to train for a bicycle race. He used his GPS watch to keep track of the number of miles he traveled at the end of each hour of his trip. He uploaded the data to his computer, which gave him the line graph below:



Even though the line does not start at 0, I know that he started at 6:00 a.m., so he had traveled 0 miles at that point.

a. How far did Hector travel in all? How long did it take?

Hector traveled 40 miles in 6 hours.

Hector started at 6:00 a.m. and stopped at noon. That's 6 hours.

The last data point at 12:00 p.m. shows 40 miles.

b. Hector took a one-hour break to have a snack and take some pictures. What time did he stop? How do you know?

Hector took his break from 9 a.m. to 10 a.m. The horizontal line at this time tells me that Hector's distance did not change; therefore, he wasn't biking for that hour.

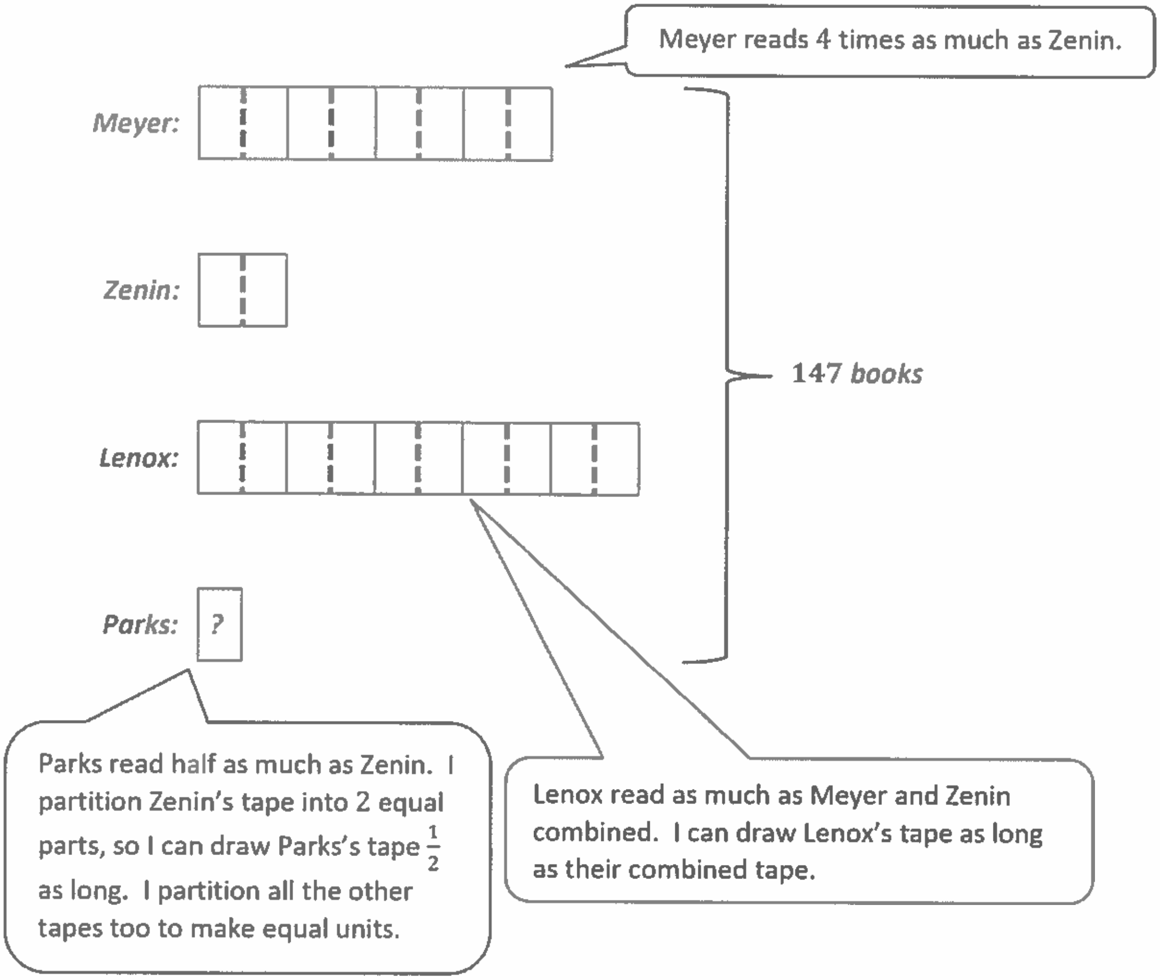
c. During which hour did Hector ride the slowest?

Hector's slowest hour was his last one between 11:00 a.m. and noon. He only rode 4 miles in that last hour whereas in the other hours he rode at least 8 miles (except when he took his break).

I also know I can look at how steep the line is between two points to help me know how fast or slow Hector rode. The line is not very steep between 11:00 a.m and noon, so I know that was his slowest hour.

G5-M6-Lesson 21

Meyer read four times as many books as Zenin. Lenox read as many as Meyer and Zenin combined. Parks read half as many books as Zenin. In total, all four read 147 books. How many books did each child read?



Parks read half as much as Zenin. I partition Zenin's tape into 2 equal parts, so I can draw Parks's tape $\frac{1}{2}$ as long. I partition all the other tapes too to make equal units.

Lenox read as much as Meyer and Zenin combined. I can draw Lenox's tape as long as their combined tape.

$21 \text{ units} = 147 \text{ books}$

$1 \text{ unit} = 147 \text{ books} \div 21 = 7 \text{ books}$

Parks read 7 books.

$7 \times 8 = 56$ *Meyer read 56 books.*

$7 \times 2 = 14$ *Zenin read 14 books.*

$56 + 14 = 70$ *Lenox read 70 books.*

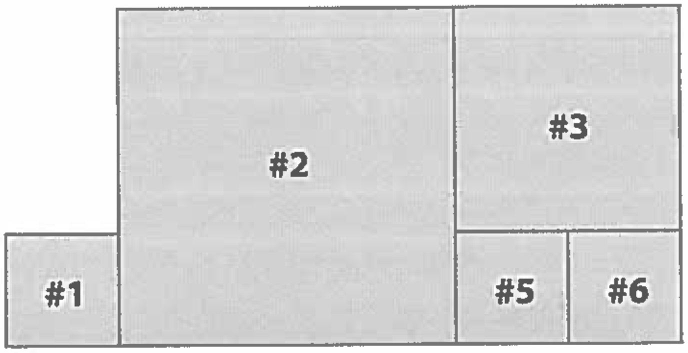
G5-M6-Lesson 22

Solve using any method. Show all your thinking.

I know that squares have all 4 sides of equal length.

Study this diagram showing all the squares. Fill in the table.

Figure	Area in Square Centimeters
1	9 cm^2
2	81 cm^2
3	36 cm^2
5	9 cm^2
6	9 cm^2



The table says the area of Figure 1 is 9 cm^2.
$3 \text{ cm} \times 3 \text{ cm} = 9 \text{ cm}^2$
I know that each side of Figure 1 is 3 cm long.

Figures 5 and 6 are the same size as Figure 1. They also have an area of 9 cm^2.

__Figure 3:__

$3 \text{ cm} + 3 \text{ cm} = 6 \text{ cm}$

$6 \text{ cm} \times 6 \text{ cm} = 36 \text{ cm}^2$

Figure 3 shares a side with Figures 5 and 6. Since the side lengths of Figures 5 and 6 are 3 cm each, the side length of Figure 3 must be 6 cm.

__Figure 2:__

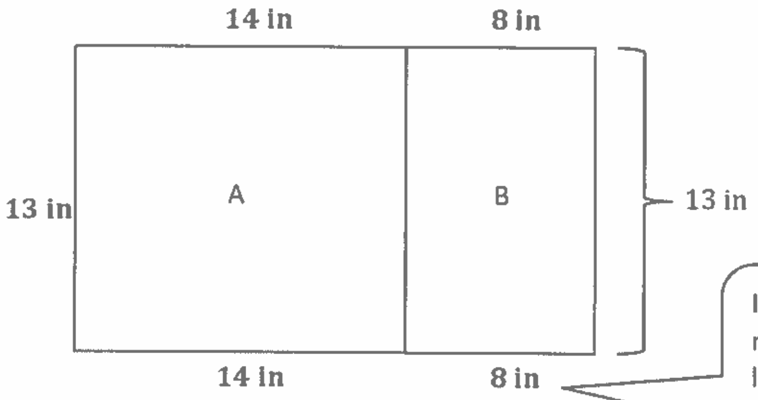
$6 \text{ cm} + 3 \text{ cm} = 9 \text{ cm}$

$9 \text{ cm} \times 9 \text{ cm} = 81 \text{ cm}^2$

Figure 2 shares a side with Figures 3 and 5. Since the side lengths of Figures 3 and 5 are 6 cm and 3 cm, respectively, the side length of Figure 2 must be 9 cm.

G5-M6-Lesson 23

In the diagram, the length of Figure B is $\frac{4}{7}$ the length of Figure A. Figure A has an area of 182 in^2. Find the perimeter of the entire figure.



I can label the missing side lengths as I find their values.

I can find the length of Figure A by dividing the area by the width.

Figure A:

$$\text{Area} = \text{length} \times \text{width}$$
$$182 = \underline{\quad} \times 13$$
$$182 \div 13 = 14$$

The length of Figure A is 14 inches.

Now that I know the length of Figure A, I can use it to find the length of Figure B.

Figure B:

$\frac{4}{7}$ *of* 14 *inches*

$$\frac{4}{7} \times 14$$
$$= \frac{4 \times 14}{7}$$
$$= \frac{56}{7}$$
$$= 8$$

The length of Figure B is 8 inches.

I can find the perimeter of the entire figure by adding up all of the sides.

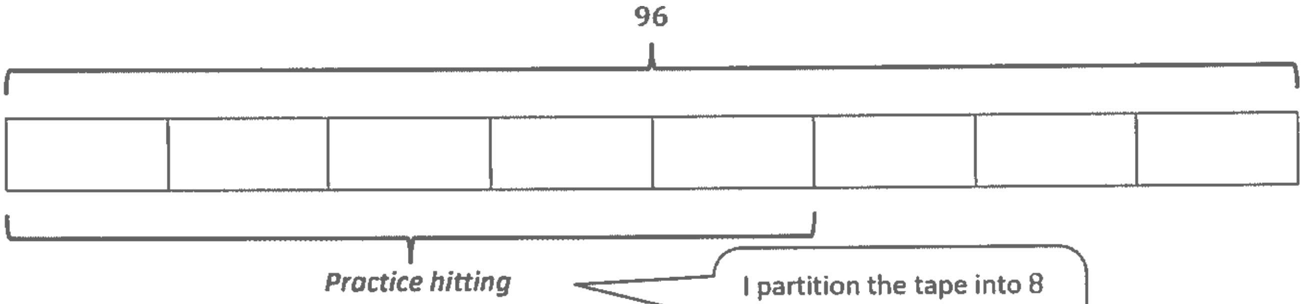
Entire Figure:

$$14 + 8 + 13 + 8 + 14 + 13 = 70$$

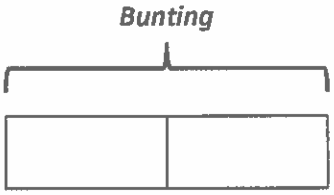
The perimeter of the entire figure is 70 inches.

G5-M6-Lesson 24

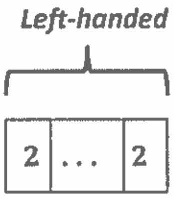
Howard's Baseball Camp welcomed 96 athletes on the first day of camp. Five-eighths of the athletes began practicing hitting. The hitting coach sent $\frac{2}{5}$ of the hitters to work on bunting. Half of the bunters were left-handed hitters. The left-handed bunters were put into teams of 2 to practice together. How many teams of 2 were practicing bunting?



I partition the tape into 8 equal units to show the $\frac{5}{8}$ that practice hitting.



$\frac{2}{5}$ of the hitters practice bunting.
$\frac{2}{5}$ of 5 units is 2 units.



Half of the bunters are left-handed.
Half of 2 units is 1 unit.

How many teams of 2 can be made from the left-handed bunters?

$\frac{1}{8}$ *of* $96 = 12$

My tape diagram shows me that $\frac{1}{8}$ of all the athletes are left-handed hitters practicing bunting.

$12 \div 2 = 6$

$12 \div 2 = 6$, so there are 6 teams of 2 practicing bunting.

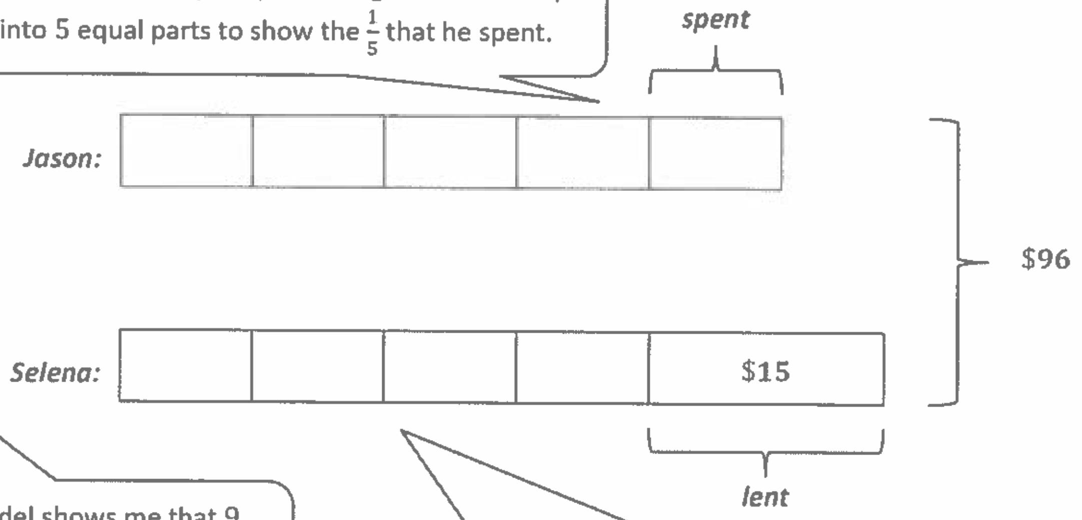
There are 6 teams of 2 practicing bunting.

G5-M6-Lesson 25

Jason and Selena had \$96 altogether at first. After Jason spent $\frac{1}{5}$ of his money and Selena lent \$15 of her money, they had the same amount of money left. How much money did each of them have at first?

This is important. *After* Jason spends and Selena lends, *then* they have the same amount left. I need to make sure that my model shows this.

I partition the tape representing Jason's money into 5 equal parts to show the $\frac{1}{5}$ that he spent.



My model shows me that 9 units, plus the \$15 that Selena lent, is equal to \$96.

To show that Selena and Jason have the same amount of money left, I partition the tape representing Selena's money the same way that I did Jason's.

$9 \text{ units} + \$15 = \$96$

$9 \text{ units} = \$81$

$1 \text{ unit} = \$81 \div 9 = \$9$

Now that I know the value of 1 unit, I can find out how much money they each had at first.

__Jason:__

$1 \text{ unit} = \$9$

$5 \text{ units} = 5 \times \$9 = \$45$

Jason had \$45 at first.

__Selena:__

$1 \text{ unit} = \$9$

$4 \text{ units} = 4 \times \$9 = \$36$

$\$36 + \$15 = \$51$

Selena had \$51 at first.

EUREKA MATH

G5-M6-Lesson 26

1. For the phrase below, write a numerical expression, and then evaluate your expression.

   Subtract three halves from one sixth of forty-two.

$$\begin{aligned} &\frac{1}{6} \times 42 - \frac{3}{2} \\ &= \frac{42}{6} - \frac{3}{2} \\ &= 7 - \frac{3}{2} \\ &= 7 - 1\frac{1}{2} \\ &= 5\frac{1}{2} \end{aligned}$$

Even though it says the word "*subtract*" first, I need to have something to subtract from. So I won't subtract until I find the value of "*one sixth of forty-two.*"

2. Write at least 2 numerical expressions for the phrase below. Then, solve.

   Two fifths of nine

$\frac{2}{5} \times 9$ $\left(\frac{1}{5} \times 9\right) \times 2$

This is "*one fifth of nine, doubled,*" which is equal to "*two fifths of nine.*"

$$\begin{aligned} &\frac{2}{5} \times 9 \\ &= \frac{2 \times 9}{5} \\ &= \frac{18}{5} \\ &= 3\frac{3}{5} \end{aligned}$$

"*Two fifths of nine*" is equal to $3\frac{3}{5}$.

3. Use <, >, or = to make true number sentences without calculating. Explain your thinking.

a. $\left(481 \times \frac{9}{16}\right) \times \frac{2}{10}$ $<$ $\left(481 \times \frac{9}{16}\right) \times \frac{7}{10}$

Both expressions have the same first factor, $\left(481 \times \frac{9}{16}\right)$.

Since the second factor, $\frac{7}{10}$, *is greater than* $\frac{2}{10}$, *the expression on the right is greater.*

b. $\left(4 \times \frac{1}{10}\right) + \left(9 \times \frac{1}{100}\right)$ $>$ 0.409

The expression on the left is equal to 0.49.

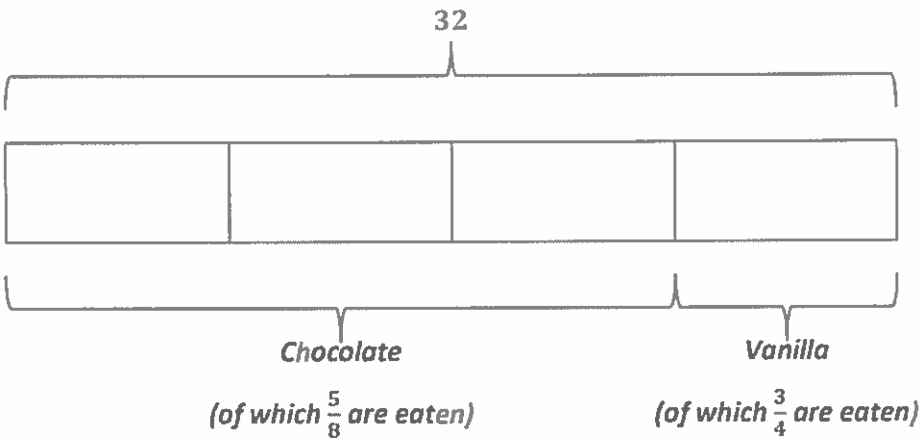
The expression on the right also has 0 *ones and* 4 *tenths, but there are* 0 *hundredths in* 0.409.

EUREKA MATH™

G5-M6-Lesson 27

1. Use the RDW process to solve the word problem below.

   Daquan brought 32 cupcakes to school. Of those cupcakes, $\frac{3}{4}$ were chocolate, and the rest were vanilla. Daquan's classmates ate $\frac{5}{8}$ of the chocolate cupcakes and $\frac{3}{4}$ of the vanilla. How many cupcakes are left?



Of all the cupcakes, 24 are chocolate.

Chocolate eaten:

$\frac{3}{4}$ *of* $32 = \frac{3 \times 32}{4} = \frac{96}{4} = 24$

$\frac{5}{8}$ *of* $24 = \frac{5 \times 24}{8} = \frac{120}{8} = 15$

Of the 24 chocolate cupcakes, 15 were eaten.

15 *chocolate cupcakes were eaten.*

Of all the cupcakes, 8 are vanilla.

Vanilla eaten:

$\frac{1}{4}$ *of* $32 = \frac{1 \times 32}{4} = \frac{32}{4} = 8$

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

Of the 8 vanilla cupcakes, 6 were eaten.

6 *vanilla cupcakes were eaten.*

Cupcakes left:

$32 - (15 + 6) = 32 - 21 = 11$

I find the number of leftover cupcakes by subtracting those that were eaten from the 32 original cupcakes.

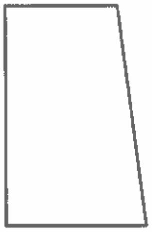
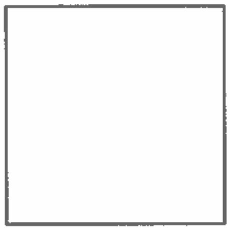
11 *cupcakes are left.*

2. Write and solve a word problem for the expression in the chart below.

Expression	Word Problem	Solution
$5 - \left(\frac{5}{12} + \frac{1}{3}\right)$	*During her 5-day work week, Mrs. Gomez spends $\frac{5}{12}$ of one day and $\frac{1}{3}$ of another in meetings. How much of her work week is not spent in meetings?*	$5 - \left(\frac{5}{12} + \frac{1}{3}\right)$ $= 5 - \left(\frac{5}{12} + \frac{4}{12}\right)$ $= 5 - \frac{9}{12}$ $= 4\frac{3}{12}$ $= 4\frac{1}{4}$ $4\frac{1}{4}$ *days of Mrs. Gomez' work week was not spent in meetings.*

G5-M6-Lesson 29

Use your ruler, protractor, and set square to help you give as many names as possible for each figure below. Then, explain your reasoning for how you named each figure.

Figure	Names	Reasoning for Names
a. 	*quadrilateral* *trapezoid*	*This figure is a quadrilateral because it is a closed figure with 4 sides.* *It's also a trapezoid because it has at least one pair of parallel sides. The top and bottom sides are parallel.*
b. I use my protractor and ruler to measure the angles and the side lengths.  This shape has four 90° angles and four equal sides. That means it's a square, but it has other names, too.	*quadrilateral* *trapezoid* *parallelogram* *rectangle* *rhombus* *kite* *square*	*This figure is a quadrilateral because it is a closed figure with 4 sides.* *It's also a trapezoid because it has at least one pair of parallel sides. This shape actually has 2 pairs.* *This shape is also a parallelogram because opposite sides are both parallel and equal in length.* *It's also a rectangle because it has 4 right angles.* *It's a rhombus because all 4 sides are equal in length.* *It's also a kite because it has 2 pairs of adjacent sides that are equal in length.* *But most specifically, it's a square because it has 4 right angles and 4 sides of equal length.*

G5-M6-Lesson 31

Lesson Notes

To get a better understanding of the Fibonacci numbers, watch the short video, "Doodling in Math: Spirals, Fibonacci, and Being a Plant" by Vi Hart (http://youtu.be/ahXIMUkSXX0).

1. In your own words, describe what you know about the Fibonacci numbers.

   The Fibonacci numbers are really interesting. They're a list of numbers. You can always find the next number in the series by adding together the 2 numbers that come before it.

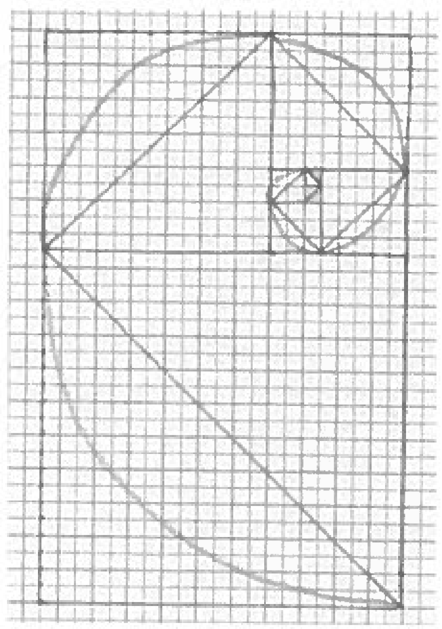
   For example, if part of the series is 13 and then 21, then the next number in the list will be 34 because $13 + 21 = 34$.

   I can remember the first few Fibonacci numbers:

   $$1, 1, 2, 3, 5, 8, 13, 21, 34.$$

2. Describe what the drawing you did in class today looked like.

I can visualize what we drew in class. It looked like this:



At first, the drawing just looked like a bunch of square boxes drawn near one another that had a side in common. But then we drew a diagonal line across each square. Then we drew a more curved line inside each square, and it created this really neat spiral pattern, kind of like a seashell.

After we drew it, we wrote down the side length of each square we drew and realized that they were the Fibonacci numbers. In other words, the first 2 squares we drew had a side length of 1, then the next square had a side length of 2, then 3, then 5, and so on.

G5-M6-Lesson 32

Lesson Notes

To get a better understanding of the Fibonacci numbers, watch the short video, "Doodling in Math: Spirals, Fibonacci, and Being a Plant" by Vi Hart (http://youtu.be/ahXIMUkSXX0).

1. Complete the Fibonacci sequence in the table below.

The values in the top row tell the order of the numbers in the sequence. For example, this is the 6th number in the sequence.

1	2	3	4	5	6	7	8	9
1	1	2	3	5	8	13	21	34

I can find the value of the next number in the sequence by adding together the two previous numbers. $5 + 8 = 13$; therefore, the 7th number in the sequence is 13.

2. If the 12th and 13th numbers in the sequence are 144 and 233, respectively, what is the 11th number in the series?

$\_\_\_ + 144 = 233$

$233 - 144 = 89$

What number plus 144 is equal to 233? I can use subtraction to solve.

The 11th number in the series is 89.

G5-M6-Lesson 33

Find a rectangular box at your home. Use a ruler to measure the dimensions of the box to the nearest centimeter. Then, calculate the volume of the box.

I find the volume of rectangular prisms, or boxes, by multiplying the 3 dimensions together.

Volume = length × width × height

Item	Length	Width	Height	Volume
Toy Shoe Box	8 cm	3 cm	6 cm	144 cm^3

The length of the shoe box was exactly 7.5 cm, but the directions said to measure to the nearest centimeter. I round 7.5 up to 8.

$8 \times 3 \times 6 = 24 \times 6 = 144$

The volume of the shoe box is 144 cubic centimeters.