Homework Helpers

Grade 7 Module 1

G7-M1-Lesson 1: An Experience in Relationships as Measuring Rate

Rate and Unit Rates

Find each rate and unit rate.

1. \$8.96 for 8 pounds of grapefruit

   $\frac{8.96}{8} = 1.12$

   I determine the cost of one pound of grapefruit in order to find the rate. To do this, I divide the cost by the number of pounds.

   Rate: 1.12 *dollars per pound*

   Unit Rate: 1.12

2. 300 miles in 4 hours

   $\frac{300}{4} = 75$

   The label explains the numerical value of the rate.

   Rate: 75 *miles per hour*

   Unit Rate: 75

Ratios and Rates

3. Dan bought 8 shirts and 3 pants. Devonte bought 12 shirts and 5 pants. For each person, write a ratio to represent the number of shirts to the number of pants they bought. Are the ratios equivalent? Explain.

   The ratio of the number of shirts Dan bought to the number of pants he bought is $8:3$.

   The ratio of the number of shirts Devonte bought to the number of pants he bought is $12:5$.

   The order of the ratios is important. In this case, it is stated that the ratio is shirts to pants, which means the first number in the ratio represents shirts and the second number represents pants.

   The ratios are not equivalent because Dan's unit rate is $\frac{8}{3}$ *or* $2\frac{2}{3}$, *and Devonte's unit rate is* $\frac{12}{5}$ *or* $2\frac{2}{5}$.

   I know these are not equivalent ratios because they do not have the same unit rate.

4. Veronica got hired by two different families to babysit over the summer. The Johnson family said they would pay her $180 for every 20 hours she worked. The Lopez family said they would pay Veronica $165 for every 15 hours she worked. If Veronica spends the same amount of time babysitting each family, which family would pay her more money? How do you know?

Calculating the unit rate helps compare different rates and ratios.

Veronica will earn $9 per hour when she babysits for the Johnson family and will earn $11 per hour when she babysits for the Lopez family. Therefore, she will earn more money from the Lopez family if she spends the same amount of time babysitting for each family.

G7-M1-Lesson 2: Proportional Relationships

Proportional Quantities

1. A vegetable omelet requires a ratio of eggs to chopped vegetables of 2 to 7.

This means that I use 2 eggs and 7 chopped vegetables to make an omelet.

a. Complete the table to show different amounts that are proportional.

Number of Eggs	2	4	6
Number of Vegetables	7	14	21

Answers may vary, but I need to create ratios that are equivalent to the ratio 2: 7.

b. Why are these quantities proportional?

The number of eggs is proportional to the number of chopped vegetables since there exists a constant number, $\frac{7}{2}$, *that when multiplied by any given number of eggs always produces the corresponding amount of chopped vegetables.*

2. The gas tank in Enrique's car has 15 gallons of gas. Enrique was able to determine that he can travel 35 miles and only use 2 gallons of gas. At this constant rate, he predicts that he can drive 240 more miles before he runs out of gas. Is he correct? Explain.

Once I calculate the unit rate, I use this to determine how many miles Enrique can travel with the gas remaining in his tank by multiplying both values by 15.

Gallons of Gas Used	1	2	15
Miles Traveled	17.5	35	262.5

Enrique can travel 227.5 *more miles because has he can only travel* 262.5 *miles with* 15 *gallons of gas, but he has already traveled* 35 *miles.* $262.5 - 35 = 227.5$. *Therefore, Enrique's prediction is not correct because he will run out of gas before traveling* 240 *more miles.*

G7-M1-Lesson 3: Identifying Proportional and Non-Proportional Relationships in Tables

Recognizing Proportional Relationships in Tables

In each table, determine if y is proportional to x. Explain why or why not.

To determine if y is proportional to x, I determine if the unit rates, or value of each ratio, are equivalent.

1.

x	y
3	6
4	8
5	10
6	11

$\frac{6}{3} = 2 \quad \frac{8}{4} = 2 \quad \frac{10}{5} = 2 \quad \frac{11}{6} = 1\frac{5}{6}$

No, y is not proportional to x because the values of all the ratios y: x are not equivalent. There is not a constant where every measure of x multiplied by the constant gives the corresponding measure in y.

2.

x	y
6	2
9	3
12	4
15	5

$\frac{2}{6} = \frac{1}{3} \quad \frac{3}{9} = \frac{1}{3} \quad \frac{4}{12} = \frac{1}{3} \quad \frac{5}{15} = \frac{1}{3}$

Yes, y is proportional to x because the values of the ratios y: x are equivalent. Each measure of x multiplied by this constant of $\frac{1}{3}$ gives the corresponding measure in y.

If I multiply each x-value by $\frac{1}{3}$, the outcome will be the corresponding y-value.

3. Ms. Lynch is planning a field trip for her class. She knows that the field trip will cost $12 per person.

   a. Create a table showing the relationships between the number of people going on the field trip and the total cost of the trip.

Number of People	1	2	3	4
Total Cost ($)	12	24	36	48

I choose any value for the number of people, and then multiply this value by 12 to determine the total cost.

   b. Explain why the cost of the field trip is proportional to the number of people attending the field trip.

   The total cost is proportional to the number of people who attend the field trip because a constant value of 12 exists where each measure of the number of people multiplied by this constant gives the corresponding measure of the total cost.

   c. If 23 people attend the field trip, how much will the field trip cost?

   $23(12) = 276$

   If 23 people attend the field trip, then the total cost of the trip is $276.

I know the relationship is proportional, so I can use the constant of 12 to determine the total cost of the field trip if 23 people attend.

G7-M1-Lesson 4: Identifying Proportional and Non-Proportional Relationships in Tables

Recognizing Proportional Relationships

1. For his birthday, Julian received 15 toy cars. He plans to start collecting more cars and is going to buy 3 more every month.

   a. Complete the table below to show the number of toy cars Julian has after each month.

Julian has 15 toy cars when he decided to start collecting more. Therefore, at month 0 he already has 15 toy cars.

Time (in months)	0	1	2	3
Number of Cars	15	18	21	24

Julian has 18 toy cars after one month because he had 15 cars and then bought 3 more during the first month.

   b. Is the number of toy cars Julian has proportional to the number of months? Explain your reasoning.

   The number of toy cars Julian has is not proportional to the number of months because the ratios are not equivalent. $15:0$ ***is not equivalent to*** $18:1$.

If an additional explanation is needed, please refer to Lesson 3.

2. Hazel and Marcus are both training for a race. The tables below show the distances each person ran over the past few days.

Hazel:

Days	2	5	9
Miles	6	15	27

Marcus:

Days	3	6	8
Miles	6	11	20

a. Which of the tables, if any, represent a proportional relationship?

Hazel:

$\frac{6}{2} = 3 \quad \frac{15}{5} = 3 \quad \frac{27}{9} = 3$

Marcus:

$\frac{6}{3} = 2 \quad \frac{11}{6} = 1\frac{5}{6} \quad \frac{20}{8} = 2\frac{1}{2}$

These ratios do not have the same value, so the number of miles is not proportional to the number of days.

The number of miles Hazel ran is proportional to the number of days because the constant of 3 is multiplied by each measure of days to get the corresponding measure of miles. There is not a constant value for Marcus's table, so this table does not show a proportional relationship.

b. Did Hazel and Marcus both run a constant number of miles each day? Explain.

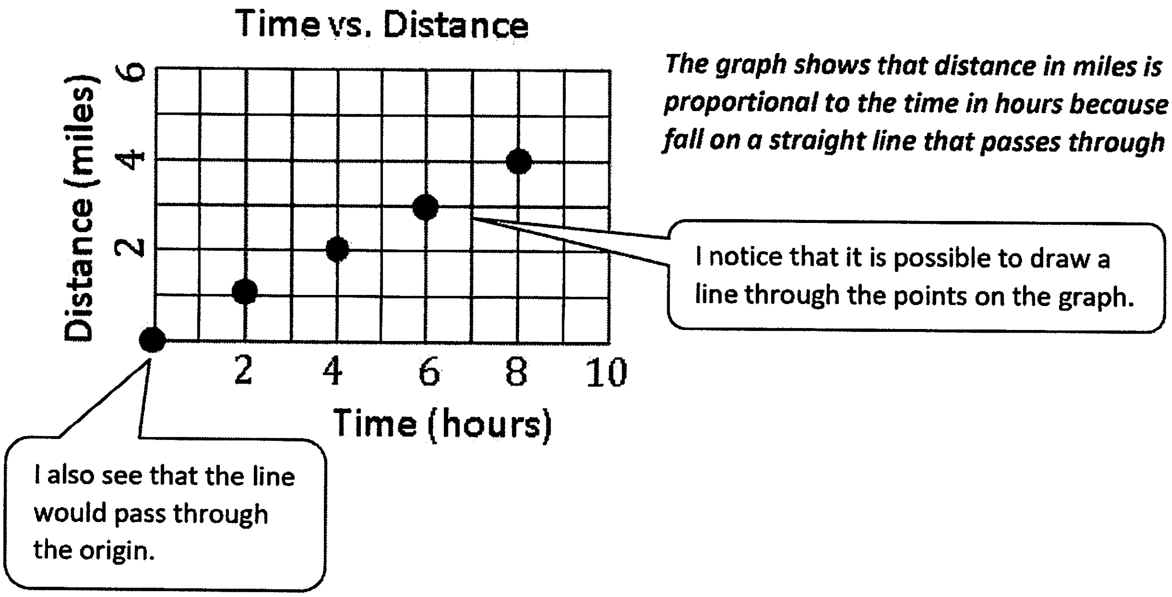
Hazel ran the same number of miles, 3, each day, but Marcus did not run a constant number of miles each day because the relationship between the number of miles he ran and the number of days is not proportional.

G7-M1-Lesson 5: Identifying Proportional and Non-Proportional Relationships in Graphs

Recognizing Proportional Graphs

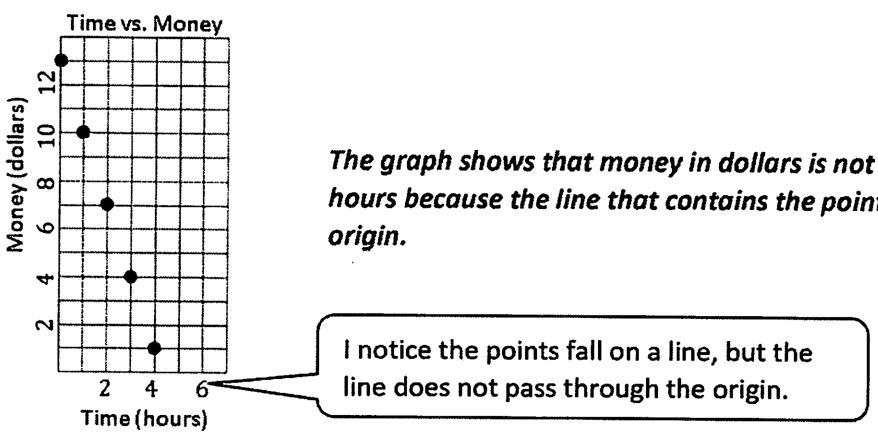
Determine whether or not the following graphs represent two quantities that are proportional to each other. Explain your reasoning.

1.



The graph shows that distance in miles is proportional to the time in hours because the points fall on a straight line that passes through the origin.

2.



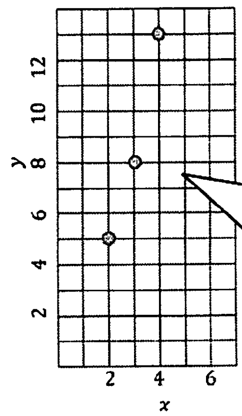
The graph shows that money in dollars is not proportional to the time in hours because the line that contains the points does not pass through the origin.

Create a table and a graph for the ratios 3: 8, 2 to 5, and 4: 13. Does the graph show that the two quantities are proportional to each other? Explain why or why not.

3.

x	y
3	8
2	5
4	13

The first number in each ratio represents the x-value, and the second number in each ratio represents the y-value.



The x-value tells me how far to move right on the graph, and the y-value tells me how far to move up on the graph.

The graph shows that y is not proportional to x because the points do not fall on a straight line.

I do not have to determine if the line would pass through the origin because it is already clear that the points do not fall on a line.

G7-M1-Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs

Recognizing Proportional Relationships in Graphs

Create a table and a graph, and explain whether or not Kirk's height and age are proportional to each other. Use your table and graph to support your reasoning.

Kirk's parents kept track of his growth during the first few years of his life.

- Kirk weighed 7 pounds 6 ounces and was 20 inches tall when he was born.
- When Kirk was three years old, he was 31 inches tall.
- Kirk was 48 inches tall when he was seven years old.
- On his tenth birthday, Kirk was 4 feet 7 inches tall.

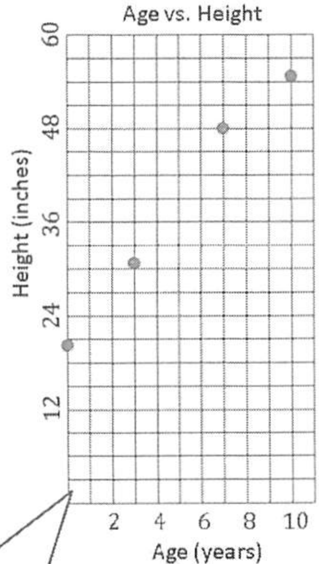
I need to convert Kirk's height to inches to be consistent with the other values.

Problem:

Kirk's mom keeps track of his height for the first ten years of his life. The ratios in the table represent Kirk's age in years to his height in inches. Create a table and a graph, and explain whether or not the quantities are proportional to each other.

Age (years)	*Height (inches)*
0	20
3	31
7	48
10	55

The ratios in the table are not equivalent, so right away I know that the relationship is not proportional.

	*Explanation:* ***Kirk's height is not proportional to his age because the ratios in the table are not equivalent. The graph also shows that this relationship is not proportional because the points do not fall on a straight line that passes through the origin.***

The graph is not proportional for two reasons: the points do not fall on a line, and they also do not pass through the origin.

G7-M1-Lesson 7: Unit Rate as the Constant of Proportionality

Calculating the Constant of Proportionality

For each of the following problems, calculate the constant of proportionality to answer the follow-up question.

1. Red apples are on sale for $0.99/pound.

   a. What is the constant of proportionality, or k?

   The unit rate is provided for me, so I do not have to complete any calculations to find the constant of proportionality.

   The constant of proportionality, k, is $\mathbf{0.99}$.

   The constant of proportionality is the cost for one pound of apples, so I use this value to determine the cost of any number of pounds of apples.

   b. How much will 8 pounds of apples cost?

   $(\mathbf{8lb.})\left(\frac{\$0.99}{\mathbf{lb.}}\right) = \$\mathbf{7.92}$

   Eight pounds of apples will cost $\$\mathbf{7.92}$.

2. Shirts are on sale: 4 shirts for $34.

   a. What is the constant of proportionality, or k?

   $\frac{34}{4} = 8.50$

   The constant of proportionality means that one shirt costs $8.50.

   The constant of proportionality, k, is $\mathbf{8.50}$.

   b. How much will 9 shirts cost?

   $(\mathbf{9\ shirts})\left(\frac{\$8.50}{\mathbf{shirt}}\right) = \$\mathbf{76.50}$.

   Nine shirts will cost $\$\mathbf{76.50}$.

3. Holly babysits for one family regularly. In the month of October, she worked 120 hours and earned \$1,320. In November, Holly worked 110 hours and earned \$1,210. Due to the family taking a vacation in December, Holly only earned \$770 for the 70 hours she worked that month.

   a. Is the amount of money Holly earned each month proportional to the number of hours she worked? Explain why or why not.

I do not have to make a table, but it helps me organize the data.

Time (hours)	70	110	120
Amount Earned (\$)	770	$1,210$	$1,320$

$\frac{770}{70} = 11$ $\frac{1,210}{110} = 11$ $\frac{1,320}{120} = 11$

This division not only shows the relationship is proportional, but it also reveals the unit rate and constant of proportionality.

The amount of money Holly earns is proportional to the amount of time she works because the ratios are equivalent. The constant of 11 can be multiplied by the time she works, in hours, and the result will be the corresponding amount earned.

I can only answer this question if the relationship is proportional. The constant of proportionality does not exist if the relationship is not proportional.

   b. Identify the constant of proportionality, and explain what it means in the context of the situation.

The constant of proportionality, k, is 11. The constant of proportionality tells us how much money Holly earns each hour.

   c. How much money will Holly earn if she babysits for 150 hours next month?

Similar to the previous problems, I can use the constant of proportionality to determine how much Holly will earn for any specified number of hours.

$(150 \text{ hours})\left(\frac{\$11}{\text{hour}}\right) = \$1,650$

Holly will earn $\$1,650$ if she works 150 hours next month.

G7-M1-Lesson 8: Representing Proportional Relationships with Equations

Writing Equations

Write an equation that will model the proportional relationship given in each real-world situation.

1. Kaedon completed a 75 mile bike race in 3.75 hours. Consider the number of miles he can ride per hour.

   a. Find the constant of proportionality in this situation.

   $$\frac{75}{3.75} = 20$$

   To find the constant of proportionality, I need to divide the distance by time.

   The constant of proportionality is 20.

   b. Write an equation to represent the relationship.

   Let m represent the number of miles Kaedon rides his bike.

   Let h represent the number of hours Kaedon rides his bike.

   $m = 20h$

   The equation shows that I can multiply the constant of proportionality by the number of hours to determine the number of miles.

   Although I can choose any variables for my equation, it is important to define the variables that are in the equation.

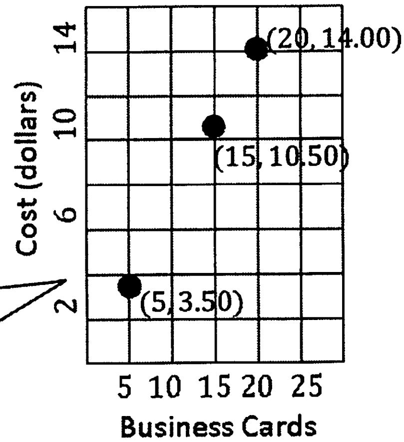
2. Clark is starting a new company and needs to order business cards. He plans on ordering 50 business cards a month. Business Cards Galore has offered to print all the business cards Clark needs for a flat rate of \$37.50 a month. The different prices for Print Options are shown on the graph below. Which is the better buy?

   a. Find the constant of proportionality for the situation.

Business Cards	5	15	20
Cost (dollars)	3.50	10.50	14.00

If I choose, I can translate the graph to a table to organize the data needed to calculate the constant of proportionality.

Business Cards vs. Cost



$\frac{3.50}{5} = 0.7$ $\frac{10.50}{15} = 0.7$ $\frac{14.00}{20} = 0.7$

The constant of proportionality is 0.7.

   b. Write an equation to represent the relationship.

Let c represent the cost in dollars.

Let b represent the number of business cards.

$$c = 0.7b$$

I can substitute values from the given ratios to make sure that my equation is correct.

$$3.50 = 0.7(5)$$
$$3.50 = 3.50$$

   c. Use your equation to find the answer to Clark's question above. Justify your answer with mathematical evidence and a written explanation.

Before I compare the cost of the two companies, it is necessary to determine the cost of 50 *business cards if Clark chooses to order from Print Options. Using the equation, b can be substituted with* 50 *since b represents the number of business cards. This work is shown below.*

$$c = 0.7(50)$$
$$c = 35$$

The calculation shows the cost for 50 *business cards from Print Options is* \$35.00*. If Clark orders* 50 *business cards from Business Cards Galore, it will cost him* \$37.50*, which is more than the price at Print Options. Therefore, the better buy is to order business cards from Print Options.*

G7-M1-Lesson 9: Representing Proportional Relationships with Equations

Applications of Proportional Relationships

Use the table to answer the following questions.

Time (hours)	Payment (dollars)
0	0
5	75
12	180
18	270

a. Which variable is the dependent variable and why?

The dependent variable is the payment because the amount someone gets paid depends on the number of hours he works.

b. Is the payment proportionally related to the time? If so, what is the equation that relates the payment to the number of hours?

$\frac{75}{5} = 15$ $\frac{180}{12} = 15$ $\frac{270}{18} = 15$

I notice that the ratios are equivalent, which means the relationship is proportional.

Yes, the payment is proportionally related to time because every number of hours can be multiplied by 15 to get the corresponding measure of dollars.

Let h represent the time in hours, and let d represent the payment in dollars.

$d = 15h$

c. What is the constant of proportionality?

The constant of proportionality is 15.

The unit rate, or constant of proportionality, is multiplied by the independent variable, and the result is the dependent variable.

d. If the time is known, can you find the payment? Explain how this value would be calculated.

The payment can be determined if I know the number of hours. To calculate the payment, I multiply the number of hours by 15.

If I am given the value of one variable, I am able to use the equation to calculate the value of the other variable.

e. If the payment is known, can you find the time? Explain how this value would be calculated.

The time can be determined if I know the payment. To calculate the number of hours, I divide the payment by 15.

f. What would the payment be if a person worked 22 hours?

I am given the value of h, so I substitute 22 into the equation to represent h.

$d = 15h$

$d = 15(22)$

$d = 330$

If a person worked 22 *hours, he would receive a payment of* $\$330$.

g. How long would a person have to work if he wanted to receive a payment of \$540?

$$\begin{aligned} d &= 15h \\ 540 &= 15h \\ 540 \div 15 &= 15h \div 15 \\ 36 &= h \end{aligned}$$

This time, I am given the value of d, so I substitute 540 into the equation to represent d.

A person would have to work 36 *hours to receive a payment of* $\$540$.

I use my knowledge of properties of equality from sixth grade to solve these equations. Therefore, I divide both sides of the equation by 15 to determine the value of h.

h. How long would a person have to work if he wanted to receive a payment of \$127.50?

$$\begin{aligned} d &= 15h \\ 127.50 &= 15h \\ 127.50 \div 15 &= 15h \div 15 \\ 8.5 &= h \end{aligned}$$

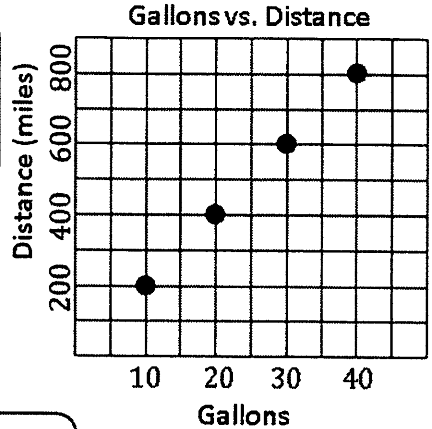
A person would have to work 8.5 *hours to receive a payment of* $\$127.50$.

G7-M1-Lesson 10: Interpreting Graphs of Proportional Relationships

Interpreting Proportional Relationships

1. The graph to the right shows the relationship of the gallons of gas to the distance (in miles) traveled by a small car.

The first number in the ordered pair represents the x-value, which is the number of gallons of gas. The second number in the ordered pair represents the y-value, which is the distance, in miles, traveled.



a. What does the point $(20, 400)$ represent in the context of the situation?

With 20 gallons of gas, the car can travel 400 miles.

I remember from Lessons 5 and 6 what a proportional graph should look like.

b. Is the distance traveled by the car proportional to the gallons of gas? Explain why or why not.

The distance traveled is proportional to the gallons of gas because the points fall on a line and pass through the origin, $(0, 0)$.

c. Write an equation to represent the distance traveled by the car. Explain or model your reasoning.

$$\frac{400}{20} = 20$$

I need to determine the constant of proportionality before writing the equation. Therefore, I must find the quotient of $\frac{y}{x}$.

The constant of proportionality, or unit rate of $\frac{y}{x}$, is 20 and can be substituted into the equation $y = kx$ in place of k.

Let d represent the distance, in miles, and let g represent the number of gallons of gas.

$d = 20g$

I know that the product of the independent variable and the constant of proportionality is the dependent variable.

d. How far can a car travel with one gallon of gas? Explain or model your reasoning.

A car can travel 20 *miles with one gallon of gas because the constant of proportionality represents the distance that can be traveled per one gallon of gas.*

If I didn't recognize this value to be the constant of proportionality, I could use my equation to answer this equation.

$d = 20(1)$

2. Ms. Stabler is creating playdough for her classroom. The recipe requires a few different ingredients, but the relationship between flour and salt for the playdough is shown in the table below.

Cups of Flour	4	6	7	10
Cups of Salt	2	3	3.5	5

Before writing an equation, I must first determine the constant of proportionality.

$\frac{2}{4} = \frac{1}{2}$ $\frac{3}{6} = \frac{1}{2}$ $\frac{3.5}{7} = \frac{1}{2}$ $\frac{5}{10} = \frac{1}{2}$

a. Write an equation to represent this relationship.

Let f *represent the cups of flour and* s *represent the cups of salt needed for the playdough recipe.*

$s = \frac{1}{2}f$

b. Using this equation, how many cups of salt are required if Ms. Stabler uses 13 cups of flour?

$$s = \frac{1}{2}f$$
$$s = \frac{1}{2}(13)$$
$$s = 6.5$$

I am given the amount of flour that is used for a batch of playdough. I can substitute this value for f in my equation.

Ms. Stabler will need 6.5 *cups of salt.*

c. How many cups of flour are needed if Ms. Stabler uses 4 cups of salt?

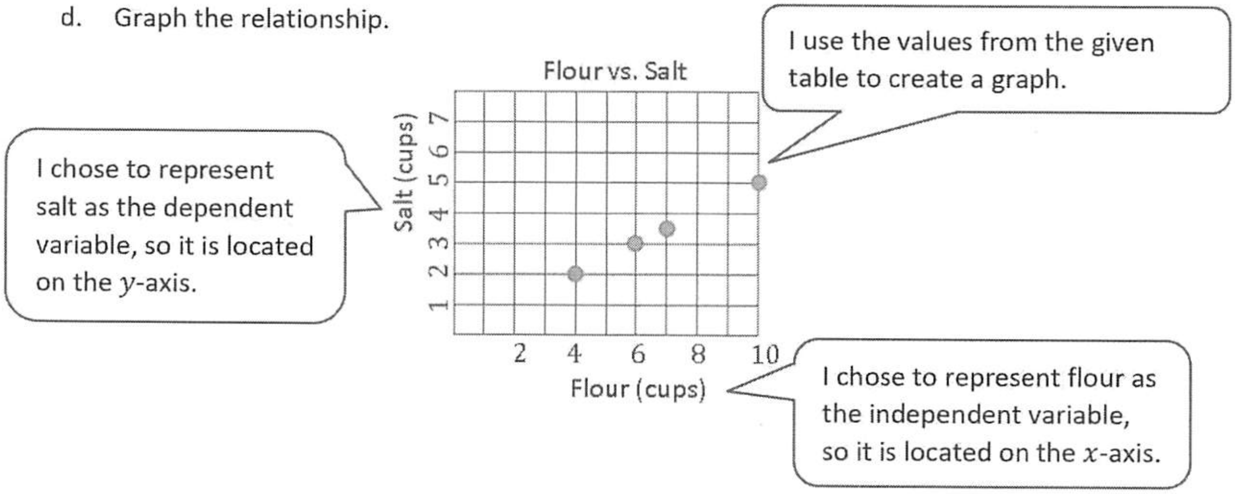
This time, I am given the amount of salt that is used for a batch of playdough. I can substitute this value for s in my equation.

$$s = \frac{1}{2}f$$
$$4 = \frac{1}{2}f$$
$$\left(\frac{2}{1}\right)(4) = \left(\frac{2}{1}\right)\left(\frac{1}{2}f\right)$$
$$8 = f$$

To solve for f, I need to multiply both sides of the equation by the multiplicative inverse of $\frac{1}{2}$, or I could divide both sides by the coefficient, which is $\frac{1}{2}$ in this equation.

Ms. Stabler will need 8 *cups of flour.*

d. Graph the relationship.



G7-M1-Lesson 11: Ratios of Fractions and Their Unit Rates

Complex Ratios

1. Determine the quotient: $3\frac{3}{5} \div 4\frac{2}{3}$.

> Before I do any calculations, I need to change each mixed number to a fraction greater than one.

$3\frac{3}{5} \div 4\frac{2}{3}$

$\frac{18}{5} \div \frac{14}{3}$

> In sixth grade, I learned to invert and multiply when dividing fractions.

$\frac{18}{5} \times \frac{3}{14}$

> To multiply fractions, I multiply the two numerators and then multiply the two denominators.

$\frac{54}{70}$

> The numerator and denominator have a common factor of 2, so I divide both by 2.

$\frac{27}{35}$

The quotient is $\frac{27}{35}$.

2. Michael is building a new fence that is 15 feet long. In order for the fence to be stable, he needs to use a post every $1\frac{1}{4}$ feet. How many posts does Michael need?

> To answer this question, I need to divide the fence length by the distance between each post.

$15 \div 1\frac{1}{4}$

> To convert a whole number to a fraction greater than 1, I can make the denominator 1 because $\frac{15}{1} = 15$.

$\frac{15}{1} \div \frac{5}{4}$

$\frac{15}{1} \times \frac{4}{5}$

$\frac{60}{5}$

12

Michael will need 12 *posts for his fence.*

3. A smoothie recipe calls for 1.2 cups of strawberries for one batch. Ms. Neal uses 4.8 cups of strawberries today.

   a. How many batches did Ms. Neal make today?

I do not have to convert the decimals to fractions, but I choose to use fractions because that is what I practiced in previous problems.

$$4.8 \div 1.2$$
$$4\frac{4}{5} \div 1\frac{1}{5}$$
$$\frac{24}{5} \div \frac{6}{5}$$
$$\frac{24}{5} \times \frac{5}{6}$$
$$4$$

To determine the number of batches, I need to calculate the quotient of the amount of strawberries used and the amount of strawberries required for one batch.

Ms. Neal made 4 batches of the smoothie recipe.

   b. If Ms. Neal can make 5 smoothies in each batch, how many smoothies did she make today?

$$5(4) = 12$$

Ms. Neal made 20 smoothies today.

I already determined that Ms. Neal made 4 batches today, so I can multiply this by the number of smoothies in each batch.

4. Garrek plans to drink 3 quarts of water every 4 days. How many <u>gallons</u> does he drink every day? (Recall: 4 quarts = 1 gallon.)

Garrek drinks $\frac{3}{4}$ gallons every 4 days.

I divide the number of quarts Garrek drinks by the number of quarts in a gallon, 4, to determine the number of gallons Garrek drinks every 4 days.

I can determine the number of gallons of water Garrek drinks daily by dividing the number of gallons he drinks by the number of days it took him to drink that amount of water.

$$\frac{3}{4} \div \frac{4}{1}$$
$$\frac{3}{4} \times \frac{1}{4}$$
$$\frac{3}{16}$$

Garrek drinks $\frac{3}{16}$ gallons of water every day.

G7-M1-Lesson 12: Ratio of Fractions and Their Unit Rates

1. The area of a poster is $51\frac{1}{3}\text{ ft}^2$. The same image from the poster can also be found on a postcard with an area of $1\frac{5}{6}\text{ ft}^2$.

Just like in previous lessons, I must divide the two values to determine the unit rate.

a. Find the unit rate, and explain, in words, what the unit rate means in the context of this problem.

I realize I am dividing mixed numbers just like I did in Lesson 11.

$$\frac{51\frac{1}{3}}{1\frac{5}{6}} = \frac{\frac{154}{3}}{\frac{11}{6}} = \frac{154}{3} \times \frac{6}{11} = 28$$

The unit rate is 28, which means the poster's area is 28 times the area of the postcard.

I know the unit rate from the poster to the postcard. The second unit rate would be the opposite; from the postcard to the poster.

b. Is there more than one unit rate that can be calculated? How do you know?

Yes, there is another unit rate, which would be $\frac{1}{28}$. I know there can be another unit rate because it would explain that the postcard's area is $\frac{1}{28}$ the area of the poster.

2. The length of a bedroom on a blueprint is $4\frac{1}{2}$ in. The length of the actual room is $12\frac{1}{4}$ ft. What is the value of the ratio of the length of the bedroom on the blueprint to the length of the actual room? What does this ratio mean in this situation?

To calculate the value of the ratio, I must divide the length of the blueprint by the length of the actual bedroom.

$$\frac{4\frac{1}{2}}{12\frac{1}{4}} = \frac{9}{2} \div \frac{49}{4} = \frac{9}{2} \times \frac{4}{49} = \frac{18}{49}$$

The value of the ratio is $\frac{18}{49}$. This means that for every 18 in. on the blueprint, there are 49 ft. in the actual bedroom.

Unlike the unit rate, there is only one correct way to calculate the value of a ratio.

There are 12 cookies in one dozen.

3. To make a dozen cookies, $\frac{1}{4}$ cup sugar is needed.

a. How much sugar is needed to make one cookie?

$\frac{1}{4} \div 12$

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

$\frac{1}{48}$

To determine the amount of sugar needed for one cookie, I need to find the unit rate.

I will need $\frac{1}{48}$ cup of sugar to make one cookie.

b. How many cups of sugar are needed to make 4 dozen cookies?

$\frac{1}{48}(48) = 1$

I will need 1 cup of sugar to make 4 dozen cookies.

There are 12 cookies in each dozen, so there are 48 cookies in four dozen.

c. How many cookies can you make with $3\frac{1}{4}$ cups of sugar?

$3\frac{1}{4} \div \frac{1}{48}$

$\frac{13}{4} \div \frac{1}{48}$

$\frac{13}{4} \times \frac{48}{1}$

156

I need to divide the amount of sugar I have by the amount of sugar that is required to make one cookie.

I can make 156 cookies with $3\frac{1}{4}$ cups of sugar.

G7-M1-Lesson 13: Finding Equivalent Ratios Given the Total Quantity

Chip is painting a few rooms the same color pink. Therefore, Chip needs to mix the same ratio of red paint to white paint for every room.

a. Complete the following table, which represents the number of gallons of paint needed to complete the paint job.

Room	Red Paint	White Paint	Total Paint
Office	2	3	5
Kitchen	4	6	10
Bedroom	$5\frac{1}{3}$	8	$13\frac{1}{3}$
Living Room	$6\frac{1}{3}$	$9\frac{1}{2}$	$15\frac{5}{6}$

After I find the total paint in the kitchen, I notice that the total paint needed for the office is half of 10. Therefore, Chip will need half as much of red and white paint for the office.

I see that the unit rate of white paint to red paint is $\frac{2}{3}$. I can multiply the amount of white paint needed by the unit rate to calculate the amount of red paint needed for the bedroom.

$$\frac{2}{3}(8) = \frac{16}{3} = 5\frac{1}{3}$$

$$\frac{3}{2}\left(6\frac{1}{3}\right) = \frac{3}{2}\left(\frac{19}{3}\right) = \frac{19}{2} = 9\frac{1}{2}$$

To calculate the amount of white paint Chip needs for the living room, I need to use the unit rate of red paint to white paint, which is $\frac{3}{2}$.

I need to find a common denominator in order to add the red paint and white paint together.

$$6\frac{1}{3} + 9\frac{1}{2} = 6\frac{2}{6} + 9\frac{3}{6} = 15\frac{5}{6}$$

b. Write an equation to represent the relationship between the amount of red paint and white paint.

Let r represent the amount of red paint and w represent the amount of white paint.

$w = \frac{3}{2}r$ *or* $r = \frac{2}{3}w$

The equation will look different, depending which unit rate I decide to use.

c. What is the relationship between the amount of red paint and the amount of white paint needed?

The amount of red paint is $\frac{2}{3}$ the amount of white paint used for the pink paint mixture.

If I multiply the amount of white paint used by $\frac{2}{3}$, I will know how much red paint is used.

G7-M1-Lesson 14: Multi-Step Ratio Problems

1. An insurance agent earns a commission equal to $\frac{1}{20}$ of his total sales. What is the commission earned if he sells $2,800 of insurance?

   $\left(\frac{1}{20}\right)(2,800) = 140$

   I want to find the part of the total sales that represents the commission by multiplying the part by the total sales.

   He will earn **$\$140$** ***in commissions.***

2.
   a. What is the cost of a $960 refrigerator after a discount of $\frac{1}{6}$ the original price?

      $\frac{1}{6}(960) = 160$

      $960 - 160 = 800$

      I know I save $160, so I subtract that from the total to find the cost after the discount.

      After the discount, the cost of the refrigerator is **$\$800$.**

   b. What is the fractional part of the original price that the customer will pay?

      $1 - \frac{1}{6} = \frac{5}{6}$

      1 represents the original price, so I subtract the discount to determine the fractional part I pay.

3. Tom bought a new computer on sale for $\frac{1}{5}$ off the original price of $750. He also wanted to use his frequent shopper discount of $\frac{1}{10}$ off the sales price. How much did Tom pay for the computer?

   If the discount is $\frac{1}{5}$, then Tom will pay $\frac{4}{5}$ of the original price.

   $\left(\frac{4}{5}\right)(750) = 600$

   $\left(\frac{9}{10}\right)(600) = 540$

   The frequent shopper discount is $\frac{1}{10}$, so Tom pays $\frac{9}{10}$ of the sale price.

   Tom will pay **$\$540$** ***for the computer.***

4. Stores often markup original prices to make a profit. A store paid a certain price for a television and marked it up by $\frac{5}{3}$ of the price paid. The store then sold the television for $800. What was the original price?

Let x represent the original price.

$$x + \frac{5}{3}x = 800$$

The $800 is the price when the original price is added to the markup rate ($\frac{5}{3}$ of the original price).

$$\frac{8}{3}x = 800$$

$$\left(\frac{3}{8}\right)\left(\frac{8}{3}x\right) = \left(\frac{3}{8}\right)(800)$$

$$x = 300$$

I first add the coefficients $\left(1 + \frac{5}{3} = \frac{8}{3}\right)$, and then I multiply both sides of the equation by the multiplicative inverse of $\frac{8}{3}$.

The original price of the television is $\$300$.

EUREKA MATH

G7-M1-Lesson 15: Equations of Graphs of Proportional Relationships Involving Fractions

Proportional Relationships

1. Jose is on the track team and keeps track of the number of calories he burns. The data is shown in the table below.

Minutes	Calories
3	$7\frac{1}{2}$
7	$17\frac{1}{2}$
$12\frac{1}{2}$	$31\frac{1}{4}$

The given information in the first row of the table is enough to calculate the unit rate.

$7\frac{1}{2} \div 3 = 2\frac{1}{2}$

Therefore, the unit rate is $2\frac{1}{2}$.

a. Use the given ratio to complete the table.

$$7\left(2\frac{1}{2}\right) = 7\left(\frac{5}{2}\right) = \frac{35}{2} = 17\frac{1}{2}$$

$$31\frac{1}{4} \div 2\frac{1}{2} = \frac{125}{4} \div \frac{5}{2} = \frac{125}{4} \times \frac{2}{5} = 12\frac{1}{2}$$

I use the unit rate to calculate the missing values on the table.

b. What is the constant of proportionality of calories to minutes?

The constant of proportionality is $2\frac{1}{2}$ because I would find the quotient of calories and minutes, just like I did for the unit rate.

c. Write an equation that models the relationship between the number of minutes Jose ran and the calories he burned.

Let m represent the minutes he ran and c represent the calories she burned.

$$c = 2\frac{1}{2}m$$

I remember writing equations in earlier lessons.

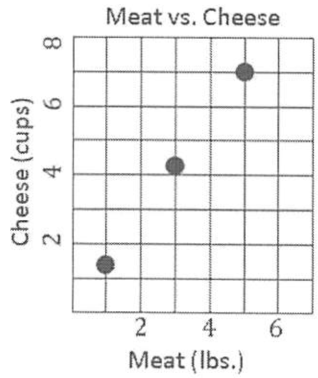
d. If Jose wants to burn 50 calories, how long would he have to run?

I can substitute 50 in for c in the equation and then use the multiplicative inverse to solve for m.

$$c = 2\frac{1}{2}m$$
$$50 = 2\frac{1}{2}m$$
$$\left(\frac{2}{5}\right)(50) = \left(\frac{2}{5}\right)\left(\frac{5}{2}m\right)$$
$$20 = m$$

Jose will have to run for 20 minutes to burn 50 calories.

2. Jenna loves to cook lasagna and often cooks large portions. The graph below shows the relationship between the pounds of meat and the cups of cheese needed for each batch of lasagna.



This is the same as calculating the constant of proportionality.

a. Using the graph, determine how many cups of cheese Jenna will use with one pound of meat.

The point (5,7) is on the graph, so I can use these values to determine the constant of proportionality or $\frac{y}{x}$. Even though I can choose any point on the graph, this is only point that does not require estimating the location.

$$\frac{7}{5} = 1\frac{2}{5}$$

Jenna will use $1\frac{2}{5}$ cups of cheese with one pound of meat.

b. Use the graph to determine the equation that models the relationship between meat and cheese.

Let m represent the amount of meat, in pounds, used in lasagna, and let c represent the amount of cheese, in cups.

$$c = 1\frac{2}{5}m$$

c. If Jenna uses $2\frac{1}{2}$ cups of meat for a batch of lasagna, how much cheese will she use?

$c = 1\frac{2}{5}\left(2\frac{1}{2}\right)$

$c = \left(\frac{7}{5}\right)\left(\frac{5}{2}\right)$

$c = \frac{35}{10}$

$c = 3\frac{1}{2}$

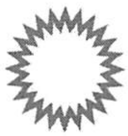
Jenna will use $3\frac{1}{2}$ cups of cheese.

G7-M1-Lesson 16: Relating Scale Drawings to Ratios and Rates

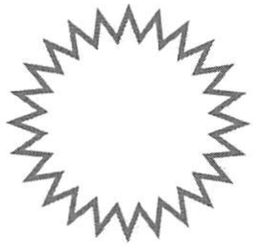
Enlargements and Reductions

1. For parts (a) and (b), identify if the scale drawing is a reduction or an enlargement of the actual picture.

   a. Actual Picture

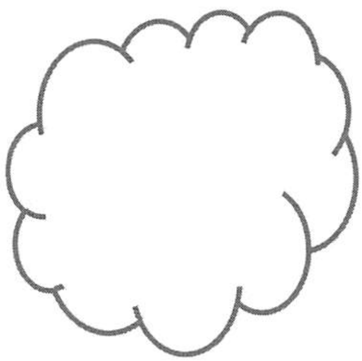
   Scale Drawing

   I need to determine if the scale drawing is smaller or larger than the actual picture. If the scale drawing is larger than the actual picture, the actual picture was enlarged to create the new image.

   This is an example of an enlargement.

   b. Actual Picture

   Scale Drawing

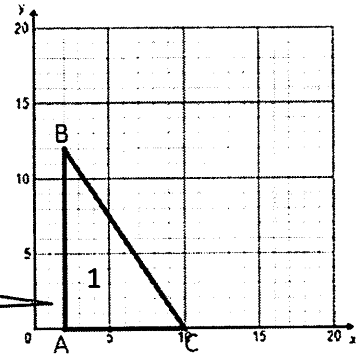
   If the scale drawing is smaller than the actual picture, the new image is called a reduction.

   This is an example of a reduction.

2. Name the coordinates of Triangle 1. Plot the points to form Triangle 2. Then decide if the triangles are scale drawings of each other.

Triangle 1

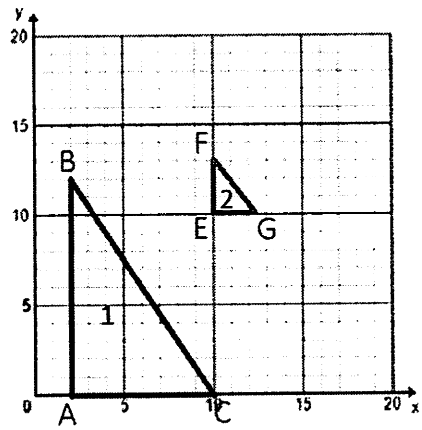
Coordinates: $A\ (2,0)$ $B\ \ (2,12)$ $C\ \ (10,0)$



I can write a point as (x, y). I start at the origin $(0,0)$ and travel right (x) and then up (y). So point A would be right 2 and up 0 making it $(2,0)$.

Triangle 2

Coordinates: $E(10,10)$, $F(10,13)$, $G(12,10)$



I can plot points the same way. If the point is $(10,13)$, I would start at the origin $(0,0)$ and then move 10 units to the right and 13 units up and plot the point.

Value of the Ratio for the Heights: $\frac{3}{12}$ *or* $\frac{1}{4}$

Value of the Ratio for the Lengths of the Bases: $\frac{2}{8}$ *or* $\frac{1}{4}$

If these two triangles are scale drawings of one another, the corresponding side lengths must be proportional. I can check the ratios of the corresponding side lengths and see if all the ratios are the same.

The triangles are scale drawings of each other. The lengths of all the sides in Triangle 2 are $\frac{1}{4}$ *as long as the corresponding sides lengths in Triangle 1.*

G7-M1-Lesson 17: The Unit Rate at the Scale Factor

Working with Scale Factors

1. Layton traveled from New York City to his mother's house 91 km away. On the map, the distance between the two locations was 7 cm. What is the scale factor?

$$91 \text{ km} = 9{,}100{,}000 \text{ cm}$$

I convert one of these measurements, so they both have the same units. I know that there are 1,000 m in 1 km. And there are 100 cm in 1 m. That means that there are 100,000 cm in 1 km.

$$\frac{7}{9{,}100{,}000}$$

$$\frac{1}{1{,}300{,}000}$$

I can determine the constant of proportionality, which is the scale factor. I notice that both have a common factor of 7, so I divide the numerator and denominator by 7.

The scale factor is $\frac{1}{1{,}300{,}000}$.

2. Frank advertises for his business by placing an ad on a highway billboard. A billboard on the highway measures 14 ft. by 48 ft. Frank liked the look of the billboard so much that he had it turned into posters that could be placed around town. The posters measured 28 in. by 96 in. Determine the scale factor used to create the posters.

I need to compare the dimensions, but I need common units. I know that there are 12 inches per foot.

$$14 \text{ ft.} \times 12 \frac{\text{in.}}{\text{ft.}} = 168 \text{ in.}$$

$$\frac{28}{168}$$

$$\frac{1}{6}$$

The scale factor of the reduction from the highway billboard to the poster is $\frac{1}{6}$.

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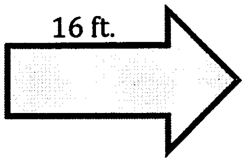
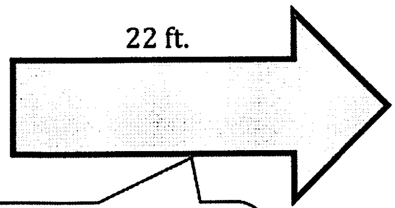
3. Use the scale drawings and measurements to complete the following.

Actual **Scale Drawing**





I can see that the scale drawing is an enlargement, so I know the scale factor will be greater than 1.

a. Determine the scale factor.

I can compare the length of the scale drawing with the corresponding side of the actual drawing.

$$\frac{22}{16}$$
$$\frac{11}{8}$$

The scale factor is $\frac{11}{8}$.

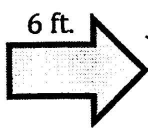
b. Determine the length of the arrow using a scale factor of $\frac{3}{8}$.

I can calculate the length of the new arrow by multiplying the length of the original by the scale factor.

$$16 \times \frac{3}{8}$$
$$\frac{16}{1} \times \frac{3}{8}$$
$$\frac{48}{8}$$
$$6$$

I can write 16 as $\frac{16}{1}$ and then multiply the numerators and multiply the denominators.

The length of the arrow will be 6 ft.



Now I can draw an arrow with a corresponding side measuring 6 ft.

G7-M1-Lesson 18: Computing Actual Lengths from a Scale Drawing

Actual Lengths

1. A snack food company has bought a larger space on a page in a magazine to place an ad. The original ad needs to be enlarged so that $\frac{1}{4}$ in. will now be shown as $\frac{7}{8}$ in. Find the length of the snack food package in the new ad if the package in the original ad was $1\frac{3}{8}$ in.

$$\frac{\frac{7}{8}}{\frac{1}{4}}$$

I divide the new measurement by the old corresponding measurement to find the scale factor.

$$\frac{7}{8} \div \frac{1}{4}$$

$$\frac{7}{8} \times \frac{4}{1}$$

$$\frac{28}{8}$$

$$\frac{7}{2}$$

When I divide fractions, I rewrite the problem as multiplying by the reciprocal. Then I just multiply the numerators and multiply the denominators.

The scale factor used to enlarge the ad is $\frac{7}{2}$.

Now I can multiply the original length by the scale factor to determine the length in the new ad.

$$1\frac{3}{8}\text{ in.} \times \frac{7}{2}$$

$$\frac{11}{8}\text{ in.} \times \frac{7}{2}$$

$$\frac{77}{16}\text{ in.}$$

$$4\frac{13}{16}\text{ in.}$$

I divide 16 into 77 in order to rewrite the fraction greater than 1 as a mixed number. The remainder will be the numerator in the mixed number.

The length of the package in the new ad will be $4\frac{13}{16}$ *inches.*

2. Hector is building a scale model of the Statue of Liberty. For the model, 1 inch represents 8 feet on the actual Statue of Liberty.

   a. If the actual Statue of Liberty is 305 feet tall, what is the height of Hector's scale model?

   1 inch of the scale drawing corresponds to 8 feet of the actual statue.

   I know the actual height, so I must divide to determine the height of the model of the statue.

   $$k = 8$$
   $$y = kx$$
   $$305 = 8x$$
   $$305 \div 8 = 8x \div 8$$
   $$38\frac{1}{8} = x$$

   In the equation $y = kx$, x is the height of the model in inches, and y is the height of the actual statue in feet.

   The height of the model will be $38\frac{1}{8}$ inches.

   b. The length of the statue's right arm in Hector's model is $5\frac{1}{4}$ inches. How long is the arm on the actual statue?

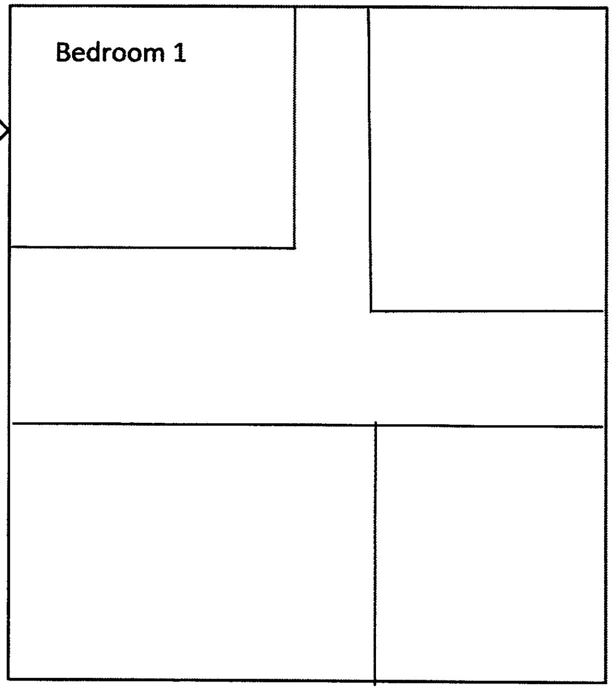
   I can use the same formula as in part (a), but this time I want to calculate the actual height, so I will multiply.

   $$k = 8$$
   $$y = kx$$
   $$y = 8\left(5\frac{1}{4}\right)$$
   $$y = \frac{8}{1}\left(\frac{21}{4}\right)$$
   $$y = \frac{168}{4}$$
   $$y = 42$$

   The length of the right arm of the actual Statue of Liberty is 42 feet.

3. A model of the second floor of a house is shown below where $\frac{1}{4}$ inch represents 3 feet in the actual house. Use a ruler to measure the drawing, and find the actual length and width of Bedroom 1.

I can use my ruler to measure the length and width of Bedroom 1 in inches. I need to make sure I am as accurate as possible.



Length of Bedroom 1*:* $1\frac{1}{2}$ *inches*

Width of Bedroom 1*:* $1\frac{1}{4}$ *inches*

I can divide the actual length by the length on the scale drawing to determine the scale factor.

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

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

$$3 \times 4$$

$$12$$

When I invert and multiply, I get $\frac{3}{1} \times \frac{4}{1}$. This is the same as 3×4.

The scale factor is 12.

For the length of Bedroom 1:

To determine the actual length and width of Bedroom 1, I multiply the measurements from the scale drawing by the scale.

$$1\frac{1}{2} \times 12$$

$$\frac{3}{2} \times \frac{12}{1}$$

$$\frac{36}{2}$$

$$18$$

For the width of Bedroom 1:

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

$$\frac{5}{4} \times \frac{12}{1}$$

$$\frac{60}{4}$$

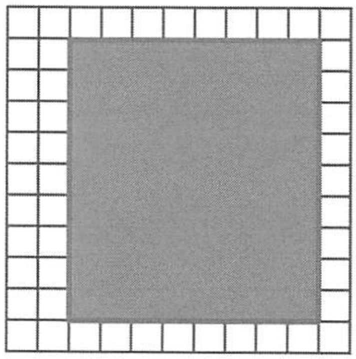
$$15$$

The actual bedroom is 18 *feet long and* 15 *feet wide.*

G7-M1-Lesson 19: Computing Actual Area from a Scale Drawing

Areas

1. The rectangle depicted by the drawing has an actual area of 128 square units. What is the scale factor from the actual rectangle to the scale drawing shown below? (Note: Each square on the grid has a length of 1 unit.)



I can count to determine the length and width of the rectangle.

$$A = \textbf{length} \times \textbf{width}$$
$$A = \textbf{8 units} \times \textbf{9 units}$$
$$A = \textbf{72 square units}$$

I need to determine the area of the scale drawing.

The ratio of the area of the scale drawing to the area of the actual rectangle is the scale factor squared or (r^2).

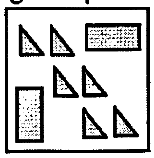
$$r^2 = \frac{72}{128}$$
$$r^2 = \frac{9}{16}$$
$$r = \frac{3}{4}$$

I know that the scale factor of the drawing must be $\frac{3}{4}$ because $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$.

The scale factor is $\frac{3}{4}$.

2. A quilter designing a new pattern for an extremely large quilt to exhibit in a museum drew a sample quilt on paper using a scale of 1 in. to $2\frac{2}{3}$ ft. Determine the total area of the square quilt from the drawing.

Drawing of Square Block



The block is a square, which means that all the sides will be the same length.

The value of the ratio of areas:

$$r^2 = \left(\frac{2\frac{2}{3}}{1}\right)^2$$

$$r^2 = \left(2\frac{2}{3}\right)^2$$

$$r^2 = \left(\frac{8}{3}\right)^2$$

$$r^2 = \frac{64}{9}$$

I can start by determining the value of the ratio of areas. Because there are two dimensions, I will need to square the ratio of the lengths.

Area of scale drawing:

$$A = \left(8\frac{1}{4}\right)\left(8\frac{1}{4}\right)$$

$$A = \left(\frac{33}{4}\right)\left(\frac{33}{4}\right)$$

$$A = \frac{1089}{16}$$

I also need the area of the scale drawing.

Let x represent the scale drawing area and y represent the actual area.

$$y = kx$$

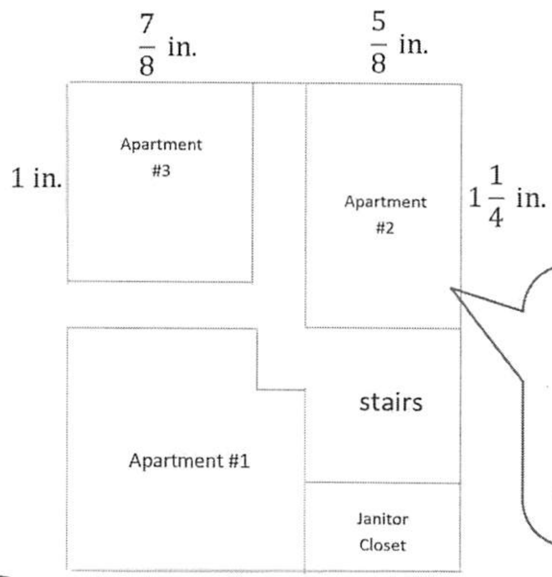
$$y = \left(\frac{64}{9}\right)\left(\frac{1089}{16}\right)$$

$$y = 484$$

I can multiply the area of the drawing by the value of the ratios of the areas to determine the area of the actual quilt.

The area of the actual quilt is 484 square feet.

3. Below is a floorplan for part of an apartment building where $\frac{1}{2}$ inch corresponds to 16 feet of the actual apartment building. The tenants in Apartment #3 claim that Apartment #2 is bigger. Are they right? Explain.



I have the length and width of each rectangular apartment, so I can multiply these to determine the areas of the scale drawing.

I have a whole number in the numerator and a fraction in the denominator, so to simplify this, I will divide. To divide fractions, I invert and multiply by the reciprocal of the second fraction.

The value of the ratio of the areas:

$$r^2 = \left(\frac{16}{\frac{1}{2}}\right)^2$$
$$r^2 = \left(\frac{16}{1} \div \frac{1}{2}\right)^2$$
$$r^2 = (16 \times 2)^2$$
$$r^2 = 32^2$$
$$r^2 = 1024$$

I can rewrite a whole number as a fraction by writing 16 as $\frac{16}{1}$. And in the same way, I can rewrite $\frac{2}{1}$ as 2.

The areas of the scale drawing:

Apartment #2

$$A = \left(\frac{5}{8}\text{ in.}\right)\left(1\frac{1}{4}\text{ in.}\right)$$
$$A = \left(\frac{5}{8}\text{ in.}\right)\left(\frac{5}{4}\text{ in.}\right)$$
$$A = \frac{25}{32}\text{ in.}^2$$

To calculate the actual area of each apartment, I will multiply the value of the ratio of the areas by the area of the apartment on the scale drawing.

Actual Area of Apartment #2:

$$A = (1024\text{ ft.})\left(\frac{25}{32}\text{ ft.}\right)$$
$$A = 800\text{ ft}^2$$

I can follow the same process for Apartment #3.

Apartment #3

$$A = (1\text{ in.})\left(\frac{7}{8}\text{ in.}\right)$$
$$A = \frac{7}{8}\text{ in.}^2$$

Actual Area of Apartment #3:

$$A = (1024\text{ ft.})\left(\frac{7}{8}\text{ ft.}\right)$$
$$A = 896\text{ ft}^2$$

Apartment #3 is bigger than Apartment #2 by* 96 *square feet. The tenants were incorrect.

Now that I have an area for both apartments, I can see that Apartment #3 is bigger. The tenants were incorrect. I can subtract to see just how much bigger Apartment #3 is than Apartment #2.

G7-M1-Lesson 20: An Exercise in Creating a Scale Drawing

Designing a Tree House

Your parents have designated you as the official tree house designer. Your job is to create a top view scale drawing of the tree house of your dreams. Show any special areas or furniture that you would have in the tree house. Use a scale factor of $\frac{1}{12}$.

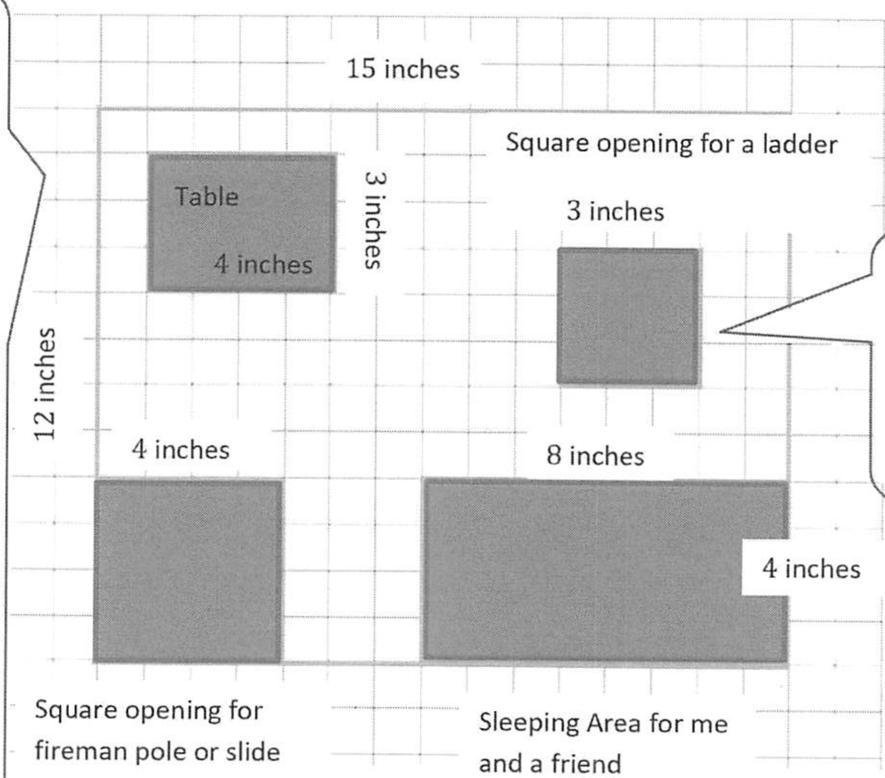
A scale factor of $\frac{1}{12}$ means that 1 inch on my scale drawing corresponds to 12 inches, or 1 foot, on the real tree house.

Sample Answers are Shown Below:

The tree house will be rectangular with a length of 12 feet and a width of 15 feet. The area of the tree house is 180 square feet, and the perimeter is 54 feet.

(Note: Assume that each square on the grid has a length of 1 inch.)

I need to decide what I want inside the tree house and how long it would be in inches. Once I determine the actual length of the objects, I multiply by the scale factor $\left(\frac{1}{12}\right)$ to convert the length needed in the scale drawing.



I can draw a 3 ft. long object as 3 inches in my drawing.

G7-M1-Lesson 21: An Exercise in Changing Scales

Scale Drawing with Different Scales

1. The original scale factor for a scale drawing of a square patio is $\frac{1}{60}$, and the length of the original drawing measures to be 15 inches.

I noticed that the problem gives the length of the square in the scale drawing but not the length of the actual patio.

   a. What is the length on the new scale drawing if the scale factor of the new scale drawing length to actual length is $\frac{1}{72}$?

I will use the first scale factor to determine the actual length of the patio.

$$15 \text{ in.} \div \frac{1}{60} = 900 \text{ in.}$$

$$900 \text{ in.} \times \frac{1}{72} = 12.5 \text{ in.}$$

I use the actual length of the patio and the second scale factor to determine the length in the new scale drawing.

The length of the square in the new scale drawing is 12.5 *inches.*

   b. What is the scale factor of the new scale drawing to the original scale drawing (Scale Drawing 2 to Scale Drawing 1)?

I can calculate the scale factor of the new scale drawing by dividing the new scale factor by the original scale factor.

$$\frac{\frac{1}{72}}{\frac{1}{60}}$$

$$\frac{1}{72} \div \frac{1}{60}$$

$$\frac{1}{72} \times \frac{60}{1}$$

$$\frac{60}{72}$$

$$\frac{5}{6}$$

60 and 72 have a common factor of 12. I divide them both by 12 to write the scale factor another way.

The scale factor of the new scale drawing to the original scale drawing is $\frac{5}{6}$.

c. If the length of the patio on the new scale drawing is 24 cm, what is the actual length, in meters, of the patio?

I divide the length in the new scale drawing by the scale factor to get back to the original length of the patio.

$$24 \text{ cm} \div \frac{1}{72}$$

$$24 \text{ cm} \times 72$$

$$1728 \text{ cm}$$

$$17.28 \text{ m}$$

There are 100 cm for every 1 m. So, I divide the number of centimeters by 100 to convert to meters.

The patio is 17.28 *meters long.*

d. What is the surface area of the actual patio? Round your answer to the nearest tenth.

The patio is a square, where all sides are equal, so I will multiply the side lengths to determine the area.

$$A = 17.28 \text{ m} \times 17.28 \text{ m}$$

$$A = 298.5984 \text{ m}^2$$

The area of the patio is about 298.6 m^2.

The 5 is in the tenths place. I can see that this number is closer to 6 tenths than 5 tenths because of the 9 in the hundredths place.

e. If the actual patio is 0.1 m thick, what is the volume of the patio? Round your answer to the nearest tenth.

I can calculate the volume of a prism by multiplying the length, width, and height. The thickness would be the height.

$$V = 17.28 \text{ m} \times 17.28 \text{ m} \times 0.1 \text{ m}$$

$$V = 29.85984 \text{ m}^3$$

The volume of the patio is about 29.9 m^3.

When I multiply meters times meters times meters, I get meters cubed.

f. If the patio is made entirely of concrete, and 1 cubic meter of concrete weighs about 2.65 tons, what is the weight of the entire patio? Round your answer to the nearest unit.

Each cubic meter of concrete weighs 2.65 tons, and I have 29.9 cubic meters.

$$29.9 \text{ m}^3 \times \frac{2.65 \text{ tons}}{1 \text{ m}^3} = 79.235 \text{ tons}$$

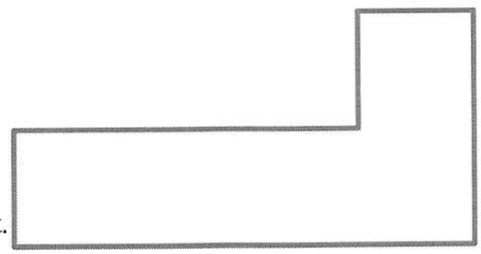
The patio weighs about 79 *tons.*

I know that rounding to the nearest unit is the same as rounding to the nearest ones place. And 79 and 2 tenths is closer to 79 than to 80.

G7-M1-Lesson 22: An Exercise in Changing Scales

Changing Scales

1. The actual lengths are labeled on the scale drawing. Measure the lengths, in centimeters, of the scale drawing with a ruler, and draw a new scale drawing with a scale (Scale Drawing 2 to Scale Drawing 1) of $\frac{2}{3}$.



I need to use my ruler and measure the lengths of each of the sides in centimeters.

The sides labeled 6 ft. *measure* 1.5 cm *or* $\frac{3}{2}$ cm.

The side labeled 12 ft. *measures* 3 cm.

The side labeled 24 ft. *measures* 6 cm.

The scale is given as a fraction, so it might be easier to write the lengths as fractions instead of decimals.

New scale drawing lengths:

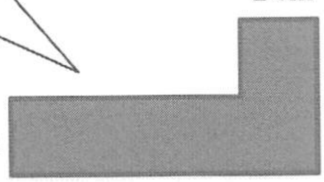
$$\frac{3}{2}\text{ cm} \times \frac{2}{3} = 1\text{ cm}$$

$$3\text{ cm} \times \frac{2}{3} = 2\text{ cm}$$

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

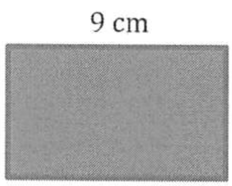
I can take the measurements and multiply by the scale to determine the lengths of the new image.

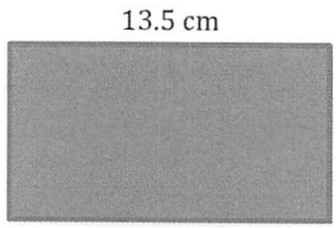
I use my ruler to draw the new image with the measurements I calculated.



2. Compute the scale factor of the new scale drawing (SD2) to the first scale drawing (SD1) using the information from the given scale drawings.

SD1: Original Scale Factor: $\frac{3}{4}$ SD2: New Scale Factor: $\frac{9}{8}$





I can calculate the scale factor of SD2 to SD1 by dividing the given scale factors.

$$\frac{\frac{9}{8}}{\frac{3}{4}}$$

$$\frac{9}{8} \div \frac{3}{4}$$

I remember from Lesson 21 how to divide fractions.

$$\frac{9}{8} \times \frac{4}{3}$$

$$\frac{36}{24}$$

$$\frac{3}{2}$$

The scale factor of SD2 to SD1 is $\frac{3}{2}$.