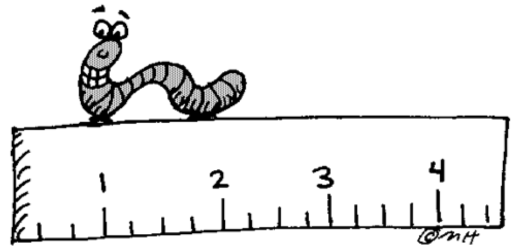
Eureka Math Module 1 - Ratios and Proportional Relationships

Name ____ Hour _______

Bring this curriculum packet with you to class every day.

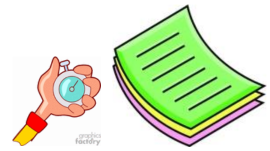


Topic A	
Lesson 1: An Experience in Relationships as Measuring Rate	
Lesson 2: Proportional Relationships	
Lesson 3: Identifying Relationships in Tables	
Lesson 4: Identifying Relationships in Tables	
Lesson 5: Identifying Relationships in Graphs	
Lesson 6: Identifying Relationships in Graphs	

Lesson 1 – An Experience in Relationships as Measuring Rate

Essential Questions:

Example 1: How fast is our class?

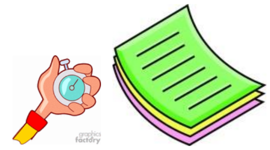


Record the results from the paper-passing exercise in the table below.

Trial	Number of Papers Passed	Time (in seconds)	Ratio of Number of Papers Passed to Time	Rate	Unit Rate
1					
2					
3					
4					

1. Are the ratios in the table equivalent? Explain why or why not.	
2. What do these terms mean? Ratio Rate Unit Rate	
3. In another class period, students were able to pass 28 papers in 15 seconds. How does this compare to our class?	
Write your own study/review question:	

Example 2: Our Class by Gender



Record the results from the paper-passing exercise in the table below.

	Number of Boys	Number of Girls	Ratio of Boys to Girls
Class 1			
Class 2			
Class 3			
Class 4			
Class 5			
Whole 7^{th} Grade Class			

1. Are the ratios of boys to girls in the first two classes equivalent?	
2. What could these ratios tell us?	
3. What does the ratio for class 1 to the ratio of the whole 7^{th} grade class tell us?	
4. Given the first four classes and the total number of students, determine the ratio for the 5^{th} class.	
Write your own study/review question	

Exercise 1: Which is the Better Buy?

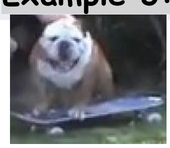
Value-Mart is advertising a Back-to-School sale on pencils. A pack of 30 sells for \$7.97, whereas a 12-pack of the same brand cost for \$4.77.

Which is the better buy? How do you know?

	Pack of 30	Pack of 12
Ratio		
Rate		
Unit Rate		

Write your own study/review question:

Example 3: Tillman the Bulldog



Watch the video clip of Tillman the English Bulldog, the Guinness World Record Holder for Fastest Dog on a Skateboard.

At the conclusion of the video, a student from anther class took out a calculator and said, "Wow that was amazing! That means the dog went about 5 meters in 1 second!" Is this student correct, and how do you know?

After seeing this video, another dog owner trained his dog, Lightning, to try to break Tillman's skateboarding record. Lightning's fastest recorded time was on a 75-meter stretch where it took him 15.5 seconds. Based on this data, did Lightning break Tillman's record for fastest dog on a skateboard? How do you know?

Summary:

Unit rate is helpful because

Lesson 1 – Independent Practice

1. Find each rate and unit rate.

   a. 420 miles in 7 hours

   b. 360 customers in 30 days

   c. 40 meters in 16 seconds

   d. $7.96 for 5 pounds

2. Write three ratios that are equivalent to the one given: The ratio of right-handed students to left-handed students is 18:4.

3. Mr. Rowley has 16 homework papers and 14 exit tickets to return. Ms. Rivera has 64 homework papers and 60 exit tickets to return. For each teacher, write a ratio to represent the number of homework papers to number of exit tickets they have to return. Are the ratios equivalent? Explain.

4. Jonathan's parents told him that for every 5 hours of homework or reading he completes, he will be able to play 3 hours of video games. His friend Lucas's parents told their son that he can play 30 minutes for every hour of homework or reading time he completes. If both boys spend the same amount of time on homework and reading this week, which boy gets more time playing video games? How do you know?

5. Of the 30 girls who tried out for the lacrosse team at Euclid Middle School, 12 were selected. Of the 40 boys who tried out, 16 were selected. Are the ratios of the number of students on the team to the number of students trying out the same for both boys and girls? How do you know?

6. Devon is trying to find the unit price on a 6-pack of drinks on sale for $2.99. His sister says that at that price, each drink would cost just over $2.00. Is she correct, and how do you know? If she is not, how would Devon's sister find the correct price?

7. Each year Lizzie's school purchases student agenda books, which are sold in the school store. This year, the school purchased 350 books at a cost of $1,137.50. If the school would like to make a profit of $1,500 to help pay for field trips and school activities, what is the least amount they can charge for each agenda book? Explain how you found your answer.

Lesson 2 - Proportional Relationships

Essential Questions:

Example 1: Pay by the Ounce Frozen Yogurt

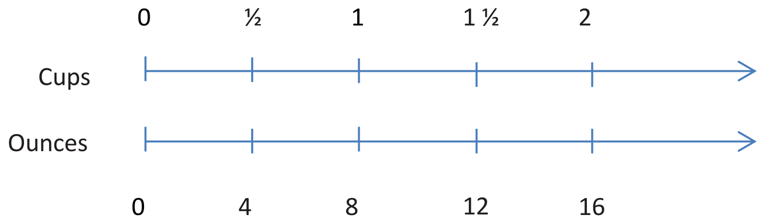
A new self-serve frozen yogurt store opened this summer that sells its yogurt at a price based upon the total weight of the yogurt and its toppings in a dish. Each member of Isabelle's family weighed their dish and this is what they found.

Weight (ounces)	12.5	10	5	8
Cost ($)	5	4	2	3.20

1. Does everyone pay the same cost per ounce? How do you know?	Since this is ________, we say: The cost is ___________________ the weight
2. Isabelle's brother takes an extra-long time to create his dish. When he puts it on the scale, it weighs 15 ounces. Knowing that the cost is proportional to the weight, how much will his dish cost? How did you calculate this cost?	
3. What happens if you don't serve yourself any yogurt or toppings? a) How much would you pay? b) Is it still proportional? Explain.	
4. In your table, label the weight x and the cost y. For any measure x, how do we find y? Write this relationship on the chart.	
5. Write an equation	
Write your own study/review question:	

Example 2: A Cooking Cheat Sheet

In the back of a recipe book, a diagram provides easy conversions to use while cooking.

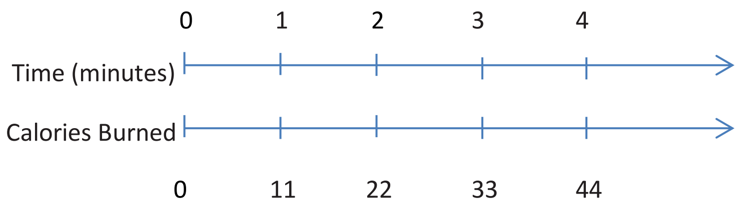


1. What does the diagram tell you?	
2. Is the number of ounces proportional to the number of cups? How do you know?	
3. What if I know how many ounces, how would I find how many cups?	48 ounces = ______ cups 63 ounces = _______ cups
4. What if I know how many cups, how would I find how many ounces?	4 cups = _______ ounces 5 cups =________ ounces
5. In your table, label the cups, x, and the ounces, y. For any measure x, how do we find y?	
6. Write the equation. Use two values for x and y to prove that your equation is correct.	
Write your own study/review question:	

Exercise

During Jose's physical education class today, students visited activity stations. Next to each station was a chart depicting how many Calories (on average) would be burned by completing the activity.

Calories burned while Jumping Roping



1. Is the number of calories burned proportional to time? How do you know?	
2. If Jose jumped rope for 6.5 minutes, how many calories would he expect to burn?	

Example 3: Summer Job

Alex spent the summer helping out at his family's business. He was hoping to earn enough money to buy a new $220 gaming system by the end of the summer. Halfway through the summer, after working for 4 weeks, he had earned $112. Alex wonders, "If I continue to work and earn money at this rate, will I have enough money to buy the gaming system by the end of the summer?" To check his assumption, he decided to make a table. He entered his total money earned at the end of week 1 and his total money earned at the end of Week 4.

Week	0	1	2	3	4	5	6	7	8
Total Earnings		$28			$112				

1. How much money do you think Alex made at the end of two weeks?	
2. How will a table help us check Alex's prediction?	
3. Did Alex make enough money to buy his gaming system? Explain your reasoning.	
4. Are Alex's total earnings proportional to the number of weeks he worked? How do you know?	
Write your own study/review question:	

Summary:

Two quantities are proportional if

We can recognize a proportional relationship in a table or set of ratios when

Lesson 2 – Independent Practice

1. A cran-apple juice blend is mixed in a ratio of cranberry to apple of 3 to 5.

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

Amount of Cranberry			
Amount of Apple			

   b. Why are these quantities proportional?

2. John is filling a bathtub that is 18 inches deep. He notices that it takes two minutes to fill the tub with three inches of water. He estimates it will take ten more minutes for the water to reach the top of the tub if it continues at the same rate. Is he correct? Explain.

Lesson 3 – Identifying Proportional and Non-Proportional Relationships in Tables

Essential Questions:

Example 1: You have been hired by your neighbors to babysit their children on Friday night. You are paid \$8 per hour. Complete the table relating your pay to the number of hours you worked.

Hours Worked	1	2	3	4	$4\frac{1}{2}$	5	6	6.5
Pay								

1. Explain how you completed the table.	
2. How did you determine the pay for $4\frac{1}{2}$ hours?	
3. How could you determine the pay for a week in which you worked 20 hours?	
4. If the quantities in the table were graphed, would the point (0,0) be on that graph? What would it mean in the context of the problem?	
5. What is the relationship between the amount of money earned and the number of hours worked?	
6. Based on the table, is the pay proportional to the hours worked? How do you know?	
Write your own study/review question:	

Exercise:

1. The table below represents the relationship of the amount of snowfall (in inches) in 5 counties to the amount of time (in hours) hours of a recent winter storm.

x Time (h)	y Snowfall (in.)
2	10
6	12
8	16
2.5	5
7	14

Is y proportional to x? Why?

What would the point (0, 0) represent on a graph?

2. The table below shows the relationship between the cost of renting a movie (in dollars) to the number of days the movie is rented.

x Number of Days	y Cost (dollars)
6	2
9	3
24	8
3	1

Is y proportional to x? Why?

What would the point (0, 0) represent on a graph?

3. Randy is planning to drive from New Jersey to Florida. Randy recorded the distance traveled and the total number of gallons used every time he stopped for gas. Assume miles driven is proportional to gallons consumed in order to complete the table.

Gallons Consumed	2	4		8	10	12
Miles Driven	54		189	216		

Describe the approach you used to complete the table	
What is the value of the constant? How do you know?	
Write your own study/review question:	

Summary:
You can use a table to determine if the relationship between two quantities is proportional by

Lesson 3 - Independent Practice

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

1.

x	y
3	12
5	20
2	8
8	32

2.

x	y
3	15
4	17
5	19
6	21

3.

x	y
6	4
9	6
12	8
3	2

4. Kayla made observations about the selling price of a new brand of coffee that sold in three different sized bags. She recorded those observations in the following table:

Ounces of Coffee	6	8	16
Price in Dollars	$2.10	$2.80	$5.60

a. Is the price proportional to the amount of coffee? Why or why not?

b. Use the relationship to predict the cost of a 20 oz. bag of coffee.

5. You and your friends go to the movies. The cost of admission is $9.50 per person. Create a table showing the relationship between the number of people going to the movies and the total cost of admission.

Explain why the cost of admission is proportional to the amount of people.

6. For every 5 pages Gil can read, his daughter can read 3 pages. Let g represent the number of pages Gil reads and let d represent the number of pages his daughter reads. Create a table showing the relationship between the number of pages Gil reads and the number of pages his daughter reads.

Is the number of pages Gil's daughter reads proportional to the number of pages he reads? Explain why or why not.

7. The table shows the relationship between the number of parents in a household and the number of children in the same household. Is the number of children proportional to the number of parents in the household? Explain why or why not.

Number of Parents	Number of Children
0	0
1	3
1	5
2	4
2	1

8. The table below shows the relationship between the number of cars sold and the amount of money earned by the car salesperson. Is the amount of money earned, in dollars, proportional to the number of cars sold? Explain why or why not.

Number of Cars Sold	Money Earned
1	250
2	600
3	950
4	1076
5	1555

9. Make your own example of a relationship between two quantities that is NOT proportional. Describe the situation and create a table to model it. Explain why one quantity is not proportional to the other.

Lesson 4 - Identifying Proportional and Non-Proportional Relationships in Tables Continued

Essential Questions:

Example 1: You have decided to run in a long distance race. There are two teams that you can join. Team A runs at a constant rate of 2.5 miles per hour. Team B runs 4 miles the first hour and then 2 miles per hour after that. Create a table for each team showing the distances that would be run for times of 1, 2, 3, 4, 5 and 6 hours.

Team A	
Time (h)	Distance (miles)

Team B	
Time (h)	Distance (miles)

1. For which team is distance proportional to time. Explain your reasoning.	
2. Explaining how you know the distance for the other is not proportional to time.	
3. At what distance in the race would it be better to be on Team B than Team A?	
4. If the members on each team ran for 10 hours, how far would each member run on each team?	
5. Will there always be a winning team, no matter the length of the course? Why or why not?	
6. If the race was 12 miles long, which team should you choose to be on if you wish to win? Why would you choose this team?	
7. How much sooner would you finish on that team compared to the other team?	
Write your own study/review question:	

Exercise:

1. Bella types at a constant rate of 42 words per minute. Is the number of words she can type proportional to the number of minutes she types? Create a table to determine the relationship.

2. Mark recently moved to a new state. During the first month he visited five state parks. Each month after he visited two more parks. Complete the table below and use the results to determine if the number of parks visited is proportional to the number of months.

Number of Months	Number of State Parks
1	
2	
3	
	23

3. The table below shows the relationship between the side length of a square and the area. Complete the table. Then determine if the length of the sides is proportional to the area.

Side Length (inches)	Area (square inches)
1	1
2	4
3	
4	
5	
8	
12	

Write your own study/review question:	

Summary:

Lesson 4 - Independent Practice

1. Joseph earns $15 for every lawn he mows. Is the amount of money he earns proportional to the number of lawns he mows? Make a table to help you identify the type of relationship.

Number of Lawns Mowed				
Earnings ($)				

2. At the end of the summer, Caitlin had saved $120 from her summer job. This was her initial deposit into a new savings account at the bank. As the school year starts, Caitlin is going to deposit another $5 each week from her allowance. Is her account balance proportional to the number of weeks of deposits? Use the table below. Explain your reasoning.

Time (in weeks)				
Account Balance ($)				

3. Lucas and Brianna read three books each last month. The table shows the number of pages in each book and the length of time it took to read the entire book.

Pages Lucas Read	208	156	234
Time (hours)	8	6	9

Pages Brianna Read	168	120	348
Time (hours)	6	4	12

a. Which of the tables, if any, shows a proportional relationship? How do you know?

b. Both Lucas and Brianna had specific reading goals they needed to accomplish. What different strategies did each person employ in reaching those goals?

Lesson 5 – Identifying Proportional and Non-Proportional Relationships in Graphs

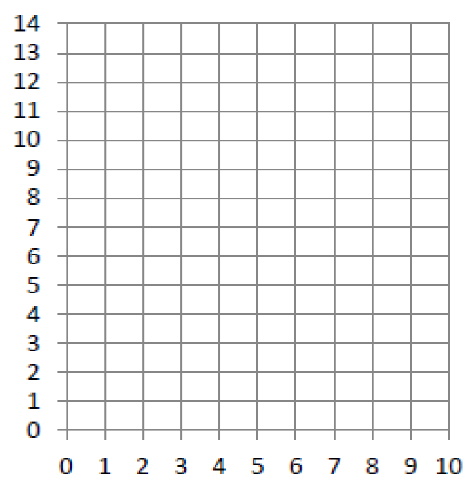
Essential Questions:

Opening Exercise: Isaiah sold candy bars to help raise money for his scouting troop. The table shows the amount of candy he sold compared to the money he received. Is the amount of candy bars sold proportional to the money Isaiah received? How do you know?

x Candy Bars Sold	y Money Received ($)
2	3
4	5
8	9
12	12

Exploratory Challenge: Using the ratio provided, create a table that shows money received is proportional to the number of candy bars sold. Plot the points in your table on the grid.

x Candy Bars Sold	y Money Received ($)
2	3



1. What observations can you make from the graph?	
2. Think back to past lessons. Would all proportional relationships pass through the origin?	

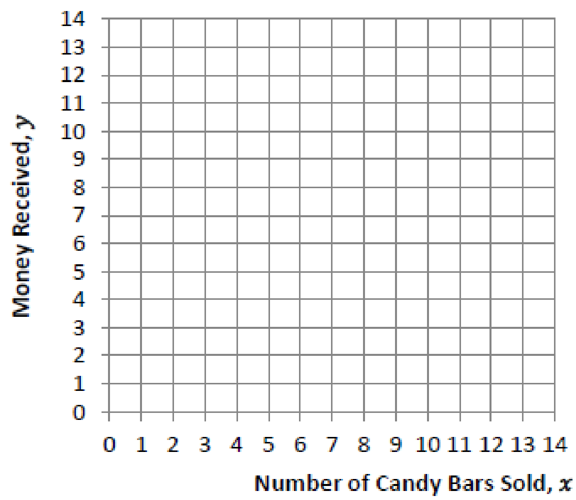
3. Why are we going to focus on quadrant 1?

4. What are 2 characteristics of graphs of proportional relationships?

Write your own study/review question:

Example 2: Look back at the table from the Opening Exercise.

x Candy Bars Sold	y Money Received ($)
2	3
4	6
8	12
12	14



1. Does the ratio table represent quantities that are proportional? Explain.

2. What can you predict about the graph of this ratio table?

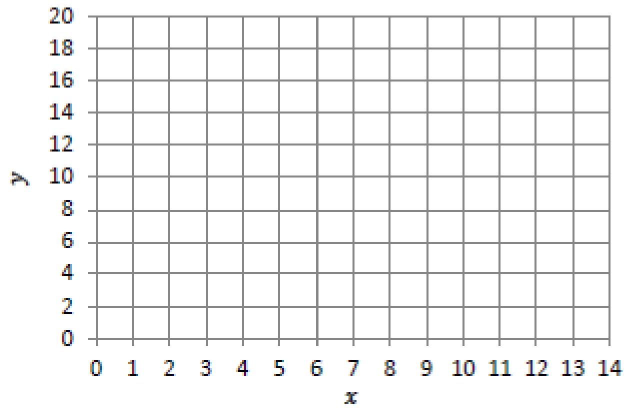
3. Graph the points. Was your prediction correct?

4. From this example, what it important to note about graphs of two quantities that are not proportional to each other?

Write your own study/review question:

Example 3

x	y
0	6
3	9
6	12
9	15
12	18



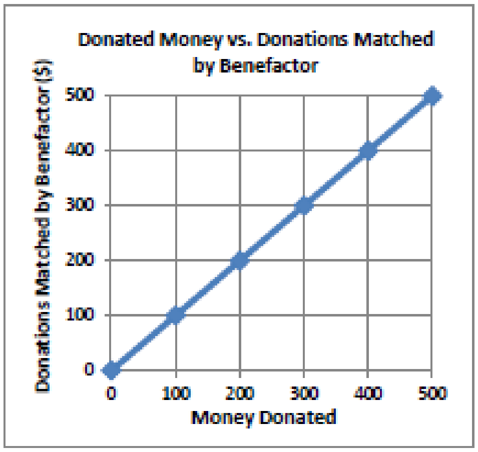
1. Before graphing, what do you know about the ratios in the table?	
2. What do you predict about the graph of this ratio table?	
3. Graph the points. Was your prediction correct?	
4. How are the graphs of the data points in Examples 1 and 3 similar? How are the different?	They are similar They are different
5. What are the similarities of the graphs of two quantities that are proportional to each other and the graphs of two quantities that are not proportional?	
Write your own study/review question:	

Summary:
When two proportional quantities are graphed on a coordinate plane

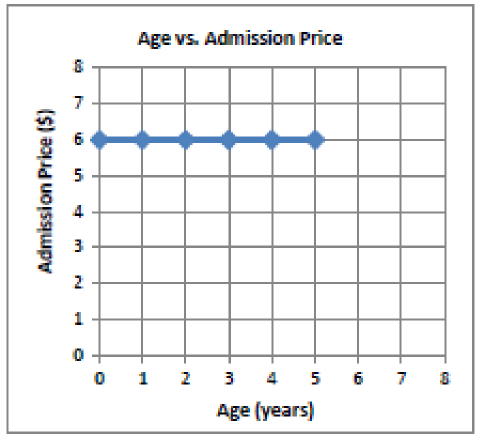
Lesson 5 - Independent Practice

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

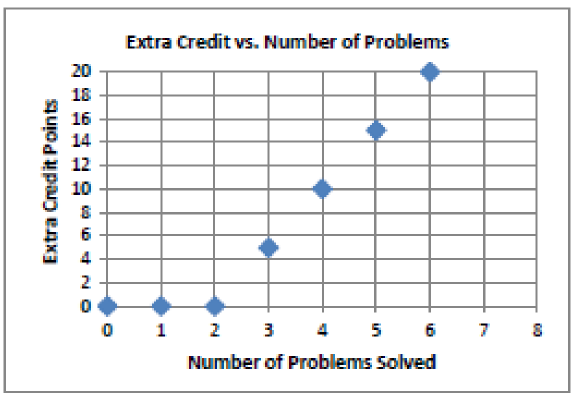
a.



b.

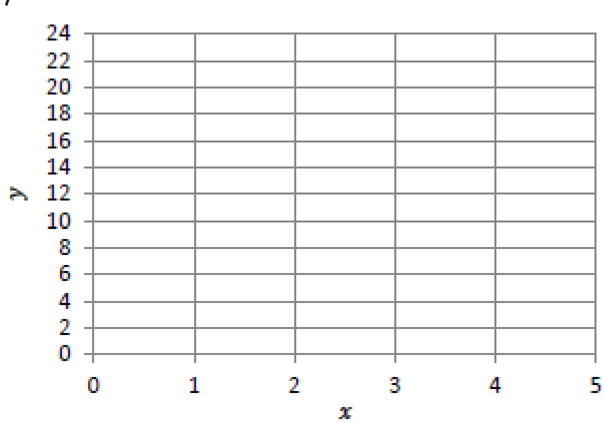


c.



2. Create a graph for the ratios 2:22, 3 to 15 and 1/11. Does the graph show that the two quantities are proportional to each other? Explain why or why not.

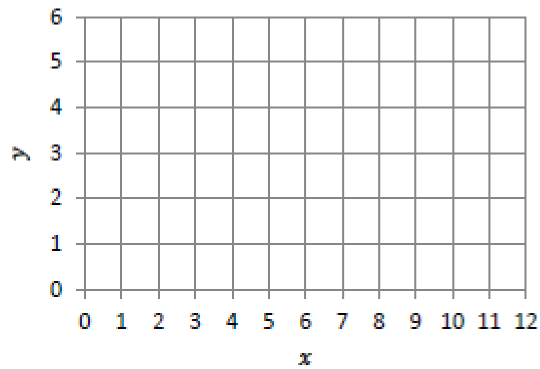
x	y
2	22
3	15
1	11



3. Graph the following tables and identify if the two quantities are proportional to each other on the graph. Explain why or why not.

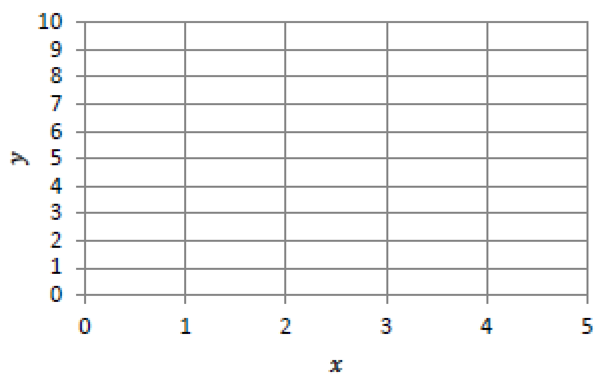
a.

x	y
3	1
6	2
9	3
12	4



b.

x	y
1	4
2	5
3	6
4	7



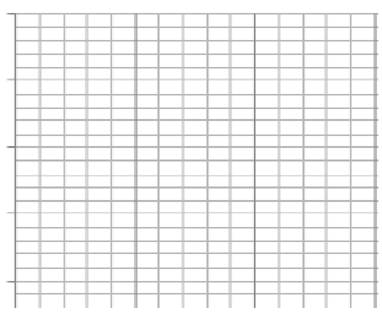
Lesson 6 - Identifying Proportional and Non-Proportional Relationships in Graphs Continued

Essential Questions:

You will be working in groups to create tables and a graph, and identify whether the two quantities are proportional to each other.

1. Fold the paper in quarters and label as follows

   Poster Layout:

Problem:	Table:
Graph: 	Proportional or Not? Explanation:

2. Take out the contents of the envelope and read the problem. Write the problem on the poster.
3. Create a table and a graph of the problem
4. Explain if the problem is proportional or not.

Gallery Walk:

Take notes about each poster and answer the following questions:

Poster #1	Poster #2	Poster #3	Poster #4
Poster #5	Poster #6	Poster #7	Poster #8

1. Were there any differences found in groups that had the same ratio?	
2. Did you notice any common mistakes? How might they be fixed?	
3. Were there any groups that stood out representing their problem and findings exceptionally clearly?	
Write your own study/review question:	

Summary:

Lesson 6 - Independent Practice

Sally's aunt put money in a savings account for her on the day Sally was born. The savings account pays interest for keeping her money in the bank. The ratios below represent the number of years to the amount of money in the savings account.

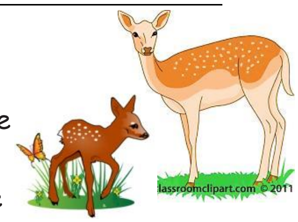
- After one year, the interest accumulated, and the total in Sally's account was $\$312$.
- After three years, the total was $\$340$. After six years, the total was $\$380$.
- After nine years, the total was $\$430$. After 12 years, the total amount in Sally's savings account was $\$480$.

Using the same four-fold method from class, create a table and a graph, and explain whether the amount of money accumulated and the time elapsed are proportional to each other. Use your table and graph to support your reasoning.

Lesson 7- Unit Rate as the Constant of Proportionality

Essential Questions:

Example 1: National Forest Deer Population in Danger?



Wildlife conservationists are concerned that the deer population might not be constant across the National Forest. The scientists found that there were 144 deer in a 16 square mile area of the forest. In another part of the forest, conservationists counted 117 deer in a 13 square mile area. Yet a third conservationist counted 216 deer in a 24 square mile plot of the forest. Do conservationists need to be worried?

<table>
<tr><td>Why does it matter if the deer population is not constant in a certain area of a National Forest?</td><td></td></tr>
<tr><td>What is the population density of deer per square mile?</td><td><table><tr><td>Square Miles (x)</td><td></td><td></td><td></td></tr><tr><td>Number of Deer (y)</td><td></td><td></td><td></td></tr></table>
The population density of deer per square mile is________.</td></tr>
<tr><td>When we find the number of deer per 1 square mile, what is this called?</td><td></td></tr>
<tr><td>When we look at the relationship between square miles and number of deer in the table, how do we know if the relationship is proportional?</td><td></td></tr>
<tr><td>We call this same proportional value:</td><td></td></tr>
<tr><td>The number of deer per square mile is 9 and the constant proportionality is 9. Do you think the unit rate of $\frac{y}{x}$ and the constant of proportionality will always be the same?</td><td></td></tr>
<tr><td>Use the unit rate of deer per square mile (or $\frac{y}{x}$) to determine how many are there for every 207 square miles.</td><td></td></tr>
<tr><td>Use the unit rate to determine the number of square miles in which you would find 486 deer.</td><td></td></tr>
<tr><td>Do conservationists need to be worried? Support your answer with reasoning about rate and unit rate.</td><td></td></tr>
</table>

Eureka Math Module 1 - Ratios and Proportional Relationships

Vocabulary:

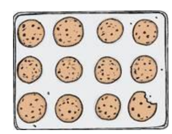
Constant	
Variable	
Unit Rate	
Constant of Proportionality	
Write your own study/review question	

Example 2: You Need What?

Brandon came home from school and informed his mother that he had volunteered to make cookies for his entire grade level. He needs 3 cookies for the 96 students in 7^{th} grade. Unfortunately, he needs the cookies the very next day! Brandon and his mother determined that they can fit 36 cookies on two cookie sheets.

Create a table that shows the data for the number of sheets needed for the total number of cookies baked.

Number of Cookie Sheets					
Number of Cookies Baked					



Is the number of cookies proportional to the number of cookies sheets used in baking? Explain your reasoning.	
How many cookies fit on one sheet?	
The unit rate of $\frac{y}{x}$ is	
The constant of proportionality is	

What do you notice about cookies on each sheet, the unit rate and constant of proportionality?	
Explain the meaning of the constant of proportionality in this problem.	
It takes 2 hours to bake 8 sheets of cookies. If Brandon and his mother begin baking at 4:00 pm, when will the finish baking the cookies?	
Write your own study/review question	

Example 3: French Class Cooking

Suzette and Margo want to prepare crêpes for all of the students in their French class. A recipe makes 20 crêpes with a certain amount of flour, milk, and 2 eggs. The girls already know that they have plenty of flour and milk to make 50 crêpes, but they need to determine the number of eggs they will need for the recipe because they are not sure they have enough.

Considering the amount of eggs necessary to make the crepes, what is the constant of proportionality?	
What does the constant or proportionality mean in the context of this problem?	
How many eggs are needed to make 50 crepes?	
Write your own study/review question	

Summary:

Lesson 7 - Independent Practice

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

Bananas are $0.59/pound.

a. What is the constant of proportionality, k?

b. How much will 25 pounds of bananas cost?

The dry cleaning fee for 3 pairs of pants is $18.

a. What is the constant of proportionality?

b. How much will the dry cleaner charge for 11 pairs of pants?

For every $5 that Micah saves, his parents give him $10.

a. What is the constant of proportionality?

b. If Micah saves $150, how much money will his parents give him?

Each school year, the 7th graders who study Life Science participate in a special field trip to the city zoo. In 2010, the school paid $1,260 for 84 students to enter the zoo. In 2011, the school paid $1,050 for 70 students to enter the zoo. In 2012, the school paid $1,395 for 93 students to enter the zoo.

a. Is the price the school pays each year in entrance fees proportional to the number of students entering the zoo?

b. Explain why or why not.

c. Identify the constant of proportionality and explain what it means in the context of this situation.

d. What would the school pay if 120 students entered the zoo?

e. How many students would enter the zoo if the school paid $1,425?

Lesson 8 –Representing Proportional Relationships with Equations

Essential Questions:

How could we use what we know about the constant of proportionality to write equations?	

Example 1: Do We have Enough Gas to Make it to the Gas Station?

Your mother has accelerated onto the interstate beginning a long road trip and you notice that the low fuel light is on, indicating that there is a half a gallon left in the gas tank. The nearest gas station is 26 miles away. Your mother keeps a log where she records the mileage and the number of gallons purchased each time she fills up the tank. Use the information in the table below to determine whether you will make it to the gas station before the gas runs out.

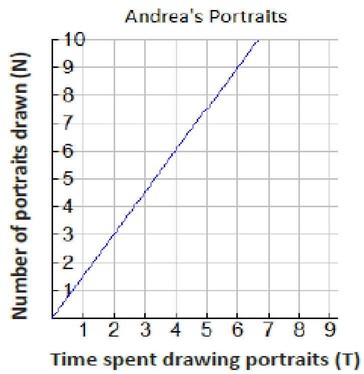
Mother's Gas Record

Gallons	Miles driven
8	224
10	280
4	112

Find the constant of proportionality and explain what it represents in this situation.	
Write equation(s) that will relate the miles driven to the number of gallons of gas.	
Knowing that there is a half-gallon left in the gas tank when the light comes on, will she make it to the nearest gas station? Explain why or why not.	
Using the equation, determine how far your mother can travel on 18 gallons of gas. Solve the problem in two ways: once using the constant of proportionality and once using an equation.	
Using the constant of proportionality, and then using the equation, determine how many gallons of gas would be needed to travel 750 miles.	
Write your own study/review question	

Example 2: Andrea's Portraits

Andrea is a street artist in New Orleans. She draws caricatures (cartoon-like portraits) of tourists. People have their portrait drawn and then come back later to pick it up from her. The graph shows the relationship between the number of portraits she draws and the amount of time in hours she needs to draw the portraits.



Write several ordered pairs from the graph and explain what each ordered pair means in the context of this graph.	
Write several equations that would relate the number of portraits drawn to the time spent drawing the portraits.	
Determine the constant of proportionality and explain what it means in this situation.	
Write your own study/review question	

Summary:

Lesson 8 - Independent Practice

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

1. There are 3 cans that store 9 tennis balls. Consider the number of balls per can.
   a. Find the constant of proportionality for this situation.

   b. Write an equation to represent the relationship.

2. In 25 minutes Li can run 10 laps around the track. Determine the number of laps she can run per minute.
   a. Find the constant of proportionality in this situation.

   b. Write an equation to represent the relationship.

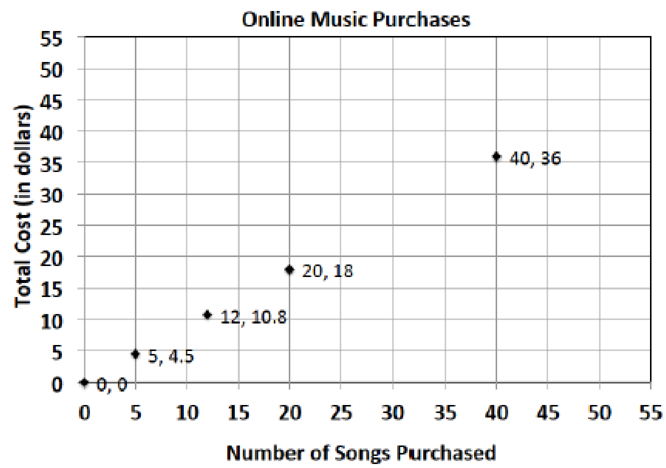
3. Jennifer is shopping with her mother. They pay $2 per pound for tomatoes at the vegetable stand.
   a. Find the constant of proportionality in this situation.

   b. Write an equation to represent the relationship.

4. It costs $15 to send 3 packages through a certain shipping company. Consider the number of packages per dollar.
   a. Find the constant of proportionality for this situation.

   b. Write an equation to represent the relationship.

5. On average, Susan downloads 60 songs per month. An online music vendor sells package prices for songs that can be downloaded on to personal digital devices. The graph shows the package prices for the most popular promotions. Susan wants to know if she should buy her music from this company or pay a flat fee of $58.00 per month offered by another company. Which is the better buy?



a. Find the constant of proportionality for this situation.

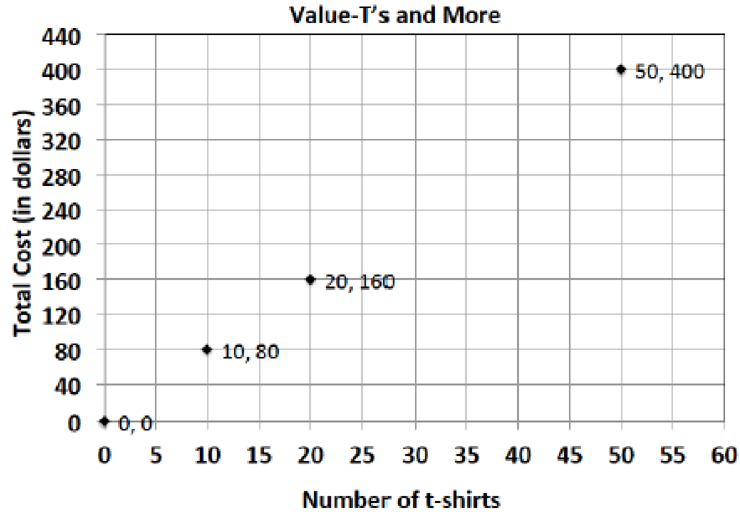
b. Write an equation to represent the relationship.

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

6. Allison's middle school team has designed t-shirts containing their team name and color. Allison and her friend Nicole have volunteered to call local stores to get an estimate on the total cost of purchasing t-shirts. Print-o-Rama charges a set-up fee, as well as a fixed amount for each shirt ordered. The total cost is shown below for the given number of shirts. Value T's and More charges $8 per shirt. Which company should they use?

Print-o-Rama

# shirts	Total cost
10	95
25	
50	375
75	
100	



a. Does either pricing model represent a proportional relationship between the quantity of t-shirts and the total cost? Explain.

b. Write an equation relating cost and shirts for Value T's and More.

c. What is the constant of proportionality Value T's and More? What does it represent?

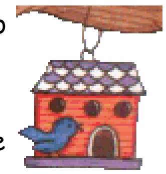
d. How much is Print-o-Rama's set-up fee?

e. Write a proposal to your teacher indicating which company the team should use. Be sure to support your choice. Determine the number of shirts that you need for your team.

Lesson 9 – Representing Proportional Relationships with Equations

Essential Questions:

Example 1: Jackson's Birdhouses



Jackson and his grandfather constructed a model for a birdhouse. Many of their neighbors offered to buy the birdhouses. Jackson decided that building birdhouses could help him earn money for his summer camp, but he is not sure how long it will take him to finish all of the requests for birdhouses. If Jackson can build 7 birdhouses in 5 hours, write an equation that will allow Jackson to calculate the time it will take him to build any given number of birdhouses, assuming he works at a constant rate.

Define the variables	B represents: H represents:
Does it matter which of these variables is independent or dependent?	
If it is important to determine the number of birdhouses that can be built in one hour, what is the constant of proportionality?	
What does that mean in the context of this situation?	
What is this problem asking you to find?	
Write an equation to find out how long it will take him to build any number of birdhouses.	
How many birdhouses can Jackson build in 40 hours?	
How long will it take Jackson to build 35 birdhouses? Use the equation to solve.	
How long does it take to build 71 birdhouses? Use the equation to solve.	
Write your own study/review question	

Example 2: Al's Produce Stand

Al's Produce Stand sells 6 ears of corn for $1.50. Barbara's Produce Stand sells 13 ears of corn for $3.12. Write two equations, one for each produce stand, that models the relationship

Al's Produce Stand					Barbara's Produce Stand				
Ears	6	14	21		Ears	13	14	21	
Cost	$1.50			$50.00	Cost	$3.12			$49.92

Which makes more sense: to use a unit rate of "ears of corn per dollar" or of "dollars (or cents) per ear of corn"?	
Based on the previous question, which will be the independent variable? Why?	
Which will be the dependent variable and why?	
What is the unit rate, or constant of proportionality, for Al's Produce Stand and for Barbara's Produce Stand? How did you determine those?	
How do you write an equation for a proportional relationship?	
Write the equation for Al's Produce Stand:	
Write the equation for Barbara's Produce Stand:	
If you use E to represent the number of ears of corn and C to represent the cost for the variables instead of x and y, how would you write the equations?	
Write your own study/review question	

Summary:

Lesson 9 - Independent Practice

1. A person who weighs 100 pounds on Earth weighs 16.6 lb. on the moon.
    a. Which variable is the independent variable? Explain why.

    b. What is an equation that relates weight on Earth to weight on the moon?

    c. How much would a 185 pound astronaut weigh on the moon? Use an equation to explain how you know.

    d. How much would a man that weighs 50 pounds on the moon weigh on Earth?

2. Use this table to answer the following questions.

Number of Gallons of Gas	Number of Miles Driven
0	0
2	62
4	124
10	310

    a. Which variable is the dependent variable and why?

    b. Is the number of miles driven proportionally related to the number of gallons of gas consumed? If so, what is the equation that relates the number of miles driven to the number of gallons of gas?

    c. In any ratio relating the number of gallons of gas and the number of miles driven, will one of the values always be larger? If so, which one?

d. If the number of gallons of gas is known, can you find the number of miles driven? Explain how this value would be calculated.

e. If the number of miles driven is known, can you find the number of gallons of gas consumed? Explain how this value would be calculated.

f. How many miles could be driven with 18 gallons of gas?

g. How many gallons are used when the car has been driven 18 miles?

h. How many miles have been driven when half of a gallon of gas is used?

i. How many gallons of gas have been used when the car has been driven for a half mile?

3. Suppose that the cost of renting a snowmobile is $37.50 for 5 hours.

   a. If c represents the cost and h represents the hours, which variable is the dependent variable? Explain why.

   b. What would be the cost of renting 2 snowmobiles for 5 hours?

4. In Katya's car, the number of miles driven is proportional to the number of gallons of gas used. Find the missing value in the table.

The Number of Gallons	The Number of Miles Driven
0	0
4	112
6	168
	224
10	280

a. Write an equation that will relate the number of miles driven to the number of gallons of gas.

b. What is the constant of proportionality?

c. How many miles could Katya go if she filled her 22-gallon tank?

d. If Katya takes a trip of 600 miles, how many gallons of gas would be needed to make the trip?

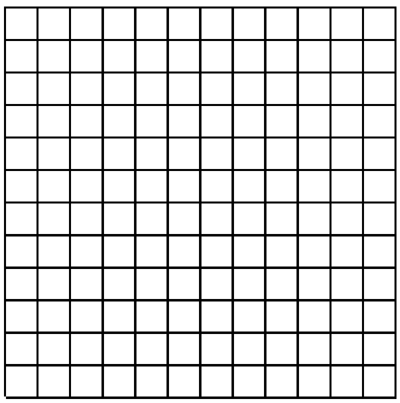
e. If Katya drives 224 miles during one week of commuting to school and work, how many gallons of gas would she use?

Lesson 10 – Interpreting Graphs of Proportional Relationships

Essential Questions:

Example 1

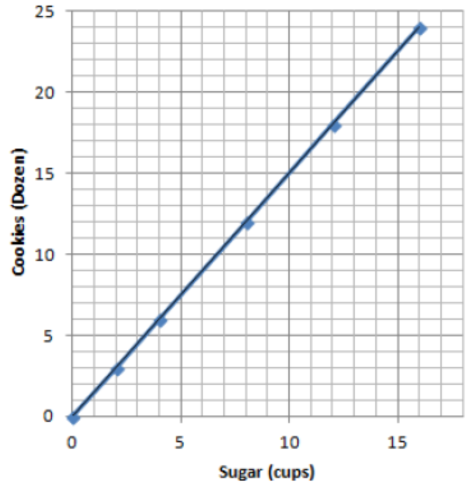
Grandma's Special Chocolate Chip Cookie recipe, which yields 4 dozen cookies, calls for 3 cups of flour. Using this information, complete the chart:

Create a table comparing the amount of flour used to the amount of cookies.	Is the number of cookies proportional to the amount of flour used? Explain why or why not.	What is the unit rate of cookies to flour $\frac{y}{x}$ and what is the meaning in the context of the problem?
Model the relationship on a graph. 	Does the graph show the two quantities being proportional to each other? Explain	Write an equation that can be used to represent the relationship.

Write your own study/review question	

Example 2

Below is a graph modeling the amount of sugar required to make Grandma's Chocolate Chip Cookies.

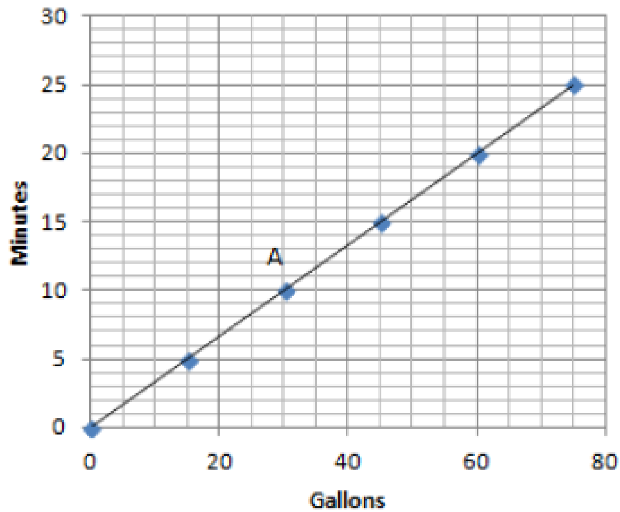


What quantity is measured along the horizontal axis?	
What quantity is represented along the vertical axis?	
Record the coordinates from the graph in a table. What do these ordered pairs represent?	
When you plot the point (A, B), what does A represent?	
When you plot the point (A, B) what does the B represent?	
Grandma has 1 remaining cup of sugar. How many dozen cookies will she be able to make? Plot the point on the graph above.	
What is the unit rate for this proportional relationship?	
How is the unit rate of $\frac{y}{x}$ related to the graph?	

How many dozen cookies can grandma make if she has no sugar? Can you graph this on the coordinate plane provided above? What do we call this point?	
Starting at the origin, if you move one unit along the horizontal axis, how far would you have to move vertically to reach the line you graphed?	
Why are we always moving 1.5 units vertically?	
What point must be on every graph of a proportional relationship?	
Write your own study/review question	

Exercise 1

The graph below shows the amount of time a person can shower with a certain amount of water.



Can you determine by looking at the graph whether the length of the shower is proportional to the number of gallons of water? Explain how you know.	
How long can a person shower with 15 gallons of water? How long can a person shower with 60 gallons of water?	
What are the coordinates of point A? Describe point A in the context of the problem.	
Can you use the graph to identify the unit rate?	
Plot the unit rate on the graph. Is the point on the line of this relationship?	
Write an equation to represent the relationship between the number of gallons of water used and the length of the shower.	

Eureka Math Module 1 - Ratios and Proportional Relationships

Exercise 2

Your friend uses the equation $C=50P$ to find the total cost, C, for the number of people, P, entering a local amusement park.

Create a table and record the cost of entering the amusement park for several different-sized groups of people.	
Is the cost of admission proportional to the amount of people entering the amusement park? Explain why or why not.	
What is the unit rate and what does it represent in context of the situation?	
Sketch a graph to represent this relationship.	
What points must be on the graph of the line if the two quantities represented are proportional to each other? Explain why and describe these points in the context of the problem.	
Would the point (5, 250) be on the graph? What does this point represent?	
Write your own study/review question	

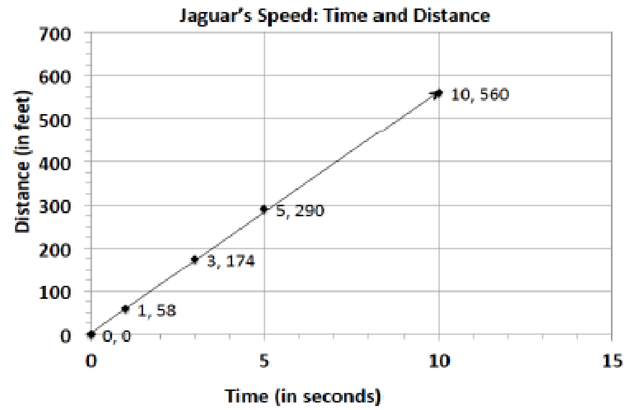
Closing Questions

What points are always on the graph of two quantities that are proportional to each other?	
How do you determine the meaning for any point on a graph that represents two quantities that are proportional to each other?	
How can you use the unit rate of $\frac{y}{x}$ to create a table, equation, or graph of the relationship of two quantities that are proportional to each other.	
How can you identify the unit rate from a table, equation or graph?	

Summary:

Lesson 10 - Independent Practice

1. The graph to the right shows the relationship of the amount of time (in seconds) to the distance (in feet) run by a jaguar.



   a. What does the point (5,290) represent in the context of the situation?

   b. What does the point (3,174) represent in the context of the situation?

   c. Is the distance run by the jaguar proportional to the time? Explain why or why not.

   d. Write an equation to represent the distance run by the jaguar. Explain or model your reasoning.

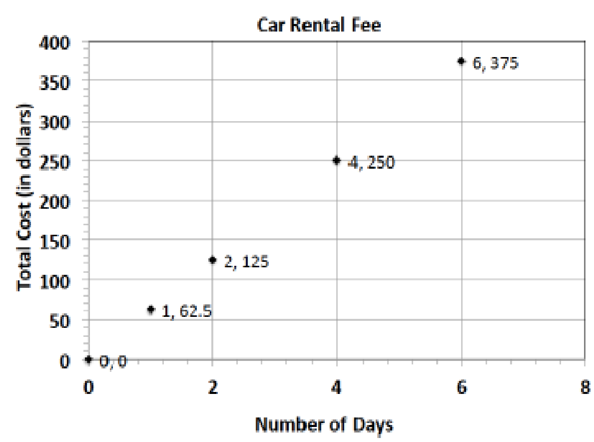
2. Championship t-shirts sell for $22 each.

   a. What point(s) must be on the graph for the quantities to be proportional to each other?

   b. What does the ordered pair (5,110) represent in the context of this problem?

   c. How many t-shirts were sold if you spent a total of $88?

3. The graph represents the total cost of renting a car. The cost of renting a car is a fixed amount each day, regardless of how many miles the car is driven.



   a. What does the ordered pair (4,250) represent?

   b. What would be the cost to rent the car for a week? Explain or model your reasoning.

4. Jackie is making a snack mix for a party. She is using cashews and peanuts. The table below shows the relationship of the number of packages of cashews she needs to the number of cans of peanuts she needs to make the mix.

Packages of Cashews	Cans of Peanuts
0	0
1	2
2	4
3	6
4	8

a. What points must be on the graph for the number of cans of peanuts to be proportional to the number of packages of cashews? Explain why.

b. Write an equation to represent this relationship.

c. Describe the ordered pair (12,24) in the context of the problem.

5. The following table shows the amount of candy and price paid.

Amount of Candy (in pounds)	2	3	5
Cost (in dollars)	5	7.5	12.5

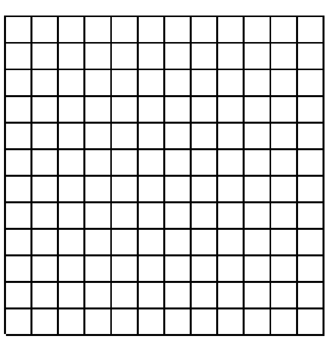
a. Is the cost of the candy proportional to the amount of candy?

b. Write an equation to illustrate the relationship between the amount of candy and the cost.

c. Using the equation, predict how much it will cost for 12 pounds of candy.

d. What is the maximum amount of candy you can buy with $60?

e. Graph the relationship.



Lesson 11 – Ratios of Fractions and Their Unit Rates

Essential Questions:

Example 1:

During their last workout, Izzy ran $2\frac{1}{4}$ mile in 15 minutes and her friend Julia ran $3\frac{3}{4}$ mile in 25 minutes. Each girl thought she was the fastest runner. Based on their last run, which girl is correct?

Write each girls' minutes in hours.	
What do we need to find in order to answer this question?	
Use a table to help you answer the question.	
Use the equation *d=rt* to answer the question.	
Write your own study/review question	

Example 2:

A turtle walks $\frac{7}{8}$ of a mile in 50 minutes.

To find the turtle's unit rate, Meredith wrote the following complex fraction

$$\frac{\frac{7}{8}}{\frac{5}{6}}$$

What is a complex fraction?	
Explain how the fraction $\frac{5}{6}$ was obtained.	

What operation does the fraction bar separating the numerator and denominator represent?	
How do we determine the unit rate?	
How would we get a denominator of 1?	
Determine the unit rate, expressed in miles per hour.	
Write your own study/review question	

Exercise 1

For Anthony's birthday, his mother is making cupcakes for his 12 friends at his daycare. The recipe calls for 313 cups of flour. This recipe makes 212 dozen cupcakes. Anthony's mother has only 1 cup of flour. Is there enough flour for each of his friends to get a cupcake? Explain and show your work.

Exercise 2

Sally is making a painting for which she is mixing red paint and blue paint. The table below shows the different mixtures being used.

Red Paint (Quarts)	Blue Paint (Quarts)
$1\frac{1}{2}$	$2\frac{1}{2}$
$2\frac{2}{5}$	4
$3\frac{3}{4}$	$6\frac{1}{4}$
4	$6\frac{2}{3}$
1.2	2
1.8	3

What is the unit rate for the values of the amount of blue paint to the amount of red paint?	
Is the amount of blue paint proportional to the amount of red paint?	
Describe, in words, what the unit rate means in the context of this problem.	
Write your own study/review question	

Summary:

Lesson 11 - Independent Practice

1. Determine the quotient: $2\frac{4}{7} \div 1\frac{3}{6}$

2. One lap around a dirt track is $\frac{1}{3}$ mile. It takes Bryce $\frac{1}{9}$ hour to ride one lap. What is Bryce's unit rate, in miles, around the track?

3. Mr. Gengel wants to make a shelf with boards that are $1\frac{1}{3}$ feet long. If he has an 18-foot board, how many pieces can he cut from the big board?

4. The local bakery uses 1.75 cups of flour in each batch of cookies. The bakery used 5.25 cups of flour this morning.
   a. How many batches of cookies did the bakery make?

   b. If there are 5 dozen cookies in each batch, how many cookies did the bakery make?

5. Jason eats 10 ounces of candy in 5 days.
   a. How many pounds will he eat per day? (Recall: 16 ounces =1 pound)

   b. How long will it take Jason to eat 1 pound of candy?

Lesson 12 – Ratios of Fractions and Their Unit Rates

Essential Questions:

Example 1:

You have decided to remodel your bathroom and install a tile floor. The bathroom is in the shape of a rectangle and the floor measures 14 feet, 8 inches long by 5 feet, 6 inches wide. The tiles you want to use cost $5 each, and each tile covers 4 2/3 square feet. If you have $100 to spend, do you have enough money to complete the project?

Make a Plan: Complete the chart to identify the necessary steps in the plan and find a solution.

What I know	What I want to find out	How to find it

Find the solution

Why was area used and not perimeter or volume?	
How is unit rate useful?	
Can I buy $17\frac{2}{7}$ tiles?	
What would happen if we round to 17 tiles?	
What would happen if we round to 18 tiles?	
Write your own study/review question	

Exercise

Which car can travel further on 1 gallon of gas?

Blue Car:

travels $18\frac{2}{5}$ miles using 0.8 gallons of gas

Red Car:

travels $17\frac{2}{5}$ miles using 0.75 gallons of gas

Summary:

Lesson 12 - Independent Practice

1. You are getting ready for a family vacation. You decide to download as many movies as possible before leaving for the road trip. If each movie takes $1\frac{2}{5}$ hours to download and you downloaded for $5\frac{1}{4}$ hours, how many movies did you download?

2. The area of a blackboard is $1\frac{1}{3}$ square yards. A poster's area is $\frac{8}{9}$ square yards. Find the unit rate and explain, in words, what the unit rate means in the context of this problem. Is there more than one unit rate that can be calculated? How do you know?

3. A toy jeep is $12\frac{1}{2}$ inches long while an actual jeep measures $18\frac{3}{4}$ feet long. What is the value of the ratio of the length of the toy jeep to length of the actual jeep? What does the ratio mean in this situation?

4. $\frac{1}{3}$ cup of flour is used to make 5 dinner rolls.

   a. How much flour is needed to make one dinner roll?

   b. How many cups of flour are needed to make 3 dozen dinner rolls?

   b. How many rolls can you make with $5\frac{2}{3}$ cups of flour?

Lesson 13:Finding Equivalent Ratios Given the Total Quantity

Essential Questions:

Example 1

A group of 6 hikers are preparing for a one-week trip. All of the group's supplies will be carried by the hikers in backpacks. The leader decides that each hiker will carry a backpack that is the same fraction of weight to all the other hikers' weights. This means that the heaviest hiker would carry the heaviest load. The table below shows the weight of each hiker and the weight of the backpack.

Complete the table. Find the missing amounts of weight by applying the same value of the ratio as the first two rows.

Hiker's Weight	Backpack Weight	Total Weight (lb.)
152 lb. 4 oz.	14 lb. 8 oz.	
107 lb. 10 oz.	10 lb. 4 oz.	
129 lb. 15 oz.		
68 lb. 4 oz.		
	8 lb. 12 oz.	
	10 lb.	

What is the value of the ratio of the backpack weight to the hiker weight?	
If a value is missing from the first or second column, how can you calculate the value?	
Write your own study/review question	

Example 2

When a business buys a fast food franchise, it is buying the recipes used at every restaurant with the same name. For example, all Pizzeria Specialty House Restaurants have different owners, but they must all use the same recipes for their pizza, sauce, bread, etc. You are now working at your local Pizzeria Specialty House Restaurant, and listed below are the amounts of meat used on one meat-lovers pizza.

$\frac{1}{4}$ cup of sausage

$\frac{1}{3}$ cup of pepperoni | $\frac{1}{8}$ cup of ham

$\frac{1}{6}$ cup of bacon | $\frac{1}{8}$ cup of beef

What is the total amount of toppings used on a meat-lovers pizza?	

The meat must be mixed using this ratio to ensure that customers will receive the same great tasting meat-lovers pizza from every Pizzeria Specialty House Restaurant nationwide. The table below shows 3 different orders for meat-lovers pizzas on Super Bowl Sunday. Using the amounts and total for one pizza given above, fill in every row and column of the table so the mixture tastes the same.

	Order 1	Order 2	Order 3
Sausage (cups)	1		
Pepperoni (cups)			3
Bacon (cups)		1	
Ham (cups)	$\frac{1}{2}$		
Beef (cups)			$1\frac{1}{8}$
TOTAL (cups)			

What must you calculate to complete the table?	
How many pizzas were made for Order 1? Explain how you obtained your answer.	

How many pizzas were made for order 2? Explain how you obtained your answer.	
How many pizzas were made for order 3? Explain how you obtained your answer.	
Is it possible to order $1\frac{1}{2}$ pizzas? Describe the steps to determine the amount of each ingredient.	
Write your own study/review question	

Exercise

The table below shows 6 different-sized pans that could be used to make macaroni and cheese. If the ratio of ingredients stays the same, how might the recipe be altered to account for the different sized pans?

Noodles (cups)	Cheese (cups)	Pan Size (number of cups)
		5
3	$\frac{3}{4}$	
	$\frac{1}{4}$	
$\frac{2}{3}$		
$5\frac{1}{3}$		
		$5\frac{5}{8}$

Summary:

Lesson 13 - Independent Practice

1. Students in 6 classes, displayed below, ate the same ratio of cheese pizza slices to pepperoni pizza slices. Complete the following table, which represents the number of slices of pizza students in each class ate.

Slices of Cheese Pizza	Slices of Pepperoni Pizza	Total Pizza
		7
6	15	
8		
	$13\frac{3}{4}$	
$3\frac{1}{3}$		
		$2\frac{1}{10}$

2. To make green paint, students mixed yellow paint with blue paint. The table below shows how many yellow and blue drops from a dropper several students used to make the same shade of green paint.

a. Complete the table.

Yellow (Y) (ml)	Blue (B) (ml)	Total
$3\frac{1}{2}$	$5\frac{1}{4}$	
		5
	$6\frac{3}{4}$	
$6\frac{1}{2}$		

b. Write an equation to represent the relationship between the amount of yellow paint and blue paint.

3. The ratio of the number of miles run to the number of miles biked is equivalent for each row in the table.
   a. Complete the table.

Distance Run (miles)	Distance Biked (miles)	Total Amount of Exercise (miles)
		6
$3\frac{1}{2}$	7	
	$5\frac{1}{2}$	
$2\frac{1}{8}$		
	$3\frac{1}{3}$	

   b. What is the relationship between distances biked and distances run?

4. The following table shows the number of cups of milk and flour that are needed to make biscuits. Complete the table.

Milk (cups)	Flour (cups)	Total (cups)
7.5		
	10.5	
12.5	15	
		11

Lesson 14 – Multi-Step Ratio Problems

Essential Questions:

Example 1: Bargains

Peter's Pants Palace advertises the following sale: Shirts are $\frac{1}{2}$ off the original price; pants are $\frac{1}{3}$ off the original price, and shoes are $\frac{1}{4}$ off the original price.

If a pair of shoes cost $40, what is the sales price?

Method 1: Tape Diagram	
Method 2: Subtracting $\frac{1}{4}$ from original price	
Method 3: Subtracting $\frac{1}{4}$ from 1 whole.	

At Pete's Pants Palace, a pair of pants usually sells for $33.00. What is the sale price of Peter's Pants?

Method 1: Tape Diagram	
Method 2: Subtracting $\frac{1}{3}$ from original price	
Method 3: Subtracting $\frac{1}{3}$ from 1 whole.	

Example 2: Big Al's Used Cars

A used car salesperson receives a commission of $\frac{1}{12}$ of the sales price of the car for each car he sells. What would the sales commission be on a car that sold for $21,999?

Example 3: Tax Time

As part of a marketing plan, some businesses mark up their prices before they advertise a sales event. Some companies use this practice as a way to entice customers into the store without sacrificing their profits.
A furniture store wants to host a sales event to improve its profit margin and to reduce its tax liability before its inventory is taxed at the end of the year.

How much profit will the business make on the sale of a couch that is marked-up by $\frac{1}{3}$ and then sold at a $\frac{1}{5}$off discount if the original price is $2,400?

Example 4: Born to Ride

A motorcycle dealer paid a certain price for a motorcycle and marked it up by $\frac{1}{5}$ of the price he paid. Later he sold it for $14,000. What is the original price?

Summary:

Lesson 14 - Independent Practice

1. A salesperson will earn a commission equal to $\frac{1}{32}$ of the total sales. What is the commission earned on sales totaling $24,000?

2. DeMarkus says that a store overcharged him on the price of the video game he bought. He thought that the price was marked $\frac{1}{4}$ of the original price, but it was really $\frac{1}{4}$ off the original price. He misread the advertisement. If the original price of the game was $48, what is the difference between the price that DeMarkus thought he should pay and the price that the store charged him?

3. What is the cost of a $1,200 washing machine after a discount of $\frac{1}{5}$ the original price?

4. If a store advertised a sale that gave customers a $\frac{1}{4}$ discount, what is the fractional part of the original price that the customer will pay?

5. Mark bought an electronic tablet on sale for $\frac{1}{4}$ off the original price of $825.00. He also wanted to use a coupon for $\frac{1}{5}$ off the sales price. Before taxes, how much did Mark pay for the tablet?

6. A car dealer paid a certain price for a car and marked it up by $\frac{7}{5}$ of the price he paid. Later he sold it for $24,000. What is the original price?

7. Joanna ran a mile in physical education class. After resting for one hour, her heart rate was 60 beats per minute. If her heart rate decreased by $\frac{2}{5}$, what was her heart rate immediately after she ran the mile?

Lesson 15 – Equations of Graphs of Proportional Relationships Involving Fractions

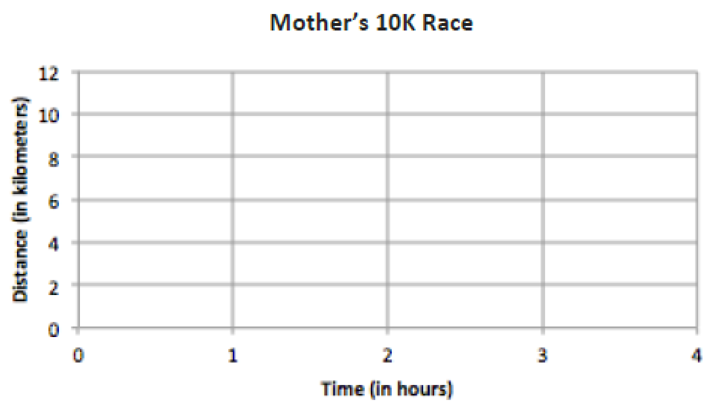
Essential Questions:

Example 1: Mother's 10K Race

Sam's mother has entered a 10K race. Sam and his family want to show their support of their mother, but they need to figure out where they should go along the race course. They also need to determine how long it will take her to run the race so that they will know when to meet her at the finish line. Previously, his mother ran a 5K race with a time of $1\frac{1}{2}$ hours. Assume Sam's mother ran the same rate as the previous race in order to complete the chart.

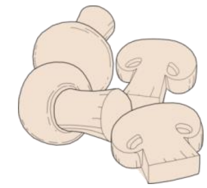
Create a table that will show how far Sam's mother has run after each half hour from the start of the race, and graph it on the coordinate plane to the right.

Time (H, in hours)	Distance Run (D, in km)



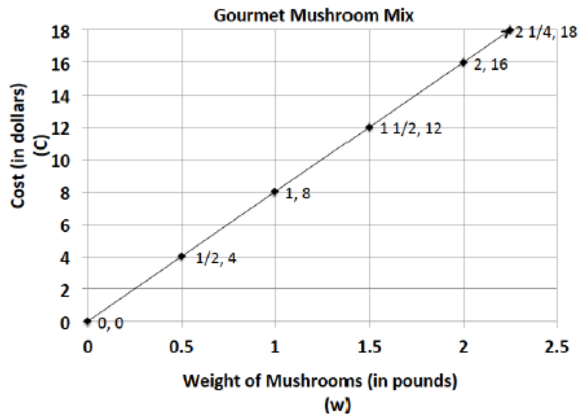
Find Sam's mother's average rate for the entire race based on her previous race time.	
What are some specific things you notice about this graph?	
What is the connection between the table and the graph?	
What does the ordered pair $(2, 6\frac{2}{3})$ represent in the context of this problem?	
Write an equation that models the data in the chart.	
Write your own study/review question	

Example 2: Gourmet Cooking



After taking a cooking class, you decide to try out your new cooking skills by preparing a meal for your family. You have chosen a recipe that uses gourmet mushrooms as the main ingredient. Using the graph below, complete the table of values and answer the following questions.

Weight (in pounds)	Cost (in dollars)
0	0
$\frac{1}{2}$	4
1	
$1\frac{1}{2}$	12
	16
$2\frac{1}{4}$	18



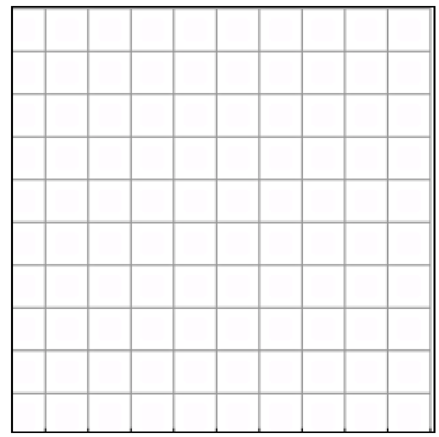
Is this relationship proportional? How do you know from examining the graph?	
What is the unit rate for cost per pound?	
Write an equation to model this data.	
What ordered pair represents the unit rate, and what does it mean?	
What does the ordered pair (2,16) mean in the context of this problem?	
If you could spend \$10.00 on mushrooms, how many pounds could you buy?	
What would be the cost of 30 pounds of mushrooms?	
Write your own study/review question	

Summary:

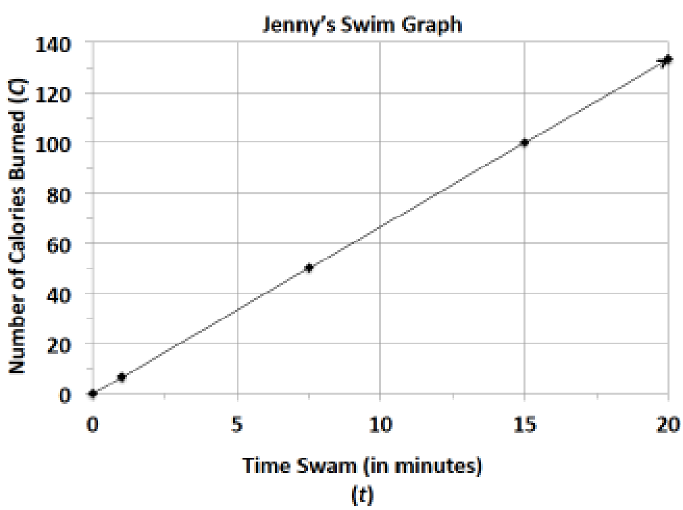
Lesson 15 - Independent Practice

1. Students are responsible for providing snacks and drinks for the Junior Beta Club Induction Reception. Susan and Myra were asked to provide the punch for the 100 students and family members who will attend the event. The chart below will help Susan and Myra determine the proportion of cranberry juice to sparkling water that will be needed to make the punch. Complete the chart, graph the data, and write the equation that models this proportional relationship.

Sparkling Water (S, in cups)	Cranberry Juice (C, in cups)
1	$\frac{4}{5}$
5	4
8	
12	$9\frac{3}{5}$
	40
100	



2. Jenny is a member of a summer swim team.

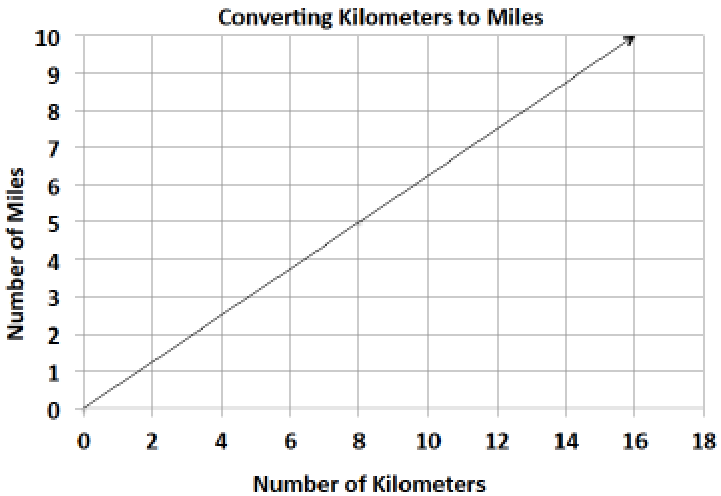


a. Using the graph, determine how many calories she burns in one minute.

b. Use the graph to determine the equation that models the number of calories Jenny burns within a certain number of minutes.

c. How long will it take her to burn off a 480-calorie smoothie that she had for breakfast?

3. Students in a world geography class want to determine the distances between cities in Europe. The map gives all distances in kilometers. The students want to determine the number of miles between towns so that they can compare distances with a unit of measure with which they are already familiar. The graph below shows the relationship between a given number of kilometers and the corresponding number of miles.



a. Find the constant of proportionality or the rate of miles per kilometer for this problem and write the equation that models this relationship.

b. What is the distance in kilometers between towns that are 5 miles apart?

c. Describe the steps you would take to determine the distance in miles between two towns that are 200 kilometers apart?

4. During summer vacation, Lydie spent time with her grandmother picking blackberries. They decided to make blackberry jam for their family. Her grandmother said that you must cook the berries until they become juice and then combine the juice with the other ingredients to make the jam.

a. Use the table below to determine the constant of proportionality of cups of juice to cups of blackberries.

Cups of Blackberries	Cups of Juice
0	0
4	$1\frac{1}{3}$
8	$2\frac{2}{3}$
12	
	8

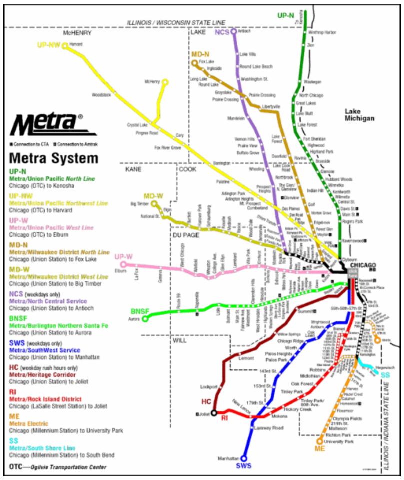
b. Write an equation that will model the relationship between the number of cups of blackberries and the number of cups of juice.

c. How many cups of juice were made from 12 cups of berries? How many cups of berries are needed to make 8 cups of juice?

Lesson 16 –Relating Scale Drawings to Ratios and Rates

Essential Questions:

Opening Exercise: Can You Guess the Image?



This is a ______________________ of
a ______________________________

This is an ______________________ of
a ________________________________

Example 1

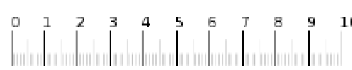
For the following problems, (a) is the actual picture and (b) is the drawing. Is the drawing an enlargement or a reduction of the actual picture?

1. a.

b.

2. a.

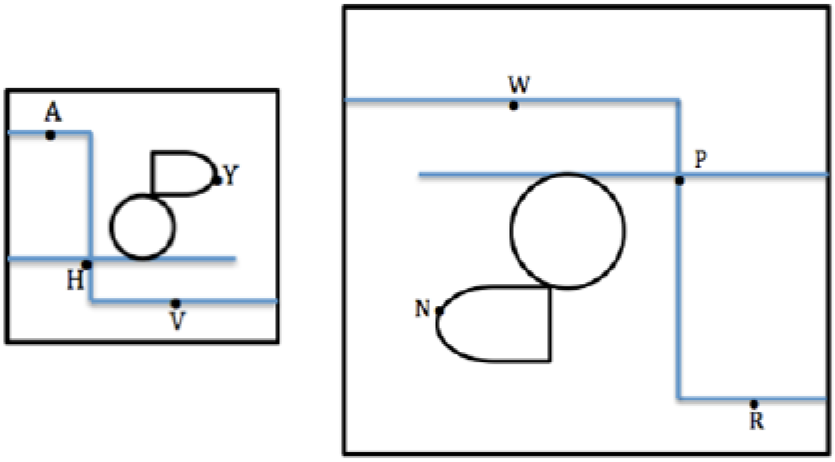
b.



What are the possible uses for enlarged drawings/pictures?	
What are the possible uses of reduced drawings?	
What is a Scale Drawing?	

Example 2

Derek's family took a day trip to a modern public garden. Derek looked at his map of the park that was a reduction of the map located at the garden entrance. The dots represent the placement of rare plants. The diagram below is the top-view as Derek held his map while looking at the posted map.

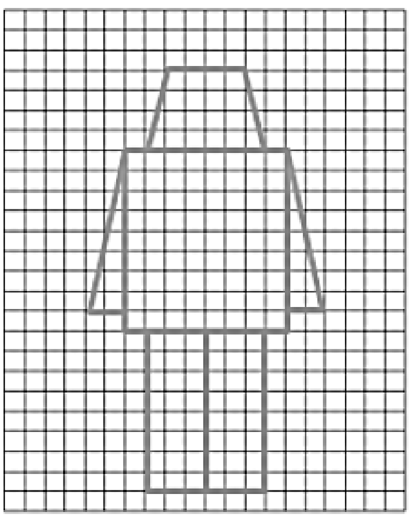


Why doesn't Point V correspond with Point R?	
What must we consider before identifying corresponding points?	
What are the corresponding points of the scale drawings of the maps?	Point A to ________ Point V to ___________ Point H to ________ Point R to ___________
Write your own study/review question	

Exploratory Challenge

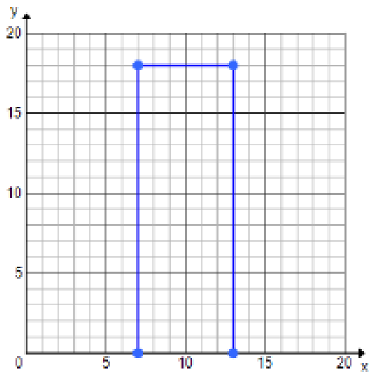
Create scale drawings of your own robots using the grids provided.

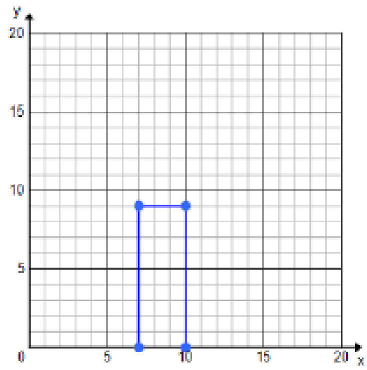
How will we enlarge or reduce the robot? Will we need to adjust the number of units?	
What is the importance of matching corresponding points and figures from the actual picture to the scale drawing?	
How can you check the accuracy of the proportions?	



Example 3

Celeste drew an outline of a building for a diagram she was making and then drew a second one mimicking her original drawing. State the coordinates of the vertices and fill in the table.



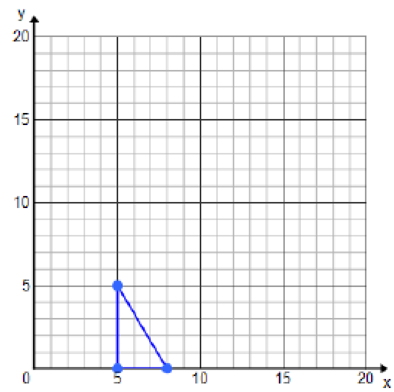


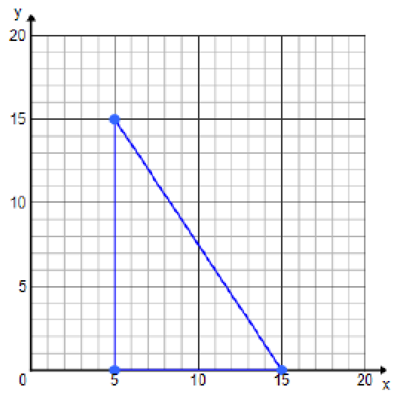
	Height	Length
Original Drawing		
Second Drawing		

Is the second image a reduction or enlargement of the first image? How do you know?	
What do you notice about the information in the table?	
Does a constant of proportionality exist? How do you know?	
What is the constant of proportionality and why is it important in the scale drawing?	
Write your own study/review question	

Exercise

Luca drew and cut out a small right triangle for a mosaic piece he was creating for art class. His mother really took a liking to the mosaic piece and asked if he could create a larger one for their living room. Luca made a second template for his triangle pieces.





	Height	Width
Original Image		
Second Image		

Does a constant of proportionality exist? Explain why or why not	
Is Luca's enlarged mosaic a scale drawing of the first image? Explain why or why not.	
Write your own study/review question	

Summary:

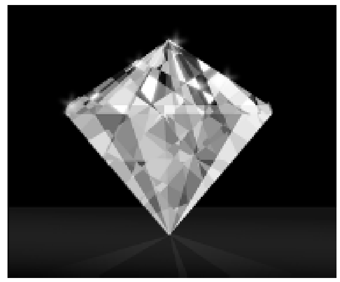
Lesson 16 - Independent Practice

For Problems 1–3, identify if the scale drawing is a reduction or an enlargement of the actual picture.

1. ______________________

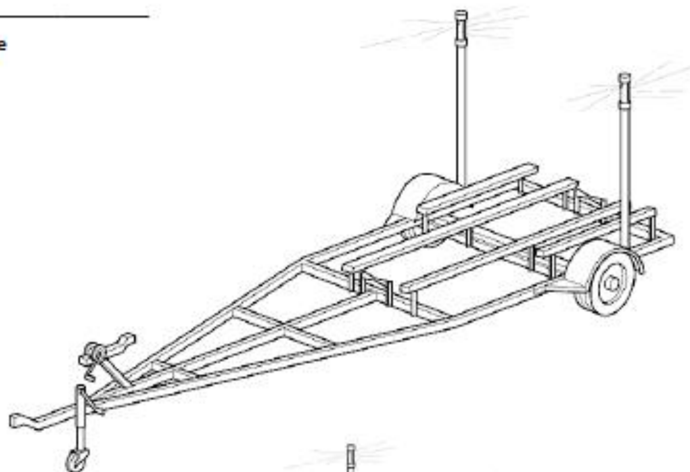
a. Actual Picture

b. Scale Drawing

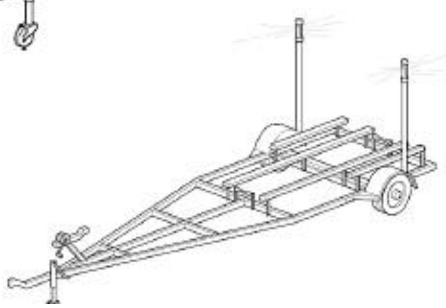


2. ______________________

a. Actual Picture



b. Scale Drawing



3. ______________________

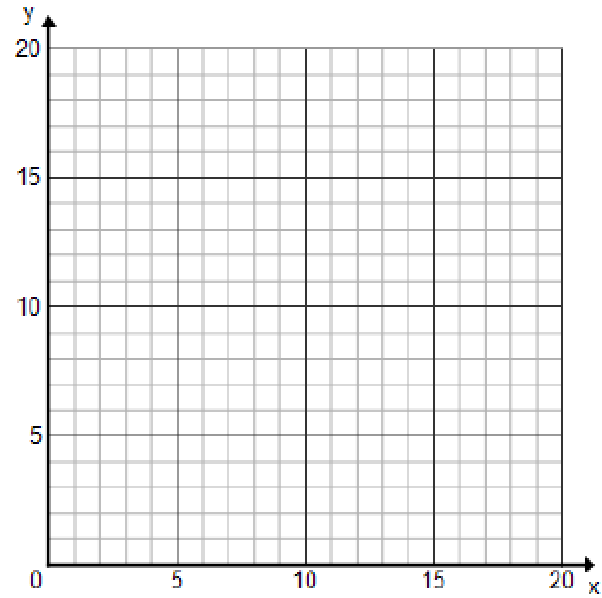
a. Actual Picture

b. Scale Drawing

4. Use the blank graph provided to plot the points and decide if the rectangular cakes are scale drawings of each other.

Cake 1: (5,3), (5,5), (11,3), (11,5)
Cake 2: (1,6), (1,12),(13,12), (13,6)

How do you know?



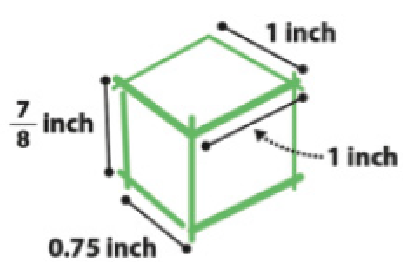
Lesson 17 – The Unit Rate as the Scale Factor

Essential Questions:

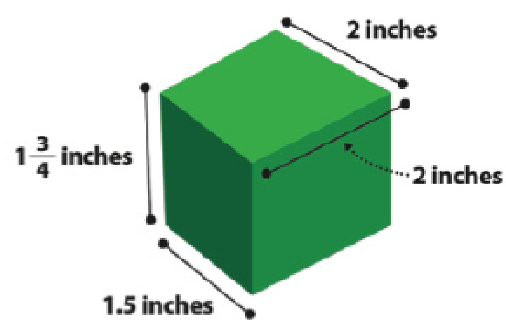
Example 1: Jake's Icon

Jake created a simple game on his computer and shared it with his friends to play. They were instantly hooked, and the popularity of his game spread so quickly that Jake wanted to create a distinctive icon so that players could easily identify his game. He drew a simple sketch. From the sketch, he created stickers to promote his game, but Jake wasn't quite sure if the stickers were proportional to his original sketch.

Original Sketch:



Sticker:

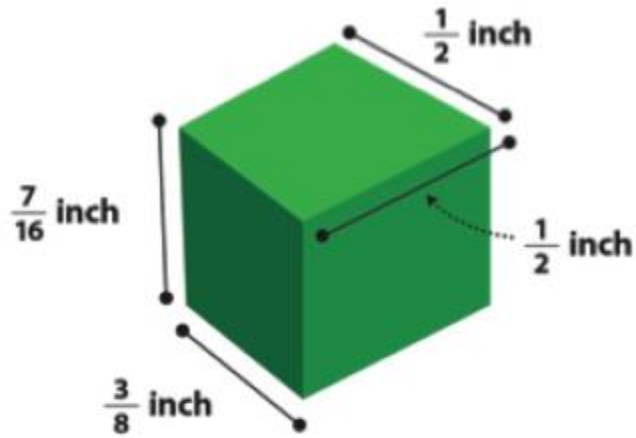


What type of scale drawing is the sticker?	
What is the importance of proportionality for Jake?	
How could we check proportionality for these two images?	
Complete the table	

Original	Sticker

What relationships do you see between the measurements?	
Is the sticker proportional to the original sketch? How do you know?	
What is that called?	
What are the steps to check for proportionality for a scale drawing?	1. 2. 3.
What is scale factor?	
What is the scale factor for the sticker? How do you know?	
What can you predict about an image that has a scale factor of 3?	
Write your own study/review question	

Exercise: App Icon



Original	App Icon

What is the relationship between the icon and the original sketch?	
What is the scale factor?	
How do we determine scale factor?	
What does the scale factor indicate?	
Write your own study/review question	

Example 2

Use a Scale Factor of 3 to create a scale drawing of the picture below. (Picture of the flag of Colombia)

Is this a reduction or an enlargement? How do you know?	
What steps were used to create this scale drawing?	
How could you double check your work?	

Exercise

Now, create a scale drawing of the original picture from the flag from example 2, but now applying a scale factor of $\frac{1}{2}$.

Example 3

Your family recently had a family portrait taken. Your aunt asks you to take a picture of the portrait using your phone and send it to her. If the original portrait is 3 feet by 3 feet, and the scale factor is $\frac{1}{18}$, draw the scale drawing that would be the size of the portrait on your phone.

What shape is the portrait?	
Is it a reduction or enlargement?	
What will the scale drawing look like.	
Write your own study/review question	

Exercise

John is building his daughter a doll house that is a miniature model of their house. The front of their house has a circular window with a diameter of 5 feet. If the scale factor for the model house is $\frac{1}{30}$, make a sketch of the circular doll house window.

Summary:

Lesson 17 - Independent Practice

1. Giovanni went to Los Angeles, California for the summer to visit his cousins. He used a map of bus routes to get from the airport to his cousin's house. The distance from the airport to his cousin's house is 56 km. On his map, the distance is 4 cm. What is the scale factor?

2. Nicole is running for school president. Her best friend designed her campaign poster, which measured 3 feet by 2 feet. Nicole liked the poster so much, she reproduced the artwork on rectangular buttons that measured 2 inches by $1\frac{1}{3}$ inches. What is the scale factor?

3. Find the scale factor using the given scale drawings and measurements below.

Scale Factor: $\frac{5}{3}$

Actual Picture

3 cm

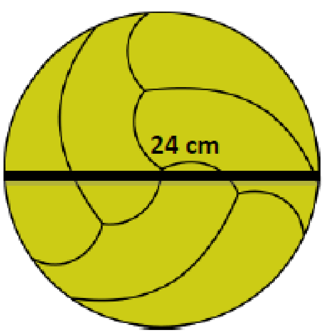
Scale Drawing

5 cm

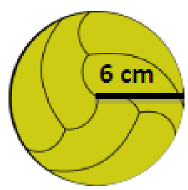
4. Find the scale factor using the given scale drawings and measurements below.

Scale Factor: $\frac{1}{2}$

Actual Picture

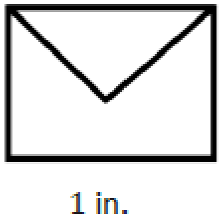


Scale Drawing

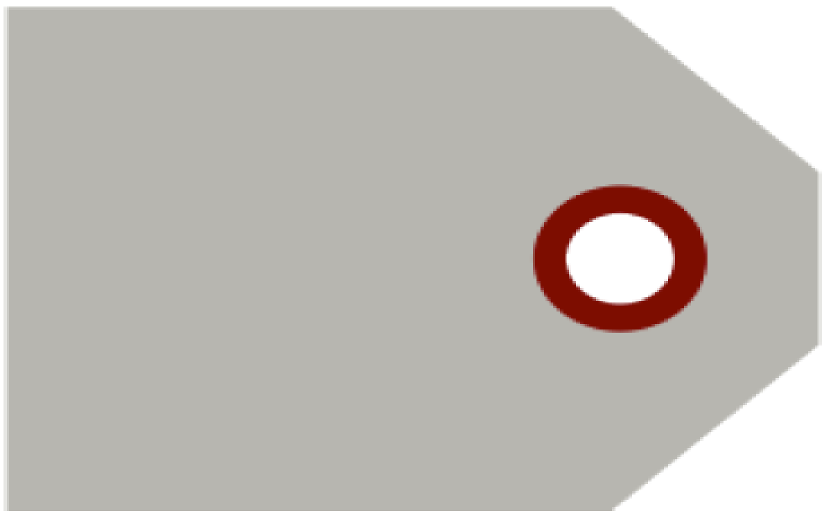


5. Using the given scale factor, create a scale drawing from the actual pictures in centimeters:

a. Scale factor: 3



b. Scale factor: $\frac{3}{4}$



6. Hayden likes building radio-controlled sailboats with her father. One of the sails, shaped like a right triangle, has side lengths measuring 6 inches, 8 inches and 10 inches. To log her activity, Hayden creates and collects drawings of all the boats she and her father built together. Using the scale factor of $\frac{1}{4}$, create a scale drawing of the sail.

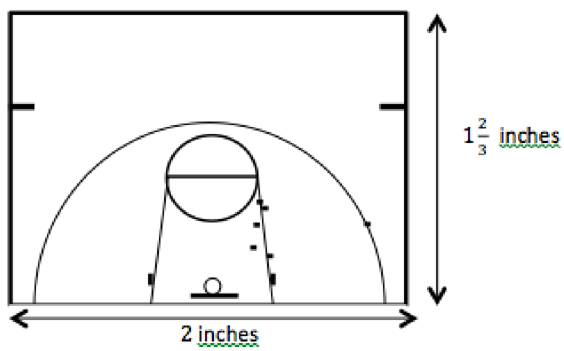
Lesson 18 – Computing Actual Lengths from a Scale Drawing

Essential Questions:

Example 1: Basketball at Recess?

Vincent proposes an idea to the Student Government to install a basketball hoop along with a court marked with all the shooting lines and boundary lines at his school for students to use at recess. He presents a plan to install a half-court design as shown below. After checking with school administration, he is told it will be approved if it will fit on the empty lot that measures 25 feet by 75 feet on the school property.

Scale Drawing: 1 inch on the drawing corresponds to 15 feet of actual length.

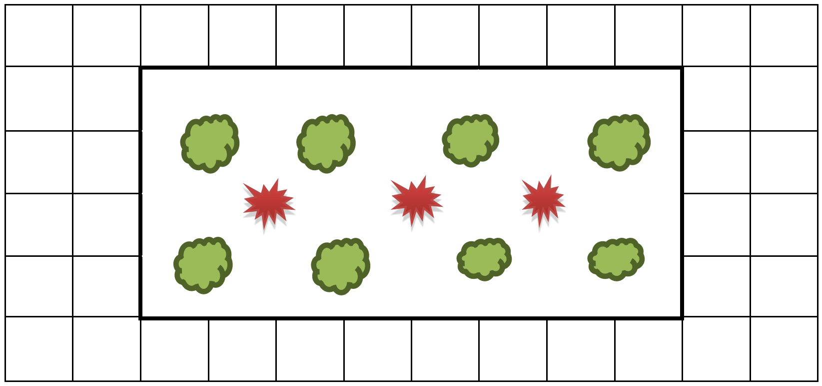


How can we use scale factor to determine the actual measurements?	
How can we use the scale factor to write an equation relating the scale drawing lengths to the actual length?	
Find the actual lengths. Will the lot be big enough for the court he planned? Explain.	(see table below)
Write your own study/review question	

	Scale	Length	Width
Drawing Lengths (x)			
Actual Lengths (y)			

Example 2

The diagram shown represents a garden. The scale is 1 centimeter for every 20 meters. Each square in the drawing measures 1 cm by 1 cm.



The word scale refers to a type of ratio. 1cm:20 m is called a scale ratio or scale. How is this different from scale factor?

Do we need to use scale factor to find actual measurements from a scale drawing, or could we just use the given scale ratio?

Find the actual length and width of the garden based upon the given drawing. Explain how you arrived at your answers.

	Scale	Length	Width
Drawing Lengths (x)			
Actual Lengths (y)			

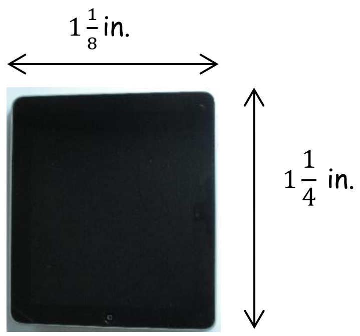
What method is more efficient, using scale ratio or scale factor? Why?

Why would we consider using scale factor?

Write your own study/review question

Example 3

A graphic designer is creating an advertisement for a tablet. She needs to enlarge the picture given here so that 0.25 inches on the scale picture will correspond to 1 inch on the actual advertisement. What will be the length and width of the tablet on the advertisement?



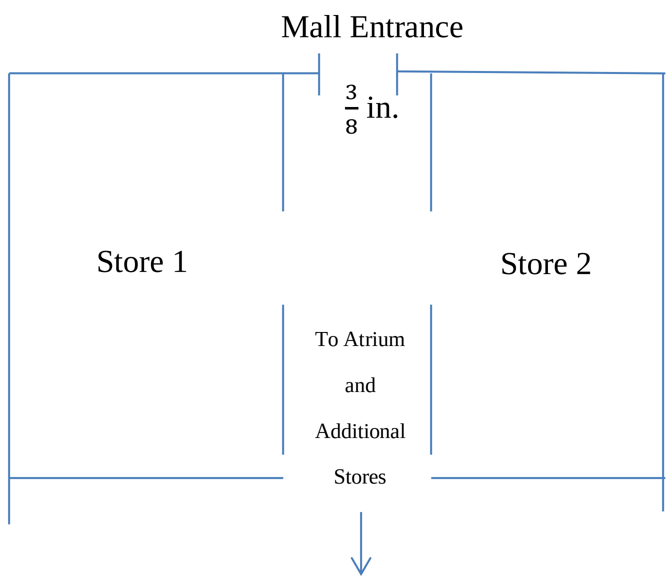
Scale Picture of Tablet

	Scale	Length	Width
Drawing Lengths (x)			
Actual Lengths (y)			

Write your own study/review question	

Exercise

Students from the high school are going to perform one of the acts from their upcoming musical at the atrium in the mall. The students want to bring some of the set with them so that the audience can get a better feel for the whole production. The backdrop that they want to bring has panels that measure 10 feet by 10 feet. The students are not sure if they will be able to fit these panels through the entrance of the mall since the panels need to be transported flat (horizontal). They obtain a copy of the mall floor plan, shown below, from the city planning office. Use this diagram to decide if the panels will fit through the entrance. Use a ruler to measure.



Scale:
$\frac{1}{8}$ inch on the drawing represents $4\frac{1}{2}$ feet of actual length

What is the relationship between the length in the drawing to the actual length? What does 1 inch in the drawing represent?	
Find the actual distance of the mall entrance, and determine whether the set panels will fit.	

Summary

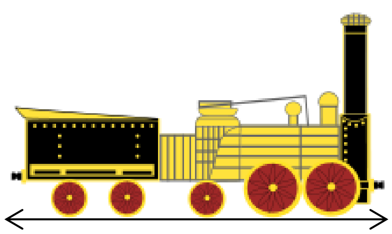
Lesson 18 - Independent Practice

1. A toy company is redesigning their packaging for model cars. The graphic design team needs to take the old image shown below and resize it so that $\frac{1}{2}$ inch on the old packaging represents $\frac{1}{3}$ inch on the new package. Find the length of the image on the new package.

   Car image length on old packaging measures 2 inches

2. The city of St. Louis is creating a welcome sign on a billboard for visitors to see as they enter the city. The following picture needs to be enlarged so that $\frac{1}{2}$ inch represents 7 feet on the actual billboard. Will it fit on a billboard that measures 14 feet in height?

3. Your mom is repainting your younger brother's room. She is going to project the image shown below onto his wall so that she can paint an enlarged version as a mural. Use a ruler to determine the length of the image of the train. Then determine how long the mural will be if the projector uses a scale where 1 inch of the image represents $2\frac{1}{2}$ feet on the wall.



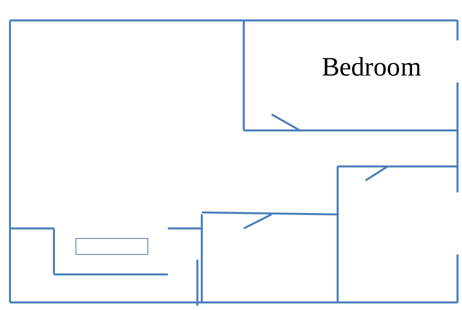
4. A model of a skyscraper is made so that 1 inch represents 75 feet. What is the height of the actual building if the height of the model is $18\frac{3}{5}$ inches?

5. The portrait company that takes little league baseball team photos is offering an option where a portrait of your baseball pose can be enlarged to be used as a wall decal (sticker). Your height in the portrait measures $3\frac{1}{2}$ inches. If the company uses a scale where 1 inch on the portrait represents 20 inches on the wall decal, find the height on the wall decal. Your actual height is 55 inches. If you stand next to the wall decal, will it be larger or smaller than you?

6. The sponsor of a 5K run/walk for charity wishes to create a stamp of its billboard to commemorate the event. If the sponsor uses a scale where 1 inch represents 4 feet, and the billboard is a rectangle with a width of 14 feet and a length of 48 feet, what will be the shape and size of the stamp?

7. Danielle is creating a scale drawing of her room. The rectangular room measures $20\frac{1}{2}$ feet by 25 feet. If her drawing uses the scale where 1 inch represents 2 feet of the actual room, will her drawing fit on an $8\frac{1}{2}$ in. by 11 in. piece of paper?

8. A model of an apartment is shown below where $\frac{1}{4}$ inch represents 4 feet in the actual apartment. Use a ruler to measure the drawing and find the actual length and width of the bedroom.



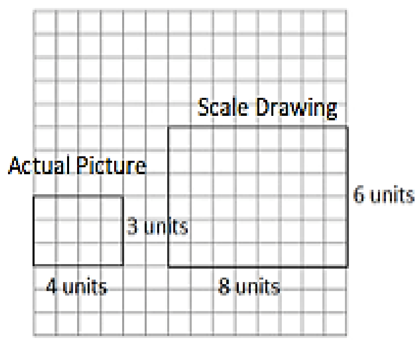
Lesson 19 – Computing Actual Areas from a Scale Drawing

Essential Questions:

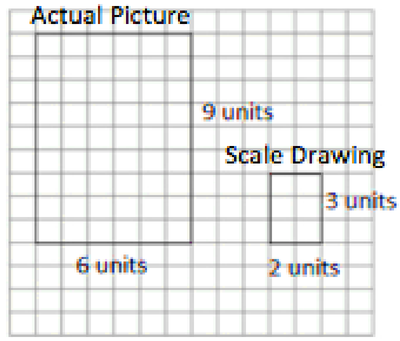
Example 1: Exploring Area Relationships

Use the diagrams below to find the scale factor and then find the area of each figure.

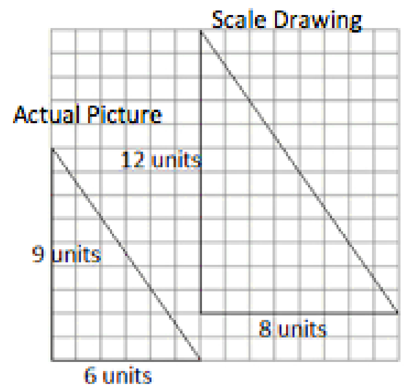
Example 1



Example 2



Example 3



What is the scale factor?	Example 1	Example 2	Example 3
What is the actual area?	Example 1	Example 2	Example 3
What is the area of the scale drawing?	Example 1	Example 2	Example 3
What is the ratio of the scale drawing area to the area of the actual picture?	Example 1	Example 2	Example 3

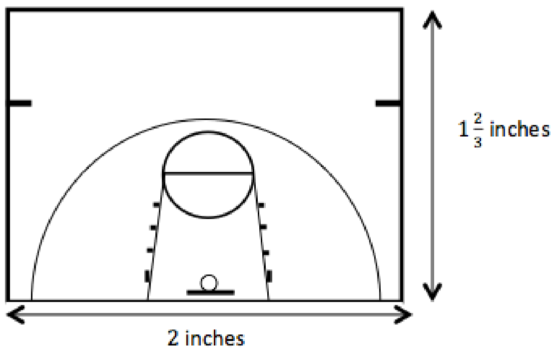
Results: What do you notice about the ratio of the areas in Examples 1–3? Complete the statements below.

When the scale factor of the sides was 2, then the value of the ratio of the areas was	
When the scale factor of the sides was $\frac{1}{3}$, then the value of the ratio of the areas was	
When the scale factor of the sides was $\frac{4}{3}$, then the value of the ratio of the areas was	
Based on these observations, what conclusion can you draw about scale factor and area?	
If the scale factor of the sides is r, then the ratio of the areas is	
Why do you think this is?	
How might you use this information in working with scale drawings?	
Suppose a rectangle has an area of 12 square meters. If the rectangle is enlarged by a scale factor of **three**, what is the area of the enlarged rectangle based on Examples 1-3? Look and think carefully!	

Example 4: They Said Yes

The Student Government liked your half-court basketball plan. They have asked you to calculate the actual area of the court so that they can estimate the cost of the project.

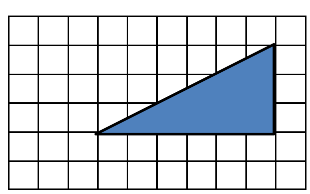
Scale Drawing: 1 inch on the drawing corresponds to 15 feet of actual length



Based on your drawing below, what will the area of the planned half-court be?	
Does the actual area you found reflect the results we found from Examples 1–3? Explain how you know.	
Write your own study/review question	

Exercise

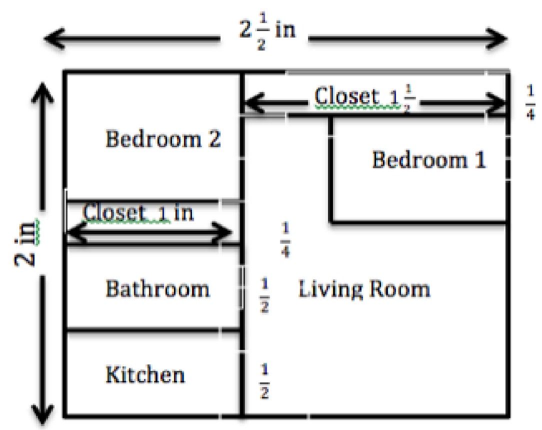
The triangle depicted by the drawing has an actual area of 36 square units. What is the scale of the drawing? (Note: Each square on the grid has a length of 1 unit.)



Exercise

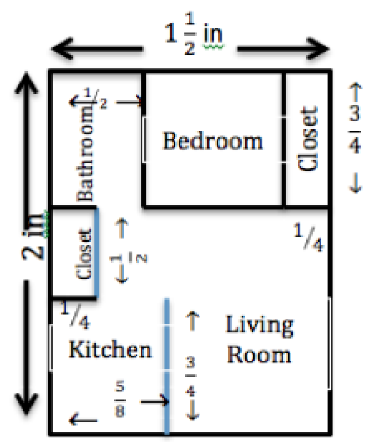
Use the scale drawings of two different apartments to answer the questions. Use a ruler to measure.

Suburban Apartment



Scale: 1 inch on scale drawing corresponds to 12 feet in the actual apartment.

City Apartment



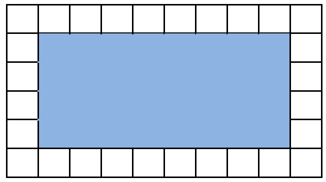
Scale: 1 inch on scale drawing corresponds to 16 feet in actual apartment.

Find the scale drawing area for both apartments, and then use it to find the actual area of both apartments.	
Which apartment has closets with more square footage? Justify your thinking.	
Which apartment has the largest bathroom? Justify your thinking.	
A one-year lease for the suburban apartment costs $750 per month. A one-year lease for the city apartment costs $925. Which apartment offers the greater value in terms of the cost per square foot?	

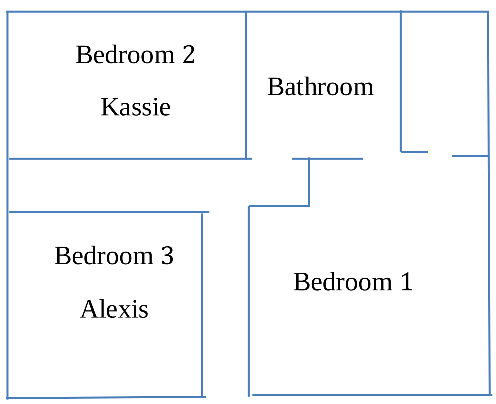
Summary

Lesson 19 - Independent Practice

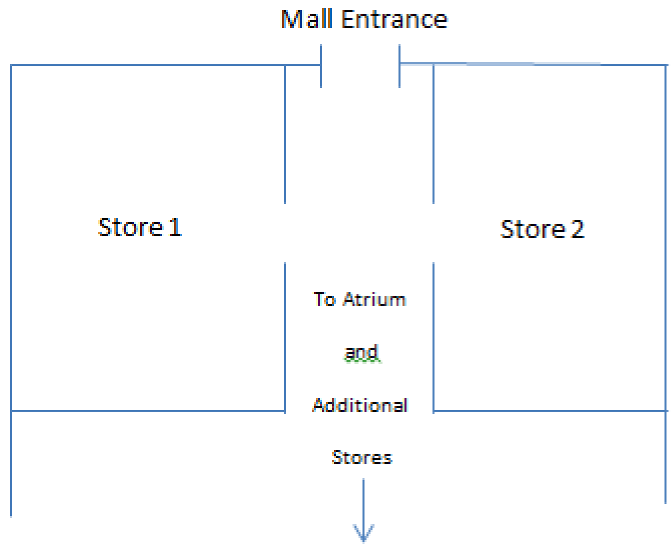
1. The shaded rectangle shown below is a scale drawing of a rectangle whose area is 288 square feet. What is the scale factor of the drawing? (Note: Each square on grid has a length of 1 unit.)



2. A floor plan for a home is shown below where $\frac{1}{2}$ inch corresponds to 6 feet of the actual home. Bedroom 2 belongs to 13-year old Kassie, and Bedroom 3 belongs to 9-year old Alexis. Kassie claims that her younger sister, Alexis, got the bigger bedroom, is she right? Explain.



3. On the mall floor plan, $\frac{1}{4}$ inch represents 3 feet in the actual store.



a. Find the actual area of Store 1 and Store 2.

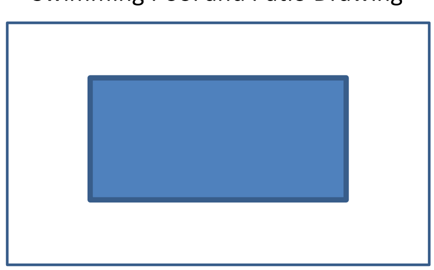
b. In the center of the atrium, there is a large circular water feature that has an area of $\left(\frac{9}{64}\right)\pi$ square inches on the drawing. Find the actual area in square feet.

4. The greenhouse club is purchasing seed for the lawn in the school courtyard. The club needs to determine how much to buy. Unfortunately, the club meets after school, and students are unable to find a custodian to unlock the door. Anthony suggests they just use his school map to calculate the area that will need to be covered in seed. He measures the rectangular area on the map and finds the length to be 10 inches and the width to be 6 inches. The map notes the scale of 1 inch representing 7 feet in the actual courtyard. What is the actual area in square feet?

5. The company installing the new in-ground pool in your backyard has provided you with the scale drawing shown below. If the drawing uses a scale of 1 inch to $1\frac{3}{4}$ feet, calculate the total amount of two-dimensional space needed for the pool and its surrounding patio.

Swimming Pool and Patio Drawing

$11\frac{3}{7}$ in.



$22\frac{2}{7}$ in.

Lesson 20 – An Exercise in Creating a Scale Drawing

Essential Questions:

Example 1: Exploring Area Relationships

Exploratory Challenge: Your Dream Classroom

Guidelines

Take measurements: All students will work with the perimeter of the classroom as well as the doors and windows. Give students the dimensions of the room. Have students use the table provided to record the measurements.

Create your dream classroom, and use the furniture catalog to pick out your furniture: Students will discuss what their ideal classroom will look like with their partners and pick out furniture from the catalog. Students should record the actual measurements on the given table.

Determine the scale and calculate scale drawing lengths and widths: Each pair of students will determine its own scale. The calculation of the scale drawing lengths, widths, and areas is to be included.

Scale Drawing: Using a ruler and referring back to the calculated scale length, students will draw the scale drawing including the doors, windows, and furniture.

Measurements

	Classroom Perimeter	Windows	Door	Additional Furniture					
Actual Length:									
Width:									
Scale Drawing Length:									
Width:									

Scale: ____________________

Initial Sketch

Area

	Classroom						
Actual Area:							
Scale Drawing Area:							

Why are scale drawings used in construction and design projects?	
How can we double check our area calculations?	
What are the biggest challenges you faced when creating your floor plan? How did you overcome these challenges?	
Write your own study/review question	

Summary

Lesson 20 - Independent Practice

Interior Designer

You won a spot on a famous interior designing TV show! The designers will work with you and your existing furniture to redesign a room of your choice. Your job is to create a top-view scale drawing of your room and the furniture within it.

- With the scale factor being $\frac{1}{24}$, create a scale drawing of your room or other favorite room in your home on a sheet of 8.5×11 inch graph paper.
- Include the perimeter of the room, windows, doorways, and three or more furniture pieces (such as tables, desks, dressers, chairs, bed, sofa, ottoman, etc.).
- Use the table to record lengths and include calculations of areas.
- Make your furniture "moveable" by duplicating your scale drawing and cutting out the furniture.
- Create a "before" and "after" to help you decide how to rearrange your furniture. Take a photo of your "before."
- What changed in your furniture plans?
- Why do you like the "after" better than the "before"?

	Entire Room	Windows	Doors	Desk/ Tables	Seating	Storage	Bed		
Actual Length:									
Actual Width:									
Scale Drawing Length:									
Scale Drawing Width:									

	Entire Room Length	Desk/Tables	Seating	Storage	Bed		
Actual Area:							
Scale Drawing Area:							

Lesson 21 – An Exercise in Changing Scales

Essential Questions:

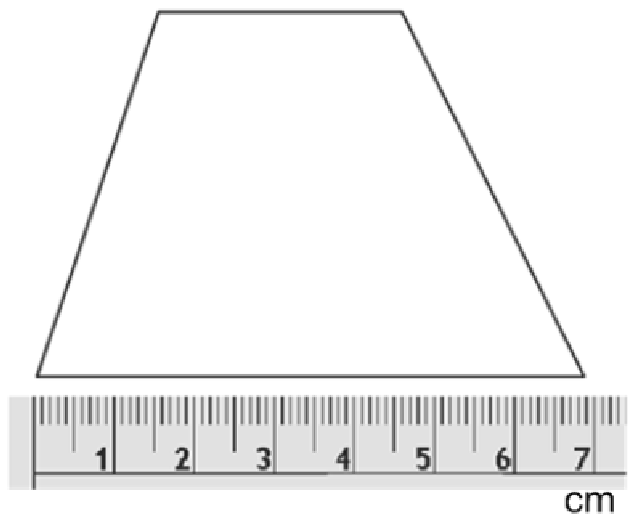
Exploratory Challenge: A new Scale Factor

The school plans to publish your work on the dream classroom in the next newsletter. Unfortunately, in order to fit the drawing on the page in the magazine, it must be $\frac{1}{4}$ its current length. Create a new drawing ($SD2$) in which all of the lengths are $\frac{1}{4}$ those in the original scale drawing ($SD1$) from Lesson 20.

How could you prove the new scale drawing is actually a scale drawing of the original room?	
How do we find the new scale factor?	
Write your own study/review question	

Exercise

The picture shows an enlargement or reduction of a scale drawing of a trapezoid.



Using the scale factor written on the card you chose, draw your new scale drawing with correctly calculated measurements.

What is the scale factor between the original scale drawing and the one you drew?	
The longest base length of the actual trapezoid is 10 cm. What is the scale factor between original scale drawing and the actual trapezoid?	
What is the scale factor between the new scale drawing you drew and the actual trapezoid?	
Write your own study/review question	

Lesson 21 - Independent Practice

Jake reads the following problem: If the original scale factor for a scale drawing of a square swimming pool is $\frac{1}{90}$, and the length of the original drawing measured to be 8 inches, what is the length on the new scale drawing if the scale factor of the new scale drawing length to actual length is $\frac{1}{144}$?

He works out the problem like so:

$8 \div \frac{1}{90} = 720$ inches.

$720 \times \frac{1}{144} = 5$ inches.

Is he correct? Explain why or why not.

1. What is the scale factor of the new scale drawing to the original scale drawing ($SD2$ to $SD1$)?

2. Using the scale, if the length of the pool measures 10 cm on the new scale drawing:
   a. Using the scale factor from Problem 1, $\frac{1}{144}$, find the actual length of the pool in meters?

   b. What is the surface area of the floor of the actual pool? Rounded to the nearest tenth.

   c. If the pool has a constant depth of 1.5 meters, what is the volume of the pool? Rounded to the nearest tenth.

   d. If 1 cubic meter of water is equal to 264.2 gallons, how much water will the pool contain when completely filled? Rounded to the nearest unit.

3. Complete a new scale drawing of your dream room from the Problem Set in Lesson 20 by either reducing by $\frac{1}{4}$ or enlarging it by 4.

Lesson 22 – An Exercise in Changing Scales

Essential Questions:

Classwork

Using the new scale drawing of your dream room, list the similarities and differences between this drawing and the original drawing completed for Lesson 20.

<u>Similarities</u> <u>Differences</u>

Original Scale Factor: ____________________ New Scale Factor: ________________________

What is the relationship between these scale factors?

Eureka Math Module 1 - Ratios and Proportional Relationships

Example 1: Building a Bench

To surprise her mother, Taylor helped her father build a bench for the front porch. Taylor's father had the instructions with drawings but Taylor wanted to have her own copy. She enlarged her copy to make it easier to read. The pictures below show the diagram of the bench shown on the original instructions and the diagram of the bench shown on Taylor's enlarged copy of the instruction.

Original Drawing of Bench (top view)

Taylor's Drawing (top view) Taylor's scale factor to bench: $\frac{1}{12}$

2 inches

6 inches

What information is important in the diagram?	
What information can we find from the given scale factor?	
How could you find the original scale factor to the actual bench?	
What is the relationship of Taylor's drawing to the original drawing?	
Using the diagram, fill in the missing information. To complete the first row of the table, write the scale factor of the bench to the bench, the bench to the original diagram, and the bench to Taylor's diagram. Complete the remaining rows similarly.	
Write your own study/review question	

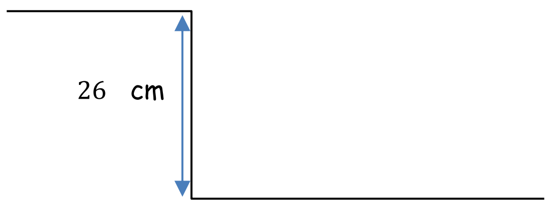
Scale Factors

	Bench	Original Diagram	Taylor's Diagram
Bench	1		
Original Diagram		1	
Taylor's Diagram			1

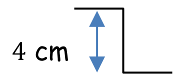
Exercise

Carmen and Jackie were driving separately to a concert. Jackie printed a map of the directions on a piece of paper before the drive, and Carmen took a picture of Jackie's map on her phone. Carmen's map had a scale factor to the actual distance of $\frac{1}{563,270}$.

Jackie's Map



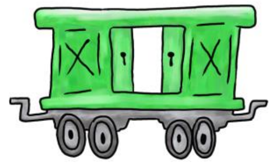
Carmen's Map



How could you find the original scale factor?	
Using the pictures, what is the scale of Carmen's map to Jackie's map?	
How could you find the scale of the new to original scale drawing?	
What was the scale factor of Jackie's printed map to the actual distance?	
What is the actual distance in miles? 1 in = 2.54 cm 1 ft = 12 in 1 mi = 5280 ft	
Write your own study/review question	

Exercise

Ronald received a special toy train set for his birthday. In the picture of the train on the package, the boxcar has the following dimensions: length is $4\frac{5}{16}$ inches; width is $1\frac{1}{8}$ inches; and height is $1\frac{5}{8}$ inches. The toy boxcar that Ronald received has dimensions l is 17.25 inches; w is 4.5 inches; and h is 6.5 inches. If the actual boxcar is 50 feet long:

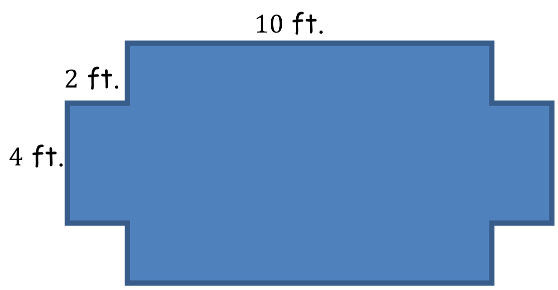


Find the scale factor of the picture on the package to the toy set.	
Find the scale factor of the picture on the package to the actual boxcar.	
Use these two scale factors to find the scale factor between the toy set and the actual boxcar.	
What are the width and height of the actual boxcar?	
Write your own study/review question	

Summary

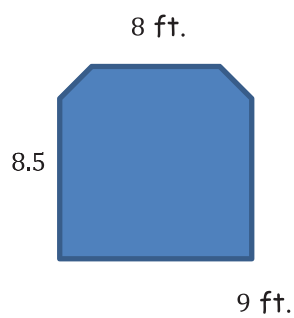
Lesson 22 - Independent Practice

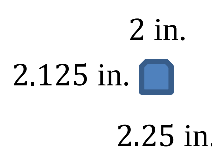
1. For the scale drawing, the actual lengths are labeled onto the scale drawing. Measure the lengths, in centimeters, of the scale drawing with a ruler, and draw a new scale drawing with a scale factor ($SD2$ to $SD1$) of $\frac{1}{2}$.



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.

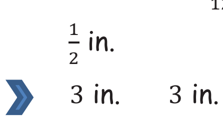
a. Original Scale Factor: $\frac{6}{35}$ New Scale Factor: $\frac{1}{280}$

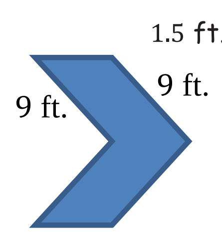




Scale Factor: ______________

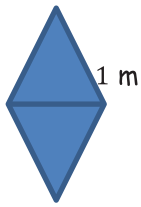
b. Original Scale Factor: $\frac{1}{12}$ New Scale Factor: 3

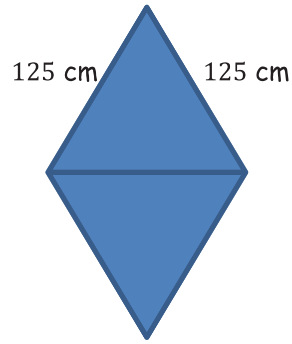




Scale Factor: ________________

c. Original Scale Factor: 20 New Scale Factor: 25



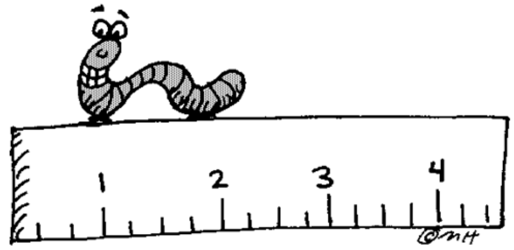


Scale Factor: _______________

Eureka Math Module 1 - Ratios and Proportional Relationships

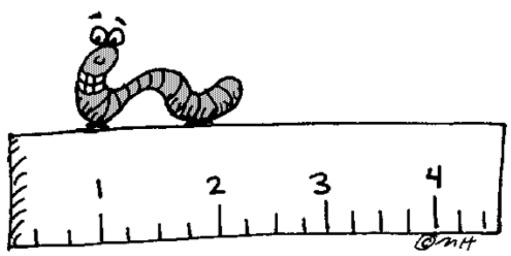
Name ____ Hour _______

Bring this curriculum packet with you to class every day.



Topic A	
Lesson 1: An Experience in Relationships as Measuring Rate	
Lesson 2: Proportional Relationships	
Lesson 3: Identifying Relationships in Tables	
Lesson 4: Identifying Relationships in Tables	
Lesson 5: Identifying Relationships in Graphs	
Lesson 6: Identifying Relationships in Graphs	

Topic B	
Lesson 7: Unit Rate as the Constant of Proportionality	
Lesson 8: Representing Relationships with Equations	
Lesson 9: Representing Relationships with Equations	
Lesson 10: Interpreting Graphs of Proportional Relationships	



Topic C	
Lesson 11: Ratios of Fractions and Their Unit Rates	
Lesson 12: Ratios of Fractions and Their Unit Rates	
Lesson 13: Finding Equivalent Ratios Given the Total	
Lesson 14: Multi-Step Ratio Problems	

Lesson 15: Equations of Graphs Involving Fractions	

Topic D	
Lesson 16: Relating Scale Drawings to Ratios and Rates	
Lesson 17: The Unit Rate as the Scale Factor	
Lesson 18: Computing Actual Lengths from a Scale Drawing	
Lesson 19: Computing Actual Areas from a Scale Drawing	
Lesson 20: An Exercise in Creating a Scale Drawing	
Lesson 21: An Exercise in Changing Scales	
Lesson 22: An Exercise in Changing Scales	