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# Chapter 1: Ratio Relations (4 weeks)

## Utah Core Standard(s):

- Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”* (6.RP.1)
- Understand the concept of a unit rate  $a/b$  associated with a ratio  $a:b$  with  $b \neq 0$ , and use rate language in the context of a ratio relationship. *For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is  $3/4$  cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.”* (6.RP.2)
- Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. (6.RP.3)
  - a) Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
  - b) Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
  - c) Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means  $30/100$  times the quantity); solve problems involving finding the whole, given a part and the percent.
  - d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

**Academic Vocabulary:** ratio,  $a:b$ , table, tape diagram, equivalent ratios, ratio statement, part to part, part to total, double number line, graph, coordinate plane, ordered pair, unit rate, rate unit, partition, iterate, equation, variable, dependent variable, independent variable




**Chapter Overview:** In this chapter, students extend their work with multiplication and division to solve ratio and rate problems about quantities. A ratio expresses a relationship between two or more quantities. The chapter begins with an introduction to ratio language and notation, a critical component to working with ratios. Students learn about different models that can be used to represent ratios, progressing from concrete to pictorial to abstract representations. Students reason about multiplication and division to find equivalent ratios and organize the equivalent ratios in tables and on graphs. Students learn about the different ways to represent and solve ratio problems (tiles, pictures, tape diagrams, double number lines, partial tables, graphs, and equations). They make decisions as to which representation might be best to use for a given problem, solve problems using a variety of strategies, and make connections between the strategies. Students learn that every ratio has an associated rate. They learn how to find unit rates and discover that unit rates can be a powerful tool for solving problems.



## Connections to Content:




**Prior Knowledge:** In this chapter, students build on their understanding of multiplication and division from earlier grades. Models such as arrays and area models and an understanding of the distributive property, concepts from **3.OA**, are helpful tools for finding equivalent ratios. Students will rely on their fraction sense and operations with fractions, **5.NF**, to determine and iterate unit rates. In **5.G**, students graphed points in the first quadrant which will help them to plot equivalent ratios in this chapter. Work in **5.OA** with writing numerical expressions and analyzing patterns and relationships provides a good foundation for writing equations to show the relationship between two quantities.

Future Knowledge: Ratios and proportional relationships are foundational for further study in mathematics and science and useful in everyday life. Later in this course, students use ratios to build an understanding of percent and to solve problems involving percents such as tip, discount, and tax. They also use ideas about ratio in their study of descriptive statistics. In 7<sup>th</sup> grade, students will use ratios in their study of similar figures and probability. In 8<sup>th</sup> grade, students use ratios when studying slopes of lines and linear relationships.

# MATHEMATICAL PRACTICE STANDARDS

	<p><b>Make sense of problems and persevere in solving them.</b></p>	<p>The tables below show three different recipes for making orange juice using orange concentrate and water.</p> <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr> <th colspan="2">Recipe 1</th> </tr> <tr> <th>Cups of Orange Con.</th> <th>Cups of Water</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>5</td> </tr> <tr> <td>6</td> <td>10</td> </tr> <tr> <td>9</td> <td>15</td> </tr> <tr> <td>10</td> <td><math>16\frac{2}{3}</math></td> </tr> </tbody> </table> <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr> <th colspan="2">Recipe 2</th> </tr> <tr> <th>Cups of Orange Con.</th> <th>Cups of Water</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> </tr> <tr> <td>4</td> <td>6</td> </tr> <tr> <td>6</td> <td>9</td> </tr> <tr> <td>8</td> <td>12</td> </tr> </tbody> </table> <table border="1" style="display: inline-table;"> <thead> <tr> <th colspan="2">Recipe 3</th> </tr> <tr> <th>Cups of Orange Con.</th> <th>Cups of Water</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>8</td> </tr> <tr> <td>10</td> <td>16</td> </tr> <tr> <td>15</td> <td>24</td> </tr> <tr> <td>20</td> <td>32</td> </tr> </tbody> </table> <p>Order the recipes from strongest orange flavor to weakest orange flavor. Justify your answer.</p> <p><i>To answer this problem, students must make sense of the quantities given and their relationship. There are a variety of strategies that students can use: find ratios with a common value, find the unit rate, examine the explicit relationship between the two quantities, etc. Students may use pictures and tape diagrams as tools while working toward an answer. They may utilize patterns of addition and multiplication. Students may rely on their fraction sense if they find and compare unit rates. Students will need to think critically about what the numbers are telling them. For example, if students find the unit rate of cups of water/cups of orange concentrate, a greater unit rate will actually indicate a weaker orange flavor. Students will be required to stop along the way and track their progress: “Which recipes have I compared?” “Which recipes do I still need to compare for my answer to be complete?” “How can I track my progress?”</i></p>	Recipe 1		Cups of Orange Con.	Cups of Water	3	5	6	10	9	15	10	$16\frac{2}{3}$	Recipe 2		Cups of Orange Con.	Cups of Water	2	3	4	6	6	9	8	12	Recipe 3		Cups of Orange Con.	Cups of Water	5	8	10	16	15	24	20	32
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	<p><b>Reason abstractly and quantitatively.</b></p>	<p>Jeff’s soccer team loses 2 soccer games for every 3 that they win. Lauren’s soccer team loses 2 soccer games for every 3 games that they play. Compare these statements. Both have a ratio of 2:3. Do Jeff and Lauren’s teams have the same winning record? Why or why not?</p> <p><i>Throughout the chapter, students are required to make sense of the quantities in problem situations and their relationship to each other. They will construct models such as tape diagrams to represent ratio relationships and use the models to solve problems. A critical component of this process involves decoding ratio language. “What quantities are involved?” “What units are involved?” “Is this a part to part relationship or a part to total relationship?” “Does my model match the ratio statement given?”</i></p>																																				
	<p><b>Construct viable arguments and critique the reasoning of others.</b></p>	<p>Dominic and Emma are running for class president. For each vote that Dominic receives Emma receives four votes. List <u>five</u> possibilities for the total number of students who voted. Justify your answers. Write a rule that describes all the possible answers to this problem.</p>																																				

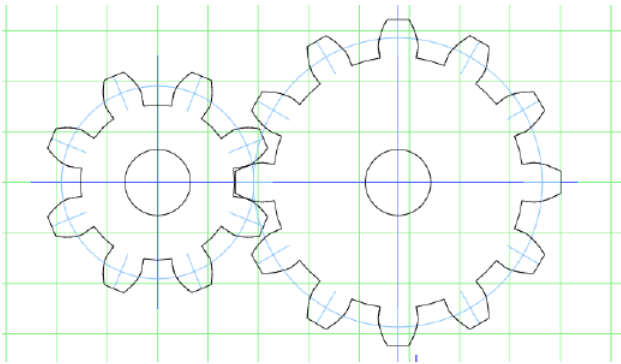
		<p><i>Throughout the chapter, problems require students to justify their answers or explain the strategies used to solve a problem. Justification can take many forms. It may be an explanation in words given orally or in writing, a picture, model, or diagram, an illustration of patterns seen in tables and on graphs, writing an equation, etc. Students may solve this problem a variety of ways: using concrete manipulatives, drawing a picture, creating a tape diagram, using ideas about multiplication, creating a partial table, writing an equation, etc. Students should share out their strategies and conclusions in order to consider multiple approaches and make connections between the approaches. Since there are infinite answers to this question, students will begin to generalize and articulate a rule for total number of students who could have voted which will help to solidify and demonstrate their understanding of ratio relations.</i></p>
	<p><b>Model with mathematics.</b></p>	<p>At a baseball game, the snack bar sells 3 hotdogs for every 2 hamburgers they sell. Create a double number line to show the relationship between the number of hotdogs and the number of hamburgers sold at the baseball game. Organize the information in the table below. Complete the graph below.</p> <p><i>Ratio relations can be modeled using several different representations (pictures, tape diagrams, double number lines, geometric models, tables, graphs, and equations). In this chapter, students have the opportunity to analyze and create these different representations to represent real world situations. They compare the representations, make connections between them, and determine when one representation may be better to use based on the problem and questions being asked.</i></p>
	<p><b>Use appropriate tools strategically.</b></p>	<p>Chen makes 2 out of every 3 free throws that he shoots. If he shoots 18 free throws in a game, how many do you expect him to make? Solve using at least <u>two</u> strategies.</p> <p><i>Throughout this chapter, students are exposed to a variety of tools that can be used to represent ratio relations and solve real world problems. These tools include concrete manipulatives such as tiles and chips, pictures, tape diagrams, tables, graphs, and equations. The chapter starts with more concrete tools then progresses into tools that are more abstract. For example, students start by modeling ratio relations with chips and tiles (concrete), then pictures (pictorial), and then tape diagrams (abstract). They understand that these all show the same relationship but more abstract representations can be more efficient and flexible for solving problems. They make connections between the different tools. For example, they consider patterns in tables and on graphs. They understand that an equation shows the explicit relationship between two variables given in a table. In the chapter, students are introduced to tools and then given the autonomy to decide which tools they want to use based on their comfort with the tools and the problem given.</i></p>

	<p><b>Attend to precision.</b></p>	<p>Sophia’s teacher asked her to create a pattern using only circles and squares so that the ratio of circles to total shapes is 2:5. Sophia created the following pattern.</p> <p style="text-align: center;">○ ○ □ □ □ □ □</p> <p>Is Sophia’s pattern correct? Justify your answer.</p> <p><i>Moving fluently between ratio statements and representations of ratio relations requires attention to precision. Students interpret and decode the language of ratio, asking questions such as, “What quantities are involved?” “What units are involved?” “Is this a part to part ratio or a part to total ratio?” “What does this notation mean?”</i></p>
	<p><b>Look for and make use of structure.</b></p>	<p>A recipe for punch calls for 5 cups of lemonade for every 2 cups of fruit punch. Draw a model to represent this relationship. Then, interpret all of the following:</p> <p>5 to 2</p> <p>2:5</p> <p><math>\frac{2}{5}</math></p> <p><math>\frac{5}{2}</math></p> <p><i>Students use structure when moving fluidly between ratios and their associated rates. While the numbers given above all express the same relationship, they have different meanings. A model is helpful for revealing this relationship. In this example, students see a model that is 2 parts fruit punch and 5 parts lemonade. A multiplicative comparison between the two parts shows that fruit punch is <math>\frac{2}{5}</math> the size of lemonade (or lemonade is <math>\frac{5}{2}</math> or 2.5 times larger than fruit punch).</i></p>
	<p><b>Look for and express regularity in repeated reasoning.</b></p>	<p>Marcus is training for an ultra-marathon where he will be running 100 miles. He can run 7 miles per hour. Complete the table below to show the relationship between time and distance for Marcus. Write an equation to show the relationship between time and distance for Marcus. Use <math>t</math> for time and <math>d</math> for distance.</p> <p><i>Early on in the chapter, students use ideas about repeated addition and scalar multiplication to find equivalent ratios and complete ratio tables. They illustrate patterns they see on double number lines, tables, and graphs. These patterns begin to surface ideas about slope and linear relationships. Later in the chapter, students write equations to represent ratio relations. To help students arrive at the equation for the example given, students can start by writing numerical expressions:</i></p> <p>After 1 hour, distance = <math>1(7) = 7</math></p> <p>After 2 hours, distance = <math>2(7) = 14</math></p> <p>After 3 hours, distance = <math>3(7) = 21</math></p> <p>After <math>t</math> hours, distance = <math>t(7) = 7t</math></p>

## 1.0 Anchor Problem: Connected Gears



Two gears are connected as shown in the picture below. The smaller gear has **8** teeth and the larger gear has **12** teeth.



- Find a way to determine the number of revolutions the small gear makes based on the number of revolutions the large gear makes. Organize your results.

- b. If the larger gear makes **20** revolutions, how many revolutions will the smaller gear make?
- c. If the smaller gear makes **24** revolutions, how many revolutions will the larger gear make?
- d. If the larger gear makes **1** full revolution, how many revolutions does the smaller gear make?
- e. If the smaller gear makes **1** full revolution, how many revolutions does the larger gear make?



- f. Create four different representations of the relationship between the number of revolutions the large gear makes and the number of revolutions the small gear makes. Make up a question that can be answered using each representation.

<p><b>Representation 1:</b></p>          <p><b>Question:</b></p>	<p><b>Representation 2:</b></p>          <p><b>Question:</b></p>
<p><b>Representation 3:</b></p>          <p><b>Question:</b></p>	<p><b>Representation 4:</b></p>          <p><b>Question:</b></p>

*This problem was adapted from a problem in Developing Essential Understanding of Ratios, Proportions, & Proportional Reasoning from the National Council of Teachers of Mathematics.*

# Section 1.1: Representing Ratios

## Section Overview:

In this section, students learn what a ratio is. Students create pictures and models (tape diagrams) to represent ratios given in words and they write ratio statements to describe relationships given in pictures and diagrams. Through the process, students develop flexibility and fluidity with ratio language and notation and familiarity with the models that can be used to represent ratios and solve ratio problems. Students also learn that there are different types of ratios (part to part and part to total) and because of this they must pay close attention to the quantities given in a problem and their relationship to each other. Students find equivalent ratios using concrete manipulatives, models, and numeric methods and connect this work to their knowledge of whole number multiplication and division. They organize equivalent ratios in tables. Lastly, students synthesize and apply the knowledge learned in the section to solve a variety of real world ratio problems.

## Concepts and Skills to Master:

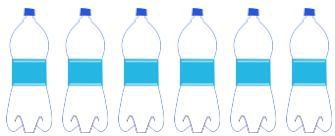
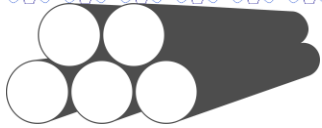
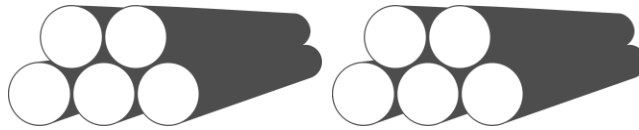
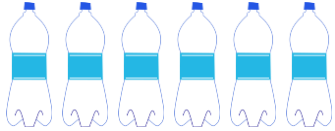
*By the end of this section, students should be able to:*


1. Understand what a ratio is.
2. Given a pictorial representation or model, use ratio language and notation to describe the relationship between two or more quantities.
3. Given a ratio statement, identify the important quantities and interpret the language and notation in order to create a pictorial representation or model of the relationship between the quantities.
4. Distinguish when a ratio is describing a part to part, part to total, or total to part relationship between quantities.
5. Determine equivalent ratios to describe a relationship between two quantities. Make and complete tables of equivalent ratios.
6. Use ratio reasoning and models (tape diagrams) to solve real world ratio problems.

## 1.1a Class Activity: The Language of Ratio

### Activity 1:


Drew's family of four is going camping for three days. Here is the gear they have packed.



- a. Make several comparisons between the items Drew's family has packed in relationship to other quantities (i.e. the number of people going, the number of days they are going, different items that are packed, etc.). 

- b. What else would you suggest Drew's family bring camping? How much/many should he bring? Relate the amount they should bring to another quantity (i.e. number of people going, number of days, quantity of another item).

**Activity 2:** Marla, Chase, and Evelyn are putting red and blue marbles in a jar. Use the information below to

draw a picture that represents the marbles that could be in each person's jar. 

**Marla:**

Marla puts three blue marbles in the jar for every five red marbles she puts in the jar.

**Chase:**

Chase puts three red marbles in the jar for every five blue marbles he puts in the jar.

**Evelyn:**

Three out of every five marbles in Evelyn's jar are blue.

The statements describing the marbles in Marla, Chase, and Evelyn’s jars are **ratio** statements.

A <b>ratio</b> expresses a relationship between two or more quantities.
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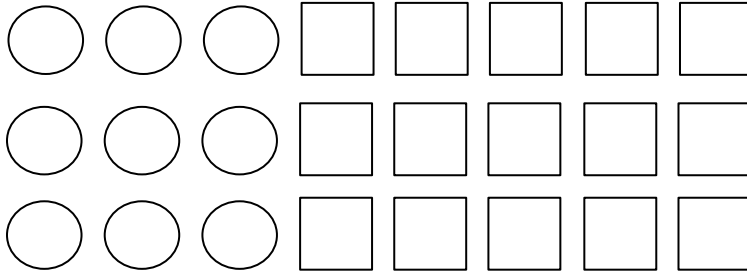
- Activity 3:** In one day, an ice cream shop sells 3 ice creams on a cone for each ice cream they sell in a cup.
- Draw a picture to represent this relationship.
  
  
  
  
  
  
  
  
  
  - Write several ratio statements about the ice creams sold at this shop. Tell whether the statement is a part-to-part, part-to-total, or total-to-part.
  
  
  
  
  
  
  
  
  
  - Based on this ratio, give some possibilities for the total number of ice creams that are sold at this shop in one day.

1. Mary is making a quilt. In her quilt, the ratio of stars to moons is 3 to 2. Sam is also making a quilt. In his quilt, the ratio of moons to stars is 3 to 2.

a. Draw a picture to show the relationship between stars and moons in each person's quilt.



2. Travis is drawing circles and squares on his paper using the pattern shown below.



a. Complete the following statements:

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 3 to 5.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 5 to 3.

3. At a carnival, there are 8 boys for every 3 girls waiting in line to climb a rock wall.

a. Complete the following statements:

The ratio of girls to boys standing in line is \_\_\_\_:\_\_\_\_.

The ratio of boys to girls standing in line is \_\_\_\_:\_\_\_\_.

The ratio of girls to total people standing in line is \_\_\_\_:\_\_\_\_.

4. Charlie and Teo are making pictures using yellow and green circles. In Charlie's picture, the ratio of yellow circles to green circles is 3:7. In Teo's picture, the ratio of yellow circles to total circles is 3:7.
- Draw a picture of the relationship between yellow and green circles for each boy.
5. In a carnival game, a player selects a rubber duck out of a pool of water. If the rubber duck has a red sticker on it, the player wins. One out of four rubber ducks has a red sticker on the bottom.
- Complete the following statements:  
 The ratio of winning ducks to losing ducks is \_\_\_\_\_.  
 The ratio of losing ducks to winning ducks is \_\_\_\_\_.  
 The ratio of winning ducks to total ducks is \_\_\_\_\_.  
 The ratio of losing ducks to total ducks is \_\_\_\_\_.  
 The ratio of total ducks to winning ducks is \_\_\_\_\_.
  - Next to each ratio above, indicate whether it is a part to part (PP), part to total (PT), or total to part (TP).
6. A deli uses 2 oranges for every 5 apples in their famous fruit salad recipe.
- Complete the following statements.  
 The ratio of oranges to apples is \_\_\_\_:\_\_\_\_.  
 The ratio of apples to total pieces of fruit is \_\_\_\_:\_\_\_\_.  
 The ratio of total pieces of fruit to apples is \_\_\_\_:\_\_\_\_.  
 The ratio of oranges to total pieces of fruit is \_\_\_\_:\_\_\_\_.
7. Leslie is making bouquets for a wedding. She uses 5 tulips for every 2 roses.
- Complete the following statements:  
 The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 5:7.  
 The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 7:2.

8. In a herd of sheep, 1 out of every 40 sheep is black. The rest are white.
- Complete the following statements:  
 The ratio of black sheep to white sheep in a herd is \_\_\_\_\_:\_\_\_\_\_.  
  
 The ratio of white sheep to black sheep in a herd is \_\_\_\_\_:\_\_\_\_\_.  
  
 The ratio of white sheep to total sheep in a herd is \_\_\_\_\_:\_\_\_\_\_.
9. Felipe is drawing yellow and blue squares. The ratio of yellow squares to total squares in Felipe's picture is 3 to 10. Create Felipe's picture.
10. Kai is drawing circles and squares on his paper. The ratio of circles to squares in Kai's picture is 1:3. Create Kai's picture.
11. Ian is also drawing circles and squares on his paper. The ratio of circles to total shapes in Ian's picture is 1:3. Create Ian's picture.

12. Both Kai's and Ian's pictures use the ratio of 1:3. Why are their pictures different?

13. Helena is drawing the following pattern on her paper.



a. Write a ratio statement to describe Helena's picture.

14. Sophia's teacher asked her to create a pattern using only circles and squares so that the ratio of circles to total shapes is 2:5. Sophia created the following pattern.



b. Is Sophia's pattern correct? Justify your answer.





## Spiral Review

1. Marley is putting together bags of cookies for a bake sale. She puts 4 cookies into each bag. If she wants to put together 5 bags of cookies, how many cookies does she need? Draw a picture of this situation and write an equation to show the number of cookies Marley needs.

What if Marley wants to make 7 bags of cookies with 4 cookies in each bag? How many cookies will she need?

2. Sierra is also putting together bags of cookies for the bake sale. If Sierra puts 5 cookies in each bag and wants to make 4 bags of cookies, how many cookies does she need? Draw a picture of this situation and write an equation to show the number of cookies Sierra needs.

What if Sierra wants to make 4 bags of cookies with 7 cookies in each bag? How many cookies will she need?

3. Compare problems #1 and #2.

4. Chloe made 3 cups of lemonade. If she wants to share the lemonade evenly with 6 people, how much lemonade will each person get? Draw a model and write a math sentence to represent this situation and solve the problem.

### 1.1a Homework: The Language of Ratio

- Simon just purchased six hamsters. Simon is trying to determine how many cages, hamster wheels, water bottles, food dishes, and bags of bark he needs to purchase with his hamsters. The owner of the pet shop told him the following:
  - Two hamsters can live in each cage.
  - You need one hamster wheel per cage.
  - You need one food bowl for every hamster.
  - You need one water bottle for each cage.
  - You need one bag of bark for every three cages.
  - How many of each item should Simon purchase?

Cages: \_\_\_\_\_ Wheels: \_\_\_\_\_ Food Bowls: \_\_\_\_\_ Water Bottles: \_\_\_\_\_ Bags of Bark: \_\_\_\_\_

- Write three different ratio statements about the picture below. Use words like “to”, “per”, “for every”, “each”, and “ratio”. Consider the relationship between birds and branches and also the relationship between birds and body parts of a bird. For example, “Each bird has two wings.”



- Kara’s necklace contains red and yellow beads. The ratio of red beads to yellow beads on Kara’s necklace is 4 to 1.
  - Draw a picture of the beads on Kara’s necklace.
  - Complete the following statements:

The ratio of red beads to yellow beads is \_\_\_\_\_: \_\_\_\_\_.



The ratio of yellow beads to red beads is \_\_\_\_\_: \_\_\_\_\_.

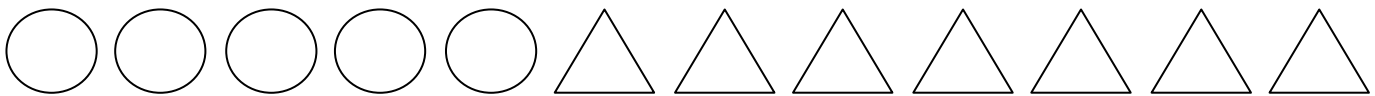
The ratio of red beads to total beads is \_\_\_\_\_: \_\_\_\_\_.
  - Give a value for the total number of beads that might be on Kara’s necklace. Give a value for the total number of beads that *cannot* be on Kara’s necklace. Explain.
- A recipe to make Pumpkin Blondies uses 2 cups of Blondie cake mix for each cup of pumpkin puree.
  - Draw a picture of this recipe.
  - Complete the following statements:



The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 1:2.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 2:1.


5. Create a pattern using green and orange circles where the ratio of green circles to orange circles is 5 to 3.
  
6. Create a pattern using green and orange circles where the ratio of orange circles to green circles is 5 to 3.
  
7. Create a pattern using green and orange circles where the ratio of total circles to orange circles is 5 to 3.
  
8. Compare the patterns from the three problems above. They all use the ratio 5 to 3 but the patterns are different. Explain why.

9. George's teacher asked him to create a pattern where the ratio of triangles to circles is 5:7. George created the following pattern:  



- a. Is George's picture correct? Why or why not?  

10. In Lizzy's neighborhood, there are 2 cats for every 5 dogs.

- a. Mr. Beck asked his class to write a ratio statement to show the relationship between cats and dogs in Lizzy's neighborhood. These are the statements made by several students. Circle the names of the students who wrote a correct statement. For the ones that are incorrect, explain why they are incorrect in the space below. 

Eva's Statement: The ratio of cats to dogs is 2:5.

Mariah's Statement: The ratio of dogs to cats is 5:2.

Tom's Statement: Two out of every five animals are cats.

Will's Statement: For every 6 cats, there are 15 dogs.

## 1.1b Class Activity: Tape Diagrams

**Activity 1:** In a pond, there are 3 geese for every 4 ducks.

- a. Draw a picture to represent this situation.



**Activity 2:** Let's revisit the marble problem from the previous lesson. Draw a tape diagram to represent the marbles in each student's jar.

**Marla:**

Marla puts three blue marbles in the jar for every five red marbles she puts in the jar.

**Chase:**

Chase puts three red marbles in the jar for every five blue marbles he puts in the jar.

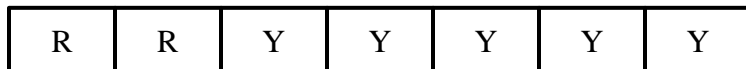
**Evelyn:**

Three out of every five marbles in Evelyn's jar are blue.

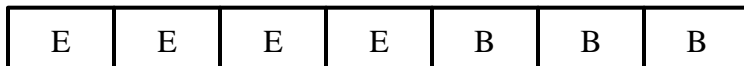
A **tape diagram** is a model commonly used to represent ratios where the quantities have the same units. Tape diagrams can be useful tools for representing ratios and solving problems.

**Directions:** Draw a tape diagram to represent each of the following situations

1. The ratio of red paint to blue paint used to make a certain shade of purple paint is 2:3.
2. The ratio of boys to girls standing in line is 3 to 5.
3. A bakery sells chocolate donuts and glazed donuts. The ratio of glazed donuts sold to total donuts sold is 3:7.
4. The ratio of fruit punch to lemonade used in a recipe is 1 to 2.
5. At a play, three out of every eight people in attendance are adults.
6. The tape diagram shows the ratio of red paint to yellow paint used to make a certain shade of orange paint. Write a ratio statement based on the diagram.



7. Bryce and Emma are running for class president. The tape diagram shows the ratio of votes Emma received to votes Bryce received. Write a ratio statement based on the diagram.



8. As people are leaving a movie, the theater manager polls them as to whether they liked the movie or not. For every 2 people that liked the movie, 3 did not like the movie.
- Draw a tape diagram of this situation.
  - Complete the following statements:

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 3:2.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 2:5.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 5:3.

### Spiral Review

- List the factors of 40.
- List the factors of 16.
- What is the greatest common factor (GCF) of 40 and 16?
- Cole is making lemonade. Each lemon yields  $\frac{1}{4}$  c. of lemon juice. How many cups of lemon juice will he get out of 8 lemons? Draw a picture to represent this situation and then write a math sentence to represent the problem and solution.

## 1.1b Homework: Tape Diagrams

1. At the skate park, Anthony notices that for every 3 kids that are on a bike, 2 kids are on a skateboard. Show some different ways you can represent this relationship using pictures or models.
  
2. Sixth graders at Mountain Crest Middle School are voting on where they want to go for their end-of-year field trip. They are choosing from the zoo and the planetarium. For each student that votes for the planetarium, two vote for the zoo.
  - a. Draw a tape diagram to model this relationship.
  
  - b. Complete the following statements:

The ratio of zoo votes to total votes is \_\_\_\_\_.

The ratio of zoo votes to planetarium votes is \_\_\_\_\_.

The ratio of planetarium votes to total votes is \_\_\_\_\_.

The ratio of total votes to planetarium votes is \_\_\_\_\_.
  
3. A popular cereal brand is giving away baseball cards in some of its cereal boxes. Two out of every seven boxes of cereal contains a pack of baseball cards.
  - a. Draw a tape diagram to represent this situation.
  
  - b. Complete the following statements:

The ratio of boxes with baseball cards to boxes without baseball cards is \_\_\_\_\_:\_\_\_\_\_.

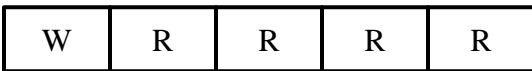
The ratio of boxes with baseball cards to total boxes is \_\_\_\_\_:\_\_\_\_\_.
  
4. At Elsa's preschool, there is 1 adult in the room for every 10 children.
  - a. Draw a tape diagram to represent this situation.
  
  - b. Complete the following statements:

The ratio of adults to children in the classroom is \_\_\_\_\_:\_\_\_\_\_.

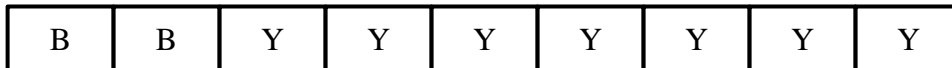
The ratio of children to adults in the classroom is \_\_\_\_\_:\_\_\_\_\_.

The ratio of children to people in the room is \_\_\_\_\_:\_\_\_\_\_.

5. Jeff's soccer team loses 2 soccer games for every 3 that they win.
- Draw a tape diagram to represent this situation.
  - Write three different ratios to describe this picture, tell whether the ratios are part to part (PP), part to total (PT), or total to part (TP).
6. Lauren's soccer team loses 2 soccer games for every 3 games that they play.
- Draw a tape diagram to represent this situation.
  - Compare this problem to the previous problem. Both have a ratio of 2:3. Do Jeff and Lauren's teams have the same winning record? Why or why not?
7. At Toby's school, students wear a uniform. Students can choose from a red shirt or a white shirt. The tape diagram below shows the ratio of white shirts sold to red shirts sold.



- Write three different ratio statements about the t-shirts sold. Tell whether your statement is a part to part (PP), part to total (PT), or total to part (TP).
8. The tape diagram below shows the ratio of blue paint to yellow paint used to make a certain shade of green paint.



- Complete the following statements:

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 7:2.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 2:9.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 7:9.



The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 9:2.



9. In preparation for tomorrow's lesson, complete the multiplication table shown below.

$\times$	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

### 1.1c Class Activity: Equivalent Ratios and Tables

**Activity 1:** A deli uses 2 oranges and 5 apples in their recipe for fruit salad. How many apples and oranges the deli should use if they want to double, triple, and quadruple their fruit salad recipe. How many apples and oranges should they use if they want to half the recipe? Organize your results in the table below.  

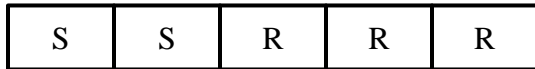
<b>What if they want to...</b>	<b>Oranges</b>	<b>Apples</b>	<b>Total Pieces of Fruit</b>
Original Recipe	2	5	7
Double the recipe?			
Triple the recipe?			
Quadruple the recipe?			
Half the recipe?			



In this problem, you found **equivalent ratios**.


- c. Write six equivalent ratios that show the relationship between apples and oranges in this recipe.
- b. Write six equivalent ratios that show the relationship between oranges and total pieces of fruit in this recipe.
- c. Write six equivalent ratios that show the relationship between apples and total pieces of fruit in this recipe.
- d. How many apples should the deli use if they use 16 oranges?

**Activity 2:** The tape diagram below shows the ratio of Ruiz’s weekly allowance to his younger sister’s weekly allowance. Determine at least five different allowances that Ruiz and his sister could be earning each week.



1. The ratio of children to adults in the swimming pool is 7:3.
  - a. Draw a picture or tape diagram to represent this situation.
  - b. Write five equivalent ratios that show the possible number of children and adults in the pool.
  - c. Write five equivalent ratios that show the possible number of children to total people in the pool.
  - d. If there are 50 total people in the pool, how many adults are there in the pool?
  - e. Is it possible for there to be 30 children in the pool with the given relationship? Explain.
  - f. Is it possible for there to be 30 adults in the pool with the given relationship? Explain.


2. Suni is making a necklace. The ratio of red beads to turquoise beads on the necklace is 5:1.
- a. Determine several possibilities for the number of red and turquoise beads Suni could have used to make her necklace. Organize the information in the table below. Illustrate any patterns you see

in the table. 

Red Beads	Turquoise Beads	Total Beads

3. Pizza Paradise sells cheese and pepperoni pizza. The tape diagram below shows the ratio of cheese to pepperoni pizzas sold in one day.

C	C	P
---	---	---

- a. With a partner, discuss three different ratio statements to describe this relationship. Tell whether your statements are part to part (PP), part to total (PT), or total to part (TP).
- b. Determine several possibilities of cheese and pepperoni pizza that Pizza Paradise may have sold in one day. Illustrate any patterns you see in the table. 

<b>Cheese</b>					
<b>Pepperoni</b>					

- c. Determine the number of cheese pizzas Pizza Paradise sold if they sold 25 pepperoni pizzas.
- d. Determine the number of cheese and pepperoni pizzas sold if Pizza Paradise sold 12 total pizzas.

4. The ratio of blue paint to red paint used to make a certain shade of purple paint is 2:3.
- a. Circle all ratios that would make the same shade of purple paint.

6 cans of blue paint to 7 cans of red paint

8 cans of blue paint to 12 cans of red paint

40 cups of blue paint to 60 cups of red paint


18 cans of blue paint to 27 cans of red paint

24 cans of red paint to 36 cans of blue paint

1 can of blue paint to  $1\frac{1}{2}$  cans of red paint


5. Maria is collecting donations to raise money for a food pantry. For every \$6 that she collects, her parents will donate \$1. The tape model below represents this situation. The white boxes represent dollars that Maria has collected and the gray box represents money her parents have contributed.

- a. Draw a tape diagram to represent this situation.

- b. Complete the table below to show several possible combinations of money that Maria collects and her parents donate. Illustrate any patterns you see in the table. 

Maria's Collections	Parent's Contribution	Total Donation
6		
	2	
		21
24		
	5	

- c. How much does Maria need to collect if she wants her total donation to be \$35?

6. A market research company is testing out a new cereal. Four out of every five people that try the cereal like it. 

a. Draw a tape diagram to represent this situation.

b. Complete the table below to show this relationship. Illustrate any patterns you see in the table.

Liked	Did Not Like	Tried
4		5
	2	
		25
	7	
40		

7. Lisa goes to the gym 5 out of 7 days each week.
- a. Draw a tape diagram to represent this situation.

b. Complete the following statements:

The ratio of days Lisa went to the gym to days Lisa did not go to the gym is \_\_\_\_\_ to \_\_\_\_\_.

The ratio of days Lisa does not go to the gym to total days is \_\_\_\_\_:\_\_\_\_\_.

c. Determine the number of days Lisa did not go to the gym if she went to the gym 15 times.

d. Determine the number of days Lisa went to the gym in a 28-day period.



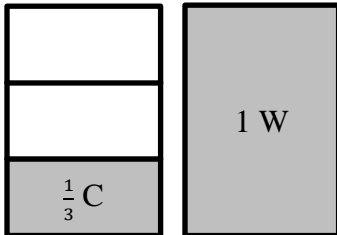
8. In the Lollipop Tree Game at a carnival, a player chooses a lollipop. If the lollipop is colored red on the end of the stick, the player wins the lollipop and an additional prize. If the lollipop is not colored red on the end, the player just gets to keep the lollipop. The ratio of lollipops with red ends to lollipops without red ends is 3:4.
- a. If there is space in the tree for 35 lollipops, how many will have red ends?

9. Camie is making a quilt with patches of red, white, and blue fabric. The ratio of red to white to blue patches in the quilt is 2:1:2.
- a. Write 5 possibilities for the number of red, white, and blue patches that could be on Camie's quilt. Organize your results in the table below.

Red Patches	White Patches	Blue Patches	Total Patches

- b. If Camie used 80 total patches, how many of each color did she use?

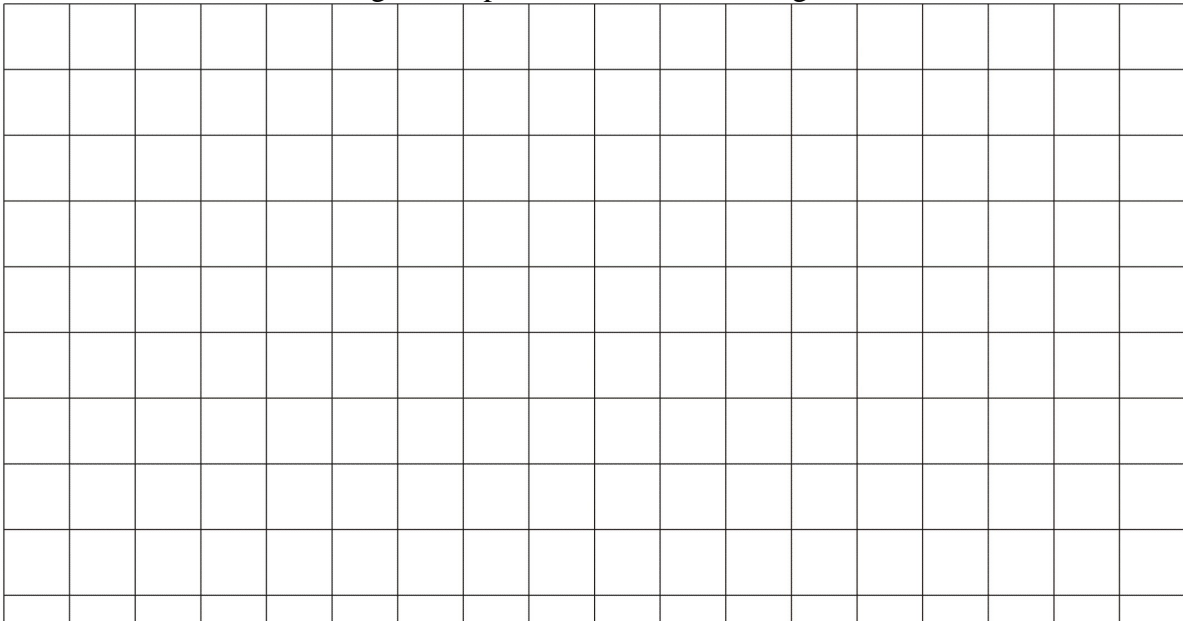
10. To make orange juice, the ratio of concentrate to water is  $\frac{1}{3}$  to 1 as shown in the picture.



- a. How many cups of concentrate would you need for two cups of water?
- b. How many cups of concentrate would you need for three cups of water?
- c. How many cups of concentrate would you need for four cups of water?



11. Blake is making a dog run in the shape of a rectangle. He plans to use 3 units of fencing for the length for each unit of fencing he uses for the width.

a. Draw several possible combinations for Blake’s dog run on the grid below. Note: Each horizontal or vertical segment represents 1 unit of fencing.



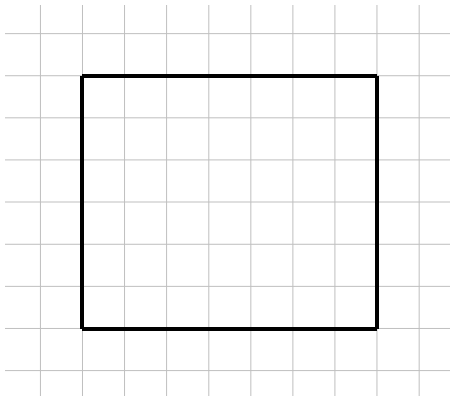
b. Complete the table to show this relationship.

<b>Units of Fencing for Width</b>					
<b>Units of Fencing for the Length</b>					

12. Dominic and Emma are running for class president. For each vote that Dominic receives Emma receives four votes. List five possibilities for the total number of students who voted. Justify your answers. Write a rule that describes all the possible answers to this problem.  

## Spiral Review

1. Ryan is playing a card game with his friends. There are 40 cards in the deck and he deals them all out. If 5 people are playing, how many cards does each person get? Write the math sentence that models this problem.
2. Peter is playing a different card game. In his game, there are 40 cards in the deck and each player needs 5 cards to play. How many people can play the game?
3. Compare problems 1 and 2. What do you notice?
4. What are the common factors of 18 and 24? What is the greatest common factor of 18 and 24?
5. Use the grid below to answer the questions that follow.



- a. Find the area of the rectangle shown. Explain or show the strategy you used.
- b. Ricky found the area by writing and simplifying the expression  $(6 \times 4) + (6 \times 3)$ . Explain and show on the grid the method Ricky used to find the area of the rectangle.

### 1.1c Homework: Equivalent Ratios and Tables

1. The ratio of sugar to flour used in a sugar cookie recipe is 1 cup sugar to 2 cups flour. Determine the amount of each ingredient needed to double, triple, quadruple, and half the recipe.

What if they want to...	Sugar	Flour
Original Recipe	1	2
Double the recipe?		
Triple the recipe?		
Quadruple the recipe?		
Half the recipe?		

2. The model below shows the ratio of chocolate to vanilla ice cream cones sold at the fair.

V	V	V	C	C	C	C	C
---	---	---	---	---	---	---	---

- a. Write three different ratio statements to describe the relationship between vanilla and chocolate ice cream cones sold at the fair. Tell whether your statements are part to part (PP), part to total (PT), or total to part (TP).
- b. Write five equivalent ratios for the number of vanilla ice creams sold to the number of chocolate ice creams sold. Justify your answers.
- c. Write five possible values for the total number of ice cream cones that could have been sold at the fair. Justify your answers.

3. Sydney polled students at her school to see whether or not they watch a certain TV show. The ratio of girls who watch the show to boys who watch the show is 3:1.
- a. Complete the following table to show different combinations of boys, girls, and total students who watch the TV show. Illustrate any patterns you see in the table.

<b>Girls</b>	<b>Boys</b>	<b>Total Students</b>

- b. If 16 total students watch the TV show, how many of them are boys? How many of them are girls? Draw a model to support your conclusion.
- Boys: \_\_\_\_\_ Girls: \_\_\_\_\_
- c. If 15 girls watch the show, how many boys watch the show? Draw a model to support your claim.

4. Alex makes 3 out of every 5 free throws he attempts.
- a. Draw a tape diagram to represent this situation.

- b. Complete the following statements:

The ratio of shots made to shots attempted is \_\_\_\_\_ to \_\_\_\_\_.

The ratio of shots made to shots missed is \_\_\_\_\_ to \_\_\_\_\_.

- c. Use your model to determine several different combinations of makes and attempts. Organize the combinations in the table below. Illustrate any patterns you see in the table.

<b>Makes</b>					
<b>Misses</b>					
<b>Attempts</b>					

- d. Use your model to determine how many free throws Alex attempted if he made 12 shots. How many shots did he miss if he made 12 shots?

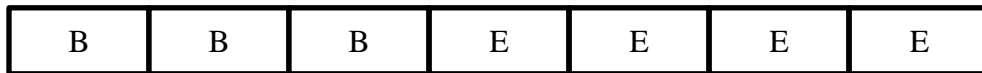
Attempts: \_\_\_\_\_

Misses: \_\_\_\_\_

5. Alli is training for a biathlon, a race where she will run and bike. For every three times that she goes for a run, she bikes once.
- Draw a tape diagram to represent this situation.
  - Complete the table below to show this relationship. Illustrate any patterns you see in the table.

Runs	Bikes	Total Workouts
		4
	2	
	3	
12		
		20
30		

6. Students at a middle school are voting on whether or not their new mascot should be an eagle or a bobcat. The tape diagram shows the ratio of students who voted for the bobcat to students who voted for the eagle.

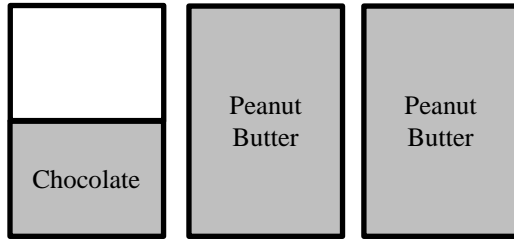


- Complete the table below to show this relationship. Illustrate any patterns you see in the table.

Bobcat	Eagle	Total Votes
		7
	16	
24		
30		
	160	

- If there are 350 students in the school who voted, how many voted for the bobcat? How many voted for the eagle? Justify your answer.

7. The ratio of chocolate to peanut butter used to make peanut butter cups is  $\frac{1}{2}$  to 2 as shown in the picture below.



- a. Determine the number of cups of chocolate and peanut butter Reese should use if he wants to...

Double the recipe:                      Cups of Chocolate: \_\_\_\_\_      Cups of Peanut Butter: \_\_\_\_\_

Triple the recipe:                      Cups of Chocolate: \_\_\_\_\_      Cups of Peanut Butter: \_\_\_\_\_

Quadruple the recipe:                      Cups of Chocolate: \_\_\_\_\_      Cups of Peanut Butter: \_\_\_\_\_

8. Determine whether each pair of ratios are equivalent ratios. Circle Yes or No. Justify your answers for b, c, and d, in the space below.

a. 2 to 3 and 4 to 6                      Yes or No



b. 4:5 and 8:9                              Yes or No

c.  $\frac{1}{2}$  and  $\frac{5}{10}$                               Yes or No

d. 2:5 and 8:20                              Yes or No

e.  $\frac{2}{5}$  and  $\frac{4}{7}$                               Yes or No

### 1.1d Class Activity: More Equivalent Ratios

**Activity 1:** Chandler's class is at the zoo for a field trip. There are 24 students on the trip and 8 adult chaperones. The students and adults will break into smaller groups to walk around the zoo. Chandler's teacher wants the ratio of adults to students to be the same in each group. What are some possibilities for the number of adults and students in each group? What is the simplified ratio of adults to students?  





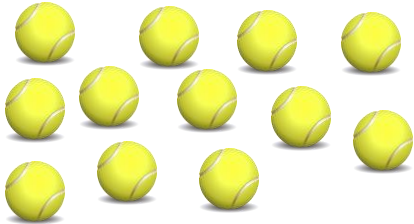
- a. Nine additional students from Chandler's class arrive at the zoo late. How many more adults need to be added to the group to keep the ratio of adults to students the same? Justify your answer.
- b. Zoe's class is also going to the zoo. There are 30 students in Zoe's class. How many adults need to come to the zoo to have the same ratio of adults to students as there are for Chandler's class? Justify your answer.
- c. Noah's class is also at the zoo with the same ratio of adults to students as Chandler and Zoe's classes. There are 48 total people in Noah's group. How many of them are adults and how many are students? Justify your answer.

**Activity 2:** A company that mass produces rice crispy treats uses 60 cups of marshmallows and 80 cups of crispy rice in their recipe. Jesse wants to follow the recipe to make rice crispy treats for her family but she wants to make a much smaller batch. How many cups of marshmallows and how many cups of crispy rice should Jesse use?

1. Danita drew the following picture on her paper.



- a. What is the simplified ratio of squares to circles in Danita's picture?
2. Brendan is a tennis coach. He is gathering supplies for an upcoming lesson. The picture below shows the ratio of tennis racquets to tennis balls he needs for the lesson.



- a. What is the simplified ratio of tennis balls to tennis racquets?
- b. If there are 6 tennis balls, how many racquets will Brendan need to keep the same ratio?
- c. If there are 20 tennis racquets, how many tennis balls will Brendan need to keep the same ratio?
3. Sierra is making a big batch of fizzy fruit punch for a school carnival. She mixes 12 cans of Sprite with 18 cans of fruit punch.
- a. Find three ways to make a smaller batch of this fizzy fruit punch.
- b. If Sierra adds 8 more cans of Sprite, how many more cans of fruit punch should she add?

4. At a car wash, cars either come in for an exterior only wash or an exterior plus interior wash. On a particular day, Mandy observes that 45 cars come in for an exterior only wash and 18 cars come in for an exterior plus interior wash. The manager of the car wash tells her that this represents the ratio of exterior only washes to exterior plus interior washes.

- a. Complete the table below to show this relationship. Explain or show how you completed the table.

<b>Exterior Only</b>	<b>Exterior plus Interior</b>
	2
10	
15	
	8
45	18
90	
100	

5. Tinkerbelle is gathering data on the number of girls and the number of boys that go on a particular ride at Disneyland. One morning, she observes that 300 girls go on the ride and 500 boys go on the ride. This represents the ratio of girls to boys that go on the ride.

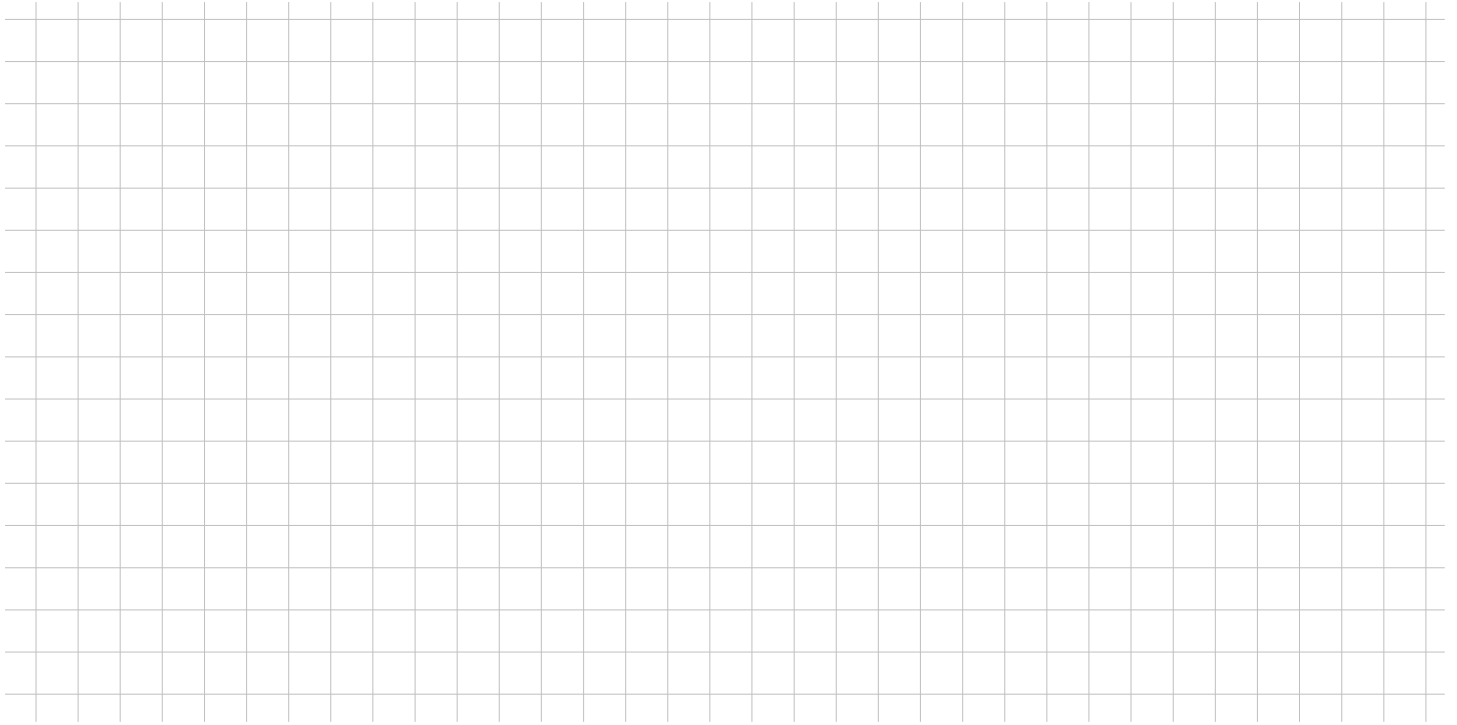
- a. Complete the table below to show this relationship. Explain or show how you completed the table.

<b>Girls</b>	<b>Boys</b>	<b>Total People</b>
		8
6		
	20	
30		
300	500	800
	800	
		1,600

6. Tina is polling children ages 8 – 12 to determine whether they would rather go to Disneyland or Lego Land. Tina begins counting the votes and counts 60 votes for Disneyland and 12 votes for Lego Land. This represents the ratio of votes for Disneyland to votes for Lego Land.
- In the next batch, Tina counts 40 votes for Disneyland. How many votes for Lego Land would you expect to be in that batch? Justify your answer.
  - If Tina counts 48 total ballots, how many votes will be for Disneyland and how many for Lego Land? Justify your answer.
7. The ratio of the amount of money Jason saves to the amount of money he earns is always the same. When he makes \$48 he saves \$12. He spends the rest.
- If Jason saves \$6, how much did he make? Justify your answer.
  - If Jason makes \$20, how much will he save? Justify your answer.
  - If Jason spent \$12, how much did he make? Justify your answer.

## Spiral Review

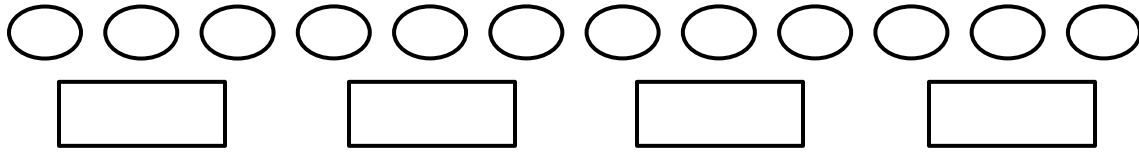
1. On the grid below, draw as many rectangles as you can that have an area of 30. Write the dimensions (length and width) of the rectangles.



2. Jessica is making S'mores. For each S'more she needs  $\frac{1}{3}$  of a chocolate bar. If Jessica has 5 chocolate bars, how many S'mores can she make? Draw a picture to represent this situation and then write a math sentence to model the problem and solution.
3. Devon is taking 20 scouts on a camping trip. He has figured out that he needs 5 bars of chocolate for each scout to have one S'more.
  - a. How many S'mores does one bar of chocolate make?
  - b. How much of a chocolate bar does it take to make one S'more?
4. Amul has 4 pieces of licorice that he needs to divide evenly between 6 people. How much licorice does each person get? Draw a picture to represent this situation and then write the math sentence that goes with this problem.

## 1.1d Homework: More Equivalent Ratios

1. The picture shows the ratio of eggs to butter used to make a sauce.



- a. Write at least three equivalent ratios that describe the ratio of eggs to butter used in this recipe based on the picture.
- b. If Emeril is using 6 sticks of butter, how many eggs should he use? Justify your answer with words or by drawing a picture or model.
- c. Paula has one egg. How much butter should she use for one egg? Justify your answer with words or by drawing a picture or model.
- d. Bobby has two eggs. How much butter should he use for two eggs? Justify your answer with words or by drawing a picture or model.
2. Jayden's soccer team wins 24 of the 30 games they play in a season.
- a. Find two equivalent ratios that are smaller than the one given in the problem. Explain how you found your smaller equivalent ratios.
- b. If Jayden's team won 16 games over a period of time, how many games do you expect they played? Justify your answer.
3. Sixth graders at a middle school can either choose art or music for their elective. Mrs. Benson, the counselor at the school, looks up 64 students and notes that 24 are enrolled in art and 40 are enrolled in music. This represents the ratio of the number of students in art to the number of students in music.
- a. In a group of 32 students, how many would you expect to be registered for art and how many for music? Justify your answer.
- b. What is the ratio of students enrolled in art to students enrolled in music? Find two equivalent ratios that are simpler than the one given in the problem.
- c. If 15 students in a group are enrolled in art, how many would be enrolled in music?
- d. Write two part to total ratios about this relationship.



4. In a certain city, it rains 20 out of the 30 days in April.
  - a. How many days would you expect it to rain in this city over a 15-day period in April?
  
  - b. How many days would you expect it to rain in this city over a 6-day period in April?
  
  - c. What is the simplified ratio of days it rains to days it does not rain in this city in April?
  
5. Juan and his older brother like to do push-ups together. The ratio of push-ups completed by Juan to push-ups completed by his older brother is always the same. One day, Juan does 18 push-ups and his older brother does 27 push-ups.
  - a. Complete the table to show this relationship. Explain or show how you completed the table.

<b>Juan</b>	<b>Juan's Older Brother</b>
	3
4	
6	
18	27
	54
60	

6. On her iPod, Emily has 50 pop songs she listens to when she works out and 25 classical songs she listens to when she studies.
  - a. The ratio of pop songs to classical songs on Megan's iPad is the same as Emily's. If Megan has 20 pop songs on her iPod, how many classical songs does she have? Justify your answer.
  
  - b. Theo also has the same ratio of pop songs to classical songs on his iPod. If Theo has 60 total songs on his iPod, how many are pop songs and how many are classical songs? Explain or show how you found your answer.

## 1.1e Class Activity: Solving Real World Ratio Problems



**Activity 1:** Pam and Corinne are running for class president. The ratio of students who voted for Pam to students who voted for Corinne is 4:3.

a. If 60 students voted for Corinne, how many students voted for Pam? Solve using at least two strategies.

b. How many total students voted? Solve using at least two strategies.



**Directions:** Solve each problem using at least two strategies. Make connections between your strategies.

1. The ratio of adults to children at a movie is 1:3.
  - a. If there are 100 total people at the movie, how many are children and how many are adults?
  
  
  
  
  
  
  
  
  
  
  - b. If 12 more people enter the theater, how many of them need to be adults and how many need to be children to keep the same ratio?
  
  
  
  
  
  
  
  
  
  
2. The ratio of Lance's allowance to his younger brother's allowance is 3 to 2. Over a four-week period Lance gets paid \$24. How much does his younger brother get paid in the four-week period?
  
  
  
  
  
  
  
  
  
  
3. It rains five out of seven days in a certain part of Kauai. How many days you do expect it to rain in a 42-day period?
  
  
  
  
  
  
  
  
  
  
4. In a group of 80 people, 8 people are left-handed.
  - a. In a classroom of 30 students, how many would you expect to be left-handed?
  
  
  
  
  
  
  
  
  
  
  - b. In a school of 300 students, how many would you expect to be left-handed?
  
  
  
  
  
  
  
  
  
  
  - c. In a group of people, there are 5 left-handed people. How many right-handed people would you expect to be in that group?

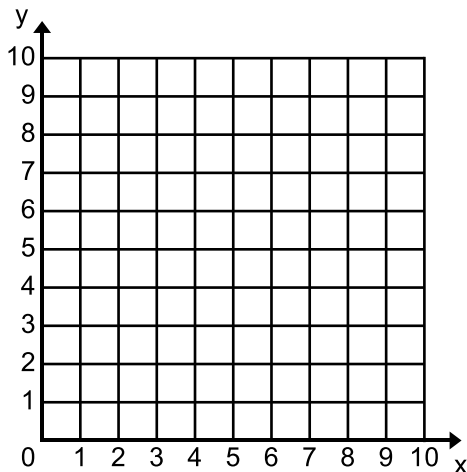
5. At a certain middle school, four out of every five students prefer hip hop music to country music.
  - a. If 30 students prefer country music, how many students prefer hip hop music?
  - b. If 30 students prefer country music, how many students are there total at the school?
6. Chloe surveyed adults to determine whether or not they prefer to watch football or basketball. Five out of every eight adults prefer to watch football. If 33 people in Chloe's survey prefer to watch basketball, how many adults took the survey?
7. At an amusement park, Mike polled people coming off of a ride and asked whether they liked the ride or not. The ratio of people who liked the ride to those who did not like the ride is 5 to 2. In a group of 70 people who went on the ride, how many would you expect to dislike the ride?
8. In Talen's class there are 24 students. Sixteen of the students go to daycare after school. In Sophia's class, the ratio of students who got to daycare after school is the same as in Talen's class. If there are 30 students in Sophia's class, how many go to daycare after school?
9. Two out of twenty-five students have food allergies. In a school of 150 students, how many would you expect to have food allergies?

10. A pizza store sells cheese and pepperoni pizzas for \$5. The ratio of cheese pizza sold to pepperoni pizza sold is 2 to 1. If the store sells 90 pizzas, how many of them are cheese and how many of them are pepperoni?
11. Bianca is making a game for her friends to play. She is putting white and yellow pieces of paper into a bag. If her friends pick out a yellow piece of paper, they win. One out of every four pieces of paper are yellow.
- If there are 15 pieces of white paper in Bianca's bag, how many pieces of yellow paper are there in the bag?
  - Owen made the same game with the same chances of winning. Owen's bag has a total of 60 pieces of paper. How many pieces of paper are white and how many are yellow?
12. For every \$3 Tiffany donates to charity her parents donate \$1. If Tiffany donates \$27, how much do they donate all together?
13. The ratio of cement to sand used to make concrete is 5 to 3. If Tim uses 25 pounds of cement, how much sand should he use?
14. One out of every four students at Miley's school takes the bus home. If there are 200 students at Miley's school, how many take the bus home?

15. The ratio of girls to boys in Mrs. Simpson's class is 4 to 3.
- If there are 16 girls, how many boys are there?
  
  
  
  
  
  
  
  
  
  
  - If 8 more girls join the class, how many boys need to join to keep the same ratio?
16. At Toby's school, students wear a uniform. Students can choose from a red shirt or a white shirt. For every white shirt that the school sells, they sell four red shirts. If the store sells 55 shirts one day, how many red shirts did they sell?
17. The ratio of Greek yogurt to flour used to make pizza dough is 1 to 2. If Luigi uses 5 cups of flour, how many cups of Greek yogurt should he use?
18. A pancake recipe calls for 3 cups of pancake mix for every 2 cups of milk.
- If Rhonda uses 5 cups of pancake mix, how much milk should she use?
  
  
  
  
  
  
  
  
  
  
  - If Rhonda uses 1 cup of milk, how much pancake mix should she use?

## Spiral Review

1. Zoe has five cookies she has to share evenly with her brother. How many cookies will each child get? Draw a picture to represent this situation and write a math sentence to model this problem.
2. Mary is making pillows. Each pillow needs  $\frac{1}{2}$  yard of fabric. How many pillows can Mary make with 3 yards of fabric? Draw a picture to represent this situation and write a math sentence to model this problem.
3. How many minutes are there in...
  - a. 1 hour
  - b. 2 hours
  - c. 3 hours
  - d.  $4\frac{1}{2}$  hour
  - e.  $\frac{1}{3}$  hour
  - f.  $\frac{1}{4}$  hour
4. Plot the following ordered pairs on the coordinate plane:  $(0, 0)$   $(1, 2)$   $(2, 4)$   $(3, 6)$   $(4, 8)$





### 1.1e Homework: Solving Real World Ratio Problems

1. Students in Mrs. Benson's gym class are voting on whether the next sport they learn how to play should be basketball or soccer. The tape model shows the results of the survey.

B	B	B	S	S	S	S
---	---	---	---	---	---	---

- a. If there are 35 students in Mrs. Benson's gym class, how many voted for soccer? Solve this problem using at least two different methods. Explain the methods you used and how they are related.
2. An illustrator and writer are submitting a children's book in a competition. They have agreed to split the cash prize in the following way: For every \$3 the writer gets, the illustrator gets \$2 as shown in the tape model below.

W	W	W	I	I
---	---	---	---	---

- a. If the winning prize in the competition is \$500, how much will the writer and illustrator each get?
- Writer: \_\_\_\_\_                      Illustrator: \_\_\_\_\_
- b. If the winning prize is \$1,000, how much will the writer and illustrator each get?
- Writer: \_\_\_\_\_                      Illustrator: \_\_\_\_\_
3. The ratio of students in band who play a wind instrument (like a flute) to students who play a percussion instrument (like a drum) is 5 to 1. If 30 people play a wind instrument, how many play a percussion instrument? Solve this problem using at least two different methods. Explain the methods you used and how they are related.

4. In a pet store, there are 40 birds and 10 cats. If the store gets 12 new birds, how many new cats does the store need to get to keep the same ratio of birds to cats?
5. In an online game, Mario destroys blocks. Some of the blocks have power-ups in them and some do not. The ratio of blocks with power-ups to blocks without power-ups is the same in every level. On Level 1, there are 36 blocks and 9 of them have power-ups in them.
- On Level 2, there are 20 blocks. How many of them will have power-ups in? Justify your answer.
  - On Level 3, there are 7 blocks that have power-ups. How many total blocks are on this level? Justify your answer.
6. The ratio of children to adults on a field trip is 5 to 1. If there are 60 children on the field trip, how many people total are there on the field trip?
7. To make ice cream sandwiches, Ina uses 2 cookies for each scoop of ice cream. If Ina uses 60 cookies, how many scoops of ice cream does she need?

8. An ice cream shop sells 3 ice creams in a cone for each ice cream they sell in a cup. If they sell 200 ice creams in a day, how many did they sell in a cone?
9. In a certain neighborhood there are 25 dogs and 10 cats.
- In a neighborhood across the way, the ratio of cats to dogs is the same. If there are 8 cats in the neighborhood, how many dogs are there?
10. A popular cereal brand is giving away baseball cards in some of its cereal boxes. Two out of every seven boxes of cereal contain a pack of baseball cards. On a shelf with 49 boxes of this cereal, how many would you expect to have baseball cards in them?
11. A market research company is testing out a new cereal. Four out of every five people that try the cereal like it. If 80 people like the cereal, how many people tried the cereal?

12. Camie is making a quilt using patches of red, white, and blue fabric. The ratio of red to white to blue patches in the quilt is 2:1:2. If she used 80 total patches to make the quilt, how many of each color patch does she have in her quilt?

Red: \_\_\_\_\_

White: \_\_\_\_\_

Blue: \_\_\_\_\_

13. The ratio of sugar to flour used in a sugar cookie recipe is 1 cup sugar to 2 cups flour. If Mrs. Smith uses 3 cups of flour, how many cups of sugar should she use to follow this recipe?

14. The ratio of blue paint to red paint used to make a certain shade of purple paint is 2:3. If John uses 1 gallon of red paint, how much blue paint should he use to make this shade of purple?

## 1.1f Self-Assessment: Section 1.1

Consider the following skills/concepts. Rate your comfort level with each skill/concept by checking the box that best describes your progress in mastering each skill/concept. Corresponding sample problems, referenced in brackets, can be found on the following page.

Skill/Concept	Minimal Understanding 1	Partial Understanding 2	Sufficient Mastery 3	Substantial Mastery 4
1. Understand what a ratio is.	I understand that a ratio involves two or more quantities.	I understand that a ratio expresses a relationship between two or more quantities. I recognize key ratio language.	I understand that a ratio expresses a relationship between two or more quantities. I recognize key ratio language. I can analyze ratios to identify the quantities involved and their relationship to each other and draw pictures to represent the relationship.	I understand that a ratio expresses a relationship between two or more quantities. I recognize key ratio language. I can analyze ratios to identify the quantities involved and their relationship to each other. I can move fluently between ratio statements and pictures/models of ratios.
2. Given a pictorial representation or model, use ratio language and notation to describe the relationship between two or more quantities.	I can write a ratio statement to show the relationship between two quantities given a picture or model using words but I sometimes mix up the order of the quantities and I am not sure about the different notations used in ratio statements.	I can write a ratio statement to show the relationship between two quantities given a picture or model using words but I often forget the different notations used when writing ratio statements.	I can accurately write a ratio statement to show the relationship between two quantities given a picture or model. I understand ratio notation and use it correctly.	I can accurately write several ratio statements (part to part and part to total) to show the relationship between two quantities given a picture or model. I understand ratio notation and use it correctly.
3. Given a ratio statement, identify the important quantities and interpret the language and notation in order to create a pictorial representation or model of the relationship between the quantities.	When given a ratio statement, I can identify the quantities involved but I don't always understand the notation being used so I have a difficult time drawing the pictures.	When given a ratio statement, I can identify the quantities involved and interpret ratio language and notation in order to draw a picture of the relationship. When drawing a picture, I sometimes mix up the quantities. I struggle to draw a tape diagram.	When given a ratio statement, I can identify the quantities involved and interpret ratio language and notation in order to accurately draw a picture of the relationship. I can also draw a tape diagram to represent the relationship between the quantities.	When given a ratio statement, I can identify the quantities involved and accurately draw a picture and tape diagram to represent the relationship between the quantities. I clearly label my pictures and diagrams so that the relationship is clear to others and shows the parts and total.

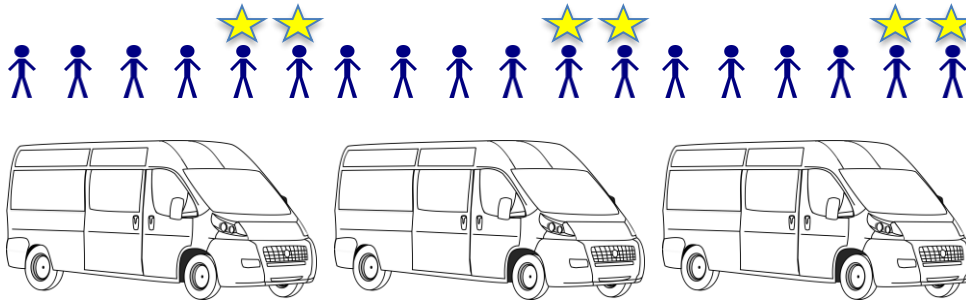
<p>4. Distinguish when a ratio is describing a part to part, part to total, or total to part relationship between quantities.</p>	<p>I understand that there are different types of ratios (part to part and part to total) but I have a difficult time determining whether the quantities given are parts or totals.</p>	<p>I can identify the different quantities in a given ratio statement and tell whether the quantity represents a part or a total but I have difficulty describing the quantity not given (i.e. If I am given the ratio statement, “There are 3 ducks for every 2 geese”, I know one part is ducks and one part is geese but I have a difficult time determining that the total is birds).</p>	<p>I can identify the different quantities in a given ratio and determine whether the quantity represents a part or a total. I can name the hidden quantity (part or total) and use this information to draw models representing the ratios.</p>	<p>I can identify the different quantities in a given ratio and determine whether the quantity represents a part or a total. I can name the hidden quantity (part or total) and use this information to draw models representing the ratios. I can write additional ratio statements, moving fluently between using parts and totals in my statements.</p>
<p>5. Determine equivalent ratios to describe a relationship between two quantities. Make and complete tables of equivalent ratios.</p>	<p>I know that an equivalent ratio shows the same relationship between two quantities but I am not sure how to find one.</p>	<p>I can find equivalent ratios using concrete tools (tiles or chips) but have a hard time finding equivalent ratios without concrete tools. I can complete partially filled in tables that are in order but have a difficult time with tables that skip around.</p>	<p>I can find equivalent ratios using concrete tools, models such as tape diagrams, and numeric methods. I can complete partially filled in tables.</p>	<p>I can find equivalent ratios using concrete tools, models such as tape diagrams, and numeric methods. I can complete partially filled in tables and make tables of equivalent ratios from scratch. I understand the connection between equivalent ratios and multiplication and division.</p>
<p>6. Use ratio reasoning and models (tape diagrams) to solve real world ratio problems.</p>	<p>When given a problem that involves ratios, I can identify the quantities involved and key ratio language but I am not always sure on how to get started solving the problem.</p>	<p>When given a problem that involves ratios, I can identify the quantities involved and key ratio language. I can draw pictures or use concrete tools (tiles or chips) to solve the problem.</p>	<p>When given a problem that involves ratios, I can identify the quantities involved and key ratio language. I can use more than one strategy (picture, tape diagram, numeric, etc.) to solve the problem.</p>	<p>When given a problem that involves ratios, I can identify the quantities and key ratio language. I can use multiple strategies (picture, tape diagram, numeric, etc.) to solve the problem and make connections between the strategies.</p>

### Sample Problems for Section 1.1

Square brackets indicate which skill/concept the problem (or parts of the problem) align to.

1. Explain ratio in your own words. Give several examples of ratios. [1]

2. In a running race, teams of runners compete in a 2-day running race that covers 120 miles. One team member runs at a time and the other teammates follow the runner in a van. They meet up at different points and runners swap out. The team runs the same number of miles each day and each runner runs the same distance each day. The picture below shows several teams lined up at the start of the race next to their vans. The people with the stars above their heads are the team captains. [2]



Write several ratio statements about the race.

3. Children in a summer camp are voting on whether or not they want their first activity every day to be swimming or tennis. The picture below shows the votes. S stands for swimming and T stands for tennis. [2] [4]

T T T T S S S T T T T S S S T T T T S S S T T T T S S S

Select all ratios that correctly describe the relationship between votes for tennis and votes for swimming.

- The ratio of votes for tennis to votes for swimming is 3 to 4.
- The ratio of votes for swimming to total votes is 3:7.
- The ratio of votes for swimming to votes for tennis is  $\frac{3}{4}$ .
- The ratio of votes for tennis to total votes is 4:28.
- The ratio of votes for swimming to votes for tennis is 9:12.

4. Talen's dad is pitching the baseball to him. The picture below shows the ratio of hits to misses for Talen. The smiley faces represent hits and the frown faces represent misses. [2] [4]



Write several ratios to describe this situation. Tell whether your statements are part to part (PP), part to total (PT), or total to part (TP).

5. Using circles and squares, create pictures that represent the ratio given. [3] [4]

The ratio of circles to squares is 3:5.

The ratio of squares to circles is 3:5.

The ratio of squares to total shapes is 3:5.

6. For a science experiment, a salt water solution requires 1 cup of salt for every 2 cups of water. Select all ratios that are equivalent. [5]

- 2 cups of salt mixed with 3 cups of water
- 3 cups of salt mixed with 6 cups of water
- 10 cups of salt mixed with 20 cups of water
- $\frac{1}{2}$  cup of salt mixed with 1 cup of water
- 10 cups of salt with 5 cups of water



7. A recipe for trail mix calls for 1 cup of chocolate chips for every 3 cups of nuts. Determine the number of cups of chocolate chips and nuts someone would use if they want to...[5]

Double the recipe: Chocolate Chips: \_\_\_\_\_ Nuts: \_\_\_\_\_

Triple the recipe: Chocolate Chips: \_\_\_\_\_ Nuts: \_\_\_\_\_

Quadruple the recipe: Chocolate Chips: \_\_\_\_\_ Nuts: \_\_\_\_\_

Half the recipe: Chocolate Chips: \_\_\_\_\_ Nuts: \_\_\_\_\_

Quarter the recipe: Chocolate Chips: \_\_\_\_\_ Nuts: \_\_\_\_\_

8. A deck of cards has 8 wild cards and 40 numbered cards. Complete the following ratios to describe the relationship between wild cards and numbered cards in the deck. [5] [2] [4]

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 1 to 5.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 1 to 6.

The ratio of \_\_\_\_\_ to \_\_\_\_\_ is 5 to 6.

9. The table below shows the ratio of time Johnny spends playing outside to time spent watching TV each day. Complete the table to show this relationship. [5]

Time Spent Playing Outside (minutes)	Time Spent Watching TV (minutes)
15	
20	
40	24
	48
100	

10. The tape diagram shows the ratio of life guards to swimmers at the pool. S represents swimmer and L represents life guard. [6]

S	S	S	S	S	S	S	S	L
---	---	---	---	---	---	---	---	---

- What is the ratio of swimmers to life guards at the pool?
- If there are 56 swimmers at the pool, how many life guards are there?

11. The ratio of lemonade to Sprite in a punch recipe is 3:1. [6]
- Draw a tape diagram to represent the relationship between lemonade and Sprite in this recipe.
  - Olivia needs 20 total cups of punch, how many cups of lemonade and Sprite should Olivia use?

Cups of Lemonade: \_\_\_\_\_      Cups of Sprite: \_\_\_\_\_

12. A cafeteria sells cartons of regular milk and chocolate milk. Three out of every five cartons of milk sold are regular milk. If the cafeteria sells 30 cartons of chocolate milk, how many total cartons of milk does the cafeteria sell? [6]
13. The owners of a camp are required by law to have a certain ratio of camp counselors to children. There are 8 counselors at the camp for 48 children at the camp. [6]
- If 12 more children sign up for the camp, how many more counselors does the camp need to hire?
14. Iya is making a blanket with yellow and blue patches of fabric. The patches of fabric are all the same size. She uses 48 patches of blue fabric and 32 patches of yellow fabric. [6]
- Hendrix is also making a quilt. He has 24 patches of blue fabric. How many patches of yellow fabric does he need to make a quilt that has the same ratio of blue to yellow fabric as Iya's quilt?
  - Kai is also making a quilt. Kai has 40 patches of yellow fabric. How many patches of blue fabric does Kai need to make a quilt that has the same ratio of blue to yellow fabric as the other quilts?

15. Doug is mixing red and blue paint to make a certain shade of purple paint. He mixes 6 cups of red paint with 4 cups of blue paint. He realizes he needs more purple paint so he adds 2 more cups of blue paint. How much more red paint should he add to keep the same shade of purple paint? [6]

## Section 1.2: Rates, Graphs, and Equations

### Section Overview:

In this section, students explore ratios that have different units of measure. They discover that a double number line is a valuable tool that can be used to represent ratios and solve real-world problems. They expand on their work with the coordinate plane, representing a collection of equivalent ratios on the coordinate plane. They examine features of the graph and use the graph to solve real world problems. Next, students learn what a unit rate is and use a variety of models to find the unit rates associated with a given ratio. They soon realize that the unit rate can be a valuable tool for solving real world problems. As the section progresses, students rely on many of the skills, concepts, and tools they have learned in this chapter in order to compare ratios. Lastly, students learn how to write equations to represent the relationship between two quantities.

### Concepts and Skills to Master:

*By the end of this section, students should be able to:*

1. Read double number lines, create them to show relationships between two quantities, and use them to solve real world problems.
2. Plot pairs of equivalent ratios on a coordinate plane.
3. Read and interpret graphs to solve real world problems involving ratios.
4. Understand what a unit rate is. Find the unit rates associated with a given ratio and use them to solve real world problems.
5. Use tables to compare ratios.
6. Write an equation to show a relationship between two quantities and use equations to solve real world problems.

## 1.2a Class Activity: Ratios with Different Units

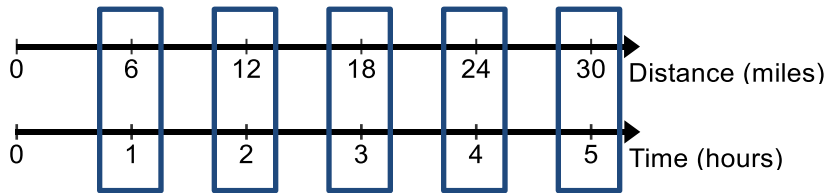
**Activity 1:** Harmony runs 6 miles per hour. How far can Harmony run in 1 hour? 2 hours? 3 hours? 4 hours? Organize your results in the table below.

Time (hours)	0	1	2	3	4	5
Distance (miles)						

- a. Write three equivalent ratios to show the relationship between time and distance.



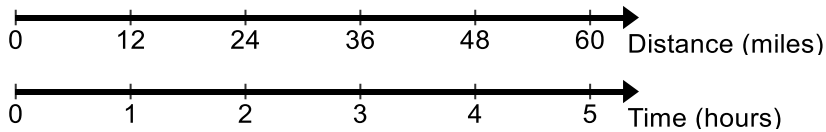
A model that is commonly used to represent ratios where the units of measure are different is a **double number line diagram**. We can use the model below to represent the problem about Harmony.




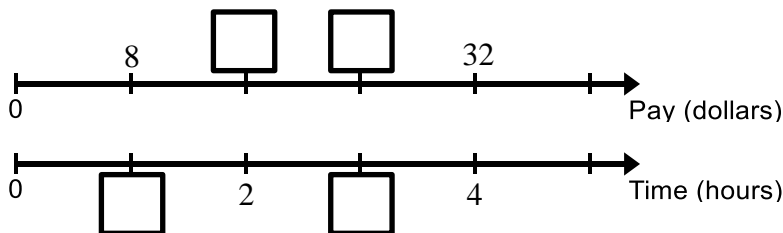
In a double number line, just as in a table, you can see that pairs of values are connected. The values on top are connected to the values directly below them.

- b. How far does Harmony run in 2 hours?
- c. How long does it take Harmony to run 30 miles?
- d. How far can Harmony run in 30 minutes? Justify your answer.
- e. How far can Harmony run in  $4\frac{1}{2}$  hours? Justify your answer.

1. Julia is riding her bike. The double number line shows Julia's distance over time.

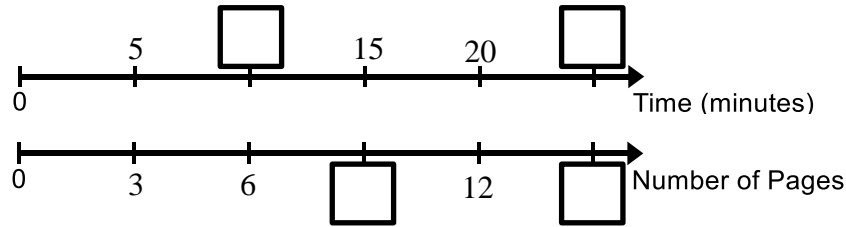


- Write three different ratios to describe this situation.
  - How far does Julia ride in 1 hour?
  - How far does Julia ride in 2 hours?
  - How far does Julia ride in 4 hours?
  - How long does it take Julia to ride 60 miles?
  - How long does it take Julia to ride 4 miles? Justify your answer.
  - How far can Julia ride in  $3\frac{1}{2}$  hours? Justify your answer.
2. The double number line below shows the amount Sean gets paid based on the number of hours he works. Complete the double number line by filling in the empty boxes. Then, answer the questions that follow. 



- How much does Sean get paid for 4 hours of work?
- How many hours would Sean have to work to make \$40? Justify your answer.
- How much will Sean make if he works for 30 minutes? Justify your answer.
- How much would Sean get paid for 8 hours of work? Justify your answer.

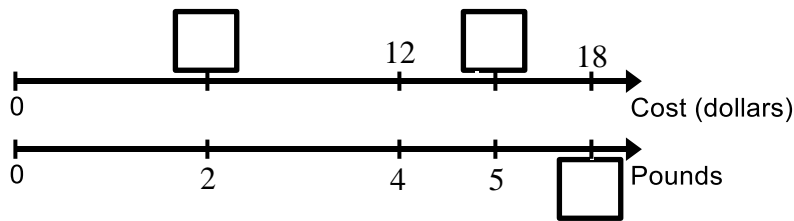
3. It takes Linda 5 minutes to read 3 pages in her book. Complete the double number line below by filling in the empty boxes to show the relationship between time and the number of pages Linda reads.



- a. How many pages can Linda read in 40 minutes? Justify your answer.


- b. How long will it take Linda to read 120 pages? Justify your answer.

4. The number line below shows the cost per pound of jelly beans. Complete the double number line to show this relationship.



- a. Ella purchased 3 pounds of jelly beans. How much did she pay? Justify your answer.

- b. What is the cost of jellybeans per pound? Explain or show where you see this on the double number line.

5. Dave paid \$40 for 8 pounds of hamburger meat for a company picnic.
- Create a double number line to represent the relationship between cost, in dollars, and pounds of meat for 0 to 10 pounds of meat.
  - Dave realizes that he needs more meat so he goes back to the store and buys 2 more pounds of meat. How much more will he spend on meat?
  - How much did Dave spend total on meat for the company picnic?
  - If Dave uses  $\frac{1}{4}$  pound of meat for each hamburger, how much does the meat used for each hamburger cost? Justify your answer.
6. A broken faucet is leaking 2 ounces of water every 5 minutes.
- Create a double number line to represent the relationship between amount of water leaking out, in ounces, and time, in minutes, for 0 to 60 minutes.
  - How much water will leak out of the faucet in  $\frac{1}{2}$  an hour?
  - How much water will leak out of the faucet in 2 hours? 
  - If there are 8 ounces in a cup of water, how many cups of water will leak out of the faucet in 2 hours?



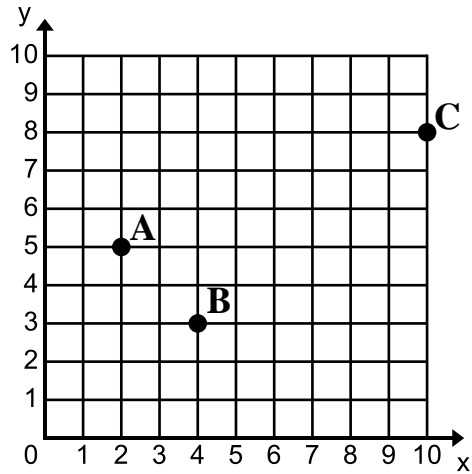
## Spiral Review

1. Write the ordered pair that corresponds to the points on the graph below.

Point A:

Point B:

Point C:



2. What is  $108 \div 8$ ?

3. What is  $2.75 \times 4$ ? Solve without a calculator (mentally) and show steps/thinking.

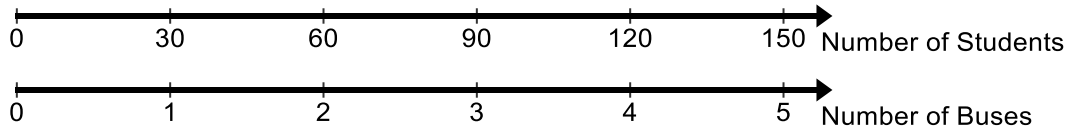
4. Find the least common multiple of the numbers given.

a. 2, 4, and 6

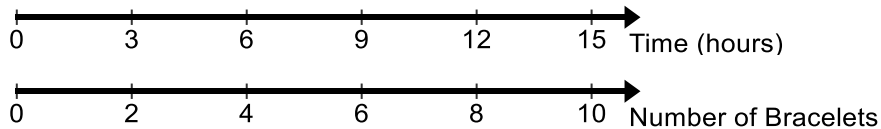
b. 5, 8, 10

## 1.2a Homework: Ratios with Different Units

1. Alexis' class is taking a field trip. The double number line shows the relationship between the number of students going on the field trip and the number of buses needed.

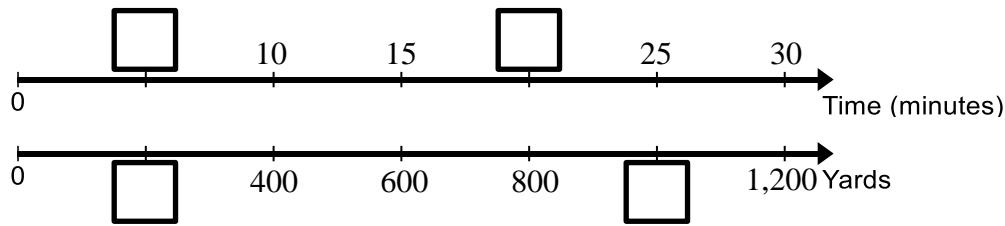


- How many students can ride on each bus?
  - How many students can ride on 3 buses?
  - How many buses will Alexis' class need if there are 120 students going on the field trip?
2. Gabby is making friendship bracelets to sell at the state fair. The double number line shows the amount of time it takes her to make bracelets.



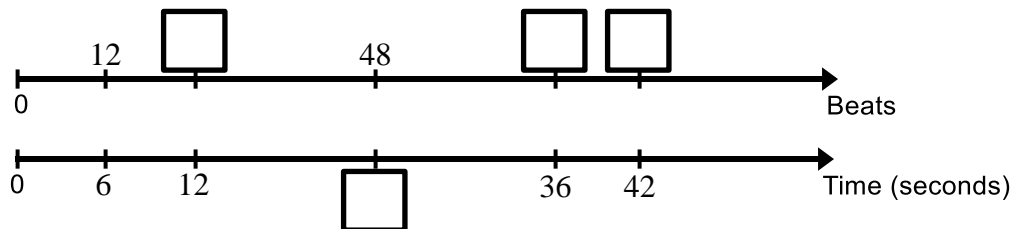
- How long does it take Gabby to make 8 friendship bracelets?
- How many bracelets can Gabby make in 6 hours?
- How long does it take Gabby to make each bracelet? Justify your answer.
- Gabby plans to make 30 bracelets to sell at the state fair. How long will it take her? Justify your answer.

3. The double number line below shows the amount of time it takes Jonas to swim based on the number of yards he swims. Complete the double number line to show this relationship. Then, answer the questions that follow.




- How far can Jonas swim in one hour? Justify your answer.
- How far can Jonas swim in 1 minute? Justify your answer.
- How long would it take Jonas to swim 3,000 yards? Justify your answer.

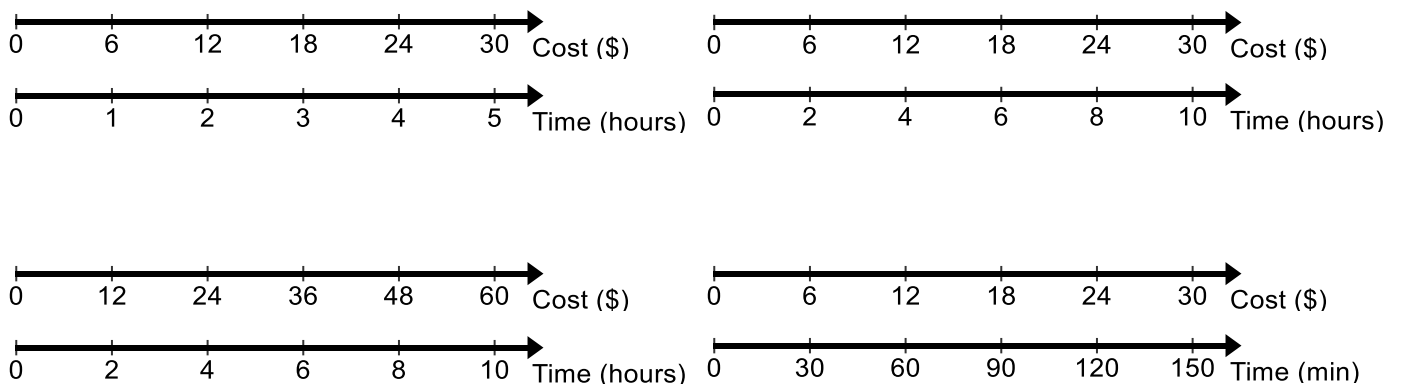
4. Stella is walking on the treadmill. The double number line shows the number of times Stella's heart beats over time. Complete the double number line to show this relationship. Then, answer the questions that follow.



- How many times does Stella's heart beat in 30 seconds? Justify your answer.
- How many times does Stella's heart beat in 1 second? Justify your answer.
- How many times does Stella's heart beat in 1 minute? Justify your answer. Remember that there are 60 seconds in 1 minute.

5. Holly is buying apples for an apple bobbing contest. Each bag of apples contains 8 apples.
- Create a double number line to represent the relationship between the number of bags of apples Holly purchases and the total number of apples she will have for 0 to 10 bags of apples. Hint: One of your number lines will show **Total Apples** and the other will show **Bags of Apples**.
  - If Holly needs 72 apples for the apple bobbing contest, how many bags of apples does she need to buy? Write your answer and circle the pair of values on your double number line that represents this answer.
6. Rosa owns a cupcake shop. She uses 8 ounces of frosting for every 12 cupcakes.
- Create a double number line that shows the relationship between the number of cupcakes Rosa makes and the amount of frosting she will need.
  - If Rosa is planning to make 60 cupcakes one day, how many ounces of frosting will she need to make? Justify your answer.

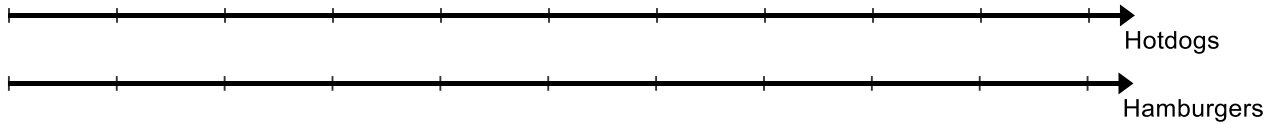
7. The double number lines below show the prices at four different trampoline parks depending on how long you jump for. Circle the number lines that show the trampoline parks with the **same** hourly rate (cost per hour). Put a star by the number line with the highest hourly rate. Justify your answers. 



## 1.2b Class Activity: Graphs of Equivalent Ratios


**Activity 1:** At a baseball game, the snack bar sells 3 hotdogs for every 2 hamburgers they sell.

- a. Create a double number line to show the relationship between the number of hotdogs and the number of hamburgers sold at the baseball game.

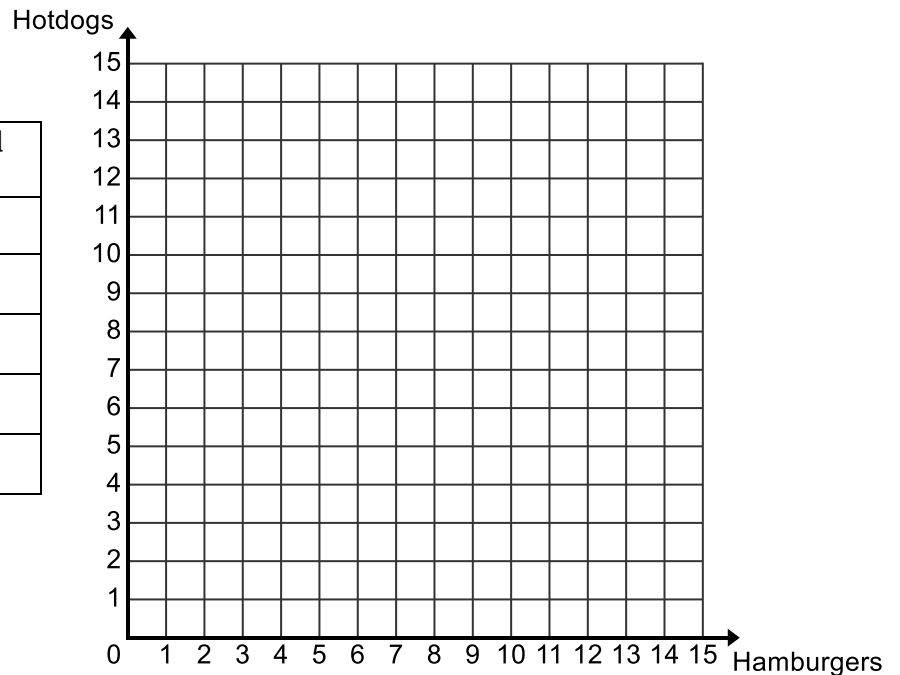


- b. Organize the information in the table below.

Another way we can show the relationship between hotdogs and hamburgers sold is on a **graph**. Complete the

graph below. 

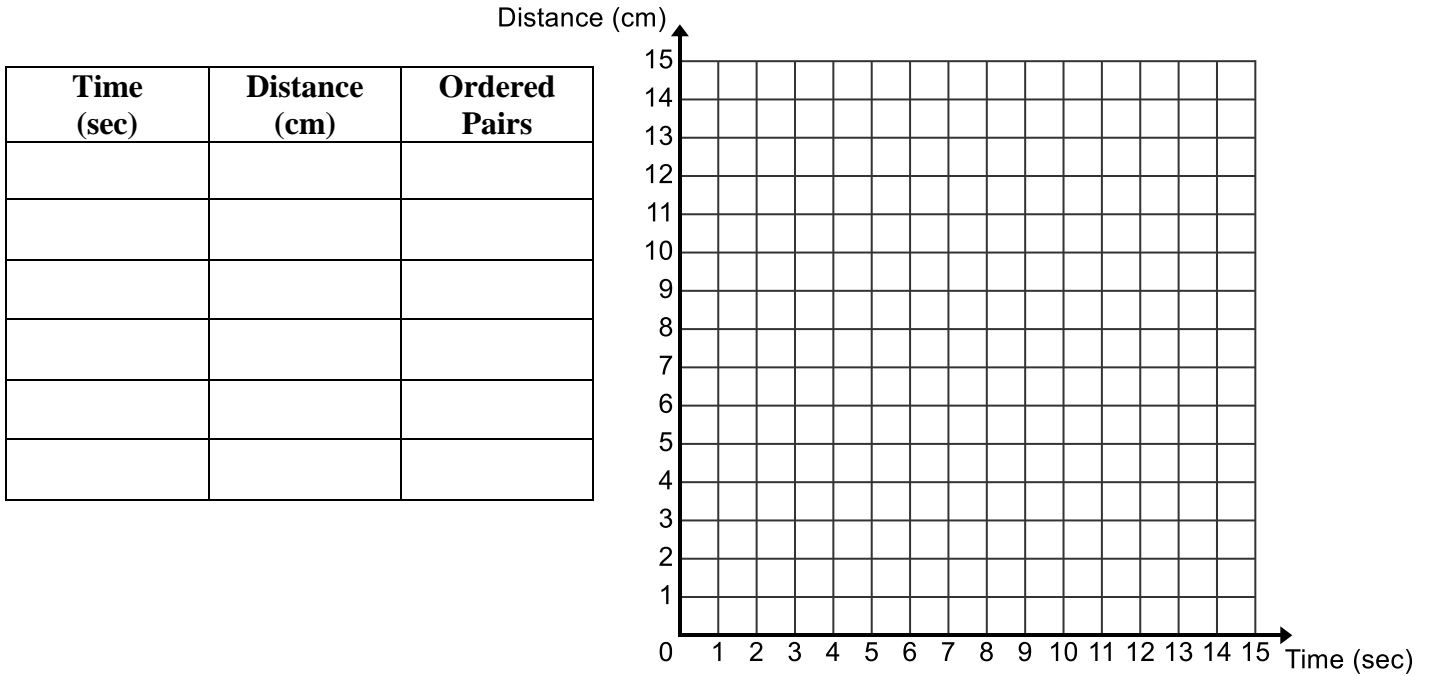
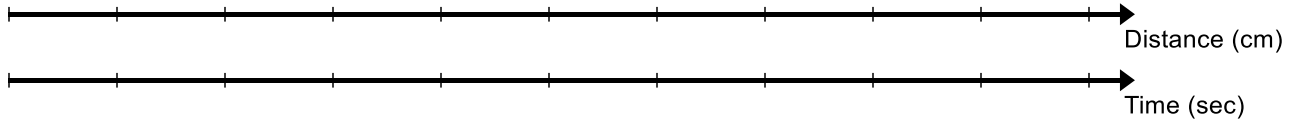
Hamburgers Sold	Hotdogs Sold	Ordered Pairs



- c. What do you notice about the graph of this relationship?
- d. What does the ordered pair (8, 12) represent in the situation?
- e. Write the ordered pair that represents 30 hotdogs and 20 hamburgers being sold.



1. A snail crawls 1 centimeter every 2 seconds. Create a **double number line**, **table**, and **graph** to show the relationship between time, in seconds, and distance, in centimeters, that the snail crawls.

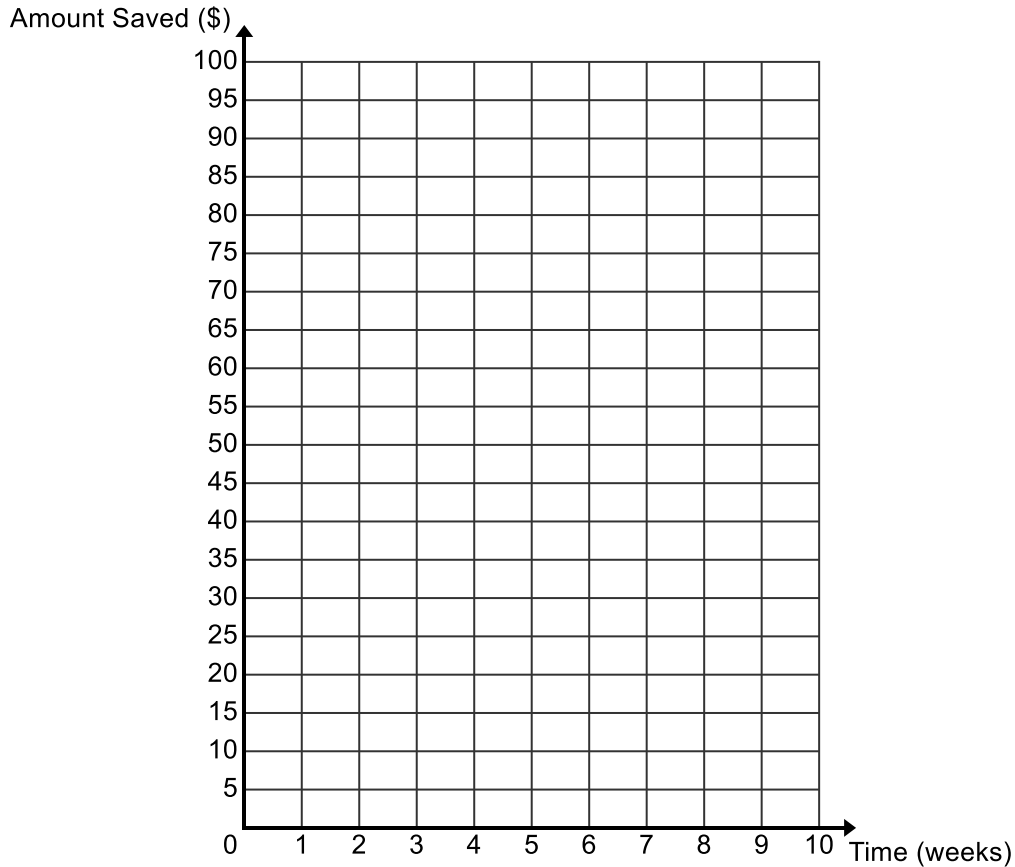


- a. What does the ordered pair (6, 3) represent in the situation?
- b. Use the graph to determine how far the snail crawls in 14 seconds.



2. Jax is saving \$10 per week.
- Complete the table and graph to show the relationship between time in weeks and the amount Jax has saved in dollars.

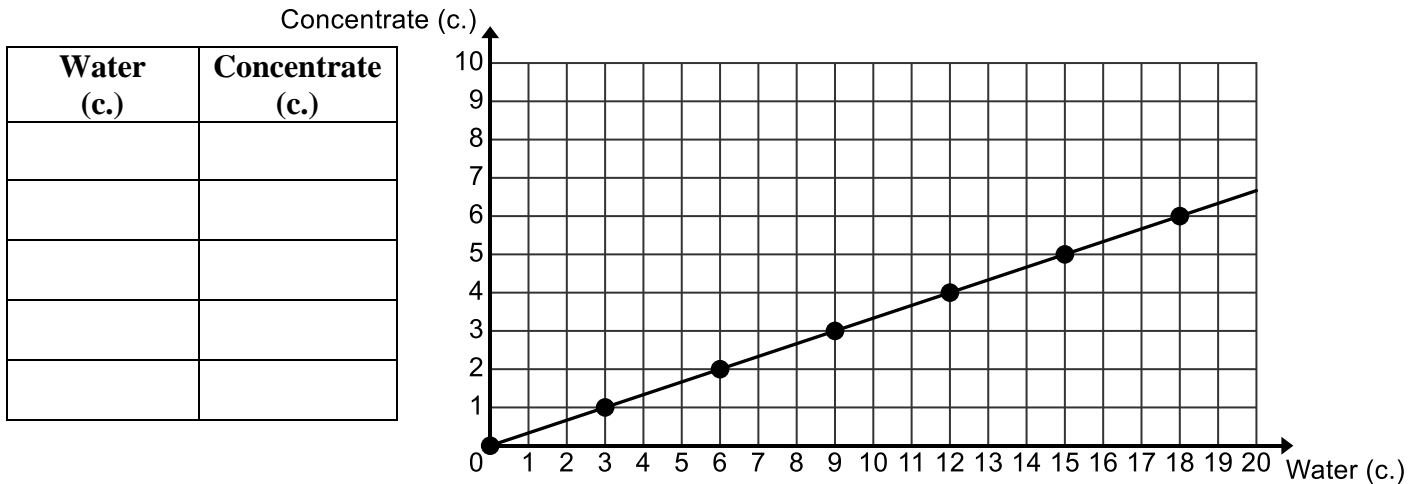
Time (weeks)	0	1	2	3	4	5
Amount Saved (dollars)						



- Use the graph to determine the amount Jax will save in 6 weeks. Write your answer in the space below and circle the point on the graph that represents your answer.
- How long will it take Jax to save \$100? Write your answer in the space below and graph the point that corresponds to your answer on the coordinate plane.

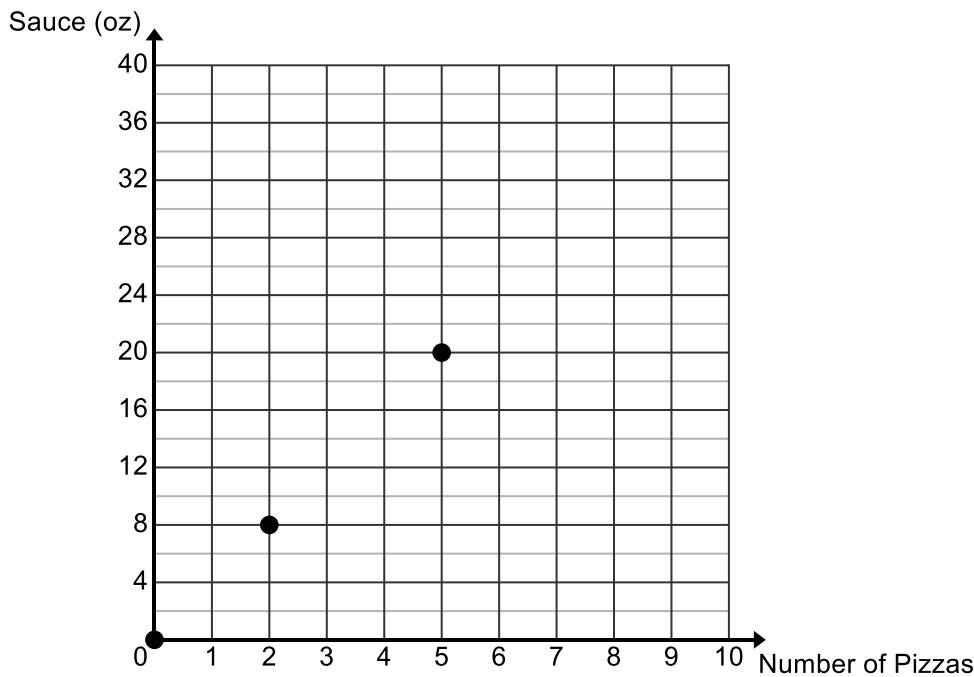
3. The graph below shows the ratio of orange concentrate to water used to make orange juice.

a. Use the graph to complete the table and answer the questions that follow.



- b. How much water is needed for 4 cups of concentrate?
- c. How much of each, water and concentrate, are needed to make 20 total cups of orange juice?
- d. What is the ratio of concentrate to water used to make orange juice?

4. The graph below shows the amount of pizza sauce the Pizza Parlor uses on their medium pizzas. Use the graph below to answer the questions that follow.

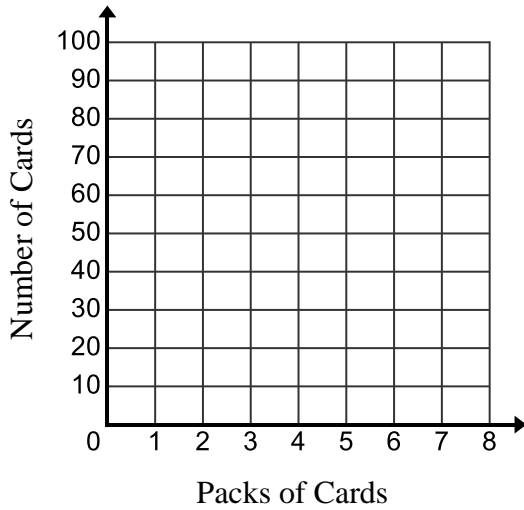


- a. How much pizza sauce does the Pizza Parlor use to make 8 medium pizzas?
- b. How many medium pizzas can the Pizza Parlor make with 24 ounces of sauce?
- c. How many ounces of pizza sauce does it take to make one medium pizza? Plot this point on the graph.

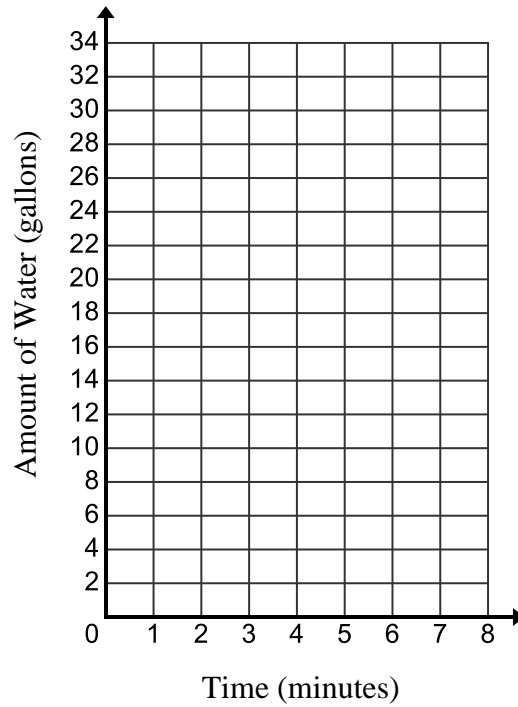


**Directions:** For each of the following situations, create a graph that shows the relationship between the two quantities.

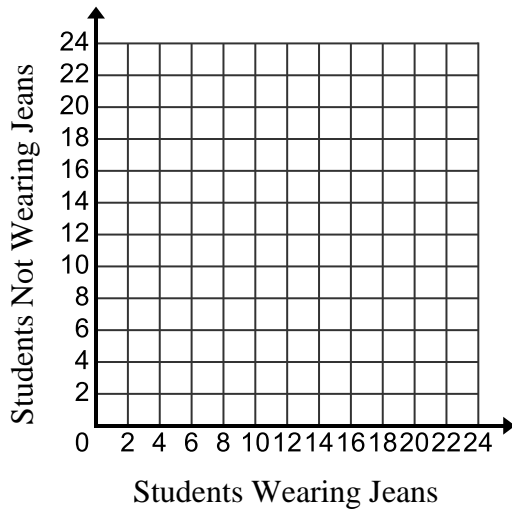
5. There are 10 baseball cards in a pack of cards.



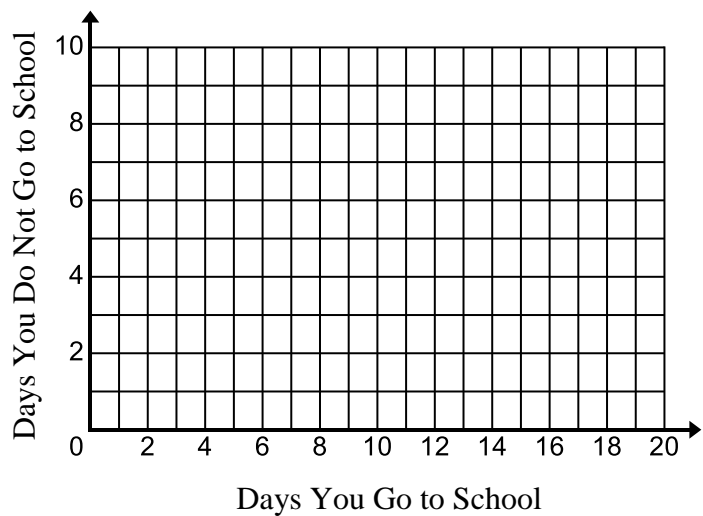
6. The swimming pool is being filled at a rate of 4 gallons per minute.



7. The ratio of students wearing jeans to students not wearing jeans is 4 to 3.



8. You go to school 5 out of 7 days a week.

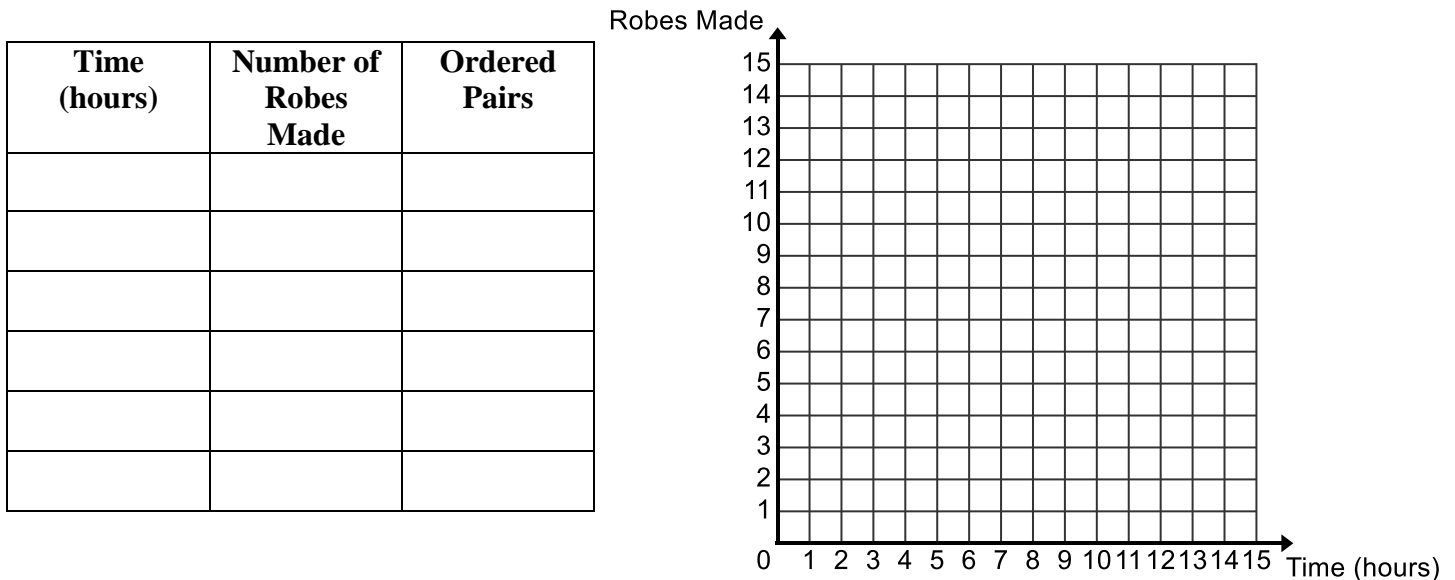
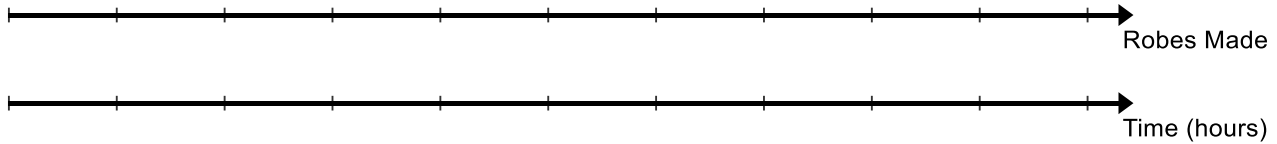


## Spiral Review

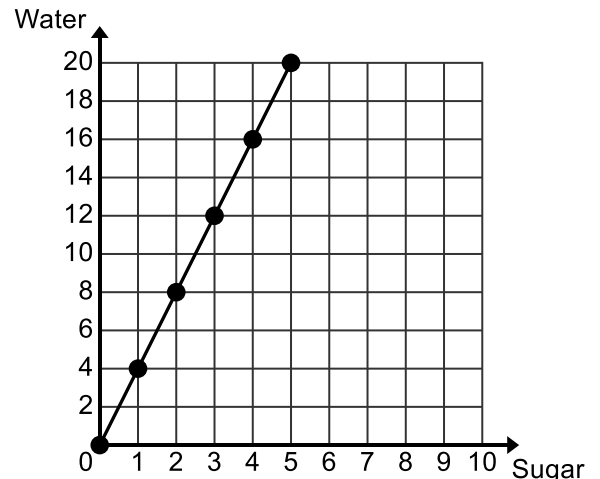
1. How would you share...
  - a. 3 licorice ropes evenly between 4 friends?
  
  
  
  
  
  
  
  
  
  
  - b. 2 candy bars evenly between 8 friends?
  
  
  
  
  
  
  
  
  
  
2. Use mental math to solve the problem  $3 \times 4.99$
  
  
  
  
  
  
  
  
  
  
3. Solve the following problems:
  - a.  $400 \div 10$
  - b.  $40 \div 10$
  - c.  $4 \div 10$
  
  
  
  
  
  
  
  
  
  
4. Shelley walks  $\frac{3}{4}$  of a mile each day for 4 days. How far did she walk?

## 1.2b Homework: Graphs of Equivalent Ratios

1. Asmar is making Jedi robes for a birthday party. He can make 2 robes every hour. Create a **double number line**, **table**, and **graph** to show the relationship between time, in hours, and the number of Jedi robes Asmar makes.



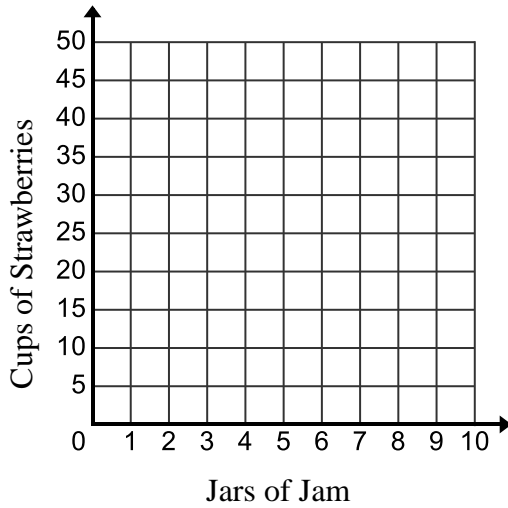
- What does the ordered pair (5, 10) represent in the situation?
  - Asmar needs to make 30 robes for the party. How long will it take him to make 30 robes? Justify your answer.
  - Write your answer from part b. as an ordered pair.
2. Louise is making a sugar solution for her hummingbird feeder. The graph below shows the relationship between the amount of sugar and amount of water used to make the solution.



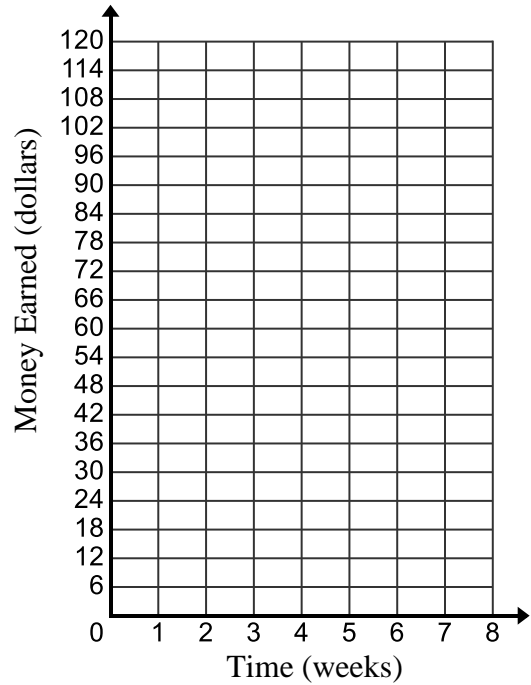
- What is the ratio of sugar to water used to make the solution for the hummingbird feeder?
- If Louise uses 4 cups of sugar, how much water should she use? Circle this point on the graph.
- If Louise uses 24 cups of water, how much sugar should she use? Justify your answer.

**Directions:** For #3 – 7 create a graph of the relationship given. Then, make up 1 question that can be answered using each graph in #3 - 7. Write your questions below the graph. For #8 and 9, use the graph to answer the questions.

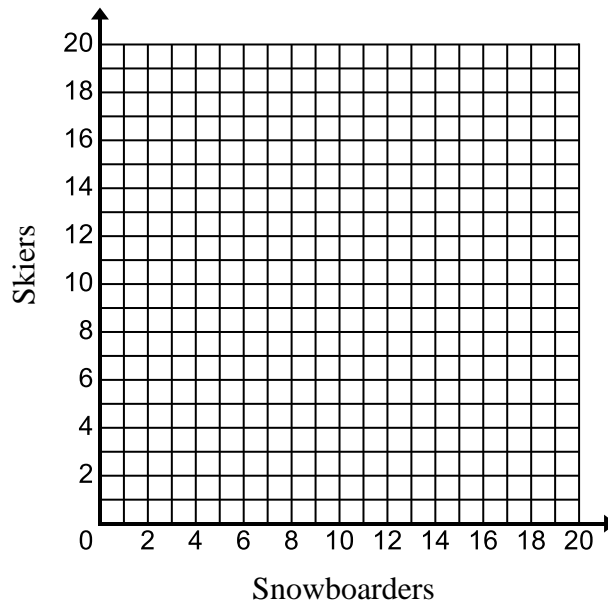
3. Marina uses 5 cups of strawberries for each jar of her strawberry jam.



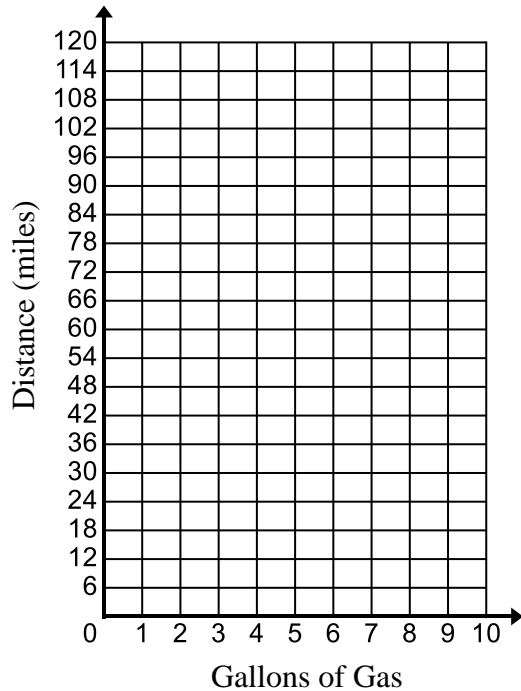
4. Darrius earns \$12 per week for his allowance.



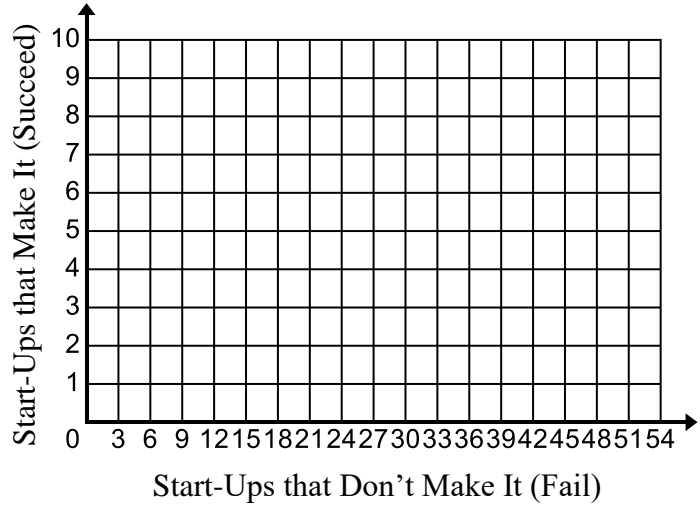
5. The ratio of snowboarders to skiers at a certain ski resort is 4:5.



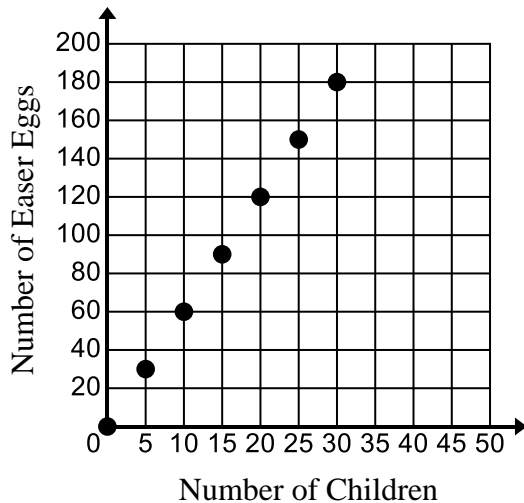
6. Dmitry's truck can travel 12 miles on each gallon of gas.



7. Only 1 out of 10 start-up companies makes it (succeeds).

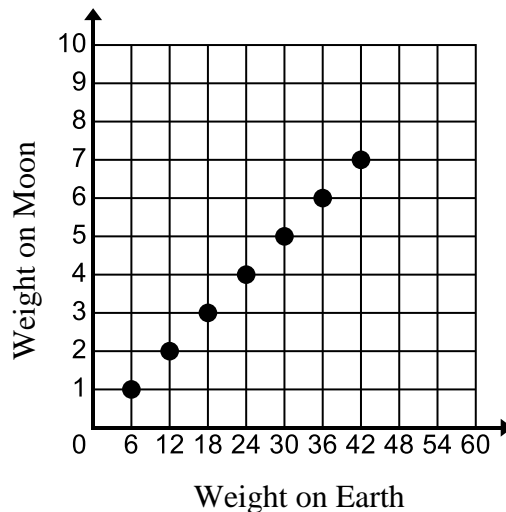


8. Chris is filling eggs for an egg hunt. The graph shows the number of eggs she needs to fill based on the number of children attending the egg hunt. Use the graph to answer the questions below.




- How many eggs does Chris need to fill if 80 children are attending the hunt?
- How many eggs does each child get?

9. The graph below shows the weight of an object on the Earth vs. the weight of the object on the Moon. Use the graph to answer the questions below.



- How much would an object that weighs 54 pounds on the Earth weigh on the moon?
- How much would a person who weighs 30 pounds on the moon weigh on Earth?

## 1.2c Class Activity: An Intro to Unit Rates

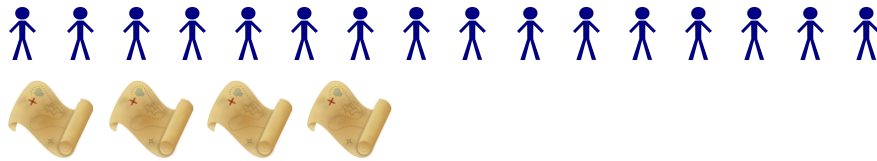
**Activity 1:** Samantha is buying pizzas for a school party. She pays \$35 for 5 pizzas. She realizes she needs more and goes back to buy 2 more pizzas. How much more will she pay for the 2 additional pizzas? How much did she spend in all for pizza? Justify your answer. 

1. The librarian can shelf 60 books in 3 hours.
  - a. How long will it take him to shelf 100 books? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - b. How many books can he shelf in 4 hours? Justify your answer.
  
2. Marcus makes \$72 in 8 hours.
  - a. How much does he make in 3 hours? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - b. How long will it take him to make \$45? Justify your answer.
  
3. Ruby burns 800 calories in 2 hours of running.
  - a. If Ruby runs for 3 hours, how many calories will she burn? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - b. If Ruby burned 200 calories, how long did she run for? Justify your answer.

4. On a road trip, Ben's car can go 75 miles on 3 gallons of gas.
  - a. If Ben's car holds 18 gallons of gas, how many miles can Ben drive with a full tank of gas? Justify your answer.
  - b. If Ben is traveling 300 miles, how many gallons of gas will he need? Justify your answer.

### Spiral Review

1. At Jake's birthday party, there will be a treasure hunt. The picture below shows the number of children at the party and the number of maps needed.



- a. What is the ratio of children to maps?
2. How would you share...
  - a. 9 cups of lemonade evenly between 4 friends?
  - b. 12 brownies evenly between 5 friends?

3. What is  $\frac{3}{2} + \frac{3}{2} + \frac{3}{2} + \frac{3}{2}$ ?

4. What is  $3 \times \frac{2}{5}$ ?

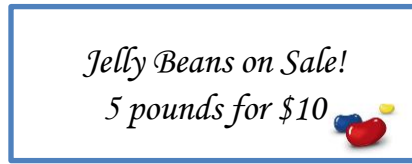


## 1.2c Homework: An Intro to Unit Rates

1. Brooke receives 160 emails in 4 hours.
  - a. How many emails will Brooke receive in 6 hours? Justify your answer.
  
  
  - b. How long will it take for Brooke to receive 120 emails? Justify your answer.
  
2. Olivia saves \$60 in 4 weeks.
  - a. At this rate, how much will Olivia have saved in 6 weeks? Justify your answer.
  
  
  - b. How long will it take Olivia to save \$150? Justify your answer.
  
3. Elise's heart beats 18 times in 6 seconds after she takes a spin class.
  - a. How many times will it beat in 10 seconds? Justify your answer.
  
  
  - b. How many times will it beat in 1 minute (60 seconds)? Justify your answer.
  
4. Alex can do 120 pushups in 3 minutes.
  - a. How many push-ups should Alex be able to do in 5 minutes?
  
  
  - b. How long will it take Alex to do 100 push-ups?
  
5. Jazmin works at a pizza place. She makes 80 pizzas in 4 hours.
  - a. How many pizzas can Jazmin make in 6 hours?
  
  
  - b. Jazmin just got an order for 5 pizzas. How long will it take her to make the 5 pizzas?

## 1.2d Class Activity: Ratios and Their Associated Rates


**Activity 1:** Chris and Danika are shopping for jelly beans to fill eggs.



- Danika needs to buy 8 pounds of jelly beans. How much will 8 pounds of jelly beans cost? Justify your answer.
- Chris has \$8. How many pounds of jelly beans can he buy for \$8? Justify your answer.

Often times, when solving word problems involving ratios, it is helpful to find the **unit rate**. The **unit rate** is the amount of one quantity that corresponds to 1 unit of the other quantity. In the example above, you can find the **unit rate** for cost per pound ( $\frac{\text{dollars}}{\text{pound}}$ ). This tells us the cost for 1 pound. You can also find the **unit rate** for pounds per dollar ( $\frac{\text{pounds}}{\text{dollar}}$ ). This tells us the number of pounds we can buy for \$1.

- What is the unit rate  $\frac{\text{dollars}}{\text{pound}}$ ? In other words, how much will you pay for 1 pound of jelly beans?
- What is the unit rate,  $\frac{\text{pounds}}{\text{dollar}}$ ? In other words, how many pounds of jelly beans can you get for 1 dollar?

1. It costs \$2.00 for 10 erasers.
  - a. How much is each eraser? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - b. How many erasers can you buy for \$1? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - c. Calvin bought 4 erasers. How much did he spend? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - d. How many erasers can Hobbes buy with \$5? Justify your answer.
  
  
  
  
  
  
  
  
  
  
2. Eli can answer 30 math facts in 60 seconds.
  - a. How long does it take Eli to answer 1 math fact? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - b. How many math facts can Eli solve in 1 second? Justify your answer.
  
  
  
  
  
  
  
  
  
  
  - c. How many math facts should Eli be able to complete in 8 seconds? Justify your answer. 
  
  
  
  
  
  
  
  
  
  
  - d. How long will it take Eli to complete 20 math facts? Justify your answer.

3. A cookie recipe calls for 3 cups of flour for every 2 cups of sugar.
- How many cups of flour should you use for 1 cup of sugar? Justify your answer.
  - How many cups of flour should you use for 1 cup of flour? Justify your answer.
  - If Jeremy uses 3 cups of sugar, how much flour will he need to use? Justify your answer.
  - If Sally uses 6 cups of flour, how much sugar will she need to use? Justify your answer.
  - If Bev uses 5 cups of flour, how much sugar will she need to use? Justify your answer.

4. 2 ounces of water leaks out of a faucet every 8 hours

a. What is the unit rate  $\frac{\text{hours}}{\text{ounce}}$ ?

b. What is the unit rate,  $\frac{\text{ounces}}{\text{hour}}$ ?

c. How many ounces of water will leak out in 5 hours? Show how you arrived at your answer.

d. How long will it take for 1 cup of water to leak out? Hint: There are 8 ounces in 1 cup of water. Show how you arrived at your answer.

5. A window washer can clean 12 window panes in 15 minutes.
- What is the unit rate, panes/minute? Show how you arrived at your answer.
  - What is the unit rate, minutes/pane? Show how you arrived at your answer.
  - How long will it take the window washer to clean 5 window panes? Show how you arrived at your answer.
  - How many windows can the window cleaner clean in 20 minutes? Show how you arrived at your answer.

6. An ant crawls 10 cm in 4 seconds.

a. How far can the ant crawl in 5 seconds? Justify your answer.

b. How long will it take the ant to reach a breadcrumb that is 8 centimeters away? Justify your answer.

7. Julius is making orange juice. He has determined that he needs 15 oranges to make 5 cups of orange juice. Complete the table below to show the relationship between oranges and cups of orange juice. Explain the process you used for completing the table.

<b>Number of Oranges</b>	<b>Cups of Orange Juice</b>
1	
	1
5	
	3
	$\frac{10}{3}$
	10
6	

8. A pumpkin that weighs 4 pounds costs \$5. Complete the table below to show the relationship between the weight of the pumpkin and the cost. Explain the process you used for completing the table.

Weight (lbs.)	Cost (dollars)
	1
1	
5	
	10
	15

### Spiral Review

- Solve the following problems.
  - If  $\frac{1}{2}$  a pound of walnuts costs \$3.25, how much is one pound of walnuts?
  
  - If  $\frac{1}{3}$  of a pound of taffy costs \$2.10, how much is one pound of taffy?
- What is  $3.25 \div 5$ ?
- Solve the following problems.
  - $1.2 \times 3$
  
  - $3 \times 2.4$
- If 6 yards of string are cut into pieces that are each  $\frac{3}{4}$  yard long for a science experiment, how many strings can be made?



## 1.2d Homework: Ratios and Their Associated Rates

1. It costs \$40 for 8 pounds of meat.
  - a. How much does each pound of meat cost? Justify your answer.
  
  - b. How many pounds of meat can you buy with \$1? Justify your answer.
  
  - c. How much will it cost for 5 pounds of meat? Justify your answer.
  
  - d. How much meat can you buy with \$4? Justify your answer.
  
2. Kara can make 15 bows with 5 yards of ribbon.
  - a. How many bows can she make with each yard of ribbon? Justify your answer.
  
  - b. How much ribbon is needed for each bow? Justify your answer.
  
  - c. How much ribbon will Kara need to make 24 bows? Justify your answer.
  
  - d. If Kara has 3 yards of ribbon, how many bows can she make? Justify your answer.
  
3. Claudia can run 15 miles in 2 hours.
  - a. How many miles can she run in 1 hour?
  
  
  
  
  
  
  
  
  
  
  - b. How long does it take her to run 1 mile?

4. For every 8 people at the party, Alecia is ordering 2 pizzas.
- What is the unit rate  $\frac{\text{people}}{\text{pizza}}$ ? Restate this question in your own words and then solve.
  - What is the unit rate  $\frac{\text{pizzas}}{\text{person}}$ ? Restate this question in your own words and then solve.
  - How many pizzas will Alecia need to get if there are going to be 28 people at the party?
  - How many people can Alecia feed with 5 pizzas?
5. Rosa uses 8 ounces of frosting for 12 cupcakes.
- What is the unit rate  $\frac{\text{ounces}}{\text{cupcake}}$ ? Restate this question in your own words and then solve.
  - What is the unit rate  $\frac{\text{cupcakes}}{\text{ounce}}$ ? Restate this question in your own words and then solve.
  - How many ounces of frosting does Rosa need for 15 cupcakes?
  - How many cupcakes can Rosa frost with 12 ounces of frosting?



6. For every 12 eggs used to make a sauce, you need 2 sticks of butter. Complete the table to show the relationship between eggs and butter used to make this sauce. Explain the process you used for completing the table.

Eggs	Sticks of Butter
1	
	1
8	
	5
31	
	8

7. The ratio of blue paint to yellow paint used to make a certain shade of green paint is 2 to 5. Complete the table. Explain the process you used for completing the table.

Blue Paint (cups)	Yellow Paint (cups)
1	
	1
6	
	25
	$27\frac{1}{2}$

## 1.2e Class Activity: Given the Unit Rate

**Activity 1:** A recipe for punch calls for 5 cups of lemonade for every 2 cups of fruit punch. Draw a model to represent this relationship. Then, interpret all of the following:  

5 to 2

2:5

$\frac{2}{5}$

$\frac{5}{2}$

**Activity 2:** Hugo's students wrote reports for their English final. Hugo can grade  $\frac{3}{5}$  reports/hour.

a. Draw a model to represent this relationship.

b. How many reports can he grade in 10 hours? Solve this problem using at least two strategies.

**Directions:** For each problem, draw a model to represent the relationship. Then, answer the questions using at least two different strategies. Make connections between the different strategies.

1. Brett uses  $\frac{3}{4}$  of a cup of blue paint for every cup of red paint to make a certain shade of purple paint. If he needs 21 cups of purple paint for an art project, how many cups of each, red and blue paint, does he need?

2. It snows  $\frac{2}{3}$  of an inch per hour. If 6 inches of snow fell, how long was it snowing for?

3. The unit rate of blue paint to white paint used to make sky blue is  $\frac{1}{5}$ . If Danny uses 4 pints of blue paint, how much white paint should he use?

4. Todd can swim  $\frac{7}{4}$  of a lap per minute. Use this information to complete the table below.

<b>Time (minutes)</b>	<b>Laps Completed</b>
1	
	1
2	
4	
	21
60	

5. The unit rate of an object's weight on Earth to its weight on Mars is approximately  $\frac{5}{2}$ . Use this information to complete the table below.

<b>Weight on Earth (lbs.)</b>	<b>Weight on Mars (lbs.)</b>
1	
	1
	2
10	
100	
150	
	200

## 1.2e Homework: Given the Unit Rate

**Directions:** For each problem, draw a model to represent the relationship. Then, answer the questions using at least two different strategies. Make connections between the different strategies.

1. On vacation, Kate reads  $\frac{3}{4}$  of a book per day. If she is on vacation for 8 days, how many books will she read?
2. Charlie can run  $\frac{3}{5}$  of a lap per minute. If he runs 12 laps, how long will it take him?
3. The unit rate of salt to water used to make a saline solution is  $\frac{1}{2}$ . If Dawn uses 10 cups of water, how much salt should she put in?
4. It takes Elise  $\frac{2}{5}$  of an hour to hike 1 mile. How long will it take her to hike 5 miles?
5. LaQuinta can type  $\frac{1}{3}$  of a page in one minute. How long will it take her to type a 5-page report?

6. A recipe for a blueberry shake calls for  $\frac{3}{8}$  cup of blueberries per cup of milk. Use this information to complete the table below.

Cups of Blueberries	Cups of Milk
	1
1	
	2
3	
	16

7. It takes a dog  $\frac{4}{15}$  of a second to run 1 meter. Use this information to complete the table below.

Time (seconds)	Distance (meters)
1	
4	
	75
60	



## 1.2f Class Activity: Comparing Ratios

How about comparing using a graph?

**Activity 1:** The tables below show three different recipes for making orange juice using orange concentrate and water.

Recipe 1	
Cups of Orange Concentrate	Cups of Water
3	5
6	10
9	15
10	$16\frac{2}{3}$

Recipe 2	
Cups of Orange Concentrate	Cups of Water
2	3
4	6
6	9
8	12

Recipe 3	
Cups of Orange Concentrate	Cups of Water
5	8
10	16
15	24
20	32

- a. Order the recipes from strongest orange flavor to weakest orange flavor. Justify your answer.



**Activity 2:** Three pigs are racing in a pig race. The tables below show each pig's distance over time.

<b>Bacon</b>	
<b>Time (sec)</b>	<b>Distance (ft.)</b>
2	30
4	60
6	90

<b>Jimmy Dean</b>	
<b>Time (sec)</b>	<b>Distance (ft.)</b>
5	60
10	120
20	240

<b>Pork Chop</b>	
<b>Time (sec)</b>	<b>Distance (ft.)</b>
8	108
10	135
15	202.5

- a. Order the pigs from fastest to slowest. Justify your answer.

1. Three families leave Utah to drive to Disneyland. The tables below show each family's distance over time.

<b>The Baker Family</b>	
<b>Time (hours)</b>	<b>Distance (miles)</b>
2	120
4	240
6	360

<b>The Sanchez Family</b>	
<b>Time (hours)</b>	<b>Distance (miles)</b>
1	65
2	130
3	195

<b>The Kim Family</b>	
<b>Time (hours)</b>	<b>Distance (miles)</b>
3	165
6	330
9	495

- a. Order the cars from fastest to slowest. Justify your answer.

2. Frank is comparing the cost of chicken at two different stores. Store A sells chicken for \$3.50 per pound. Store B sells chicken in 5-pound bags for \$16.25.

Store A	
Pounds of Chicken	Cost (\$)
1	3.50
2	7
3	10.50

Store B	
Pounds of Chicken	Cost (\$)
5	16.25
10	32.50
15	48.75

- a. Which store has the better deal on chicken? Justify your answer.

3. Cami is making pink paint for a Valentine's Day project in art class. She makes three different shades of pink by mixing red and white paint as shown in the tables below.

Shade A	
Red (cups)	White (cups)
2	3

Shade B	
Red (cups)	White (cups)
3	4

Shade C	
Red (cups)	White (cups)
4	5

- a. Order the shades of pink from the lightest pink to the darkest pink. Justify your answer.

4. Olivia is making hot cocoa for the Halloween carnival at her school. She looks up three different recipes shown in the tables below.

Recipe 1	
Milk (ounces)	Cocoa (T)
10	4

Recipe 2	
Milk (ounces)	Cocoa (T)
4	2

Recipe 3	
Milk (ounces)	Cocoa (T)
12	5

- a. Which recipe for hot cocoa will taste the most chocolaty? Which will taste the least chocolaty? Justify your answer.

5. The tables below show the number of calories in three different kinds of crackers based on the number of crackers you eat.

Cracker A	
Number of Crackers	Calories
16	140

Cracker B	
Number of Crackers	Calories
15	140

Cracker C	
Number of Crackers	Calories
4	30

- a. Order the crackers from least number of calories per cracker to most number of calories per cracker. Justify your answer.

6. At a carnival, there is a game with kiddie pools full of rubber ducks. Each player chooses a duck. If your duck has a red sticker on the bottom, you win a prize. There are three different kiddie pools, each with a different chance of winning as shown in the tables below. In Pool A, there are 6 losing ducks for every 2 winning ducks. In Pool B, 3 out of every 8 ducks is a winning duck. In Pool C, the ratio of winning ducks to losing ducks is 1:4.

Pool A	
Winning Ducks	Losing Ducks
2	6

Pool B	
Winning Ducks	Losing Ducks
3	5

Pool C	
Winning Ducks	Losing Ducks
1	4

- a. Which pool should you play at if you want the best chances of winning? Justify your answer.

7. Jen is buying Halloween candy for a school carnival. She researches the cost of Halloween candy in bulk at three different stores to see which has the best deal.

Store A	
Pounds of Candy	Cost (\$)
$\frac{1}{2}$	\$2.50

Store B	
Pounds of Candy	Cost (\$)
1	\$5.10

Store C	
Pounds of Candy	Cost (\$)
5	\$25

- a. Which store has the best deal on Halloween candy? Justify your answer.

## Spiral Review

1. Solve the following problems:

a.  $15,000 \div 3$

b.  $15,000 \div 30$

c.  $15,000 \div 300$

d.  $15,000 \div 3,000$

2. Solve the following problems:

a.  $24 \times \frac{1}{3}$

b.  $24 \times \frac{2}{3}$

c.  $24 \times \frac{3}{3}$

d.  $24 \times \frac{4}{3}$

3. Students at Snow Basin Elementary School had to stay inside for recess three out of five days this week due to bad weather.

a. Draw a tape diagram to represent this situation.

b. Write a part to part ratio to describe this relationship.

4. The tables below show Selena's scores on three different math quizzes. Complete the tables to show equivalent ratios.

Quiz 1	
Number of Questions Correct	Total Number of Questions
4	5
	100

Quiz 2	
Number of Questions Correct	Total Number of Questions
9	10
	100

Quiz 3	
Number of Questions Correct	Total Number of Questions
22	25
	100

## 1.2f Homework: Comparing Ratios

1. Mary and Tiffany are making paper hats for a Thanksgiving parade. The table below shows the number of hats each girl can make over time.

Mary	
Time (hours)	Number of Hats
1	5
2	10
3	15
4	20

Tiffany	
Time (hours)	Number of Hats
2	8
4	16
6	24
8	32

- a. If each girl needs to make 200 hats, who will finish first? Justify your answer.

2. Owen is racing three toy bugs across the floor. The tables below show each car's distance over time.

Red Bug	
Time (sec)	Distance (cm)
3	15
5	25
7	35
9	45

Blue Bug	
Time (sec)	Distance (cm)
2	9
4	18
6	27
8	36

Green Bug	
Time (sec)	Distance (cm)
3	12
6	24
9	36
12	48

- a. Order the bugs from fastest to slowest. Justify your answer.

3. Three friends are comparing how much they get in allowance. The tables show how much each person gets for allowance.

Harry	
Time (weeks)	Allowance (\$)
1	6
2	12
3	18

Ron	
Time (weeks)	Allowance (\$)
2	11
4	22
6	33

Hermione	
Time (weeks)	Allowance (\$)
4	24
8	48
12	72

- a. Which friend gets paid the most allowance? Justify your answer.

4. Three friends enter in a bike race. The tables below show each friend's distance over time.

Moe	
Time (minutes)	Distance (km)
20	9
40	18
60	27

Larry	
Time (minutes)	Distance (km)
10	4.2
20	8.4
30	12.6

Curly	
Time (minutes)	Distance (km)
30	14
60	28
90	42

- a. Order the bikers from fastest to slowest. Justify your answer.

5. Johnny is buying apples at the farmer's market. The table below shows the cost of apples at three different stands.

Stand A	
Apples	Cost (\$)
5	2.25

Stand B	
Apples	Cost (\$)
10	4

Stand C	
Apples	Cost (\$)
2	1

- a. Which stand has the best deal on apples? Justify your answer.



6. Eva is making homemade peanut butter cups. She found two recipes shown in the tables below.

Recipe 1	
Ounces of Peanut Butter	Ounces of Chocolate
9	6

Recipe 2	
Ounces of Peanut Butter	Ounces of Chocolate
4	2

a. Which recipe is more peanut buttery? Justify your answer.

7. Pedro is buying bagels for soccer camp. He visits three stores to see how much they charge for bagels.

Store A	
Number of Bagels	Cost (\$)
6	3.30

Store B	
Time (weeks)	Allowance (\$)
12	5.40

Store C	
Time (weeks)	Allowance (\$)
1	0.50

a. Which store has the best deal on bagels? Justify your answer.



8. The tables below show the amount of sugar in two popular sports drink.

Sports Drink A	
Ounces of Drink	Sugar (tsp)
20	7

Sports Drink B	
Ounces of Drink	Sugar (tsp)
32	14

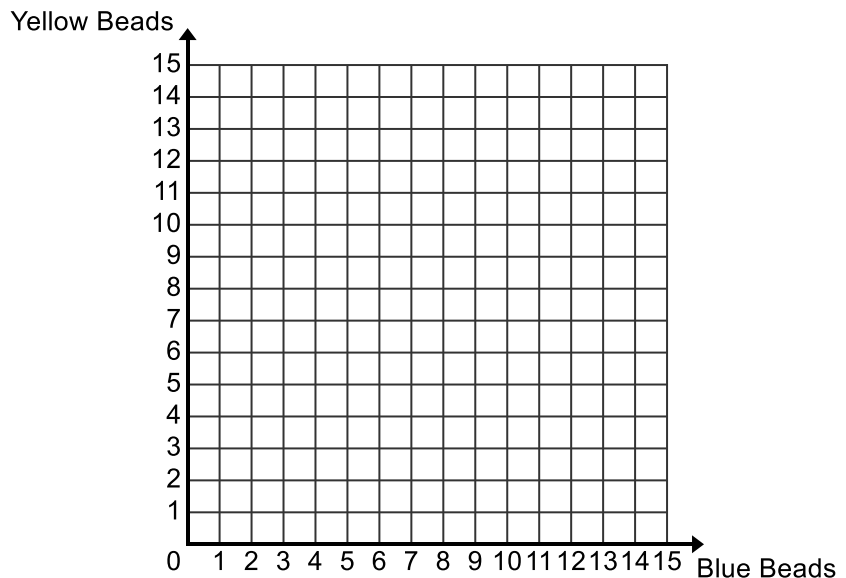
a. Which sports drink is more sugary? Justify your answer.

## 1.2g Class Activity: Equations to Represent Relationships Between Two Quantities

**Activity 1:** Chance is making a necklace with blue and yellow beads on it. The ratio of blue beads to yellow beads is 1 to 3.  

- a. Complete the table and graph to show the relationship between yellow and blue beads on Chance's necklace.

Blue Beads	Yellow Beads
1	
2	
3	
4	
10	
100	
$b$	



- b. Do your table and graph show all the possible values for the number of blue and yellow beads Chance can have on his necklace?
- c. Is it possible to list all the possible values for the number of blue and yellow beads that could be on Chance's necklace? Why or why not?

It is *not* possible to list all the possible values for the number of blue and yellow beads on Chance's necklace. But we can write a rule that shows the relationship between blue and yellow beads on Chance's necklace. This rule is called an **equation** and it represents all the possible values for the number of blue and yellow beads on Chance's necklace. Every pair of values that makes the equation true is a possible pair of values for the number of blue and yellow beads on Chance's necklace.

- d. In your own words, state a rule that shows the relationship between yellow and blue beads on Chance's necklace.
- e. Write an equation that shows the relationship between yellow beads and blue beads on Chance's necklace. Let  $y$  stand for yellow beads and  $b$  stand for blue beads.

- f. Chance has 12 blue beads to use on his necklace. How many yellow beads should he use?

**Activity 2:** Marcus is training for an ultra-marathon where he will be running 100 miles. He can run 7 miles per hour.



- a. Complete the table below to show the relationship between time and distance for Marcus.

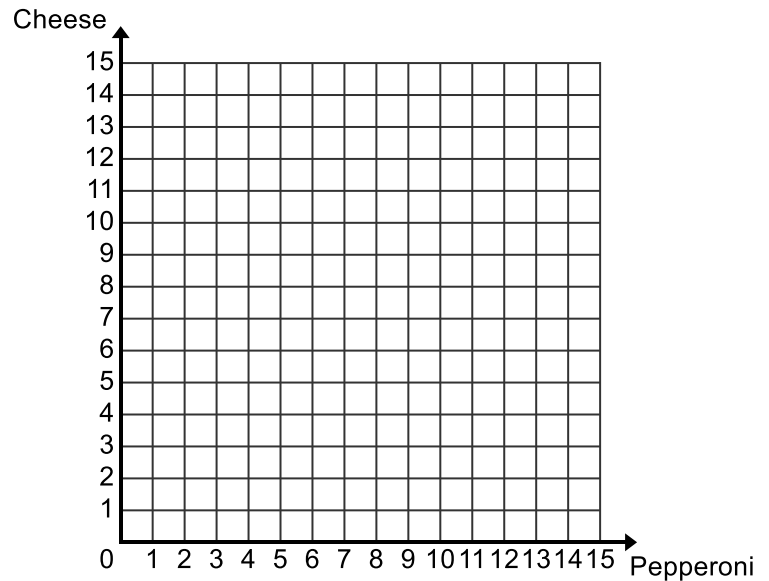
<b>Time (hours)</b>	<b>Distance (miles)</b>	<b>Expression for Distance</b>
1		
2		
3		
4		
10		
$t$		

- b. Write an equation to show the relationship between time and distance for Marcus. Use  $t$  for time and  $d$  for distance. Check your equation using values from the table.
- c. How far can Marcus run in 6 hours?
- d. If Marcus plans to run 56 miles, how long will it take him?
- e. How long will it take Marcus to run the 100-mile ultra-marathon at this pace?

1. Pizza Paradise only sells cheese and pepperoni pizzas. One out of every three pizzas sold is pepperoni. The rest are cheese.

a. Complete the table and graph to show the relationship between cheese and pepperoni pizzas sold at Pizza Paradise.

Pepperoni Pizzas Sold	Cheese Pizzas Sold
1	
2	
3	
4	
10	
100	
$p$	



b. Write an equation that shows the relationship between cheese and pepperoni pizzas sold at Pizza Paradise. Let  $c$  stand for cheese and  $p$  stand for pepperoni.

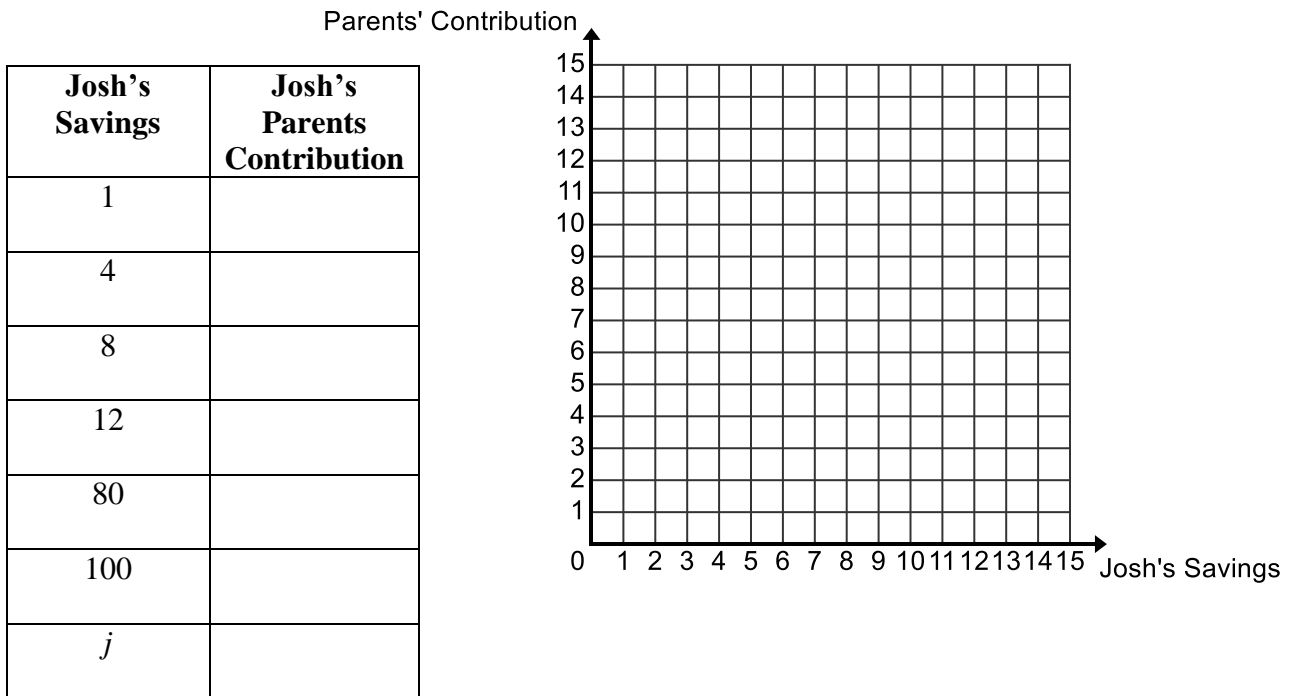
c. If Pizza Paradise sells 200 pepperoni pizzas in one day, how many cheese pizzas will they sell?

d. If Pizza Paradise sells 300 cheese pizzas in one day, how many pepperoni pizzas will they sell?

e. If Pizza Paradise sells 900 total pizzas in one day, how many were cheese and how many were pepperoni?



2. Josh is saving money to buy a tablet. For every \$4 he saves, his parents will contribute \$1.
- Complete the table and graph to show the relationship between the amount Josh saves and the amount his parents contribute.



- Write an equation that shows the relationship between the amount Josh's parents contribute,  $p$ , and the amount Josh saves,  $j$ .
  - If Josh saves \$200, how much will his parents need to contribute?
  - If the tablet Josh is saving for is \$450, how much will Josh need to save?
3. Zoe is saving \$5 each week.
- Write an equation that shows the relationship between time in weeks,  $t$ , and the amount Zoe saves in dollars,  $s$ .
  - How long will it take Zoe to save \$35?
  - How much can Zoe save in 12 weeks?

4. Almonds cost \$7.99 per pound.
  - a. Write an equation that shows the relationship between cost in dollars,  $c$ , and pounds of almonds purchased,  $p$ .
  
  - b. How much will 3 pounds of almonds cost?
  
5. Teya is saving \$400 per month.
  - a. Write an equation that shows the relationship between time in months,  $t$ , and amount of money Teya saves,  $s$ .
  
  - b. Teya's goal is to have \$12,000 saved. How long will it take her to save \$12,000?
  
6. There are 150 calories in 10 cheesy tortilla chips.
  - a. Write an equation to show the relationship between number of calories,  $c$ , you consume based on how many cheesy tortilla chips,  $t$ , you eat.
  
  - b. Renee ate 6 cheesy tortilla chips. How many calories did she consume?
  
7. A car travels 135 miles in 3 hours at a constant rate.
  - a. Write an equation to show the relationship between time in hours,  $t$ , and the number of miles,  $m$ , the car travels at this rate.
  
  - b. How long will it take the car to reach a town that is 225 miles away?

8. In the Lollipop Tree Game at a carnival, a player chooses a lollipop. If the lollipop is colored red on the end of the stick, the player wins the lollipop and an additional prize. If the lollipop is not colored red on the end, the player just gets to keep the lollipop. The ratio of lollipops with red ends to lollipops without red ends is 3 to 4.
- a. Complete the table to show the relationship between lollipops with red ends and lollipops without red ends.

<b>Lollipops with Red Ends</b>	<b>Lollipops without Red Ends</b>
1	
3	
6	
9	
12	
15	
$r$	

- b. Write an equation to show the relationship between lollipops with red ends,  $r$ , and lollipops without red ends,  $w$ .



c. If Lizzy has 24 lollipops with red ends, how many should she put in the tree without red ends?

9. The ratio of fruit punch to Sprite used to make Fizzy Fruit Punch is 3 to 2.

a. Complete the table to show the relationship between Sprite and fruit punch used to make Fizzy Punch.

<b>Fruit Punch (cups)</b>	<b>Sprite (cups)</b>
1	
3	
6	
9	
12	
15	
$c$	

b. Write an equation to show the relationship between cups of Sprite,  $s$ , and cups of fruit punch,  $f$ .

c. If Jesse uses 27 cups of fruit punch for a school dance, how much Sprite should she use?

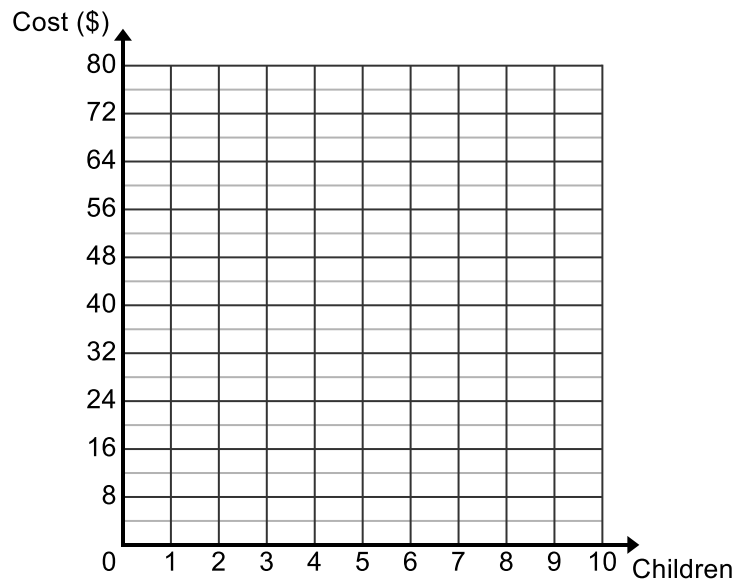
## Spiral Review

1. Mr. Longe is preparing for a science experiment. He has determined that he needs 15 cups of goo for 30 students to do the experiment.
  - a. Mr. Longe teaches four class periods of science with 30 students in each class. How many cups of goo does Mr. Longe need for all four class periods?
  - b. Each lab table in Mr. Longe's classroom holds 6 students. How many cups of goo does each lab table need?
  - c. How many cups of goo does each student need to do the experiment?

## 1.2g Homework: Equations to Represent Relationships Between Two Quantities

1. Stefan is planning a birthday party at a family fun center. It costs \$8 for each person to attend.
  - a. Complete the table and graph to show the relationship between the number of people that attend the party and the cost of the party.

Number of People	Cost (dollars)
1	
2	
3	
4	
10	
$p$	



- b. Write an equation to show the relationship between number of people at the party,  $p$ , and total cost of the party,  $c$ .
  - c. If Stefan paid \$160, how many children were at the party?
2. Jack and Carol both submitted drawings for the cover of the yearbook. The student body voted on whose drawing will be on the cover. For every vote that Jack receives, Carol receives three.
  - a. Complete the table to show the relationship between votes for Jack, votes for Carol, and total votes.

Votes for Jack	Votes for Carol	Total Votes
1		
2		
3		
10		
25		
100		
$j$		

- b. Write an equation that shows the relationship between votes for Jack,  $j$ , and votes for Carol,  $c$ .
  - c. Write an equation that shows the relationship between votes for Jack,  $j$ , and total votes,  $t$ .
  - d. If Jack received 60 votes, how many did Carol receive?
  - e. If 200 total people voted, how many voted for Jack and how many voted for Carol?

3. Dessie is making Valentine's cards for her classmates. She can make 4 cards in 20 minutes.
- Complete the table below to show the relationship between time in minutes and the number of cards Dessie can make.

Time (minutes)	Number of Cards
20	
40	
60	
120	
200	
$t$	

- Write an equation to show the relationship between time Dessie works and the number of cards she can make. Use  $t$  for time in minutes and  $c$  for number of cards made.
  - If Dessie works on cards for 3 hours, how many can she complete?
4. It takes Sabina 1 hour to bike 12 miles.
- Write an equation to show how long it takes Sabina to bike based on how far she goes. Use  $t$  for time in hours and  $d$  for distance in miles.
  - If Sabina is biking 60 miles for a race, how long will it take her at this pace?
5. Charlie's school is selling wrapping paper for a fundraiser. The school makes \$0.40 for each roll of wrapping paper they sell.
- Write an equation to show the relationship between the number of rolls of wrapping paper,  $r$ , the school sells and the amount of money they raise,  $m$ .
  - If the school sells 1,000 rolls of wrapping paper, how much money will they raise?

6. A car is driving at a constant speed. After 3 hours, the car has driven 195 miles.
- Write an equation that shows the relationship between time in hours,  $t$ , and distance,  $d$ , that the car travels at this rate.
  - How long will it take the car to drive 325 miles at this speed?
7. Ben is paid the same amount each hour that he babysits. When he works 6 hours, he is paid \$36.
- Write an equation that shows the amount of money in dollars,  $m$ , Ben makes for  $h$  hours of work.
  - If Ben babysits for 8 hours, how much will he make?
8. Sandeep is buying hamburger meat for a company picnic. It costs \$21.25 for 5 pounds of hamburger meat.
- Write an equation to show cost in dollars,  $c$ , for  $p$  pounds of hamburger meat.
  - If Sandeep buys 8 pounds of hamburger meat, how much will it cost him?
9. A new movie was just released. The movie theater is gathering data to see if boys or girls are more likely to see the movie. The ratio of girls to boys who come to see the movie is 5 to 3.
- Complete the table below to show the relationship between girls, boys, and total children who see the movie.

Girls	Boys	Total Children
5		
10		
15		
20		
$g$		

- Write an equation to show the relationship between number of boys  $b$  and number of girls  $g$  who see the movie.
- Write an equation to show the relationship between number of girls  $g$  and total number of children  $t$  who see the movie.
- If 50 girls are at a showing, how many boys would you expect to be at the showing?
- If 100 girls are at a showing, how many total children would you expect to be at the showing?

## 1.1h Self-Assessment: Section 1.2

Consider the following skills/concepts. Rate your comfort level with each skill/concept by checking the box that best describes your progress in mastering each skill/concept. Corresponding sample problems, referenced in brackets, can be found on the following page.

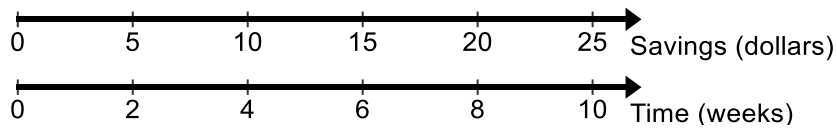
Skill/Concept	Minimal Understanding 1	Partial Understanding 2	Sufficient Mastery 3	Substantial Mastery 4
1. Read double number lines, create them to show relationships between two quantities, and use them to solve real world problems.	I can read and answer questions about a double number line if the values are given on the number line but have a difficult time when the values are not given. I cannot complete or create double number lines.	I can read and answer questions about a double number line and complete a partially filled in double number line but have a difficult time creating my own double number line.	I can read and answer questions about a double number line and complete a partially filled in double number line. I can create my own double number line but sometimes need help with how to scale the number lines. I can iterate and partition a double number line to find additional values but sometimes struggle when the values are fractions.	I can read and answer questions about a double number line and complete a partially filled in double number line. I can create my own double number line choosing an appropriate scale for both number lines. I can iterate and partition a double number line to find additional values, including fractional values.
2. Plot pairs of equivalent ratios on a coordinate plane.	I know what an ordered pair is but I have trouble plotting ordered pairs because I often mix up the quantities.	I can plot ordered pairs on a coordinate plane that have been given in a table.	I can create tables of equivalent ratios and plot the ordered pairs on a coordinate plane. I understand that an ordered pair represents a pair of values that correspond with each other to show a relationship between two quantities.	I can create tables of equivalent ratios and plot the ordered pairs on a coordinate plane. I understand that an ordered pair represents a pair of values that correspond with each other to show a relationship between two quantities. I know what the graph of equivalent ratios should look like and I can use this information to find additional values and answer questions.
3. Read and interpret graphs to solve real world problems involving ratios.	I can identify the quantities on a graph but I have a difficult time reading the graph because I am not sure how to identify the ordered pairs that correspond to a point on a graph or what the ordered pairs mean in the context.	I can identify the quantities on a graph. I can read a graph to answer questions about points given on the graph and circle points on the graph that represent answers to questions.	I can identify the quantities on a graph. I can read a graph to answer questions about points given on the graph and circle points on the graph that represent answers to questions. I can write the ordered pairs that correspond to each point on the	I can identify the quantities on a graph. I can read a graph to answer questions about points given on the graph and circle points on the graph that represent answers to questions. I can write the ordered pairs that correspond to each

			graph, transferring this information to a table, and know what the ordered pairs represent in the context.	point on the graph, transferring this information to a table, and know what the ordered pairs represent in the context. I can use patterns in the graph to answer questions about values not shown on the graph.
4. Understand what a unit rate is. Find the unit rates associated with a given ratio and use them to solve real world problems.	I know that the unit rate is the amount of one quantity when the other quantity is equal to 1 unit but I am not sure how to find a unit rate given a ratio.	I know that the unit rate is the amount of one quantity when the other quantity is equal to 1 unit. I can find the unit rate for easy problems that do not involve fractions (i.e. Nicolas completes 100 math facts in 5 minutes. How many does he complete each minute?).	I know what a unit rate is. I can find the unit rates associated with a given ratio even those involving fractions. I can use the unit rates I find to answer additional questions about the situation.	I know what a unit rate is. I can find the unit rates associated with a given ratio even those involving fractions. I understand the relationship between the unit rates associated with a ratio. I know which unit rate to find to solve a real world problem based on the question that is asked.
5. Use tables to compare ratios.	I know to look for values in the table that are the same but I have a difficult time making sense of what the information is telling me in order to compare the ratios.	I can compare ratios given in two tables when at least one of the values in the input or output columns is the same.	I can compare ratios given in two or more tables by finding additional ordered pairs not given in the table.	I can compare ratios given in two or more tables by finding additional ordered pairs not given in the table. I can quickly and easily identify which additional ordered pairs would be helpful to find in order to compare the ratios. I can verify my results using additional strategies (i.e. finding the unit rate).
6. Write an equation to show a relationship between two quantities and use equations to solve real world problems.	I can express the relationship between two quantities using words (i.e. the cost is three times larger than the number of pounds) but have a difficult time writing the equation symbolically (i.e. $c = 3p$ where $c$ is cost in dollars and $p$ is pounds).	I can write an equation to show the relationship between two quantities in words and symbolically but I struggle when the equation involves fractions and I sometimes mix up where the variables go in the equation.	I can write an equation to show a relationship between two quantities in words and symbolically, including equations that contain fractions.	I can write an equation to show a relationship between two quantities in words and symbolically, including equations that contain fractions. I can write additional equations that show the same relationship (i.e. $c = 3p$ or $p = \frac{c}{3}$ where $c$ is cost in dollars and $p$ is pounds).

## Sample Problems for Section 1.2

Square brackets indicate which skill/concept the problem (or parts of the problem) align to.

1. Select all statements that are true about the double number line shown below. For the statements that are false, correct them to make them true. [1]



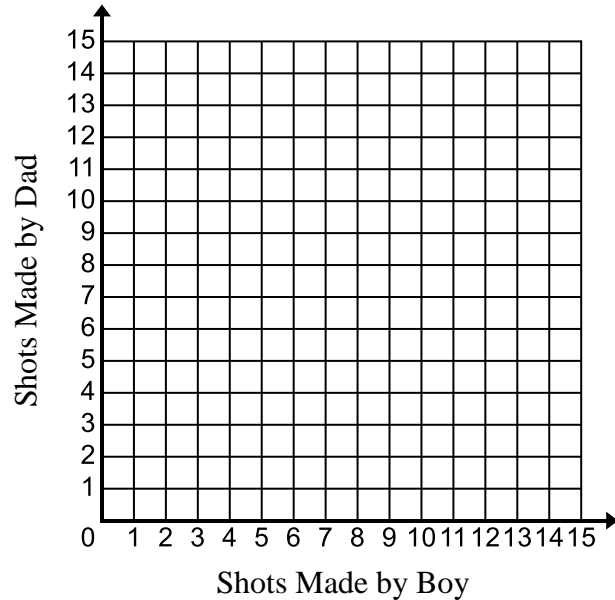
- Carl saves \$5 each week.
  - In 10 weeks, Carl has saved \$4.
  - In 8 weeks, Carl has saved \$20.
  - Carl will save \$30 in 15 weeks.
  - It will take Carl 16 weeks to save \$40.
  - In 5 weeks, Carl will have saved \$12.50.
2. The Nest Egg Café charges \$2 for 4 chocolate chip cookies. [1]
- a. Create a double number line to represent this situation.
  
  
  
  
  
  
  
  
  
  
  - b. Make up 3 questions that can be answered using your double number line. Then, answer them.



3. A boy and his dad are taking turns shooting a basketball. For every shot that the boy makes, his dad makes three.

a. Complete the table and graph to show this relationship. [2]

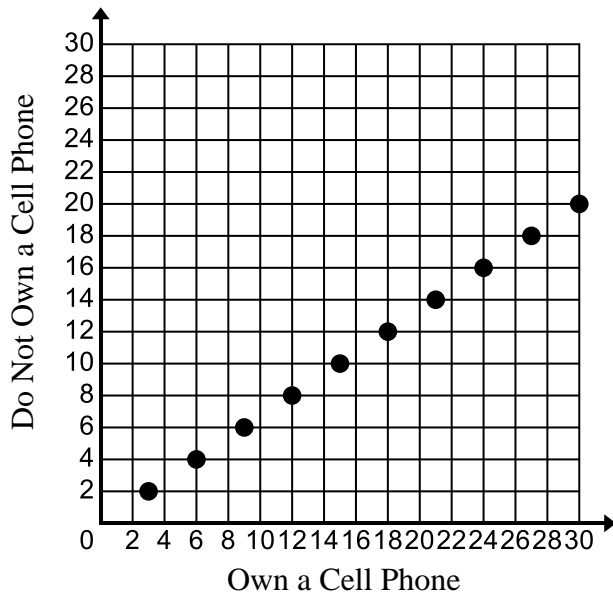
Shots Made by Boy	Shots Made by Dad
1	
2	
3	
4	
5	



b. What does the ordered pair (8, 24) represent in this situation? [2]

c. If the boy makes 4 shots, how many will his dad make? Circle this ordered pair on the graph. [3]

4. Lance polled the 6<sup>th</sup> grade students at his school to determine whether or not they own their own cell phone. The graph shows the results of his survey. [3]



a. In a homeroom of 6<sup>th</sup> graders at Lance's school, 16 students do not own a cell phone. Based on the graph, how many students in the homeroom own a cell phone?

b. Write a ratio statement to show the relationship between students who own a cell phone and students who don't own a cell phone.

c. If there are 200 6<sup>th</sup> graders in Lance's school, how many would you expect own a cell phone and how many would you expect do not own a cell phone?

5. Oscar is planning to buy 10 sub sandwiches for every 8 kids at a birthday party. [4]
- How much of a sub sandwich does each child get?
  
  
  
  
  
  
  
  
  
  
  - If there are 12 kids at the birthday party, how many sub sandwiches does Oscar need to buy?
6. George can read 5 pages of his book in 20 minutes. [4]
- How long will it take him to read 8 pages of his book?
  
  
  
  
  
  
  
  
  
  
  - If he reads for an hour, how many pages will he be able to read?
7. Tina jogs 5 meters every 2 seconds. [4]
- Find the unit rate  $\frac{\text{meters}}{\text{second}}$ . Write in your own words what this answer means.
  
  
  
  
  
  
  
  
  
  
  - Find the unit rate  $\frac{\text{seconds}}{\text{meter}}$ . Write in your own words what this answer means.
  
  
  
  
  
  
  
  
  
  
  - How long will it take Tina to jog 100 meters?
  
  
  
  
  
  
  
  
  
  
  - How far can Tina jog in 30 seconds?
8. An elevator at a hotel travels 36 feet to get from floor 2 to floor 5. [4]
- If someone rides from floor 1 to floor 10, how many feet will they go?
9. A recipe for pancakes calls for 1 cup of water for every  $\frac{2}{3}$  cup pancake mix. [4]
- If Charlotte uses 10 cups of pancake mix, how much water does she need to use?

10. Leo's Landscaping is looking to hire another gardener. The tables below show the rate at which two different job candidates can mow lawns. [5]

Candidate 1	
Number of Lawns	Time (hours)
4	7

Candidate 2	
Number of Lawns	Time (hours)
5	8

- a. Which gardener should Leo's Landscaping hire if they want the candidate who mows lawns at the fastest rate? Justify your answer.

11. There are 8 party hats in a package of party hats. [6]

- a. Write an equation that shows the relationship between number of party hats  $h$  and packages of party hats  $p$ .

- b. If Terry buys 3 packages of party hats, how many party hats will she have?

12. The table below shows the amount Hadley earns babysitting and the amount she saves. [6]

Amount Earned	Amount Saved
12	6
30	15
60	30
100	50

- a. Write an equation that shows the relationship between the amount Hadley earns  $e$  and the amount she saves  $s$ .

- b. If she earns \$45 on a babysitting job, how much will she save?

13. Two pounds of macaroni salad at a deli costs \$7.40. Three pounds of the same macaroni salad costs \$11.10. [6]
- Write an equation that shows how much someone will pay in dollars,  $c$ , based on the number of pounds,  $p$ , of macaroni purchased.
  - If Ellie buys 5 pounds of this macaroni salad, how much will it cost her?
14. A candy company just released a new pizza-flavored taffy. They are doing a taste test to see whether or not people like the taffy. Only one out of every five people that tries the taffy likes it. [6]
- Write an equation to show the relationship between the number of people who try the taffy  $t$  and the number of people who like the taffy  $l$ .
  - Write an equation to show the relationship between the number of people who try the taffy  $t$  and the number of people who don't like the taffy  $d$ .
  - Write an equation between the number of people who like the taffy  $l$  and the number of people who don't like the taffy  $d$ .