Dear Family,

This week your student is learning about ratios comparing parts and wholes.

Sometimes the two quantities in a ratio relationship can be combined to make a total amount, or a whole.

For example, a recipe might require 2 cups of pineapple juice for every 3 cups of cranberry juice. This would make a total of 5 cups of juice.

Pineapple

Cranberry

Total:
5 cups of juice

Your student will be learning to solve problems like the one below.

> Leon needs 20 gal of fruit punch for a party. The recipe requires 2 parts pineapple juice and 3 parts cranberry juice. How much pineapple juice and how much cranberry juice does Leon need for the party?

➤ **ONE WAY** to find the parts that make up a whole is to use a tape diagram.

The 20 gal must be divided evenly between the 5 parts.

$$20 \div 5 = 4$$

Pineapple	**4** gal	**4** gal	
Cranberry	**4** gal	**4** gal	**4** gal

Total:
20 gal of fruit punch
5 parts

➤ **ANOTHER WAY** is to use a table of equivalent ratios.

Pineapple (gal)	Cranberry (gal)	Total (gal)
2	3	**5**
8	12	**20**

× 4

Both methods show that Leon needs 8 gal of pineapple juice and 12 gal of cranberry juice for the party.

> Use the next page to start a conversation about ratios with total amounts.

Activity Thinking About Ratios Around You

➤ **Do this activity together to investigate ratios in the real world.**

Plants need food to grow, just like humans and animals. Fertilizer is often used to help feed plants. A bag of fertilizer contains three major nutrients (nitrogen, phosphorus, and potassium), as well as some filler material.

To see how the amount of each nutrient compares to the total amount of fertilizer, look at the label on the bag. The label *10-30-10* on this bag shows that the fertilizer contains 10 parts nitrogen, 30 parts phosphorous, and 10 parts potassium.

? Where else do you see ratios that show parts of a whole in the world around you?

Explore Ratios That Describe Parts of a Whole

Previously, you learned about equivalent ratios. In this lesson, you will learn about ratios that involve parts and a whole, or a total amount.

Green Tea Latte
4 : 3
Tea : Milk

➤ **Use what you know to try to solve the problem below.**

Hasina is making green tea lattes. She steams milk to mix with hot tea. Hasina has 12 fl oz of hot tea. Based on the ratio in the recipe, how much milk does Hasina need to steam?

TRY IT

Math Toolkit connecting cubes, counters, double number lines, grid paper

DISCUSS IT

Ask: Would your model look different if Hasina used 12 cups of hot tea instead of 12 fl oz? Explain.

Share: In my model, . . .

◎ **Learning Targets** SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6, SMP 7
Use ratio and rate reasoning to solve real-world and mathematical problems.
• 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.

CONNECT IT

1 **Look Back** How much milk does Hasina need to steam to mix with 12 fl oz of hot tea? Explain how you know.

2 **Look Ahead** The ratio for Hasina's recipe could be given as 4 parts hot tea to 3 parts milk. Serafina's tea latte recipe calls for using **2 parts** hot tea to **4 parts** milk. A tape diagram is one way to model ratios that compare parts of a whole, or a total amount.

Serafina's Recipe

Hot Tea	1 part	1 part		
Milk	1 part	1 part	1 part	1 part
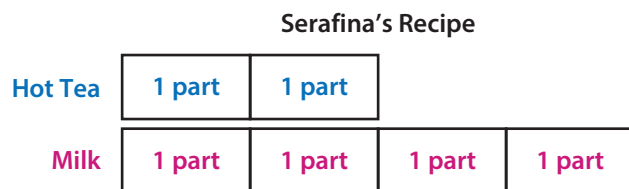
This diagram is made up of six equal parts. Each part represents the same amount. This amount can be any measurement, such as 1 cup, 2 fl oz, or 3 gal.

a. What is the ratio of hot tea to the total amount of tea latte?

b. Suppose 1 part of the tape diagram represents 1 cup. What is the total amount of tea latte the recipe makes?

c. Suppose 1 part of the tape diagram represents 2 fl oz. What is the total amount of tea latte the recipe makes? What is the ratio of hot tea to the total amount of tea latte?

3 **Reflect** Suppose you change the amount that each equal part in a tape diagram represents. Does this change result in an equivalent ratio? Explain.

Prepare for Using Part-to-Part and Part-to-Whole Ratios

1 Think about what you know about using ratios to compare quantities. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

What Is It?	What I Know About It

ratio

Examples	Examples
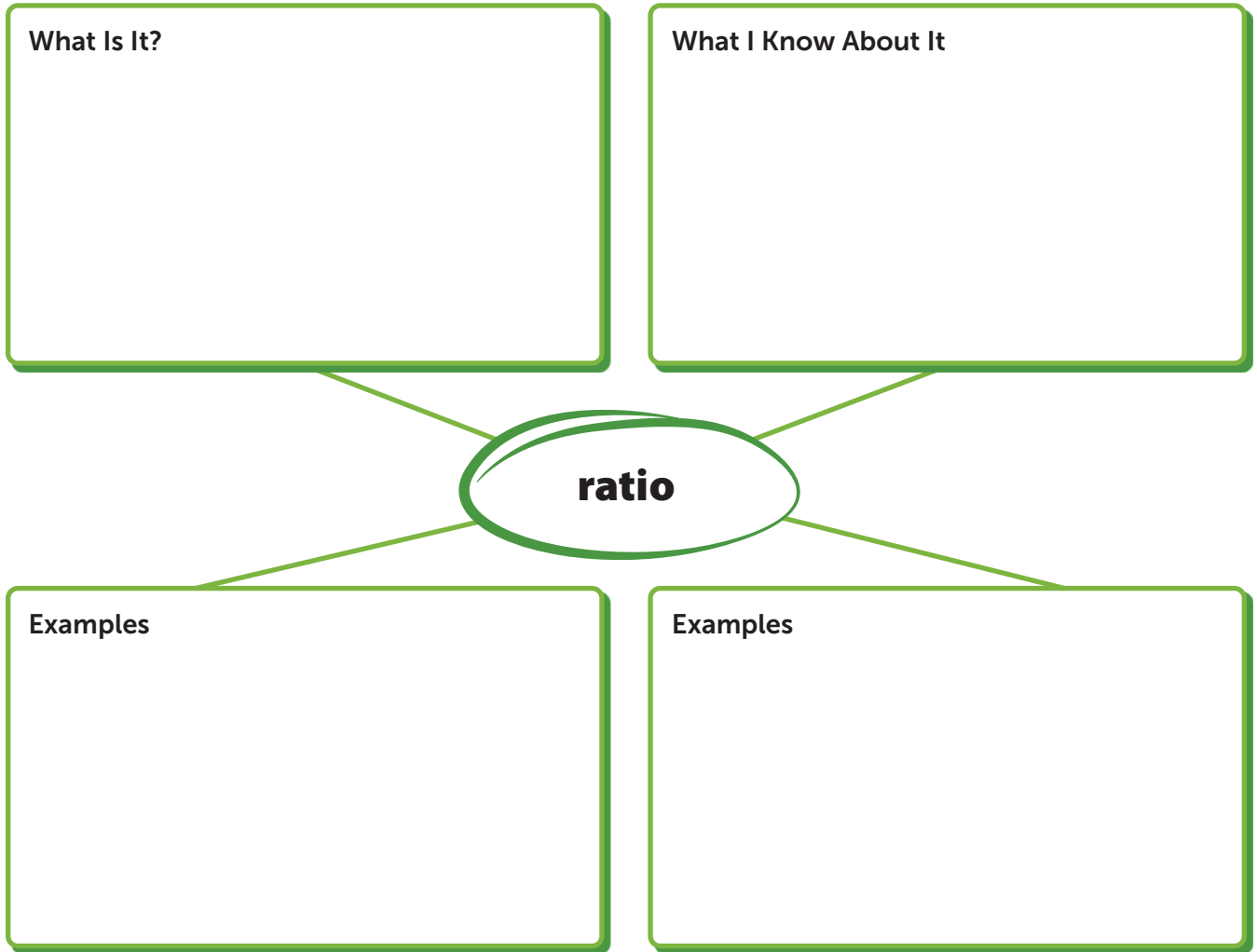
2 Write three different ratios to describe this model. What do each of your ratios represent?
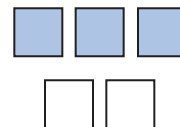
3 Dara is making salad dressing. The recipe calls for olive oil and vinegar to be mixed in the ratio 3 : 1.

a. Dara has 4 tbsp of vinegar. Based on the ratio of olive oil to vinegar being 3 : 1, how much olive oil does Dara need? Show your work.

SOLUTION

b. Check your answer to problem 3a. Show your work.

Develop Solving Ratio Problems Involving Parts and Wholes

➤ **Read and try to solve the problem below.**

Tessa and her grandmother are decorating Tessa's quinceañera dress using two types of beads. They plan to use a total of 900 beads arranged in the pattern shown. How many of each type of bead do they need?

rhinestone

pearl

TRY IT

✎ **Math Toolkit** connecting cubes, counters, double number lines, grid paper

DISCUSS IT

Ask: How did you use the total number of beads in your solution?

Share: In my solution, I . . .

Lesson 14 Use Part-to-Part and Part-to-Whole Ratios   **313**

➤ **Explore different ways to solve ratio problems involving parts and wholes.**

> Tessa and her grandmother are decorating Tessa's quinceañera dress using two types of beads. They plan to use a total of 900 beads arranged in the pattern shown. How many of each type of bead do they need?

rhinestone

pearl

Model It

You can use a tape diagram to model the relationship between the parts and the total.

The ratio of rhinestones to pearls is 1 : 5.

Rhinestones	1 part				
Pearls	1 part	1 part	1 part	1 part	1 part

Total: **900** beads **6** parts
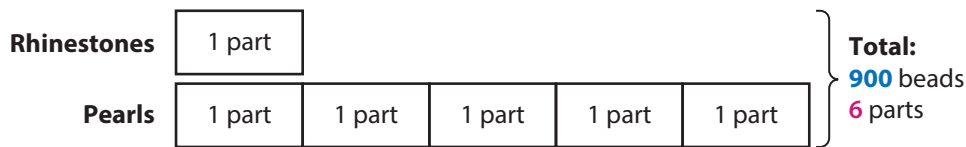
The **total number** of beads is equal to the **number of equal parts** times the **value of each part**. Divide to determine the value of each part.

$900 = 6 \times ?$

$900 \div 6 = 150$

There are **150** beads in each of the 6 parts.

Rhinestones	150				
Pearls	150	150	150	150	150

Total: **900** beads **6** parts
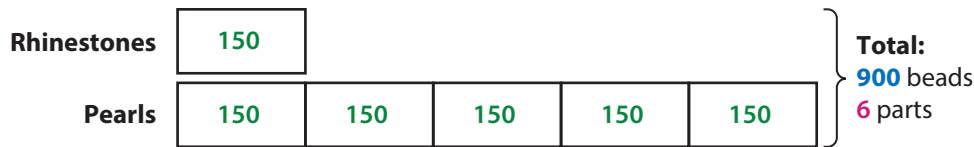
Model It

You can make a table of equivalent ratios to represent the relationship between the parts and the total.

Multiply to find an equivalent ratio.

Rhinestones	Pearls	Total Beads
1	5	6
?	?	900

× 150

➤ **Use the problem from the previous page to help you understand how to solve ratio problems involving parts and wholes.**

1 Look at the first **Model It**. How are the values 1, 5, and 6 represented?

2 How do you determine the value of each part of the tape diagram? How does knowing this value help you solve the problem?

3 Look at the second **Model It**. How does the table show the same relationship between the parts and the total as the tape diagram?

4 When using a table of equivalent ratios to solve the problem, how do you determine what number to multiply by? How is this number related to the tape diagram?

5 How many rhinestones and how many pearls do Tessa and her grandmother need for the dress? How can you check your answer?

6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

➤ **Use what you learned to solve these problems.**

7　A store is handing out scratch-off cards to its customers. For each card, a customer wins either a coupon or a free T-shirt. The ratio of coupon cards to T-shirt cards is 9 : 2. The store orders a total of 8,250 cards. How many of the cards are T-shirt cards? Show your work.

SOLUTION

8　Raúl is mixing a cleaning spray. The instructions say to combine 2 parts vinegar and 1 part water. Raúl wants to make 24 fl oz of the spray. How many fluid ounces of vinegar and how many fluid ounces of water should Raúl use? Show your work.

SOLUTION

9　Emily makes 75 pins to sell at the school craft fair. She has two designs: a star and a bumblebee. She makes 2 star pins for every 3 bumblebee pins. How many pins of each type does Emily make? Show your work.

SOLUTION

Practice Solving Ratio Problems Involving Parts and Wholes

➤ **Study the Example showing how to solve ratio problems involving parts and wholes. Then solve problems 1–5.**

Example

Mr. Ramírez uses a ratio of 1 part pork to 3 parts beef when he makes meatloaf. He needs 32 oz of meat. How many ounces of beef and how many ounces of pork does Mr. Ramírez need for his meatloaf?

You can use a tape diagram to relate the parts to the total.

Divide the **total amount** by the **number of equal parts** to find the **value of each part**.

32 oz $÷$ 4 $=$ 8 oz

Pork: $1 × 8$ oz $= 8$ oz

Beef: $3 × 8$ oz $= 24$ oz

1 part

Pork: 8 oz

Beef: 8 oz | 8 oz | 8 oz

3 parts

Total: 32 oz of meat, 4 parts
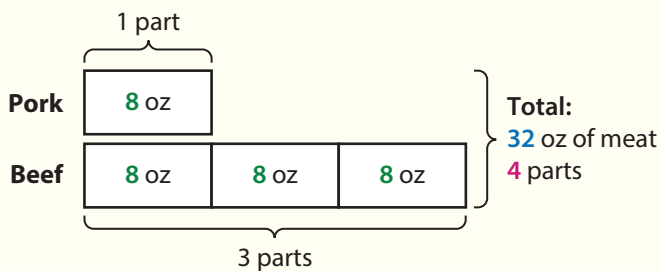
Mr. Ramírez needs 8 oz of pork and 24 oz of beef.

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1 Suppose Mr. Ramírez from the Example needs 40 oz of meat.

a. What changes would you need to make to the tape diagram?

b. How many ounces of pork and how many ounces of beef would Mr. Ramírez need for a meatloaf with 40 oz of meat?

2 A movie theater sells only adult tickets and child tickets. For one movie, the theater sells 126 tickets in all. The tape diagram shows the ratio of adult tickets to child tickets the theater sells. What does each square of the diagram represent?

Adult tickets

Child tickets

A 9 tickets

B 14 tickets

C 18 tickets

D 28 tickets

3 Indira finds that on a typical day, 4 out of every 5 students at her school eat a cafeteria lunch. The rest of the students bring their lunch from home. Indira's school has 495 students. On a typical day, how many students at her school bring their lunch from home? Show your work.

SOLUTION

4 Rhode Island Red chicks cost $3.20 each and Buckeye chicks cost $3.44 each. A farmer buys 4 Rhode Island Red chicks for every 3 Buckeye chicks. He buys 70 chicks in all. What is the total cost of the farmer's chicks? Show your work.

SOLUTION

5 A sixth-grade class collects 176 items for recycling. Three out of every eight items are cans, and the rest are bottles. How many bottles does the class collect? Show your work.

SOLUTION

Develop Comparing Ratios

➤ **Read and try to solve the problem below.**

Charlotte and Pablo are each making purple paint by mixing blue paint and red paint. Charlotte uses 1 cup of red paint for every 2 cups of blue paint. Pablo uses 2 cups of red paint for every 3 cups of blue paint. Whose paint is a bluer shade of purple?
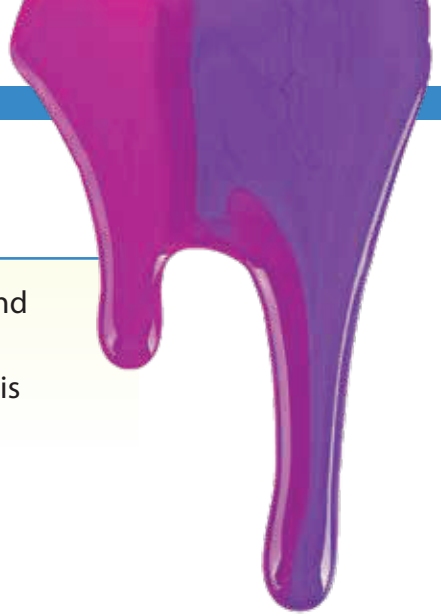
TRY IT

Math Toolkit connecting cubes, counters, double number lines, grid paper

DISCUSS IT

Ask: How are your models similar to mine? How are they different?

Share: My models are similar to yours because . . . They are different because . . .

➤ **Explore different ways to compare ratios.**

Charlotte and Pablo are each making purple paint by mixing blue paint and red paint. Charlotte uses 1 cup of red paint for every 2 cups of blue paint. Pablo uses 2 cups of red paint for every 3 cups of blue paint. Whose paint is a bluer shade of purple?

Model It

You can use part-to-part ratios to compare two ratios.

Charlotte	
Red (cups)	**Blue (cups)**
1	2
2	**4**
3	6
4	8
5	10
6	12

Pablo	
Red (cups)	**Blue (cups)**
2	**3**
4	6
6	9
8	12
10	15
12	18

Model It

You can use part-to-whole ratios to compare ratios.

Charlotte		
Red (cups)	**Blue (cups)**	**Total (cups)**
1	2	3
2	4	6
3	6	9
4	8	12
5	**10**	**15**
6	12	18

Pablo		
Red (cups)	**Blue (cups)**	**Total (cups)**
2	3	5
4	6	10
6	**9**	**15**
8	12	20
10	15	25
12	18	30

➤ **Use the problem from the previous page to help you understand how to compare ratios.**

1 Look at the ratios 2 : 4 and 2 : 3 in the first **Model It**. What quantity is the same in the ratios? How can the ratios help you compare the two shades of purple paint?

2 Look at the second **Model It**. Instead of listing all the batches shown, how could you use multiplication to find equivalent ratios with the same total amount?

3 Is Charlotte's paint or Pablo's paint a bluer shade of purple? Use either pair of tables to explain how you know.

4 To compare ratios, why is it helpful to find equivalent ratios in which one quantity in each ratio is the same?

5 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to compare ratios.

Apply It

➤ **Use what you learned to solve these problems.**

6 Darius and Khadija are learning to play chess. Darius's ratio of wins to losses is 2 to 13. Khadija's ratio of wins to losses is 3 to 17. Who has the better winning record? Explain how you know.

7 Arturo's food coloring uses the ratio 30 drops yellow to 27 drops blue. Ravi's food coloring uses the ratio 30 drops yellow to 24 drops blue. Linda says that Arturo's food coloring is yellower because 27 > 24. Do you agree? Explain.

8 Efia and Mora are mixing oils to make scented candles. Whose oil mixture has a stronger vanilla smell? Explain.

Scented Candle Ratios

Efia's oil	Mora's oil
12 parts vanilla to 8 parts lavender	10 parts vanilla to 6 parts lavender

Practice Comparing Ratios

➤ **Study the Example showing how to compare ratios. Then solve problems 1–5.**

Example

A science teacher makes two mixtures of red dye and water. Mixture A has 3 mL of red dye for every 20 mL of water. Mixture B has 4 mL of red dye for every 30 mL of water. Which mixture is redder?

You can use tables to find equivalent ratios with the same amount of water.

Mixture A	
Red Dye (mL)	Water (mL)
3	20
6	40
9	60

Mixture B	
Red Dye (mL)	Water (mL)
4	30
8	60
12	90

When both mixtures have 60 mL of water, Mixture A has more red dye than Mixture B. So, Mixture A is redder.

1 In the Example problem, how could you use multiplication to find equivalent ratios with the same amount of water?

2 Adsila's recipe for peach frozen yogurt says to mix 3 cups blended peaches for every 2 cups vanilla yogurt. Which of these frozen yogurt recipes has a stronger peach taste than Adsila's? Select all that apply.

A 5 cups blended peaches for every 3 cups vanilla yogurt

B 8 cups blended peaches for every 5 cups vanilla yogurt

C 9 cups blended peaches for every 6 cups vanilla yogurt

D 10 cups blended peaches for every 8 cups vanilla yogurt

E 14 cups blended peaches for every 10 cups vanilla yogurt

3 Ramón makes nectar for a hummingbird feeder by mixing 8 cups of water with 2 cups of sugar. Tiffany makes nectar by mixing 9 cups of water with 3 cups of sugar. Whose nectar is more sugary? Explain.

4 To make cherry trail mix, Sebastián needs 4 oz of nuts for every 3 oz of dried cherries. To make sunflower trail mix, he needs 5 oz of nuts for every 2 oz of sunflower seeds. Can Sebastián make more cherry trail mix or sunflower trail mix with 20 oz of nuts? Show your work.

SOLUTION

5 An artist combines copper and other metals to make bronze. A bronze sculpture of a dolphin contains 43 g of copper for every 7 g of other metals. A bronze sculpture of a bird contains 83 g of copper for every 17 g of other metals. Which sculpture is more coppery? Explain.

Refine Using Part-to-Part and Part-to-Whole Ratios

➤ **Complete the Example below. Then solve problems 1–9.**

Example

A pet store sells brown mice and white mice. The ratio of brown mice to white mice is 5 : 3. The store has 6 more brown mice than white mice. What is the total number of mice at the store?

Look at how you could show your work with tape diagrams.

2 parts represent 6 mice, so 1 part represents 3 mice.
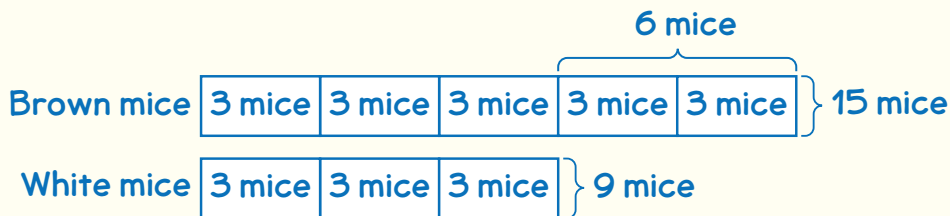
	6 mice	
Brown mice	3 mice | 3 mice | 3 mice | 3 mice | 3 mice	} 15 mice
White mice	3 mice | 3 mice | 3 mice	} 9 mice

SOLUTION _____

Apply It

1 Dawn is ordering 1 veggie sandwich for every 3 ham sandwiches. She needs 12 sandwiches in all. Veggie sandwiches cost $4.00 each, and ham sandwiches cost $4.50 each. How much will Dawn spend on sandwiches? Show your work.

SOLUTION _____

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2 In science class, students are mixing water and a citric acid solution. The table shows how much water and acid solution two students use. Whose mixture is more acidic? Show your work.

Student	Water (mL)	Acid Solution (mL)
Bao	26	4
Moses	17	3

SOLUTION

3 Amata mixes 2 parts black paint with 3 parts white paint to make 90 mL of gray paint. How much white paint does Amata use to make the gray paint?

A 18 mL

B 30 mL

C 45 mL

D 54 mL

José chose A as the correct answer. How might he have gotten that answer?

4 The graph shows the ratio of goals attempted to goals made for two soccer players, Andres and Deyvi. Which player has a better record of making goals? Explain how you know.

Soccer Goals
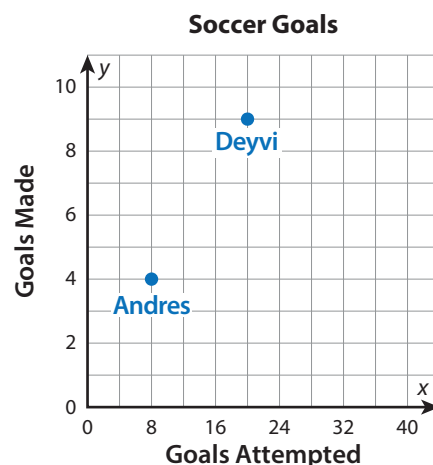
5 Kwame and Olivia each combine orange juice and mango juice. Kwame makes a total of 12 cups, and Olivia makes a total of 20 cups. Kwame uses less orange juice than Olivia, but his orange-mango juice tastes more like oranges than hers does. Give an example of the number of cups of each ingredient each person could have used. Explain your thinking.

6 There are 39 people on a city bus. The ratio of adults to children is 10 : 3. At the next stop, 3 adults get off the bus. What is the new ratio of adults to children on the bus?

A 3 : 1

B 9 : 2

C 7 : 3

D 12 : 1

39 people
10 : 3
adults : children

7 A box holds red pens and blue pens. The ratio of red pens to blue pens is 1 to 4. The box holds 12 more blue pens than red pens. What is the total number of pens in the box? Show your work.

SOLUTION

8 Lulu and Cece collect a total of 35 shells from the beach. At first, the ratio of Lulu's shells to Cece's shells is 5 : 2. Then Lulu gives 5 of her shells to Cece. Tell whether each statement is *True* or *False*.

	True	False
a. At first, Lulu has 25 shells.	○	○
b. After Lulu gives Cece 5 shells, Cece has 15 shells.	○	○
c. After Lulu gives Cece 5 shells, the ratio of Lulu's shells to Cece's shells is 5 : 3.	○	○

9 **Math Journal** In cooking class, Lupita and Jacob each make a mixture of basil and oregano. Lupita uses 2 tsp basil for every 3 tsp oregano. Jacob uses 4 tsp basil for every 5 tsp oregano. Lupita says the two mixtures will taste the same. Jacob says his will have a stronger basil taste than Lupita's. Who is correct? Explain.

✔ **End of Lesson Checklist**

☐ **INTERACTIVE GLOSSARY** Write a new entry for *determine*. Write at least one synonym for *determine.*

☐ **SELF CHECK** Go back to the Unit 3 Opener and see what you can check off.