Lesson 1
Ratios

CCSS Focus

Domain
Ratios and Proportional Relationships

Cluster
A. Understand ratio concepts and use ratio reasoning to solve problems.

Standard
6.RP.A.1 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."*

Standards for Mathematical Practice (SMP)
4 Model with mathematics.

6 Look for and make use of structure.

Lesson Objectives

Content Objectives
- Understand the concept of a ratio as a way of expressing relationships between quantities.
- Write a ratio to describe the relationship between two quantities.
- Write a ratio using three different formats: a to b, $\frac{a}{b}$, $a:b$.

Language Objectives
- Explain how a visual model and a ratio represent a problem situation orally and in writing.
- Use the phrases *for every, each,* and *per* to describe ratio relationships.
- Explain solution strategies using complete sentences. Listen to and understand the solution strategies of others.
- Describe the reasoning that may have led to incorrect answers to ratio problems in writing.
- Understand and use the term *ratio* accurately in speaking and writing.

Prerequisite Skills

- Compute with whole numbers and fractions.
- Understand equivalent fractions.

Lesson Vocabulary

- **ratio** a way to compare two different quantities.

Review the following key terms.
- **affect** cause something to change in some way.
- **at least** a certain amount or more.
- **each** one; for one thing.
- **expression** one or more numbers, unknown numbers, and/or operation symbols that represents a quantity.

Learning Progression

In Grade 6 students develop the concept of ratio and rate reasoning. They apply an understanding of fractions and of multiplication and division developed in previous grades as they work with ratios.

In this lesson students learn to use ratios to compare part to whole as well as part to part. They express ratios both with words and with symbols. **Later in Grade 6** students learn to use rates, unit rates, equivalent ratios, and percents to solve various kinds of everyday problems.

In Grade 7 students focus on proportions and proportional reasoning. They solve ratios with complex fractions and use equations to solve problems involving proportional relationships.

Lesson Pacing Guide

Whole Class Instruction

Use the Ratios slides in the Teacher Toolbox for the Think-Share-Compare routine.

Day 1
45–60 minutes

Toolbox: Interactive Tutorial*
Concept of Ratio

Introduction
• Use What You Know *20 min*
• Find Out More *20 min*
• Reflect *5 min*

Practice and Problem Solving
Assign pages 3–4.

Day 2
45–60 minutes

Modeled and Guided Instruction
Learn About Comparing Quantities Using Ratios
• Picture It/Model It *15 min*
• Connect It *20 min*
• Try It *10 min*

Practice and Problem Solving
Assign pages 5–6.

Day 3
45–60 minutes

Guided Practice
Practice Comparing Quantities Using Ratios
• Example *10 min*
• Problems 9–11 *20 min*
• Pair/Share *5 min*
• Solutions *10 min*

Practice and Problem Solving
Assign pages 7–8.

Day 4
45–60 minutes

Independent Practice
Practice Comparing Quantities Using Ratios
• Problems 1–6 *25 min*
• Quick Check and Remediation *10 min*
• Hands-On or Challenge Activity *10 min*

Toolbox: Lesson Quiz
Lesson 1 Quiz

Small Group Differentiation

Teacher-Toolbox.com

Reteach
Ready Prerequisite Lessons *45–90 min*

Grade 4
• Lesson 23 Convert Measurements
Grade 5
• Lesson 15 Understand Multiplication as Scaling
• Lesson 20 Analyze Patterns and Relationships

Teacher-led Activities
Tools for Instruction *15–20 min*

Grade 6
• Write Ratios

Personalized Learning

i-Ready.com

Independent
i-Ready Lessons* *15–20 min*

Grade 6
• Concept of Ratio

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Prepare for Day 1: Use with *Reflect*

Academic Vocabulary: *Affect* means "to change in some way."

ELP Levels 1–3	ELP Levels 2–4	ELP Levels 4–5
Reading/Writing Use the *Three Reads* routine, reading the problem aloud and clarifying the meaning of the Academic Vocabulary word *affect* as needed. For the third read, display and label the key quantities as students identify them: tennis balls, baseballs, and the total number of balls with and without the basketball. After students write the ratios, provide these frames for written responses about the effect of adding the basketball. • The basketball affects the total/the whole. • The basketball does not affect the ratio of tennis balls to baseballs. • The basketball does affect the ratio of the total to tennis balls.	**Reading/Writing** Use the *Three Reads* routine to help students identify the question and key quantities in *Reflect*. Call on pairs to explain the question and the important quantities before having students write the ratios independently. Then, ask partners to discuss the effect of adding the basketball before answering the last question in writing. Provide frames: • The basketball affects the total/the whole. • The basketball does not affect the ratio of tennis balls to baseballs because it is a part-to-part ratio and does not include the whole. • The basketball does affect the ratio of the total to tennis balls because the new total is greater.	**Reading/Writing** Use the *Three Reads* routine to help students identify the question and key quantities in *Reflect*. Have them write the ratios independently and then compare responses with a partner. Then, have students discuss with a partner how the addition of the basketball affects the ratios before writing their explanations independently. Challenge students to use "part to part," "part to whole," or "whole to part" to express their reasoning about why the ratio is or is not affected by the addition of the basketball.

Prepare for Day 2: Use with *Try It*

Academic Vocabulary: The phrase *at least two* means "two or more."

ELP Levels 1–3	ELP Levels 2–4	ELP Levels 4–5
Reading/Writing Display *Try It* problem 7 and read it aloud, pointing to the quantities. Clarify the meaning of *each* and ask students to describe the situation in their own words. Then, clarify the meaning of "at least two" and ask students to explain what the problem asks them to do. Read the description of the first ratio aloud. Ask students to name the quantities and state the ratio in a complete sentence before writing it in at least two ways: • The quantities are Miss Garcia's sales and the goal. • The ratio of Miss Garcia's sales to the goal is 87 to 100. Continue in the same way with the other two ratios.	**Reading/Writing** Have students partner-read *Try It* problem 7. Call on pairs to explain the situation and name the quantities. Ask a volunteer to explain the task. Ensure that students understand the meaning of "at least two." Ask partners to work together to read the description of the ratio, name the quantities, and state each ratio in complete sentences, using frames as needed: • The quantities are _____ and _____. • The ratio of _____ to _____ is _____. When partners agree, each student should then write the ratio in at least two ways. Circulate and provide help as needed.	**Reading/Writing** Have students read *Try It* problem 7 independently. Then, call on volunteers to explain the situation and the task in their own words. If needed, clarify the meaning of "at least two." Have students complete the *Try It* problems independently and compare answers with a partner. When partners agree that the ratios they have written are correct, ask them to state the ratios to one another in complete sentences.

Prepare for Day 3: Use with *Example* and *Pair/Share*

ELP Levels 1–3

Reading/Writing Read the *Example* aloud. Ask students to explain the diagram by pointing to quantities in the problem and the corresponding parts of the diagram. Have them explain the diagram in complete sentences, for example, "There are 5 peaches and 5 parts of the diagram with a P." Read the example solution and ask students to repeat chorally. Before *Pair/Share*, be sure students understand sharing equally. Point to the *if* clause. Explain that it tells something the reader should assume is true. Offer frames for responses:

- The fruit is shared equally. So, each student will receive $1\frac{1}{2}$ pieces of fruit.
- We found the solution by _____ .

ELP Levels 2–4

Reading/Writing Have students partner-read the *Example* and identify the number of apples, peaches, pieces of fruit, and students. Help students explain how the tape diagram represents the problem. Call on students to read the sample solution aloud. Then, ask pairs to work on the *Pair/Share*, using any method to find a solution. If needed, review that clauses beginning with *if* often tell something the reader should assume is true. Offer frames for pairs to share responses with the class:

- If the fruit is shared equally, each student will receive $1\frac{1}{2}$ pieces of fruit.
- We found the solution by _____ .

ELP Levels 4–5

Reading/Writing Have students read the *Example* independently. Call on students to show how each quantity in the problem is represented in the tape diagram.

Ask partners to work together on the *Pair/Share* question, using any method to find a solution. When most students have found a solution, challenge them to use the wording of the *Pair/Share* question in a complete sentence that answers the problem. Then, call on partners to share their solution strategies with the class using complete sentences.

👥 Introduction

At A Glance

Students read a problem involving making comparisons using ratios. They write both part-to-whole and part-to-part comparisons. Then they learn about different types of ratios and ratio phrases and notation.

Step By Step

- Work through **Use What You Know** as a class.
- Tell students that this page models how to write comparisons of different quantities.
- Have students read the problem at the top of the page.

▶ Visual Model

- Point out the different ways to write ratios: fraction bar, the word *to*, and the colon.
- Ask student pairs or groups to explain their answers for the ratios they wrote.
- Discuss the last question. Which notation format do students find easiest to understand? Can they think of situations in which one format might be easier to use than another?

▶ Real-World Connection

Lesson 1 👥 Introduction
Ratios

🅖 Use What You Know

You already know that a fraction is a way to compare a part to a whole. Take a look at this problem.

Carlos has 4 tennis balls and 5 baseballs.

How can you compare the number of each type of ball to the total number of balls? How can you compare the number of one type to the number of the other type?

Use the math you already know to solve the problem.

a. What fraction of the balls are tennis balls? $\dfrac{4}{9}$

b. What fraction of the balls are baseballs? $\dfrac{5}{9}$

c. You can also compare two quantities with the word *to*. You can write the comparison of the number of tennis balls to the total number of balls as *4 to 9*. Use the word *to* to write a comparison of the number of baseballs to the total number of balls.

   Compare: 5 baseballs to 9 total balls

d. You can also use a colon (:) to compare numbers. Use a colon to compare the number of tennis balls to the total. Then use a colon to compare the number of baseballs to the total. **4:9 and 5:9**

e. How does each of these expressions, $\dfrac{4}{9}$, 4 to 9, and 4:9, compare the number of tennis balls to the total number of balls?

   Each notation first tells the number of tennis balls and then tells the number

   of total balls. A symbol or word separates the two numbers.

4

▶ Visual Model
Use circles to show ratios.

Materials: two colors of chalk

- Write *4 tennis balls : 5 baseballs* on the board. Underneath, draw 4 yellow circles and 5 white circles separated with a colon to illustrate the ratio. Have students describe how the words and the pictures are related.
- Sketch 7 white circles and 3 yellow circles separated by a colon. Choose a volunteer to write the ratio using three different notations.
- Sketch 4 yellow circles and 2 white circles separated by a colon. Call on another volunteer to write the ratio using three different notations.
- Have volunteers come to the board and sketch their own ratios using pictures. Have them call on classmates to name the ratio illustrated.

▶ Real-World Connection
Consider how people use ratios in the real world.

Discuss with the class ways in which workers might use ratios in their jobs and ways the students might. Ask: *What are ratios teachers might use when describing classrooms or schools? Truck drivers when describing their job? What are ways you might use ratios?*

Teachers: markers compared to students, minutes students are in class compared to at lunch, teachers in school compared to students in school

Truck drivers: miles traveled compared to gallons of gas used, miles traveled compared to hours driving, cost of a load compared to weight

Students: miles walked compared to minutes, hours on the Internet compared to hours in a day

⏩ Find Out More

A **ratio** is a way to compare two different quantities.

Sometimes you compare the two parts.	Sometimes you compare the part and the whole amount.
4 tennis balls to 5 baseballs	4 tennis balls to 9 balls
5 baseballs to 4 tennis balls	5 baseballs to 9 balls

To write a ratio you can use the word *to,* a colon, or a fraction bar. The expressions **4 to 5**, **4:5**, and $\frac{4}{5}$ all represent the ratio of **4** compared to **5**.

There are many ways to compare the numbers of balls.

Part to Part	Part to Whole	Whole to Part
tennis balls to baseballs 4 to 5 4:5 $\frac{4}{5}$	tennis balls to total balls 4 to 9 4:9 $\frac{4}{9}$	total balls to tennis balls 9 to 4 9:4 $\frac{9}{4}$
baseballs to tennis balls 5 to 4 5:4 $\frac{5}{4}$	baseballs to total balls 5 to 9 5:9 $\frac{5}{9}$	total balls to baseballs 9 to 5 9:5 $\frac{9}{5}$

You can also use the phrases "for each" and "for every" to describe ratios. For example:

4 tennis balls for every 5 baseballs.

4 tennis balls for each set of 5 baseballs.

▶ Reflect

1 Suppose Carlos was given a basketball. What is the ratio of tennis balls to baseballs? **4:5** What is the ratio of total balls to tennis balls? **10:4** Compare the ratios before Carlos got the basketball and after he got it. How did the basketball affect the ratios?

Sample answer: The new ball does not affect the part-to-part ratio but it does
change the whole-to-part ratio because the total changes.

5

Step By Step

- Read **Find Out More** as a class.
- Discuss the difference between part-to-whole and part-to-part comparisons.

▶ Mathematical Discourse 1 and 2

- Write the three types of notation on the board. Emphasize that all three mean "compared to."
- Examine the table which illustrates types of ratios and types of notation. Point out that another way to think about ratios is by using the phrases *for each* and *for every*.

▶ English Language Learners

- Discuss **Reflect** with students. Emphasize that the additional ball affects only the whole-to-part ratio.

> **SMP TIP   Attend to Precision**
> When students use standard notation to express ratios, they are attending to precision. It is important to continue to model standard notation and terminology throughout the year so that students can communicate concisely and accurately when talking about mathematics. *(SMP 6)*

📘 Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 3–4** after students have completed this section.

▶ English Language Learners

- Write *part* and *whole* on the board. Have volunteers explain the difference between the two terms.
- Show 3 red pens and 2 blue pens. Say: *One part is 3 red pens. Another part is 2 blue pens. The whole is 5 pens.*
- Ask students to use other classroom objects to model the terms *part* and *whole*.

▶ Mathematical Discourse

1 *Sometimes people talk about part-to-whole and part-to-part comparisons. What do you think they mean?*

Students should use their own words to explain that *part-to-whole* means "comparing the number in a category with the total number within that same category." *Part-to-part* means "comparing the number in one category with the number in another category."

2 *What is an example of a part-to-whole comparison? A part-to-part comparison? Explain your examples.*

Students' examples will vary. Encourage them to justify their choices.

👥 Modeled and Guided Instruction

At A Glance

Students read a problem concerning ratios and study different ways to model it. They revisit the problem on this page and use ratios to describe the relationships among quantities.

Step By Step

- Read the problem at the top of the page as a class. Use the **Think-Share-Compare** routine to guide students to generate solution strategies and discuss select approaches as well as the representations in the **Picture It** and **Model It**.

Picture It

- Look at **Picture It**. Talk about how the diagram makes it easy to compare the amounts of each ingredient.

Model It

- Study the tape diagram in **Model It**. Have students compare and contrast it with the other diagram.

> **SMP TIP Model with Mathematics**
> Students learn to model with mathematics when they use diagrams to help them understand a problem. Throughout the unit, encourage students to sketch diagrams to help them visualize problems they do not understand well. *(SMP 4)*

▶ **Mathematical Discourse 1 and 2**

Learn About ▸ **Comparing Quantities Using Ratios**

Read the problem below. Then explore different ways to compare quantities using diagrams and ratios.

> Chris mixes 4 cups of cereal, 3 cups of pecans, and 2 cups of raisins to make a snack mix. How can you compare the quantities of each ingredient and the total amount of snack mix?

▶ **Picture It** You can use a diagram to represent the information in the problem.

Cereal   Pecans   Raisins

▶ **Model It** You can use a tape diagram to help you see how the amounts of ingredients compare to one another and to the total amount.

To show how the ingredients compare, represent each cup with a rectangle. Then line up the rectangles for each ingredient in a row.

Cereal

Pecans

Raisins

Total mix

6
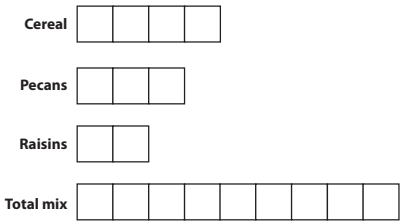
▶ **Mathematical Discourse**

1 *Which diagram helps you understand the problem the best? Explain why.*

Students' explanations should involve explaining which diagram makes it easier to compare the amounts.

2 *What are some other ways you could illustrate the situation?*

Students' responses will vary. Have volunteers show their ways on the board. One example: Draw three equal number lines marked off in 1s. Darken the line from 0 to the number of cups for each ingredient. Compare the lengths.

Connect It Now you will solve the problem from the previous page using ratios to compare the quantities.

2 What are three ways to write the ratio of cups of cereal to cups of pecans?

4 to 3, 4:3; $\frac{4}{3}$

3 Does the ratio of cereal to pecans compare part to part, part to whole, or whole to part? part to part

4 Write ratios to compare the amount of each ingredient to the total amount of snack mix. cereal to total: 4 to 9, pecans to total 3 to 9, raisins to total 2 to 9

5 Explain how you can write a ratio to compare two different quantities.

Sample answer: You find the quantities that you want to compare and then write a comparison using the word to, using a :, or using a fraction bar. The order of the quantities should match the order of the numbers.

Try It Use what you learned about writing ratios to solve these problems.

6 Leo blew up 7 balloons. Kathy blew up 5 balloons. Write each ratio in at least two different ways.

ratio of Kathy's balloons to Leo's balloons 5 to 7; 5:7; $\frac{5}{7}$

ratio of Leo's balloons to Kathy's balloons 7 to 5; 7:5; $\frac{7}{5}$

ratio of total balloons to Leo's balloons 12 to 7; 12:7; $\frac{12}{7}$

7 Each class has the goal of selling 100 tickets to the school carnival. Miss Garcia's class sells 87 tickets. Mr. Carpenter's class sells 113 tickets. Write each ratio in at least two different ways.

ratio of Miss Garcia's sales to the goal 87 to 100; 87:100; $\frac{87}{100}$

ratio of Mr. Carpenter's sales to the goal 113 to 100; 113:100; $\frac{113}{100}$

ratio of Mr. Carpenter's sales to Miss Garcia's sales 113 to 87; 113:87; $\frac{113}{87}$

7

▶ Concept Extension

Explore how ratios change when the quantities being compared change.

- Have students look at the diagrams on the previous page. Say that Chris changed his mind and only used 1 cup of raisins but added 2 cups of chocolate candy. Have students describe how the diagrams would change. [cereal would remain the same at 4; pecans would remain at 3; raisins would reduce to 1; new cups or tape would be added for 2 candies]

- Have students find each of these ratios and compare them with the ratios from the original problem: cereal : pecans   cereal : total   total : raisins.

- Discuss which ratios changed and which did not. Have students explain why. [Any part-to-whole or whole-to-part ratio changed because the total number of ingredients changed from 9 to 10.]

Step By Step

Connect It

- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.

- Review the three types of notation that can be used to write ratios. Talk about the differences between part-to-part, part-to-whole, and whole-to-part.

- Have students share their answers to the remaining questions. Have them justify the thinking that leads to their answers.

- Have students complete **Try It** on their own. Then ask volunteers to write their answers on the board. Encourage students to write their ratios in different ways. Discuss any questions or misconceptions that become evident.

▶ Concept Extension

Try It

6 **Solution**
5 to 7, 5:7, or $\frac{5}{7}$; 7 to 5, 7:5, or $\frac{7}{5}$; 12 to 7, 12:7, or $\frac{12}{7}$; Students may use any 2 of the 3 ways to show each ratio.

7 **Solution**
87 to 100, 87:100, or $\frac{87}{100}$; 113 to 100, 113:100, or $\frac{113}{100}$; 113 to 87, 113:87, or $\frac{113}{87}$; Students may use any 2 of the 3 ways to show each ratio.

Error Alert Students who wrote 87 to 200 for the ratio of Miss Garcia's sales and the goal used the total number of tickets sold by the two classes instead of the goal.

Ready Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 5–6** after students have completed this section.

Guided Practice

At A Glance

Students use models and ratio notation to compare quantities.

Step By Step

- Ask students to solve the problems individually using standard ratio notations.
- **Pair/Share** When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group.

Solutions

Example Another way to solve the problem is to compute numerically: $5 + 4 = 9$, ratio of fruit to students is 9:6.

8 Solution

Possible answers: 4 to 3, 4:3, $\frac{4}{3}$; Students could also use phrases *4 for every 3* or *4 for each 3*.

DOK 1

Practice **Comparing Quantities Using Ratios**

Study the example below. Then solve problems 8–10.

Example

Ahmad's mom prepares a plate with 5 peaches and 4 apples for the 6 students in Ahmad's study group. What is the ratio of fruit to students?

Look at how you could show your work using a diagram.

Fruits	P	P	P	P	P	A	A	A	A

Students	S	S	S	S	S	S

Solution Add $5 + 4 = 9$; there are 9 pieces of fruit in all. There are 6 students. The ratio of fruit to students is 9 to 6. The ratio can also be written as 9:6 and $\frac{9}{6}$.

> The student used a tape diagram to show the total pieces of fruit and the number of students in the study group.

> **Pair/Share**
> If the students shared all of the fruit equally, how many pieces would each student receive?

8 Kaya received these ribbons at swim meets. What is the ratio of first-place ribbons to third-place ribbons?

> Are you looking for a part-to-part, a part-to-whole, or a whole-to-part ratio?

> **Pair/Share**
> Suppose Kaya won two more second-place ribbons. How would the ratio change?

Solution Possible answers: 4 to 3, 4:3, $\frac{4}{3}$, 4 for every 3

8

Teacher Notes

9 Ms. Powell's class voted on where to go for a field trip. The museum received 11 votes, and 16 students voted to go to the aquarium. Use numbers and words to write the ratio of votes for the aquarium to votes for the museum.

> Remember to pay close attention to the order of the quantities in the ratio.

Solution Possible answers: 16 aquarium votes for every 11 museum votes or 16 aquarium votes for each 11 museum votes

> **Pair/Share**
> Suppose 3 students who voted to go to the aquarium changed their votes to the museum. How would the ratio change?

10 Donnie's dog had a litter of puppies. He notices that 2 are brown, 1 is white, and 3 are spotted. What is the ratio of total puppies to brown puppies? Circle the letter of the correct answer.

A 2:6

B 2:4

C 4:2

D 6:2

> What are the two quantities that need to be included in the ratio?

Anya chose **A** as the correct answer. How did she get that answer?

She added to find that there are 6 puppies. She compared the 2 brown puppies to the total 6 instead of comparing the total to the brown puppies.

> **Pair/Share**
> What are some other ratios you can write with the information given in the problem?

9

Solutions

9 Solution
Possible answers: 16 to 11, or 16:11, or 16 aquarium votes for every 11 museum votes, or 16 aquarium votes for each 11 museum votes.
DOK 1

10 Solution
D; Anya mistakenly compared part to the whole.
Explain to students why the other two answer choices are not correct:
B is not correct because it compares brown puppies to the other puppies.
C is not correct because it compares the other puppies to brown puppies.
DOK 3

Ready® Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 7–8** after students have completed this section.

Teacher Notes

Independent Practice

At A Glance

Students write ratios to solve word problems that might appear on a mathematics test.

Solutions

1 **Solution**

C; Find the diameters of the large and medium pizzas and compare them using ratio notation.

DOK 1

2 **Solution**

B; Conclude that *three times as many* means a ratio of 3 parts to 1 part and that the whole is 4. Then compare 3 parts to the whole using ratio notation.

DOK 1

3 **Solution**

a. True; **b.** False; **c.** False; **d.** True

DOK 1

Practice **Comparing Quantities Using Ratios**

Solve the problems.

1 Percy's Pizza Parlor sells three sizes of pizza. What is the ratio of the diameter of the large pizza to the diameter of the medium pizza?

Size	Diameter
Small	11 in.
Medium	14 in.
Large	17 in.

A 14 to 17

B 17:11

C $\frac{17}{14}$

D 3:14

2 Rita reads 3 times as many fiction books as non-fiction books. What is the ratio of fiction books to total books?

A 1:4

B 3 to 4

C 4 to 3

D 3:1

3 The ratio of girls to boys in a student basketball league is 5:6. Choose *True* or *False* for each statement.

		True	False
a.	For every 5 girls in the league, there are 6 boys.	☒ True	☐ False
b.	For every 6 girls in the league, there are 5 boys.	☐ True	☒ False
c.	There are exactly 11 students in the league.	☐ True	☒ False
d.	The ratio of girls to total students in the league is 5:11.	☒ True	☐ False

10

Quick Check and Remediation

- Ask students to find the ratio of dogs to cats and cats to pets if a family has 2 cats, 1 dog, and 4 parakeets. [1:2 and 2:7]
- For students who are struggling, use the chart to guide remediation.
- After providing remediation, check students' understanding. Ask students to find the ratio of dogs to cats and dogs to pets if a family has 1 cat, 3 dogs, and 3 parakeets. [3:1 and 3:7]

If the error is . . .	Students may . . .	To remediate . . .
2:1 and 2:7	have found the ratio of cats to dogs.	Stress that the order is important in ratios. Have students note that they are to find the ratio of dogs to cats.
1:2 and 2:5	have found the ratio of cats to the other pets instead of total pets.	Point out that the word *pets* means all the animals, which includes the cats.
1:7 and 2:7	have found the ratio of dogs to pets instead of cats.	Have students describe the first ratio they are trying to find and note that it should be a part-to-part ratio.

4 Of the 15 children at the park, 12 children are riding bicycles and 3 children are riding scooters. Which ratio is correct? Circle all that apply.

A The ratio of bicycles to scooters is 12 to 3.

B The ratio of scooters to children is 3 to 15.

C The ratio of bicycles to children is 12 to 15.

D The ratio of scooters to children is 9 to 12.

E The ratio of bicycles to children is 12 to 3.

5 Haley buys 8 apples for $3 and 3 bananas for $1. What is the ratio of the number of pieces of fruit she buys to the total dollars she spends? Write the answer in at least 2 different ways.

Answer ___11 to 4, 11:4, or $\frac{11}{4}$___

6 In the talent show, 6 students plan to sing, 7 students plan to dance, and 2 students plan to tell jokes. Rick said that the ratio of singers to joke-tellers is 6 to 2. Leah said that the ratio of joke-tellers to singers is 1 to 3. Who is correct? Explain why.

Possible answer: They are both correct. They compared singers to joke-tellers in a different order, but in each ratio the number of singers is 3 times the number of joke-tellers.

✔ **Self Check** Go back and see what you can check off on the Self Check on page 1.

11

Solutions

4 **Solution**

A; Find the number of scooters and the total number of children and compare them using ratio notation.

B; Find the number of children riding scooters and the total number of children and compare them using ratio notation.

C; Find the number of children riding bicycles and the total number of children and compare them using ratio notation.

DOK 1

5 **Solution**

11 to 4, 11:4, or $\frac{11}{4}$; Students should write the ratio in at least two different ways.

DOK 2

6 **Solution**

Both are correct; students could say the order of the words is different, so the order of the numbers must be different, and that one of the ratios is simplified.

DOK 3

▶ Hands-On Activity

Write part-to-part and part-to-whole ratios.

Materials: 8 to 12 pennies for every pair of students

Give each pair of students several pennies. Have the students flip the pennies and separate them into a row of heads and a row of tails. They should record the number of heads and tails in a table similar to the one shown. Then have them write the ratios. Have the students flip the pennies several more times, recording the results and writing the ratios each time.

Heads	Tails	Heads: Tails	Tails: Heads	Heads: Coins	Tails: Coins

▶ Challenge Activity

Explore three-part ratios.

Draw 3 circles, 2 triangles, and 4 rectangles on the board. Tell students that they can write three-part ratios using a colon or the word *to*. Give examples such as these.

triangles : circles : rectangles	rectangles to circles to triangles
2 : 3 : 4	4 to 3 to 2

Point out that the part-to-whole ratios will still be two-part ratios.

triangles : shapes	rectangles to shapes	$\frac{circles}{shapes}$
2 : 9	4 to 9	$\frac{3}{9}$

Write *4 apples, 5 bananas, and 2 grapefruit* on the board. Instruct students to write 3 three-part ratios comparing part to part to part and 3 two-part ratios comparing part to whole. Ask them to write each ratio using words and then using numbers. Remind them to use proper ratio notation.

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Overview

Assign the Lesson 1 Quiz and have students work independently to complete it.

Use the results of the quiz to assess students' understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson for suggested instructional resources.

Tested Skills

Assesses 6.RP.A.1

Problems on this assessment form require students to be able to understand the concept of a ratio, identify ratios that are part-to-part and part-to-whole, and write a ratio using three different formats (a to b, $\frac{a}{b}$, $a{:}b$) to describe the relationship between two quantities. Students will also need to be familiar with computing with whole numbers and fractions.

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Lesson 1 Quiz

Solve the problems.

1 A recipe uses 5 cups of water, 3 cups of rice, and 1 cup of black beans. What is the ratio of cups of rice to cups of water?

  A 3:9

  B 5 to 3

  C 1 to 3

  D 3:5

2 Nora has a flower arrangement with 7 pink flowers, 9 purple flowers, and 5 white flowers. Write a word from the box in each blank to compare the quantities using ratios. Answer choices may be used more than once.

pink	purple	white	total

The ratio of _____ flowers to _____ flowers is $\frac{5}{9}$.

The ratio of _____ flowers to _____ flowers is 9 to 21.

The ratio of _____ flowers to _____ flowers is 21:7.

3 Lisa goes to school 7 hours per day, works 3 hours per day, and sleeps for 8 hours per day. What is the ratio of hours Lisa works to hours Lisa sleeps?

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Lesson 1 Quiz continued

4 Nicole is making carrot bread. She needs 5 cups of carrots for every 2 cups of sugar. What is the ratio of cups of sugar to cups of carrots that Nicole will need? Write the ratio in three different ways.

_____ _____ _____

5 In a city, there are 11 public and 5 private swimming pools. On weekends, 6 of the pools are open. George says that the ratio of pools open on weekends to the total number of pools is 6:11. Emma says the ratio of pools open on weekends to the total number of pools is 6:22.

Is either student correct? Explain.

_____

_____

_____

_____

_____

Common Misconceptions and Errors

Errors may result if students:

• reverse the order of the quantities in a ratio.

• use a total instead of a part for a part-to-part ratio.

• use a part instead of a total for a part-to-whole ratio.

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Lesson 1 Quiz Answer Key

1. D
   DOK 1

2. white, purple
   purple, total
   total, pink
   DOK 2

3. $\frac{3}{8}$
   DOK 1

4. 2 to 5
   2:5
   $\frac{2}{5}$
   DOK 1

5. Neither student is correct. Possible explanation: There are 6 pools open on the weekend out of the 16 total pools. The ratio is 6:16.
   DOK 3