

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.

- What fraction of the balls are tennis balls? _____
- What fraction of the balls are baseballs? _____
- 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.

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

Find Out More

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

Sometimes you compare the two parts.

4 tennis balls to 5 baseballs

5 baseballs to 4 tennis balls

Sometimes you compare the part and the whole amount.

4 tennis balls to 9 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? _____ What is the ratio of total balls to tennis balls? _____ Compare the ratios before Carlos got the basketball and after he got it. How did the basketball affect the ratios?

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.



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	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>								
Pecans	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>								
Raisins	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>								
Total mix	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>								

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?

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

4 Write ratios to compare the amount of each ingredient to the total amount of snack mix. _____

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

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 _____

ratio of Leo's balloons to Kathy's balloons _____

ratio of total balloons to Leo's balloons _____

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 _____

ratio of Mr. Carpenter's sales to the goal _____

ratio of Mr. Carpenter's sales to Miss Garcia's sales _____

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 _____

- 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 _____



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?

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



Pair/Share

What are some other ratios you can write with the information given in the problem?

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.
- | | | |
|---|-------------------------------|--------------------------------|
| 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 |

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 _____

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.

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