



Lesson 7: Associated Ratios and the Value of a Ratio

Student Outcomes

- Students understand the relationship between ratios and fractions. Students describe the fraction $\frac{A}{B}$ associated with the ratio $A : B$ as the value of the ratio A to B .
- Students understand that when given a ratio $A : B$, different ratios can be formed from the numbers A and B . For example, $B : A$, $A : (A + B)$, and $B : (A + B)$ are associated with the same ratio relationship.

Classwork

Example 1 (2 minutes)

Direct students to select an answer to the question posed by Example 1 in their student materials.

Example 1

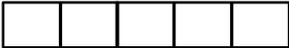
Which of the following correctly models that the number of red gumballs is $\frac{5}{3}$ the number of white gumballs?

a.	Red	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	b.	Red	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	White	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		White	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
c.	Red	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	d.	Red	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	White	<input type="checkbox"/> <input type="checkbox"/>		White	<input type="checkbox"/>

Poll students and host a discussion encouraging students to express their reasoning about their choices. Ideally, the students can come to a consensus that (b) is the correct answer without teacher direction. Provide an additional example if needed before moving on.

Example 2 (5 minutes)

Example 2
 The duration of two films are modeled below.

Film A 

Film B 

a. The ratio of the length of Film A to the length of Film B is **5:7**.

b. The length of Film A is $\frac{\boxed{5}}{\boxed{7}}$ of the length of Film B.

c. The length of Film B is $\frac{\boxed{7}}{\boxed{5}}$ of the length of Film A.

Exercise 1 (10 minutes)

Have students work the following problem independently and then compare their answers with a neighbor’s answer. Encourage discussion among the pairs of students or among students who arrived at different answers.

Exercise 1
 Sammy and Kaden went fishing using live shrimp as bait. Sammy brought 8 more shrimp than Kaden brought. When they combined their shrimp they had 32 shrimp altogether.

a. How many shrimp did each boy bring?
Kaden brought 12 shrimp. Sammy brought 20 shrimp.

b. What is the ratio of the number of shrimp Sammy brought to the number of shrimp Kaden brought?
20:12

c. Express the number of shrimp Sammy brought as a fraction of the number of shrimp Kaden brought.
 $\frac{20}{12}$

d. What is the ratio of the number of shrimp Sammy brought to the total number of shrimp?
20:32

e. What fraction of the total shrimp did Sammy bring?
 $\frac{20}{32}$



Exercise 2 (20 minutes)

Exercise 2

A food company that produces peanut butter decides to try out a new version of its peanut butter that is extra crunchy, using twice the number of peanut chunks as normal. The company hosts a sampling of its new product at grocery stores and finds that 5 out of every 9 customers prefer the new extra crunchy version.

- a. Let's make a list of ratios that might be relevant for this situation.
 - i. The ratio of number preferring new extra crunchy to total number surveyed is **5 to 9**.
 - ii. The ratio of number preferring regular crunchy to the total number surveyed is **4 to 9**.
 - iii. The ratio of number preferring regular crunchy to number preferring new extra crunchy is **4 to 5**.
 - iv. The ratio of number preferring new extra crunchy to number preferring regular crunchy is **5 to 4**.

- b. Let's use the value of each ratio to make multiplicative comparisons for each of the ratios we described here.
 - i. The number preferring new extra crunchy is $\frac{5}{9}$ of the total number surveyed.
 - ii. The number preferring regular crunchy is $\frac{4}{9}$ of the total number surveyed.
 - iii. The number preferring regular crunchy is $\frac{4}{5}$ of those preferring new extra crunchy.
 - iv. The number preferring new extra crunchy is $\frac{5}{4}$ of those preferring regular crunchy.

- c. If the company is planning to produce 90,000 containers of crunchy peanut butter, how many of these containers should be the new extra crunchy variety, and how many of these containers should be the regular crunchy peanut butter? What would be helpful in solving this problem? Does one of our comparison statements above help us?

The company should produce 50,000 containers of new crunchy peanut butter and 40,000 containers of regular crunchy peanut butter.

Discuss whether it is appropriate to assume that the company will still sell the same amount of regular crunchy peanut butter or whether the 90,000 containers will simply be split between the two kinds of peanut butter.

- What would be helpful in solving this problem? Does one of our comparison statements above help us?

Guide students to the recognition that if we assume 90,000 is the total number of containers sold for both types, then the number of new extra crunchy containers should be $\frac{5}{9}$ of that number.

Allow students to try solving the following three scenarios:

Try these next scenarios:

- d. If the company decides to produce 2,000 containers of regular crunchy peanut butter, how many containers of new extra crunchy peanut butter would it produce?
2,500 new extra crunchy peanut butter containers

- e. If the company decides to produce 10,000 containers of new extra crunchy peanut butter, how many containers of regular crunchy peanut butter would it produce?
8,000 regular crunchy peanut butter containers

- f. If the company decides to only produce 3,000 containers of new extra crunchy peanut butter, how many containers of regular crunchy peanut butter would it produce?

2,400 regular crunchy peanut butter containers

Closing (3 minutes)

- Given the ratio $A:B$, if $B \neq 0$, then the value of the ratio is the quotient $\frac{A}{B}$.
- Make up a ratio.
- Find the value of that ratio.

Lesson Summary

For a ratio $A:B$, we are often interested in the associated ratio $B:A$. Further, if A and B can both be measured in the same unit, we are often interested in the associated ratios $A:(A+B)$ and $B:(A+B)$.

For example, if Tom caught 3 fish and Kyle caught 5 fish, we can say:

- The ratio of the number of fish Tom caught to the number of fish Kyle caught is 3:5.
- The ratio of the number of fish Kyle caught to the number of fish Tom caught is 5:3.
- The ratio of the number of fish Tom caught to the total number of fish the two boys caught is 3:8.
- The ratio of the number of fish Kyle caught to the total number of fish the two boys caught is 5:8.

For the ratio $A:B$, where $B \neq 0$, the value of the ratio is the quotient $\frac{A}{B}$.

For example: For the ratio 6:8, the value of the ratio is $\frac{6}{8}$ or $\frac{3}{4}$.

Exit Ticket (5 minutes)

Exit Ticket Sample Solutions

Alyssa's extended family is staying at the lake house this weekend for a family reunion. She is in charge of making homemade pancakes for the entire group. The pancake mix requires 2 cups of flour for every 10 pancakes.

1. Write a ratio to show the relationship between the number of cups of flour and the number of pancakes made.

2:10

2. Determine the value of the ratio.

$$\frac{2}{10} = \frac{1}{5}$$

3. Use the value of the ratio to make a multiplicative comparison statement.

- a. The number of pancakes made is 5 times the number of cups of flour needed.
- b. The number of cups of flour needed is $\frac{1}{5}$ of the number of pancakes made.

4. If Alyssa has to make 70 pancakes, how many cups of flour will she have to use?

Alyssa will have to use 14 cups of flour.

Problem Set Sample Solutions

1. Maritza is baking cookies to bring to school and share with her friends on her birthday. The recipe requires 3 eggs for every 2 cups of sugar. To have enough cookies for all of her friends, Maritza determined she would need 12 eggs. If her mom bought 6 cups of sugar, does Maritza have enough sugar to make the cookies? Why or why not?

Maritza will NOT have enough sugar to make all the cookies because she needs 8 cups of sugar and only has 6 cups of sugar.

2. Hamza bought 8 gallons of brown paint to paint his kitchen and dining room. Unfortunately, when Hamza started painting, he thought the paint was too dark for his house, so he wanted to make it lighter. The store manager would not let Hamza return the paint but did inform him that if he used $\frac{1}{4}$ of a gallon of white paint mixed with 2 gallons of brown paint, he would get the shade of brown he desired. If Hamza decided to take this approach, how many gallons of white paint would Hamza have to buy to lighten the 8 gallons of brown paint?

Hamza would need 1 gallon of white paint to make the shade of brown he desires.