



Lesson 4: Equivalent Ratios

Student Outcomes

- Given a ratio, students identify equivalent ratios. Students use tape diagrams and the description of equivalent ratios to determine if two ratios are equivalent.
- Students relate the positive number, c , in the description of equivalent ratios to the tape diagrams they have been using to find equivalent ratios.

Classwork

Example 1 (7 minutes)

Present Example 1 by reading it aloud or asking a student to read it aloud. Then encourage students to discuss what would need to be done. Guide the students to a mathematically correct conclusion and have them summarize their decisions.

Conclude by having students come up with the total number of students that would make Jasmine's statement true.

Example 1

The morning announcements said that two out of every seven 6th graders in the school have an overdue library book. Jasmine said, "That would mean 24 of us have overdue books!" Grace argued, "No way. That is way too high." How can you determine who is right?

You would have to know the total number of 6th graders, and then see if the ratio 24: total is equivalent to 2: 7.

$$\begin{array}{cc} 2: 7 & 24: 84 \\ \swarrow \quad \searrow & \swarrow \quad \searrow \\ \times 12 & \times 12 \end{array}$$

- Let's look at the ratios we determined in Example 1. We found the ratios 2: 7 and 24: 84.
- How have we previously determined two sets of ratios to be equivalent?
 - Each number in the first ratio must be multiplied by the same positive number in order to determine the corresponding numbers in the second ratio.
- Let's test these two ratios to see if they are equivalent. Since the corresponding number to 2 in the second ratio is 24, what must we multiply 2 by to find 24?
 - 12
- We can determine from this that 12 is the positive number, c , that we will multiply each number in the first ratio by to determine the corresponding numbers in the second ratio.
- If we multiply 2 by 12, then following the description, we must also multiply 7 by 12. What is the product of 7×12 ?
 - 84

- Is 84 the number that corresponds to 7?
 - Yes.

Allow the students to finish the remaining problems independently.

Allow students to indicate their answers orally for each problem and debate with classmates when there are disagreements. If needed, step in and guide students to the correct reasoning process, ensuring all students come to understand how to use the description to determine equivalence.

Exercise 1 (20 minutes)

Exercise 1

Decide whether or not each of the following pairs of ratios is equivalent.

- If the ratios are not equivalent, find a ratio that is equivalent to the first ratio.
- If the ratios are equivalent, identify the positive number, c , that could be used to multiply each number of the first ratio by in order to get the numbers for the second ratio.

a. 6: 11 and 42: 88

$$\begin{array}{c} \diagup \quad \diagdown \\ \times 7 \quad \times 8 \end{array}$$

Yes, the value, c , is _____

X No, an equivalent ratio would be 42: 77

b. 0: 5 and 0: 20

$$\begin{array}{c} \diagup \quad \diagdown \\ ? \times 4 \\ 0 \times 4 = 0 \\ 5 \times 4 = 20 \end{array}$$

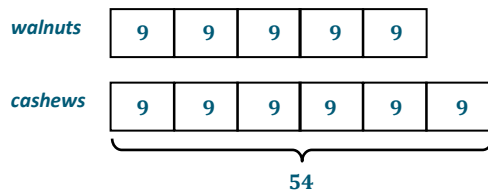
X Yes, the value, c , is 4

No, an equivalent ratio would be _____

Exercise 2 (8 minutes)

Exercise 2

In a bag of mixed walnuts and cashews, the ratio of the number of walnuts to the number of cashews is 5: 6. Determine the amount of walnuts that are in the bag if there are 54 cashews. Use a tape diagram to support your work. Justify your answer by showing that the new ratio you created of the number of walnuts to the number of cashews is equivalent to 5: 6.



54 divided by 6 equals 9.

5 times 9 equals 45.

There are 45 walnuts in the bag.

The ratio of the number of walnuts to the number of cashews is 45: 54. That ratio is equivalent to 5: 6.

$$\begin{array}{c} \diagup \quad \diagdown \\ 5: 6 \text{ and } 45: 54 \\ \times 9 \quad \times 9 \end{array}$$

Closing (5 minutes)

- How can we use the description of equivalent ratios to find an equivalent ratio?
- What do the numbers in the boxes of the tape diagram represent in terms of the ratios?
 - *Inside each of the boxes, the positive number, c , comes from the value of one unit in the tape diagram.*
- We can determine that to find an equivalent ratio, the positive number, c , must be the same in each box in the tape diagram. This can also be described as “constant.” If the number, c , is *constantly* the same number, then the ratios are equivalent. As in Exercise 4, the value of each unit is 9. It is constantly nine. We multiplied 5 by the *constant* 9 and multiplied the 6 by the *constant* 9 to determine the equivalent ratio.

Lesson Summary

Recall the description:

Two ratios $A:B$ and $C:D$ are equivalent ratios if there is a positive number, c , such that $C = cA$ and $D = cB$.

Ratios are equivalent if there is a positive number that can be multiplied by both quantities in one ratio to equal the corresponding quantities in the second ratio.

This description can be used to determine whether two ratios are equivalent.

Exit Ticket (5 minutes)



Name _____

Date _____

Lesson 4: Equivalent Ratios

Exit Ticket

There are 35 boys in the sixth grade. The number of girls in the sixth grade is 42. Lonnie says that means the ratio of the number of boys in the sixth grade to the number of girls in the sixth grade is 5: 7. Is Lonnie correct? Show why or why not.

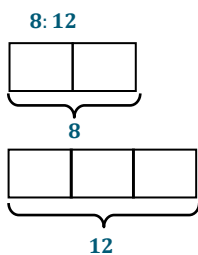
Exit Ticket Sample Solutions

There are 35 boys in the sixth grade. The number of girls in the sixth grade is 42. Lonnie says that means the ratio of the number of boys in the sixth grade to the number of girls in sixth grade is 5:7. Is Lonnie correct? Show why or why not.

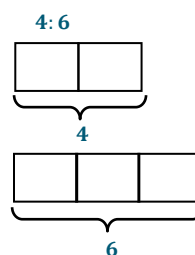
No, Lonnie is not correct. The ratios 5:7 and 35:42 are not equivalent. They are not equivalent because $5 \times 7 = 35$, but $7 \times 7 = 49$, not 42.

Problem Set Sample Solutions

1. Use diagrams or the description of equivalent ratios to show that the ratios 2:3, 4:6, and 8:12 are equivalent.



8 is 2 times 4; 12 is 3 times 4.
The constant number, c , is 4.

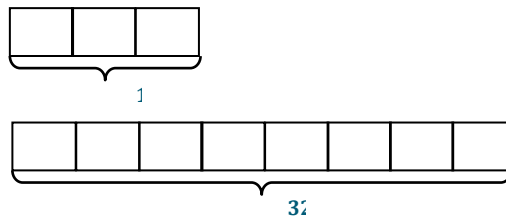


4 is 2 times 2; 6 is 3 times 2.
The constant number, c , is 2.

2. Prove that 3:8 is equivalent to 12:32.

- a. Use diagrams to support your answer.

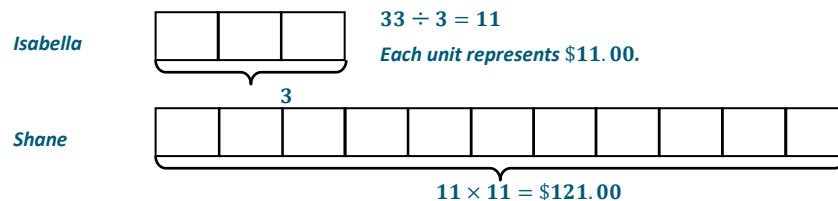
12 is 3 times 4; 32 is 8 times 4.



- b. Use the description of equivalent ratios to support your answer.

Answers will vary. Descriptions should include multiplicative comparisons, such as 12 is 3 times 4 and 32 is 8 times 4. The constant number, c , is 4.

3. The ratio of Isabella's money to Shane's money is 3:11. If Isabella has \$33, how much money do Shane and Isabella have together? Use diagrams to illustrate your answer.



Isabella has \$33, and Shane has \$121. $\$33 + \$121 = \$154$. Together, Isabella and Shane have \$154.00.