MSTAR INTERVENTION

L8

Lesson 8: Generate Equivalent Ratios

Lesson Objective

- Students will generate equivalent ratios.

Instructional Materials

Material	Quantity	Description
Paper	1 sheet per student	
Colored pencils	1 per student	
How Am I Doing? graph	1 per student	
Display Masters	1 each	• Preview: Key Idea: Generate Equivalent Ratios • Demonstrate: Large Apples to Small Apples A • Demonstrate: Large Apples to Small Apples B • Demonstrate: Large Apples to Small Apples C • Demonstrate: 40 Small Apples • Demonstrate: Linking Cubes Problem
Handouts	1 each per student	• Cumulative Review • Practice • Independent Practice
Answer Keys	1 each	• Cumulative Review • Practice • Independent Practice

Cumulative Review

Have students answer the questions on the Cumulative Review handout. Go over the answers. Correct misconceptions. Have students make corrections, as needed, using a colored pencil. Collect student papers to determine who needs additional instruction.

Preview

This lesson will build on students' prior conceptual knowledge of equivalent ratios. Students will use multiplication to calculate equivalent ratios.

Display and introduce through a brief explanation the key idea for this lesson:

- Multiplication can be used to generate equivalent ratios.

Use the Key Idea: Generate Equivalent Ratios DM display master as needed.

Engage Prior/Informal Knowledge

To open the lesson, present questions to activate students' background knowledge or preskills related to the content to be taught in this lesson. Ask students questions such as:

- What is an example of 2 equivalent ratios? (2 cups of sugar to 3 cups of flour is equivalent to 4 cups of sugar to 6 cups of flour.)
- How can you find the missing part of an equivalent ratio? (Draw a picture to show the missing part when the ratio is equivalent.)

If students cannot answer these questions, stop and explicitly teach the material.

Demonstrate

1. Find an equivalent ratio, using multiplication.

Say: *In the previous lesson, we learned how to find an equivalent ratio through modeling. Today, we will use multiplication to calculate equivalent ratios.*

Say: *Let's review the apple problem from the previous lesson. Remember that we started with the ratio of 3 large apples to 4 small apples. Then, we were asked to find an equivalent ratio with 8 small apples. That equivalent ratio was 6 large apples to 8 small apples. The 2 ratios describe the same relationship. There are 3 large apples for every 4 small apples.*

Use the Large Apples to Small Apples A **DM** display master as needed.

Say: *Another way to find the number of large apples is to think about what operation was used to get from 4 small apples to 8 small apples. To get from 4 to 8, I multiply by 2. If I multiply 3 large apples by 2, I get 6 large apples. I can still show that for every 3 large apples, there are 4 small apples.*

Use the Large Apples to Small Apples B **DM** display master as needed.

Say: *I can also calculate an equivalent ratio without using pictures.*

Say: *Just like when I was modeling the ratios, I first want to identify what 2 things I am comparing.*

Use the Large Apples to Small Apples C **DM** display master as needed.

Say: *The first expression represents the model. We multiplied the large apples and small apples by 2 to calculate the equivalent ratio.*

Say: *In the second expression, the ratios are in fractional form, so I can multiply the top and bottom by 2, just like I did when calculating equivalent fractions. In the third form, this calculation is represented by multiplying the first ratio, 3 to 4, by* $\frac{2}{2}$*, which is the same thing as multiplying by 1. Because we are multiplying by a fraction that represents 1, the ratio 6 to 8 is equivalent to the ratio 3 to 4.*

Say: *Another way I could think about this is that I have twice as many*

groups of 3 large apples to 4 small apples. If I multiplied the original ratio, 3 to 4, by $\frac{3}{3}$, I would have the equivalent ratio 9 to 12, and there would be 3 groups of 3 large apples to 4 small apples.

2. Use multiplication to generate equivalent ratios with larger numbers.

Say: *I use calculations when it is not convenient to use models. For example, what if I need to find another equivalent ratio—but this time with 40 small apples? Do I want to use a model to represent all those apples?*

Say: *I use multiplication to calculate how many large apples there are. Because I multiply 4 small apples by 10 to get 40 small apples, I will multiply 3 large apples by 10 also to find the number of large apples. How many large apples are there? (30)*

Use the 40 Small Apples DM display master as needed.

Say: *Let's work through another example together.*

Use the Linking Cubes Problem DM display master as needed.

Have a student read the problem:

The teacher needs 5 blue linking cubes and 8 yellow linking cubes for each student. She has 12 students in her class. How many blue and yellow linking cubes will she need for the entire class?

Say: *First, what 2 things are we comparing? (blue to yellow linking cubes) What ratio are we given? (5 to 8)*

Construct the solution to this problem for the class. Have students follow along with you on a piece of paper. Refer to the diagram below for guidance.

Say: *We are told that the teacher has 12 students in her class, so I will multiply*

both quantities of cubes, the top and the bottom, by 12. Why? (5 blue and 8 yellow is for 1 student, so you multiply by 12 to find out how many for 12 students.)

Say: *What does 5 multiplied by 12 equal? (60) What does 8 multiplied by 12 equal? (96) So, the teacher would need 60 blue cubes and 96 yellow cubes for 12 students.*

Say: *Remember, we multiply the top and bottom by 12 because multiplying by* $\frac{12}{12}$ *is the same thing as multiplying by 1. Another way to think about it is we now have 12 groups of 5 blue cubes and 12 groups of 8 yellow cubes, 1 set for each student.*

$$\frac{\text{blue}}{\text{yellow}} \quad \frac{5}{8} \overset{\times 12}{=} \frac{60}{96}$$

Say: *I can confirm these 2 ratios are equivalent by simplifying them to the same ratio.* $\frac{5}{8}$ *is already simplified, and* $\frac{60}{96}$ *can be simplified to* $\frac{5}{8}$ *by dividing the top and bottom by 12.*

Practice

For the practice activity, provide detailed feedback to students, highlighting what was done correctly and what needs improvement. Provide opportunities for students to correct their errors. Collect student work to review and monitor student progress.

Activity: Help students complete the activity on the Practice handout. Select a few students to share their reasoning.

Independent Practice

1. Have students work independently to complete the activity on the Independent Practice handout.

2. Go over the answers (students self-check and correct, using a colored pencil).

3. Have students record the number correct in the box and complete their How Am I Doing? graph.

4. Collect the papers to review student progress.

Closure

Review the key idea. Have students provide examples from the lesson.

Have students discuss their answers to the following questions.

- How do you know whether 2 ratios are equivalent?
- Describe what is happening when you multiply the top and bottom of a ratio by the same number.

Clear up any misconceptions. Students who have trouble generating equivalent ratios need additional instruction.