☆MSTAR
INTERVENTION

L3

Lesson 3: Simplify Ratios

Lesson Objective

- Students will simplify ratios.

Instructional Materials

Material	Quantity	Description
2-color counters *Use the optional display masters if 2-color counters are not available.*	1 bag per student	12 in small plastic bag
Paper	1 sheet per student	
How Am I Doing? graph	1 per student	
Red and yellow colored pencils	1 per student	
Display Masters	1 each	- Preview: Key Idea: Simplify Ratios - Engage Prior/ Informal Knowledge: Simplify Fractions - Demonstrate: 2-Color Counters: 8 Red and 4 Yellow (optional) - Demonstrate: Ratio of Red to Yellow: 8 to 4 - Demonstrate: Simplified Ratio of Red to Yellow - Demonstrate: 2-Color Counters: 7 Red and 5 Yellow (optional) - Demonstrate: Ratio of Red to Yellow: 7 to 5
Handouts	1 each per student	- Cumulative Review - Practice 1 (optional) - Practice 2 - Independent Practice
Answer Keys	1 each	- Cumulative Review - Practice 1 - Practice 2 - 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 ratios. Students will write and simplify ratios to represent real-life situations.

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

* Ratios compare quantities and can be simplified like fractions.

Use the Key Idea: Simplify Ratios **DM** display master as needed.

Engage Prior/Informal Knowledge

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

* When can a fraction be simplified? (when the numerator and denominator have a common factor other than 1)

* Which of the following fractions can be simplified? ($\frac{9}{6}$, $\frac{4}{2}$, $\frac{18}{27}$)

$$\frac{1}{3} \qquad \frac{3}{8} \qquad \frac{9}{6} \qquad \frac{2}{9} \qquad \frac{4}{2} \qquad \frac{18}{27}$$

* Write the following fractions in simplest form. ($\frac{2}{1}$ or 2, $\frac{1}{3}$, $\frac{5}{2}$, $\frac{1}{4}$, $\frac{4}{3}$)

$$\frac{4}{2} \qquad \frac{5}{15} \qquad \frac{35}{14} \qquad \frac{4}{16} \qquad \frac{8}{6}$$

Use the Simplify Fractions **DM** display master as needed.

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

Demonstrate

1. Use 2-color counters to write a ratio comparing red counters to yellow counters.

Display 8 red and 4 yellow counters. Use the 2-Color Counters: 8 Red and 4 Yellow **DM** display master as needed.

>   **Say:** *How many red counters do you see? (8) How many yellow counters do you see? (4)*

>   **Say:** *What is the ratio of red counters to yellow counters? Write it 3 ways.*

Display the ratio of red counters to yellow counters written 3 ways. Use the Ratio of Red to Yellow: 8 to 4 **DM** display master as needed.

2. Think aloud as you determine whether the ratio can be simplified.

>   **Say:** *Ratios can be simplified like fractions.*

>   **Say:** *When can a fraction be simplified? (when the numerator and denominator have a common factor other than 1)*

Draw attention to the ratio of red to yellow counters.

>   **Say:** *Can this ratio be simplified? (Yes, because 2 and 4 are common factors of both 8 and 4.)*

>   **Say:** *The ratio of red to yellow counters can be simplified by dividing both 8 and 4 by the same factor. I will divide both by 4 because 4 is the greatest common factor. The ratio of red to yellow counters in simplest form is 2 to 1.*

>   **Say:** *I can divide the ratio by $\frac{4}{4}$ without changing the relationship described by the ratio because $\frac{4}{4}$ is equal to 1. This step is similar to when we multiplied a fraction by $\frac{4}{4}$ to calculate an equivalent fraction.*

Display the ratio of red to yellow counters as 8 to 4 and 2 to 1 in each form. Use the Simplified Ratio of Red to Yellow **DM** display master as needed.

Draw attention to the ratio written $\frac{2}{1}$. Explain to students that this ratio is in simplest form and is read "2 to 1." ✎ ①

3. Think aloud as you determine that a ratio cannot be simplified.

Display 7 red counters and 5 yellow counters. Use the 2 Color-Counters: 7 Red and 5 Yellow **DM** display master as needed.

Think aloud as you find the ratio of red to yellow.

Display the ratio of red to yellow. Use the Ratio of Red to Yellow: 7 to 5 **DM** display master as needed.

> **Say:** *How do you know whether a ratio can be simplified? (If both numbers have a common factor other than 1, a ratio can be simplified.)*

Draw attention to the ratio of red to yellow counters.

> **Say:** *Can this ratio be simplified? (no) Why not? (because 1 is the only common factor of both 7 and 5)*

✎ ① **TEACHER NOTE**

Students may wonder whether $\frac{2}{1}$ can be written as "2." Explain to students that because the ratio represents 2 red counters to 1 yellow counter, the number 2 would not describe the relationship. This is 1 way in which ratios and fractions are different.

Practice

For each 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.

For Students Who Need Additional Instruction: Some students have difficulty simplifying ratios. To help these students, follow the steps outlined below.

Display 8 red and 4 yellow counters.

Say: *What is the ratio of red to yellow counters? ($\frac{8 \text{ red}}{4 \text{ yellow}}$)*

Say: *How do I know whether this ratio can be simplified? (Both numbers must divide by a common factor other than 1.)*

Say: *What numbers divide evenly into 8 and 4? (2 and 4)*

Say: *When there are 2 factors other than 1 that divide evenly, select the largest factor. (4) This is called finding the greatest common factor.*

Say: *When I divide both the numerator and denominator by the same number, the ratio is still describing the same relationship. Because 4 is a common factor, I need to divide both by 4 to keep the ratio the same.*

Say: *What is 8 divided by 4? (2) What is 4 divided by 4? (1)*

Say: *$\frac{8 \text{ red}}{4 \text{ yellow}}$ becomes $\frac{2 \text{ red}}{1 \text{ yellow}}$ when it is simplified.*

Say: *When you simplify, first check for common factors.*

Say: *Let's try another example. If the ratio of yellow to red counters is 10 to 15, what is the common factor? (5)*

Say: *What number would I divide both the numerator and denominator by? (5)*

Say: *So $\frac{10 \text{ yellow}}{15 \text{ red}}$ becomes $\frac{2 \text{ yellow}}{3 \text{ red}}$ when I divide both the numerator and denominator by 5.*

Illustrate this procedure for students or repeat with additional examples, if needed.

Activity 1: Ask students to simplify ratios and share their work on the board. Select a few students to verbalize their reasoning. As students work, circulate around the room and ensure that students correctly simplify the ratios. Then, complete the activity below.

Distribute a sheet of paper to each student.

Have students fold the paper in half horizontally and vertically, forming 4 rectangles, as pictured below.
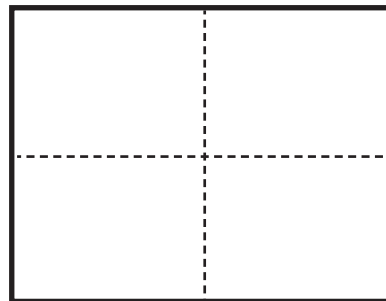
Distribute a bag of 2-color counters to each student. Alternatively, use the Practice 1 handout.

Have students take out some of their 2-color counters and write the ratio of red to yellow counters in a rectangle on their paper. If the ratio can be simplified, have students simplify the ratio. If it cannot be simplified, have students write "No."

The example shown below is for 10 red and 2 yellow counters.

10 to 2

5 to 1
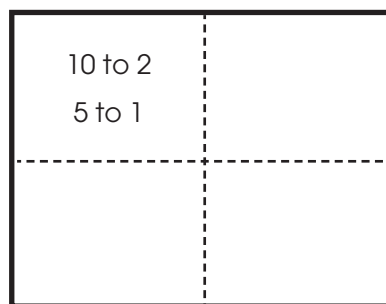
After each ratio is complete, have students put the counters back in

the bag, take out a different number, and repeat the steps above.

Activity 2: Have students work in pairs to complete the activity on the Practice 2 handout. Have students verbalize their reasoning and each step in the process to their partners.

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 and monitor student progress.

Closure

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

Have students discuss their answers to the following questions:

- How would you explain simplifying ratios to a third-grader? (Simplifying a ratio is finding an equivalent ratio that uses smaller numbers.)

- What representation would you use? (Use pictures of objects, such as 10 red apples compared to 2 green apples, and show how each green apple matches 5 red apples, so the ratio of red apples to green apples is 5 to 1.)

Clear up any misconceptions. Students who have difficulty simplifying ratios need additional instruction.