

Lesson 5: Simplify Rates

Lesson Objectives

- Students will model and generate rates.
- Students will simplify rates.

Instructional Materials

Material	Quantity	Description
How Am I Doing? graph	1 per student	
Colored pencils	2 different colors per student	
Paper	1 sheet per student	
Display Masters	1 each	<ul style="list-style-type: none"> • Preview: Key Idea: Simplify Rates • Demonstrate: 12 Boys to 3 Footballs A • Demonstrate: 12 Boys to 3 Footballs B • Demonstrate: 12 Boys to 3 Footballs C • Demonstrate: 12 Boys to 3 Footballs D
Handouts	1 each per student	<ul style="list-style-type: none"> • Cumulative Review • Practice 1 • Practice 2 • Independent Practice
Answer Keys	1 each	<ul style="list-style-type: none"> • 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 rates. Students will write rates for real-life situations, check whether rates can be simplified, and simplify rates when possible.

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

- Rates can be simplified like ratios, using common factors.

Use the Key Idea: Simplify Rates  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 do you know about rates? (Rates are a special type of ratio that compares 2 unlike quantities.)
- What are some examples of rates that you see in everyday life? (miles per hour, dollars per pound)
- How can a rate be written? (part to part, part:part, $\frac{\text{part}}{\text{part}}$)
- If 12 peaches and 3 bowls were on a table, how could they be compared with a rate? (12 peaches to 3 bowls, 3 bowls to 12 peaches.)

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

Demonstrate

1. Simplify rates.

Say: Rates compare 2 unlike quantities like boys and footballs.

Say: There are 12 boys and 3 footballs. What is the rate? ($\frac{12 \text{ boys}}{3 \text{ footballs}}$)

Say: When the 2 quantities of a rate have a common factor other than 1, the rate can be simplified like a fraction.

Say: What is the greatest common factor of 12 and 3? (3)

Say: How does the rate $\frac{12 \text{ boys}}{3 \text{ footballs}}$ simplify? (Divide both the numerator and denominator by 3.) Remember, dividing the rate by $\frac{3}{3}$ is the same thing as dividing by 1, so the new rate will still accurately describe the relationship between boys and footballs.


Say: The rate $\frac{12 \text{ boys}}{3 \text{ footballs}}$ simplifies to $\frac{4 \text{ boys}}{1 \text{ football}}$.

2. Model rates with drawings.

Distribute 1 sheet of paper to each student.

Demonstrate how to fold the paper horizontally into 2 equal parts. Have students do the same.


Distribute 2 different colored pencils to each student.

Demonstrate how to draw 2 rectangles of equal length across the top half of the paper—the top rectangle divided into 12 pieces and the bottom rectangle divided into 3 pieces, as shown in the 12 Boys to 3 Footballs A  display master. Have students do the same.


Say: Remember that your drawing does not have to be perfect. Do the best you can.

Say: *What things are we comparing in this problem? (boys to footballs)*

Say: *Use 1 of your colored pencils to write “boys” above the top rectangle. Use another colored pencil to write “footballs” below the bottom rectangle.*

Write the words in the appropriate places. Use the 12 Boys to 3 Footballs B  display master as needed.

Say: *Now, write a “b” on each part in the top rectangle and an “f” on each part in the bottom rectangle.*


Write the letters in the appropriate places. Use the 12 Boys to 3 Footballs C  display master as needed.

3. Generate a rate to represent the modeled situation.

Say: *How many boys are there? (12) How many footballs are there? (3)*

Say: *What is the rate of boys to footballs? ($\frac{12 \text{ boys}}{3 \text{ footballs}}$)*

Say: *Write the rate to the right of your rectangles.*

Write the rate to the right of the model. Use the 12 Boys to 3 Footballs D  display master as needed.

Say: *Can this rate be simplified? (Yes. Divide the numerator and denominator by the same number: 3.)*

Say: *What is the simplified rate? ($\frac{4 \text{ boys}}{1 \text{ football}}$) Write this rate on your paper.*

Say: *Are there any other ways to compare these 2 quantities? (compare 3 footballs to 12 boys, which simplifies to 1 football to 4 boys)*

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.

Activity 1: Help students complete the Practice 1 handout. Select a few students to verbalize their reasoning.

Students can complete the problem on the bottom half of the paper used in the Demonstrate section.

Circulate and watch students as they model the situation. Encourage them to label the drawing, as shown in the Practice 1 answer key. As you circulate, ask students the following questions:

- Can this rate be simplified? (Yes, it divides by a whole, $\frac{2}{2}$.)
- What is the new rate? ($\frac{7 \text{ friends}}{2 \text{ cars}}$)
- Are there any other ways to compare these 2 quantities? (compare 4 cars to 14 friends or 2 cars to 7 friends)

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



WATCH FOR

Some students believe that rates can be simplified to a mixed number or a whole number. Remind students that ratios and rates must compare 2 quantities and therefore cannot be simplified to a mixed number. So 15 boys to 5 bats becomes 3 boys to 1 bat, not 3, and 14 girls to 4 boys becomes 7 to 2, not $3\frac{1}{2}$.

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 rates to a third-grader?
- What representations would you use?

Clear up any misconceptions. Students who believe that rates can be simplified to a mixed number or a whole number need additional instruction.