MSTAR INTERVENTION

L4

Lesson 4: Model Rates

Lesson Objective

- Students will model and generate rates.

Instructional Materials

Material	Quantity	Description
How Am I Doing? graph	1 per student	
Colored pencils	1 per student	
Display Masters	1 each	• Preview: Key Idea: Model Rates • Demonstrate: 8 Cookies to 4 Boys • Demonstrate: Cookies to Boys A • Demonstrate: Cookies to Boys B • Demonstrate: Cookies to Boys C • Demonstrate: Cookies to Boys D
Handouts	1 each per student	• Cumulative Review • Cookies to Boys • Practice 1 • 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. Rates will be used to compare 2 different quantities, such as boys and cookies, girls and basketballs, and miles driven and gallons of gasoline used.

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

- Rates compare unlike quantities.

Use the Key Idea: Model Rates 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 do you know about ratios? (Ratios compare 2 quantities of similar things.)
- How can a ratio be written? (using the word "to," a colon, or a fraction bar)
- If there were 15 boys and 12 girls in a science class, how could they be compared with a ratio? ($\frac{15}{12}$, $\frac{12}{15}$, $\frac{15}{27}$, $\frac{27}{15}$, $\frac{12}{27}$, $\frac{27}{12}$)

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

Demonstrate

1. Provide a scenario to model a rate.

Say: *A rate is a type of ratio that compares 2 unlike quantities, such as cookies and boys. If I had 8 cookies for 4 boys to share, I could write the relationship in 3 ways, just like other ratios.*

Display the 3 ways to write the rate: 8 cookies to 4 boys, 8 cookies:4 boys, and $\frac{8 \text{ cookies}}{4 \text{ boys}}$. Use the 8 Cookies to 4 Boys **DM** display master as needed.

Say: *Notice that we need to write labels for the quantities that we are comparing.*

2. Model rates by dividing rectangles.

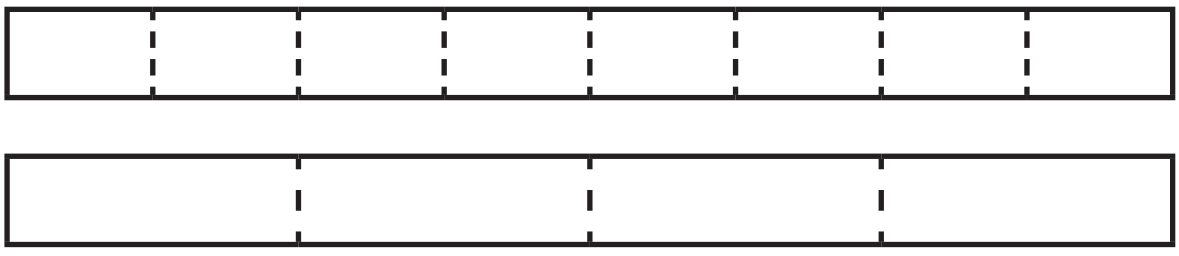
Say: *Let's use a model to represent rates.*

Distribute the Cookies to Boys handout.

Use the Cookies to Boys A **DM** display master as needed.

Have students complete each step of the following demonstration on their handouts.

Demonstrate how to divide 1 of the rectangles into 8 even parts and the second rectangle into 4 even parts. Use the Cookies to Boys B **DM** display master, which shows the diagram below, as needed.



Say: *What 2 things are we comparing in this problem? (cookies and boys)*

Write "cookies" above the top rectangle and "boys" below the bottom rectangle.

Write "cookies" and "boys" in the appropriate places.

Use the Cookies to Boys C **DM** display master, as needed, for the next step.

Say: *Now, write a "c" for "cookie" in each part of the top rectangle and a "b" for "boy" in each part of the bottom rectangle.*

Write "c" and "b" in the appropriate places.

3.Generate a rate to represent the modeled situation.

Say: *How many cookies are there? (8) How many boys are there? (4)*

Say: *If I match the cookies to the boys, what is the rate? ($\frac{8}{4}$)*

Use the Cookies to Boys D **DM** display master, as needed.

Say: *Are there any other ways to compare these 2 quantities? (compare 4 boys to 8 cookies)*

Say: *Remember that when we wrote other ratios, we could compare 1 part of the ratio to the whole. However, when we use rates, we usually do not compare either quantity to a whole. Does anyone know why?*

Say: *We usually do not compare either quantity to a whole because we cannot add 2 different types of things. If we did, we would not have a label for the total. So, usually there are only 2 possible rates for 2 quantities. In this case, those 2 rates are 8 cookies to 4 boys and 4 boys to 8 cookies.*

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 activity on the Practice 1 handout. Select a few students to verbalize their reasoning.

After students have completed the problem, ask the following questions:

- Are there any other ways to compare these 2 quantities? (compare 3 basketballs to 15 girls)
- Can the rate be simplified? (Yes: 1 basketball to 5 girls.)

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 generate a rate, given a situation? (Write the rate comparing the 2 quantities and then simplify, if possible.)
- What ways could you model the rate? (Drawings and objects can be used to model rates.)

Clear up any misconceptions. Students who struggle with modeling and generating rates need additional instruction.