

Lesson 1: Model Ratios

Lesson Objective

- Students will generate ratios, given a situation represented concretely or pictorially.

Instructional Materials

Material	Quantity	Description
Apples (optional)	<ul style="list-style-type: none"> 3 large 4 small 	
Color tiles	1 bag per student	12 red/green in small plastic bag
Paper	1 sheet per student	
How Am I Doing? graph	1 per student	
Colored pencils	1 per student	
Display Masters	1 each	<ul style="list-style-type: none"> Preview: Key Idea: Model Ratios Demonstrate: Apples Demonstrate: 3 Large Apples to 4 Small Apples Demonstrate: 4 Small Apples to 3 Large Apples Demonstrate: 3 Large Apples to 7 Total Apples Practice: 4 Apples (as needed) Practice: Number Line (as needed)
Handouts	1 each per student	<ul style="list-style-type: none"> Colored Tiles (alternative to color tiles) Practice Independent Practice
Answer Keys	1 each	<ul style="list-style-type: none"> Practice Independent Practice

Preview

Today's lesson will build on students' conceptual knowledge of fractions. Ratios will be introduced as a way to compare quantities with the same unit, such as people (girls to boys) or apples (large to small).

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

- Ratios describe the relationship between quantities with the same unit.

Use the Key Idea: Model Ratios  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:

- What do you know about fractions? (Fractions compare a part to a whole. The top number is the numerator, which represents the selected number of parts. The bottom number is the denominator, which represents the total number of parts.)
- What 2 situations can a fraction represent? (a part of a whole or a part of a group)
- What fraction represents a classroom in which 12 out of 27 total students are boys?
($\frac{12}{27}$)
- Is the fraction for the previous question part of a whole or part of a group? (part of a group)
- If there are 8 slices in a whole pizza and 3 slices are left over, what fraction of pizza is left over? ($\frac{3}{8}$)
- Is the fraction for the previous question part of a whole or part of a group? (part of a whole)

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

Demonstrate

1. Think aloud as you demonstrate how to compare 2 quantities.


Display 7 real apples (3 large and 4 small) or pictures of apples. Use the Apples  display master as needed.

Say: *How could I compare these apples? (large to small, small to large, large to all of the apples, or small to all of the apples)*

Say: *A ratio is a comparison of quantities.* 

2. Demonstrate while explaining the 3 ways to write a ratio, given a situation represented concretely or pictorially.

Say: *There are 3 ways to write a ratio: I can use a colon, the word “to,” or a fraction bar between the quantities.*

Use the 3 Large Apples to 4 Small Apples  display master as needed.

Say: *I want to compare the large apples to the small apples.*

Say: *3 to 4.*

Draw attention to $\frac{3}{4}$, which is read “3 to 4,” even though it looks similar to a fraction that would be read “three-fourths.”

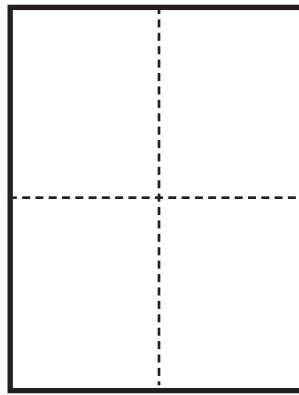
Distribute a sheet of paper to each student.

Have students fold the paper in half horizontally and vertically, making 4 rectangles, as pictured below.



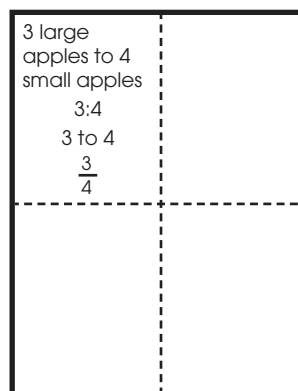
TEACHER NOTE

Emphasize that a ratio can compare 2 quantities, part to part (such as small apples to large apples), or part to whole (such as small apples to all apples). This is in contrast to fractions, which can describe only part-to-whole relationships.



Display the 3 ways to write the ratio: 3 to 4, 3:4, $\frac{3}{4}$.

Have students write “3 large apples to 4 small apples” and the 3 ways the ratio can be written in the upper-left rectangle, as shown below.




3. Discuss the effects of changing the order of comparison.

Say: Now, I will change the comparison order. What is the ratio of small apples to large apples? (4 to 3)

Draw attention to how the order of comparison has changed.

Say: Does this representation look different than when I compared the large apples to small apples? No, I still have the same apples.

Say: Would the written ratios look different? (Yes, the order has changed, so the written ratios change.)

Display the 3 ways to write the ratio: 4 to 3, 4:3, $\frac{4}{3}$. Use the 4 Small Apples to 3 Large Apples  display master as needed.


Have students write these ratios in a square on their paper.

4. Provide an example of a part-to-whole ratio.

Say: *As I mentioned earlier, a ratio can also compare a part to a whole, just like a fraction.*

Say: *We can compare the number of large apples to the total number of apples. How many large apples are there? (3) How many apples total? (7)*

Say: *So, the ratio of large apples to total apples is 3 to 7.*

Display the 3 ways to write this ratio. Use the 3 Large Apples to 7 Total Apples  display master as needed.

Have students write these ratios in a square on their paper.

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 additional examples. Select a few students to verbalize their reasoning.

Distribute plastic bags of color tiles. Alternately, use the Colored Tiles handout as needed.

Have students select some of the red and green color tiles from their bag and write “___ red tiles to ___ green tiles” and the 3 ways the ratio can be written in another


**TEACHER NOTE**

Remind students to read each question carefully. Sometimes the illustration and text for an item are ordered differently. For example, an item showing first dogs and then cats might ask for the ratio of cats to dogs. Make sure that students identify the correct ratios as they work.

rectangle on their folded paper.

As students work, circulate and ask questions, such as the following:
How did you know that the ratio of the tiles you chose was ____ to ____?

Students should repeat this activity 2 additional times, using the same piece of folded paper.

Activity 2: Have students work in pairs or small groups to complete the Practice handout. Have students verbalize their reasoning to their partners. 

For Students Who Need Additional Instruction: Some students believe that ratios always compare a part to a whole, like fractions. To address this misconception, follow the steps below.

Display a picture of 4 apples, 1 large and 3 small. Use the 4 Apples  display master as needed.

Say: *What is the fraction of large apples? ($\frac{1}{4}$)*

Display a number line. Use the Number Line  display master as needed.

Say: *Where is that fraction? (between 0 and $\frac{1}{2}$)*

Say: *$\frac{1}{4}$ compares 1 selected part to 4 total parts and is on a number line.*

Say: *What is the fraction of small apples? ($\frac{3}{4}$)*

Say: *Where is that fraction? (between $\frac{1}{2}$ and 1)*

Say: *$\frac{3}{4}$ compares 3 selected parts to 4 total parts and is on a number line.*

Say: *What is the ratio of large to small apples? (1 to 3)*

Say: *1 to 3 compares 1 part large apples to 3 parts small apples. There are no*

total parts in this ratio. Where is the ratio $\frac{1}{3}$ on the number line? (It's not there.)

Say: *Ratios can also compare part to part. Fractions can compare only part to whole. The ratio 1 to 3 is comparing a set of the apples to another set of the apples. It is not on the number line because it is a ratio. Only rational numbers like integers, fractions, and decimals are found on or compared using a number line.*

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 represent a ratio to a third-grader? (For example, show the student some crayons and sort them into 2 groups, used and new. Then compare the number of used to new.)
- What representations would you use? (crayons/pencils, white shoes/other shoes, girls/boys)

Clear up any misconceptions. Students who believe ratios always compare a part to a whole need additional instruction.