LESSON 7

Number and Operations–Fractions

Divide a Unit Fraction by a Whole Number

Objective

Divide a unit fraction by a whole number.

Common Core State Standards

- **5.NF.7a** Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*
- **5.NF.7c** Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

Students begin their exploration of fractions by dividing shapes into equal-size sections. They learn how to write a unit fraction to represent one section. Just as one whole can be divided into equal-size parts, one of those parts can be further divided. In this lesson, students apply this idea to divide a unit fraction by a whole number.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Ask:** *If Bonnie has 2 children, how much land will each child get? How much land will the 2 children get together?*
- **Ask:** *If Bonnie has 3 children, how much land will each child get? How much land will the 3 children get together?*
- **Say:** *Continue, and describe the patterns in this problem.*

Solve It

Reread the problem with students. In every case, the children will get half of the grandfather's land. As that half is divided among more and more children, the half is divided into more and more pieces. Have students write number sentences to express the division for 2, 3, 4, 5, and 6 children.

More Ideas

For other ways to teach about dividing a unit fraction by a whole number—

- Have students do this problem again using Deluxe Rainbow Fraction® Circles. They can stack the equal areas for $\frac{1}{2}$ and spread the colors out to see the increase in the number of pieces for 2, 3, 4, 5, and 6 children. Ask students what the fraction would be for 10 children.
- Use Deluxe Rainbow Fraction® Circles and Squares to divide different unit fractions by whole numbers.

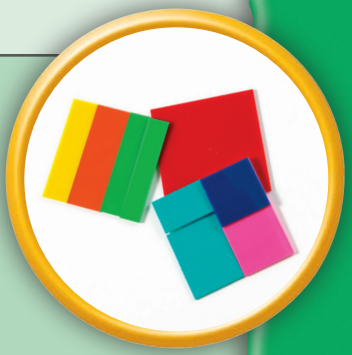
Formative Assessment

Have students try the following problem.

What is $\frac{1}{3} \div 5$?

A. $\frac{1}{15}$ **B.** $\frac{1}{8}$ **C.** $\frac{3}{5}$ **D.** $\frac{5}{3}$

Try It! 15 minutes | Groups of 5



Here is a problem about dividing a unit fraction by a whole number.

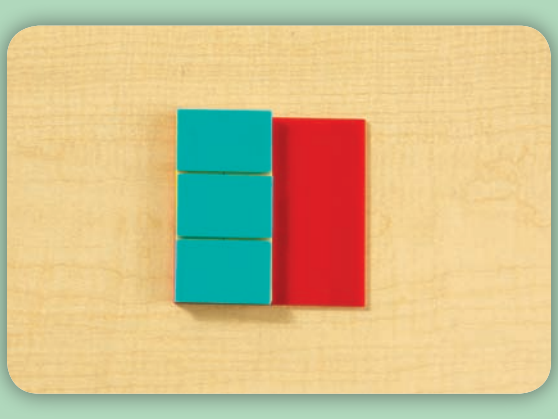
Bonnie bought half of her father's land and will divide it evenly among her own children. What fraction describes the portion of their grandfather's land that each child will receive if Bonnie has 2 children? 3 children? 4 children? 5 children? 6 children?

Introduce the problem. Then have students do the activity to solve the problem. Each student in the group can answer one question. Distribute the Fraction Squares, paper, and pencils to students.

Materials

- Deluxe Rainbow Fraction® Squares (1 set per group)
- paper (2 sheets per group)
- pencils (1 per group)

1. Say: *Use the red square to represent Bonnie's father's land. Place a pink rectangle on the square to represent Bonnie's land, which is half of her father's land. Now show how Bonnie's land can be divided evenly for 2 children.* Students place 2 yellow rectangles on top of the pink rectangle to divide it into two equal halves.



2. Ask: *How can you show Bonnie's land divided into 3 equal parts for 3 children?* Students place 3 aqua rectangles on top of the 2 yellow rectangles to divide the area into three equal thirds.

3. Say: *Continue the problem for 4, 5, and 6 children.* Students continue with blue, purple, and then black rectangles. Have students undo the stack, line up the colors on paper, and write a fraction for each color.

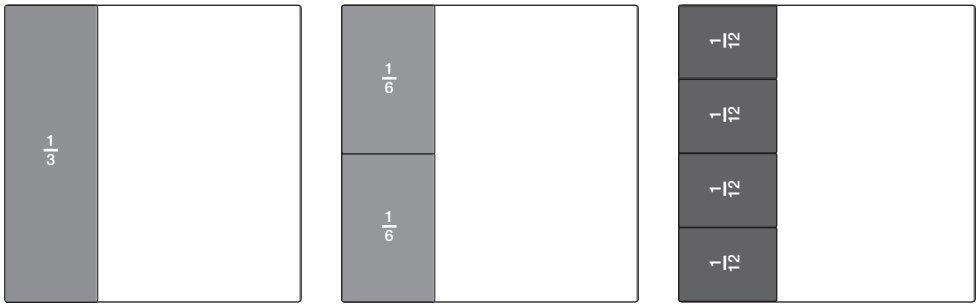
4. Elicit from students that the models they have lined up represent $\frac{1}{2}$ divided into different numbers of equal parts. Write $\frac{1}{2} \div 2 = ?$ on the board, and have students use the yellow model to determine the quotient. Continue for the aqua model, the blue model, and so on.

Answer Key

Use Fraction Squares to model the fraction compared to 1. Complete each equation.

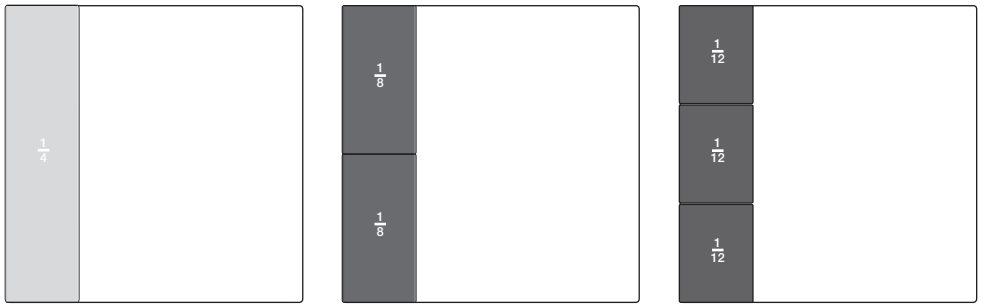
(Check students' work.)

1.



$\frac{1}{3} \div 2 = \frac{1}{6}$ $\frac{1}{3} \div 4 = \frac{1}{12}$

2.



$\frac{1}{4} \div 2 = \frac{1}{8}$ $\frac{1}{4} \div 3 = \frac{1}{12}$

Using Fraction Squares, model the division. Sketch the models. Write the quotient.

3. $\frac{1}{5} \div 2 = \frac{1}{10}$

(Check students' models.)

Find the quotient

4. $\frac{1}{2} \div 7 = \frac{1}{14}$

5. $\frac{1}{3} \div 3 = \frac{1}{9}$

6. $\frac{1}{4} \div 4 = \frac{1}{16}$

7. $\frac{1}{5} \div 4 = \frac{1}{20}$

8. $\frac{1}{6} \div 2 = \frac{1}{12}$

9. $\frac{1}{8} \div 2 = \frac{1}{16}$

Answer Key

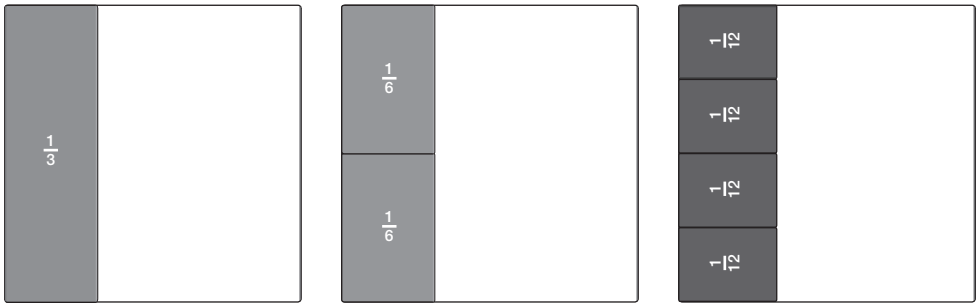
Challenge! What method do you use to divide a unit fraction by a whole number when you don't use the Fraction Squares? Why does it work?

Challenge: (Sample) Multiply the denominator of the unit fraction by the whole number. It works because dividing by a whole number is the same as multiplying by its reciprocal.

Name _____

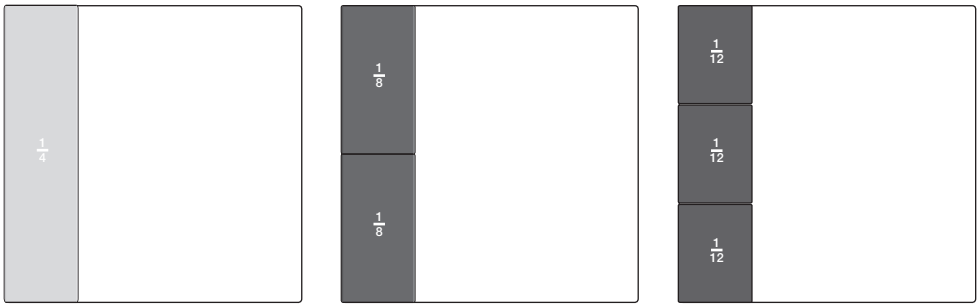
Use Fraction Squares to model the fraction compared to 1. Complete each equation.

1.



$\frac{1}{3} \div 2 =$ _____ $\frac{1}{3} \div 4 =$ _____

2.



$\frac{1}{4} \div 2 =$ _____ $\frac{1}{4} \div 3 =$ _____

Using Fraction Squares, model the division. Sketch the models. Write the quotient.

3. $\frac{1}{5} \div 2 =$ _____

Find the quotient

4. $\frac{1}{2} \div 7 =$ _____

5. $\frac{1}{3} \div 3 =$ _____

6. $\frac{1}{4} \div 4 =$ _____

7. $\frac{1}{5} \div 4 =$ _____

8. $\frac{1}{6} \div 2 =$ _____

9. $\frac{1}{8} \div 2 =$ _____

Name _____

Challenge! What method do you use to divide a unit fraction by a whole number when you don't use the Fraction Squares? Why does it work?