Lesson 1: Interpreting Division of a Fraction by a Whole Number—Visual Models

Student Outcomes

- Students use visual models, such as fraction bars, number lines, and area models, to show the quotient of whole numbers and fractions and to show the connection between them and the multiplication of fractions.
- Students divide a fraction by a whole number.

Classwork

Opening Exercise (5 minutes)

At the beginning of class, hand each student a fraction card (see page 18). Ask students to do the following Opening Exercise.

> **Opening Exercise**
>
> **Draw a model of the fraction.**
>
> **Describe what the fraction means.**

After two minutes, have students share some of their models and descriptions. Emphasize the key point that a fraction shows division of the numerator by the denominator. In other words, a fraction shows a part being divided by a whole. Also, remind students that fractions are numbers; therefore, they can be added, subtracted, multiplied, or divided.

To conclude the Opening Exercise, students can share where their fractions would be located on a number line. A number line can be drawn on a chalkboard or projected onto a board. Then, students can describe how the fractions on the cards would be placed in order on the number line.

Example 1 (7 minutes)

This lesson will focus on fractions divided by whole numbers. Students learned how to divide unit fractions by whole numbers in Grade 5. Teachers can become familiar with what was taught on this topic by reviewing the materials used in the Grade 5, Module 4 lessons and assessments.

> *Scaffolding:*
>
> Each class should have a set of fraction tiles. Students who are struggling may benefit from using the fraction tiles to see the division until they are better at drawing the models.

<div style="border: 1px solid #000; padding: 10px;">

Example 1

Maria has $\frac{3}{4}$ lb. of trail mix. She needs to share it equally among 6 friends. How much will each friend be given? What is this question asking us to do?

We are being asked to divide the trail mix into six equal portions. So, we need to divide three-fourths by six.

How can this question be modeled?

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▪ Let's take a look at how to solve this using a number line and a fraction bar.

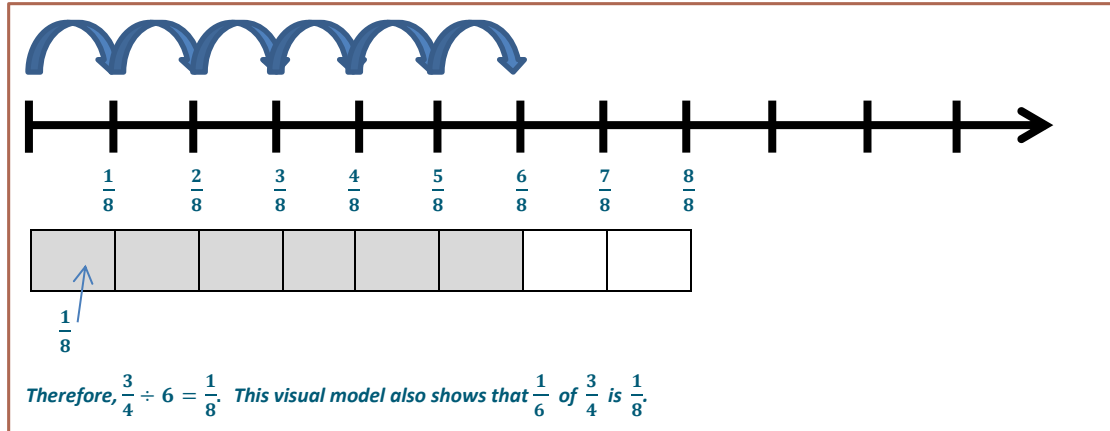We will start by creating a number line broken into fourths and a fraction bar broken into fourths.

$$0 \qquad \frac{1}{4} \qquad \frac{2}{4} \qquad \frac{3}{4} \qquad 1$$
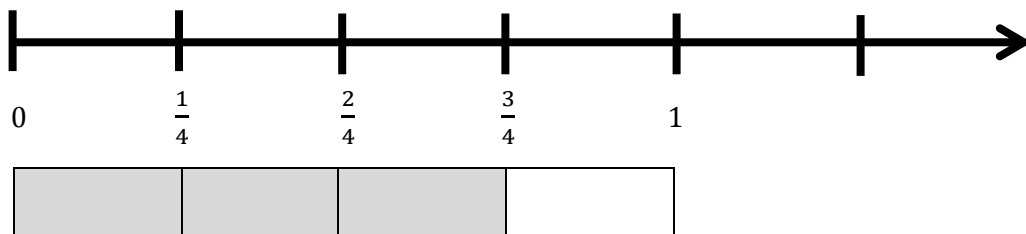
▪ We are going to give equal amounts of trail mix to each person. How can we show this in the model?
  ▫ *We will divide the shaded portion so that it includes six equal-sized pieces.*
▪ How will we show this on the number line?
  ▫ *There are three equal sections on the number line that also need to be divided into six equal shares.*

$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$$

$$\frac{1}{4} \qquad \frac{2}{4} \qquad \frac{3}{4} \qquad \frac{4}{4}$$
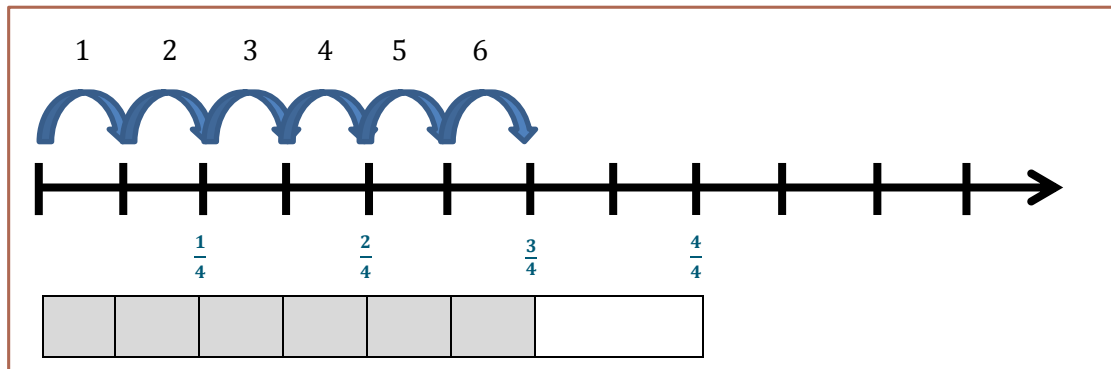
▪ Next, we need to determine the unit. What did we do to each of the three sections in the fraction bar?
  ▫ *We divided them into two pieces.*
▪ What should we do to the remaining piece of the fraction bar?
  ▫ *Divide it into two pieces.*
▪ How many pieces are there total?
  ▫ *8 pieces*

- What does each piece or section represent?
  - $\frac{1}{8}$

Therefore, $\frac{3}{4} \div 6 = \frac{1}{8}$. This visual model also shows that $\frac{1}{6}$ of $\frac{3}{4}$ is $\frac{1}{8}$.

- This is an example of partitive division. You can tell because we were given the original amount of trail mix and how many "parts" of trail mix to make. We needed to determine the size of each part, where the size of each part is less than the original amount.
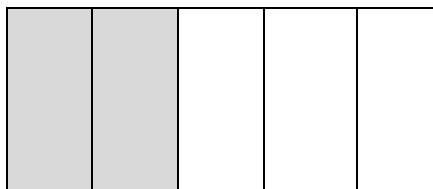
Example 2 (7 minutes)

Example 2

Let's look at a slightly different example. Imagine that you have $\frac{2}{5}$ of a cup of frosting to share equally among three desserts. How would we write this as a division question?

$$\frac{2}{5} \div 3$$

We can start by drawing a model of two-fifths.

How can we show that we are dividing two-fifths into three equal parts?

MP.1 & MP.2

What does this part represent?

From the visual model, we can determine that $\frac{2}{5} \div 3 = \frac{2}{15}$.
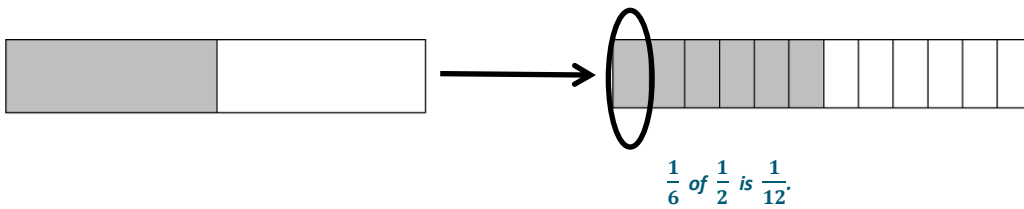
Exercises 1–5 (16 minutes)

Students will work in pairs to solve the following questions.

Exercises 1–5
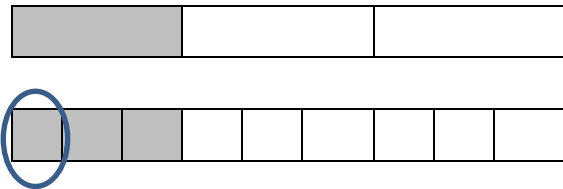
For each question below, rewrite the problem as a multiplication question. Then, model the answer.

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

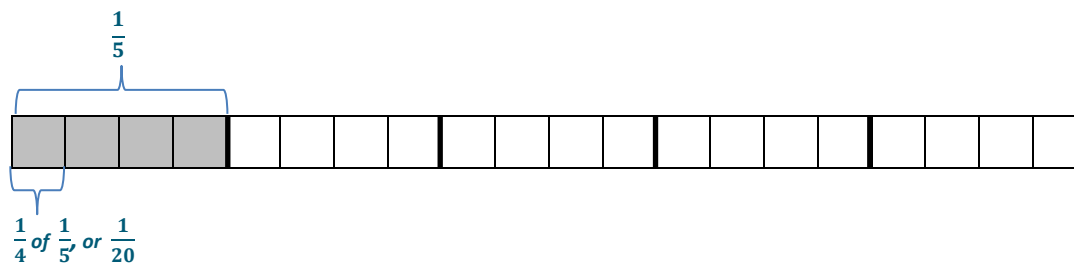$\frac{1}{6}$ *of* $\frac{1}{2}$ *is* $\frac{1}{12}$.

I need to divide $\frac{1}{2}$ *into 6 equal sections. Or, I need to rewrite the problem as* $\frac{1}{6}$ *of* $\frac{1}{2}$.

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

$\frac{1}{3}$ *of* $\frac{1}{3}$ *is* $\frac{1}{9}$.

I need to divide $\frac{1}{3}$ *into 3 equal sections. Or, I need to rewrite the problem as* $\frac{1}{3}$ *of* $\frac{1}{3}$.

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

$\frac{1}{4}$ *of* $\frac{1}{5}$, *or* $\frac{1}{20}$

I need to divide $\frac{1}{5}$ *into 4 equal sections. Or, I need to rewrite the problem as* $\frac{1}{4}$ *of* $\frac{1}{5}$.

4. $\frac{3}{5} \div 4 = \frac{3}{20}$

I need to divide $\frac{3}{5}$ into 4 equal sections. Or, I need to rewrite the problem as $\frac{1}{4}$ of $\frac{3}{5}$.

5. $\frac{2}{3} \div 4 = \frac{2}{12}$, or $\frac{1}{6}$

I need to divide $\frac{2}{3}$ into 4 equal sections. Or, I need to rewrite the problem as $\frac{1}{4}$ of $\frac{2}{3}$.

Closing (5 minutes)

- When a fraction is divided by a whole number, how does the answer compare with the dividend (the original fraction)?
  - □   *Students should notice that the quotient is smaller than the original fraction.*

Exit Ticket (5 minutes)

Name _____   Date_____

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Exit Ticket
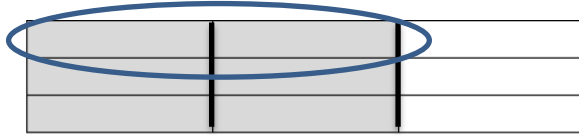
Find the quotient using a model.
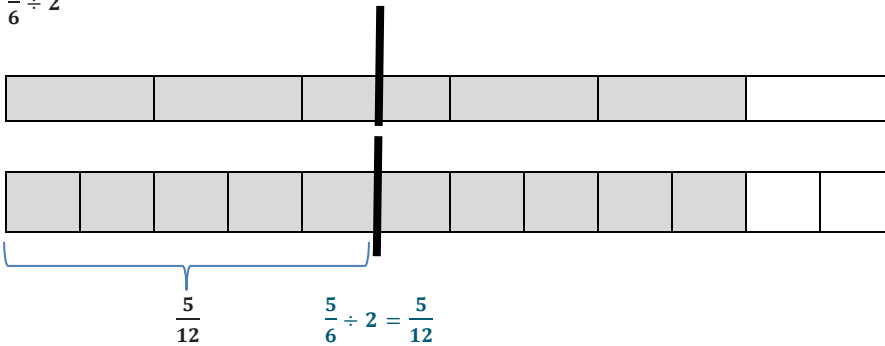
1. $\dfrac{2}{3} \div 3$

2. $\dfrac{5}{6} \div 2$

Exit Ticket Sample Solutions

Solve each division problem using a model.

1. $\frac{2}{3} \div 3 = \frac{2}{9}$

2. $\frac{5}{6} \div 2$

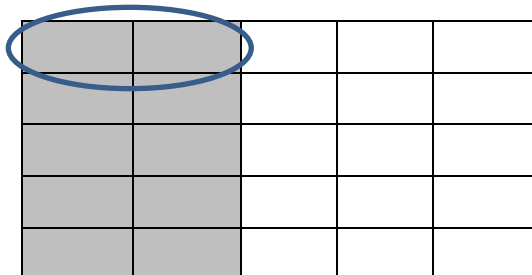$\frac{5}{12}$ $\frac{5}{6} \div 2 = \frac{5}{12}$

Problem Set Sample Solutions

Rewrite each problem as a multiplication question. Model your answer.
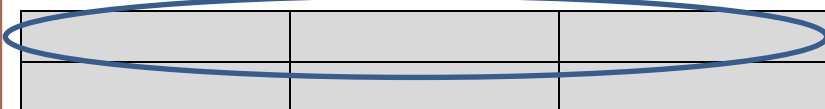
1. $\frac{2}{5} \div 5$

I need to find $\frac{1}{5}$ of $\frac{2}{5}$. I would get $\frac{2}{25}$.

2. $\frac{3}{4} \div 2$

I need to find $\frac{1}{2}$ of $\frac{3}{4}$. I would get $\frac{3}{8}$.

Fraction cards to use at the beginning of class:

$\dfrac{1}{2}$	$\dfrac{3}{4}$	$\dfrac{2}{3}$	$\dfrac{2}{5}$
$\dfrac{3}{5}$	$\dfrac{4}{5}$	$\dfrac{1}{5}$	$\dfrac{2}{6}$
$\dfrac{1}{3}$	$\dfrac{3}{6}$	$\dfrac{4}{6}$	$\dfrac{5}{6}$
$\dfrac{7}{8}$	$\dfrac{5}{8}$	$\dfrac{1}{8}$	$\dfrac{3}{8}$