



Lesson 3: Interpreting and Computing Division of a Fraction by a Fraction—More Models

Student Outcomes

- Students use fraction bars and area models to show the division of fractions by fractions with common denominators.
- Students make connections to the multiplication of fractions. In addition, students understand that to get the quotient when dividing fractions, they must ask, “How many groups of the divisor are in the dividend?”

Classwork

Opening Exercise (5 minutes)

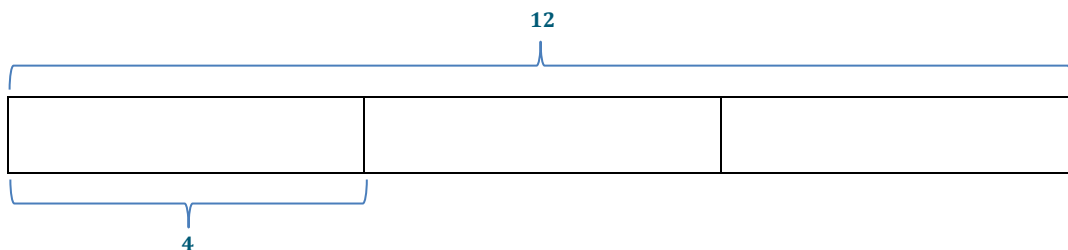
Begin class with a review of how to divide a whole number by a whole number using a model.

Opening Exercise

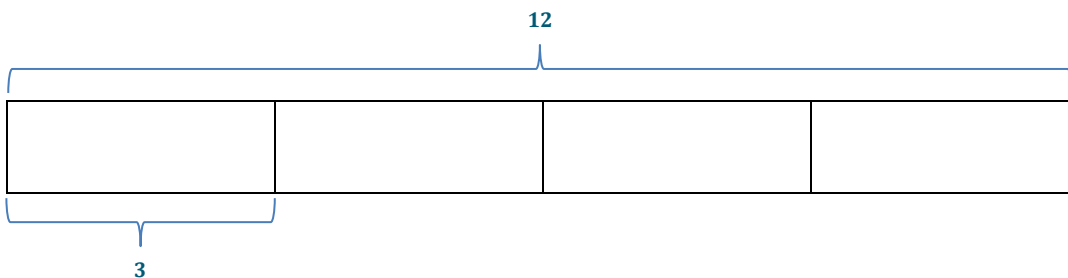
Draw a model to represent $12 \div 3$.

There are two interpretations:

Measurement Division



Partitive Division



How could we reword this question?

Answers will vary. Sample Solutions:

If we divide 12 into three groups of equal size, what is the size of each group?

If we divide 12 into groups of size 3, how many groups would we have?

If I have 12 chickens and put 3 chickens in each cage, how many cages will I need?

If I have 12 flowers and place 3 flowers in each vase, how many vases will I need?

Example 1 (5 minutes)

Next, we will introduce an example where students are asked to divide a fraction by a fraction with the same denominator. The whole number examples in the opening are used to give students ideas to build off of when dealing with fractions.

- What is $\frac{8}{9} \div \frac{2}{9}$? Take a moment to use what you know about division to create a model to represent this division problem.

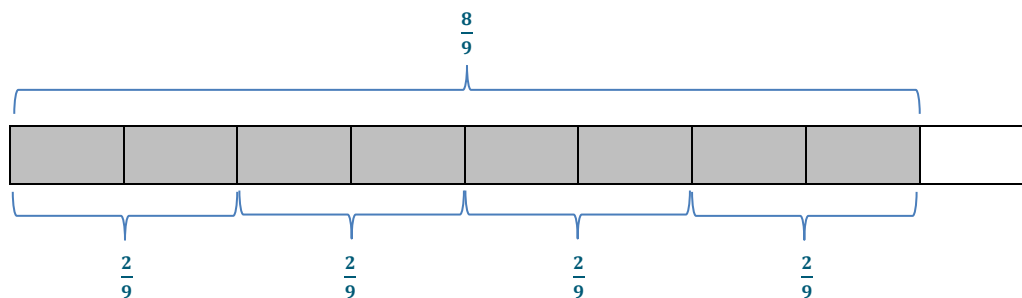
Give students a chance to explore this question and draw models without giving them the answer. After three minutes or so, ask students to share the models that they have created and to discuss what conclusions they have made about dividing fractions with the same denominator.

- One way to interpret the question is to say how many $\frac{2}{9}$ are in $\frac{8}{9}$. From the model, I can see that there are 4 groups of $\frac{2}{9}$ in $\frac{8}{9}$. This would give the same solution as dividing 8 by 2 to get 4.

Example 1

$$\frac{8}{9} \div \frac{2}{9}$$

Draw a model to show the division problem.



Here we have 4 groups of $\frac{2}{9}$. Therefore, the answer is 4.

MP.1

Example 2 (5 minutes)

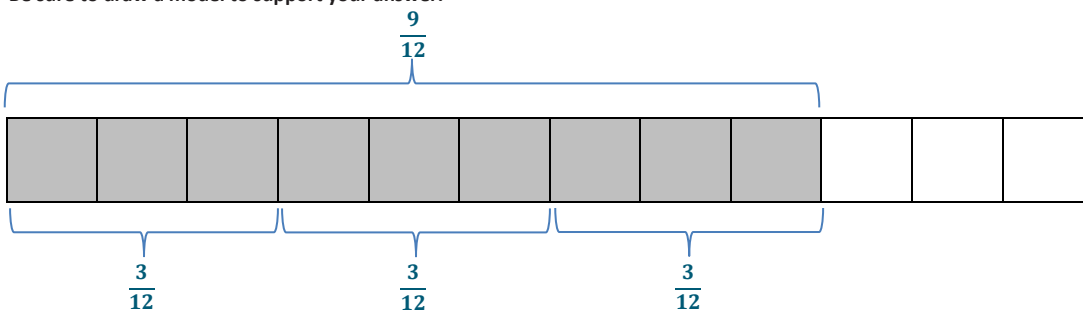
Another example of fractions divided by fractions will help students see the connection between the two concepts.

- What is $\frac{9}{12} \div \frac{3}{12}$? Be sure to create a model to support your answer.
 - One way to interpret this question is by saying how many $\frac{3}{12}$ are in $\frac{9}{12}$. In other words, I need to divide nine twelfths by three twelfths, which is the same as 9 units $\div$ 3 units, which is 3.

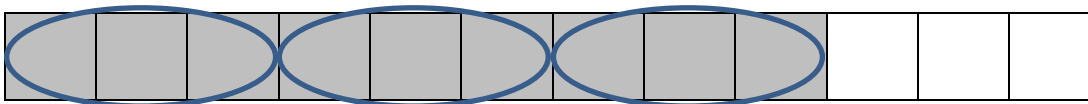
Example 2

$$\frac{9}{12} \div \frac{3}{12}$$

Be sure to draw a model to support your answer.



Students might also circle the sections that are equal to $\frac{3}{12}$.



Here we have 3 groups of $\frac{3}{12}$. Therefore, the answer is 3.

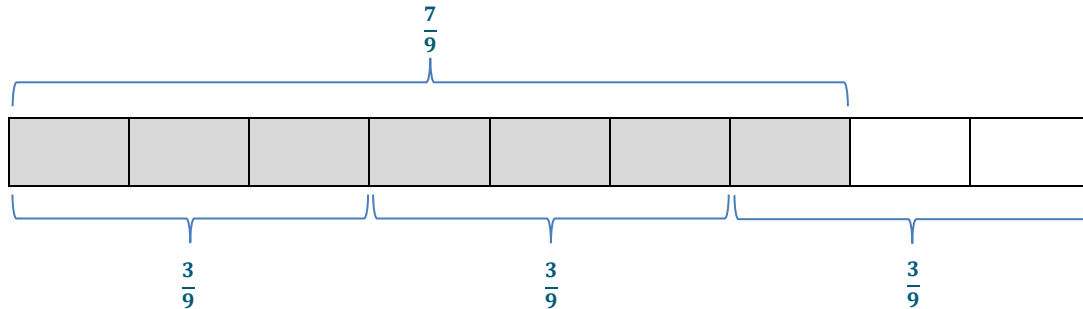
Example 3 (3 minutes)

- What is $\frac{7}{9} \div \frac{3}{9}$? Be sure to create a model to support your answer.
 - One way to interpret this question is by saying how many $\frac{3}{9}$ are in $\frac{7}{9}$. In other words, I need to divide seven ninths by three ninths, which is the same as 7 units $\div$ 3 units, which is $2\frac{1}{3}$.
- Start by drawing a model in order to divide the two fractions.
 - $\frac{7}{9} \div \frac{3}{9}$

Example 3

$$\frac{7}{9} \div \frac{3}{9}$$

Be sure to create a model to support your answer.



MP.1

- How many whole $\frac{3}{9}$ will go into $\frac{7}{9}$?
 - 2 wholes and then part of a whole
- How do we represent the remainder?
 - There is one out of the three needed pieces to make another whole. So, the remainder is $\frac{1}{3}$.
 - This means that $\frac{7}{9} \div \frac{3}{9} = 2\frac{1}{3}$.
 - This is the same as $7 \div 3$.

Exercises 1–6 (17 minutes)

Students will work in pairs or alone to solve more questions about division with like denominators.

Exercises 1–6

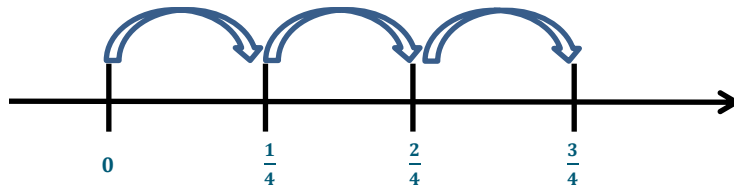
For the following exercises, rewrite the division problem. Then, be sure to draw a model to support your answer.

1. How many fourths are in three fourths?

I need to divide three fourths by one fourth, which is 3.

$$\frac{3}{4} \div \frac{1}{4}$$

Draw a model to support your answer.



There are 3 one-fourths in three-fourths.

How are Example 2 and Exercise 1 similar?

Both questions have a quotient of 3.

How are the divisors and dividends related?

$\frac{9}{12}$ is equivalent to $\frac{3}{4}$, and $\frac{3}{12}$ is equivalent to $\frac{1}{4}$.

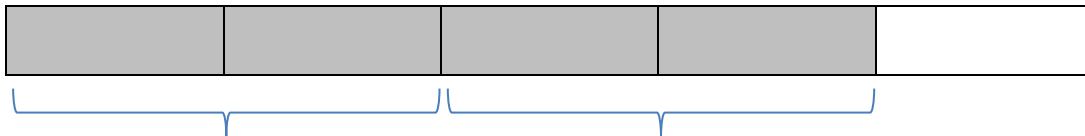
$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}, \text{ and } \frac{1 \times 3}{4 \times 3} = \frac{3}{12}.$$

What conclusions can you draw from these observations?

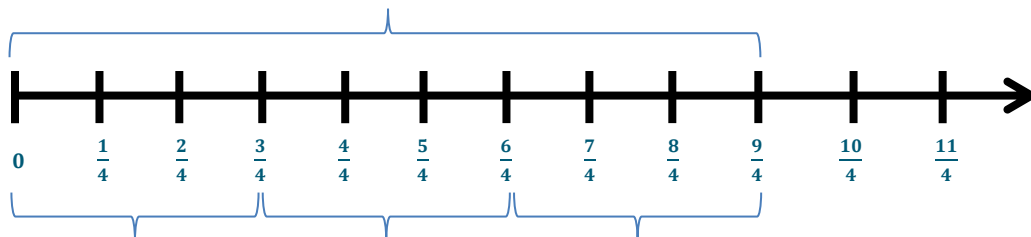
When the dividend and divisor are scaled up or scaled down by the same amounts, the quotient stays the same.

2. $\frac{4}{5} \div \frac{2}{5}$

This is really four fifths divided by two fifths, which is 2.



3. $\frac{9}{4} \div \frac{3}{4}$



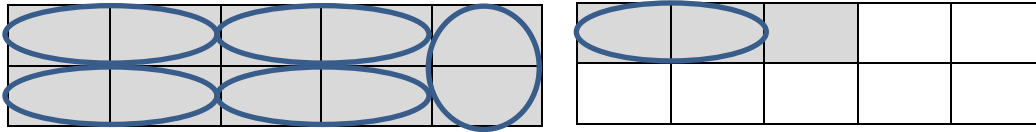
This is really nine fourths divided by three fourths, which is 3.

4. $\frac{7}{8} \div \frac{2}{8}$



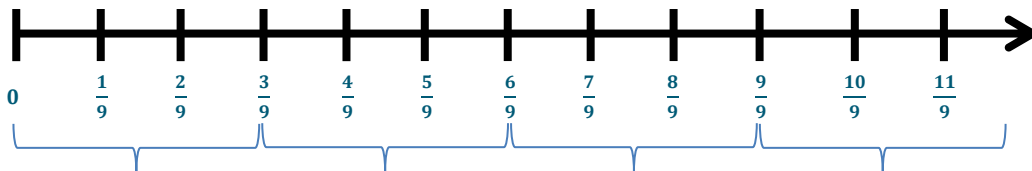
This is really seven eighths divided by two eighths, which is $\frac{7}{2}$ or $3\frac{1}{2}$.

5. $\frac{13}{10} \div \frac{2}{10}$



This is really thirteen sixths divided by two sixths, which is $\frac{13}{2}$ or $6\frac{1}{2}$.

6. $\frac{11}{9} \div \frac{3}{9}$



This is really eleven ninths divided by three ninths, which is $\frac{11}{3}$ or $3\frac{2}{3}$.

Closing (5 minutes)

Depending on how much time you have in the class, you could have each student write to another student an actual note that contains models and a description of the ideas discussed in class. Or, if time is short, this can be a discussion.

- Imagine that your best friend missed today's lesson. What key ideas would you want your friend to know in order to be able to divide fractions by fractions with the same denominator?
 - *We can use a variety of models to show that when dividing fractions by fractions with the same denominator, it is equivalent to dividing the numerators.*

Lesson Summary

When dividing a fraction by a fraction with the same denominator, we can use the general rule $\frac{a}{c} \div \frac{b}{c} = \frac{a}{b}$.

Exit Ticket (5 minutes)

Name _____

Date _____

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Exit Ticket

Draw a model to support your answer to the division questions.

1. $\frac{9}{4} \div \frac{3}{4}$

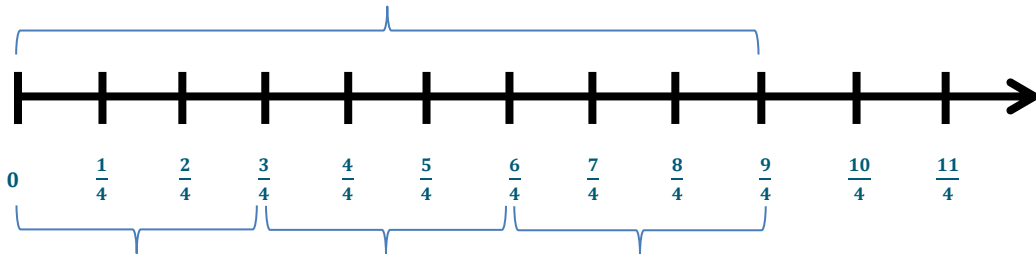
2. $\frac{7}{3} \div \frac{2}{3}$

Exit Ticket Sample Solutions

Draw a model to support your answer to the division questions.

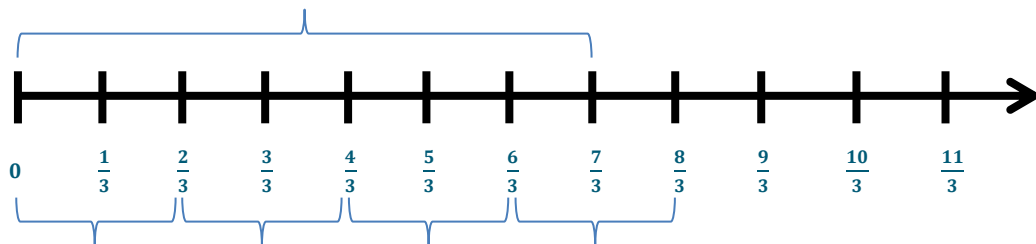
1. $\frac{9}{4} \div \frac{3}{4}$

This is really nine fourths $\div$ three fourths = 3.



2. $\frac{7}{3} \div \frac{2}{3}$

This is really asking seven thirds $\div$ two thirds, which is $\frac{7}{2}$ or $3\frac{1}{2}$.

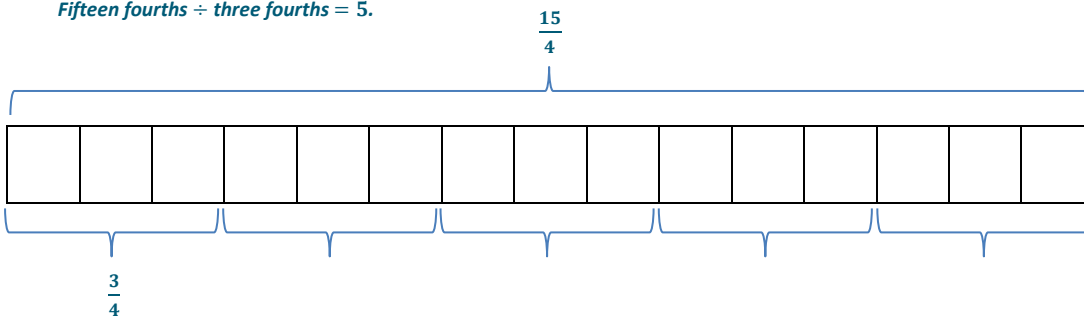


Problem Set Sample Solutions

For the following exercises, rewrite the division problem in words. Then, be sure to draw a model to support your answer.

1. $\frac{15}{4} \div \frac{3}{4}$

Fifteen fourths $\div$ three fourths = 5.



2. $\frac{8}{5} \div \frac{3}{5}$

Eight fifths $\div$ *three fifths* = $\frac{8}{3}$ or $2\frac{2}{3}$.

