

Understand Division with Fractions

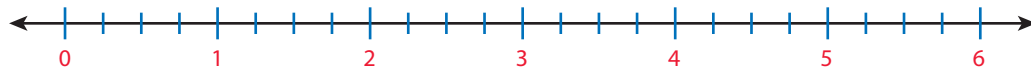
Think It Through

What does it mean to divide a fraction by a fraction?



You know how to divide a whole number by a unit fraction. For example, you can think of 6 divided by $\frac{1}{4}$ as “how many one-fourths are there in 6?” Using a number line, you can divide 6 into fourths and count to see there are 24 fourths in 6.

$$6 \div \frac{1}{4} = 24$$



You also learned that dividing a number by a fraction is the same as multiplying the number by the reciprocal of the fraction.

$$6 \div \frac{1}{4} \text{ is the same as } 6 \times 4, \text{ or } 24.$$

Think What does dividing a whole number by a fraction mean?

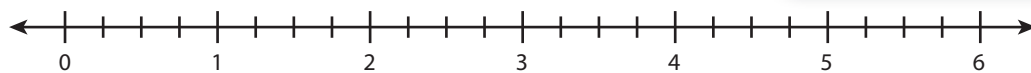
Madison cuts a 6-yard length of ribbon into $\frac{3}{4}$ -yard pieces.

To figure out how many pieces Madison cut, think, “How many three-fourths are in 6?”

You can draw the same number line to represent the 6 yards of ribbon and divide it into fourths.

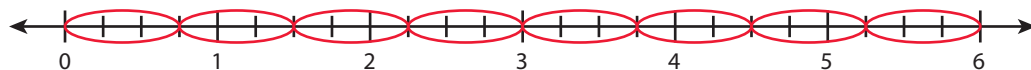


Circle the multiplication expression that is the same as the division expression.



You can circle three $\frac{1}{4}$ sections to represent $\frac{3}{4}$ -yard pieces. You can see there are eight $\frac{3}{4}$ -yard pieces in 6 yards.

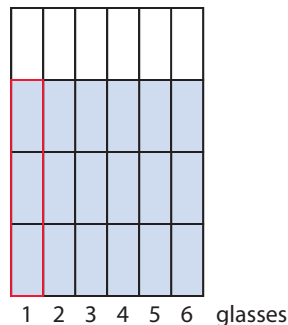
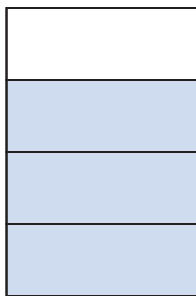
$$6 \div \frac{3}{4} = 8$$



$$6 \times \frac{4}{3} = 8$$

Think What does dividing a fraction by a whole number mean?

Cory wants to pour $\frac{3}{4}$ of a quart of juice equally into 6 glasses. This means he needs to divide $\frac{3}{4}$ into 6 equal parts. You can represent the problem with an area model. First, you can show the $\frac{3}{4}$ quart of juice. Then, you can draw vertical lines to divide the model into 6 equal parts.



$$\frac{3}{4} \div 6 = \frac{3}{24} = \frac{1}{8}$$

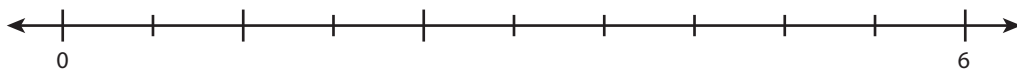
$\frac{3}{4}$ quart of juice divided equally into 6 glasses means Cory will pour $\frac{3}{24}$ or $\frac{1}{8}$ quart of juice into each glass.

$$\frac{3}{4} \div 6 \text{ is the same as } \frac{3}{4} \times \frac{1}{6}.$$

Cory pours $\frac{1}{6}$ of $\frac{3}{4}$ quart of juice into each glass.

Reflect

1 Use the number line to show and explain why $\frac{4}{10} \div 2$ and $\frac{4}{10} \times \frac{1}{2}$ both equal $\frac{2}{10}$.



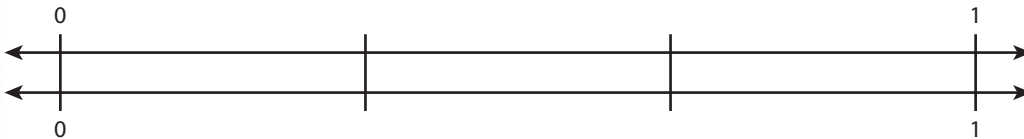
Think About**Dividing by a Fraction**

Let's Explore the Idea Explore dividing a fraction by a fraction with the problem below.



Kate has $\frac{2}{3}$ yards of fabric to make small flags. Each flag requires $\frac{1}{6}$ yard of fabric. How many flags can Kate make?

- 2 You need to find out how many _____ are in _____.
- 3 The number lines below are divided into thirds. Label $\frac{2}{3}$ on the top number line to represent $\frac{2}{3}$ yards of fabric.



- 4 Each flag requires $\frac{1}{6}$ yard of fabric. Divide the bottom number line into sixths to show how many sixths are in $\frac{2}{3}$.
- 5 Look at the bottom number line. How many sixths are there in $\frac{2}{3}$? _____
- 6 How many flags can Kate make? _____
- 7 $\frac{2}{3} \div \frac{1}{6} =$ _____
- 8 $\frac{2}{3} \times$ _____ $= 4$



Let's Talk About It

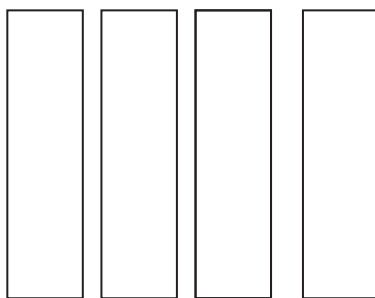
Solve the problem below as a group.



Kevin has 6 cups of flour. It takes $\frac{3}{8}$ cup of flour to make one cake. How many cakes can Kevin make?

- 9 You need to find out how many _____ are in _____.
- 10 Do you think the number of cakes Kevin can make is greater than or less than 6? Why?

- 11 Represent 6 cups with 6 rectangles. 4 rectangles are shown below. Draw 2 more rectangles.



- 12 Circle and count groups of $\frac{3}{8}$ in the model. How many did you circle? _____
- 13 How many $\frac{3}{8}$ -cups of flour are in 6 cups of flour? _____
- 14 $6 \div \frac{3}{8} =$ _____

► Try It Another Way Explore dividing by a unit fraction using a common denominator.

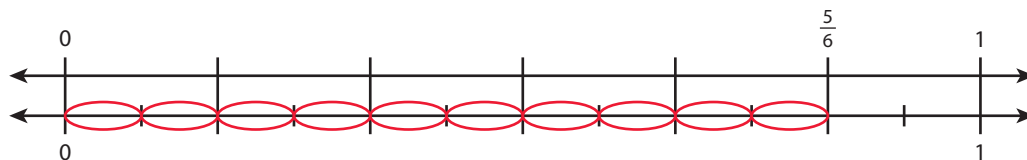
To solve $5 \div \frac{1}{2}$, write 5 as a fraction with a denominator of 2 and think, "How many halves are in ten halves?" $\frac{10}{2} \div \frac{1}{2} = 10$. Use the same reasoning to find $\frac{8}{6} \div \frac{2}{3}$.

- 15 Write $\frac{8}{6}$ as a fraction with a denominator of 3. _____ To solve $\frac{4}{3} \div \frac{2}{3}$, think, "How many two-thirds are in four-thirds"? _____
- 16 Write $\frac{2}{3}$ as a fraction with a denominator of 6. _____ To solve $\frac{8}{6} \div \frac{4}{6}$, think, "How many four-sixths are in eight-sixths"? _____

Dividing by a Fraction

Talk through these problems as a class, then write your answers below.

- 17 Explain** Look at the model below. Write the division equation that the model represents. Explain how to find the quotient using the model.



- 18 Analyze** Sam said that $\frac{3}{2} \div \frac{1}{4}$ equals $\frac{3}{8}$. Draw a model and use words to explain why Sam's statement is not reasonable.

- 19 Justify** Show that $2 \div \frac{4}{6} = 3$ by using a model. Explain why the answer is greater than the number you started with.

Apply**Dividing by a Fraction****20 Put It Together** Use what you have learned to complete this task.

Choose one of the following problems to solve. Circle the problem you choose.

Greg made $\frac{2}{3}$ gallon of lemonade and plans to share it equally among 4 friends.
How much lemonade will each friend get?

Keisha plans to run 4 miles this week. If she runs $\frac{2}{3}$ of a mile each day, how many days will it take her to run 4 miles? Will she be able to run 4 miles in a week?

Part A Write a division expression and draw a model to represent the problem.

Part B Estimate what you think the quotient will be. Will the quotient be greater than or less than the dividend? How do you know?

Part C Use your model to explain how to find the quotient and what the quotient means.
