

Divide Fractions

KEY Concept

A diagram can help you to divide fractions.

For example, determine the quotient of $\frac{3}{4} \div \frac{1}{8}$.

The product of a fraction and its reciprocal is 1. The reciprocal of $\frac{3}{8}$ is $\frac{8}{3}$.

$$\frac{3}{8} \times \frac{8}{3} = \frac{3 \times 8}{8 \times 3} = \frac{24}{24} = 1$$

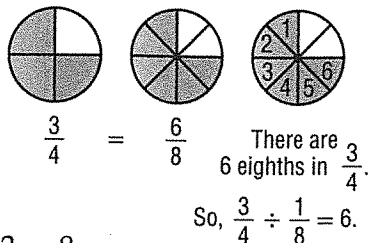
Notice that the reciprocal of a fraction is the fraction obtained by switching the numerator and denominator of the original fraction.

To divide by a fraction you can also multiply by the reciprocal of the divisor.

Notice that the result is the same as that in the diagram above.

Multiply by the reciprocal of $\frac{1}{8}$.

$$\begin{array}{c} \text{dividend} \quad \text{divisor} \\ \frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{8}{1} = \frac{24}{4} = 6 \end{array}$$



VOCABULARY

dividend

a number that is being divided

divisor

the number by which the dividend is divided

quotient

the result to a division problem

reciprocals

two numbers that have a product of 1

To divide fractions, change the operation to multiplication, and use the reciprocal of the divisor.

Example 1

Find the reciprocal of $\frac{2}{3}$.

1. Write the reciprocal.

$$\frac{3}{2}$$

2. Check your answer by multiplying the two fractions.

$$\frac{2}{3} \times \frac{3}{2} = \frac{2 \times 3}{3 \times 2} = 1$$

The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.

YOUR TURN!

Find the reciprocal of $\frac{5}{7}$.

1. Write the reciprocal.

$$\frac{\square}{\square}$$

2. Check your answer by multiplying the two

fractions. $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square \times \square}{\square \times \square} = 1$

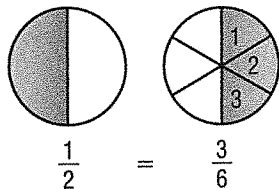
3. The reciprocal of $\frac{5}{7}$ is $\frac{\square}{\square}$.

GO ON

Example 2

Find $\frac{1}{2} \div \frac{1}{6}$ using a model.

1. Model $\frac{1}{2}$.
2. Look at the denominator of the divisor. You need to find how many sixths are in $\frac{1}{2}$. Change the model to have 6 sections.



3. There are 3 sixths in $\frac{1}{2}$. $\frac{3}{6} = \frac{1}{2}$
4. Write the division sentence.

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

YOUR TURN!

Find $\frac{3}{4} \div \frac{1}{12}$ using a model.

1. Model $\frac{3}{4}$.
2. Look at the denominator of the divisor. You need to find how many twelfths are in $\frac{3}{4}$. Change the model to have that many sections.

3. How many twelfths are in $\frac{3}{4}$? _____
4. Write the division sentence.

$$\frac{3}{4} \div \frac{1}{12} = \underline{\hspace{2cm}}$$

Example 3

Find $\frac{1}{4} \div \frac{1}{5}$.

1. Write the reciprocal of the divisor $\frac{1}{5}$.
 $\frac{5}{1}$
2. Multiply by the reciprocal of the divisor.

$$\begin{array}{c} \frac{1}{4} \div \frac{1}{5} \\ \downarrow \\ \frac{1}{4} \times \frac{5}{1} \end{array}$$

3. Multiply. Write in simplest form.

$$\frac{1 \times 5}{4 \times 1} = \frac{5}{4} = 1\frac{1}{4}$$

YOUR TURN!

Find $\frac{2}{7} \div \frac{4}{10}$.

1. Write the reciprocal of the divisor. $\frac{\square}{\square}$
2. Multiply by the reciprocal of the divisor.

$$\frac{\square}{\square} \times \frac{\square}{\square}$$

3. Multiply. Write in simplest form.

$$\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square}$$

Who is Correct?

Find $\frac{3}{8} \div \frac{1}{4}$.

Kristen

$$\begin{aligned} \frac{3}{8} \div \frac{1}{4} &= \frac{3}{8} \times \frac{4}{1} \\ &= \frac{12}{8} = \frac{12 \div 4}{8 \div 4} \\ &= \frac{3}{2} \end{aligned}$$

Justin

$$\begin{aligned} \frac{3}{8} \div \frac{1}{4} &= \frac{3}{8} \times \frac{1}{4} \\ &= \frac{3}{2} \end{aligned}$$

Dario

$$\begin{aligned} \frac{3}{8} \div \frac{1}{4} &= \frac{3}{8} \times \frac{4}{1} = \\ & \frac{3 \times \cancel{4} \times \cancel{4}}{2 \times \cancel{4} \times \cancel{4}} \\ &= \frac{3}{2} \end{aligned}$$

Circle correct answer(s). Cross out incorrect answer(s).

Guided Practice

Find the reciprocal of each number.

1 $\frac{1}{2}$ _____

2 $\frac{3}{4}$ _____

3 $\frac{5}{6}$ _____

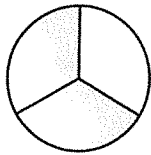
4 $\frac{4}{7}$ _____

5 $\frac{1}{8}$ _____

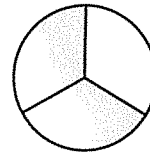
6 $\frac{9}{12}$ _____

Divide using a model.

7 $\frac{2}{3} \div \frac{1}{6} = \frac{3}{3}$



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



8 $\frac{3}{5} \div \frac{1}{10} =$

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10 $\frac{3}{5} \div \frac{1}{15} =$

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Step by Step Practice

- 11 Find $\frac{2}{5} \div \frac{2}{3}$. Write the quotient in simplest form.

Step 1 Write the reciprocal of the divisor.

The divisor is $\frac{2}{3}$. Its reciprocal is $\frac{\square}{\square}$.

Step 2 Multiply by the reciprocal of the divisor.

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

↓

$$= \frac{2}{5} \times \frac{\square}{\square}$$

Step 3 Multiply the fractions.

$$= \frac{2 \times \square}{5 \times \square}$$

Write your answer in simplest form.

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

Divide. Write each quotient in simplest form.

12

$$\frac{6}{7} \div \frac{1}{2}$$

↓

$$= \frac{\square \times \square}{\square \times \square} = \frac{\square}{\square}$$

13 $\frac{3}{7} \div \frac{1}{4} = \underline{\hspace{2cm}}$

14 $\frac{1}{2} \div \frac{5}{6} = \underline{\hspace{2cm}}$

15 $\frac{2}{3} \div \frac{8}{9} = \underline{\hspace{2cm}}$

16 $\frac{1}{4} \div \frac{7}{8} = \underline{\hspace{2cm}}$

17 $\frac{2}{5} \div \frac{6}{10} = \underline{\hspace{2cm}}$

Step (by) Step Problem-Solving Practice

Solve.

- 18 **BAKERY** Each morning a large sheet cake is made and cut into pieces. If the baker needs $\frac{5}{8}$ of a cake to cut 6 equal pieces, what part of the cake will each piece be?

Understand Read the problem. Write what you know.

_____ pieces are cut from _____ of a cake.

Plan

Pick a strategy. One strategy is to draw a diagram.

To divide $\frac{5}{8}$ into 6 equal parts, draw a rectangle.

Divide it vertically into 8 equal parts. Shade

5 parts. Then divide it horizontally into 6 equal parts.



There are 6 equal parts that make up each eighth. Each one is equal to $\frac{1}{48}$.

Solve

Count the shaded parts that make up each sixth.

$$\frac{5}{8} \div 6 = \frac{\boxed{}}{\boxed{}} \div \frac{\boxed{}}{\boxed{}}$$

$$= \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

Each sixth is $\frac{\boxed{}}{\boxed{}}$.

- 19 **CELEBRATIONS** For Molly's birthday party, she serves 4 cups of potato chips. If one serving is $\frac{3}{5}$ of a cup, how many servings are there? Check off each step.

_____ **Understand:** I underlined key words.

_____ **Plan:** To solve the problem, I will _____.

_____ **Solve:** The answer is _____.

_____ **Check:** I checked my answer by _____.

GO ON

- 20 **ART** Nikki and Fidel attended an art exhibit. They saw a painting that was created from a series of dots. Together they counted 240 dots in an area that was $\frac{1}{36}$ of the painting.

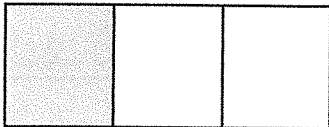
About how many dots cover the entire painting? _____

- 21 **Reflect** Write a note to an absent student explaining how to divide fractions. Be sure to use the word *reciprocal*.

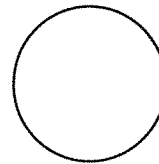
Skills, Concepts, and Problem Solving

Divide using diagrams. Write each quotient in simplest form.

22 $\frac{1}{3} \div \frac{1}{9} =$ _____



23 $\frac{1}{2} \div \frac{1}{4} =$ _____



Divide. Write each quotient in simplest form.

24 $\frac{2}{7} \div \frac{5}{9} =$ _____

25 $\frac{4}{5} \div \frac{5}{6} =$ _____

26 $\frac{2}{3} \div \frac{9}{12} =$ _____

27 $\frac{2}{3} \div \frac{12}{15} =$ _____

28 $\frac{3}{4} \div 12 =$ _____

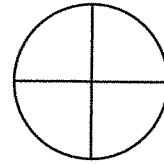
29 $\frac{3}{5} \div 15 =$ _____

Solve. Write the answer in simplest form.

- 30 **CARPENTRY** Aaron has a board that is $\frac{2}{3}$ of a foot long. He has to cut 4 equal pieces of wood from this piece. What will be the length of each piece?

- 31 **FOOD** The cafeteria baked 23 pies. A serving is $\frac{1}{8}$ of a pie. How many servings can they get from 23 pies? _____
- 32 **DINING** You and a friend are trying to split up $\frac{3}{4}$ of a pizza evenly. How much of the pizza do you each get? Use a model to justify

your answer. _____



Vocabulary Check Write the vocabulary word that completes each sentence.

- 33 In the division problem $24 \div 8 = 3$, the _____ is 8.
- 34 A fraction made from another fraction by switching the numerator and denominator is the _____ of that fraction.
- 35 The _____ is the answer to a division problem.
- 36 **Writing in Math** Explain how you would divide 5 by $\frac{1}{4}$.

Spiral Review

Multiply. Write each product in simplest form. (Lesson 2-3, p. 77)

37 $\frac{2}{3} \times \frac{9}{20} =$ _____

38 $\frac{2}{7} \times \frac{21}{18} =$ _____

39 $\frac{2}{3} \times \frac{2}{4} \times \frac{3}{5} =$ _____

40 $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} =$ _____

41 $\frac{2}{16} \times \frac{12}{10} =$ _____

42 $\frac{8}{11} \times \frac{3}{4} \times \frac{1}{2} =$ _____

Solve.

- 43 **ALLOWANCE** Of the 21 students who earn an allowance, 14 do chores around the house. What fraction of these students, in simplest form, do chores around the house?



ALLOWANCE Students earn an allowance by doing chores.

