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# 12 Dividing Fractions



## Introduction

To divide a number by a fraction, multiply by the **reciprocal** of the divisor. The reciprocal of a fraction is its inverse.

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

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

Multiply by the reciprocal:  $\frac{2}{5} \times \frac{5}{3} = \frac{10}{15}$

Simplify:  $\frac{10}{15} = \frac{2}{3}$

For problems with whole numbers, you can write the whole number as a fraction with 1 as the denominator. You can rewrite mixed numbers as improper fractions as well.

To solve word problems that involve dividing fractions, you can write an equation or draw a fraction model to help you find the answer.

Tammy pours  $\frac{2}{3}$  cup of trail mix into a bag. How many  $\frac{1}{6}$ -cup servings are in the bag?

Start by writing an equation. The question asks how many groups of  $\frac{1}{6}$  are in  $\frac{2}{3}$ .

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

Divide the fractions by multiplying by the reciprocal of the divisor.

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

The bag has 4 servings that are each  $\frac{1}{6}$  cup.

To find the reciprocal, flip the numerator and the denominator.

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

To write a mixed number as an improper fraction, multiply the whole number by the denominator. Then add the numerator. The denominator stays the same.

$$2\frac{1}{2} = \frac{2 \times 2 + 1}{2} = \frac{5}{2}$$

Sometimes when you are multiplying fractions, you can cancel common factors to make it easier to solve.

In the equation on the previous page, you can cancel out the common factor, 3, for 3 and 6:

$$\frac{2}{1\cancel{3}} \times \frac{\cancel{6}^2}{1} = \frac{4}{1} = 4$$

### Think About It



Recipes often involve measurements in fraction form. Describe an example of when you might need to divide an amount by a fraction when using a recipe.

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### Focused Instruction

**By cancelling common factors, you work with smaller numbers. This makes the operations easier to do.**

- ▶ Find the quotient of  $\frac{3}{10} \div \frac{5}{12}$ .

Which fraction must you find the reciprocal of? \_\_\_\_\_

What is the reciprocal of that fraction? \_\_\_\_\_

Rewrite this division problem as a multiplication problem. \_\_\_\_\_

Look at the denominator of the dividend and the numerator of the divisor. Do these numbers have any common factors? \_\_\_\_\_

If so, what is the common factor? \_\_\_\_\_

How many times does the common factor divide each number?  
\_\_\_\_\_

In your expression above, cross out these numbers and replace them with the number that multiplies the common factor to result in each number.

Look at the numerator of the dividend and the denominator of the divisor. Do these numbers have any common factors? \_\_\_\_\_

Factors are the numbers that are multiplied to get a product.

If so, cancel them as you did before. If not, leave them as they are.

Do the multiplication in your expression. What is the quotient

of  $\frac{3}{10} \div \frac{5}{12}$ ? \_\_\_\_\_

How does cancelling common factors help you put the answer in lowest terms?

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**Sometimes you must divide a fraction by a whole number. You can use a fraction model to help you.**

- ▶ There are 5 friends who are sharing a  $\frac{1}{2}$ -pound bag of tortilla chips evenly. What fraction of a pound will each friend get?

Start by using a fraction model. Show  $\frac{1}{2}$  pound on the fraction bar.



Divide the fraction bar to show 5 groups in each part.

How many smaller sections are there in all? \_\_\_\_\_

What fraction of the bar does each smaller section make up? \_\_\_\_\_

How much of a pound does each friend get? \_\_\_\_\_

Write and solve the same problem as an equation. \_\_\_\_\_

**Use what you know about dividing fractions to solve these problems.**

**1**  $15 \div \frac{3}{4} =$  \_\_\_\_\_

**2**  $\frac{3}{8} \times$  \_\_\_\_\_  $= \frac{1}{4}$

**Solve the following problems.**

- 1** Sabrina and Jake are at soccer camp. The length of a soccer practice is  $\frac{2}{3}$  hour. The coaches have set aside 8 hours for soccer practice. How many soccer practices can the coaches have?

**Part A** Write and solve an equation to answer the question.

**Answer** \_\_\_\_\_

Use the information in the problem to write an equation.

**Part B** Draw a model of this problem using a fraction bar.

How many smaller sections should each section be divided into?

**Part C** Explain how the model matches the solution from Part A.

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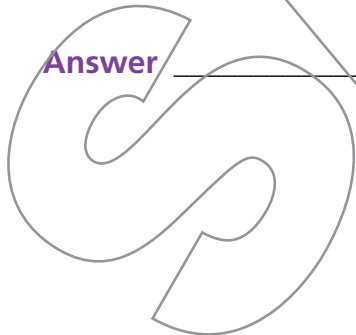


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- 2** Carmen walked  $2\frac{1}{2}$  miles in  $\frac{3}{4}$  hour. What was her average walking speed, in miles per hour?

Speed is measured by distance divided by time.

**Answer** \_\_\_\_\_ miles per hour



Solve the following problems.

- 1 A bottle contains 8 cups of juice. The juice is poured into glasses that hold  $\frac{3}{4}$  cup each. How many glasses can be filled with the juice?

A 6

B  $8\frac{3}{4}$

C  $10\frac{2}{3}$

D 12

- 2 Manuel ordered 6 super-sub sandwiches for a party. Each  $\frac{1}{3}$  of a sandwich is 1 serving. Including Manuel, there will be 16 people at the party. Manuel wants to be sure everyone will get at least 1 serving.

**Part A** Draw a number line to illustrate this situation.

**Part B** Write a division equation to solve this problem.

**Answer** \_\_\_\_\_

**Part C** Did Manuel order enough food to feed 16 people? Justify your answer.

\_\_\_\_\_  
\_\_\_\_\_

**3** The area of a rectangular ice rink is  $1,035\frac{2}{9}$  square feet. The length of the ice rink is  $25\frac{2}{3}$  feet.

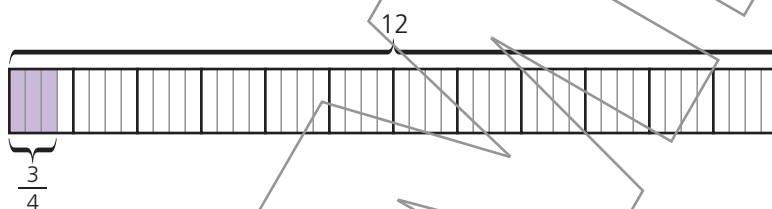
**Part A** Write an equation to find the width of the ice rink. Use improper fractions.

**Answer** \_\_\_\_\_

**Part B** What is the width of the rink, in feet? Show your work.

**Answer** \_\_\_\_\_ feet

**4** Write and solve a division equation based on the model.



**Answer** \_\_\_\_\_

**5** The perimeter of a square is found by multiplying the side lengths by 4. The perimeter of a certain square is  $40\frac{5}{8}$  feet. Write and solve an equation to find the length of one side of the square. Show your work.

**Answer** \_\_\_\_\_ feet



- 6 How fast is a car going that traveled  $330\frac{1}{3}$  miles in  $5\frac{1}{4}$  hours? Show your work.

**Answer** \_\_\_\_\_ miles per hour

- 7 Mark True or False for each of the following statements.

The reciprocal of 38 is  $\frac{1}{38}$ .

**True**

**False**



The reciprocal of  $\frac{25}{3}$  is  $3\frac{2}{5}$ .



The quotient of  $4\frac{1}{2} \div 2$  is  $2\frac{1}{2}$ .



The quotient of  $\frac{3}{4} \div \frac{8}{3}$  is 2.



- 8 A piece of land is  $\frac{2}{3}$  acre. It is divided evenly into 3 pieces. What is the size of each piece of land?

**A**  $\frac{1}{3}$  acre

**B**  $\frac{2}{9}$  acre

**C** 2 acres

**D**  $2\frac{1}{3}$  acres