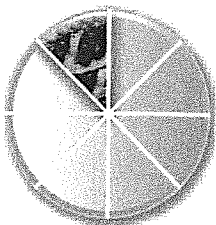
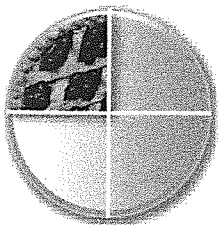


# Multiply Fractions

## KEY Concept

You have  $\frac{1}{4}$  of a pie. You eat *half* of that  $\frac{1}{4}$  slice.



Eating  $\frac{1}{2}$  of  $\frac{1}{4}$  of one pie is the same as eating  $\frac{1}{8}$  of the

original pie. So,  $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$ .

To multiply two fractions, multiply the numerators and multiply the denominators.

## VOCABULARY

### factor

a number that divides into a whole number evenly; also a number that is multiplied by another number

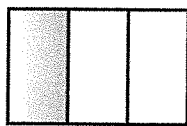
The word *of* means to multiply in these problems. Notice that  $\frac{1}{2}$  of  $\frac{1}{4}$  is the same as multiplying  $\frac{1}{2}$  and  $\frac{1}{4}$ .

### Example 1

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

1. Divide a figure into thirds.

Shade  $\frac{1}{3}$ .



2. Now cut each third into fourths.

Each third is cut into fourths.



3. Shade in one of the fourths.

$$\frac{1}{4} \text{ of } \frac{1}{3} = \frac{1}{12}$$



4. Name the fraction that represents the area common to both the  $\frac{1}{3}$  and the  $\frac{1}{4}$  models.  $\frac{1}{12}$

### YOUR TURN!

Find  $\frac{1}{2} \times \frac{1}{5}$  using a model.

1. Divide a figure into \_\_\_\_\_.

Shade \_\_\_\_\_.



2. Now cut each half into \_\_\_\_\_.



3. Shade in \_\_\_\_\_ of the fifths.

4. Name the shaded fraction. \_\_\_\_\_

GO ON

### Example 2

Find  $\frac{2}{3} \times \frac{9}{8}$ . Write the product in simplest form.

- Multiply the numerators. Multiply the denominators.  
$$\frac{2}{3} \times \frac{9}{8} = \frac{2 \times 9}{3 \times 8} = \frac{18}{24}$$
- Write the fraction in simplest form.

$$\frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

The GCF of 18 and 24 is 6.

### YOUR TURN!

Find  $\frac{3}{4} \times \frac{2}{15}$ . Write the product in simplest form.

- Multiply the numerators. Multiply the denominators.

$$\frac{3}{4} \times \frac{2}{15} = \frac{3 \times 2}{4 \times 15} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

- Write the fraction in simplest form. \_\_\_\_\_

### Example 3

Find  $\frac{2}{3} \times \frac{9}{8}$ . Factor first. Write the product in simplest form.

- Factor the numerators and denominators.

$$\frac{2}{3} \times \frac{9}{8} = \frac{2}{3} \times \frac{3 \times 3}{2 \times 2 \times 2}$$

- Cross out all equivalent factors of one.

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

$$= \frac{3}{2 \times 2} = \frac{3}{4}$$

- Multiply. Write in simplest form. \_\_\_\_\_

### YOUR TURN!

Find  $\frac{3}{5} \times \frac{10}{18}$ . Factor first. Write the product in simplest form.

- Factor the numerators and denominators.

$$\frac{3}{5} \times \frac{10}{18} = \frac{3}{5} \times \frac{\boxed{\phantom{00}} \times \boxed{\phantom{00}}}{\boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}}}$$

- Cross out all equivalent factors of one.

$$= \frac{\boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}}}{\boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}}}$$

- Multiply. Write in simplest form. \_\_\_\_\_

### Who is Correct?

Find  $\frac{2}{5} \times \frac{3}{5}$ . Write the product in simplest form.

Len

$$\frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$$

Jason

$$\frac{2}{5} \times \frac{3}{5} = \frac{6}{5} = 1\frac{1}{5}$$

Britney

$$\frac{2}{5} \times \frac{3}{5} = \frac{6}{10} = \frac{2}{5}$$

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



## Guided Practice

Multiply using drawings. Write each product in simplest form.

$$1 \quad \frac{1}{2} \times \frac{1}{2} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} \quad \boxed{\phantom{0}}$$

$$2 \quad \frac{1}{2} \text{ of } \frac{1}{3} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} \quad \boxed{\phantom{0}}$$

Multiply. Write the product in simplest form.

$$3 \quad \frac{1}{3} \times \frac{2}{6} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$4 \quad \frac{4}{5} \times \frac{5}{6} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$5 \quad \frac{3}{8} \times \frac{2}{3} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$6 \quad \frac{1}{9} \times \frac{3}{4} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

### Step by Step Practice

7 Find  $\frac{3}{10} \times \frac{6}{7}$ . Factor first. Write the product in simplest form.

**Step 1** Factor the numerators.  
Factor the denominators.

$$\frac{3}{10} \times \frac{6}{7} = \frac{3}{\boxed{\phantom{0}} \times \boxed{\phantom{0}}} \times \frac{\boxed{\phantom{0}} \times \boxed{\phantom{0}}}{7}$$

$$= \frac{3 \times \boxed{\phantom{0}} \times \boxed{\phantom{0}}}{\boxed{\phantom{0}} \times \boxed{\phantom{0}} \times 7}$$

**Step 2** Cross out all equivalent forms of one.

$$= \frac{\boxed{\phantom{0}} \times 3 \times 3}{\boxed{\phantom{0}} \times 5 \times 7}$$

**Step 3** Multiply the remaining numerators and denominators. Write the fraction in simplest form.

$$= \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

Multiply. Factor first. Write each product in simplest form.

$$8 \quad \frac{3}{8} \times \frac{8}{3} = \frac{\boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}}}{\boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \underline{\hspace{2cm}}$$

GO ON 

## Step (by) Step Problem-Solving Practice

### Problem-Solving Strategies

- Draw a diagram.
- Solve a simpler problem.
- Work backward.
- Act it out.
- Look for a pattern.

**Solve.**

- 9 **HOBBIES** Eli bought a sheet of poster board. He needs one-half of  $\frac{2}{3}$  of the poster board for a project. How much will he have left?

**Understand** Read the problem. Write what you know.

He will use \_\_\_\_\_ of \_\_\_\_\_ of the poster board. Subtract what he uses from \_\_\_\_\_ to find the amount that will be left.

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

You need to find how much he will use in order to figure out what will be left.

**Solve** Draw a picture and divide it into thirds. Then divide the thirds in half and mark out one-half of the shaded section.



One of those halves represents  $\frac{1}{2}$  of  $\frac{2}{3}$ .

$$\frac{1}{2} \times \frac{2}{3} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$= \frac{\boxed{\phantom{0}} \div \boxed{\phantom{0}}}{\boxed{\phantom{0}} \div \boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

How much poster board did Eli use? \_\_\_\_\_ How much will he have left?

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**Check** Does the answer make sense? Look over your solution. Did you answer the question?

- 10 **SCHOOL** Mr. Ortega needed  $\frac{1}{3}$  of the students to take a quiz. On the quiz,  $\frac{3}{5}$  of these students received a passing grade. What fraction of the students received a passing grade?

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 \_\_\_\_\_.

- 11 **MUSIC** Keith practices the saxophone every day for  $\frac{2}{3}$  hour. He spends  $\frac{1}{4}$  of that time practicing scales. How much time does he spend on scales?

\_\_\_\_\_

- 12 **Reflect** When multiplying two fractions, suppose you factor the numerators and denominators and then cancel equivalents of one. What step should you **not** have to do after you multiply?

\_\_\_\_\_



## Skills, Concepts, and Problem Solving

**Multiply using drawings. Write each product in simplest form.**

13  $\frac{2}{3} \times \frac{3}{4} =$  \_\_\_\_\_ = \_\_\_\_\_

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

**Multiply. Write each product in simplest form.**

15  $\frac{2}{3} \times \frac{9}{20} =$  \_\_\_\_\_

16  $\frac{2}{7} \times \frac{21}{18} =$  \_\_\_\_\_

17  $\frac{2}{16} \times \frac{12}{10} =$  \_\_\_\_\_

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

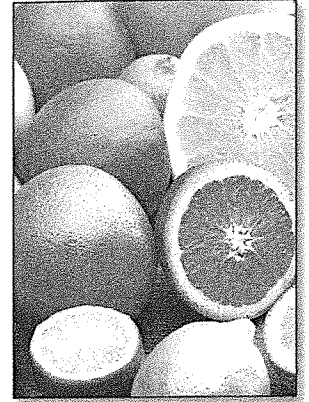
19  $\frac{2}{3} \times \frac{2}{4} \times \frac{3}{5} =$  \_\_\_\_\_

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



**Solve. Write your answer in simplest form.**

- 21 **BAKING** Selena baked a cake. She served half of it and left the rest on the table. Lorenzo ate half of the cake on the table. Then Kim ate half of the cake she found on the table. What fraction of the whole cake was left after Kim ate her portion? \_\_\_\_\_
- 22 **RETAIL** Crystal bought a bag of fruit. She kept  $\frac{2}{3}$  of the bag for herself. She gave the rest of the fruit to 3 friends. If each of her friends received 2 pieces of fruit, how many pieces of fruit did Crystal keep?  
\_\_\_\_\_
- 23 **FOOD** A pizza parlor has an all-you-can-eat lunch buffet. There were  $\frac{5}{8}$  of a sausage pizza and  $\frac{7}{8}$  of a mushroom pizza when Paulo and Coty arrived. Each of them ate  $\frac{2}{3}$  of each amount left. What fraction of a pizza did the boys eat?  
\_\_\_\_\_



**RETAIL** Crystal kept  $\frac{2}{3}$  of the bag of fruit.

**Vocabulary Check** Write the vocabulary word that completes each sentence.

- 24 A(n) \_\_\_\_\_ of a number divides that number evenly.
- 25 A number that is multiplied by another number is called a(n) \_\_\_\_\_.
- 26 **Writing in Math** You want to find  $\frac{3}{14}$  of  $\frac{21}{42}$ . One friend says to multiply  $\frac{21}{42} \times \frac{3}{14}$ . Another friend says to multiply  $\frac{3}{14} \times \frac{21}{42}$ . A third friend says either equation will work. Which friend is correct? Explain why.  
\_\_\_\_\_  
\_\_\_\_\_

## Spiral Review

**Find the GCF of each set of numbers.** (Lesson 2-1, p. 60)

- 27 100 and 125 \_\_\_\_\_
- 28 54 and 63 \_\_\_\_\_

**Write the fraction in simplest form.** (Lesson 2-2, p. 69)

- 29  $\frac{16}{44}$  \_\_\_\_\_
- 30  $\frac{27}{54}$  \_\_\_\_\_

