

# Multiply Fractions

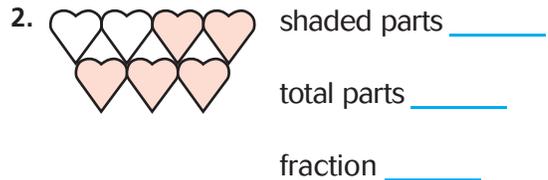
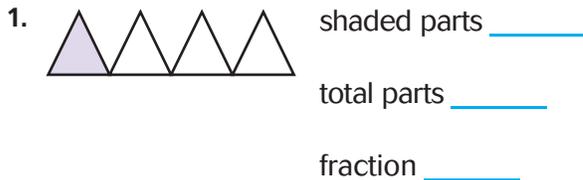
## Show What You Know



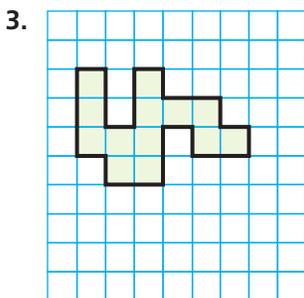
Check your understanding of important skills.

Name \_\_\_\_\_

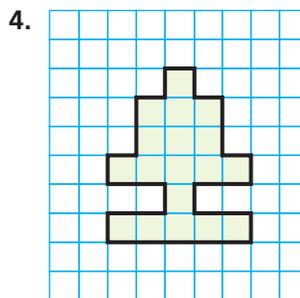
► **Part of a Group** Write a fraction that names the shaded part.



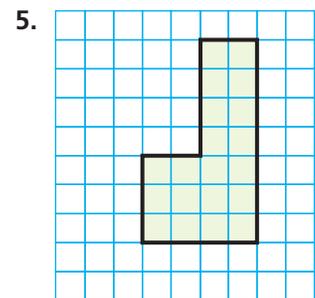
► **Area** Write the area of each shape.



\_\_\_\_\_ square units



\_\_\_\_\_ square units



\_\_\_\_\_ square units

► **Equivalent Fractions** Write an equivalent fraction.

6.  $\frac{3}{4}$  \_\_\_\_\_

7.  $\frac{9}{15}$  \_\_\_\_\_

8.  $\frac{24}{40}$  \_\_\_\_\_

9.  $\frac{5}{7}$  \_\_\_\_\_



Carmen recovered 2 gold bars that were stolen from a safe. The first bar weighed  $2\frac{2}{5}$  pounds. The second bar weighed  $1\frac{2}{3}$  times as much as the first bar. Be a Math Detective and find out how much gold was recovered.



## Vocabulary Builder

### ► Visualize It

Match the review words with their examples.

What is it?	What are some examples?
<input type="text"/>	$\frac{5}{10}$
<input type="text"/>	$\frac{5}{10}$
<input type="text"/>	$4\frac{1}{5}, 1\frac{3}{8}, 6\frac{3}{6}$
<input type="text"/>	$\frac{2}{3}, \frac{4}{6}, \frac{10}{15}$

### Review Words

denominator

equivalent fractions

mixed number

numerator

product

simplest form

### ► Understand Vocabulary

Complete the sentences by using the review words.

1. A \_\_\_\_\_ is a number that is made up of a whole number and a fraction.
2. A fraction is in \_\_\_\_\_ when the numerator and denominator have only 1 as a common factor.
3. The number below the bar in a fraction that tells how many equal parts are in the whole or in the group is the \_\_\_\_\_.
4. The \_\_\_\_\_ is the answer to a multiplication problem.
5. Fractions that name the same amount or part are called \_\_\_\_\_.
6. The \_\_\_\_\_ is the number above the bar in a fraction that tells how many equal parts of the whole are being considered.

Name \_\_\_\_\_

## Find Part of a Group

**Essential Question** How can you find a fractional part of a group?

### UNLOCK the Problem REAL WORLD

Maya collects stamps. She has 20 stamps in her collection. Four-fifths of her stamps have been canceled. How many of the stamps in Maya's collection have been canceled?



▲ The post office cancels stamps to keep them from being reused.

**Find  $\frac{4}{5}$  of 20.**

- Put 20 counters on your MathBoard.

Since you want to find  $\frac{4}{5}$  of the stamps, you should arrange the 20 counters in \_\_\_\_\_ equal groups.

- Draw the counters in equal groups below. How many counters are in each group? \_\_\_\_\_

- Each group represents \_\_\_\_\_ of the stamps. Circle  $\frac{4}{5}$  of the counters.

How many groups did you circle? \_\_\_\_\_

How many counters did you circle? \_\_\_\_\_

$\frac{4}{5}$  of 20 = \_\_\_\_\_, or  $\frac{4}{5} \times 20 =$  \_\_\_\_\_

So, \_\_\_\_\_ of the stamps have been canceled.

#### Math Talk

#### MATHEMATICAL PRACTICES

How many groups would you circle if  $\frac{3}{5}$  of the stamps were canceled? **Explain.**

## Example

Max's stamp collection has stamps from different countries. He has 12 stamps from Canada. Of those twelve,  $\frac{2}{3}$  of them have pictures of Queen Elizabeth II. How many stamps have the queen on them?

- Draw an array to represent the 12 stamps by drawing an **X** for each stamp. Since you want to find  $\frac{2}{3}$  of the stamps, your array should show \_\_\_\_\_ rows of equal size.



- Circle \_\_\_\_\_ of the 3 rows to show  $\frac{2}{3}$  of 12. Then count the number of **X**s in the circle.

There are \_\_\_\_\_ **X**s circled.

- Complete the number sentences.

$$\frac{2}{3} \text{ of } 12 = \underline{\hspace{2cm}}, \text{ or } \frac{2}{3} \times 12 = \underline{\hspace{2cm}}$$

So, there are \_\_\_\_\_ stamps with a picture of Queen Elizabeth II.



- On your MathBoard, use counters to find  $\frac{4}{6}$  of 12. **Explain** why the answer is the same as when you found  $\frac{2}{3}$  of 12.

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### Try This! Draw an array.

Susan has 16 stamps. In her collection,  $\frac{3}{4}$  of the stamps are from the United States. How many of her stamps are from the United States and how many are not?



So, \_\_\_\_\_ of Susan's stamps are from the United States and \_\_\_\_\_ stamps are not.

Name \_\_\_\_\_

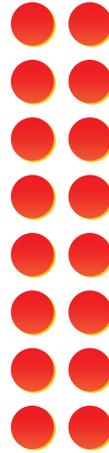
## Share and Show

1. Complete the model to solve.

$$\frac{7}{8} \text{ of } 16, \text{ or } \frac{7}{8} \times 16$$

- How many rows of counters are there? \_\_\_\_\_
- How many counters are in each row? \_\_\_\_\_
- Circle \_\_\_\_\_ rows to solve the problem.
- How many counters are circled? \_\_\_\_\_

$$\frac{7}{8} \text{ of } 16 = \underline{\hspace{2cm}}, \text{ or } \frac{7}{8} \times 16 = \underline{\hspace{2cm}}$$



Use a model to solve.

2.  $\frac{2}{3} \times 18 =$  \_\_\_\_\_

 3.  $\frac{2}{5} \times 15 =$  \_\_\_\_\_

 4.  $\frac{2}{3} \times 6 =$  \_\_\_\_\_

### Math Talk

MATHEMATICAL PRACTICES

Explain how you used a model to solve Exercise 4.

## On Your Own

Use a model to solve.

5.  $\frac{5}{8} \times 24 =$  \_\_\_\_\_

6.  $\frac{3}{4} \times 24 =$  \_\_\_\_\_

7.  $\frac{4}{7} \times 21 =$  \_\_\_\_\_

8.  $\frac{2}{9} \times 27 =$  \_\_\_\_\_

9.  $\frac{3}{5} \times 20 =$  \_\_\_\_\_

10.  $\frac{7}{11} \times 22 =$  \_\_\_\_\_



Name \_\_\_\_\_

## Multiply Fractions and Whole Numbers

**Essential Question** How can you use a model to show the product of a fraction and a whole number?

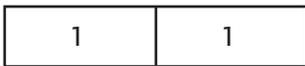
### Investigate

Martin is planting a vegetable garden. Each row is two meters long. He wants to plant carrots along  $\frac{3}{4}$  of each row. How many meters of each row will he plant with carrots?

**Key** Multiply.  $\frac{3}{4} \times 2$

**Materials** ■ fraction strips ■ MathBoard

- A.** Place two 1-whole fraction strips side-by-side to represent the length of the garden.
- B.** Find 4 fraction strips all with the same denominator that fit exactly under the two wholes.
- C.** Draw a picture of your model.



- D.** Circle  $\frac{3}{4}$  of 2 on the model you drew.
- E.** Complete the number sentence.  $\frac{3}{4} \times 2 = \underline{\hspace{2cm}}$

So, Martin will plant carrots along \_\_\_\_\_ meters of each row.



### Draw Conclusions

1. **Explain** why you placed four fraction strips with the same denominator under the two 1-whole strips.

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2. **Explain** how you would model  $\frac{3}{10}$  of 2?

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# Make Connections . . . . .

In the Investigate, you multiplied a whole number by a fraction. You can also use a model to multiply a fraction by a whole number.

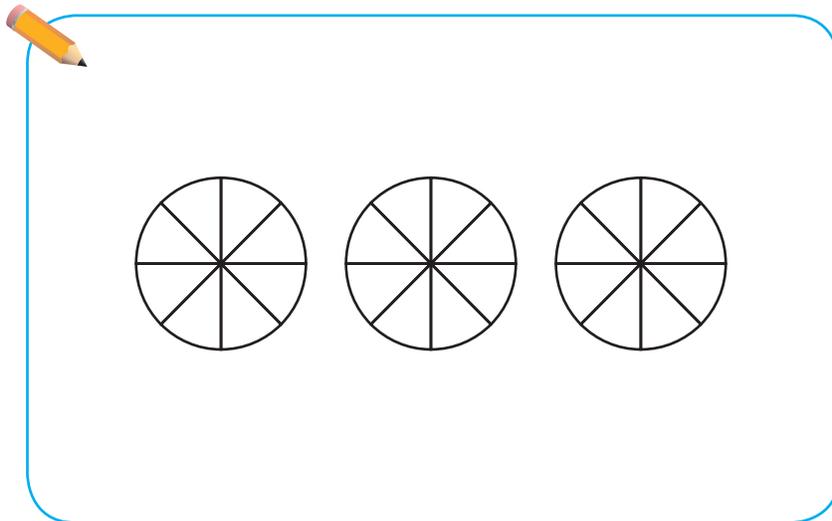
Margo was helping clean up after a class party. There were 3 boxes remaining with pizza in them. Each box had  $\frac{3}{8}$  of a pizza left. How much pizza was left in all?

**Materials** ■ fraction circles

**STEP 1** Find  $3 \times \frac{3}{8}$ . Model three 1-whole fraction circles to represent the number of boxes containing pizza.

**STEP 2** Place  $\frac{1}{8}$  fraction circle pieces on each circle to represent the amount of pizza that was left in each box.

- Shade the fraction circles below to show your model.



Each circle shows \_\_\_\_\_ eighths of a whole.

The 3 circles show \_\_\_\_\_ eighths of a whole.

**STEP 3** Complete the number sentences.

$$\frac{3}{8} + \frac{3}{8} + \frac{3}{8} = \underline{\hspace{2cm}}$$

$$3 \times \frac{3}{8} = \underline{\hspace{2cm}}$$

So, Margo had \_\_\_\_\_ boxes of pizza left.



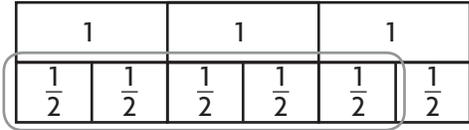
**Math Talk** **MATHEMATICAL PRACTICES**  
**Explain** how you would know there is more than one pizza left.

Name \_\_\_\_\_

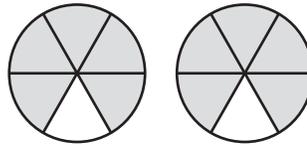
# Share and Show

Use the model to find the product.

1.  $\frac{5}{6} \times 3 =$  \_\_\_\_\_



2.  $2 \times \frac{5}{6} =$  \_\_\_\_\_



Find the product.

3.  $\frac{5}{12} \times 3 =$  \_\_\_\_\_

 4.  $9 \times \frac{1}{3} =$  \_\_\_\_\_

 5.  $\frac{7}{8} \times 4 =$  \_\_\_\_\_

6.  $4 \times \frac{3}{5} =$  \_\_\_\_\_

7.  $\frac{7}{8} \times 2 =$  \_\_\_\_\_

8.  $7 \times \frac{2}{5} =$  \_\_\_\_\_

9.  $\frac{3}{8} \times 4 =$  \_\_\_\_\_

10.  $11 \times \frac{3}{4} =$  \_\_\_\_\_

11.  $\frac{4}{15} \times 5 =$  \_\_\_\_\_

12.  **Write Math** Matt has a 5-pound bag of apples. To make a pie, he needs to use  $\frac{3}{5}$  of the bag. How many pounds of apples will he use for the pie? **Explain** what a model for this problem might look like.

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Name \_\_\_\_\_

## Fraction and Whole Number Multiplication

**Essential Question** How can you find the product of a fraction and a whole number without using a model?

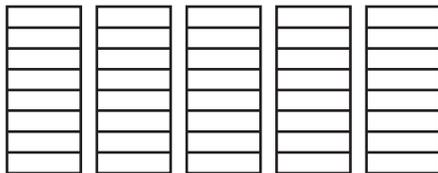
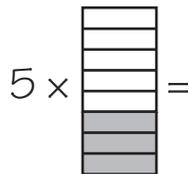
### UNLOCK the Problem REAL WORLD

Charlene has five 1-pound bags of different color sands. For an art project, she will use  $\frac{3}{8}$  pound of each bag of sand to create a colorful sand-art jar. How much sand will be in Charlene's sand-art jar?

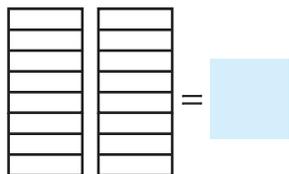
**1** Multiply a fraction by a whole number.

**MODEL**

- Shade the model to show 5 groups of  $\frac{3}{8}$ .



- Rearrange the shaded pieces to fill as many wholes as possible.



So, there are \_\_\_\_\_ pounds of sand in Charlene's sand-art jar.

- How much sand is in each bag?  
\_\_\_\_\_
- Will Charlene use all of the sand in each bag? Explain.  
\_\_\_\_\_

**RECORD**

- Write an expression to represent the problem.

$$5 \times \frac{3}{8} \quad \text{Think: I need to find 5 groups of 3 eighth-size pieces.}$$

- Multiply the number of eighth-size pieces in each whole by 5. Then write the answer as the total number of eighth-size pieces.

$$\frac{\square}{8} \times \square = \frac{\square}{\square}$$

- Write the answer as a mixed number in simplest form.

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

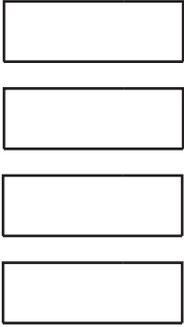
**Math Talk** **MATHEMATICAL PRACTICES** Explain how you can find how much sand Charlene has left.

**Example** Multiply a whole number by a fraction.

Kirsten brought in 4 loaves of bread to make sandwiches for the class picnic. Her classmates used  $\frac{2}{3}$  of the bread. How many loaves of bread were used?

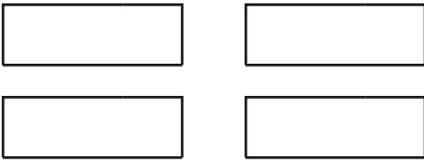
**MODEL**

- Shade the model to show  $\frac{2}{3}$  of 4.



**Think:** I can cut the loaves into thirds and show  $\frac{2}{3}$  of them being used.

- Rearrange the shaded pieces to fill as many wholes as possible.



So, \_\_\_\_\_ loaves of bread were used.

**RECORD**

- Write an expression to represent the problem.

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

**Think:** I need to find  $\frac{2}{3}$  of 4 wholes.

- Multiply 4 by the number of third-size pieces in each whole. Then write the answer as the total number of third-size pieces.

- Write the answer as a mixed number.

- Would we have the same amount of bread if we had 4 groups of  $\frac{2}{3}$  of a loaf? **Explain.**

**Try This!** Find the product. Write the product in simplest form.

**A**  $4 \times \frac{7}{8}$

**B**  $\frac{5}{9} \times 12$

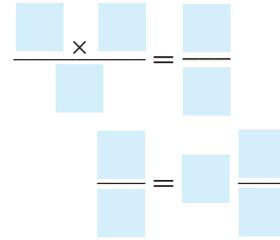
Name \_\_\_\_\_

# Share and Show

Find the product. Write the product in simplest form.

1.  $3 \times \frac{2}{5} =$  \_\_\_\_\_

- Multiply the numerator by the whole number. Write the product over the denominator.
- Write the answer as a mixed number in simplest form.



 2.  $\frac{2}{3} \times 5 =$  \_\_\_\_\_

 3.  $6 \times \frac{2}{3} =$  \_\_\_\_\_

4.  $\frac{5}{7} \times 4 =$  \_\_\_\_\_

## On Your Own

Find the product. Write the product in simplest form.

5.  $5 \times \frac{2}{3} =$  \_\_\_\_\_

6.  $\frac{1}{4} \times 3 =$  \_\_\_\_\_

7.  $7 \times \frac{7}{8} =$  \_\_\_\_\_

8.  $2 \times \frac{4}{5} =$  \_\_\_\_\_

9.  $4 \times \frac{3}{4} =$  \_\_\_\_\_

10.  $\frac{7}{9} \times 2 =$  \_\_\_\_\_

**Practice: Copy and Solve.** Find the product. Write the product in simplest form.

11.  $\frac{3}{5} \times 11$

12.  $3 \times \frac{3}{4}$

13.  $\frac{5}{8} \times 3$

 **H.O.T. Algebra** Find the unknown digit.

14.  $\frac{\square}{2} \times 8 = 4$

$\square =$  \_\_\_\_\_

15.  $\square \times \frac{5}{6} = \frac{20}{6}$ , or  $3\frac{1}{3}$

$\square =$  \_\_\_\_\_

16.  $\frac{1}{\square} \times 18 = 3$

$\square =$  \_\_\_\_\_

**UNLOCK the Problem** REAL WORLD

17. The caterer wants to have enough turkey to feed 24 people. If he wants to provide  $\frac{3}{4}$  of a pound of turkey for each person, how much turkey does he need?

- (A) 72 pounds      (C) 18 pounds
- (B) 24 pounds      (D) 6 pounds



- a. What do you need to find? \_\_\_\_\_  
\_\_\_\_\_
- b. What operation will you use? \_\_\_\_\_
- c. What information are you given? \_\_\_\_\_  
\_\_\_\_\_

d. Solve the problem.

e. Complete the sentences.

The caterer wants to serve 24 people  
\_\_\_\_\_ of a pound of turkey each.

He will need \_\_\_\_\_  $\times$  \_\_\_\_\_, or  
\_\_\_\_\_ pounds of turkey.

f. Fill in the bubble for the correct answer choice.

18. Patty wants to run  $\frac{5}{6}$  of a mile every day for 5 days. How far will she run in that time?

- (A) 25 miles
- (B) 5 miles
- (C)  $4\frac{1}{6}$  miles
- (D)  $1\frac{2}{3}$  miles

19. Doug has 33 feet of rope. He wants to use  $\frac{2}{3}$  of it for his canoe. How many feet of rope will he use for his canoe?

- (A) 11 feet
- (B) 22 feet
- (C) 33 feet
- (D) 66 feet

Name \_\_\_\_\_

## Multiply Fractions

**Essential Question** How can you use an area model to show the product of two fractions?

### Investigate

Jane is making reusable grocery bags and lunch bags. She needs  $\frac{3}{4}$  yard of material to make a grocery bag. A lunch bag needs  $\frac{2}{3}$  of the amount of material a grocery bag needs. How much material does she need to make a lunch bag?



Find  $\frac{2}{3}$  of  $\frac{3}{4}$ . **Materials** ■ color pencils

- A.** Fold a sheet of paper vertically into 4 equal parts. Using the vertical folds as a guide, shade  $\frac{3}{4}$  yellow.
- B.** Fold the paper horizontally into 3 equal parts. Using the horizontal folds as a guide, shade  $\frac{2}{3}$  of the yellow sections blue.
- C.** Count the number of sections into which the whole paper is folded.
  - How many rectangles are formed by all the folds in the paper? \_\_\_\_\_
  - What fraction of the whole sheet of paper does one rectangle represent? \_\_\_\_\_
- D.** Count the sections that are shaded twice and record the answer.  $\frac{2}{3} \times \frac{3}{4} =$  \_\_\_\_\_

So, Jane needs \_\_\_\_\_ yard of material to make a lunch bag.



## Draw Conclusions

1. **Explain** why you shaded  $\frac{2}{3}$  of the yellow sections blue rather than shading  $\frac{2}{3}$  of the whole.

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2. **Analyze** what you are finding if a model shows  $\frac{1}{2}$  of a sheet of paper shaded yellow and  $\frac{1}{3}$  of the yellow section shaded blue?

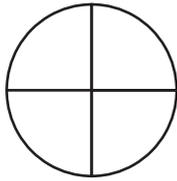
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# Make Connections . . . . .

You can find a part of a part in different ways. Margo and James both correctly solved the problem  $\frac{1}{3} \times \frac{3}{4}$  using the steps shown.

Use the steps to show how each person found  $\frac{1}{3} \times \frac{3}{4}$ .

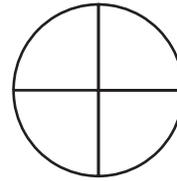
Margo



- Shade the model to show  $\frac{3}{4}$  of the whole.
- How many  $\frac{1}{4}$  pieces did you shade?  
\_\_\_\_\_ one-fourth pieces
- To find  $\frac{1}{3}$  of  $\frac{3}{4}$ , circle  $\frac{1}{3}$  of the three  $\frac{1}{4}$  pieces that are shaded.
- What part of the whole is  $\frac{1}{3}$  of the shaded pieces? \_\_\_\_\_ of the whole

So,  $\frac{1}{3} \times \frac{3}{4}$  is \_\_\_\_\_.

James



- Shade the model to show  $\frac{3}{4}$  of the whole.
- Divide each  $\frac{1}{4}$  piece into thirds.
- What part of the whole is each small piece? \_\_\_\_\_
- To find  $\frac{1}{3}$  of  $\frac{3}{4}$ , circle  $\frac{1}{3}$  of each of the three  $\frac{1}{4}$  pieces that are shaded.
- How many  $\frac{1}{12}$  pieces are circled?  
\_\_\_\_\_ one-twelfth pieces

So,  $\frac{1}{3} \times \frac{3}{4}$  is \_\_\_\_\_.

- **Pose a Problem** that can be solved using the equation above.

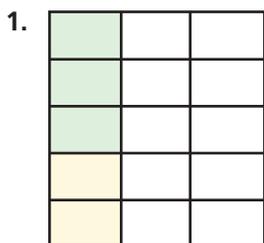
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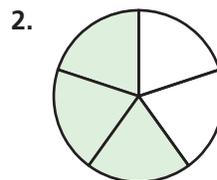
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## Share and Show

Use the model to find the product.



$\frac{3}{5} \times \frac{1}{3} =$  \_\_\_\_\_



Circle  $\frac{2}{3}$  of  $\frac{3}{5}$ .

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

Name \_\_\_\_\_

Find the product. Draw a model.

3.  $\frac{2}{3} \times \frac{1}{5} =$  \_\_\_\_\_

4.  $\frac{1}{2} \times \frac{5}{6} =$  \_\_\_\_\_

5.  $\frac{3}{5} \times \frac{1}{3} =$  \_\_\_\_\_

6.  $\frac{3}{4} \times \frac{1}{6} =$  \_\_\_\_\_

7.  $\frac{2}{5} \times \frac{5}{6} =$  \_\_\_\_\_

8.  $\frac{5}{6} \times \frac{3}{5} =$  \_\_\_\_\_

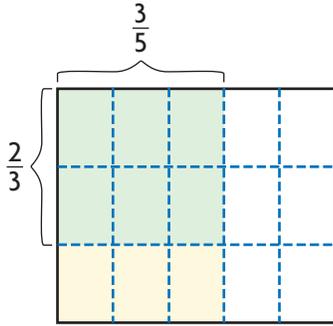
# Problem Solving **REAL WORLD**

## **H.O.T.** What's the Error?



9. Cheryl and Marcus are going to make a two-tiered cake. The smaller tier is  $\frac{2}{3}$  the size of the larger tier. The recipe for the bottom tier calls for  $\frac{3}{5}$  cup of water. How much water will they need to make the smaller tier?

They made a model to represent the problem. Cheryl says they need  $\frac{6}{9}$  cup of water. Marcus says they need  $\frac{2}{5}$  cup water. Who is correct? **Explain.**



**Cheryl's answer**

**Marcus' answer**

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Name \_\_\_\_\_

## Compare Fraction Factors and Products

**Essential Question** How does the size of the product compare to the size of one factor when multiplying fractions?

### UNLOCK the Problem REAL WORLD

Multiplication can be thought of as resizing one number by another number. For example,  $2 \times 3$  will result in a product that is 2 times as great as 3.

What happens to the size of a product when a number is multiplied by a fraction rather than a whole number?



### One Way Use a model.

**A** During the week, the Smith family ate  $\frac{3}{4}$  of a box of cereal.

- Shade the model to show  $\frac{3}{4}$  of a box of cereal.
- Write an expression for  $\frac{3}{4}$  of 1 box of cereal.  $\frac{3}{4} \times$  \_\_\_\_\_
- Will the product be *equal to*, *greater than*, or *less than* 1?  
\_\_\_\_\_


**B** The Ling family has 4 boxes of cereal. They ate  $\frac{3}{4}$  of all the cereal during the week.

- Shade the model to show  $\frac{3}{4}$  of 4 boxes of cereal.
- Write an expression for  $\frac{3}{4}$  of 4 boxes of cereal.  $\frac{3}{4} \times$  \_\_\_\_\_
- Will the product be *equal to*, *greater than*, or *less than* 4?  
\_\_\_\_\_


**C** The Carter family has only  $\frac{1}{2}$  of a box of cereal at the beginning of the week. They ate  $\frac{3}{4}$  of the  $\frac{1}{2}$  box of cereal.

- Shade the model to show  $\frac{3}{4}$  of  $\frac{1}{2}$  box of cereal.
- Write an expression to show  $\frac{3}{4}$  of  $\frac{1}{2}$  box of cereal.  $\frac{3}{4} \times$  \_\_\_\_\_
- Will the product be *equal to*, *greater than*, or *less than*  $\frac{1}{2}$ ? *than*  $\frac{3}{4}$ ?  
\_\_\_\_\_


## **Another Way** Use a diagram.

You can use a diagram to show the relationship between the products when a fraction is multiplied or scaled (resized) by a number.

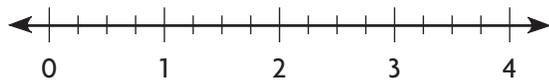
**Graph a point to show  $\frac{3}{4}$  scaled by 1,  $\frac{1}{2}$ , and 4.**

**A**  $1 \times \frac{3}{4}$



**Think:** Locate  $\frac{3}{4}$  on the diagram and shade that distance from 0. Then graph a point to show 1 of  $\frac{3}{4}$ .

**B**  $\frac{1}{2} \times \frac{3}{4}$



**Think:** Locate  $\frac{3}{4}$  on the diagram and shade that distance from 0. Then graph a point to show  $\frac{1}{2}$  of  $\frac{3}{4}$ .

**C**  $4 \times \frac{3}{4}$



**Think:** Locate  $\frac{3}{4}$  on the diagram and shade that distance from 0. Then graph a point to show 4 times  $\frac{3}{4}$ .

Complete each statement with *equal to*, *greater than*, or *less than*.

- The product of 1 and  $\frac{3}{4}$  will be \_\_\_\_\_  $\frac{3}{4}$ .
- The product of a number less than 1 and  $\frac{3}{4}$  will be \_\_\_\_\_  $\frac{3}{4}$  and \_\_\_\_\_ the other factor.
- The product of a number greater than 1 and  $\frac{3}{4}$  will be \_\_\_\_\_  $\frac{3}{4}$  and \_\_\_\_\_ the other factor.

### **Math Talk**

#### **MATHEMATICAL PRACTICES**

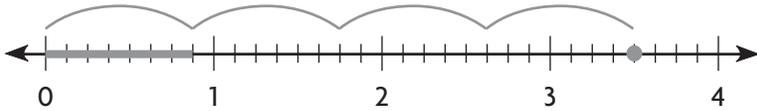
What if  $\frac{3}{5}$  was multiplied by  $\frac{1}{6}$  or by the whole number 7? Would the products be equal to, greater than, or less than  $\frac{3}{5}$ ? **Explain.**

Name \_\_\_\_\_

## Share and Show

Complete the statement with *equal to*, *greater than*, or *less than*.

1.  $4 \times \frac{7}{8}$  will be \_\_\_\_\_  $\frac{7}{8}$ .



2.  $\frac{3}{5} \times \frac{2}{7}$  will be \_\_\_\_\_  $\frac{3}{5}$ .

3.  $\frac{5}{8} \times 6$  will be \_\_\_\_\_  $\frac{5}{8}$ .

4.  $\frac{2}{3} \times \frac{5}{5}$  will be \_\_\_\_\_  $\frac{2}{3}$ .

5.  $8 \times \frac{7}{8}$  will be \_\_\_\_\_ 8.

## On Your Own

Complete the statement with *equal to*, *greater than*, or *less than*.

6.  $\frac{4}{9} \times \frac{3}{8}$  will be \_\_\_\_\_  $\frac{3}{8}$ .

7.  $7 \times \frac{9}{10}$  will be \_\_\_\_\_  $\frac{9}{10}$ .

8.  $5 \times \frac{1}{3}$  will be \_\_\_\_\_  $\frac{1}{3}$ .

9.  $\frac{6}{11} \times 1$  will be \_\_\_\_\_  $\frac{6}{11}$ .

10.  $\frac{1}{6} \times \frac{7}{7}$  will be \_\_\_\_\_ 1.

11.  $4 \times \frac{3}{5}$  will be \_\_\_\_\_  $\frac{3}{5}$ .

# Problem Solving **REAL WORLD**

12. Lola is making cookies. She plans to multiply the recipe by 3 so she can make enough cookies for the whole class. If the recipe calls for  $\frac{2}{3}$  cup of sugar, will she need more than  $\frac{2}{3}$  or less than  $\frac{2}{3}$  cup of sugar to make all the cookies?

---

13. Peter is planning on spending  $\frac{2}{3}$  as many hours watching television this week as he did last week. Is Peter going to spend more hours or fewer hours watching television this week?

---

14. **Test Prep** Rochelle saves  $\frac{1}{4}$  of her allowance. If she decides to start saving  $\frac{1}{2}$  as much, which statement below is true?

- (A) She will be saving the same amount.
- (B) She will be saving more.
- (C) She will be saving less.
- (D) She will be saving twice as much.

## Connect to Art

A scale model is a representation of an object with the same shape as the real object. Models can be larger or smaller than the actual object but are often smaller.

Architects often make scale models of the buildings or structures they plan to build. Models can give them an idea of how the structure will look when finished. Each measurement of the building is scaled up or down by the same factor.

Bob is building a scale model of his bike. He wants his model to be  $\frac{1}{5}$  as long as his bike.



15. If Bob's bike is 60 inches long, how long will his model be? \_\_\_\_\_

16. **H.O.T.** If one wheel on Bob's model is 4 inches across, how many inches across is the actual wheel on his bike? **Explain.**

---



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Name \_\_\_\_\_

## Fraction Multiplication

**Essential Question** How do you multiply fractions?

### UNLOCK the Problem REAL WORLD

Sasha has  $\frac{3}{5}$  of a scarf left to knit. If she finishes  $\frac{1}{2}$  of that today, how much of the scarf will Sasha knit today?

**Multiply.**  $\frac{1}{2} \times \frac{3}{5}$

**One Way** Use a model.

- Shade  $\frac{3}{5}$  of the model yellow.
- Draw a horizontal line across the rectangle to show 2 equal parts.
- Shade  $\frac{1}{2}$  of the yellow sections blue.
- Count the sections that are shaded twice and write a fraction for the parts of the whole that are shaded twice.

$$\frac{1}{2} \times \frac{3}{5} = \underline{\hspace{2cm}}$$

- Compare the numerator and denominator of the product with the numerators and denominators of the factors. **Describe** what you notice.

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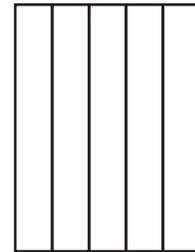


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- How much of the scarf does Sasha have left to knit?  
\_\_\_\_\_
- Of the fraction that is left, how much will she finish today?  
\_\_\_\_\_



**Another Way** Use paper and pencil.

You can multiply fractions without using a model.

- Multiply the numerators.
- Multiply the denominators.

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

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

So, Sasha will knit \_\_\_\_\_ of the scarf today.



**CONNECT** Remember you can write a whole number as a fraction with a denominator of 1.

## Example

Find  $4 \times \frac{5}{12}$ . Write the product in simplest form.

$$4 \times \frac{5}{12} = \frac{4}{\square} \times \frac{5}{12}$$

Write the whole number as a fraction.

$$= \frac{4 \times \square}{\square \times \square} = \frac{\square}{\square}$$

Multiply the numerators.  
Multiply the denominators.

$$= \frac{\square \div \square}{12 \div \square} = \frac{\square}{\square}, \text{ or } \square$$

Write the product as a fraction or a mixed number in simplest form.

So,  $4 \times \frac{5}{12} = \underline{\hspace{2cm}}$ , or  $\underline{\hspace{2cm}}$ .

### Math Talk

**MATHEMATICAL PRACTICES**

Is the answer reasonable? **Explain.**

**Try This!** Evaluate  $c \times \frac{4}{5}$  for  $c = \frac{5}{8}$ .

- What number does  $c$  represent?  $\underline{\hspace{2cm}}$
- Replace  $c$  in the expression with  $\underline{\hspace{2cm}}$ .
- Multiply the numerators.
- Multiply the denominators.
- Write the product in simplest form.

$$\frac{\square}{\square} \times \frac{4}{5}$$

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

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

So,  $c \times \frac{4}{5}$  is equal to  $\underline{\hspace{2cm}}$  for  $c = \frac{5}{8}$ .

- Since  $\frac{4}{5}$  is being multiplied by a number less than one, should the product be *greater than* or *less than*  $\frac{4}{5}$ ? **Explain.**  $\underline{\hspace{10cm}}$

Name \_\_\_\_\_

## Share and Show



Find the product. Write the product in simplest form.

1.  $6 \times \frac{3}{8}$

$$\frac{6}{1} \times \frac{3}{8} = \frac{\square}{\square}$$

\_\_\_\_\_

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

\_\_\_\_\_

3.  $\frac{2}{3} \times 27$

\_\_\_\_\_

4.  $\frac{5}{12} \times \frac{3}{5}$

\_\_\_\_\_

5.  $\frac{1}{2} \times \frac{3}{5}$

\_\_\_\_\_

6.  $\frac{2}{3} \times \frac{4}{5}$

\_\_\_\_\_

7.  $\frac{1}{3} \times \frac{5}{8}$

\_\_\_\_\_

8.  $4 \times \frac{1}{5}$

\_\_\_\_\_

### Math Talk

MATHEMATICAL PRACTICES

Explain how to find the product  $\frac{1}{6} \times \frac{2}{3}$  in simplest form.

## On Your Own

Find the product. Write the product in simplest form.

9.  $2 \times \frac{1}{8}$

\_\_\_\_\_

10.  $\frac{4}{9} \times \frac{4}{5}$

\_\_\_\_\_

11.  $\frac{1}{12} \times \frac{2}{3}$

\_\_\_\_\_

12.  $\frac{1}{7} \times 30$

\_\_\_\_\_

13. Of the pets in the pet show,  $\frac{5}{6}$  are cats.  $\frac{4}{5}$  of the cats are calico cats. What fraction of the pets are calico cats?

\_\_\_\_\_

14. Five cats each ate  $\frac{1}{4}$  cup of food. How much food did they eat altogether?

\_\_\_\_\_

**Algebra** Evaluate for the given value.

15.  $\frac{2}{5} \times c$  for  $c = \frac{4}{7}$

\_\_\_\_\_

16.  $m \times \frac{4}{5}$  for  $m = \frac{7}{8}$

\_\_\_\_\_

17.  $\frac{2}{3} \times t$  for  $t = \frac{1}{8}$

\_\_\_\_\_

18.  $y \times \frac{4}{5}$  for  $y = 5$

\_\_\_\_\_

# Problem Solving REAL WORLD

Speedskating is a popular sport in the Winter Olympics. Many young athletes in the U.S. participate in speedskating clubs and camps.

19. At a camp in Green Bay, Wisconsin,  $\frac{7}{9}$  of the participants were from Wisconsin. Of that group,  $\frac{3}{5}$  were 12 years old. What fraction of the group was from Wisconsin and 12 years old?

---

20. **H.O.T.** Maribel wants to skate  $1\frac{1}{2}$  miles on Monday. If she skates  $\frac{9}{10}$  mile Monday morning and  $\frac{2}{3}$  of that distance Monday afternoon, will she reach her goal? **Explain.**

---

21. **Write Math** On the first day of camp,  $\frac{5}{6}$  of the skaters were beginners. Of the beginners,  $\frac{1}{3}$  were girls. What fraction of the skaters were girls and beginners? **Explain** why your answer is reasonable.

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22. **Test Prep** On Wednesday, Danielle skated  $\frac{2}{3}$  of the way around the track in 2 minutes. Her younger brother skated  $\frac{3}{4}$  of Danielle's distance in 2 minutes. What fraction of the track did Danielle's brother finish in 2 minutes?

- (A)  $\frac{1}{3}$
- (B)  $\frac{1}{2}$
- (C)  $\frac{5}{7}$
- (D)  $\frac{3}{4}$



## SHOW YOUR WORK

A large area with a dotted border for showing work, containing a vertical column of yellow dots on the left side.

Name \_\_\_\_\_



## Mid-Chapter Checkpoint

### ► Concepts and Skills

1. **Explain** how you would model  $5 \times \frac{2}{3}$ .

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2. When you multiply  $\frac{2}{3}$  by a fraction less than one, how does the product compare to the factors. **Explain.**

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Find the product. Write the product in simplest form.

3.  $\frac{2}{3} \times 6$

---

4.  $\frac{4}{5} \times 7$

---

5.  $8 \times \frac{5}{7}$

---

6.  $\frac{7}{8} \times \frac{3}{8}$

---

7.  $\frac{1}{2} \times \frac{3}{4}$

---

8.  $\frac{7}{8} \times \frac{4}{7}$

---

9.  $2 \times \frac{3}{11}$

---

10.  $\frac{5}{8} \times \frac{2}{3}$

---

11.  $\frac{7}{12} \times 8$

---

Complete the statement with *equal to*, *greater than*, or *less than*.

12.  $3 \times \frac{2}{3}$  will be \_\_\_\_\_ 3.

13.  $\frac{5}{7} \times 3$  will be \_\_\_\_\_  $\frac{5}{7}$ .

Fill in the bubble completely to show your answer.

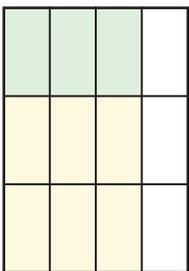
14. There is  $\frac{5}{6}$  of an apple pie left from dinner. Tomorrow, Victor plans to eat  $\frac{1}{6}$  of the pie that was left. How much of the whole pie will he eat tomorrow?

- (A)  $\frac{1}{36}$   
(B)  $\frac{5}{36}$   
(C)  $\frac{1}{3}$   
(D)  $\frac{2}{3}$

15. Everett and Marie are going to make brownies for their family reunion. They want to make 4 times the amount the recipe makes. If the recipe calls for  $\frac{2}{3}$  cup of oil, how much oil will they need?

- (A) 8 cups  
(B)  $4\frac{2}{3}$  cups  
(C)  $2\frac{2}{3}$  cups  
(D) 2 cups

16. Matt made the model below to help him solve his math problem. Which of the expressions could he have been working on?



- (A)  $\frac{3}{12} \times \frac{3}{4}$   
(B)  $\frac{3}{4} \times 3$   
(C)  $\frac{3}{12} \times \frac{3}{12}$   
(D)  $\frac{1}{3} \times \frac{3}{4}$

Name \_\_\_\_\_

## Area and Mixed Numbers

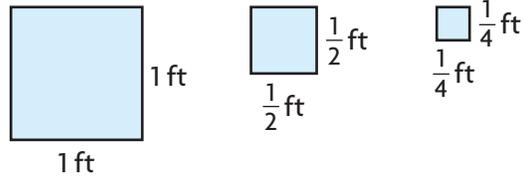
**Essential Question** How can you use a unit tile to find the area of a rectangle with fractional side lengths?

### Investigate

You can use square tiles with side lengths that are unit fractions to find the area of a rectangle.

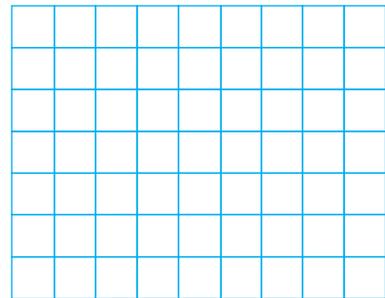
Sonja wants to cover the rectangular floor of her closet with tile. The floor is  $2\frac{1}{2}$  feet by  $3\frac{1}{2}$  feet. She wants to use the fewest tiles possible and doesn't want to cut any tiles. The tiles come in three sizes: 1 foot by 1 foot,  $\frac{1}{2}$  foot by  $\frac{1}{2}$  foot, and  $\frac{1}{4}$  foot by  $\frac{1}{4}$  foot. Choose the tile that Sonja should use. What is the area of the closet floor?

- A.** Choose the largest tile Sonja can use to tile the floor of the closet and avoid gaps or overlaps.



- Which square tile should Sonja choose? **Explain.** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- B.** On the grid, let each square represent the dimensions of the tile you chose. Then draw a diagram of the floor.



- C.** Count the squares in your diagram.

- How many squares cover the diagram?  
 \_\_\_\_\_  $\times$  \_\_\_\_\_, or \_\_\_\_\_ squares
- What is the area of the tile you chose? \_\_\_\_\_
- Since 1 square on your diagram represents an area of \_\_\_\_\_ square foot,  
 the area represented by \_\_\_\_\_ squares is \_\_\_\_\_  $\times$  \_\_\_\_\_,  
 or \_\_\_\_\_ square feet.

So, the area of the floor written as a mixed number is \_\_\_\_\_ square feet.

**Math Talk**

MATHEMATICAL PRACTICES

**Explain** how you found the area of the tile you chose.

## Draw Conclusions . . . . .

1. Write a number sentence for the area of the floor using fractions greater than 1. **Explain** how you knew which operation to use in your number sentence.

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2. **Explain** how using fractions greater than 1 could help you multiply mixed numbers.

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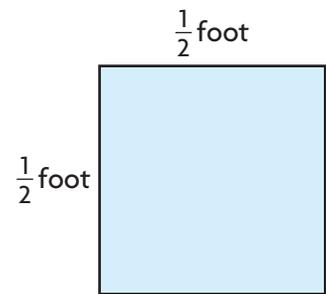
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3. How many  $\frac{1}{4}$  foot by  $\frac{1}{4}$  foot tiles would Sonja need to cover one  $\frac{1}{2}$  foot by  $\frac{1}{2}$  foot tile? \_\_\_\_\_

4. How could you find the number of  $\frac{1}{4}$  foot by  $\frac{1}{4}$  foot tiles needed to cover the same closet floor?

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## Make Connections . . . . .

Sometimes it is easier to multiply mixed numbers if you break them apart into whole numbers and fractions.

**Use an area model to solve.**  $1\frac{3}{5} \times 2\frac{3}{4}$

**STEP 1** Rewrite each mixed number as the sum of a whole number and a fraction.

$$1\frac{3}{5} = \underline{\hspace{2cm}} \quad 2\frac{3}{4} = \underline{\hspace{2cm}}$$

**STEP 2** Draw an area model to show the original multiplication problem.

**STEP 3** Draw dashed lines and label each section to show how you broke apart the mixed numbers in Step 1.

**STEP 4** Find the area of each section.

**STEP 5** Add the area of each section to find the total area of the rectangle.

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So, the product of  $1\frac{3}{5} \times 2\frac{3}{4}$  is \_\_\_\_\_.

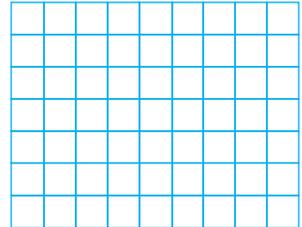
Name \_\_\_\_\_

# Share and Show

Use the grid to find the area. Let each square represent  $\frac{1}{3}$  meter by  $\frac{1}{3}$  meter.

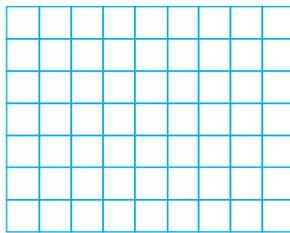
1.  $1\frac{2}{3} \times 1\frac{1}{3}$

- Draw a diagram to represent the dimensions.
- How many squares cover the diagram? \_\_\_\_\_
- What is the area of each square? \_\_\_\_\_
- What is the area of the diagram? \_\_\_\_\_



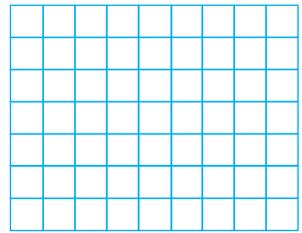
Use the grid to find the area. Let each square represent  $\frac{1}{4}$  foot by  $\frac{1}{4}$  foot.

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



The area is \_\_\_\_\_ square feet.

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



The area is \_\_\_\_\_ square feet.

Use an area model to solve.

4.  $1\frac{3}{4} \times 2\frac{1}{2}$

\_\_\_\_\_

5.  $1\frac{3}{8} \times 2\frac{1}{2}$

\_\_\_\_\_

 6.  $1\frac{1}{9} \times 1\frac{2}{3}$

\_\_\_\_\_

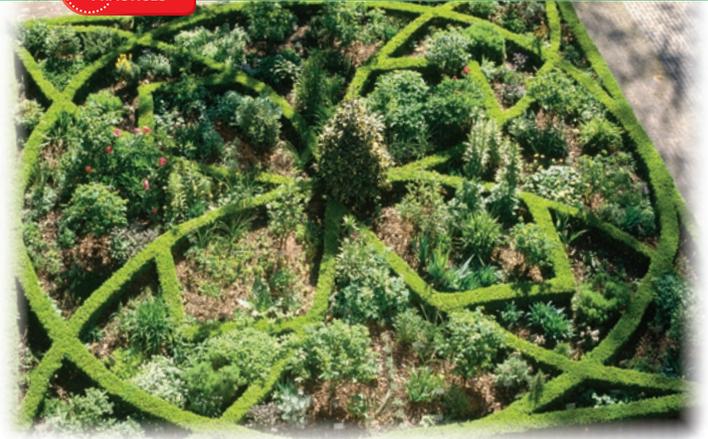
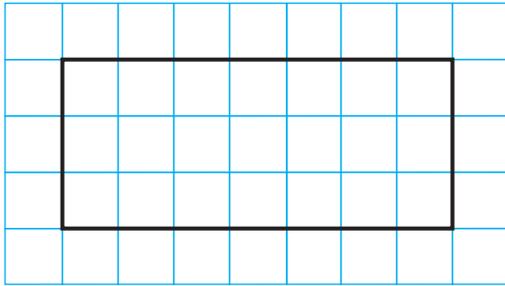
7.  **Write Math** **Explain** how finding the area of a rectangle with whole-number side lengths compares to finding the area of a rectangle with fractional side lengths.

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

# Problem Solving **REAL WORLD**

## **H.O.T.** Pose a Problem

8. Terrance is designing a garden. He drew the following diagram of his garden. Pose a problem using mixed numbers that can be solved using his diagram.



**Pose a Problem.**

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**Solve your problem.**

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- **Describe** how you decided on the dimensions of Terrance’s garden.

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Name \_\_\_\_\_

## Compare Mixed Number Factors and Products

**Essential Question** How does the size of the product compare to the size of one factor when multiplying fractions greater than one?

### UNLOCK the Problem REAL WORLD

You can make generalizations about the relative size of a product when one factor is equal to 1, less than 1, or greater than 1.

**One Way** Use a model.

Jane has a recipe that calls for  $1\frac{1}{4}$  cups of flour. She wants to know how much flour she would need if she made the recipe as written, if she made half the recipe, and if she made  $1\frac{1}{2}$  times the recipe.

Shade the models to show  $1\frac{1}{4}$  scaled by 1, by  $\frac{1}{2}$ , and by  $1\frac{1}{2}$ .

**A**  $1 \times 1\frac{1}{4}$

- What can you say about the product when  $1\frac{1}{4}$  is multiplied by 1?

\_\_\_\_\_

**B**  $\frac{1}{2} \times 1\frac{1}{4}$

- What can you say about the product when  $1\frac{1}{4}$  is multiplied by a

fraction less than 1? \_\_\_\_\_

**C**  $1\frac{1}{2} \times 1\frac{1}{4} = \left(1 \times 1\frac{1}{4}\right) + \left(\frac{1}{2} \times 1\frac{1}{4}\right)$

+

- What can you say about the product when  $1\frac{1}{4}$  is multiplied by a number greater than 1?

\_\_\_\_\_



**Think:** I can use what I know about the Identity Property.

**Think:** The product will be half of what I started with.

**Think:** The product will be what I started with and  $\frac{1}{2}$  more.

#### Math Talk

MATHEMATICAL PRACTICES

Which expression has the greatest product? Which has the least product?

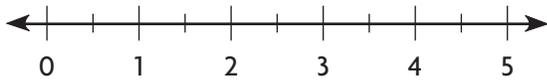
**CONNECT** You can also use a diagram to show the relationship between the products when a fraction greater than one is multiplied or scaled (resized) by a number.

**Another Way** Use a diagram.

Jake wants to train for a road race. He plans to run  $2\frac{1}{2}$  miles on the first day. On the second day, he plans to run  $\frac{3}{5}$  of the distance he runs on the first day. On the third day, he plans to run  $1\frac{2}{5}$  of the distance he runs on the first day. Which distance is greater: the distance on day 2 when he runs  $\frac{3}{5}$  of  $2\frac{1}{2}$  miles, or the distance on day 3 when he runs  $1\frac{2}{5}$  of  $2\frac{1}{2}$  miles?

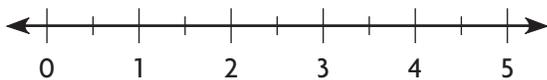
Graph a point on the diagram to show the size of the product. Then complete the statement with *equal to*, *greater than*, or *less than*.

**A**  $1 \times 2\frac{1}{2}$



- The product of 1 and  $2\frac{1}{2}$  will be \_\_\_\_\_  $2\frac{1}{2}$ .

**B**  $\frac{3}{5} \times 2\frac{1}{2}$



- The product of a number less than 1 and  $2\frac{1}{2}$  is \_\_\_\_\_  $2\frac{1}{2}$ .

**C**  $1\frac{2}{5} \times 2\frac{1}{2} = (1 \times 2\frac{1}{2}) + (\frac{2}{5} \times 2\frac{1}{2})$



- The product of a number greater than 1 and  $2\frac{1}{2}$  will be \_\_\_\_\_  $2\frac{1}{2}$  and \_\_\_\_\_ the other factor.

So, \_\_\_\_\_ of \_\_\_\_\_ miles is a greater distance than \_\_\_\_\_ of \_\_\_\_\_ miles.



**Think:** Locate  $2\frac{1}{2}$  on the diagram and shade that distance. Then graph a point to show 1 of  $2\frac{1}{2}$ .

**Think:** Locate  $2\frac{1}{2}$  on the diagram and shade that distance. Then graph a point to show  $\frac{3}{5}$  of  $2\frac{1}{2}$ .

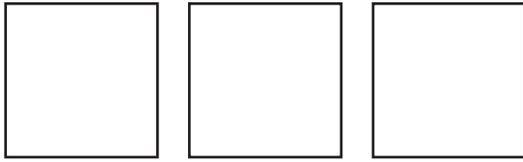
**Think:** Locate  $2\frac{1}{2}$  on the diagram and shade that distance. Then graph a point to show 1 of  $2\frac{1}{2}$  and  $\frac{2}{5}$  more of  $2\frac{1}{2}$ .

Name \_\_\_\_\_

## Share and Show

Complete the statement with *equal to*, *greater than*, or *less than*.

1.  $\frac{5}{6} \times 2\frac{1}{5}$  will be \_\_\_\_\_  $2\frac{1}{5}$ .



Shade the model to show  $\frac{5}{6} \times 2\frac{1}{5}$ .

 2.  $1\frac{1}{5} \times 2\frac{2}{3}$  will be \_\_\_\_\_  $2\frac{2}{3}$ .

 3.  $\frac{4}{5} \times 2\frac{2}{5}$  will be \_\_\_\_\_  $2\frac{2}{5}$ .

## On Your Own

Complete the statement with *equal to*, *greater than*, or *less than*.

4.  $\frac{2}{2} \times 1\frac{1}{2}$  will be \_\_\_\_\_  $1\frac{1}{2}$ .

5.  $\frac{2}{3} \times 3\frac{1}{6}$  will be \_\_\_\_\_  $3\frac{1}{6}$ .

6.  $2 \times 2\frac{1}{4}$  will be \_\_\_\_\_  $2\frac{1}{4}$ .

7.  $4 \times 1\frac{3}{7}$  will be \_\_\_\_\_  $1\frac{3}{7}$ .



**Algebra** Tell whether the unknown factor is *less than 1* or *greater than 1*.

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

The unknown factor is \_\_\_\_\_ 1.

9.  $\square \times 1\frac{1}{4} = 2\frac{1}{2}$

The unknown factor is \_\_\_\_\_ 1.

# Problem Solving **REAL WORLD**

10. Kyle is making a scale drawing of his math book. The dimensions of his drawing will be  $\frac{1}{3}$  the dimensions of his book. If the width of his book is  $8\frac{1}{2}$  inches, will the width of his drawing be equal to, greater than, or less than  $8\frac{1}{2}$  inches?

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11. **Write Math**  **Sense or Nonsense?**

Penny wants to make a model of a beetle that is larger than life-size. Penny says she is going to use a scaling factor of  $\frac{7}{12}$ . Does this make sense or is it nonsense? **Explain.**

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12. **H.O.T.** Shannon, Mary, and John earn a weekly allowance. Shannon earns an amount that is  $\frac{2}{3}$  of what John earns. Mary earns an amount that is  $1\frac{2}{3}$  of what John earns. John earns \$20 a week. Who earns the greatest allowance? Who earns the least?

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13. **Test Prep** Addie's puppy weighs  $1\frac{2}{3}$  times what it weighed when it was born. It weighed  $1\frac{1}{3}$  pounds at birth. Which statement below is true?

- (A) The puppy weighs the same as it did at birth.
- (B) The puppy weighs less than it did at birth.
- (C) The puppy weighs more than it did at birth.
- (D) The puppy weighs twice what it did at birth.



**SHOW YOUR WORK**



Name \_\_\_\_\_

## Multiply Mixed Numbers

**Essential Question** How do you multiply mixed numbers?

### UNLOCK the Problem REAL WORLD

One-third of a  $1\frac{1}{4}$  acre park has been set aside as a dog park. Find the number of acres that are used as a dog park.

Multiply.  $\frac{1}{3} \times 1\frac{1}{4}$

**One Way** Use a model.

**STEP 1** Shade the model to represent the whole park.

**Think:** The whole park is \_\_\_\_\_ acres.

**STEP 2** Double-shade the model to represent the part of the park that is a dog park.

**Think:** The dog park is \_\_\_\_\_ of the park.

Draw horizontal lines across each rectangle to show \_\_\_\_\_.

- How many parts does each rectangle show? \_\_\_\_\_
- What fraction of each rectangle is shaded twice?  
\_\_\_\_\_ and \_\_\_\_\_
- What fraction represents all the parts which are shaded twice?  
\_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_

So, \_\_\_\_\_ acre has been set aside.

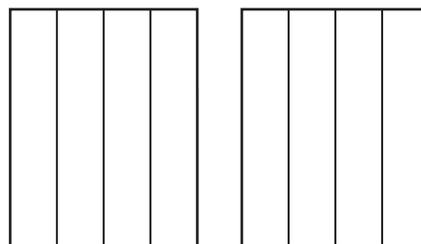
**Another Way** Rename the mixed number as a fraction.

**STEP 1** Write the mixed number as a fraction greater than 1.

**STEP 2** Multiply the fractions.

So,  $\frac{1}{3} \times 1\frac{1}{4} =$  \_\_\_\_\_.

- Is the area of the dog park less than or greater than the area of the  $1\frac{1}{4}$  acre park?  
\_\_\_\_\_



$$\frac{1}{3} \times 1\frac{1}{4} = \frac{1}{3} \times \frac{\square}{4}$$

$$= \frac{1 \times \square}{3 \times 4} = \frac{\square}{\square}$$

**Math Talk**

**MATHEMATICAL PRACTICES**

**Explain** why your answer is reasonable.

**Example 1** Rename the whole number.

Multiply.  $12 \times 2\frac{1}{6}$  Write the product in simplest form.

**STEP 1** Determine how the product will compare to the greater factor.

$12 \times 2\frac{1}{6}$  will be \_\_\_\_\_ 12.

**STEP 2** Write the whole number and mixed number as fractions.

**STEP 3** Multiply the fractions.

**STEP 4** Write the product in simplest form.

So,  $12 \times 2\frac{1}{6} =$  \_\_\_\_\_.

$$12 \times 2\frac{1}{6} = \frac{\square}{1} \times \frac{\square}{6}$$
$$= \frac{\square}{\square} = \frac{\square}{\square}, \text{ or } \square$$

**Example 2** Use the Distributive Property.

Multiply.  $16 \times 4\frac{1}{8}$  Write the product in simplest form.

**STEP 1** Rewrite the expression by using the Distributive Property.

**STEP 2** Multiply 16 by each number.

**STEP 3** Add.

So,  $16 \times 4\frac{1}{8} =$  \_\_\_\_\_.

$$16 \times 4\frac{1}{8} = 16 \times \left( \text{---} + \frac{1}{8} \right)$$
$$= (16 \times 4) + \left( 16 \times \frac{\square}{\square} \right)$$
$$= \text{---} + 2 = \text{---}$$

**Math Talk** **MATHEMATICAL PRACTICES** Explain how you know that your answers to both examples are reasonable.

1. Explain why you might choose to use the Distributive Property to solve Example 2.

2. When you multiply two factors greater than 1, is the product less than, between, or greater than the two factors? Explain.

Name \_\_\_\_\_

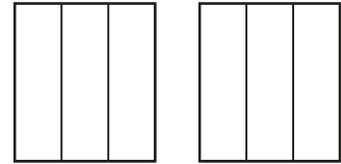
## Share and Show



Find the product. Write the product in simplest form.

$$1. 1\frac{2}{3} \times 3\frac{4}{5} = \frac{\square}{3} \times \frac{\square}{5}$$
$$= \frac{\square}{\square}$$
$$= \underline{\hspace{2cm}}$$

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



Shade the model to find the product.

3.  $1\frac{1}{8} \times 2\frac{1}{3}$

\_\_\_\_\_

4.  $\frac{3}{4} \times 6\frac{5}{6}$

\_\_\_\_\_

5.  $1\frac{2}{7} \times 1\frac{3}{4}$

\_\_\_\_\_

6.  $\frac{3}{4} \times 1\frac{1}{4}$

\_\_\_\_\_

Use the Distributive Property to find the product.

7.  $16 \times 2\frac{1}{2}$

\_\_\_\_\_

8.  $1\frac{4}{5} \times 15$

\_\_\_\_\_

### Math Talk

MATHEMATICAL PRACTICES

Explain how multiplying a mixed number by a whole number is similar to multiplying two mixed numbers.

## On Your Own

Find the product. Write the product in simplest form.

9.  $\frac{3}{4} \times 1\frac{1}{2}$

\_\_\_\_\_

10.  $4\frac{2}{5} \times 1\frac{1}{2}$

\_\_\_\_\_

11.  $5\frac{1}{3} \times \frac{3}{4}$

\_\_\_\_\_

12.  $2\frac{1}{2} \times 1\frac{1}{5}$

\_\_\_\_\_

13.  $12\frac{3}{4} \times 2\frac{2}{3}$

\_\_\_\_\_

14.  $3 \times 4\frac{1}{2}$

\_\_\_\_\_

15.  $2\frac{3}{8} \times \frac{4}{9}$

\_\_\_\_\_

16.  $1\frac{1}{3} \times 1\frac{1}{4} \times 1\frac{1}{5}$

\_\_\_\_\_

Use the Distributive Property to find the product.

17.  $10 \times 2\frac{3}{5}$

\_\_\_\_\_

18.  $3\frac{3}{4} \times 12$

\_\_\_\_\_

**Changing Recipes**

You can make a lot of recipes more healthful by reducing the amounts of fat, sugar, and salt.



Kelly has a muffin recipe that calls for  $1\frac{1}{2}$  cups of sugar. She wants to use  $\frac{1}{2}$  that amount of sugar and more cinnamon and vanilla. How much sugar will she use?

Multiply  $1\frac{1}{2}$  by  $\frac{1}{2}$  to find what part of the original amount of sugar to use.

Write the mixed number as a fraction greater than 1.

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

Multiply.

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

So, Kelly will use \_\_\_\_\_ cup of sugar.

19. Michelle has a recipe that calls for  $2\frac{1}{2}$  cups of vegetable oil. She wants to use  $\frac{2}{3}$  that amount of oil and use applesauce to replace the rest. How much vegetable oil will she use?

\_\_\_\_\_

20. Tony's recipe for soup calls for  $1\frac{1}{4}$  teaspoons of salt. He wants to use  $\frac{1}{2}$  that amount. How much salt will he use?

\_\_\_\_\_

21. Jeffrey's recipe for oatmeal muffins calls for  $2\frac{1}{4}$  cups of oatmeal and makes one dozen muffins. If he makes  $1\frac{1}{2}$  dozen muffins for a club meeting, how much oatmeal will he use?

\_\_\_\_\_

22. **H.O.T.** Cara's muffin recipe calls for  $1\frac{1}{2}$  cups of flour for the muffins and  $\frac{1}{4}$  cup of flour for the topping. If she makes  $\frac{1}{2}$  of the original recipe, how much flour will she use?

\_\_\_\_\_

Name \_\_\_\_\_

**Problem Solving • Find Unknown Lengths**

**Essential Question** How can you use the strategy *guess, check, and revise* to solve problems with fractions?



Sarah wants to design a rectangular garden with a section for flowers that attract butterflies. She wants the area of this section to be  $\frac{3}{4}$  square yard. If she wants the width to be  $\frac{1}{3}$  the length, what will the dimensions of the butterfly section be?

**Read the Problem**

**What do I need to find?**

I need to find \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

**What information do I need to use?**

The part of the garden for butterflies has an area of \_\_\_\_\_ square yard and the width is \_\_\_\_\_ the length.

**How will I use the information?**

I will \_\_\_\_\_ the sides of the butterfly area. Then I will \_\_\_\_\_ my guess and \_\_\_\_\_ it if it is not correct.

**Solve the Problem**

I can try different lengths and calculate the widths by finding  $\frac{1}{3}$  the length. For each length and width, I find the area and then compare. If the product is less than or greater than  $\frac{3}{4}$  square yard, I need to revise the length.

Guess	Width (in yards) ( $\frac{1}{3}$ of the length)	Check Area of Butterfly Garden (in square yards)	Revise
$\frac{3}{4}$	$\frac{1}{3} \times \frac{3}{4} = \frac{1}{4}$	$\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$ too low	Try a longer length.
$2\frac{1}{4}$ , or $\frac{9}{4}$			

So, the dimensions of Sarah's butterfly garden will be \_\_\_\_\_ yard by \_\_\_\_\_ yards.

## Try Another Problem

Marcus is building a rectangular box for his kitten to sleep in. He wants the area of the bottom of the box to be 360 square inches and the length of one side to be  $1\frac{3}{5}$  the length of the other side. What should the dimensions of the bottom of the bed be?



### Read the Problem

What do I need to find?

What information do I need to use?

How will I use the information?

### Solve the Problem

So, the dimensions of the bottom of the kitten's bed will be \_\_\_\_\_ by \_\_\_\_\_.

- **What if** the longer side was still  $1\frac{3}{5}$  the length of the shorter side and the shorter side was 20 inches long? What would the area of

the bottom of the bed be then? \_\_\_\_\_  
\_\_\_\_\_

Name \_\_\_\_\_

## Share and Show

1. When Pascal built a dog house, he knew he wanted the floor of the house to have an area of 24 square feet. He also wanted the width to be  $\frac{2}{3}$  the length. What are the dimensions of the dog house?

**First**, choose two numbers that have a product of 24.

Guess: \_\_\_\_\_ feet and \_\_\_\_\_ feet

**Then**, check those numbers. Is the greater number  $\frac{2}{3}$  of the other number?

Check:  $\frac{2}{3} \times$  \_\_\_\_\_ = \_\_\_\_\_

My guess is \_\_\_\_\_.

**Finally**, if the guess is not correct, revise it and check again. Continue until you find the correct answer.

So, the dimensions of the dog house are \_\_\_\_\_.



-  2. **What if** Pascal wanted the area of the floor to be 54 square feet and the width still to be  $\frac{2}{3}$  the length? What would the dimensions of the floor be?

-  3. Leo wants to paint a mural that covers a wall with an area of 1,440 square feet. The height of the wall is  $\frac{2}{5}$  of its length. What is the length and the height of the wall?

# On Your Own . . . . .

**Choose a STRATEGY**

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

4. Barry wants to make a drawing that is  $\frac{1}{4}$  the size of the original. If a tree in the original drawing is 14 inches tall, how tall will the tree in Barry's drawing be?

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5. **H.O.T.** A blueprint is a scale drawing of a building. The dimensions of the blueprint for Penny's doll house are  $\frac{1}{4}$  of the measurements of the actual doll house. The floor of the doll house has an area of 864 square inches. If the width of the doll house is  $\frac{2}{3}$  the length, what are the dimensions of the floor on the blueprint of the doll house?

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6. **Write Math** **Pose a Problem** Look back at Exercise 4. Write a similar problem using a different measurement and a different fraction. Then solve your problem.

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7. **Test Prep** Albert's photograph has an area of 80 square inches. The length of the photo is  $1\frac{1}{4}$  the width. Which of the following could be the dimensions of the photograph?

- (A) 5 inches by 16 inches
- (B) 12 inches by 10 inches
- (C) 6 inches by 5 inches
- (D) 10 inches by 8 inches

**SHOW YOUR WORK**

Vertical dotted line for showing work.

Name \_\_\_\_\_



## Chapter Review/Test

### ► Concepts and Skills

1. When you multiply  $3\frac{1}{4}$  by a number greater than one, how does the product compare to  $3\frac{1}{4}$ ? **Explain.**

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Use a model to solve.

2.  $\frac{2}{3} \times 6$

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3.  $\frac{3}{7} \times 14$

---

4.  $\frac{5}{8} \times 24$

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Find the product. Write the product in simplest form.

5.  $\frac{3}{5} \times 8 =$  \_\_\_\_\_

6.  $\frac{1}{4} \times 10 =$  \_\_\_\_\_

7.  $\frac{5}{7} \times 15 =$  \_\_\_\_\_

8.  $\frac{5}{6} \times \frac{2}{3} =$  \_\_\_\_\_

9.  $\frac{1}{5} \times \frac{5}{7} =$  \_\_\_\_\_

10.  $\frac{3}{8} \times \frac{1}{6} =$  \_\_\_\_\_

Complete the statement with *equal to*, *greater than*, or *less than*.

11.  $\frac{7}{8} \times \frac{6}{6}$  will be \_\_\_\_\_  $\frac{7}{8}$ .

12.  $\frac{1}{2} \times \frac{8}{9}$  will be \_\_\_\_\_  $\frac{8}{9}$ .

Fill in the bubble completely to show your answer.

13. Wolfgang wants to enlarge a picture he developed. Which factor listed below would scale up (enlarge) his picture the most if he used it to multiply its current dimensions?

(A)  $\frac{7}{8}$

(B)  $\frac{14}{14}$

(C)  $1\frac{4}{9}$

(D)  $\frac{3}{2}$

14. Rachel wants to reduce the size of her photo. Which factor listed below would scale down (reduce) the size of her picture the most?

(A)  $\frac{5}{8}$

(B)  $\frac{11}{16}$

(C)  $\frac{3}{4}$

(D)  $\frac{8}{5}$

15. Marteen wants to paint  $\frac{2}{3}$  of her room today. She wants to paint  $\frac{1}{4}$  of that before lunch. How much of her room will she paint today before lunch?

(A)  $\frac{1}{12}$

(B)  $\frac{1}{6}$

(C)  $\frac{5}{12}$

(D)  $\frac{11}{12}$

Name \_\_\_\_\_

Fill in the bubble completely to show your answer.

16. Gia's bus route to school is  $5\frac{1}{2}$  miles. The bus route home is  $1\frac{3}{5}$  times as long. How long is Gia's bus route home?
- (A)  $5\frac{3}{10}$  miles
- (B) 8 miles
- (C)  $8\frac{4}{5}$  miles
- (D)  $17\frac{3}{5}$  miles
17. Carl's dog weighs  $2\frac{1}{3}$  times what Judy's dog weighs. If Judy's dog weighs  $35\frac{1}{2}$  pounds, how much does Carl's dog weigh?
- (A)  $88\frac{3}{4}$  pounds
- (B)  $82\frac{5}{6}$  pounds
- (C)  $81\frac{2}{3}$  pounds
- (D) 71 pounds
18. In a fifth grade class,  $\frac{4}{5}$  of the girls have brown hair. Of the brown-haired girls,  $\frac{3}{4}$  of the girls have long hair. What fraction of the girls in the class have long brown hair?
- (A)  $\frac{1}{20}$
- (B)  $\frac{1}{5}$
- (C)  $\frac{3}{5}$
- (D)  $\frac{1}{4}$

## ► Constructed Response

19. Tasha plans to tile the floor in her room with square tiles that are  $\frac{1}{4}$  foot long. Will she use more or fewer tiles if she is only able to purchase square tiles that are  $\frac{1}{3}$  foot long? **Explain.**

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## ► Performance Task

20. For a bake sale, Violet wants to use the recipe at the right.

- A** If she wants to double the recipe, how much flour will she need?

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- B** Baxter wants to make  $1\frac{1}{2}$  times the recipe. Will he need more or less sugar than Violet needs if she doubles the recipe? **Explain.**

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- C** As shown, the recipe makes 60 cookies. Jorge wants to bring 150 cookies. How much flour will he need to make 150 cookies? **Explain** how you got your answer. (Hint: what can you multiply 60 by to get 150?)

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### Sugar Cookies

$2\frac{3}{4}$  cups flour

1 tsp baking soda

$\frac{1}{2}$  tsp baking powder

$1\frac{1}{2}$  cups sugar

1 cup butter

1 egg

1 tsp vanilla