Chapter 10

Name _____

Multiply Fractions

Show What You Know

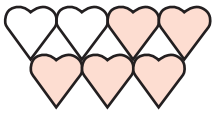
Part of a Group Write a fraction that names the shaded parts.

1. 

shaded parts _____

total parts _____

fraction _____

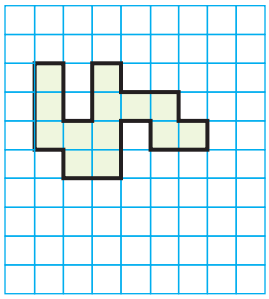
2. 

shaded parts _____

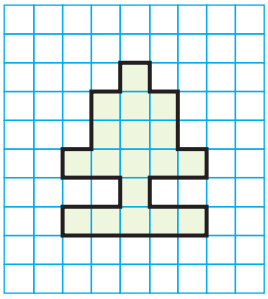
total parts _____

fraction _____

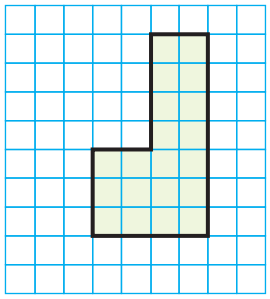
Area Write the area of each shape.

3. 

_____ square units

4. 

_____ square units

5. 

_____ square units

Equivalent Fractions Write an equivalent fraction.

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

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

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

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

MATH in the Real World

A bank vault has 2 gold bars. The first bar weighs $2\frac{2}{5}$ pounds. The second bar weighs $1\frac{2}{3}$ times as much as the first bar. How much gold is in the bank vault?

Vocabulary Builder

Go Online For more help

Visualize It

Match the review words with their examples.

What is it?	What are some examples?
_____	$\frac{5}{10}$
_____	$\frac{5}{10}$
_____	$4\frac{1}{5}, 1\frac{3}{8}, 6\frac{3}{6}$
_____	$\frac{2}{3}, \frac{4}{6}, \frac{10}{15}$

Connect to Vocabulary

Review Words

- denominator
- equivalent fractions
- mixed number
- numerator
- product

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. The number below the bar in a fraction that tells how many equal parts are in the whole or in the group is the _____.
3. The _____ is the answer to a multiplication problem.
4. Fractions that name the same amount or part are called _____.
5. The _____ is the number above the bar in a fraction that tells how many equal parts of the whole are being considered.

Name _____

Multiply Fractions

Florida's B.E.S.T.

- **Fractions** 5.FR.2.2
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.5.1, MTR.6.1

I Can use visual models to show the product of two fractions.

Investigate

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

Materials ■ color pencils

Find $\frac{2}{3}$ of $\frac{3}{4}$.

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 sheet of 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 cloth 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.

_____

_____

2. **MTR** 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.

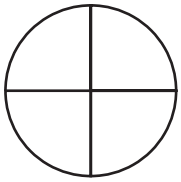
_____

Make Connections

You can find a part of a part in different ways. Marguerite 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 $\frac{1}{3} \times \frac{3}{4}$.

Marguerite

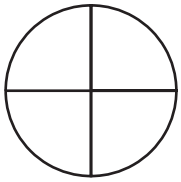


- Shade the model to show $\frac{3}{4}$ of the whole.
- How many $\frac{1}{4}$ pieces did you shade?

  _____ 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 expression above.

_____

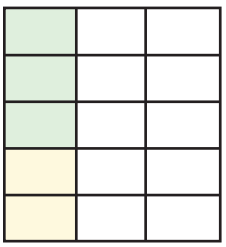
_____

Share and Show

Math Board

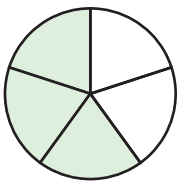
Use the model or *i*Tools to find the product.

1.



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

2.



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

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

On Your Own

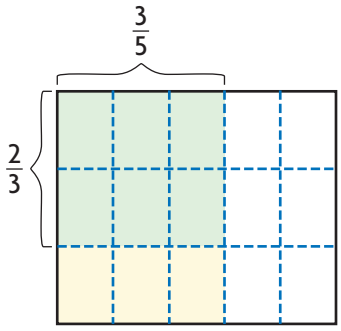
7. MTR Ricardo's recipe for 4 loaves of bread requires $\frac{2}{3}$ cup of olive oil. He only wants to make 1 loaf. Ricardo makes a model to find out how much oil he needs to use. He folds a piece of paper vertically into three parts and shades two parts. Then he folds the paper horizontally into four parts and shades $\frac{1}{4}$ of the shaded part. Ricardo decides he needs $\frac{1}{4}$ cup of olive oil. Is he right? Explain.

8. Three-fourths of a spinach casserole is left over after Sam has lunch. Jackie and Alicia each take $\frac{1}{2}$ of the leftover casserole. Jackie eats only $\frac{2}{3}$ of her portion. What fraction of a whole casserole did Jackie eat? Draw a model.

What's the Error?

MATH on the Spot

9. Cheryl and Marcus are going to make 2 batches of muffins. The smaller batch is $\frac{2}{3}$ the size of the larger batch. The recipe for the larger batch requires $\frac{3}{5}$ cup of water. How much water will they need to make the smaller batch?



They made a model to represent the problem. Cheryl says they need $\frac{6}{9}$ cup of water. Marcus says they need $\frac{6}{15}$ cup of water. Who is correct? Explain.

10. A farmer took $\frac{2}{3}$ of the strawberries that he harvested to a market. At the market, the farmer sold $\frac{1}{4}$ of the strawberries. How can you find what part of the harvested strawberries were sold at the market? For 10a–10d, choose the number that makes each sentence true.

10a. Draw a rectangular array with 3 rows and [3 / 4 / 5] columns.

10b. Shade [1 / 2 / 3] of the rows gray.

10c. Shade [2 / 3 / 4] of the gray squares black.

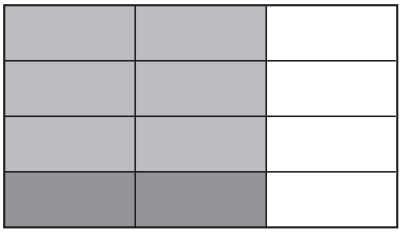
10d. The farmer sold [$\frac{3}{8}$ / $\frac{1}{4}$ / $\frac{1}{6}$] of his strawberries at the market.

Name _____

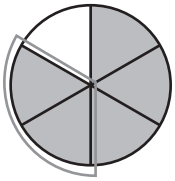
Multiply Fractions

Go Online
Interactive Examples

Find the product.

1. 

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

2. 

$\frac{2}{5} \times \frac{5}{6} =$ _____

Find the product. Draw a model.

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

4. $\frac{3}{4} \times \frac{1}{3} =$ _____

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

6. $\frac{3}{5} \times \frac{3}{5} =$ _____

Problem Solving Real World

7. Nora has a piece of ribbon that is $\frac{3}{4}$ yard long. She will use $\frac{1}{2}$ of it to make a bow. What length of the ribbon in yards will she use for the bow?

_____

8. Marlon bought $\frac{7}{8}$ pound of turkey at the deli. He used $\frac{2}{3}$ of it to make sandwiches for lunch. How much turkey in pounds did Marlon use for sandwiches?

_____

Lesson Check

9. Tina has $\frac{3}{5}$ pound of rice. She will use $\frac{2}{3}$ of it to make fried rice for her family. How much rice in pounds will Tina use to make fried rice?

10. The Waterfall Trail is $\frac{3}{4}$ mile long. At $\frac{1}{6}$ of the distance from the trailhead, there is a lookout. In miles, how far is the lookout from the trailhead?

Spiral Review

11. Hayden bought 48 new trading cards. Three-fourths of the new cards are baseball cards. How many baseball cards did Hayden buy?

12. Yesterday, Deja walked $\frac{9}{10}$ mile to her friend's house. Together, they walked $\frac{1}{3}$ mile to the library. What is a reasonable estimate for how far Deja walked yesterday?

13. Vy is going to sew a jacket and a skirt. She needs $2\frac{3}{4}$ yards of material for the jacket and $1\frac{1}{2}$ yards of material for the skirt. Altogether, how many yards of material does Vy need?

14. Use properties to solve.

$$(3 \times 6) + (5 \times 2) \div 7$$

Name _____

Compare Relative Size of Products to Fraction Factors

Florida's B.E.S.T.

- **Fractions** 5.FR.2.3
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1

I Can compare the size of a product to the size of one factor when multiplying fractions.

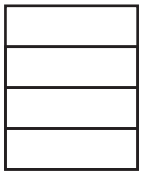
UNLOCK the Problem

Multiplication can be thought of as resizing one number by another number. For example, 2×3 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.

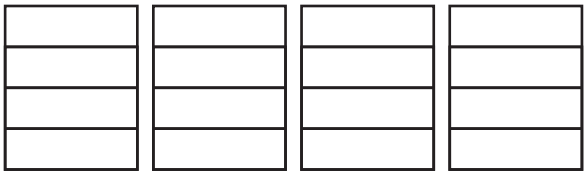
A **During the week, the Delgado family ate $\frac{3}{4}$ of a box of cereal.**



- 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?

_____

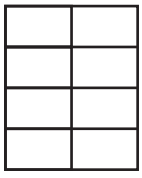
B **The Ling family has 4 boxes of cereal. They ate $\frac{3}{4}$ of all the cereal during the week.**



- 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* $\frac{3}{4}$?

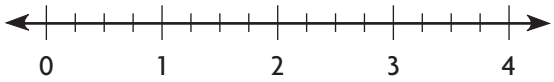
_____

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.

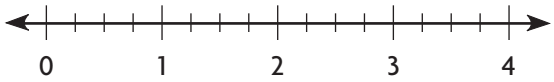
Graph a point to show $\frac{3}{4}$ scaled by 1, $\frac{1}{2}$, and 4.

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



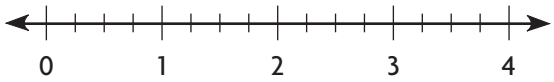
Think: Locate $\frac{3}{4}$ on the diagram and shade that distance from 0. Then graph a point to show 1 of $\frac{3}{4}$.

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 $\frac{3}{4}$.

MTR Complete each statement with *equal to, greater than,* or *less than*. Explain your choices.

- 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

MTR 6.1 Assess the reasonableness of solutions.

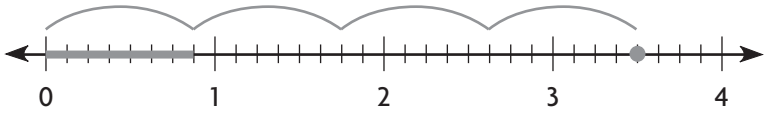
What if $\frac{3}{5}$ was multiplied by $\frac{1}{6}$ or by the whole number 7? Would the products be equal to, greater than, or less than $\frac{3}{5}$? Explain.

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

On Your Own

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

4. $\frac{7}{8} \times \frac{3}{5}$ will be _____ $\frac{3}{5}$.

5. $7 \times \frac{9}{10}$ will be _____ $\frac{9}{10}$.

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

7. $\frac{6}{11} \times 1$ will be _____ $\frac{6}{11}$.

Problem Solving · Applications

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

_____

9. Mrs. Rodriguez has 18 packages of pens in stock at her store on Monday. On Tuesday, she has $\frac{5}{6}$ the number of pens she had on Monday. On Wednesday, she has $\frac{2}{5}$ of the number of pens she had on Tuesday. How many packages of pens does she have on Wednesday?

_____

10. MTR Ariel goes running for $\frac{5}{6}$ of an hour. The next day, she runs for $\frac{3}{4}$ as much time. Does she spend more or less time running the second day? Draw a diagram or make a model to represent the problem.

_____

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.

11. If Bob's bike is 60 inches long, how long will his model be? _____

12. If one wheel on Bob's model is 4 inches across, how many inches across is the actual wheel on his bike? Explain.

_____

_____

_____

MATH on the Spot

13. Write each multiplication expression in the correct box.

$\frac{5}{6} \times \frac{2}{3}$ $2 \times \frac{5}{6}$ $\frac{5}{6} \times \frac{4}{4}$ $\frac{5}{6} \times \frac{7}{3}$ $\frac{10}{10} \times \frac{5}{6}$ $\frac{5}{6} \times \frac{5}{6}$

Product is equal to $\frac{5}{6}$.	Product is greater than $\frac{5}{6}$.	Product is less than $\frac{5}{6}$.

Name _____

Compare Relative Size of Products to Fraction Factors

Go Online
Interactive Examples

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

1. $\frac{3}{5} \times \frac{4}{7}$ will be less than $\frac{4}{7}$.

Think: $\frac{4}{7}$ is multiplied by a number less than 1; so, $\frac{3}{5} \times \frac{4}{7}$ will be less than $\frac{4}{7}$.

2. $5 \times \frac{7}{8}$ will be _____ $\frac{7}{8}$.

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

4. $\frac{1}{9} \times 1$ will be _____ $\frac{1}{9}$.

5. $\frac{4}{9} \times \frac{3}{8}$ will be _____ $\frac{3}{8}$.

6. $\frac{4}{5} \times \frac{7}{7}$ will be _____ $\frac{4}{5}$.

Problem Solving Real World

7. Shani is making hot cocoa. She plans to multiply the recipe by 4 to make enough hot cocoa for the whole class. If the recipe calls for $\frac{1}{2}$ teaspoon vanilla extract, will she need more than $\frac{1}{2}$ teaspoon or less than $\frac{1}{2}$ teaspoon of vanilla extract to make all the hot cocoa?

8. Miles is planning to spend $\frac{2}{3}$ as many hours cycling this week as he did last week. Is Miles going to spend more hours or fewer hours cycling this week than last week?

9. WRITE Math Explain how you can compare the size of a product to the size of a factor when multiplying fractions without actually doing the multiplication. Include a model.

Lesson Check

10. Trevor saves $\frac{2}{3}$ of the money he earns at his after-school job. Suppose Trevor starts saving $\frac{1}{4}$ as much as he is saving now. Will he be saving less, more, or the same amount?

11. Suppose you multiply a whole number greater than 1 by the fraction $\frac{3}{5}$. Will the product be greater than, less than, or equal to $\frac{3}{5}$?

Spiral Review

12. In the next 10 months, Kai wants to save $900 for his vacation. He plans to save $75 each of the first 8 months. How much must he save each of the last 2 months in order to meet his goal if he saves the same amount each month?

13. What is the total cost of 0.5 pound of peaches selling for $0.80 per pound and 0.7 pound of oranges selling for $0.90 per pound?

14. Cerise hiked 15.12 miles in 6.3 hours. If Cerise hiked the same number of miles each hour, how many miles did she hike each hour?

15. It is $42\frac{1}{2}$ miles from Eaton to Baxter, and $37\frac{4}{5}$ miles from Baxter to Wellington. How far is it from Eaton to Wellington, if you go by way of Baxter?

Name _____

Compare Relative Size of Products with Fraction Multiplication

Florida's B.E.S.T.
- **Fractions** 5.FR.2.2, 5.FR.2.3
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.2.1, MTR.4.1, MTR.5.1, MTR.6.1

I Can multiply fractions and explain how the size of a product compares to the size of the factors.

UNLOCK the Problem

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

- How much of the scarf does Sasha have left to knit?

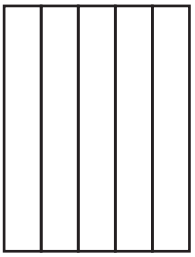
_____

- Of the fraction that is left, how much will she finish today?

_____

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.



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

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

_____

_____

_____

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.

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

Examples

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

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

Write the whole number as a fraction.

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

Multiply the numerators.
Multiply the denominators.

$$= \frac{\square \div \square}{12 \div \square} = \frac{\square}{\square}$$

Write the product as a fraction.

So, $4 \times \frac{5}{12} =$ _____.

Math Talk

MTR 6.1 Assess the reasonableness of solutions.

Is the answer reasonable? Explain.

Try This! Evaluate $c \times \frac{4}{5}$ for $c = \frac{2}{2}$.

- What is another way to write the value of c? _____
- What happens when you multiply a whole number by 1?

  _____

- Replace c in the expression with _____.
- Multiply the numerators.
- Multiply the denominators.
- What do you notice about the product?

  _____

So, multiplying $c \times \frac{4}{5}$ is equal to _____ when $c = \frac{2}{2}$.

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

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

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

- MTR Will you get the same result if you multiply $\frac{4}{5}$ by any fraction with a numerator and denominator that are the same digit? Explain.

_____

_____

Name _____

Share and Show

Math Board

Find the product.

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

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

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

MTR 4.1 Engage in discussions on mathematical thinking.

What fractions could you multiply $\frac{1}{5}$ by to get a product that is less than $\frac{1}{5}$? equal to $\frac{1}{5}$? Explain.

On Your Own

Find the product.

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

14. $\frac{7}{8} \times \frac{4}{5}$

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

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

17. 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?

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

Problem Solving · Applications

Speed skating is a popular sport in the Winter Olympics. Many young athletes in the United States participate in speed-skating 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. 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.

MATH on the Spot

_____

_____

_____

21. MTR 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.

_____

_____

22. A scientist had $\frac{3}{5}$ liter of solution. He used $\frac{1}{6}$ of the solution for an experiment. How much solution in liters did the scientist use for the experiment? Use the numbers on the tiles to complete the calculations. You may use numbers more than once or not at all.

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

1	2	3	4
5	10	20	30

_____ liter

Name _____

Compare Relative Size of Products with Fraction Multiplication

Go Online
Interactive Examples

Find the product.

1. $\frac{4}{5} \times \frac{7}{8} = \frac{4 \times 7}{5 \times 8}$ $\frac{28}{40}$, or $\frac{7}{10}$

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

3. $\frac{5}{9} \times \frac{3}{4}$ _____

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

5. $\frac{1}{8} \times 20$ _____

6. Ciara raked $\frac{3}{5}$ of the yard. Minni raked $\frac{1}{3}$ of the amount Karen raked. How much of the yard did Minni rake?

_____

7. In the pet show, $\frac{3}{8}$ of the pets are dogs. Of the dogs, $\frac{2}{3}$ have long hair. What fraction of the pets are dogs with long hair?

_____

Algebra **Evaluate for the given value of the variable.**

8. $\frac{7}{8} \times c$ for $c = 8$ _____

9. $t \times \frac{3}{4}$ for $t = \frac{8}{9}$ _____

10. $\frac{1}{2} \times s$ for $s = \frac{3}{10}$ _____

11. $y \times 6$ for $y = \frac{2}{3}$ _____

Problem Solving Real World

12. Peja ran $\frac{5}{7}$ of the distance around the school track. Sara ran $\frac{4}{5}$ of Peja's distance. What fraction of the total distance around the track did Sara run?

_____

13. A group of students attend a math club. Half of the students are boys and $\frac{4}{9}$ of the boys have brown eyes. What fraction of the group are boys with brown eyes?

_____

14. WRITE Math Explain how multiplying fractions is similar to multiplying whole numbers and how it is different.

_____

Lesson Check

15. Som attended band practice for $\frac{5}{6}$ hour. Then he went home and practiced for $\frac{2}{5}$ as long as band practice. How many minutes did he practice at home?

16. Vailea read $\frac{5}{8}$ of a 56-page book. How many pages did Vailea read?

Spiral Review

17. What is the quotient of $\frac{18}{1{,}000}$?

18. A machine produces 1,000 bowling pins per hour, each valued at $8.37. What is the total value of the pins produced in 1 hour?

19. Keith had $8\frac{1}{2}$ cups of flour. He used $5\frac{2}{3}$ cups to make bread. How many cups of flour does Keith have left?

20. The Blue Lake Trail is $11\frac{3}{8}$ miles long. Gemma has hiked $2\frac{1}{2}$ miles each hour for 3 hours. How far is she from the end of the trail?

Name _____

Compare Relative Size of Products to Mixed Number Factors

Florida's B.E.S.T.

- **Fractions** 5.FR.2.3
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.4.1, MTR.5.1, MTR.6.1

I Can compare the size of a product to the size of one factor when multiplying fractions greater than one.

UNLOCK the Problem

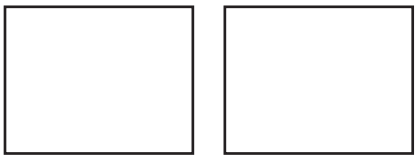
You can make general statements about the relative size of a product when one factor is equal to 1, less than 1, or greater than 1.

One Way Use a model.

Sherise has a recipe that requires $1\frac{1}{4}$ 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 $1 \times 1\frac{1}{4}$

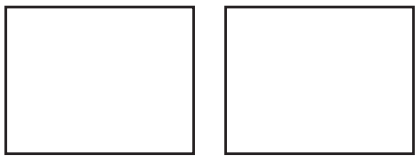


Think: I can use what I know about the Identity Property.

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

_____

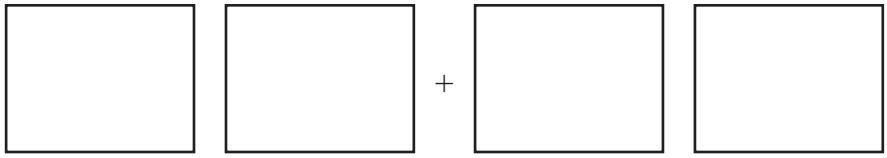
B $\frac{1}{2} \times 1\frac{1}{4}$



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

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

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



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

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

_____

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

Explain your answer to Part C.

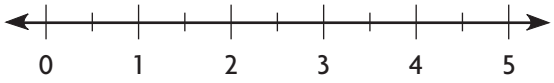
MTR You can also use a diagram to show the relationship between the products when a fraction greater than one is multiplied or scaled (resized) by a number.

Another Way Use a diagram.

Venec 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*.

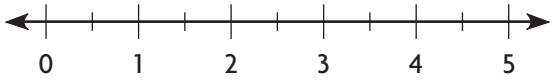
A $1 \times 2\frac{1}{2}$



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

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

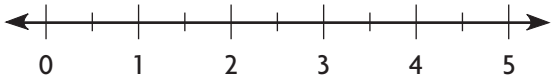
B $\frac{3}{5} \times 2\frac{1}{2}$



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

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

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



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

- 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.

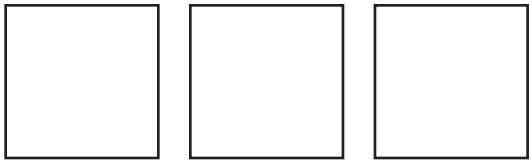
Name _____

Share and Show

Math Board

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 _____ $3\frac{1}{6}$.

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

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

The unknown factor is _____ 1.

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

The unknown factor is _____ 1.

8. Kadeem is making two drawings of an oak leaf. The dimensions of the first drawing will be $\frac{1}{3}$ the dimensions of the leaf. The dimensions of the second drawing will be $2\frac{1}{2}$ the dimensions of the leaf. If the length of the oak leaf is $5\frac{1}{2}$ inches, will the length of each drawing be equal to, greater than, or less than $5\frac{1}{2}$ inches?

_____

_____

Problem Solving · Applications

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

10. 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?

MATH on the Spot

11. Stuart rode his bicycle $6\frac{3}{5}$ miles on Friday. On Saturday, he rode $1\frac{1}{3}$ times as far as he rode on Friday. On Sunday, he rode $\frac{5}{6}$ times as far as he rode on Friday. For 11a–11d, select True or False for each statement.

11a. Stuart rode more miles on Saturday than he rode on Friday.

○ True ○ False

11b. Stuart rode more miles on Friday than he rode on Saturday and Sunday combined.

○ True ○ False

11c. Stuart rode fewer miles on Sunday than he rode on Friday.

○ True ○ False

11d. Stuart rode more miles on Sunday than he rode on Saturday.

○ True ○ False

Name _____

Compare Relative Size of Products to Mixed Number Factors

Go Online
Interactive Examples

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

1. $\frac{2}{3} \times 1\frac{5}{8}$ will be less than $1\frac{5}{8}$.

Think: $1 \times 1\frac{5}{8}$ is $1\frac{5}{8}$.
Since $\frac{2}{3}$ is less than 1,
$\frac{2}{3} \times 1\frac{5}{8}$ will be less than $1\frac{5}{8}$.

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

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

4. $9 \times 1\frac{4}{5}$ will be _____ $1\frac{4}{5}$.

5. $1\frac{7}{8} \times 2\frac{3}{8}$ will be _____ $2\frac{3}{8}$.

6. $3\frac{4}{9} \times \frac{5}{9}$ will be _____ $3\frac{4}{9}$.

Problem Solving Real World

7. Karim is making a scale drawing of a doghouse. The dimensions of the drawing will be $\frac{1}{8}$ of the dimensions of the actual doghouse. The height of the actual doghouse is $36\frac{3}{4}$ inches. Will the dimensions of Karim's drawing be equal to, greater than, or less than the dimensions of the actual doghouse?

_____

8. Jorge has a recipe that calls for $2\frac{1}{3}$ cups of flour. He plans to make $1\frac{1}{2}$ times the recipe. Will the amount of flour Jorge needs be equal to, greater than, or less than the amount of flour his recipe calls for?

_____

9. WRITE Math Explain how scaling a mixed number by $\frac{1}{2}$ will affect the size of the number.

_____

_____

_____

Lesson Check

10. Jenna skis $2\frac{1}{3}$ miles down the mountain. Her instructor skis $1\frac{1}{2}$ times as far. Does Jenna ski a lesser, greater, or the same distance as her instructor?

11. Suppose you multiply a fraction less than 1 by the mixed number $2\frac{3}{4}$. Will the product be less than, greater than, or equal to $2\frac{3}{4}$?

Spiral Review

12. Washington County is shaped like a rectangle. It measures 15 miles by 9 miles. What is the county's area?

13. Lysha jogged 7.8 miles. Riley jogged 0.5 times as far. How far did Riley jog?

14. One bread recipe calls for $2\frac{1}{3}$ cups of flour. Another bread recipe calls for $2\frac{1}{2}$ cups of flour. Tim has 5 cups of flour. If he makes both recipes, how much flour will he have left over?

15. On Monday, it rained $1\frac{1}{4}$ inches. On Tuesday, it rained $\frac{3}{5}$ inch. How much more did it rain on Monday than on Tuesday?

Name _____

Find Unknown Fractional Lengths

I Can solve real-world problems involving fractional lengths.

Florida's B.E.S.T.

- **Fractions** 5.FR.2.2, 5.FR.2.3
- **Algebraic Reasoning** 5.AR.1.2
- **Geometric Reasoning** 5.GR.2.1
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.4.1

UNLOCK the Problem

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

So, the dimensions of Sara'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 _____.

- MTR 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

Math Board

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

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

Guess: _____ feet and _____ feet

Then, check those numbers. Is the lesser 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 $\frac{2}{3}$ of 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

4. Josue 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 and 5 inches wide, what will be the length and width of the tree in Josue's drawing?

5. A blueprint is a scale drawing of a building. The dimensions of the blueprint for Patricia's dollhouse are $\frac{1}{4}$ of the measurements of the actual dollhouse. The floor of the dollhouse has an area of 864 square inches. If the width of the dollhouse is $\frac{2}{3}$ of the length, what are the dimensions of the floor on the blueprint of the doll house?

MATH on the Spot

6. MTR Beth wants the floor of her tree house to be 48 square feet. She wants the length to be $\frac{3}{4}$ the width. Using the strategy *guess, check, and revise,* Beth guesses the dimensions will be 4 feet by 12 feet. Is Beth's guess the correct dimensions? Explain.

7. Sally has a photograph that has an area of 35 square inches. She creates two enlargements of the photograph. The enlargements have areas of 140 square inches and 560 square inches. In each photograph, the length is $1\frac{2}{5}$ times the width. Select which of the following could be the dimensions of the original photograph or one of the enlargements. Mark all that apply.

- (A) 5 inches by 7 inches
- (B) 20 inches by 28 inches
- (C) 7 inches by 20 inches
- (D) 21 inches by 15 inches
- (E) 10 inches by 14 inches

Show the Math

Demonstrate Your Thinking

Name _____

Find Unknown Fractional Lengths

Go Online
Interactive Examples

1. Kamal's bedroom has an area of 120 square feet. The width of the room is $\frac{5}{6}$ the length of the room. What are the dimensions of Kamal's bedroom?

Guess: $6 \times 20 = 120$
Check: $\frac{5}{6} \times 20 = 16\frac{2}{3}$; try a longer width.
Guess: $10 \times 12 = 120$
Check: $\frac{5}{6} \times 12 = 10$. Correct!

10 feet by 12 feet

2. Sezja is painting on a piece of canvas that has an area of 180 square inches. The length of the painting is $1\frac{1}{4}$ times the width. What are the dimensions of the painting?

3. A small plane is flying a banner in the shape of a rectangle. The area of the banner is 144 square feet. The width of the banner is $\frac{1}{4}$ the length of the banner. What are the dimensions of the banner?

4. WRITE Math Explain how you can use the strategy *guess, check, and revise* to solve problems that involve a given area when the relationship between the side lengths is also given.

Lesson Check

5. Consuelo's living room is in the shape of a rectangle and has an area of 360 square feet. The width of the living room is $\frac{5}{8}$ its length. What is the length of the living room?

6. A rectangular park has an area of $\frac{2}{3}$ square mile. The length of the park is $2\frac{2}{3}$ the width of the park. What is the width of the park?

Spiral Review

7. Olga babysits for $3\frac{1}{2}$ hours on Friday and $1\frac{1}{2}$ times as long on Saturday. Did Olga babysit more, fewer, or the same number of hours on Saturday than she did on Friday?

8. Tory practiced basketball shots for $\frac{2}{3}$ hour. Tim practiced basketball shots for $\frac{3}{4}$ as much time as Tory did. How long did Tim practice basketball shots?

9. Leah bought $4\frac{1}{2}$ pounds of grapes. Of the grapes she bought, $1\frac{7}{8}$ pounds were red grapes. The rest were green grapes. How many pounds of green grapes did Leah buy?

10. To which place value is the following number rounded?

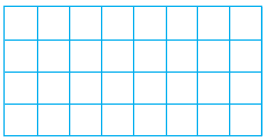
5.927 to 5.93

Name _____

Chapter 10

Chapter Review

1. Multiply $\frac{1}{4} \times \frac{5}{8}$. Shade the model and complete the calculations below to show how you found your answer.



$\frac{1}{4} \times \frac{5}{8} = \frac{\square}{\square}$

2. Diana worked on her science project for $5\frac{1}{3}$ hours. Gabe worked on his science project $1\frac{1}{4}$ times as long as Diana. Paula worked on her science project $\frac{3}{4}$ times as long as Diana. For Problems 2a–2d, select True or False for each statement.

2a. Diana worked longer on her science project than Gabe worked on his science project. ○ True ○ False

2b. Paula worked less on her science project than Diana worked on her science project. ○ True ○ False

2c. Gabe worked longer on his science project than Paula worked on her science project. ○ True ○ False

2d. Gabe worked longer on his science project than Diana and Paula combined. ○ True ○ False

3. Luis wants to carpet the rectangular floor of his basement. The basement has an area of 864 square feet. The width of the basement is $\frac{2}{3}$ its length. What is the length of the basement?

_____ feet

4. Katana put $\frac{2}{3}$ of her music collection on her phone. While on vacation, she listened to $\frac{3}{5}$ of the music on the player. How much of Katana's music collection did she listen to while on vacation?
For Problems 4a–4d, choose the correct values to describe how to solve the problem.

4a. Draw a rectangular array with 3 rows and [3 / 4 / 5] columns.

4b. Shade [1 / 2 / 3] of the rows gray.

4c. Shade [3 / 5 / 6] of the gray squares black.

4d. Katana listened to [$\frac{2}{5}$ / $\frac{3}{5}$ / $\frac{3}{10}$] of her music collection while on vacation.

5. Logyn bought balloons. Four-fifths of the balloons are purple, and $\frac{2}{3}$ of the purple balloons have stars on them. What fraction of the balloons are purple with stars on them? Show your work.

_____

6. Kayla walks $\frac{17}{5}$ miles each day. Which of the following statements correctly describe how far she walks? Mark all that apply.

Ⓐ Kayla walks $\frac{20}{17}$ miles in 4 days.

Ⓑ Kayla walks a little more than 10 miles in 3 days.

Ⓒ Kayla walks 34 miles in 10 days.

Ⓓ Kayla walks less than 6 miles in 6 days.

Name _____

7. Write each multiplication expression in the correct box.

$\frac{4}{5} \times 1\frac{1}{8}$ $\frac{1}{3} \times \frac{4}{5}$ $3 \times \frac{4}{5}$ $\frac{4}{5} \times \frac{4}{5}$ $\frac{8}{8} \times \frac{4}{5}$ $\frac{4}{5} \times \frac{2}{2}$

Product is equal to $\frac{4}{5}$.	Product is greater than $\frac{4}{5}$.	Product is less than $\frac{4}{5}$.

8. A postcard has an area of 24 square inches. Two enlargements of the postcard have areas of 54 square inches and 96 square inches. In each postcard, the length is $1\frac{1}{2}$ times the width. Which of the following could be the dimensions of the postcard or one of the enlargements? Mark all that apply.

Ⓐ 6 inches by 9 inches

Ⓑ 10 inches by 15 inches

Ⓒ 8 inches by 12 inches

Ⓓ 6 inches by 12 inches

Ⓔ 4 inches by 6 inches

9. In a fifth grade class, $\frac{4}{5}$ of the class has brown hair. Of the brown-haired classmates, $\frac{3}{4}$ of them have long hair. Of the classmates with long brown hair, $\frac{1}{3}$ of them have green eyes.

Part A

What fraction of the class has long brown hair?

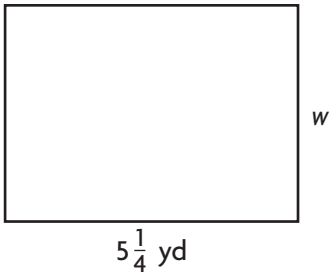
_____ of the classmates

Part B

What fraction of the class has long brown hair and green eyes? Explain how you found your answer.

_____ of the classmates

10. The length of a rectangle is $5\frac{1}{4}$ yards. Give a possible width w for Problems 10a–10c.



10a. For what width will the area of the rectangle be $5\frac{1}{4}$ square yards?

_____

10b. For what width will the area of the rectangle be greater than $5\frac{1}{4}$ square yards?

_____

10c. For what width will the area of the rectangle be less than $5\frac{1}{4}$ square yards?

_____

11. Doreen lives $\frac{3}{4}$ mile from the library. Sheila lives $\frac{1}{3}$ as far away from the library as Doreen. For Problems 11a–11c, choose Yes or No to answer each question.

11a. Does Doreen live farther from the library than Sheila? ○ Yes ○ No

11b. Does Sheila live $\frac{1}{4}$ mile from the library? ○ Yes ○ No

11c. Does Sheila live twice as far from the library as Doreen? ○ Yes ○ No

12. Taniqua took a test where $\frac{2}{3}$ of the questions were multiple choice. The rest of the questions were true/false. She got $\frac{9}{10}$ of the multiple choice questions correct.

12a. What fraction of the test questions were multiple choice questions that she got correct?

_____

12b. If Taniqua got $\frac{4}{5}$ of the true/false questions correct, what fraction of the test questions were true/false questions that she got incorrect?

_____

Name _____

13. The table shows how many hours some of the part-time employees at a toy store worked last week.

Name	Hours Worked
Conrad	6
Giovanni	9
Sally	11

This week, Conrad will work $1\frac{3}{4}$ times as long as last week. Giovanni will work $1\frac{1}{3}$ times as long as last week. Sally will work $\frac{2}{3}$ the number of hours she worked last week. Match each employee's name to the number of hours he or she will work this week.

Employee	**Hours This Week**
Conrad •	• more than last week
Giovanni •	• fewer than last week
Sally •	

14. Annika wants the floor of her chicken coop to be 48 square feet. She wants the length to be $\frac{4}{3}$ of the width.

14a. Estee designs a coop to be 12 feet by 4 feet. Does the design meet all of Annika's conditions? Explain.

_____

_____

14b. What should the dimensions of the coop be?

_____

15. Ruby conducted a survey and found that $\frac{5}{6}$ of her classmates have a pet and $\frac{2}{3}$ of those pets are dogs. What fraction of her classmates has dogs? Write a number from the number tiles in each box to complete the calculations shown below. You may use numbers more than once or not at all.

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

1	2	3	4
5	9	10	18

_____ of her classmates

16. Revel is using the recipe below to make chicken noodle soup. She has enough chicken broth for $\frac{3}{4}$ of a recipe.

Chicken Noodle Soup

4 cups chicken broth

2 medium carrots, sliced

3 stalks of celery, sliced

$\frac{1}{2}$ cup uncooked egg noodles

$\frac{1}{8}$ teaspoon ground black pepper

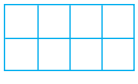
1 cup shredded cooked chicken

Part A

Write an expression that Revel can use to determine how many cups of egg noodles she needs.

Part B

Draw a model to show how Revel can find the product from Part A.



Part C

Does Revel need more or less than $\frac{1}{8}$ teaspoon of black pepper? How do you know?