

## Applications

- Greg buys  $\frac{2}{5}$  of a square pan of brownies that has only  $\frac{7}{10}$  of the pan left.
  - Draw a picture of how the brownie pan might look before and after Greg buys his brownies.
  - What fraction of a whole pan does Greg buy?
- Ms. Guerdin owns  $\frac{4}{5}$  acre of land in Tupelo Township. She wants to sell  $\frac{2}{3}$  of her land to her neighbor.
  - What fraction of an acre does she want to sell? Draw pictures to illustrate your thinking.
  - Write a number sentence that can be used to solve the problem.
- Find each answer and explain how you know.
  - Is  $\frac{3}{4} \times 1$  greater than or less than 1?
  - Is  $\frac{3}{4} \times \frac{2}{3}$  greater than or less than 1?
  - Is  $\frac{3}{4} \times \frac{2}{3}$  greater than or less than  $\frac{2}{3}$ ?
  - Is  $\frac{3}{4} \times \frac{2}{3}$  greater than or less than  $\frac{3}{4}$ ?
- Use a brownie-pan model to show whether finding  $\frac{2}{3}$  of  $\frac{3}{4}$  of a pan of brownies means the same thing as finding  $\frac{3}{4}$  of  $\frac{2}{3}$  of a pan of brownies.
  - If the brownie pans are the same size, how do the final amounts of brownies compare in the situations in part (a)?
  - What does this say about  $\frac{2}{3} \times \frac{3}{4}$  and  $\frac{3}{4} \times \frac{2}{3}$ ?
- Find each product. Describe any patterns that you see.
  - $\frac{1}{2}$  of  $\frac{1}{3}$
  - $\frac{1}{2}$  of  $\frac{1}{4}$
  - $\frac{1}{2}$  of  $\frac{2}{3}$
  - $\frac{1}{2}$  of  $\frac{3}{4}$

6. Mrs. Mace's class is planning a field trip, and  $\frac{3}{5}$  of her students want to go to Chicago. Of those who want to go to Chicago,  $\frac{2}{3}$  say they want to go to Navy Pier. What fraction of the class wants to go to Navy Pier?



7. Min Ji uses balsa wood to build airplane models. After completing a model, she has a strip of balsa wood measuring  $\frac{7}{8}$  yard left over. Shawn wants to buy half of the strip from Min Ji. How long is the strip of wood Shawn wants to buy?
8. Aran has a fruit roll-up for a snack. He gives half of it to Jon. Jon then gives Kiona  $\frac{1}{3}$  of his part. How much of the fruit roll-up does each person get?
9. In Vashon's class, three fourths of the students are girls. Four fifths of the girls in Vashon's class have brown hair.
- What fraction represents the girls in Vashon's class with brown hair?
  - How many students do you think are in Vashon's class?
10. Find each product.
- $\frac{1}{3}$  of  $\frac{2}{3}$
  - $\frac{5}{6}$  of 3
  - $\frac{2}{3}$  of  $\frac{5}{6}$
  - $\frac{2}{5}$  of  $\frac{5}{8}$
11. Estimate each product. Explain.
- $\frac{2}{3} \times 4$
  - $2 \times \frac{2}{3}$
  - $2\frac{1}{2} \times \frac{2}{3}$

- 12.** Esteban is making turtle brownies. The recipe calls for  $\frac{3}{4}$  bag of caramel squares. The bag has 24 caramel squares in it.
- How many caramel squares should Esteban use to make one batch of turtle brownies?
  - Esteban decides to make two batches of turtle brownies. Write a number sentence to show how many bags of caramel squares he will use.
- 13.** Isabel is adding a sun porch onto her house. She measures and finds that covering the entire floor requires 12 rows with  $11\frac{1}{3}$  tiles in each row. Write a number sentence to show how many tiles Isabel will use to cover the floor.
- 14.** Judi is making a frame for her little sister's drawing. The wood strip for the frame is 1 inch wide. She allows two extra inches of wood for each corner. If the square is  $11\frac{3}{8}$  inches on a side, how much wood should Judi buy?



- 15.** Find each product. Look for patterns to help you.
- $\frac{1}{3} \times 18$
  - $\frac{2}{3} \times 18$
  - $\frac{5}{3} \times 18$
  - $1\frac{2}{3} \times 18$
- 16.** Write a number sentence for each situation. (Assume that the fractions are all less than 1.)
- a fraction and a whole number with a whole number product
  - a fraction and a whole number with a product less than 1
  - a fraction and a whole number with a product greater than 1
  - a fraction and a whole number with a product between  $\frac{1}{2}$  and 1

- 17.** Bonnie and Steve are making snack bags for their daughter's field hockey team. They put  $\frac{3}{4}$  cup of pretzels,  $\frac{2}{3}$  cup of popcorn,  $\frac{1}{3}$  cup of peanuts, and  $\frac{1}{4}$  cup of chocolate chips in each bag.
- If they want to make 12 bags, how much of each ingredient do they need?
  - Bonnie decides that she would like to make snack bags for her card club. There are 15 people in the card club. How much of each ingredient will she need?
- 18. a.** When Sierra gets home from school,  $\frac{3}{4}$  of a sandwich is left in the refrigerator. She cuts the part remaining into three equal parts and eats two of them. What fraction of the whole sandwich did she eat?
- b.** Write a number sentence to show your computation.



- 19.** Mr. Jablonski's class is making fudge for a bake sale. He has a recipe that makes  $\frac{3}{4}$  pound of fudge. There are 21 students in the class and each one makes one batch of fudge for the bake sale. How many pounds of fudge do the students make?
- 20.** Carolyn is making cookies. The recipe calls for  $1\frac{3}{4}$  cups of brown sugar. If she makes  $2\frac{1}{2}$  batches of cookies, how much brown sugar will she need?

**For Exercises 21–29, use your algorithm for multiplying fractions to determine each product.**

**21.**  $\frac{5}{12} \times 1\frac{1}{3}$

**22.**  $\frac{2}{7} \times \frac{7}{8}$

**23.**  $3\frac{2}{9} \times \frac{7}{3}$

**24.**  $2\frac{2}{5} \times 1\frac{1}{15}$

**25.**  $10\frac{3}{4} \times 2\frac{2}{3}$

**26.**  $1\frac{1}{8} \times \frac{4}{7}$

**27.**  $\frac{11}{6} \times \frac{9}{10}$

**28.**  $\frac{9}{4} \times 1\frac{1}{6}$

**29.**  $\frac{5}{2} \times \frac{8}{11}$

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**30. Multiple Choice** Choose the number that, when multiplied by  $\frac{4}{7}$ , will be greater than  $\frac{4}{7}$ .

- A.  $\frac{1}{7}$       B.  $\frac{7}{7}$       C.  $\frac{17}{7}$       D.  $\frac{4}{7}$

**31. Multiple Choice** Choose the number that, when multiplied by  $\frac{4}{7}$ , will be less than  $\frac{4}{7}$ .

- F.  $\frac{1}{7}$       G.  $\frac{7}{7}$       H.  $\frac{17}{7}$       J.  $\frac{8}{7}$

**32. Multiple Choice** Choose the number that, when multiplied by  $\frac{4}{7}$ , will be exactly  $\frac{4}{7}$ .

- A.  $\frac{1}{7}$       B.  $\frac{7}{7}$       C.  $\frac{17}{7}$       D.  $\frac{4}{7}$

**33. a.** How many minutes are in 1 hour?

**b.** How many minutes are in  $\frac{1}{2}$  hour?

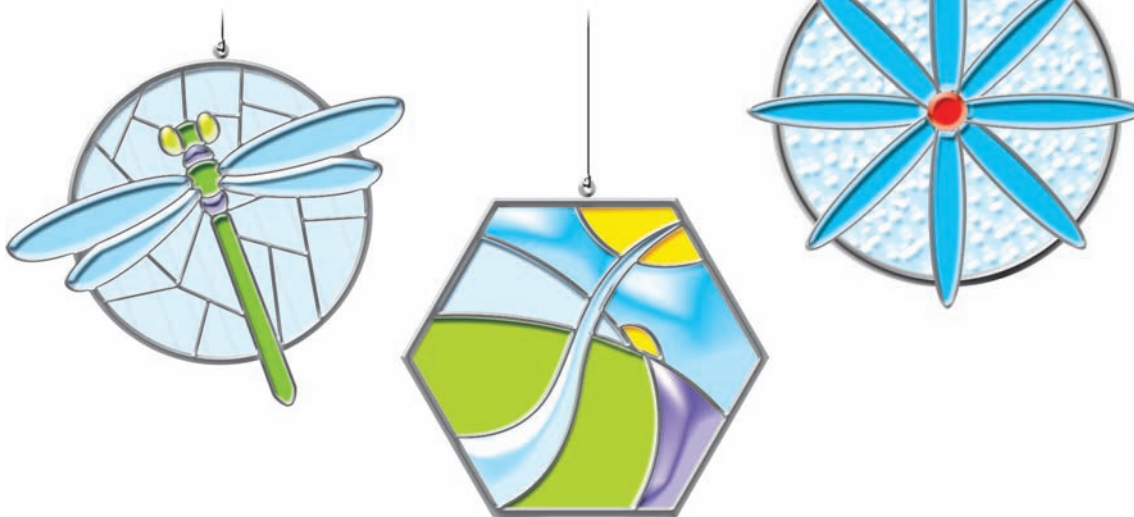
**c.** How many minutes are in 0.5 hour?

**d.** How many minutes are in 0.1 hour?

**e.** How many minutes are in 1.25 hours?




**f.** How many hours are in 186 minutes? Express this as a mixed number and as a decimal.

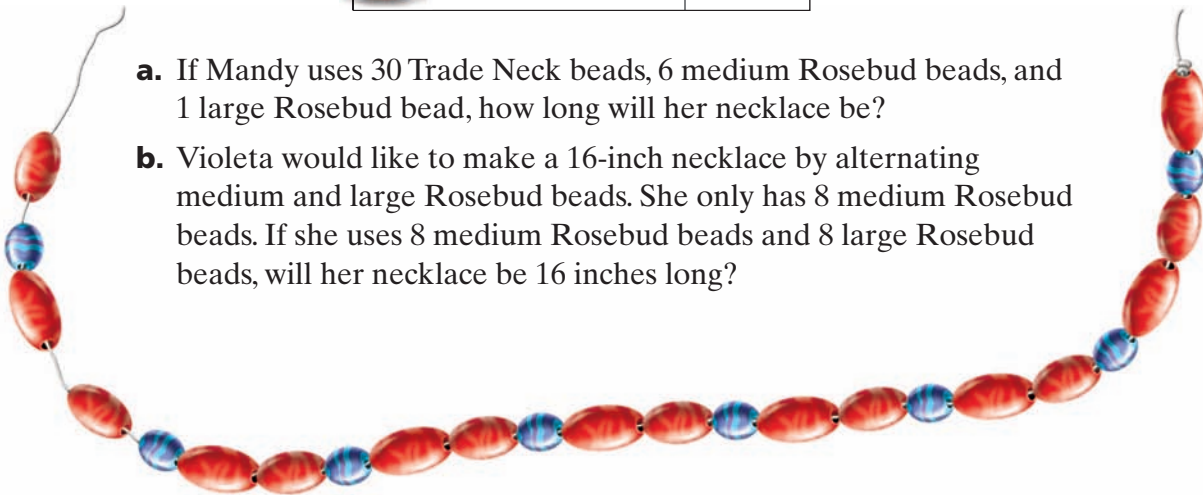
**34.** A magazine advertises stained glass sun catchers. The ad says that the actual sun catcher is  $1\frac{3}{4}$  times the size shown in the picture. Mrs. Inman wants to know how tall the actual sun catcher is. She gets a ruler and measures the sun catcher in the picture. If the sun catcher in the picture is  $1\frac{3}{8}$  inches high, how tall is the actual sun catcher?



35. Violeta and Mandy are making beaded necklaces. They have several beads in various colors and widths. As they design patterns to use, they want to figure out how long the final necklace will be. Violeta and Mandy have the following bead widths to work with.

Widths of Beads

	Bead	Width
	Trade Neck	$\frac{1}{4}$ inch
	Medium Rosebud	$\frac{3}{8}$ inch
	Large Rosebud	$\frac{7}{16}$ inch



- a. If Mandy uses 30 Trade Neck beads, 6 medium Rosebud beads, and 1 large Rosebud bead, how long will her necklace be?
- b. Violeta would like to make a 16-inch necklace by alternating medium and large Rosebud beads. She only has 8 medium Rosebud beads. If she uses 8 medium Rosebud beads and 8 large Rosebud beads, will her necklace be 16 inches long?

## Connections

36. Here is a multiplication-division fact family:

$$4 \times 5 = 20 \quad 5 \times 4 = 20 \quad 20 \div 4 = 5 \quad 20 \div 5 = 4$$

For each number sentence, write a multiplication-division fact family.

- a.  $3 \times 6 = 18$       b.  $16 \times 3 = 48$       c.  $1\frac{1}{2} \times 7 = 10\frac{1}{2}$   
 d.  $15 \div 3 = 5$       e.  $100 \div 20 = 5$       f.  $15 \div 1\frac{1}{2} = 10$

37. Roshaun and Lea go to an amusement park. Lea spends  $\frac{1}{2}$  of her money, and Roshaun spends  $\frac{1}{4}$  of his money. Is it possible for Roshaun to have spent more money than Lea? Explain your reasoning.
38. Bianca and Yoko work together to mow the lawn. Suppose Yoko mows  $\frac{5}{12}$  of the lawn and Bianca mows  $\frac{2}{5}$  of the lawn. How much lawn still needs to be mowed?

39. Joe and Ashanti need  $2\frac{2}{5}$  bushels of apples to make applesauce.

Suppose Joe picks  $1\frac{5}{6}$  bushels of apples. How many more bushels need to be picked?

For Exercises 40–45, calculate each sum or difference.

40.  $2\frac{2}{3} + 3\frac{5}{6}$

41.  $2\frac{8}{10} + 2\frac{4}{5} + 1\frac{1}{2}$

42.  $4\frac{3}{10} + 2\frac{2}{6}$

43.  $5\frac{5}{8} - 2\frac{2}{3}$

44.  $6\frac{7}{10} - 3\frac{4}{5}$

45.  $8 - 3\frac{14}{15}$

46. Three students multiply  $6 \times \frac{1}{5}$ . Their answers are  $\frac{6}{5}$ , 1.2, and  $1\frac{1}{5}$ . Match each answer to the strategy described below that is most likely to produce it. Explain.

a. Fala draws six shapes, each representing  $\frac{1}{5}$ , and fits them together.



b. Bri writes  $\frac{6}{1} \times \frac{1}{5}$ .

c. Hiroshi writes  $6 \times 0.2$ .

47. **Multiple Choice** Linda is making bows to put on wreaths. Each bow uses  $2\frac{1}{3}$  yards of ribbon. A spool of ribbon contains 15 yards of ribbon. Choose the number of whole bows she can make from one spool.

F. 6

G. 7

H. 12

J. 35

## Extensions

48. Find each product.

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

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

49. **Multiple Choice** Choose the best answer for the number of square tiles needed to make a rectangle that is  $4\frac{1}{3}$  tiles long by  $\frac{1}{2}$  tile wide.

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

B.  $2\frac{1}{6}$

C. 2

D.  $2\frac{1}{4}$