

Applying Fractions

Indiana Academic Standards

7.1.7 Solve problems that involve multiplication and division with integers, fractions, decimals and combinations of the four operations.

Key Vocabulary

compatible numbers (p. 232)

like fractions (p. 236)

reciprocal (p. 258)

unlike fractions (p. 237)



Real-World Link

Baking The measurements found on measuring cups and spoons are written as fractions. You will use fractions to find how much of each ingredient is needed when you make part of a whole recipe.

FOLDABLES[®] Study Organizer

Applying Fractions Make this Foldable to help you organize your notes.

Begin with a plain sheet of 11" by 17" paper, four index cards, and glue.

- 1** **Fold** the paper in half widthwise.



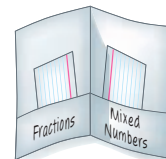
- 2** **Open** and fold along the length about $2\frac{1}{2}$ " from the bottom.



- 3** **Glue** the edge on each side to form two pockets.



- 4** **Label** the pockets *Fractions* and *Mixed Numbers*, respectively. Place two index cards in each pocket.



GET READY for Chapter 5

Diagnose Readiness You have two options for checking Prerequisite Skills.

Option 2

IN Math Online

Take the Online Readiness Quiz at glencoe.com.

Option 1

Take the Quick Quiz below. Refer to the Quick Review for help.

QUICK Quiz

Find the LCD of each pair of fractions. (Lesson 4-8)

- $\frac{5}{7}, \frac{3}{5}$
- $\frac{1}{2}, \frac{4}{9}$
- $\frac{8}{15}, \frac{1}{6}$
- $\frac{3}{4}, \frac{7}{10}$

Multiply or divide. (Prior Grade)

- 1.8×12
- $99 \div 12$
- $83 \div 100$
- 4.6×0.3

9. **MEASUREMENT** How many 1.6-meter sections of rope can be cut from a length of rope 6.4 meters? (Prior Grade)

10. **COINS** Manuel owes each of 8 friends \$0.35. How much does he owe in all? (Prior Grade)

Complete to show equivalent mixed numbers. (Prior Grade)

- $3\frac{1}{5} = 2\frac{\square}{5}$
- $9\frac{2}{3} = \square\frac{5}{3}$
- $6\frac{1}{4} = 5\frac{\square}{4}$
- $8\frac{6}{7} = 7\frac{\square}{7}$

15. **RECIPES** A recipe calls for $4\frac{2}{3}$ cups of flour. This is equivalent to 3 cups of flour plus an additional how many cups of flour? (Prior Grade)

QUICK Review

Example 1

Find the LCD of $\frac{5}{6}$ and $\frac{3}{10}$.

The LCD is the LCM of the denominators, 6 and 10, or 30.

Example 2

Find $7.8 \div 0.25$.

$$\begin{array}{r} 31.2 \\ 0.25 \overline{)7.800} \\ \underline{-75} \\ 30 \\ \underline{-25} \\ 50 \\ \underline{-50} \\ 0 \end{array}$$

Move the decimal point 2 places to the right and divide as with whole numbers.

Example 3

Complete $4\frac{2}{9} = \square\frac{11}{9}$ to show equivalent mixed numbers.

$$\begin{aligned} 4\frac{2}{9} &= 3 + 1\frac{2}{9} \\ &= 3 + \frac{9}{9} + \frac{2}{9} \\ &= 3 + \frac{11}{9} \\ &= 3\frac{11}{9} \end{aligned}$$

MAIN IDEA

Estimate sums, differences, products, and quotients of fractions and mixed numbers.

IN Academic Standards

7.1.7 Solve problems that involve multiplication and division with integers, fractions, decimals and combinations of the four operations. Also addresses P.6.1, P.6.3.

New Vocabulary

compatible numbers

IN Math Online

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

▶ GET READY for the Lesson

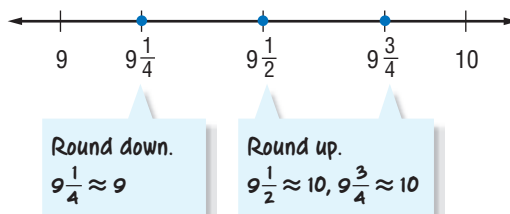
MAMMALS The table below lists the average length for a few mammals.

1. Graph $9\frac{1}{4}$ on a number line. To the nearest whole number, how long is an American Bison?
2. Graph $3\frac{3}{4}$ on a number line. To the nearest whole number, how long is a dingo?
3. About how much longer is the American bison than a dingo?

Mammal	Length (ft)
Brown Bear	$6\frac{1}{2}$
American Bison	$9\frac{1}{4}$
Opossum	$2\frac{1}{2}$
Dingo	$3\frac{3}{4}$



To estimate the sum, difference, product, or quotient of mixed numbers, round the mixed numbers to the nearest whole number.

**EXAMPLES****Estimate with Mixed Numbers**

1 Estimate $3\frac{2}{3} + 5\frac{1}{6}$.
 $3\frac{2}{3} + \frac{31}{6} \approx 4 + 5$ or 9
 The sum is *about* 9.

2 Estimate $6\frac{2}{5} \times 1\frac{7}{8}$.
 $6\frac{2}{5} \times 1\frac{7}{8} \approx 6 \times 2$ or 12
 The product is *about* 12.

✓ CHECK Your Progress

Estimate.

a. $2\frac{1}{5} + 3\frac{1}{2}$

b. $4\frac{3}{8} \times 5\frac{1}{4}$

c. $8\frac{7}{9} \div 2\frac{3}{4}$



To estimate the sum, difference, product, or quotient of fractions, round each fraction to 0, $\frac{1}{2}$, or 1, whichever is closest. Number lines and fraction models, like the ones shown below, can help you decide how to round.

Fractions Close to 0	Fractions Close to $\frac{1}{2}$	Fractions Close to 1
The numerator is much smaller than the denominator.	The numerator is about half of the denominator.	The numerator is almost as large as the denominator.

EXAMPLES Estimate with Fractions

3 Estimate $\frac{1}{8} + \frac{2}{3}$.



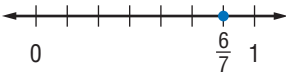
1 is much smaller than 8, so $\frac{1}{8} \approx 0$.



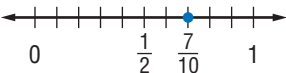
2 is close to half of 3, so $\frac{2}{3} \approx \frac{1}{2}$.

$$\frac{1}{8} + \frac{2}{3} \approx 0 + \frac{1}{2} = \frac{1}{2} \quad \text{The sum is about } \frac{1}{2}.$$

4 Estimate $\frac{6}{7} - \frac{7}{10}$.



6 is almost as large as 7, so $\frac{6}{7} \approx 1$.



7 is about half of 10, so $\frac{7}{10} \approx \frac{1}{2}$.

$$\frac{6}{7} - \frac{7}{10} \approx 1 - \frac{1}{2} = \frac{1}{2} \quad \text{The difference is about } \frac{1}{2}.$$

5 Estimate $\frac{8}{9} \div \frac{5}{6}$.

$$\frac{8}{9} \div \frac{5}{6} \approx 1 \div 1 = 1 \quad \frac{8}{9} \approx 1 \text{ and } \frac{5}{6} \approx 1.$$

The quotient is about 1.

Study Tip

Estimating with Fractions
If one of the fractions is a mixed number, such as $3\frac{5}{8} + \frac{2}{3}$, round the mixed number to the nearest whole number and the fraction to the nearest half. $3\frac{5}{8} + \frac{2}{3} \approx 4 + \frac{1}{2}$ or about $4\frac{1}{2}$.

CHECK Your Progress

Estimate.

d. $\frac{1}{7} + \frac{3}{5}$

e. $\frac{7}{8} - \frac{5}{9}$

f. $\frac{3}{5} \times \frac{11}{12}$

g. $\frac{7}{8} \div \frac{2}{5}$



Compatible numbers, or numbers that are easy to compute mentally, can also be used to estimate.

EXAMPLES Use Compatible Numbers

Estimate using compatible numbers.

6 $\frac{1}{3} \cdot 14$

THINK What is $\frac{1}{3}$ of 14?

$$\frac{1}{3} \cdot 14 \approx \frac{1}{3} \cdot 15 \text{ or } 5$$

Round 14 to 15, since 15 is divisible by 3.

$\frac{1}{3}$ of 15 is $15 \div 3$ or 5.

7 $9\frac{7}{8} \div 4\frac{1}{5}$

$$9\frac{7}{8} \div 4\frac{1}{5} \approx 10 \div 4\frac{1}{5}$$

Round $9\frac{7}{8}$ to 10.

$$\approx 10 \div 5 \text{ or } 2$$

Round $4\frac{1}{5}$ to 5, since 10 is divisible by 5.

✓ CHECK Your Progress

Estimate using compatible numbers.

h. $\frac{1}{4} \cdot 21$

i. $\frac{1}{3} \cdot 17$

j. $12 \div 6\frac{2}{3}$

Study Tip

Compatible Numbers
When dividing mixed numbers, round so that the dividend is a multiple of the divisor.

Real-World EXAMPLE

- 8 **MONSTER TRUCKS** The height of the wheels on the monster truck at the left is about $\frac{2}{3}$ of the total height of the truck. Estimate the height of the wheels.

Words

Wheel height is $\frac{2}{3}$ of the truck height.

Variable

Let x represent the wheel height.

Equation

$$x = \frac{2}{3} \cdot 15\frac{1}{2}$$

$$x \approx \frac{2}{3} \cdot 15 \quad \text{Round } 15\frac{1}{2} \text{ to } 15, \text{ since } 15 \text{ is divisible by } 3.$$

$$x \approx 10 \quad \frac{1}{3} \text{ of } 15 \text{ is } 5, \text{ so } \frac{2}{3} \text{ of } 15 \text{ is } 2 \cdot 5 \text{ or } 10.$$

The wheels are about 10 feet high.

✓ CHECK Your Progress

- k. **MEASUREMENT** The area of a rectangle is $19\frac{3}{4}$ square feet. The width of the rectangle is $5\frac{1}{4}$ feet. What is the approximate length of the rectangle?



Real-World Link

The monster truck shown is $15\frac{1}{2}$ feet tall and weighs 28,000 pounds.

Source: Monster Trucks UK

✓ CHECK Your Understanding

Examples 1–5
(p. 230–231)

Estimate.

1. $8\frac{3}{8} + 1\frac{4}{5}$

2. $2\frac{5}{6} - 1\frac{1}{8}$

3. $5\frac{5}{7} \cdot 2\frac{7}{8}$

4. $9\frac{2}{7} \div 2\frac{2}{3}$

5. $\frac{1}{6} + \frac{2}{5}$

6. $\frac{6}{7} - \frac{1}{5}$

7. $\frac{5}{8} \cdot \frac{8}{9}$

8. $\frac{4}{5} \div \frac{6}{7}$

Examples 6, 7
(p. 232)

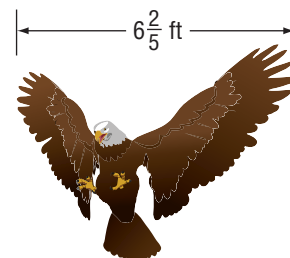
Estimate using compatible numbers.

9. $\frac{1}{4} \cdot 15$

10. $21\frac{5}{6} \div 9\frac{3}{4}$

Example 8
(p. 232)

11. **BIRDS** A seagull's wingspan is about $\frac{2}{3}$ of a bald eagle's wingspan. The eagle's wingspan is shown at the right. Estimate the wingspan of a seagull.



▶ Practice and Problem Solving

HOMEWORK HELP	
For Exercises	See Examples
12–19	1, 2
20–29	3–5
30–35	6–8

Estimate.

12. $3\frac{3}{4} + 4\frac{5}{6}$

13. $1\frac{1}{8} + 5\frac{11}{12}$

14. $5\frac{1}{3} - 3\frac{1}{6}$

15. $4\frac{2}{5} - 1\frac{1}{2}$

16. $2\frac{2}{3} \cdot 6\frac{1}{3}$

17. $1\frac{4}{5} \cdot 3\frac{1}{4}$

18. $6\frac{1}{8} \div 1\frac{2}{3}$

19. $8\frac{1}{2} \div 2\frac{5}{8}$

20. $\frac{3}{4} + \frac{3}{8}$

21. $\frac{5}{8} + \frac{3}{7}$

22. $\frac{5}{9} - \frac{1}{6}$

23. $\frac{3}{4} - \frac{3}{5}$

24. $\frac{1}{8} \cdot \frac{3}{4}$

25. $\frac{4}{9} \cdot \frac{11}{12}$

26. $\frac{4}{5} \div \frac{7}{8}$

27. $\frac{1}{10} \div \frac{5}{6}$

28. **COOKING** Joaquim wants to make the macaroni and cheese shown at the right, but he has only about $1\frac{3}{4}$ cups of macaroni. About how much more macaroni does he need?

Macaroni & Cheese
3 tbsp butter
$2\frac{1}{2}$ c uncooked macaroni
1 tbsp salt
$\frac{1}{4}$ tbsp pepper
1 qt milk
$\frac{1}{2}$ lb cheese

29. **MEASUREMENT** Isabella is sewing a trim that is $1\frac{1}{8}$ inches wide on the bottom of a skirt that is $15\frac{7}{8}$ inches long. Approximately how long will the skirt be?

Estimate using compatible numbers.

30. $\frac{1}{4} \cdot 39$

31. $\frac{1}{6} \cdot 37$

32. $23\frac{2}{9} \div 3$

33. $25\frac{3}{10} \div 5\frac{2}{3}$

34. **MONEY** Arleta has \$22. She uses $\frac{1}{3}$ of her money to buy a pair of earrings. About how much money did she spend on the earrings?

35. **SNACKS** A cereal company has 24 pounds of granola to package in bags that contain $1\frac{3}{4}$ pounds of granola. About how many bags will they have?



36. **FIND THE DATA** Refer to the Data File on pages 16–19. Choose some data and write a real-world problem in which you would estimate with fractions.

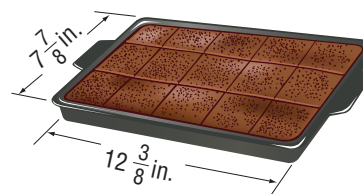
37. **SPORTS** Paquito and Jeff are on a basketball team. The table shows the approximate fraction of the team’s points that each of them scored in a game. If the team scored a total of 72 points, about how many did Paquito and Jeff score together?

Player's Names	Fraction of Total Points Scored
Paquito	$\frac{3}{8}$
Jeff	$\frac{1}{6}$



38. **RESEARCH** Research the statistics of any basketball team. How can you use fractions to analyze the statistics?

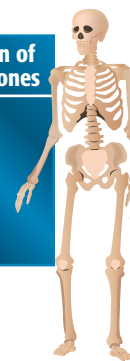
39. **COOKING** Kathryn baked the sheet of brownies shown. She wants to cut it into brownies that are about 2 inches square. How many brownies will there be?



40. **ANALYZE TABLES** For Exercises 40–43, use the following information and the table shown.

The adult human skeleton is made up of 206 bones. The table shows the approximate fraction of the bones that each body part(s) makes up.

Body Part(s)	Fraction of Total Bones
Feet	$\frac{1}{4}$
Hands & Feet	$\frac{1}{2}$



40. About how many bones are in the feet?
41. About how many bones are in both hands and feet?
42. About how many bones are in one hand?
43. The length of your thighbone is equal to $\frac{1}{4}$ of your height. About how many inches long is your thighbone?



Real-World Link

The femur or thigh bone is the longest in length, largest in volume, and strongest bone of the human body.

Academic Standards • ISTEP+

Extra Practice, pp. 679, 708



H.O.T. Problems

44. **CHALLENGE** In a division expression, the divisor is rounded up and the dividend is rounded down. How does the new quotient compare to the original quotient? Explain.
45. **OPEN ENDED** Select two fractions whose estimated difference and product is $\frac{1}{2}$. Justify your selection.
46. **NUMBER SENSE** Decide which of the following have sums that are less than 1. Explain.
- a. $\frac{1}{3} + \frac{2}{5}$
- b. $\frac{7}{8} + \frac{1}{2}$
- c. $\frac{5}{6} + \frac{2}{3}$
- d. $\frac{1}{7} + \frac{3}{9}$



47. **SELECT A TECHNIQUE** To make the crust for a peach cobbler, Dion needs $3\frac{1}{4}$ cups of flour, $1\frac{2}{3}$ cups of sugar, and $1\frac{2}{3}$ cups of hot water. He needs to mix all of these in a large bowl. The largest bowl he can find holds 6 cups. Which of the following techniques might Dion use to determine whether he can use this bowl to mix the ingredients? Justify your selection(s). Then use the technique(s) to solve the problem.

mental math

number sense

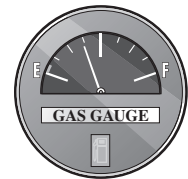
estimation

48. **WRITING IN MATH** Explain when estimation would *not* be the best method for solving a problem. Then give an example.

ISTEP+ PRACTICE

7.1.7

49. **SHORT RESPONSE** A chef has $15\frac{2}{3}$ cups of penne pasta and $22\frac{1}{4}$ cups of rigatoni pasta. About how much pasta is there altogether?
50. On a full tank of gasoline, a certain car can travel 360 miles. The needle on its gasoline gauge is shown. Without refueling, which is the best estimate of how far the car can travel?
- A 150 miles
B 180 miles
C 240 miles
D 329 miles



Spiral Review

Replace each \bullet with $<$, $>$, or $=$ to make a true sentence. (Lesson 4-9)

51. $2\frac{7}{8} \bullet 2.75$

52. $\frac{-1}{3} \bullet \frac{-7}{3}$

53. $\frac{5}{7} \bullet \frac{4}{5}$

54. $3\frac{6}{11} \bullet 3\frac{9}{14}$

55. **SHOPPING** A store sells a 3-pack of beaded necklaces and a 5-pack of beaded bracelets. How many packages of each must you buy so that you have the same number of necklaces and bracelets? (Lesson 4-8)



Write each decimal as a percent. (Lesson 4-7)

56. 0.56

57. 0.375

58. 0.07

59. 0.019

GET READY for the Next Lesson

PREREQUISITE SKILL Find the LCD of each pair of fractions. (Lesson 4-9)

60. $\frac{3}{4}, \frac{5}{12}$

61. $\frac{1}{2}, \frac{7}{10}$

62. $\frac{1}{6}, \frac{1}{8}$

63. $\frac{4}{5}, \frac{2}{3}$

5-2

Adding and Subtracting Fractions

MAIN IDEA

Add and subtract fractions.

IN Academic Standards

Reinforcement of 6.1.6 Solve problems involving addition, subtraction, multiplication and division of positive fractions and decimals and explain why a particular operation was used for a given situation.

New Vocabulary

like fractions
unlike fractions

IN Math Online

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz
- Reading in the Content Area

▶ GET READY for the Lesson

INSTANT MESSENGER Sean surveyed ten classmates to find which abbreviation they use most when they instant message.

Abbreviation	Number
L8R	5
LOL	3
BRB	2

1. What fraction uses L8R? BRB?
2. What fraction uses either L8R or BRB?

Fractions that have the same denominators are called **like fractions**.

Add and Subtract Like Fractions

Key Concept

Words To add or subtract like fractions, add or subtract the numerators and write the result over the denominator.

Examples

Numbers

$$\frac{5}{10} + \frac{2}{10} = \frac{5+2}{10} \text{ or } \frac{7}{10}$$

$$\frac{11}{12} - \frac{4}{12} = \frac{11-4}{12} \text{ or } \frac{7}{12}$$

Algebra

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}, \text{ where } c \neq 0$$

$$\frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}, \text{ where } c \neq 0$$

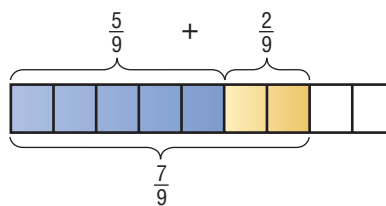
EXAMPLES Add and Subtract Like Fractions

- 1 Add $\frac{5}{9} + \frac{2}{9}$. Write in simplest form.

$$\begin{aligned} \frac{5}{9} + \frac{2}{9} &= \frac{5+2}{9} \\ &= \frac{7}{9} \end{aligned}$$

Add the numerators.

Write the sum over the denominator.



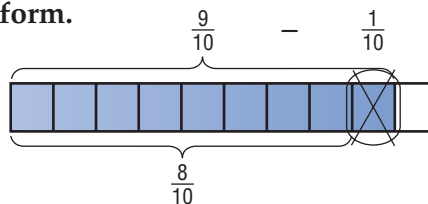
- 2 Subtract $\frac{9}{10} - \frac{1}{10}$. Write in simplest form.

$$\begin{aligned} \frac{9}{10} - \frac{1}{10} &= \frac{9-1}{10} \\ &= \frac{8}{10} \\ &= \frac{4}{5} \end{aligned}$$

Subtract the numerators.

Write the difference over the denominator.

Simplify.



✓ CHECK Your Progress

a. $\frac{1}{6} + \frac{3}{6}$

b. $\frac{3}{7} - \frac{1}{7}$

Review Vocabulary

LCD the least common multiple of the denominators of two or more fractions;

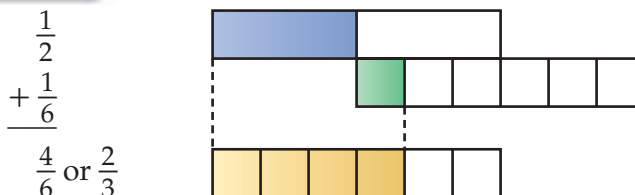
Example: the LCD of $\frac{1}{4}$ and $\frac{2}{3}$ is 12. (Lesson 4-9)

To add or subtract **unlike fractions**, or fractions with different denominators, rename the fractions using the LCD. Then add or subtract as with like fractions.

EXAMPLES Add and Subtract Unlike Fractions

3 Add $\frac{1}{2} + \frac{1}{6}$. Write in simplest form. **Estimate** $\frac{1}{2} + 0 = \frac{1}{2}$

METHOD 1 Use a model.



METHOD 2 Use the LCD.

The least common denominator (LCD) of $\frac{1}{2}$ and $\frac{1}{6}$ is 6.

	Rename using the LCD, 6.		Add.
$\frac{1}{2}$	$\rightarrow \frac{1 \times 3}{2 \times 3} = \frac{3}{6}$	\rightarrow	$\frac{3}{6}$
$+ \frac{1}{6}$	$\rightarrow \frac{1 \times 1}{6 \times 1} = +\frac{1}{6}$	\rightarrow	$+\frac{1}{6}$
<hr style="width: 50%; margin: 0 auto;"/>			<hr style="width: 50%; margin: 0 auto;"/>
			$\frac{4}{6} \text{ or } \frac{2}{3}$

So, $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$. **Check for Reasonableness** $\frac{2}{3} \approx \frac{1}{2}$ ✓

Study Tip

Renaming Fractions
To rename a fraction, multiply both the numerator and the denominator of the original fraction by the same number. By doing so, the renamed fraction has the same value as the original fraction.

4 Subtract $\frac{11}{12} - \frac{3}{8}$. Write in simplest form. **Estimate** $1 - \frac{1}{2} = \frac{1}{2}$

Since $12 = 2^2 \cdot 3$ and $8 = 2^3$, the LCM of 12 and 8 is $2^3 \cdot 3$ or 24. Rename each fraction using a denominator of 24. Then subtract.

Think: $12 \times 2 = 24$, so $\frac{11 \times 2}{12 \times 2}$ or $\frac{22}{24}$.

Think: $8 \times 3 = 24$, so $\frac{3}{8} = \frac{3 \times 3}{8 \times 3}$ or $\frac{9}{24}$.

$$\frac{11}{12} - \frac{3}{8} = \frac{11 \times 2}{12 \times 2} - \frac{3 \times 3}{8 \times 3}$$

The LCD of $\frac{11}{12}$ and $\frac{3}{8}$ is 24.

$$= \frac{22}{24} - \frac{9}{24}$$

Rename the fractions using LCD, 24.

$$= \frac{13}{24}$$

Subtract the fractions.

Check for Reasonableness $\frac{13}{24} \approx \frac{1}{2}$ ✓

CHOOSE Your Method

c. $\frac{8}{9} - \frac{2}{3}$

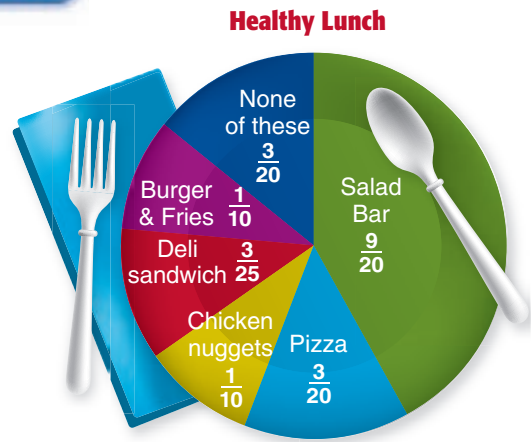
d. $\frac{5}{6} - \frac{3}{8}$

e. $\frac{7}{8} + \frac{3}{4}$



Real-World EXAMPLES

SURVEYS In a recent survey, students were asked what they would choose for a healthy lunch. The results are shown in the graph.



Study Tip

Key Words The phrase *what fraction more* suggests subtraction.

- 5** What fraction more of the students chose salad bar rather than a deli sandwich?

$$\begin{aligned} \frac{9}{20} - \frac{3}{25} &= \frac{9 \times 5}{20 \times 5} - \frac{3 \times 4}{25 \times 4} && \text{The LCD of } \frac{9}{20} \text{ and } \frac{3}{25} \text{ is } 100. \\ &= \frac{45}{100} - \frac{12}{100} && \text{Rename the fractions using the LCD.} \\ &= \frac{33}{100} && \text{Subtract the numerators.} \end{aligned}$$

So, $\frac{33}{100}$ more students chose salad bar rather than a deli sandwich.

- 6** What fraction of students chose pizza or chicken nuggets?

$$\begin{aligned} \frac{3}{20} + \frac{1}{10} &= \frac{3}{20} + \frac{2}{20} && \text{Rename.} \\ &= \frac{5}{20} && \text{Add.} \\ &= \frac{1}{4} && \text{Simplify.} \end{aligned}$$

So, $\frac{1}{4}$ of the students chose pizza or chicken nuggets combined.

CHECK Your Progress

- f. **SURVEYS** What fraction more of the students chose a deli sandwich rather than a burger and fries?



CHECK Your Understanding

Examples 1–4
(pp. 236–237)

Add or subtract. Write in simplest form.

1. $\frac{4}{9} + \frac{2}{9}$

2. $\frac{5}{6} + \frac{4}{9}$

3. $\frac{3}{8} - \frac{1}{8}$

4. $\frac{4}{5} - \frac{2}{5}$

5. $\frac{1}{6} + \frac{3}{8}$

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

7. $\frac{5}{6} - \frac{7}{12}$

8. $\frac{3}{4} - \frac{1}{3}$

Examples 5, 6
(p. 238)

For Exercises 9 and 10, choose an operation to solve each problem. Explain your reasoning. Then solve the problem.

9. **MEASUREMENT** Cassandra cuts $\frac{5}{16}$ inch off the top of a photo and $\frac{3}{8}$ inch off the bottom. How much smaller is the total height of the photo now?

10. **CHORES** A bucket was $\frac{7}{8}$ full with soapy water. After washing the car, the bucket was only $\frac{1}{4}$ full. What part of the water was used?



Practice and Problem Solving

HOMEWORK HELP

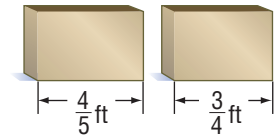
For Exercises	See Examples
11–14	1, 2
15–22	3, 4
23–26	5, 6

Add or subtract. Write in simplest form.

11. $\frac{3}{7} + \frac{1}{7}$ 12. $\frac{5}{8} + \frac{7}{8}$ 13. $\frac{5}{6} - \frac{1}{6}$ 14. $\frac{7}{10} - \frac{3}{10}$
 15. $\frac{1}{15} + \frac{3}{5}$ 16. $\frac{7}{12} + \frac{7}{10}$ 17. $\frac{5}{8} + \frac{11}{12}$ 18. $\frac{7}{9} + \frac{5}{6}$
 19. $\frac{7}{9} - \frac{1}{3}$ 20. $\frac{4}{5} - \frac{1}{6}$ 21. $\frac{4}{9} - \frac{2}{15}$ 22. $\frac{3}{10} - \frac{1}{4}$

For Exercises 23–26, choose an operation to solve each problem. Explain your reasoning. Then solve the problem.

23. **MEASUREMENT** Ebony is building a shelf to hold the two boxes shown. What is the smallest width she should make the shelf?



24. **WEATHER** Using the information under the photo, find the difference of the average precipitation for Boise in February and November.



25. **MEASUREMENT** Makayla bought $\frac{1}{4}$ pound of ham and $\frac{5}{8}$ pound of turkey. How much more turkey did she buy?

26. **ANIMALS** The three-toed sloth can travel $\frac{3}{20}$ miles per hour while a giant tortoise can travel $\frac{17}{100}$ miles per hour. How much faster, in miles per hour, is the giant tortoise?

Simplify.

27. $\frac{1}{7} + \frac{1}{2} + \frac{5}{28}$ 28. $\frac{1}{4} + \frac{5}{6} + \frac{7}{12}$ 29. $\frac{1}{6} + \left(\frac{2}{3} - \frac{1}{4}\right)$ 30. $\frac{5}{6} - \left(\frac{1}{2} + \frac{1}{3}\right)$
 31. $1 + \frac{1}{4}$ 32. $1 - \frac{5}{8}$ 33. $2 + \frac{2}{3}$ 34. $3 - \frac{1}{6}$

35. **MONEY** Chellise saves $\frac{1}{5}$ of her allowance and spends $\frac{2}{3}$ of her allowance at the mall. What fraction of her allowance remains?

36. **ANALYZE TABLES** Pepita and Francisco each spend an equal amount of time on homework. The table shows the fraction of their time they spend on each subject. Determine the missing fraction for each student.

Homework	Fraction of Time	
	Pepita	Francisco
Math	■	$\frac{1}{2}$
English	$\frac{2}{3}$	■
Science	$\frac{1}{6}$	$\frac{3}{8}$

ALGEBRA Evaluate each expression if $a = \frac{3}{4}$ and $b = \frac{5}{6}$.

37. $\frac{1}{2} + a$ 38. $b - \frac{7}{10}$ 39. $b - a$ 40. $a + b$



Real-World Link . . .

The average precipitation for February and November for Boise, Idaho, is $\frac{4}{10}$ and $\frac{7}{10}$ inches, respectively.

Source: The Weather Channel



41. **BOOK REPORTS** Four students were scheduled to give book reports in a 1-hour class period. After the first report, $\frac{2}{3}$ hour remained. If the next two students' reports took $\frac{1}{6}$ hour and $\frac{1}{4}$ hour, respectively, what fraction of the hour remained after the final students' report? Justify your answer.
42. **MEASUREMENT** Mrs. Escalante was riding a bicycle on a bike path. After riding $\frac{2}{3}$ of a mile, she discovered that she still needed to travel $\frac{3}{4}$ of a mile to reach the end of the path. How long is the bike path?
43. **CELL PHONES** One hundred sixty cell phone owners were surveyed. What fraction of owners prefers using their cell phone for text messaging or taking pictures?
44. **MEASUREMENT** LaTasha and Eric are jogging on a track. LaTasha jogs $\frac{1}{4}$ of a mile and then stops. Eric jogs $\frac{5}{8}$ of a mile, stops and then turns around and jogs $\frac{1}{2}$ of a mile. Who is farther ahead on the track? How much farther?

How Do You Use a Cell Phone?



Academic Standards • ISTEP+
Extra Practice, pp. 679, 708

H.O.T. Problems

45. **CHALLENGE** Fractions, such as $\frac{1}{2}$ or $\frac{1}{3}$, whose numerators are 1, are called *unit fractions*. Describe a method you can use to add two unit fractions mentally. Explain your reasoning and use your method to find $\frac{1}{99} + \frac{1}{100}$.
46. **OPEN ENDED** Provide a counterexample to the following statement.
The sum of three fractions with odd numerators is never $\frac{1}{2}$.
47. **FIND THE ERROR** Meagan and Lourdes are finding $\frac{1}{4} + \frac{3}{5}$. Who is correct? Explain.



Meagan

$$\frac{1}{4} + \frac{3}{5} = \frac{1+3}{4+5}$$



Lourdes

$$\frac{1}{4} + \frac{3}{5} = \frac{1 \times 5}{4 \times 5} + \frac{3 \times 4}{5 \times 4}$$

48. **WRITING IN MATH** To make a cake, Felicia needs 1 cup of flour but she only has a $\frac{2}{3}$ -measuring cup and a $\frac{3}{4}$ -measuring cup. Which method will bring her closest to having the amount of flour she needs? Explain.
- a. Fill the $\frac{2}{3}$ -measuring cup twice. b. Fill the $\frac{2}{3}$ -measuring cup once.
c. Fill the $\frac{3}{4}$ -measuring cup twice. d. Fill the $\frac{3}{4}$ -measuring cup once.

**ISTEP+ PRACTICE****Reinforcement of 6.1.6**

49. The table gives the number of hours Orlando spent at football practice for one week.

Day	Time (hours)
Monday	$1\frac{1}{2}$
Tuesday	2
Wednesday	$2\frac{1}{3}$
Thursday	$1\frac{5}{6}$
Friday	$2\frac{1}{2}$
Saturday	$1\frac{3}{4}$

How many more hours did he practice over the last three days than he did over the first three days?

- A $\frac{1}{4}$ h
 B $\frac{1}{2}$ h
 C $\frac{2}{3}$ h
 D $\frac{3}{4}$ h

50. Which of the following is the prime factored form of the lowest common denominator of $\frac{7}{12} + \frac{11}{18}$?

- F 2×3
 G 2×3^2
 H $2^2 \times 3^2$
 J $2^3 \times 3$

51. Find $\frac{5}{6} - \frac{1}{8}$.

- A $\frac{4}{7}$
 B $\frac{3}{8}$
 C $\frac{7}{12}$
 D $\frac{17}{24}$

Spiral Review

Estimate. (Lesson 5-1)

52. $\frac{6}{7} - \frac{5}{12}$

53. $4\frac{1}{9} + 3\frac{3}{4}$

54. $16\frac{2}{3} \div 8\frac{1}{5}$

55. $5\frac{4}{5} \cdot 3\frac{1}{3}$

56. **WEATHER** The table shows about how much rain falls in Albuquerque and Denver. Which city has the greater fraction of inches of rain per day? Explain. (Lesson 4-9)

City	Amount of Rain (in.)	Number of Days
Albuquerque, NM	9	60
Denver, CO	15	90

Source: The Weather Channel

57. Write 0.248 as a percent. (Lesson 4-7)

ALGEBRA Find each sum if $a = -3$ and $b = 2$. (Lessons 2-4 and 2-5)

58. $a + b$

59. $a - b$

60. $b - a$

GET READY for the Next Lesson

PREREQUISITE SKILL Complete.

61. $5\frac{2}{3} = 5 + \blacksquare$

62. $1 = \frac{\blacksquare}{9}$

63. $1 = \frac{\blacksquare}{5}$

64. $\blacksquare = 4 + \frac{3}{8}$

Adding and Subtracting Mixed Numbers

MAIN IDEA

Add and subtract mixed numbers.

IN Academic Standards

Reinforcement of

6.1.6 Solve problems involving addition, subtraction, multiplication and division of positive fractions and decimals and explain why a particular operation was used for a given situation.

IN Math Online

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

▶ GET READY for the Lesson

BABIES The birth weights of several babies in the hospital nursery are shown.

Birth Weight (pounds)	
Jackson	$8\frac{1}{8}$
Nicolás	$7\frac{15}{16}$
Rebekah	$6\frac{13}{16}$
Mia	$5\frac{7}{8}$



1. Write an expression to find how much more Nicolás weighs than Mia.
2. Rename the fractions using the LCD.
3. Find the difference of the fractional parts of the mixed numbers.
4. Find the difference of the whole numbers.
5. **MAKE A CONJECTURE** Explain how to find $7\frac{15}{16} - 5\frac{7}{8}$. Then use your conjecture to find the difference.

To add or subtract mixed numbers, first add or subtract the fractions. If necessary, rename them using the LCD. Then add or subtract the whole numbers and simplify if necessary.

EXAMPLES Add and Subtract Mixed Numbers

- 1** Find $7\frac{4}{9} + 10\frac{2}{9}$. Write in simplest form.

Estimate $7 + 10 = 17$

$$\begin{array}{r} 7\frac{4}{9} \\ + 10\frac{2}{9} \\ \hline \end{array}$$

Add the whole numbers and fractions separately.

$$17\frac{6}{9} \text{ or } 17\frac{2}{3}$$

Simplify.

Check for Reasonableness $17\frac{2}{3} \approx 17$ ✓

✓ CHECK Your Progress

a. $6\frac{1}{8} + 2\frac{5}{8}$

b. $5\frac{1}{5} + 2\frac{3}{10}$

c. $1\frac{5}{9} + 4\frac{1}{6}$



2 Find $8\frac{5}{6} - 2\frac{1}{3}$. Write in simplest form.

Estimate $9 - 2 = 7$

$$\begin{array}{r} 8\frac{5}{6} \rightarrow 8\frac{5}{6} \\ -2\frac{1}{3} \rightarrow -2\frac{2}{6} \\ \hline 6\frac{3}{6} \text{ or } 6\frac{1}{2} \end{array}$$

Rename the fraction using the LCD. Then subtract.
Simplify.

Check for Reasonableness $6\frac{1}{2} \approx 7$ ✓

✓ CHECK Your Progress

Subtract. Write in simplest form.

- d. $5\frac{4}{5} - 1\frac{3}{10}$ e. $13\frac{7}{8} - 9\frac{3}{4}$ f. $8\frac{2}{3} - 2\frac{1}{2}$
g. $7\frac{3}{4} - 4\frac{1}{3}$ h. $11\frac{5}{6} - 3\frac{1}{8}$ i. $9\frac{4}{7} - 5\frac{1}{2}$

Study Tip

Improper Fractions An improper fraction has a numerator that is greater than or equal to the denominator. Examples of improper fractions are $\frac{5}{4}$ and $2\frac{6}{5}$.

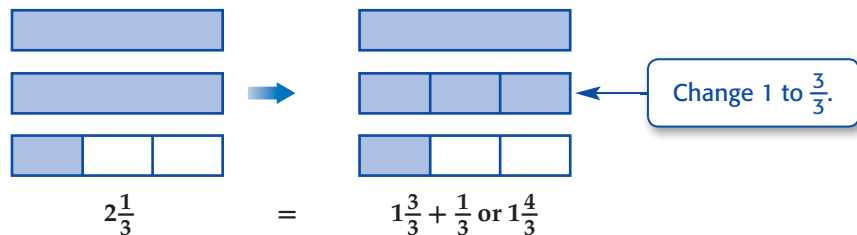
Sometimes when you subtract mixed numbers, the fraction in the first mixed number is less than the fraction in the second mixed number. In this case, rename the first fraction as an improper fraction in order to subtract.

EXAMPLES **Rename Mixed Numbers to Subtract**

3 Find $2\frac{1}{3} - 1\frac{2}{3}$.

Estimate $2 - 1\frac{1}{2} = \frac{1}{2}$

Since $\frac{1}{3}$ is less than $\frac{2}{3}$, rename $2\frac{1}{3}$ before subtracting.



$2\frac{1}{3} \rightarrow 1\frac{4}{3}$ Rename $2\frac{1}{3}$ as $1\frac{4}{3}$.

$$\begin{array}{r} -1\frac{2}{3} \rightarrow -1\frac{2}{3} \\ \hline \frac{2}{3} \end{array}$$

Subtract the whole numbers and then the fractions.

Check for Reasonableness $\frac{2}{3} \approx \frac{1}{2}$ ✓



4 Find $8 - 3\frac{3}{4}$.

Estimate $8 - 4 = 4$

Using the denominator of the fraction in the subtrahend, $8 = 8\frac{0}{4}$.

Since $\frac{0}{4}$ is less than $\frac{3}{4}$, rename 8 before subtracting.

$$\begin{array}{r} 8 \rightarrow 7\frac{4}{4} \\ -3\frac{3}{4} \rightarrow -3\frac{3}{4} \\ \hline 4\frac{1}{4} \end{array}$$

Rename 8 as $7 + \frac{4}{4}$ or $7\frac{4}{4}$.

Subtract.

Check for Reasonableness $4\frac{1}{4} \approx 4$ ✓

CHECK Your Progress

j. $11\frac{2}{5} - 2\frac{3}{5}$

k. $5\frac{3}{8} - 4\frac{11}{12}$

l. $7 - 1\frac{1}{2}$



Real-World Career . . .

How Does an Urban Planner Use Math?

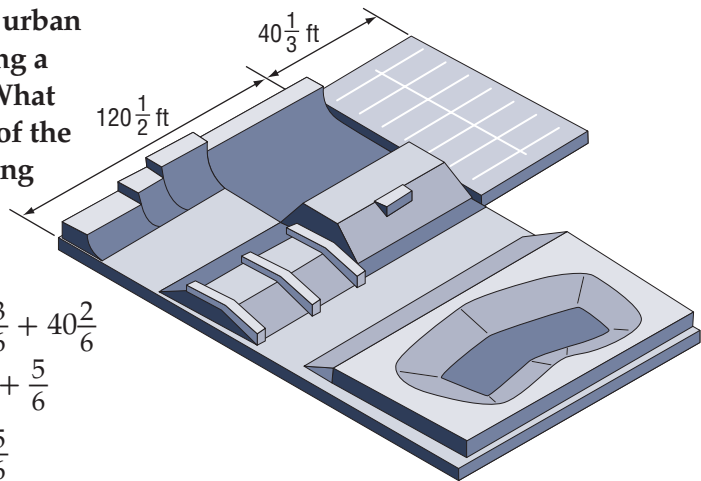
An urban planner uses math to measure and draw site plans for future development.

IN Math Online

For more information, go to glencoe.com.

Real-World EXAMPLE

5 MEASUREMENT An urban planner is designing a skateboard park. What will be the length of the park and the parking lot combined?



$$\begin{aligned} 120\frac{1}{2} + 40\frac{1}{3} &= 120\frac{3}{6} + 40\frac{2}{6} \\ &= 160 + \frac{5}{6} \\ &= 160\frac{5}{6} \end{aligned}$$

The total length is $160\frac{5}{6}$ feet.

CHECK Your Progress

m. **MEASUREMENT** Jermaine walked $1\frac{5}{8}$ miles on Saturday and $2\frac{1}{2}$ miles on Sunday. How many more miles did he walk on Sunday?

CHECK Your Understanding

Examples 1–4 Add or subtract. Write in simplest form.

(pp. 242–244)

1. $1\frac{5}{7} + 8\frac{1}{7}$

2. $8\frac{1}{2} + 3\frac{4}{5}$

3. $7\frac{5}{6} - 3\frac{1}{6}$

4. $9\frac{4}{5} - 2\frac{3}{4}$

5. $3\frac{1}{4} - 1\frac{3}{4}$

6. $5\frac{2}{3} - 2\frac{3}{5}$

7. $11 - 6\frac{3}{8}$

8. $16 - 5\frac{5}{6}$

Example 5
(p. 244)

9. **CARS** A hybrid car's gas tank can hold $11\frac{9}{10}$ gallons of gasoline. It contains $8\frac{3}{4}$ gallons of gasoline. How much more gasoline is needed to fill the tank?



Practice and Problem Solving

HOMework HELP

For Exercises	See Examples
10–17	1, 2
18–23	3
24–25	4
26–29	5

Add or subtract. Write in simplest form.

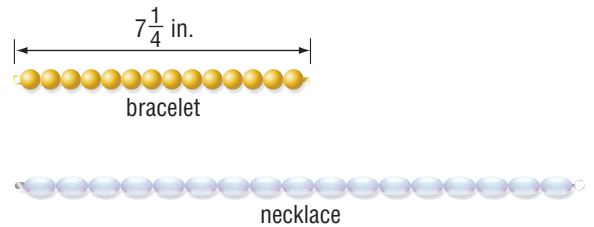
10. $2\frac{1}{9} + 7\frac{4}{9}$ 11. $3\frac{2}{7} + 4\frac{3}{7}$ 12. $10\frac{4}{5} - 2\frac{1}{5}$ 13. $8\frac{6}{7} - 6\frac{5}{7}$
 14. $9\frac{4}{5} - 2\frac{3}{10}$ 15. $11\frac{3}{4} - 4\frac{1}{3}$ 16. $8\frac{5}{12} + 11\frac{1}{4}$ 17. $8\frac{3}{8} + 10\frac{1}{3}$
 18. $9\frac{1}{5} - 2\frac{3}{5}$ 19. $6\frac{1}{4} - 2\frac{3}{4}$ 20. $6\frac{3}{5} - 1\frac{2}{3}$ 21. $4\frac{3}{10} - 1\frac{3}{4}$
 22. $14\frac{1}{6} - 7\frac{1}{3}$ 23. $12\frac{1}{2} - 6\frac{5}{8}$ 24. $8 - 3\frac{2}{3}$ 25. $13 - 5\frac{5}{6}$

For Exercises 26–29, choose an operation to solve each problem. Explain your reasoning. Then solve the problem.

26. **HIKING** If Sara and Maggie hiked both of the trails listed in the table, how far did they hike altogether?

Trail	Length (mi)
Woodland Park	$3\frac{2}{3}$
Mill Creek Way	$2\frac{5}{6}$

27. **JEWELRY** Margarite made the jewelry shown at the right. If the necklace is $10\frac{5}{8}$ inches longer than the bracelet, how long is the necklace that Margarite made?



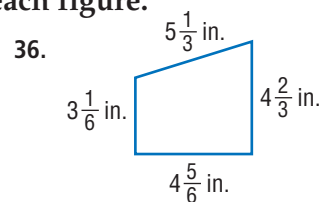
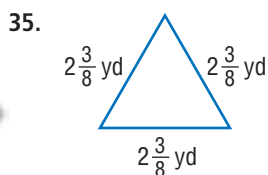
28. **GARDENS** The length of Kasey's garden is $4\frac{5}{8}$ feet. Find the width of Kasey's garden if it is $2\frac{7}{8}$ feet shorter than the length.
29. **HAIRSTYLES** Before Alameda got her haircut, the length of her hair was $9\frac{3}{4}$ inches. After her haircut, the length was $6\frac{1}{2}$ inches. How many inches did she have cut?

Add or subtract. Write in simplest form.

30. $10 - 3\frac{5}{11}$ 31. $24 - 8\frac{3}{4}$ 32. $6\frac{1}{6} + 1\frac{2}{3} + 5\frac{5}{9}$ 33. $3\frac{1}{4} + 2\frac{5}{6} - 4\frac{1}{3}$

34. **TIME** Karen wakes up at 6:00 A.M. It takes her $1\frac{1}{4}$ hours to shower, get dressed, and comb her hair. It takes her $\frac{1}{2}$ hour to eat breakfast, brush her teeth, and make her bed. At what time will she be ready for school?

MEASUREMENT Find the perimeter of each figure.



Academic Standards • ISTEP+
Extra Practice, pp. 680, 708

H.O.T. Problems

37. **NUMBER SENSE** Which of the following techniques could be used to determine whether $6\frac{3}{4} + \frac{4}{5}$ is *greater than*, *less than*, or *equal to* $2\frac{1}{9} + 6\frac{7}{8}$? Justify your selection(s). Then use the technique(s) to solve the problem.

number sense

mental math

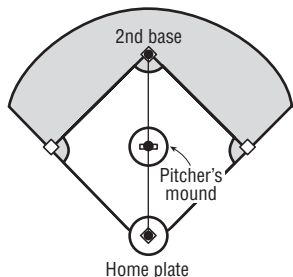
estimation

38. **CHALLENGE** A string is cut in half. One of the halves is thrown away. One fifth of the remaining half is cut away and the piece left is 8 feet long. How long was the string initially? Justify your answer.
39. **WRITING IN MATH** The fence of a rectangular garden is constructed from 12 feet of fencing wire. Suppose that one side of the garden is $2\frac{5}{12}$ feet long. Explain how to find the length of the other side.

ISTEP+ PRACTICE**Reinforcement of 6.1.6**

40. The distance from home plate to the pitcher's mound is 60 feet 6 inches and from home plate to second base is 127 feet $3\frac{3}{8}$ inches. Find the distance from the pitcher's mound to second base.

- A 68 ft $3\frac{1}{4}$ in.
 B 67 ft $8\frac{3}{4}$ in.
 C 67 ft $2\frac{5}{8}$ in.
 D 66 ft $9\frac{3}{8}$ in.



41. A recipe for party mix calls for $4\frac{3}{4}$ cups of cereal. The amount of peanuts needed is $1\frac{2}{3}$ cups less than the amount of cereal needed. How many cups of peanuts and cereal are needed?

- F $3\frac{1}{12}$ cups
 G $6\frac{1}{2}$ cups
 H $7\frac{5}{6}$ cups
 J $8\frac{1}{2}$ cups

Spiral Review

42. **SCHOOL** Kai did $\frac{1}{5}$ of her homework in class and $\frac{1}{3}$ more of it on the bus.

What fraction of homework does she still need to do? (Lesson 5-2)

Estimate. (Lesson 5-1)

43. $\frac{8}{9} \div \frac{9}{10}$

44. $3\frac{1}{2} + 6\frac{2}{3}$

45. $8\frac{4}{5} \times 7\frac{1}{9}$

46. $4\frac{2}{9} - 1\frac{1}{4}$

47. **MEASUREMENT** To carpet a living room with a length of 17 feet, 255 square feet of carpet is needed. Find the width of the living room. (Lesson 3-6)

GET READY for the Next Lesson

48. **PREREQUISITE SKILL** Andre needs to be at the train station by 5:30 P.M. It takes him $\frac{1}{3}$ hour to pack and $1\frac{1}{4}$ hours to get to the station. Find the latest time he should begin packing. Use the *work backward* strategy. (Lesson 3-4)

1. **MONEY** Latisha spends $\frac{3}{4}$ of her money on a birthday present for her brother. If she has \$33, estimate the amount she spends on her brother's present. (Lesson 5-1)

Estimate. (Lesson 5-1)

2. $5\frac{1}{9} + 1\frac{7}{8}$ 3. $13\frac{1}{2} \div 7\frac{2}{9}$
 4. $\frac{11}{20} - \frac{5}{8}$ 5. $4\frac{2}{3} \times 1\frac{3}{4}$
 6. $7\frac{3}{4} \div 1\frac{4}{5}$ 7. $\frac{8}{9} + 2\frac{13}{15}$

8. **MULTIPLE CHOICE** Mrs. Ortega is making 5 batches of muffins for the school bake sale. Each batch uses $2\frac{1}{4}$ cups sugar and $1\frac{1}{2}$ cups milk. Which is the best estimate of the total amount of sugar and milk Mrs. Ortega uses for the muffins? (Lesson 5-1)

- A less than 15 cups
 B between 15 and 20 cups
 C between 20 and 25 cups
 D more than 25 cups

Add or subtract. Write in simplest form.

(Lesson 5-2)

9. $\frac{11}{15} - \frac{1}{15}$ 10. $\frac{4}{7} - \frac{3}{14}$
 11. $\frac{1}{2} + \frac{2}{9}$ 12. $\frac{5}{8} + \frac{3}{4}$

13. **SCIENCE** $\frac{39}{50}$ of Earth's atmosphere is made up of nitrogen while only $\frac{21}{100}$ is made up of oxygen. What fraction of Earth's atmosphere is either nitrogen or oxygen? (Lesson 5-2)

Add or subtract. Write in simplest form.

(Lesson 5-3)

14. $8\frac{3}{4} - 2\frac{5}{12}$ 15. $5\frac{1}{6} - 1\frac{1}{3}$
 16. $2\frac{5}{9} + 1\frac{2}{3}$ 17. $2\frac{3}{5} + 6\frac{13}{15}$

18. **MULTIPLE CHOICE** The table shows the weight of a newborn infant for the first year. (Lesson 5-3)

Month	Weight (lb)
0	$7\frac{1}{4}$
3	$12\frac{1}{2}$
6	$16\frac{5}{8}$
9	$19\frac{4}{5}$
12	$23\frac{3}{20}$

During which three-month period was the infant's weight gain the greatest?

- F 0–3 months H 6–9 months
 G 3–6 months J 9–12 months

19. **MEASUREMENT** How much does a $50\frac{1}{4}$ -pound suitcase weigh after $3\frac{7}{8}$ pounds is removed? (Lesson 5-3)

20. **MULTIPLE CHOICE** The table gives the average annual snowfall for several U.S. cities. (Lesson 5-3)

City	Average Snowfall (in.)
Anchorage, AK	$70\frac{4}{5}$
Mount Washington, NH	$259\frac{9}{10}$
Buffalo, NY	$93\frac{3}{5}$
Birmingham, AL	$1\frac{1}{2}$

Source: Fact Monster

On average, how many more inches of snow does Mount Washington, New Hampshire, receive than Anchorage, Alaska?

- A $330\frac{7}{10}$ in. C $166\frac{3}{10}$ in.
 B $189\frac{1}{10}$ in. D $92\frac{1}{10}$ in.

5-4

Problem-Solving Investigation

MAIN IDEA: Solve problems by eliminating possibilities.

Academic Standards

P.1.3 Apply and adapt a variety of appropriate strategies to solve problems. **P.2.4** Select and use various types of reasoning and methods of proof. Also addresses 7.3.4, P.2.1, P.5.2.

P.S.I. TEAM +

e-Mail: ELIMINATE POSSIBILITIES

MADISON: I am making school pennants to decorate the cafeteria. I use $1\frac{1}{4}$ yards of fabric for each pennant.

YOUR MISSION: Eliminate possibilities to find the greatest number of pennants Madison can make with 12 yards of fabric. Is it 6, 9, or 12?



Understand	You know she has 12 yards of fabric. Each pennant uses $1\frac{1}{4}$ yards of fabric.
Plan	Eliminate the answers that are not reasonable.
Solve	<p>Madison needs more than 1 yard of fabric for each pennant. So, she needs more than 12 yards for 12 pennants. Eliminate this choice.</p> <p>Now check the choice of 9 pennants.</p> <ul style="list-style-type: none"> $1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} = 5$. <p>So, Madison can make 4 pennants with 5 yards of fabric. Therefore, she can make 8 pennants out of 10 yards of fabric.</p> <ul style="list-style-type: none"> She can also make 1 more pennant with the remaining 2 yards. <p>So, Madison can make $8 + 1$ or 9 pennants.</p>
Check	Making 6 pennants would take $1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} = 7\frac{1}{2}$ yards. This is not the greatest number she can make. So, making 6 pennants is <i>not</i> reasonable.

Analyze The Strategy

- Describe different ways that you can eliminate possibilities when solving problems.
- Explain how the strategy of eliminating possibilities is useful for taking multiple-choice tests.
- WRITING IN MATH** Write a problem that could be solved by eliminating possibilities.



Mixed Problem Solving

Eliminate possibilities to solve Exercises 4–6.

4. **TRAINS** A train passes through an intersection at the rate of 3 cars per 30 seconds. Assume that it takes 5 minutes for the train to completely pass through the intersection. How many cars does the train have altogether?
- A 6 cars C 30 cars
B 15 cars D 45 cars
5. **PIZZA** A pizza shop used 100 pounds of pizza dough to make 125 pizzas. If a large pizza requires 1 pound of dough and a medium pizza requires $\frac{1}{2}$ pound, how many large- and medium-sized pizzas were made?
- F 40 large, 85 medium
G 65 large, 60 medium
H 55 large, 70 medium
J 75 large, 50 medium
6. **PILLOWS** Pat is making pillows out of fabric. He uses $\frac{3}{4}$ yard of fabric for each pillow. What is the greatest number of pillows Pat can make with 9 yards of fabric: 9, 12, or 15?

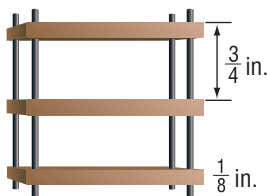


Use any strategy to solve Exercises 7–14. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES

- Look for a pattern.
- Work backward.
- Make an organized list.

7. **MEASUREMENT** The diagram shows a shelf that holds CDs. Each shelf is $\frac{1}{8}$ inch thick, and the distance between shelves is as shown. How much space is available on each layer of the shelf for a CD?



8. **BRIDGES** A covered bridge has a maximum capacity of 48,000 pounds. If an average school bus weighs 10,000 pounds, about how many school buses could a covered bridge hold?
9. **GEOMETRY** Draw the next two figures in the pattern.



10. **SLEEP** A 9-month-old infant needs about 14 hours of sleep each day while a teenager needs about 10 hours of sleep each day. How much more sleep does a 9-month-old need than a teenager? Write as a fraction of a day.
11. **PRECIPITATION** In Olympia, Washington, the average annual precipitation is $50\frac{3}{5}$ inches. Is $\frac{1}{49}$ inch, 1 inch, or 14 inches the best estimate for the average precipitation per day?
12. **MONEY** Kristen has \$15 to go to the movies. Her ticket costs \$7.25, drinks are \$3.50, popcorn is \$5.75, and pretzels are \$4.25. Which two items can Kristen get from the concession stand?
13. **PIZZA** Sebastian ate $\frac{2}{5}$ of a pizza while his sister ate $\frac{1}{3}$ of the same pizza. The remainder was stored in the refrigerator. What fraction of the pizza was stored in the refrigerator?
14. **GRADES** Jerome had an average of 88 on his first three science tests. His score on the second and third tests were 92 and 87. What was his score on the first test?

Explore 5-5

Math Lab Multiplying Fractions

Just as the product of 3×4 is the number of square units in a rectangle, the product of two fractions can be shown using area models.

MAIN IDEA

Use area models to multiply fractions and mixed numbers.

IN Academic Standards

7.1.7 Solve problems that involve multiplication and division with integers, fractions, decimals and combinations of the four operations. Also addresses P.2.2, P.5.1, P.5.2, P.5.3.

IN Math Online

glencoe.com

• Concepts In Motion

ACTIVITY

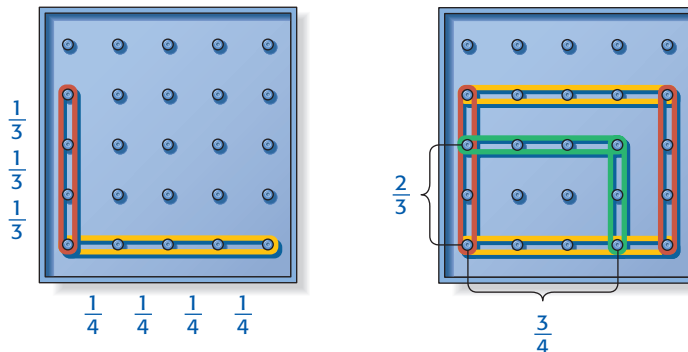
- 1 Find $\frac{3}{4} \times \frac{2}{3}$ using a geoboard.

The first factor is 3 *fourths* and the second factor is 2 *thirds*.

STEP 1 Use one geoband to show fourths and another to show thirds on the geoboard.

STEP 2 Use geobands to form a rectangle. Place one geoband on the peg to show 3 fourths and another on the peg to show 2 thirds.

STEP 3 Connect the geobands to show a small rectangle.



The area of the small square is 6 square units. The area of the large rectangle is 12 square units. So, $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$ or $\frac{1}{2}$.

CHECK Your Progress

Find each product using a geoboard.

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

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

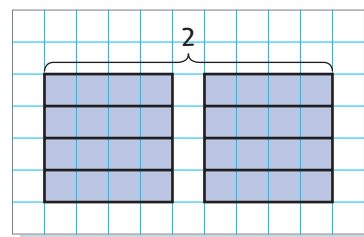
c. $\frac{3}{4} \times \frac{1}{2}$

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

ACTIVITY

- 2 Find $2 \times \frac{1}{4}$ using an area model.

STEP 1 To represent 2 or $\frac{2}{1}$, draw 2 large rectangles, side by side. Divide each rectangle horizontally into fourths. Color both large rectangles blue.



Study Tip

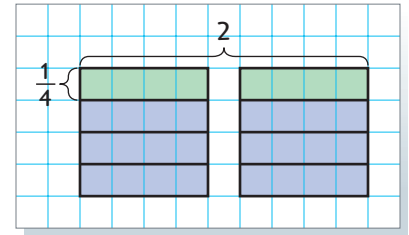
Shading

Yellow and blue make green. So, the green sections have been shaded twice and represent the product.

STEP 2 Color 1 fourth of each large rectangle yellow.

The fraction that compares the number of green sections, 2, to the number of sections in one rectangle, 4, is $\frac{2}{4}$ or $\frac{1}{2}$.

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



CHECK Your Progress

Find each product using a model.

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

f. $2 \times \frac{2}{5}$

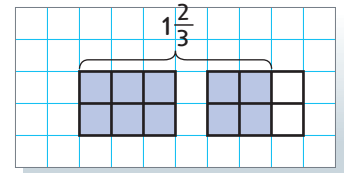
g. $4 \times \frac{1}{2}$

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

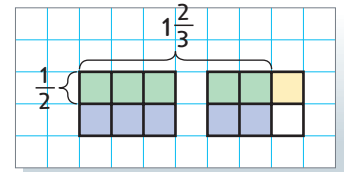
ACTIVITY

3 Find $1\frac{2}{3} \times \frac{1}{2}$ using a model.

STEP 1 Draw 2 rectangles divided vertically into thirds and horizontally into halves. Color $1\frac{2}{3}$ of the squares blue.



STEP 2 Color $\frac{1}{2}$ of the squares yellow. Then count the small squares that are green.



Since the green area is $\frac{3}{6}$ of the first rectangle and $\frac{2}{6}$ of the second rectangle, the total area shaded green is $\frac{3}{6} + \frac{2}{6}$ or $\frac{5}{6}$. So, $1\frac{2}{3} \times \frac{1}{2} = \frac{5}{6}$.

CHECK Your Progress

Find each product using a model.

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

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

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

ANALYZE THE RESULTS

- Analyze Exercises a–k. What is the relationship between the numerators of the factors and of the product? between the denominators of the factors and of the product?
- MAKE A CONJECTURE** Write a rule you can use to multiply two fractions.

Multiplying Fractions and Mixed Numbers

MAIN IDEA

Multiply fractions and mixed numbers.

IN Academic Standards

7.1.7 Solve problems that involve multiplication and division with integers, fractions, decimals and combinations of the four operations. Also addresses P.5.1, P.5.2, P.5.3, P.6.2.

IN Math Online

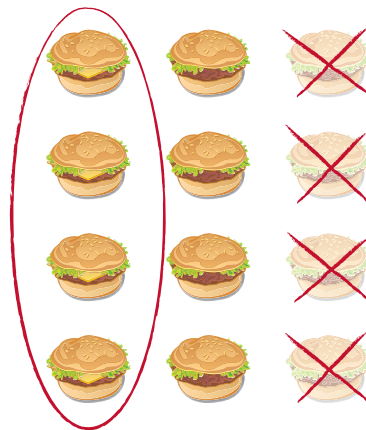
glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

▶ GET READY for the Lesson

LUNCH Two thirds of the students at the lunch table ordered a hamburger for lunch. One half of those students ordered cheese on their hamburgers.

1. What fraction of the students at the lunch table ordered a cheeseburger?
2. How are the numerators and denominators of $\frac{2}{3}$ and $\frac{1}{2}$ related to the fraction in Exercise 1?



Multiply Fractions

Key Concept

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

Examples	Numbers	Algebra
	$\frac{1}{2} \times \frac{2}{3} = \frac{1 \times 2}{2 \times 3}$ or $\frac{2}{6}$	$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$ or $\frac{ac}{bd}$, where $b, d \neq 0$

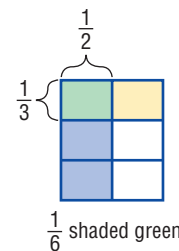
EXAMPLES Multiply Fractions

Multiply. Write in simplest form.

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

$$\frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} \leftarrow \begin{array}{l} \text{Multiply the numerators.} \\ \text{Multiply the denominators.} \end{array}$$

$$= \frac{1}{6} \quad \text{Simplify.}$$

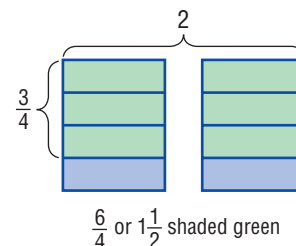


2 $2 \times \frac{3}{4}$

$$2 \times \frac{3}{4} = \frac{2}{1} \times \frac{3}{4} \quad \text{Write 2 as } \frac{2}{1}.$$

$$= \frac{2 \times 3}{1 \times 4} \leftarrow \begin{array}{l} \text{Multiply the numerators.} \\ \text{Multiply the denominators.} \end{array}$$

$$= \frac{6}{4} \text{ or } 1\frac{1}{2} \quad \text{Simplify.}$$



Study Tip

Whole Numbers
When multiplying a fraction by a whole number, write the whole number as a fraction with a denominator of 1.

✓ CHECK Your Progress

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

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

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



If the numerator and denominator of either fraction have common factors, you can simplify before multiplying.

Review Vocabulary

GCF the greatest of the common factors of two or more numbers; *Example:* the GCF of 8 and 12 is 4. (Lesson 4-2)

EXAMPLE Simplify Before Multiplying

3 Find $\frac{2}{7} \times \frac{3}{8}$. Write in simplest form.

$$\begin{aligned} \frac{2}{7} \times \frac{3}{8} &= \frac{\overset{1}{\cancel{2}}}{7} \times \frac{3}{\underset{4}{\cancel{8}}} && \text{Divide 2 and 8 by their GCF, 2.} \\ &= \frac{1 \times 3}{7 \times 4} \text{ or } \frac{3}{28} && \text{Multiply.} \end{aligned}$$

CHECK Your Progress

Multiply. Write in simplest form.

d. $\frac{1}{3} \times \frac{3}{7}$

e. $\frac{4}{9} \times \frac{1}{8}$

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

Study Tip

Simplifying
If you forget to simplify before multiplying, you can always simplify the final answer. However, it is usually easier to simplify before multiplying.

EXAMPLE Multiply Mixed Numbers

4 Find $\frac{1}{2} \times 4\frac{2}{5}$. Write in simplest form. **Estimate** $\frac{1}{2} \times 4 = 2$

METHOD 1 Rename the mixed number.

$$\begin{aligned} \frac{1}{2} \times 4\frac{2}{5} &= \frac{1}{2} \times \frac{\overset{11}{\cancel{22}}}{\underset{1}{\cancel{5}}} && \text{Rename } 4\frac{2}{5} \text{ as an improper fraction, } \frac{22}{5}. \\ &&& \text{Divide 2 and 22 by their GCF, 2.} \\ &= \frac{1 \times 11}{1 \times 5} && \text{Multiply.} \\ &= \frac{11}{5} \text{ or } 2\frac{1}{5} && \text{Simplify.} \end{aligned}$$

METHOD 2 Use mental math.

The mixed number $4\frac{2}{5}$ is equal to $4 + \frac{2}{5}$.

So, $\frac{1}{2} \times 4\frac{2}{5} = \frac{1}{2} \left(4 + \frac{2}{5} \right)$. Use the Distributive Property to multiply, then add mentally.

$$\begin{aligned} \frac{1}{2} \left(4 + \frac{2}{5} \right) &= 2 + \frac{1}{5} && \text{THINK Half of 4 is 2 and half of 2 fifths is 1 fifth.} \\ \underbrace{\hspace{2cm}} &= 2\frac{1}{5} && \text{Rewrite the sum as a mixed number.} \end{aligned}$$

So, $\frac{1}{2} \times 4\frac{2}{5} = 2\frac{1}{5}$. **Check for Reasonableness** $2\frac{1}{5} \approx 2$ ✓

CHOOSE Your Method

Multiply. Write in simplest form.

g. $\frac{1}{4} \times 8\frac{4}{9}$

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

i. $1\frac{7}{8} \times 2\frac{2}{5}$



Real-World EXAMPLES

Study Tip

Meaning of Multiplication
Recall that one meaning of 3×4 is three groups with 4 in each group. In Example 5, there are $365\frac{1}{4}$ groups with $\frac{1}{3}$ in each group.

- 5 SLEEP** Humans sleep about $\frac{1}{3}$ of each day. If each year is equal to $365\frac{1}{4}$ days, determine the number of days in a year the average human sleeps.

Words

Humans sleep about $\frac{1}{3}$ of $365\frac{1}{4}$ days.

Variable

Let d represent the number of days a human sleeps.

Equation

$$d = \frac{1}{3} \cdot 365\frac{1}{4}$$

$$d = \frac{1}{3} \cdot 365\frac{1}{4}$$

Write the equation.

$$d = \frac{1}{3} \cdot \frac{1,461}{4}$$

Rename the mixed number as an improper fraction.

$$d = \frac{1}{\cancel{3}^1} \cdot \frac{\overset{487}{1,461}}{4}$$

Divide 3 and 1,461 by their GCF, 3.

$$d = \frac{487}{4} \text{ or } 121\frac{3}{4}$$

Multiply. Then rename as a mixed number.

The average human sleeps $121\frac{3}{4}$ days each year.



- 6 ANIMALS** The house cat has an average lifespan that is $\frac{4}{5}$ of a lion's. If a lion's lifespan is 15 years, find the average lifespan of a house cat.

Words

The lifespan of a house cat is $\frac{4}{5}$ of that of the lion.

Variable

Let c represent the lifespan of a house cat.

Equation

$$c = \frac{4}{5} \cdot 15$$

$$c = \frac{4}{5} \cdot 15$$

Write the equation.

$$c = \frac{4}{5} \cdot \frac{15}{1}$$

Write the whole number 15 as an improper fraction.

$$c = \frac{4}{\cancel{5}^1} \cdot \frac{\overset{3}{15}}{1}$$

Divide 5 and 15 by their GCF, 5.

$$c = \frac{12}{1} \text{ or } 12$$

Multiply, then simplify.

The average lifespan of a house cat is 12 years.



Real-World Link

The average group of lions, called a pride, consists of about 15 lions with about $\frac{2}{3}$ of the pride being female.

Source: African Wildlife Foundation



CHECK Your Progress

- j. **COOKING** Sofia wishes to make $\frac{1}{2}$ of a recipe. If the original recipe calls for $3\frac{3}{4}$ cups of flour, how many cups should she use?



CHECK Your Understanding

Examples 1–4
(pp. 252–253)

Multiply. Write in simplest form.

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

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

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

4. $\frac{1}{4} \times \frac{8}{9}$

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

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

Examples 5, 6
(p. 254)

7. **WEIGHT** The weight of an object on Mars is about $\frac{2}{5}$ its weight on Earth. How much would an 80-pound dog weigh on Mars?

Practice and Problem Solving

HOMEWORK HELP

For Exercises	See Examples
8–11	1, 2
12–19	3, 4
20–23	5, 6

Multiply. Write in simplest form.

8. $\frac{3}{4} \times \frac{1}{8}$

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

10. $9 \times \frac{1}{2}$

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

12. $\frac{1}{5} \times \frac{5}{6}$

13. $\frac{4}{9} \times \frac{1}{4}$

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

15. $\frac{1}{12} \times \frac{3}{5}$

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

17. $\frac{2}{5} \times \frac{15}{16}$

18. $\frac{3}{8} \times \frac{10}{27}$

19. $\frac{9}{10} \times \frac{5}{6}$

20. **DVDs** Each DVD storage case is about $\frac{1}{5}$ inch thick. What will be the height of 12 cases sold together in plastic wrapping?
21. **PIZZA** Mark left $\frac{3}{8}$ of a pizza in the refrigerator. On Friday, he ate $\frac{1}{2}$ of what was left of the pizza. What fraction of the entire pizza did he eat on Friday?
22. **MEASUREMENT** The width of a vegetable garden is $\frac{1}{3}$ times its length. If the length of the garden is $7\frac{3}{4}$ feet, what is the width?
23. **RECIPES** A recipe to make one batch of blueberry muffins calls for $4\frac{2}{3}$ cups of flour. How many cups of flour are needed to make 3 batches of blueberry muffins?

Multiply. Write in simplest form.

24. $4\frac{2}{3} \times \frac{4}{7}$

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

26. $14 \times 1\frac{1}{7}$

27. $3\frac{3}{4} \times 8$

28. $9 \times 4\frac{2}{3}$

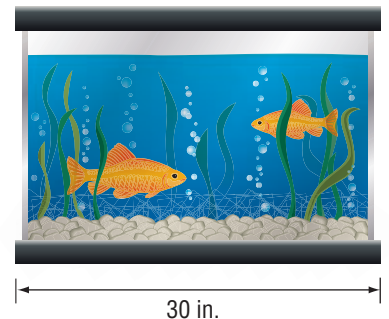
29. $4 \times 7\frac{5}{6}$

30. $3\frac{1}{4} \times 2\frac{2}{3}$

31. $5\frac{1}{3} \times 3\frac{3}{4}$

32. **MEASUREMENT** The width of the fish tank is $\frac{2}{5}$ of its length. What is the width of the fish tank?

33. **BICYCLING** Philip rode his bicycle at $9\frac{2}{5}$ miles per hour. If he rode for $\frac{3}{4}$ of an hour, how many miles did he cover?

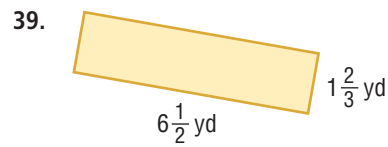
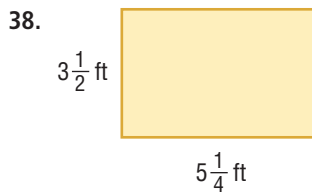




Evaluate each verbal expression.

34. one half of five eighths 35. four sevenths of two thirds
 36. nine tenths of one fourth 37. one third of eleven sixteenths

MEASUREMENT Find the perimeter and area of each rectangle.



40. **POOLS** A community swimming pool is $90\frac{2}{5}$ feet long and $55\frac{1}{2}$ feet wide. If Natalie swims the perimeter of the pool four times, what is the total number of feet she will swim? Explain how you solved the problem.

MEASUREMENT For Exercises 41–44, use measurement conversions.

41. Find $\frac{1}{2}$ of $\frac{1}{4}$ of a gallon. 42. What is $\frac{1}{60}$ of $\frac{1}{24}$ of a day?
 43. Find $\frac{1}{100}$ of $\frac{1}{1,000}$ of a kilometer. 44. What is $\frac{1}{12}$ of $\frac{1}{3}$ of a yard?

ALGEBRA Evaluate each expression if $a = 4$, $b = 2\frac{1}{2}$, and $c = 5\frac{3}{4}$.

45. $a \times b + c$ 46. $b \times c - a$ 47. $2bc$

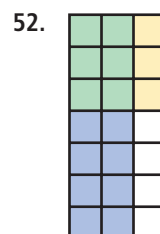
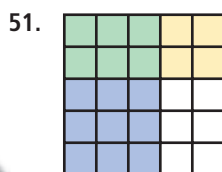
48. **TELEVISION** One evening, $\frac{2}{3}$ of the students in Rick's class watched television, and $\frac{3}{8}$ of those students watched a reality show, of which $\frac{1}{4}$ taped the show. What fraction of the students in Rick's class watched and taped a reality TV show?

49. **FOOD** Alano wants to make one and a half recipes of the pasta salad recipe shown at the right. How much of each ingredient will Alano need? Explain how you solved the problem.

Pasta Salad Recipe	
Ingredient	Amount
broccoli	$1\frac{1}{4}$ c
cooked pasta	$3\frac{3}{4}$ c
salad dressing	$\frac{2}{3}$ c
cheese	$1\frac{1}{3}$ c

50. **FIND THE DATA** Refer to the Data File on pages 16–19. Choose some data and write a real-world problem in which you would multiply fractions.

Write and evaluate a multiplication expression to represent each model. Explain how the models show the multiplication process.



Real-World Link

There are an estimated 5 million in-ground swimming pools in the U.S.

Source: Pool & Spa Service Industry News

Academic Standards • ISTEP+
 Extra Practice, pp. 680, 708

H.O.T. Problems

53. **CHALLENGE** Two improper fractions are multiplied. Is the product *sometimes, always, or never* less than 1? Explain your reasoning.
54. **OPEN ENDED** Write a word problem that involves finding the product of $\frac{3}{4}$ and $\frac{1}{8}$.
55. **WRITING IN MATH** Refer to Example 2. Explain how the model represents the meaning of the multiplication process.

ISTEP+ PRACTICE 7.1.7

56. Of the dolls in Marjorie's doll collection, $\frac{1}{5}$ have red hair. Of these, $\frac{3}{4}$ have green eyes. What fraction of Marjorie's doll collection has both red hair and green eyes?
- A $\frac{2}{9}$ C $\frac{4}{9}$
 B $\frac{3}{20}$ D $\frac{19}{20}$

57. Which description gives the relationship between a term and n , its position in the sequence?

Position	1	2	3	4	5	n
Value of Term	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	

- F Subtract 4 from n .
 G Add $\frac{1}{4}$ to n .
 H Multiply n by $\frac{1}{4}$.
 J Divide n by $\frac{1}{4}$.

Spiral Review

58. **MEASUREMENT** Find which room dimensions would give an area of $125\frac{3}{8}$ square feet. Use the *eliminate possibilities* strategy. (Lesson 5-4)
- A $11\frac{1}{2}$ feet by $10\frac{3}{8}$ feet C $13\frac{5}{8}$ feet by 9 feet
 B $10\frac{7}{8}$ feet by $12\frac{1}{4}$ feet D $14\frac{3}{4}$ feet by $8\frac{1}{2}$ feet
59. **MEASUREMENT** How much longer is a $2\frac{1}{2}$ -inch-long piece of string than a $\frac{2}{5}$ -inch-long piece of string? (Lesson 5-3)

Replace each \bullet with $<$, $>$, or $=$ to make a true sentence. (Lesson 4-9)

60. $\frac{5}{12} \bullet \frac{2}{5}$ 61. $\frac{3}{16} \bullet \frac{1}{8}$ 62. $3\frac{7}{6} \bullet 3\frac{6}{5}$

63. **PHONES** A long-distance telephone company charges a flat monthly fee of \$4.95 and \$0.06 per minute on all long-distance calls. Write and solve an equation to find the number of monthly minutes spent talking long-distance if the bill total was \$22.95. (Lesson 3-5)

GET READY for the Next Lesson

PREREQUISITE SKILL Solve each equation mentally. (Lesson 1-7)

64. $x + 2 = 8$ 65. $9 + m = 12$ 66. $7 - w = 2$

MAIN IDEA

Solve equations with rational number solutions.

IN Academic Standards**Preparation for**

7.2.2 Write and solve two-step linear equations and inequalities in one variable. Also addresses 7.1.7.

New Vocabulary

multiplicative inverse reciprocal

IN Math Online

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

▶ GET READY for the Lesson

HOMEWORK Shawnda spends $\frac{1}{2}$ hour doing homework after school. Then she spends another $\frac{1}{2}$ hour doing homework before bed.

- Write a multiplication expression to find how much time Shawnda spends doing homework. Then find the product.
- Copy and complete the table below.

$\frac{3}{2} \times \frac{2}{3} = \square$	$\frac{1}{5} \times \square = 1$	$\frac{5}{6} \times \frac{6}{5} = \square$	$\frac{7}{8} \times \frac{8}{7} = \square$
$\square \times \frac{5}{7} = 1$	$\frac{2}{6} \times \frac{6}{2} = \square$	$\frac{7}{1} \times \square = 1$	$\square \times 8 = 1$

- What is true about the numerators and denominators in the fractions in Exercise 2?

Two numbers with a product of 1 are called **multiplicative inverses**, or **reciprocals**.

Inverse Property of Multiplication**Key Concept**

Words The product of a number and its multiplicative inverse is 1.

Examples**Numbers**

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

Algebra

$$\frac{a}{b} \cdot \frac{b}{a} = 1, \text{ for } a, b \neq 0$$

EXAMPLES**Find Multiplicative Inverses**

- 1** Find the multiplicative inverse of $\frac{2}{5}$.

$$\frac{2}{5} \cdot \frac{5}{2} = 1 \quad \text{Multiply } \frac{2}{5} \text{ by } \frac{5}{2} \text{ to get the product 1.}$$

The multiplicative inverse of $\frac{2}{5}$ is $\frac{5}{2}$, or $2\frac{1}{2}$.

- 2** Find the multiplicative inverse of $2\frac{1}{3}$.

$$2\frac{1}{3} = \frac{7}{3} \quad \text{Rename the mixed number as an improper fraction.}$$

$$\frac{7}{3} \cdot \frac{3}{7} = 1 \quad \text{Multiply } \frac{7}{3} \text{ by } \frac{3}{7} \text{ to get the product 1.}$$

The multiplicative inverse of $2\frac{1}{3}$ is $\frac{3}{7}$.

✓ CHECK Your Progress

- a. $\frac{5}{6}$ b. $1\frac{1}{2}$ c. 8 d. $\frac{4}{3}$



In Chapter 3, you learned to solve equations using the Addition, Subtraction, and Division Properties of Equality. You can also solve equations by multiplying each side by the same number. This is called the **Multiplication Property of Equality**.

Study Tip
Fractions
 The fraction bar indicates division. So, $\frac{x}{2}$ means x divided by 2.

Multiplication Property of Equality Key Concept

Words If you multiply each side of an equation by the same nonzero number, the two sides remain equal.

Examples

Numbers	Algebra	
$5 = 5$	$\frac{x}{2} = -3$	$\frac{2}{3}x = 4$
$5 \cdot 2 = 5 \cdot 2$	$\frac{x}{2}(2) = -3(2)$	$\frac{3}{2} \cdot \frac{2}{3}x = \frac{3}{2} \cdot 4$
$10 = 10$	$x = -6$	$x = 6$

EXAMPLES Solve a Division Equation

3 Solve $7 = \frac{n}{4}$. Check your solution.

$7 = \frac{n}{4}$ Write the equation.

$7 \cdot 4 = \frac{n}{4} \cdot 4$ Multiply each side of the equation by 4.

$28 = n$ Simplify.

Check $7 = \frac{n}{4}$ Write the original equation.

$7 \stackrel{?}{=} \frac{28}{4}$ Replace n with 28.

$7 = 7$ ✓ Is this sentence true?

4 Solve $\frac{d}{3.5} = 4.2$.

$\frac{d}{3.5} = 4.2$ Write the equation.

$\frac{d}{3.5} \cdot 3.5 = 4.2 \cdot 3.5$ Multiply each side by 3.5.

$d = 14.7$ Simplify.

The solution is 14.7.

Check $\frac{d}{3.5} = 4.2$ Write the original equation.

$\frac{14.7}{3.5} \stackrel{?}{=} 4.2$ Replace d with 14.7.

$4.2 = 4.2$ ✓ Is this sentence true?

✓ CHECK Your Progress

Solve each equation. Check your solution.

e. $6 = \frac{m}{8}$ f. $\frac{p}{2.8} = 1.5$ g. $\frac{k}{4.7} = 2.3$



Study Tip

Fractions as Coefficients

The expression $\frac{3}{4}x$ can be read as $\frac{3}{4}$ of x , $\frac{3}{4}$ multiplied by x , $3x$ divided by 4, or $\frac{x}{4}$ multiplied by 3.

EXAMPLE

Solve a Multiplication Equation

5 Solve $\frac{3}{4}x = \frac{12}{20}$.

$$\frac{3}{4}x = \frac{12}{20}$$

$$\left(\frac{4}{3}\right) \cdot \frac{3}{4}x = \left(\frac{4}{3}\right) \cdot \frac{12}{20}$$

$$\frac{\cancel{4}}{\cancel{3}} \cdot \frac{\cancel{3}}{\cancel{4}}x = \frac{\cancel{4}}{\cancel{3}} \cdot \frac{12}{20}$$

$$x = \frac{4}{5}$$

Write the equation.

Multiply each side by the reciprocal of $\frac{3}{4}$, $\frac{4}{3}$.

Divide by common factors.

Simplify.

✓ CHECK Your Progress

Solve each equation. Check your solution.

h. $\frac{1}{2}x = 8$

i. $\frac{3}{4}x = 9$

j. $\frac{7}{8}x = \frac{21}{64}$

ISTEP+ EXAMPLE

Preparation for 7.2.2

6 Valerie needs $\frac{2}{3}$ yard of fabric to make each hat for the school play. How many hats can she make with 6 yards of fabric?

A 12

C 8

B 9

D 4

Read the Item

Each hat needs $\frac{2}{3}$ yard of fabric. Given the number of hats, you would multiply by $\frac{2}{3}$ to find the number of yards of fabric needed.

Solve the Item

Write and solve a multiplication equation.

$$\frac{2}{3}n = 6$$

Write the equation.

$$\left(\frac{3}{2}\right) \cdot \frac{2}{3}n = \left(\frac{3}{2}\right) \cdot 6$$

Multiply each side by $\frac{3}{2}$.

$$n = 9$$

Simplify.

So, the answer is B.

✓ CHECK Your Progress

k. Wilson has 9 pounds of trail mix. How many $\frac{3}{4}$ -pound bags of trail mix can he make?

F 3

H 9

G 6

J 12

Test-Taking Tip

Verify Your Answer

It is a good idea to verify your answer by checking the other answer choices. By doing so, you can greatly reduce your chances of making an error.



CHECK Your Understanding

Examples 1, 2
(p. 258)

Find the multiplicative inverse of each number.

1. $\frac{8}{5}$ 2. $\frac{2}{9}$ 3. $5\frac{4}{5}$ 4. 9

Examples 3–5
(p. 259–260)

Solve each equation. Check your solution.

5. $\frac{k}{16} = 2$ 6. $4 = \frac{y}{3}$ 7. $\frac{b}{8.2} = 2.5$
8. $0.5 = \frac{h}{3.6}$ 9. $\frac{3}{8}a = \frac{12}{40}$ 10. $6 = \frac{4}{7}x$

Example 5
(p. 260)

11. **FRUIT** Three fourths of the fruit in a refrigerator are apples. There are 24 apples in the refrigerator. The number of pieces of fruit is given by the equation $\frac{3}{4}f = 24$. How many pieces of fruit are in the refrigerator?

Example 6
(p. 260)

12. **MULTIPLE CHOICE** Dillon deposited $\frac{3}{4}$ of his paycheck into the bank. The deposit slip shows how much he deposited. What was the amount of his paycheck?
- A \$15 C \$60
B \$33.75 D \$75



Practice and Problem Solving

HOMEWORK HELP

For Exercises	See Examples
13–20	1, 2
21–26 33–34	3, 4
27–32	5
51–52	6

Find the multiplicative inverse of each number.

13. $\frac{5}{6}$ 14. $\frac{11}{2}$ 15. $\frac{1}{6}$ 16. $\frac{1}{10}$
17. 3 18. 14 19. $5\frac{1}{8}$ 20. $6\frac{2}{3}$

Solve each equation. Check your solution.

21. $\frac{x}{12} = 3$ 22. $28 = \frac{d}{4}$ 23. $\frac{b}{2.4} = 6$
24. $5 = \frac{w}{4.9}$ 25. $0.8 = \frac{h}{3.6}$ 26. $\frac{m}{4.6} = 2.8$
27. $\frac{2}{5}t = \frac{12}{25}$ 28. $\frac{24}{16} = \frac{3}{4}a$ 29. $\frac{7}{8}k = \frac{5}{6}$
30. $\frac{2}{3} = \frac{8}{3}b$ 31. $\frac{1}{2}g = 3\frac{1}{3}$ 32. $\frac{3}{5}c = 6\frac{1}{4}$

33. **DISTANCE** The distance d Toya travels in her car while driving 60 miles per hour for 3.25 hours is given by the equation $\frac{d}{3.25} = 60$. How far did she travel?

34. **ANIMALS** An adult Fitch ferret weighs about 1.8 kilograms. To find its weight in pounds p , you can use the equation $\frac{p}{1.8} = 2.2$. How many pounds does an adult Fitch ferret weigh?



Solve each equation. Check your solution.

35. $\frac{a}{-5} = 15$

36. $-8 = \frac{r}{-2}$

37. $34.5 = \frac{5}{6}m$

38. $\frac{5}{7}x = -1.5$

39. $\frac{1}{4}t = \frac{3}{8}$

40. $\frac{3}{8}m = 1\frac{1}{2}$

For Exercises 41–46, define a variable and write an equation. Then solve.

41. **CAVES** The self-guided Mammoth Cave Discovery Tour includes an elevation change of 140 feet. This is $\frac{7}{15}$ of the elevation change on the Wild Cave Tour. What is the elevation change on the Wild Cave Tour?

42. **MUSEUMS** Twenty-four students brought their permission slips to attend the class field trip to the local art museum. If this represented $\frac{4}{5}$ of the class, how many students are in the class?

43. **MEASUREMENT** If one serving of cooked rice is $\frac{3}{4}$ cup, how many servings will $16\frac{1}{2}$ cups of rice yield?

44. **HIKING** After Alana hiked $2\frac{5}{8}$ miles along a hiking trail, she realized that she was only $\frac{3}{4}$ of the way to the end of the trail. How long is the trail?

45. **SLEEP** The average person spends $\frac{1}{3}$ of his life asleep. According to this, if a person has spent 26 years asleep, how old is he?

46. **ANALYZE TABLES** Tierra recorded the distance she ran each day last week. If she ran $\frac{5}{6}$ of her weekly running goal, what was her running goal?

Distance Ran in One Week	
Day	Distance (mi)
Monday	$1\frac{3}{4}$
Wednesday	2
Friday	$1\frac{1}{2}$
Saturday	$2\frac{1}{4}$

47. **REASONING** Complete the statement: If $8 = \frac{m}{4}$, then $m - 12 = \square$. Explain your reasoning.

48. **Which One Doesn't Belong?** Identify the pair of numbers that does not belong with the other three. Explain.

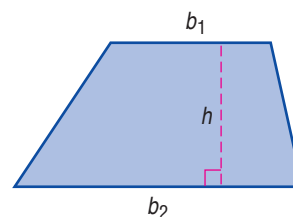
$\frac{9}{6}, \frac{6}{9}$

$4, \frac{1}{4}$

$\frac{3}{5}, 5$

$\frac{2}{7}, \frac{7}{2}$

49. **CHALLENGE** The formula for the area of a trapezoid is $A = \frac{1}{2}h(b_1 + b_2)$, where b_1 and b_2 are both bases and h is the height. Find the value of h in terms of A , b_1 , and b_2 . Justify your answer.



50. **WRITING IN MATH** Explain the Multiplication Property of Equality. Then give an example of an equation in which you would use this property to solve the equation.



Real-World Link . . .

Kentucky's Mammoth Cave is the longest recorded cave system in the world, with more than 360 miles explored and mapped. The Wild Cave Tour requires visitors to crawl through an opening only 9 inches high.

Source: National Park Service

Academic Standards • ISTEP+
Extra Practice, pp. 681, 708



H.O.T. Problems

ISTEP+ PRACTICE Preparation for 7.2.2

51. Audrey drove 200 miles in 3.5 hours. Which equation can you use to find the rate r at which Audrey was traveling?

- A $200 = 3.5r$
 B $200 \cdot 3.5 = r$
 C $\frac{r}{3.5} = 200$
 D $200r = 3.5$

52. The table shows the results of a survey.

Music Preference	
Type	Fraction of Students
pop	$\frac{5}{8}$
jazz	$\frac{1}{8}$
rap	$\frac{1}{4}$

If there are 420 students surveyed, which equation can be used to find the number of students s who prefer rap?

- F $\frac{1}{4}s = 420$ H $s + \frac{1}{4} = 420$
 G $s = \frac{1}{4} \cdot 420$ J $420 + s = \frac{1}{4}$

Spiral Review

Multiply. Write in simplest form. (Lesson 5-5)

53. $\frac{3}{8} \times \frac{4}{9}$

54. $1\frac{1}{2} \times 6$

55. $2\frac{2}{5} \times \frac{1}{6}$

56. $1\frac{1}{2} \times 1\frac{7}{9}$

57. **COOKING** Lawana had $4\frac{2}{3}$ cups of chopped walnuts. She used $1\frac{1}{4}$ cups in a recipe. How many cups of chopped walnuts are left? (Lesson 5-3)

Write each percent as a decimal. (Lesson 4-7)

58. 25%

59. 8%

60. 25.6%

61. 123%

62. **MEASUREMENT** A farmer has a rectangular pumpkin field with a perimeter of 3,800 feet. If the width of the pumpkin field is 800 feet, what is the length of the field? (Lesson 3-6)

ALGEBRA Solve each equation. Check your solution. (Lesson 3-2)

63. $7 = x + 8$

64. $k - 3 = -14$

65. $-2 = m + 6$

66. **ALGEBRA** The table shows the time needed to complete 4 art projects. If the pattern continues, how much time is needed to complete the fifth art project? (Lesson 2-7)

Project	1	2	3	4	5
Time (min)	8	25	42	59	■

GET READY for the Next Lesson

PREREQUISITE SKILL Estimate. (Lesson 5-1)

67. $18\frac{1}{6} \div 3$

68. $24\frac{3}{8} \div 11\frac{7}{9}$

69. $\frac{2}{11} \div \frac{11}{12}$

70. $\frac{9}{10} \div \frac{6}{7}$

READING to SOLVE PROBLEMS

Meaning of Division

You know that one meaning of division is to *put objects into equal groups*. But there are other meanings too. Look for these meanings when you're solving a word problem.

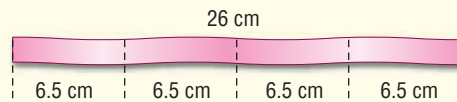
• To share

Zach and his friend are going to share 3 apples equally. How many apples will each boy have?



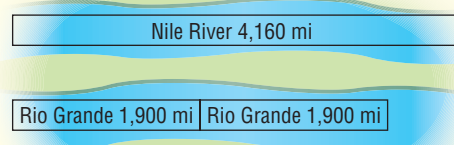
• To take away equal amounts

Isabel is making bookmarks from a piece of ribbon. Each bookmark is 6.5 centimeters long. How many bookmarks can she make from a piece of ribbon that is 27 centimeters long?



• To find how many times greater

The Nile River, the longest river on Earth, is 4,160 miles long. The Rio Grande River is 1,900 miles long. About how many times longer is the Nile than the Rio Grande?



PRACTICE

1. Solve each problem above.

Identify the meaning of division shown in each problem.

Then solve the problem.

2. A landscape architect wants to make a border along one side of a garden using bricks that are 0.25 meter long. If the garden is 11.25 meters long, how many bricks does she need?
3. The Jackson family wants to buy a flat-screen television that costs \$1,200. They plan to pay in six equal payments. What will be the amount of each payment?
4. A full-grown blue whale can weigh 150 tons. An adult African elephant weighs about 5 tons. How many times greater does a blue whale weigh than an African elephant?
5. Each story in an office building is about 4 meters tall. The Eiffel Tower in Paris, France, is 300 meters tall. How many stories tall is the Eiffel Tower?

5-7

Dividing Fractions and Mixed Numbers

MAIN IDEA

Divide fractions and mixed numbers.

IN Academic Standards

7.1.7 Solve problems that involve multiplication and division with integers, fractions, decimals and combinations of the four operations. Also addresses P.5.1, P.5.2, P.5.3, P.6.2.

IN Math Online

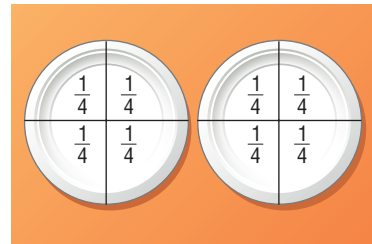
glencoe.com

- Concepts In Motion
- Extra Examples
- Personal Tutor
- Self-Check Quiz

MINI Lab

Cut two paper plates into four equal pieces each to show $2 \div \frac{1}{4}$.

1. How many $\frac{1}{4}$'s are in 2 plates?
2. How would you model $3 \div \frac{1}{2}$?
3. What is true about $3 \div \frac{1}{2}$ and 3×2 ?



Dividing 8 by 2 gives the same result as multiplying 8 by $\frac{1}{2}$, which is the reciprocal of 2. In the same way, dividing 4 by $\frac{1}{3}$ is the same as multiplying 4 by the reciprocal of $\frac{1}{3}$, or 3.

$$\begin{array}{ccc}
 \text{reciprocals} & & \text{reciprocals} \\
 \swarrow & & \swarrow \\
 8 \div 2 = 4 & 8 \cdot \frac{1}{2} = 4 & 4 \div \frac{1}{3} = 12 & 4 \cdot 3 = 12 \\
 \searrow & \swarrow & \swarrow & \searrow \\
 & \text{same result} & & \text{same result}
 \end{array}$$

Is this pattern true for any division expression?

Consider $\frac{7}{8} \div \frac{3}{4}$, which can be rewritten as $\frac{\frac{7}{8}}{\frac{3}{4}}$.

$$\frac{7}{8} = \frac{7}{8} \times \frac{4}{3}$$

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

Multiply the numerator and denominator by the reciprocal of $\frac{3}{4}$, which is $\frac{4}{3}$.

$$= \frac{7}{8} \times \frac{4}{3}$$

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

$$= \frac{7}{8} \times \frac{4}{3}$$

So, $\frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \times \frac{4}{3}$. These examples suggest the following rule.

Divide by Fractions

Key Concept

Words To divide by a fraction, multiply by its multiplicative inverse, or reciprocal.

Examples

Numbers

$$\frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \cdot \frac{4}{3}$$

Algebra

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}, \text{ where } b, c, d \neq 0$$



EXAMPLE Divide by a Fraction

1 Find $\frac{3}{4} \div \frac{1}{2}$. Write in simplest form.

Estimate $1 \div \frac{1}{2} = \blacksquare$

Think: How many groups of $\frac{1}{2}$ are in 1? $1 \div \frac{1}{2} = 2$

$$\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \cdot \frac{2}{1} \quad \text{Multiply by the reciprocal of } \frac{1}{2}, \text{ which is } \frac{2}{1}.$$

$$= \frac{3}{\cancel{4}^2} \cdot \frac{\cancel{2}^1}{1} \quad \text{Divide 4 and 2 by their GCF, 2.}$$

$$= \frac{3}{2} \text{ or } 1\frac{1}{2} \quad \text{Multiply.}$$

Check for Reasonableness $1\frac{1}{2} \approx 2$ ✓

✓ CHECK Your Progress

Divide. Write in simplest form.

a. $\frac{3}{4} \div \frac{1}{4}$

b. $\frac{4}{5} \div \frac{8}{9}$

c. $\frac{5}{6} \div \frac{2}{3}$

To divide by a mixed number, first rename the mixed number as an improper fraction. Then multiply the first fraction by the reciprocal, or multiplicative inverse, of the second fraction.

EXAMPLE Divide by Mixed Numbers

2 Find $\frac{2}{3} \div 3\frac{1}{3}$. Write in simplest form.

Estimate $\frac{1}{2} \div 3 = \frac{1}{2} \times \frac{1}{3} \text{ or } \frac{1}{6}$

$$\frac{2}{3} \div 3\frac{1}{3} = \frac{2}{3} \div \frac{10}{3} \quad \text{Rename } 3\frac{1}{3} \text{ as an improper fraction.}$$

$$= \frac{2}{3} \cdot \frac{3}{10} \quad \text{Multiply by the reciprocal of } \frac{10}{3}, \text{ which is } \frac{3}{10}.$$

$$= \frac{\cancel{2}^1}{\cancel{3}^1} \cdot \frac{\cancel{3}^1}{10} \quad \text{Divide out common factors.}$$

$$= \frac{1}{5} \quad \text{Multiply.}$$

Check for Reasonableness $\frac{1}{5}$ is close to $\frac{1}{6}$. ✓

✓ CHECK Your Progress

Divide. Write in simplest form.

d. $5 \div 1\frac{1}{3}$

e. $-\frac{3}{4} \div 1\frac{1}{2}$

f. $2\frac{1}{3} \div 5$

g. **NUTS** In planning for a party, $5\frac{1}{4}$ pounds of cashews will be divided into $\frac{3}{4}$ -pound bags. How many such bags can be made?

Study Tip

Dividing by a Whole Number

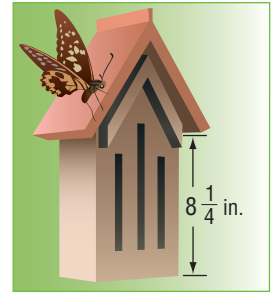
Remember that a whole number can be written as a fraction with a 1 in the denominator.

So, $2\frac{1}{3} \div 5$ can be rewritten as $2\frac{1}{3} \div \frac{5}{1}$.



Real-World EXAMPLE

- 3 WOODWORKING** Students in a woodworking class are making butterfly houses. The side pieces of the house need to be $8\frac{1}{4}$ inches long. How many side pieces can be cut from a board measuring $49\frac{1}{2}$ inches long?



To find how many side pieces can be cut, divide $49\frac{1}{2}$ by $8\frac{1}{4}$.

Estimate Use compatible numbers. $48 \div 8 = 6$

$$\begin{aligned}
 49\frac{1}{2} \div 8\frac{1}{4} &= \frac{99}{2} \div \frac{33}{4} && \text{Rename the mixed numbers as improper fractions.} \\
 &= \frac{99}{2} \cdot \frac{4}{33} && \text{Multiply by the reciprocal of } \frac{33}{4}, \text{ which is } \frac{4}{33}. \\
 &= \frac{\overset{3}{\cancel{99}}}{\underset{1}{\cancel{2}}} \cdot \frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{33}}} && \text{Divide out common factors.} \\
 &= \frac{6}{1} \text{ or } 6 && \text{Multiply.}
 \end{aligned}$$



So, 6 side pieces can be cut.

Check for Reasonableness The answer matches the estimate. ✓

✓ CHECK Your Progress

- h. **FOOD** Suppose a small box of cereal contains $12\frac{2}{3}$ cups of cereal. How many $1\frac{1}{3}$ -cup servings are in the box?
- i. **MEASUREMENT** The area of a rectangular bedroom is $146\frac{7}{8}$ square feet. If the width of the bedroom is $11\frac{3}{4}$ feet, find the length.

✓ CHECK Your Understanding

Examples 1–3
(pp. 266–267)

Divide. Write in simplest form.

1. $\frac{1}{8} \div \frac{1}{3}$

2. $\frac{3}{5} \div \frac{1}{4}$

3. $3 \div \frac{6}{7}$

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

5. $\frac{1}{2} \div 7\frac{1}{2}$

6. $\frac{4}{7} \div 1\frac{2}{7}$

7. $5\frac{3}{5} \div 4\frac{2}{3}$

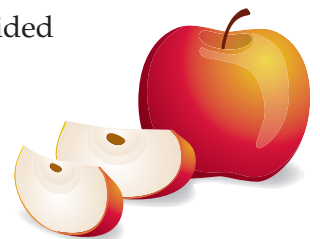
8. $6\frac{1}{2} \div 3\frac{5}{7}$

Example 2
(p. 266)

9. **FOOD** Deandre has 7 apples, and each apple is divided evenly into eighths. How many apple slices does Deandre have?

Example 3
(p. 267)

10. **WALKING** On Saturday, Lindsay walked $3\frac{1}{2}$ miles in $1\frac{2}{5}$ hours. What was her walking pace, in miles per hour?





Practice and Problem Solving

HOMEWORK HELP

For Exercises	See Examples
11–14	1
15–32	2, 3

Divide. Write in simplest form.

11. $\frac{3}{8} \div \frac{6}{7}$

12. $\frac{5}{9} \div \frac{5}{6}$

13. $\frac{2}{3} \div \frac{1}{2}$

14. $\frac{7}{8} \div \frac{3}{4}$

15. $6 \div \frac{1}{2}$

16. $\frac{4}{9} \div 2$

17. $2\frac{2}{3} \div 4$

18. $5 \div 1\frac{1}{3}$

19. **FOOD** Mason has 8 cups of popcorn kernels to divide into $\frac{2}{3}$ -cup portions. How many portions will there be?

20. **MOVIES** Cheryl is organizing her movie collection. If each movie case is $\frac{3}{4}$ inch wide, how many movies can fit on a shelf 5 feet wide?

Divide. Write in simplest form.

21. $\frac{2}{3} \div 2\frac{1}{2}$

22. $\frac{8}{9} \div 5\frac{1}{3}$

23. $4\frac{1}{2} \div 6\frac{3}{4}$

24. $5\frac{2}{7} \div 2\frac{1}{7}$

25. $3\frac{4}{5} \div 1\frac{1}{3}$

26. $9\frac{1}{2} \div 2\frac{5}{6}$

27. $5\frac{1}{5} \div \frac{2}{3}$

28. $6\frac{7}{8} \div \frac{3}{4}$

29. **ICE CREAM** Vinh bought $4\frac{1}{2}$ gallons of ice cream to serve at his birthday party. If a pint is $\frac{1}{8}$ of a gallon, how many pint-sized servings can be made?

30. **BEVERAGES** William has $8\frac{1}{4}$ cups of fruit juice. If he divides the juice into $\frac{3}{4}$ -cup servings, how many servings will he have?

BIRDS For Exercises 31 and 32, use the table that gives information about several types of birds of prey found at the Woodland Park Zoo in Seattle, Washington.

31. How many times as heavy is the Golden Eagle as the Red-tailed Hawk?

32. How many times as heavy is the Golden Eagle as the Northern Bald Eagle?

Bird	Maximum Weight (lb)
Golden Eagle	$13\frac{9}{10}$
Northern Bald Eagle	$9\frac{9}{10}$
Red-Tailed Hawk	$3\frac{1}{2}$

Source: Woodland Park Zoo

Draw a model of each verbal expression and then evaluate the expression. Explain how the model shows the division process.

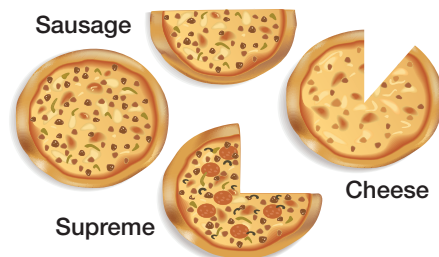
33. one half divided by two fifths

34. five eighths divided by one fourth

35. one and three eighths divided by one half

36. two and one sixth divided by two thirds

37. **PIZZA** A concession stand sells three types of pizza. The diagram shows how much pizza of each type is left after the concession stand was open for one hour. If the pizza is sold in slices that are $\frac{1}{8}$ of a whole pizza, how many more slices can be sold?



Real-World Link

Red-tailed hawks are large, stocky birds with long, broad wings and short, broad tails. Females are larger than males and can weigh up to $3\frac{1}{2}$ pounds.

Source: Woodland Park Zoo



ALGEBRA Evaluate each expression if $g = \frac{1}{6}$, $h = \frac{1}{2}$, and $j = 3\frac{2}{3}$.

38. $j \div h$ 39. $g \div j$ 40. $3g \div h$ 41. $h \div \left(\frac{1}{2}j\right)$

42. **SHOPPING** A supermarket sells pretzels in $\frac{3}{4}$ -ounce snack-sized bags or $12\frac{1}{2}$ -ounce regular-sized bags. How many times larger is the regular-sized bag than the snack-sized bag?

43. **MEASUREMENT** A recipe calls for $2\frac{2}{3}$ cups of brown sugar and $\frac{2}{3}$ cup of confectioner's sugar. How many times greater is the number of cups of brown sugar in the recipe than of confectioner's sugar?

SCHOOL For Exercises 44 and 45, use the table that shows the number of hours students spend studying each week during the school year.

Weekly Study Hours	
Hours	Fraction of Students
none	$\frac{1}{50}$
1-2	$\frac{2}{25}$
3-5	$\frac{11}{50}$
6-7	$\frac{17}{100}$
8-10	$\frac{1}{5}$
Over 10	$\frac{1}{5}$
Not sure	$\frac{3}{25}$

Source: Time Magazine

44. How many times greater was the number of students who spent over 10 hours each week studying than those who spent only 1-2 hours each week studying?

45. How many times greater was the number of students who spent 3 or more hours each week studying than those who spent less than 3 hours each week studying?

46. **SCHOOL SUPPLIES** Tara bought a dozen folders. She took $\frac{1}{3}$ of the dozen and then divided the remaining folders equally among her four friends. What fraction of the dozen did each of her four friends receive and how many folders was this per person?

47. **WEATHER** A meteorologist has issued a thunderstorm warning. So far, the storm has traveled 35 miles in $\frac{1}{2}$ hour. If it is currently 5:00 P.M., and the storm is 105 miles away from you, at what time will the storm reach you? Explain how you solved the problem.

Academic Standards • ISTEP+
Extra Practice, pp. 681, 708



H.O.T. Problems

48. **CHALLENGE** If $\frac{5}{6}$ is divided by a certain fraction $\frac{a}{b}$, the result is $\frac{1}{4}$. What is the fraction $\frac{a}{b}$?

49. **SELECT A TOOL** Reynaldo cut a rope to make the running knot shown. The rope used to make the knot was $1\frac{1}{2}$ feet long and was $\frac{3}{4}$ of the original rope length. Which of the following tools could be used to determine the rope's original length? Justify your selection(s). Then use your tool(s) to find the length.



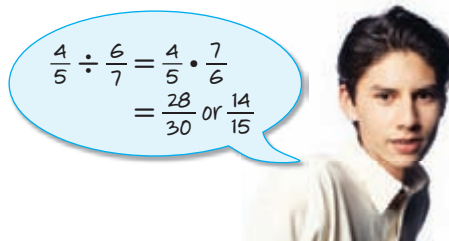
- paper and pencil
- model
- calculator
- real object

50. **FIND THE ERROR** Evan and José are finding $\frac{4}{5} \div \frac{6}{7}$. Who is correct? Explain your reasoning.



Evan

$$\begin{aligned}\frac{4}{5} \div \frac{6}{7} &= \frac{5}{4} \cdot \frac{6}{7} \\ &= \frac{30}{28} \text{ or } 1\frac{1}{14}\end{aligned}$$



José

$$\begin{aligned}\frac{4}{5} \div \frac{6}{7} &= \frac{4}{5} \cdot \frac{7}{6} \\ &= \frac{28}{30} \text{ or } \frac{14}{15}\end{aligned}$$

51. **WRITING IN MATH** If you divide a proper fraction by another proper fraction, is it possible to get a mixed number as an answer? Explain your reasoning.

ISTEP+ PRACTICE 7.1.7

52. The Corbett family owns 300 acres of land that they plan to rent to people for their horses. How many $7\frac{1}{2}$ -acre lots can they make using the 300 acres?
- A 21 C $40\frac{1}{2}$
B 40 D $292\frac{1}{2}$
53. How many $1\frac{1}{8}$ -pound boxes of peanuts can be made using $6\frac{3}{4}$ pounds of peanuts?
- F 4 H 6
G 5 J 7

Spiral Review

Find the multiplicative inverse of each number. (Lesson 5-6)

54. $\frac{6}{7}$

55. $\frac{4}{13}$

56. 8

57. $5\frac{1}{4}$

58. Find $\frac{1}{10} \times \frac{5}{8}$. Write in simplest form. (Lesson 5-5)

59. **MEASUREMENT** Find the length of a rectangular flower bed if the perimeter is 12 feet and the width is 1.5 feet. (Lesson 3-6)

60. **ANIMALS** An elephant herd can move 50 miles in a day. At this rate, about how many miles can an elephant herd move each hour? (Lesson 1-1)

Problem Solving in Geography



Real-World Unit Project

A Traveling We Will Go It's time to complete your project. Use the data you have gathered about schedules and costs to prepare a travel brochure for your vacation destination. Be sure to include a paragraph describing why you chose your vacation spot.

IN Math Online

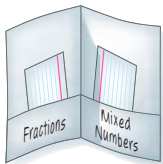
Unit Project at glencoe.com

FOLDABLES

Study Organizer

▶ GET READY to Study

Be sure the following Big Ideas are noted in your Foldable.



BIG Ideas

Estimating with Fractions (Lesson 5-1)

- When the numerator is much smaller than the denominator, round the fraction to 0.
- When the numerator is about half of the denominator, round the fraction to $\frac{1}{2}$.
- When the numerator is almost as large as the denominator, round the fraction to 1.

Adding and Subtracting Fractions

(Lessons 5-2 and 5-3)

- To add or subtract like fractions, add or subtract the numerators and write the result over the denominator.
- To add or subtract unlike fractions, rename the fractions using the LCD. Then add or subtract as with like fractions.
- To add or subtract mixed numbers, first add or subtract the fractions. If necessary, rename them using the LCD. Then add or subtract the whole numbers and simplify if necessary.

Multiplying and Dividing Fractions

(Lessons 5-5 and 5-7)

- To multiply fractions, multiply the numerators and multiply the denominators.
- The product of a number and its multiplicative inverse is 1.
- To divide by a fraction, multiply by its multiplicative inverse, or reciprocal.

Solving Equations (Lesson 5-6)

If you multiply each side of an equation by the same nonzero number, the two sides remain equal.

Key Vocabulary

compatible numbers

(p. 232)

multiplicative inverse (p. 258)

reciprocal (p. 258)

like fractions (p. 236)

unlike fractions (p. 237)

Vocabulary Check

Choose the correct term or number to complete each sentence.

1. To add like fractions, add the (numerators, denominators).
2. The symbol \approx means (*approximately*, *exactly*) equal to.
3. When dividing by a fraction, multiply by its (value, reciprocal).
4. When estimating, if the numerator of a fraction is much smaller than the denominator, round the fraction to $(0, \frac{1}{2})$.
5. Fractions with different denominators are called (like, unlike) fractions.
6. The multiplicative inverse of $\frac{5}{6}$ is $(\frac{6}{5}, -\frac{5}{6})$.
7. The mixed number $2\frac{4}{7}$ can be renamed as $(2\frac{7}{7}, 1\frac{11}{7})$.
8. When multiplying fractions, multiply the numerators and (multiply, keep) the denominators.
9. The reciprocal of $\frac{1}{3}$ is $(-3, 3)$.
10. The fractions $\frac{4}{16}$ and $\frac{2}{4}$ are (like, unlike) fractions.
11. Another word for multiplicative inverse is (reciprocal, denominator).
12. The fraction $\frac{x}{2}$ can be read x multiplied by $(2, \frac{1}{2})$.

Lesson-by-Lesson Review

5-1

Estimating with Fractions (pp. 230–235)



7.1.7

Estimate.

13. $2\frac{9}{10} \div 1\frac{1}{8}$

14. $6\frac{2}{9} - 5\frac{1}{7}$

15. $\frac{13}{15} \times \frac{1}{5}$

16. $\frac{1}{2} + \frac{3}{8}$

17. $\frac{1}{2} \cdot 25$

18. $15\frac{6}{7} \div 7\frac{1}{3}$

19. **MEASUREMENT** Gina wishes to carpet her living room. It has a length of $18\frac{5}{8}$ feet and the width of her living room is $9\frac{1}{2}$ feet. About how many square feet of carpet would be needed for her living room?

20. **FOOTBALL** Jamil practiced football for $1\frac{3}{4}$ hours on Saturday and $2\frac{2}{3}$ hours on Sunday. About how many more hours did he practice on Sunday than on Saturday?

Example 1 Estimate $5\frac{1}{12} + 2\frac{5}{6}$.

1 is much smaller than 12, so $5\frac{1}{12} \approx 5$.

5 is almost as large as 6, so $2\frac{5}{6} \approx 3$.

$$5\frac{1}{12} + 2\frac{5}{6} \approx 5 + 3 \text{ or } 8$$

The sum is *about* 8.

Example 2 Estimate $\frac{7}{8} - \frac{4}{7}$.

7 is almost as large as 8, so $\frac{7}{8} \approx 1$.

4 is about half of 7, so $\frac{4}{7} \approx \frac{1}{2}$.

$$\frac{7}{8} - \frac{4}{7} \approx 1 - \frac{1}{2} \text{ or } \frac{1}{2}$$

The difference is *about* $\frac{1}{2}$.

5-2

Adding and Subtracting Fractions (pp. 236–241)



6.1.6

Add or subtract. Write in simplest form.

21. $\frac{2}{6} - \frac{1}{6}$

22. $\frac{3}{7} + \frac{9}{14}$

23. $\frac{1}{9} + \frac{5}{9}$

24. $\frac{9}{10} - \frac{3}{10}$

25. $\frac{5}{8} - \frac{5}{12}$

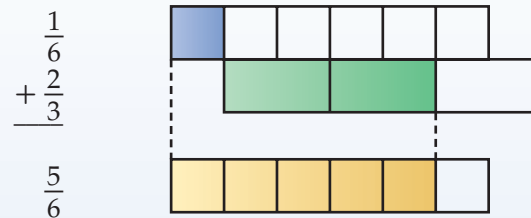
26. $\frac{3}{4} + \frac{7}{20}$

27. **RAIN** At 8 A.M., Della's rain gauge read $\frac{1}{8}$ inch. By 4 P.M., the gauge read $\frac{3}{4}$ inch. How much rain fell between 8 A.M. and 4 P.M.?

28. **PIZZA** Owen ate $\frac{1}{8}$ of a pizza Tuesday night. The next day, he ate an additional $\frac{1}{2}$ of the pizza. What fraction of the pizza has he eaten?

Example 3 Find $\frac{1}{6} + \frac{2}{3}$.

Use a model.



Example 4 Find $\frac{3}{10} - \frac{1}{4}$.

$$\begin{aligned} \frac{3}{10} - \frac{1}{4} &= \frac{6}{20} - \frac{5}{20} \\ &= \frac{1}{20} \end{aligned}$$

Rename the fractions using the LCD, 20.

Subtract the numerators.

5-3

Adding and Subtracting Mixed Numbers (pp. 242–246)



6.1.6

Add or subtract. Write in simplest form.

29. $3\frac{2}{15} + 6\frac{9}{15}$

30. $4\frac{1}{3} - 2\frac{2}{3}$

31. $8\frac{2}{7} + 1\frac{6}{7}$

32. $7\frac{11}{12} - 4\frac{3}{12}$

33. $7\frac{3}{5} - 5\frac{1}{3}$

34. $5\frac{3}{4} + 1\frac{1}{6}$

35. $3\frac{5}{8} + 11\frac{1}{2}$

36. $4\frac{3}{10} - 2\frac{4}{5}$

37. **BABYSITTING** Lucas watched his little sister for $2\frac{1}{2}$ hours on Friday, $3\frac{2}{3}$ hours on Saturday, and $1\frac{3}{4}$ hours on Sunday. How many hours did Lucas watch his little sister?

Example 5 Find $5\frac{2}{3} + 3\frac{1}{2}$.

$$5\frac{2}{3} + 3\frac{1}{2} = 5\frac{4}{6} + 3\frac{3}{6}$$

Rename the fractions.

$$= 8\frac{7}{6}$$

Add the whole numbers and add the fractions.

$$= 9\frac{1}{6}$$

$$8\frac{7}{6} = 8 + 1\frac{1}{6} \text{ or } 9\frac{1}{6}$$

Example 6 Find $4\frac{1}{5} - 2\frac{3}{5}$.

$$4\frac{1}{5} - 2\frac{3}{5} = 3\frac{6}{5} - 2\frac{3}{5}$$

Rename $4\frac{1}{5}$ as $3\frac{6}{5}$.

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

Subtract the whole numbers and subtract the fractions.

5-4

PSI: Eliminate Possibilities (pp. 248–249)



P.1.3,
P.2.4

Solve by eliminating possibilities.

38. **SCHOOL** It takes Beth 15 minutes to walk to school, $\frac{1}{2}$ mile away. What is her walking pace?
A 2 miles per hour
B 1 mile per hour
C 7.5 miles per hour
D 30 miles per hour
39. **COOKING** Which of the following would yield a larger batch of bagels?
F Multiply a recipe by $\frac{1}{2}$.
G Divide a recipe by $\frac{1}{2}$.
H Multiply a recipe by $\frac{3}{4}$.
J Divide a recipe by 3.

Example 7 A group of friends went to a theme park. Six of the friends rode the Ferris wheel. If this was $\frac{2}{3}$ of the group, how many friends were in the group?

- A 3
B 6
C 9
D 12

Since 6 friends rode the Ferris wheel and this was $\frac{2}{3}$ of the total number of friends in the group, the number of friends in the group must be greater than 6. So, eliminate choices A and B.

If there were 12 friends in the group, the 6 that rode the Ferris wheel would represent $\frac{1}{2}$ of the group. So, eliminate choice D.

Choice C is the only remaining possibility. Since 6 out of 9 is $\frac{6}{9}$ or $\frac{2}{3}$, C is correct.

5-5

Multiplying Fractions and Mixed Numbers (pp. 252–257)



7.1.7

Multiply. Write in simplest form.

40. $\frac{3}{5} \times \frac{2}{7}$

41. $\frac{5}{12} \times \frac{4}{9}$

42. $\frac{3}{5} \times \frac{10}{21}$

43. $4 \times \frac{13}{20}$

44. $2\frac{1}{3} \times \frac{3}{4}$

45. $4\frac{1}{2} \times 2\frac{1}{12}$

46. **FOOD** An average slice of American cheese is about $\frac{1}{8}$ inch thick. What is the height of a package containing 20 slices?

Example 8 Find $\frac{5}{9} \times \frac{2}{3}$.

$$\frac{5}{9} \times \frac{2}{3} = \frac{5 \times 2}{9 \times 3}$$

Multiply the numerators and multiply the denominators.

$$= \frac{10}{27}$$

Simplify.

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

$$3\frac{1}{2} \times 2\frac{3}{4} = \frac{7}{2} \times \frac{11}{4}$$

Rename $3\frac{1}{2}$ and $2\frac{3}{4}$.

$$= \frac{7 \times 11}{2 \times 4}$$

Multiply the numerators and multiply the denominators.

$$= \frac{77}{8} \text{ or } 9\frac{5}{8}$$

Simplify.

5-6

Algebra: Solving Equations (pp. 258–263)



7.2.2

Find the multiplicative inverse of each number.

47. $\frac{7}{12}$

48. 5

49. $3\frac{1}{3}$

Solve each equation. Check your solution.

50. $8 = \frac{w}{2}$

51. $\frac{4}{5}b = 12$

52. $-7.6 = \frac{n}{3}$

53. $\frac{x}{0.3} = 2.5$

54. **BOOKS** Of the books on a shelf, $\frac{2}{3}$ are mysteries. If there are 10 mystery books, how many books are on the shelf?

Example 10 Find the multiplicative inverse of $\frac{9}{5}$.

$$\frac{9}{5} \cdot \frac{5}{9} = 1$$

The product of $\frac{9}{5}$ and $\frac{5}{9}$ is 1.The multiplicative inverse of $\frac{9}{5}$ is $\frac{5}{9}$.**Example 11** Solve $\frac{3}{4}g = 2$.

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

Write the equation.

$$\frac{4}{3} \cdot \frac{3}{4}g = \frac{4}{3} \cdot 2$$

Multiply each side by the reciprocal of $\frac{3}{4}$.

$$g = \frac{8}{3} \text{ or } 2\frac{2}{3}$$

Simplify.

5-7

Dividing Fractions and Mixed Numbers (pp. 265–270)



7.1.7

Divide. Write in simplest form.

55. $\frac{3}{5} \div \frac{6}{7}$

56. $4 \div \frac{2}{3}$

57. $2\frac{3}{4} \div \frac{5}{6}$

58. $-\frac{2}{5} \div 3$

59. $4\frac{3}{10} \div 2\frac{1}{5}$

60. $-\frac{2}{7} \div \frac{8}{21}$

61. **MEASUREMENT** How many $\frac{1}{8}$ -inch lengths are in $6\frac{3}{4}$ inches?

Example 12 Find $2\frac{4}{5} \div \frac{7}{10}$.

$$2\frac{4}{5} \div \frac{7}{10} = \frac{14}{5} \div \frac{7}{10}$$

Rename $2\frac{4}{5}$.

$$= \frac{14}{5} \cdot \frac{10}{7}$$

Multiply by the reciprocal of $\frac{7}{10}$.

$$= \frac{4}{1} \text{ or } 4$$

Simplify.

Estimate.

1. $5\frac{7}{9} - 1\frac{2}{13}$

2. $3\frac{1}{12} + 6\frac{5}{7}$

3. $\frac{3}{7} \times \frac{13}{15}$

4. $5\frac{2}{3} \div 1\frac{4}{5}$

5. **BAKING** A restaurant uses $2\frac{3}{4}$ pounds of flour to make a batch of dinner rolls. About how many pounds of flour are needed if 3 batches of dinner rolls are to be made?

Add, subtract, multiply, or divide. Write in simplest form.

6. $\frac{4}{15} + \frac{8}{15}$

7. $\frac{7}{10} - \frac{1}{6}$

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

9. $6 \times \frac{8}{21}$

10. $4\frac{5}{12} - 2\frac{1}{12}$

11. $6\frac{7}{9} + 3\frac{5}{12}$

12. $8\frac{4}{7} - 1\frac{5}{14}$

13. $4\frac{5}{6} \times 1\frac{2}{3}$

14. $\frac{8}{9} \div 5\frac{1}{3}$

15. $\frac{1}{6} \div 5$



16. **MULTIPLE CHOICE** Seth drove $5\frac{3}{4}$ miles to the bank, $6\frac{1}{3}$ miles to the post office, and $4\frac{5}{6}$ miles to the park. What is the total distance Seth drove?

A $15\frac{9}{13}$ miles

B $\frac{7}{12}$ miles

C $\frac{11}{12}$ miles

D $16\frac{11}{12}$ miles



17. **SPORTS** Tyler's football practice lasted $2\frac{1}{2}$ hours. If $\frac{1}{4}$ of the time was spent catching passes, how many hours were spent catching passes?



18. **MEASUREMENT** The floor of a moving van is $11\frac{1}{3}$ feet long and $7\frac{5}{12}$ feet wide. Find the area of the moving van floor.



19. **MULTIPLE CHOICE** For his birthday, Keith received a check from his grandmother. Of this amount, the table shows how he spent or saved the money.

Fraction of Check	How Spent or Saved
$\frac{2}{5}$	spent on baseball cards
$\frac{1}{4}$	spent on a CD
$\frac{7}{20}$	deposited into savings account

Two weeks later, he withdrew $\frac{2}{3}$ of the amount he had deposited into his savings account. What fraction of the original check did he withdraw from his savings account?

F $\frac{2}{3}$

H $\frac{7}{30}$

G $\frac{9}{23}$

J $\frac{7}{40}$



20. **MEASUREMENT** An ounce is $\frac{1}{16}$ of a pound. How many ounces are in $8\frac{3}{4}$ pounds?

ALGEBRA Solve each equation. Check your solution.

21. $\frac{y}{3.7} = 8.1$

22. $6 = \frac{2}{5}m$

23. $\frac{3}{4} = \frac{5}{8}x$

24. $3\frac{1}{6} = \frac{2}{3}p$



25. **MULTIPLE CHOICE** Maria is making a mural that is $9\frac{2}{3}$ feet long. She wants to divide the mural into sections that are each $\frac{5}{8}$ foot. Which equation can be used to find n , the number of sections in Maria's mural?

A $\frac{5}{8}n = 9\frac{2}{3}$

C $\frac{5}{8} + n = 9\frac{2}{3}$

B $9\frac{2}{3}n = \frac{5}{8}$

D $n - \frac{5}{8} = 9\frac{2}{3}$

PART 1 Multiple Choice

Read each question. Then fill in the correct answer on the answer sheet provided by your teacher or on a sheet of paper.

- Mrs. Brown needs to make two different desserts for a dinner party. The first recipe requires $2\frac{1}{4}$ cups of flour, and the second recipe requires $\frac{3}{4}$ cup less than the first. Which equation can be used to find n , the number of cups of flour needed for the second recipe?

A $n = 2\frac{1}{4} - \frac{3}{4}$ C $n = 2\frac{1}{4} + \frac{3}{4}$
 B $n = 2\frac{1}{4} \cdot \frac{3}{4}$ D $n = 2\frac{1}{4} \div \frac{3}{4}$
- Which of the following is true concerning the least common multiple of 6 and 9?

F It is greater than the least common multiple of 8 and 12.
 G It is greater than the least common multiple of 5 and 15.
 H It is less than the least common multiple of 4 and 6.
 J It is less than the least common multiple of 3 and 4.
- Kyle's hockey team has 6 sixth graders, 9 seventh graders, and 5 eighth graders. Which statement below is true?

A One fourth of the team members are sixth graders.
 B More than half of the team members are seventh graders.
 C 25% of the team members are eighth graders.
 D 30% of the team members are seventh graders.

- The fraction $\frac{5}{6}$ is found between which pair of fractions on a number line?

- F $\frac{1}{4}$ and $\frac{5}{8}$
 G $\frac{1}{3}$ and $\frac{4}{9}$
 H $\frac{11}{12}$ and $\frac{31}{36}$
 J $\frac{7}{12}$ and $\frac{17}{18}$

- The table shows the distance Kelly swam over a four-day period. What was the total distance, in miles, Kelly swam?

Kelly's Swimming	
Day	Distance (miles)
Monday	1.5
Tuesday	$2\frac{3}{4}$
Wednesday	2.3
Thursday	$3\frac{1}{2}$

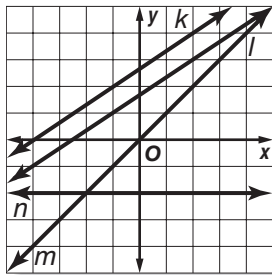
- A 10.5 miles C $10\frac{1}{20}$ miles
 B $10\frac{1}{4}$ miles D 9 miles
- Which of the following gives the correct meaning of the expression $\frac{5}{8} \div \frac{1}{3}$?

F $\frac{5}{8} \div \frac{1}{3} = \frac{8}{5} \times \frac{3}{1}$
 G $\frac{5}{8} \div \frac{1}{3} = \frac{5}{8} \times \frac{3}{1}$
 H $\frac{5}{8} \div \frac{1}{3} = \frac{5+1}{8+3}$
 J $\frac{5}{8} \div \frac{1}{3} = \frac{5}{8} \times \frac{1}{3}$

7. What is the value of the expression $(3 + 4)^2 \div 7 - 2 \times 6$?

- A -9 C 30
B -5 D 1

8. Which line contains the ordered pair $(-1, 2)$?



- F Line k
G Line l
H Line m
J Line n

9. A pizza shop tried 45 new types of pizza during the past year and 20% of them became popular. Which best represents the fraction of pizzas that did *not* become popular?

- A $\frac{1}{5}$ C $\frac{3}{5}$
B $\frac{4}{9}$ D $\frac{4}{5}$

TEST-TAKING TIP

Question 9 Be sure to pay attention to emphasized words, or words that are italicized. In Question 9, you are asked to find which answer is *not* correct.

PART 2 Short Response/Grid In

Record your answers on the answer sheet provided by your teacher or on a sheet of paper.

10. Write an equation using two variables to show the relationship between the position x and the value of a term y .

Position (x)	1	2	3	4	5	n
Value of Term (y)	5	9	13	17	21	

11. Evan runs $2\frac{3}{8}$ miles each week. He runs $\frac{3}{4}$ mile on Mondays and $\frac{3}{4}$ mile on Tuesdays. How far does he run, in miles, if the only other day he runs each week is Thursday?

12. Find $15 \div (-5)$.

PART 3 Extended Response

Record your answers on the answer sheet provided by your teacher or on a sheet of paper. Show your work.

13. A box of laundry detergent contains 35 cups. It takes $1\frac{1}{4}$ cups per load of laundry.

- Write an equation to represent how many loads ℓ you can wash with one box.
- How many loads can you wash with one box?
- How many loads can you wash with 3 boxes?

NEED EXTRA HELP?													
If You Missed Question...	1	2	3	4	5	6	7	8	9	10	11	12	13
Go to Lesson...	5-2	4-8	4-6	4-9	4-5	5-7	1-4	3-7	4-6	1-10	5-2	2-8	5-7
IN Academic Standards	6.1.6	7.1.3	6.1.4	7.1.6	6.1.4	7.1.7	7.2.3	8.2.4	6.1.4	7.2.1	6.1.6	7.1.7	7.1.7