1-1 Practice

A Plan for Problem Solving

Use the four-step plan to solve each problem.

Toppings	Price
1	$12.99
2	$13.79
3	$14.59
4	$15.39

1. **FOOD** The table shows a portion of the price list for a local pizzeria. Tony has $17 that he can spend to buy one large pizza. If the pattern in the prices continues, what is the greatest number of toppings that Tony can order on his pizza? What is the cost of that pizza?

2. **MOVIES** Mr. Sedgwick paid $13 for one adult ticket and one child ticket for a movie. Mrs. Wong paid $18 for one adult ticket two child tickets to see the same movie, and Mr. Gomez paid $23 for one adult ticket and three child tickets. If the pattern continues, how much should Mrs. Beauregard expect to pay for one adult ticket and four child tickets?

3. **SPORTS** The track coach must buy at least two bottles of water for each participant in a track meet. One team has 35 members, and the other team has 28 members. If each case of water contains 24 bottles, what is the fewest number of full cases that the coach can buy?

4. **GEOGRAPHY** The land area of Washington, D.C., is 61 square miles. In 2003, the population of Washington, D.C., was 563,384. If one square mile is equal to 640 acres, about how many people per acre were there in Washington, D.C., in 2003?

5. **ART SUPPLIES** At the craft store, a paint brush costs $0.79, and a small bottle of paint costs $0.89. What combination of paint brushes and bottles of paint could you buy for exactly $4.15?

6. **GEOMETRY** Draw the next two figures in the pattern.
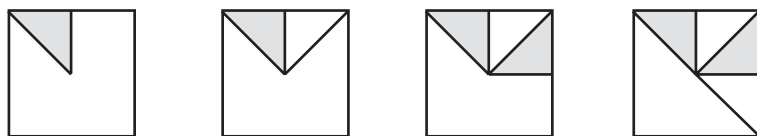
1-2 Practice

Variables, Expressions, and Properties

Evaluate each expression if $r = 3$, $s = 5$, and $t = 2$.

1. $3r + s$ **2.** $4s - 5t$ **3.** $8 + 6t - r$ **4.** rs^2

5. $(st)^2$ **6.** $\dfrac{r^2 + 1}{t + 3}$ **7.** $s(7 + t) - r$ **8.** $2s^2 - 8s + 3$

Name the property shown by each statement.

9. $6(5 + 1) = 6(5) + 6(1)$ **10.** $1(2 + 3) = 2 + 3$

11. $(10 + 7) + 4 = 10 + (7 + 4)$ **12.** $5 + (1 + 9) = 5 + (9 + 1)$

State whether each conjecture is *true* or *false*. If *false*, provide a counter example.

13. The sum of an even number and an odd number is always even.

14. Multiplication of whole numbers is associative.

Rewrite each expression using the indicated property.

15. $(x + 7) + 3$, Associative Property   **16.** $5(3) + 5(4)$, Distributive Property

17. INTERNET A bookstore offers wireless Internet access to its customers for a charge. The cost of using this service is given by the expression $\$1.50 + \dfrac{m}{20}$, where m is the number of minutes online. How much would it cost to be online 40 minutes?

18. TEMPERATURE When a temperature in degrees Celsius C is known, the expression $\dfrac{9C + 160}{5}$ can be used to find the temperature in degrees Fahrenheit. If a thermometer shows that a temperature is 20°C, what is the temperature in degrees Fahrenheit?

1-3 Practice

Integers and Absolute Value

Replace each ● with <, >, or = to make a true sentence.

1. $0 ● 8$

2. $-5 ● -3$

3. $1 ● -7$

4. $-4 ● -4$

5. $-12 ● 10$

6. $5 ● -6$

7. $-6 ● -7$

8. $0 ● -8$

9. $-10 ● -10$

Order each set of integers from least to greatest.

10. $\{-5, -7, 0, 5, 7\}$

11. $\{-1, 2, -3, 4\}$

12. $\{-2, -4, -6, -8, -10, -12\}$

13. $\{0, -9, -3, -7, 1, -1\}$

Evaluate each expression.

14. $|-19|$

15. $|15|$

16. $|0|$

17. $|-1| + |3|$

18. $|-19| + |-8|$

19. $|-12| - |4|$

Evaluate each expression if $k = 4$, $m = -2$, $n = 7$, and $p = -5$.

20. $|m| + 6$

21. $n - |p|$

22. $k + |p|$

23. $5|n| + k$

24. $|n| - 4$

25. $9|m| - 14$

TEMPERATURE **For Exercises 26 and 28, use the following information.**

During a five-day cold spell, Jose recorded the temperature each day at noon. The temperature was $-3°F$ on Monday, $-5°F$ on Tuesday, $-4°F$ on Wednesday, $-1°F$ on Thursday, and $0°F$ on Friday.

26. On which day was it the coldest at noon?

27. On which day was it the warmest at noon?

28. The temperature at noon on Saturday was $25°$ warmer than the temperature on Tuesday. What was the temperature on Saturday? Justify your answer using a number line.

Lesson 1–3

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1-4 Practice

Adding Integers

Find each sum.

1. $-1 + (-8)$

2. $13 + 15$

3. $19 + (-7)$

4. $-14 + (-14)$

5. $-12 + 10$

6. $-5 + (-26)$

7. $-46 + 27$

8. $-33 + 55$

9. $-29 + (-25)$

10. $6 + 14 + (-12)$

11. $-15 + (-17) + 10$

12. $-13 + (-13) + (-18)$

13. $-5 + 8 + (-1) + (-6)$

14. $8 + (-7) + (-8) + (-9)$

15. $-15 + 10 + (-16) + 12$

POPULATION For Exercises 16 and 17, use the table below that shows the change in population for four northeastern cities between 1990 and 2000.

City	1990 Population (thousands)	Change as of 2000 (thousands)
Albany, New York	100	-4
Boston, Massachusetts	574	$+15$
Pittsburgh, Pennsylvania	370	-36
Rochester, New York	231	-11

Source: U.S. Census Bureau

16. What is the population of each of these cities as of 2000?

17. What was the total population change for these four cities?

Write an addition expression to describe each situation. Then find each sum and explain its meaning.

18. GAMES On one turn, you move 10 spaces forward around the game board. On the next turn, you move 4 spaces backward.

19. CAMPING While hiking down into a canyon, Manuel passed a sign stating that the elevation was 100 feet below sea level. He descended another 56 feet before reaching his campsite.

20. WEATHER Before you went to sleep last night, the temperature was $-3°F$. During the night the temperature dropped by $5°$.

21. ELEVATOR Mrs. Brown parked in the parking garage 30 feet below street level. She then got in an elevator and went up 80 feet to her office.

1-5 **Practice**

Subtracting Integers

Subtract.

1. $15 - 7$ **2.** $3 - 12$ **3.** $-8 - 9$

4. $4 - (-12)$ **5.** $18 - (-7)$ **6.** $-8 - (-9)$

7. $-14 - (-18)$ **8.** $-19 - (-13)$ **9.** $8 - (-22)$

10. $-1 - 15$ **11.** $12 - 19$ **12.** $-10 - (-5)$

Evaluate each expression if $d = -4$, $f = -7$, and $g = 11$.

13. $d - 10$ **14.** $g - 15$ **15.** $d - g$

16. $d - f$ **17.** $d - f - g$ **18.** $g - d - f$

GEOGRAPHY For Exercises 19–21, use the table that shows the elevations above sea level of the lowest and highest points on six continents.

19. How far below the highest point in Australia is the lowest point in Australia?

20. How far below the highest point in North America is the lowest point in Asia?

21. Find the difference between the lowest point in South America and the lowest point in Africa.

Continent	Lowest Point (m)	Highest Point (m)
Africa	-156	5,895
Asia	-400	8,850
Australia	-12	2,228
Europe	-28	5,642
North America	-86	6,194
South America	-42	6,960

Source: www.worldoffacts.com

Simplify.

22. $29 - (-4) - (-15)$ **23.** $-10 - [8 + (-16)]$

24. $25 - [16 + (-9)]$ **25.** $[22 - (-18)] - (-5 + 11)$

26. $(-5 + 9) - (-20 - 12)$ **27.** $[-15 + (-7)] - (-8 - 11)$

1-6 Practice

Multiplying and Dividing Integers

Multiply.

1. $5(-7)$ **2.** $-3 \cdot 12$ **3.** $-8(-9)$

4. $-4(-12)$ **5.** $(-7)^2$ **6.** $-2(-5)(-3)$

Divide.

7. $-14 \div 2$ **8.** $35 \div (-7)$ **9.** $-48 \div (-6)$

10. $\dfrac{-66}{6}$ **11.** $\dfrac{56}{-7}$ **12.** $\dfrac{-80}{-5}$

Evaluate each expression if $r = -4$, $s = 11$, and $t = -7$.

13. $s + 5t$ **14.** $10 - rt$ **15.** $\dfrac{5s}{t-4}$

16. $\dfrac{-42}{r-t}$ **17.** $-r^2 - 16$ **18.** $(2t + 4)^2 \div 4$

Find the mean of each set of integers.

19. $-8, -5, 3, -9, 5, 2$ **20.** $11, -15, -16, 17, -20, -18, -22$

21. $-5, 4, 8, -12, 10$ **22.** $-22, -19, -14, -17, -18$

Find each product or quotient.

23. $(3)^2 \cdot (-4)^2$ **24.** $-3(-5)^2$ **25.** $-5(-2)(4)(-3)$

26. $\dfrac{-10(15)}{6}$ **27.** $\dfrac{12^2}{-12}$ **28.** $\dfrac{-4 \cdot 12}{8}$

29. MONEY If you have \$216 and you spend \$12 each day, how long would it be until you had no money left?

30. WEATHER During a six hour period, the temperature dropped 18°F. Find the average hourly change in the temperature.

1-7 **Practice**

Writing Equations

Define a variable. Then write an equation to model each situation.

1. After receiving $25 for her birthday, Latisha had $115.

2. At 14 years old, Adam is 3 years younger than his brother Michael.

3. A class of 30 students separated into equal sized teams results in 5 students per team.

4. When the bananas were divided evenly among the 6 monkeys, each monkey received 4 bananas.

Define a variable. Then write an equation that could be used to solve each problem.

5. **GRADES** Kelly's test score was 6 points higher than Michelle's. If Kelly's test score was 88, what was Michelle's test score?

6. **GEOMETRY** A rectangle's width is one-third its length. If the width is 8 inches, what is the length of the rectangle?

7. **FOOTBALL** A team had a total gain of -15 yards over several plays with an average gain of -5 yards per play. How many plays are represented?

Write an equation to model the relationship between the quantities in each table.

8.

Kilograms, k	Grams, g
1	1,000
2	2,000
3	3,000
4	4,000
k	g

9.

Feet, f	Yards, y
3	1
6	2
9	3
12	4
f	y

10. **MONEY** Carlotta earns $3 for every hour that she baby sits. Complete the table of values showing the amount she earns for baby sitting 1, 2, 3, 4, and h hours. Given h, a number of hours, write an equation to find a, the amount that Carlotta earns.

Hours, h	Amount, a

1-8 Practice

Problem-Solving Investigation: Work Backward

Mixed Problem Solving

Use the work backward strategy to solve Exercises 1 and 2.

1. **TRAVEL** Rajiv and his family left home on a trip and drove for 2 hours before they stopped to eat. After 1.5 hours, they were back on the road. They arrived at their destination 3 hours later at 5:00 P.M. What time did they leave home?

2. **GRADES** Kumiko had an average of 92 on her first three math tests. Her scores on the second and third tests were 97 and 89. What was her score on the first test?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

Problem-Solving Strategies
• Use the four-step plan.
• Work backward.

3. **BAKING** Isabel doubled her recipe for chocolate chip cookies. After her brothers ate 8 cookies, she set aside half of the remaining cookies for a school party. Isabel then gave 2 dozen cookies to her neighbor. She had 12 cookies left over. How many cookies does one recipe make?

4. **ANALYZE TABLES** The table below gives the results from a poll taken at school about the times in minutes that boys and girls spend using the Internet for school work and the total time spent using the Internet each week.

Gender	Time Used for School Work	Total Time per Week
Boys	33 min	255 min
Girls	72 min	213 min

How many more minutes per week do boys spend using the Internet for purposes other than school work than girls?

Select the Operation

For Exercises 5 and 6, select an appropriate operation to solve the problem. Justify your solution and solve the problem.

5. **MOVIES** The two animated films with the highest box office receipts brought in a total of $775 million. If one film brought in $97 million more than the other, how much did the film with the highest receipts bring in?

6. **U.S. PRESIDENTS** Harry S Truman was elected president in 1944. He died in 1972 at the age of 88. How old was he at the time he was elected?

1-9 Practice

Solving Addition and Subtraction Equations

Solve each equation. Check your solution.

1. $t + 7 = 12$ **2.** $h - 3 = 8$ **3.** $8 = b - 9$

4. $k - 4 = -14$ **5.** $m + 9 = -7$ **6.** $y - 10 = -3$

7. $-14 = 2 + d$ **8.** $15 + n = 10$ **9.** $-8 = r - 6$

10. $11 = w - 5$ **11.** $-9 = g + 9$ **12.** $12 + c = 16$

13. GEOMETRY Two angles are supplementary if the sum of their measures is 180°. The two angles shown are supplementary. Write and solve an equation to find the measure of angle R.

140°
R   S
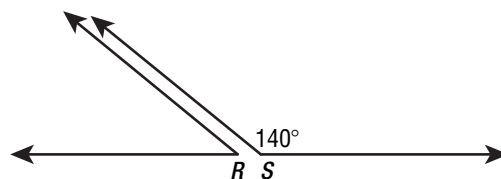
14. ARCHITECTURE The Sears Tower in Chicago was the tallest building in the world when it was completed. Twenty-three years later, a taller building was completed in 1996 on Taiwan. Write and solve an equation to find the year that the Sears Tower was completed.

15. FUND RAISING During a five-day fund raiser, Shantell sold 8 boxes of greeting cards the first day, 6 boxes the second day, 10 boxes the third day, and 7 boxes the fourth day. If she sold a total of 45 boxes of greeting cards during the five days, write an equation that can be used to find the number of boxes Shantell sold the fifth day. Explain two methods of solving this equation. Then solve the equation.

16. ANALYZE TABLES The total points scored by both teams in the 2005 Super Bowl was 16 less than the total points for 2004. Write and solve an equation to find the total points for 2004.

Total Points Scored by Both Teams in Super Bowl	
Year	Points
2003	69
2004	p
2005	45

Source: www.superbowl.com

Lesson 1-9

1-10 Practice

Solving Multiplication and Division Equations

Solve each equation. Check your solution.

1. $5s = 45$

2. $8h = 64$

3. $36 = 9b$

4. $-3p = 24$

5. $-12m = -72$

6. $-56 = 7d$

7. $\dfrac{x}{5} = 11$

8. $\dfrac{v}{4} = 20$

9. $\dfrac{c}{-2} = 43$

10. $16 = \dfrac{y}{-3}$

11. $-9 = \dfrac{n}{8}$

12. $\dfrac{a}{25} = -3$

13. CARS Mrs. Alvarez bought a new car. Her monthly payments are $525. If she will pay a total of $25,200 in payments, write and solve a multiplication equation to find the number of payments.

14. POPULATION The population of South Africa is four times the population of Greece. If the population of South Africa is 44 million, write and solve a multiplication equation to find the population of Greece.

MEASUREMENT For Exercises 15 and 16, refer to the table. Write and solve an equation to find each quantity.

15. the number of quarts in 24 pints

Customary System Conversions (capacity)
1 pint = 2 cups
1 quart = 2 pints
1 quart = 4 cups
1 gallon = 4 quarts
1 gallon = 8 pints

16. the number of gallons in 104 pints

Solve each equation.

17. $3 = \dfrac{-84}{g}$

18. $\dfrac{-4}{x} = -8$

19. $\dfrac{-144}{r} = -16$

Lesson 1-10

2-1 Practice

Rational Numbers

Write each fraction or mixed number as a decimal.

1. $\dfrac{3}{5}$

2. $\dfrac{5}{8}$

3. $\dfrac{9}{20}$

4. $\dfrac{37}{50}$

5. $-\dfrac{11}{16}$

6. $-\dfrac{9}{32}$

7. $3\dfrac{1}{5}$

8. $4\dfrac{3}{8}$

9. $\dfrac{5}{33}$

10. $-\dfrac{7}{9}$

11. $-8\dfrac{11}{18}$

12. $-9\dfrac{11}{30}$

Write each decimal as a fraction or mixed number in simplest form.

13. -0.8

14. 0.44

15. 1.35

16. $0.\overline{8}$

17. $-1.\overline{5}$

18. $4.\overline{4}$

POPULATION   For Exercises 19–21, refer to the table at the right.

19. Express the fraction for Asian as a decimal.

20. Find the decimal equivalent for the fraction of the population that is African American.

21. Write the fraction for Hispanic as a decimal. Round to the nearest thousandth.

Population of California by Race	
Race	**Fraction of Total Population**
Asian	$\dfrac{1}{10}$
African American	$\dfrac{1}{16}$
Hispanic	$\dfrac{1}{3}$

Source: U.S. Census Bureau

MEASUREMENTS   For Exercises 22 and 23, use the figure at the right.

22. Write the width of the jellybean as a fraction.

23. Write the width of the jellybean as a decimal.

in.   1
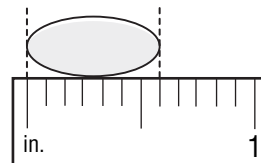
2-2 Practice

Comparing and Ordering Rational Numbers

Replace each ● with <, >, or = to make a true sentence.

1. $\dfrac{3}{5}$ ● $\dfrac{5}{7}$

2. $\dfrac{4}{9}$ ● $\dfrac{5}{11}$

3. $3\dfrac{2}{11}$ ● $3\dfrac{1}{9}$

4. $5\dfrac{7}{15}$ ● $5\dfrac{8}{17}$

5. 0.2 ● $\dfrac{2}{11}$

6. 0.25 ● $\dfrac{5}{21}$

7. $8\dfrac{10}{27}$ ● 8.3

8. $4\dfrac{8}{30}$ ● 4.3

9. $-\dfrac{8}{13}$ ● $-\dfrac{5}{13}$

10. $-\dfrac{3}{8}$ ● $-\dfrac{7}{8}$

11. $-\dfrac{2}{5}$ ● $-\dfrac{6}{7}$

12. $-\dfrac{2}{9}$ ● $-\dfrac{9}{11}$

13. -4.5 ● -4.55

14. -6.14 ● -6.15

15. -3.57 ● -3.5

16. -1.9 ● -1.99

17. Which is least: $\dfrac{3}{8}$, 0.4, $\dfrac{4}{11}$, $0.03\overline{5}$, or $\dfrac{5}{13}$?

18. Which is greatest: $\dfrac{7}{9}$, 0.778, $0.\overline{78}$, $\dfrac{11}{13}$, or 0.787?

Order each set of rational numbers from least to greatest.

19. $-5.81, -5\dfrac{3}{4}, -5\dfrac{3}{5}, -5.69$

20. $-1.01, -1.1, -1\dfrac{1}{9}, -1\dfrac{1}{11}$

21. Which point on the number line is the graph of 0.875?
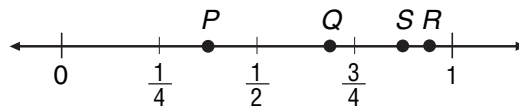
22. **STATISTICS** If you order a set of numbers from least to greatest, the middle number is the *median*. Find the median of 43.7, 41.3, 44.5, $42\dfrac{4}{5}$, and $43\dfrac{3}{4}$.

2-3 Practice

Multiplying Positive and Negative Fractions

Find each product. Write in simplest form.

1. $\dfrac{1}{4} \cdot \dfrac{4}{5}$

2. $\dfrac{6}{7} \cdot \dfrac{1}{2}$

3. $\dfrac{3}{10} \cdot \dfrac{2}{3}$

4. $-\dfrac{15}{16} \cdot \dfrac{4}{5}$

5. $\left(-\dfrac{8}{25}\right)\dfrac{15}{16}$

6. $\left(-\dfrac{7}{8}\right)\left(-\dfrac{1}{7}\right)$

7. $1\dfrac{1}{4} \cdot \dfrac{1}{5}$

8. $1\dfrac{1}{4} \cdot 1\dfrac{1}{5}$

9. $-2\dfrac{2}{3} \cdot \left(-\dfrac{1}{4}\right)$

10. $\dfrac{1}{4} \cdot \left(-\dfrac{4}{15}\right) \cdot \dfrac{5}{7}$

11. $2\dfrac{2}{5} \cdot 2\dfrac{1}{3} \cdot 2$

12. $10 \cdot 8.56 \cdot \dfrac{1}{2}$

ALGEBRA Evaluate each expression if $a = -\dfrac{1}{5}, b = \dfrac{2}{3}, c = \dfrac{7}{8}$, and $d = -\dfrac{3}{4}$.

13. bc

14. ab

15. abc

16. abd

17. **COOKING** A recipe calls for $2\dfrac{1}{4}$ cups of flour. How much flour would you

need to make $\dfrac{1}{3}$ of the recipe?

18. **FARMING** A farmer has $6\dfrac{1}{2}$ acres of land for growing crops. If she plants corn on

$\dfrac{3}{5}$ of the land, how many acres of corn will she have?

ALGEBRA Evaluate each expression if $e = -1\dfrac{1}{4}, f = 2\dfrac{2}{3}, g = -2\dfrac{1}{6}$, and $h = 1\dfrac{1}{5}$.

19. efh^2

20. e^2h^2

21. $\dfrac{1}{8}f^2g$

22. $-2ef(-gh)$

2-4 **Practice**

Dividing Positive and Negative Fractions

Write the multiplicative inverse of each number.

1. $\dfrac{4}{5}$ **2.** $\dfrac{7}{12}$ **3.** -20 **4.** $-5\dfrac{3}{8}$

Find each quotient. Write in simplest form.

5. $\dfrac{1}{5} \div \dfrac{1}{4}$ **6.** $\dfrac{2}{5} \div \dfrac{5}{6}$ **7.** $\dfrac{3}{7} \div \dfrac{6}{11}$

8. $\dfrac{3}{10} \div \dfrac{4}{5}$ **9.** $\dfrac{3}{8} \div 6$ **10.** $\dfrac{6}{7} \div 3$

11. $\dfrac{4}{5} \div 10$ **12.** $\dfrac{6}{11} \div 8$ **13.** $-\dfrac{4}{5} \div \dfrac{5}{6}$

14. $\dfrac{5}{12} \div \left(-\dfrac{3}{5}\right)$ **15.** $-\dfrac{3}{10} \div \left(-\dfrac{2}{5}\right)$ **16.** $-\dfrac{13}{18} \div \left(-\dfrac{8}{9}\right)$

17. $4\dfrac{1}{5} \div 1\dfrac{3}{4}$ **18.** $8\dfrac{1}{3} \div 3\dfrac{3}{4}$ **19.** $-10\dfrac{1}{2} \div 2\dfrac{1}{3}$

20. OFFICE SUPPLIES A regular paper clip is $1\dfrac{1}{4}$ inches long, and a jumbo paper clip is $1\dfrac{7}{8}$ inches long. How many times longer is the jumbo paper clip than the regular paper clip?

21. STORAGE The ceiling in a storage unit is $7\dfrac{2}{3}$ feet high. How many boxes may be stacked in a single stack if each box is $\dfrac{3}{4}$ foot tall?

ALGEBRA **Evaluate each expression for the given values.**

22. $r \div s$ if $r = -\dfrac{7}{20}$ and $s = \dfrac{7}{15}$ **23.** $m \div n$ if $m = \dfrac{4}{9}$ and $n = \dfrac{11}{12}$

2-5 Practice

Adding and Subtracting Like Fractions

Add or subtract. Write in simplest form.

1. $-\dfrac{1}{4} + \dfrac{3}{4}$

2. $-\dfrac{3}{8} + \left(-\dfrac{1}{8}\right)$

3. $-\dfrac{8}{11} + \dfrac{10}{11}$

4. $-\dfrac{5}{7} - \dfrac{4}{7}$

5. $\dfrac{11}{12} - \dfrac{7}{12}$

6. $\dfrac{2}{15} - \dfrac{7}{15}$

7. $4\dfrac{3}{4} + 6\dfrac{3}{4}$

8. $5\dfrac{7}{10} + 9\dfrac{9}{10}$

9. $7\dfrac{4}{9} + \left(-3\dfrac{5}{9}\right)$

10. $-1\dfrac{8}{9} - 4\dfrac{8}{9}$

11. $-4\dfrac{4}{5} - 5\dfrac{4}{5}$

12. $8\dfrac{5}{6} - 3\dfrac{5}{6}$

13. SEWING Naomi needs $2\dfrac{3}{4}$ yards of fabric to make a banner for a football game. The fabric store has $6\dfrac{1}{4}$ yards of the fabric she wants. How much of the fabric will remain at the store after Naomi buys her fabric?

14. GEOMETRY Find the perimeter of the triangle.

$2\dfrac{7}{8}$ in. $4\dfrac{3}{8}$ in.

$5\dfrac{1}{8}$ in.
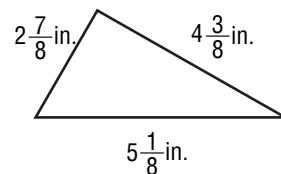
Simplify each expression.

15. $-5\dfrac{4}{7} + 2\dfrac{1}{7} - \left(3\dfrac{5}{7}\right)$

16. $-7\dfrac{1}{12} - \left(-4\dfrac{11}{12}\right) + 9\dfrac{7}{12}$

ALGEBRA Evaluate each expressions for the given values.

17. $r + s$ if $r = 8\dfrac{4}{5}$ and $s = -3\dfrac{2}{5}$

18. $b - c$ if $b = -2\dfrac{7}{9}$ and $c = -9\dfrac{5}{9}$

2-6 **Practice**

Adding and Subtracting Unlike Fractions

Add or subtract. Write in simplest form.

1. $-\dfrac{1}{2} + \dfrac{7}{10}$

2. $\dfrac{5}{6} + \left(-\dfrac{5}{9}\right)$

3. $-\dfrac{4}{5} + \left(-\dfrac{1}{3}\right)$

4. $\dfrac{7}{9} - \dfrac{2}{5}$

5. $\dfrac{3}{4} - \left(-\dfrac{1}{12}\right)$

6. $-\dfrac{7}{8} - \left(-\dfrac{2}{3}\right)$

7. $4\dfrac{1}{5} + 6\dfrac{3}{4}$

8. $1\dfrac{7}{10} + \left(-5\dfrac{3}{5}\right)$

9. $7\dfrac{3}{5} - \left(-5\dfrac{1}{3}\right)$

10. $-3\dfrac{2}{3} - 4\dfrac{5}{9}$

11. $-4\dfrac{3}{5} - 5\dfrac{9}{10}$

12. $-18\dfrac{5}{12} + 14\dfrac{3}{4}$

13. POPULATION About $\dfrac{1}{5}$ of the world's population lives in China, and $\dfrac{1}{6}$ of the world's population lives in India. What fraction of the world's population lives in other countries?

ALGEBRA For Exercises 14 and 15, evaluate each expression using the given information.

14. $m - n$ if $m = -\dfrac{3}{5}$ and $n = -10\dfrac{7}{10}$

15. $j - k$ if $j = -\dfrac{5}{9}$ and $k = 4\dfrac{5}{6}$

GEOMETRY Find the missing measure for each figure.

16.

$3\dfrac{1}{3}$ in. x in.

$5\dfrac{1}{4}$ in.

perimeter $= 12\dfrac{23}{24}$ in.

17.

$10\dfrac{1}{2}$ in.

x in. $14\dfrac{5}{8}$ in.

$17\dfrac{3}{4}$ in.
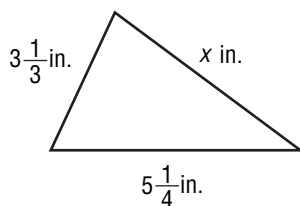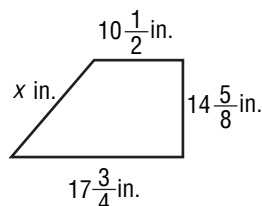
perimeter $= 59\dfrac{1}{4}$ in.

2-7 Practice

Solving Equations with Rational Numbers

Solve each equation. Check your solution.

1. $m + 0.88 = 1.64$

2. $t - 2.89 = 9.15$

3. $-\dfrac{3}{5} = d - \dfrac{5}{6}$

4. $-\dfrac{7}{16} = b + \dfrac{1}{4}$

5. $h - (-6.3) = 8.12$

6. $-2.5 = n - (-5.37)$

7. $-\dfrac{5}{8}k = 25$

8. $-\dfrac{3}{7}v = -27$

9. $-2.94 = -0.42a$

10. $-8.4 = 1.4y$

11. $\dfrac{f}{2.4} = -7.5$

12. $\dfrac{p}{-6.25} = -3.6$

13. $2.5x = -\dfrac{13}{16}$

14. $-4.5w = -8\dfrac{1}{3}$

15. $8\dfrac{2}{3} = -1.\overline{3}g$

17. MONEY The currency in Switzerland is called a franc. On a certain day, one U.S. dollar equaled $1\dfrac{1}{4}$ Swiss francs. Write and solve a multiplication equation to find the number of U.S. dollars that would equal 15 Swiss francs.

FOOTBALL For Exercise 18, refer to the table.

18. Let s equal the number of additional seats that the Pittsburgh Steelers' stadium needs to equal the number of seats in Kansas City Chiefs' stadium. Write and solve an addition equation to determine the number of seats that the Steelers' stadium needs to equal the number of seats in the Chiefs' stadium.

NFL Stadiums Seating Capacity	
Stadium	**Seats (thousands)**
Dallas Cowboys	65.7
Kansas City Chiefs	79.4
Pittsburgh Steelers	64.5
San Diego Chargers	71.3

Source: stadiumsofnfl.com

2-8 Practice

Problem-Solving Investigation: Look for a Pattern

Mixed Problem Solving

For Exercises 1 and 2, look for a pattern. Then use the pattern to solve the problem.

1. **GEOMETRY** Draw the next two angles in the pattern.

   a. 10°

   b. 20°

   c. 30°

   d. 40°
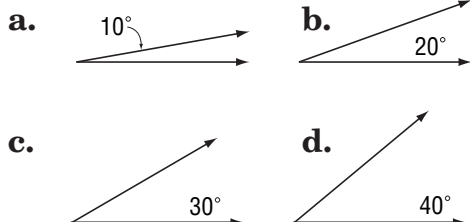
2. **ANALYZE TABLES** A falling object continues to fall faster until it hits the ground. How far will an object fall during the fifth second?

Time Period	Distance Fallen
1st second	16 feet
2nd second	48 feet
3rd second	80 feet
4th second	112 feet

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Look for a pattern.

3. **YARD WORK** Denzel can mow $\frac{1}{8}$ of his yard every 7 minutes. If he has 40 minutes to mow $\frac{3}{4}$ of the yard, will he have enough time?

4. **READING** Ling read 175 pages by 1:00 P.M., 210 pages by 2:00 P.M., and 245 pages by 3:00 P.M. If she continues reading at this rate, how many pages will Ling have read by 4:00 P.M.?

Select the Operation

For Exercises 5 and 6, select an appropriate operation to solve the problem. Justify your solution and solve the problem.

5. **MOVIES** The land area of Alaska is about 570 thousand square miles. The land area of Washington, D.C., is about 0.06 thousand square miles. How many times larger is Alaska than Washington, D.C.?

6. **U.S. PRESIDENTS** President Clinton served 5 two-year terms as governor of Arkansas and 2 four-year terms as President of the United States. How many total years did he serve in these two government offices?

2-9 Practice

Powers and Exponents

Write each expression using exponents.

1. $3 \cdot 3 \cdot m$

2. $2 \cdot d \cdot 5 \cdot d \cdot d \cdot 5$

3. $p \cdot 9 \cdot 3 \cdot q \cdot p \cdot 9$

4. $g \cdot 7 \cdot 7 \cdot g \cdot h \cdot 7 \cdot h$

5. $2 \cdot 5 \cdot r \cdot 7 \cdot s \cdot r \cdot 5 \cdot r \cdot 7 \cdot r \cdot s$

6. $x \cdot 8 \cdot y \cdot x \cdot 5 \cdot x \cdot 5 \cdot y \cdot 8 \cdot y \cdot y \cdot 5$

Evaluate each expression.

7. 2^4

8. 5^3

9. $2^2 \cdot 6^2$

10. $2^3 \cdot 5^2$

11. 3^{-4}

12. 8^{-3}

13. 9^{-2}

14. 5^{-3}

15. $7 \cdot 2^2 \cdot 5^2$

16. $3^2 \cdot 6 \cdot 10^2$

17. $3^{-2} \cdot 2^{-3}$

18. $7 \cdot 3^3 \cdot 5^{-4}$

ALGEBRA **Evaluate each expression.**

19. $r^3 \cdot s$, if $r = 5$ and $s = 4$

20. $m^2 \cdot n^3$, if $m = 6$ and $n = 2$

21. $f^4 \cdot g^5$, if $f = 3$ and $g = 1$

22. $x^5 \cdot y$, if $x = 2$ and $y = 8$

23. Complete the following pattern.
$5^4 = 625, 5^3 = 125, 5^2 = 25, 5^1 = 5, 5^0 = \underline{?}, 5^{-1} = \underline{?}, 5^{-2} = \underline{?}, 5^{-3} = \underline{?}$

24. **MONEY** Suppose $100 is deposited into an account and the amount doubles every 8 years. How much will be in the account after 40 years?

25. **EPIDEMICS** At the beginning of an epidemic, 50 people are sick. If the number of sick people triples every other day, how many people will be sick at the end of 2 weeks?

Lesson 2-9

2-10 Practice

Scientific Notation

Write each number in standard form.

1. 9.03×10^2 **2.** 7.89×10^3 **3.** 4.115×10^5 **4.** 3.201×10^6

5. 5.1×10^{-2} **6.** 7.7×10^{-5} **7.** 3.85×10^{-4} **8.** 1.04×10^{-3}

Write each number in scientific notation.

9. 4,400   **10.** 75,000   **11.** 69,900,000   **12.** 575,000,000

13. 0.084   **14.** 0.0099   **15.** 0.000000515   **16.** 0.0000307

17. Which number is greater: 3.5×10^4 or 2.1×10^6?

18. Which number is less: 7.2×10^7 or 9.9×10^5?

19. **POPULATION** The table lists the populations of five countries. List the countries from least to greatest population.

Country	Population
Australia	2.0×10^7
Brazil	1.9×10^8
Egypt	7.7×10^7
Luxembourg	4.7×10^5
Singapore	4.4×10^6

Source: *The World Factbook*

20. **SOLAR SYSTEM** Pluto is 3.67×10^9 miles from the Sun. Write this number in standard form.

21. **MEASUREMENT** One centimeter is equal to about 0.0000062 mile. Write this number in scientific notation.

22. **DISASTERS** In 2005, Hurricane Katrina caused over $125 billion in damage in the southern United States. Write $125 billion in scientific notation.

3-1 Practice

Square Roots

Find each square root.

1. $\sqrt{36}$

2. $-\sqrt{144}$

3. $-\sqrt{\dfrac{9}{16}}$

4. $\sqrt{1.96}$

5. $\pm\sqrt{2.25}$

6. $\pm\sqrt{\dfrac{121}{289}}$

7. $\sqrt{\dfrac{81}{100}}$

8. $\pm\sqrt{0.0025}$

9. $-\sqrt{0.49}$

10. $-\sqrt{3.24}$

11. $-\sqrt{\dfrac{25}{441}}$

12. $\pm\sqrt{361}$

ALGEBRA **Solve each equation. Check your solution(s).**

13. $h^2 = 121$

14. $324 = a^2$

15. $x^2 = \dfrac{81}{169}$

16. $0.0196 = m^2$

17. $\sqrt{y} = 6$

18. $\sqrt{z} = 8.4$

19. **GARDENING**   Moesha has 196 pepper plants that she wants to plant in square formation. How many pepper plants should she plant in each row?

20. **RESTAURANTS**   A new restaurant has ordered 64 tables for its outdoor patio. If the manager arranges the tables in a square formation, how many will be in each row?

GEOMETRY   **The formula for the perimeter of a square is $P = 4s$, where s is the length of a side. Find the perimeter of each square.**

21.

Area =
144 square
inches

22.

Area =
81 square
feet

23.

Area =
324 square
meters
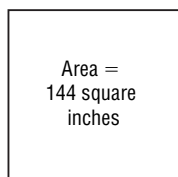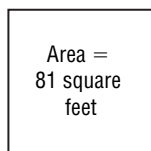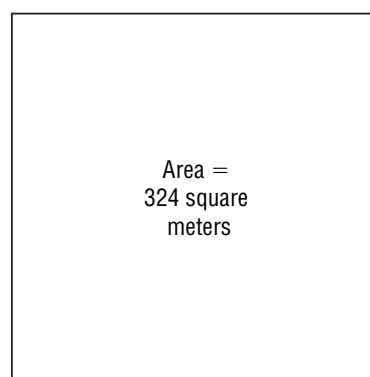
3-2 **Practice**

Estimating Square Roots

Estimate to the nearest whole number.

1. $\sqrt{38}$ **2.** $\sqrt{53}$ **3.** $\sqrt{99}$ **4.** $\sqrt{227}$

5. $\sqrt{8.5}$ **6.** $\sqrt{35.1}$ **7.** $\sqrt{67.3}$ **8.** $\sqrt{103.6}$

9. $\sqrt{86.4}$ **10.** $\sqrt{45.2}$ **11.** $\sqrt{7\frac{2}{5}}$ **12.** $\sqrt{27\frac{3}{8}}$

Order from least to greatest.

13. $8, 10, \sqrt{61}, \sqrt{73}$ **14.** $\sqrt{45}, 9, 6, \sqrt{63}$ **15.** $\sqrt{50}, 7, \sqrt{44}, 5$

ALGEBRA Estimate the solution of each equation to the nearest integer.

16. $d^2 = 61$ **17.** $z^2 = 85$ **18.** $r^2 = 3.7$

19. GEOMETRY The radius of a cylinder with volume V and height 10 centimeters is approximately $\sqrt{\dfrac{V}{30}}$. If a can that is 10 centimeters tall has a volume of 900 cubic centimeters, estimate its radius.

20. TRAVEL The formula $s = \sqrt{18d}$ can be used to find the speed s of a car in miles per hour when the car needs d feet to come to a complete stop after slamming on the brakes. If it took a car 12 feet to come to a complete stop after slamming on the brakes, estimate the speed of the car.

GEOMETRY The formula for the area of a square is $A = s^2$, where s is the length of a side. Estimate the length of a side for each square.

21.

Area =
40 square
inches

22.

Area =
97 square
feet
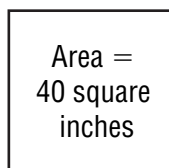
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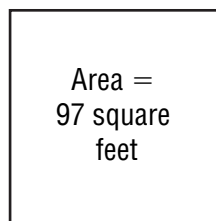
3-3 Practice

Problem Solving Investigation: Use a Venn Diagram

Mixed Problem Solving

Use a Venn diagram to solve Exercises 1 and 2.

1. **SPORTS** Of the 25 baseball players on the Baltimore Orioles 2005 roster, 17 threw right handed, 12 were over 30 years old, and 9 both threw right handed and were over 30 years old. How many players on the team neither threw right handed nor were over 30 years old?

2. **GRADES** The principal noticed that 45 students earned As in English, 49 students earned As in math, and 53 students earned As in science. Of those who earned As in exactly two of the subjects, 8 earned As in English and math, 12 earned As in English and science, and 18 earned As in math and science. Seventeen earned As in all three subjects. How many earned As in English only?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Look for a pattern.
• Use a Venn diagram.

3. **NUMBERS** What are the next two numbers in the pattern?

   486, 162, 54, 18, ___, ___

4. **GEOGRAPHY** Of the 50 U.S. states, 30 states border a major body of water and 14 states border a foreign country. Seven states border both a major body of water and a foreign country. How many states border on just a major body of water and how many border on just a foreign country?

Select the Operation

For Exercises 5 and 6, select an appropriate operation to solve the problem. Justify your solution and solve the problem.

5. **LANDSCAPING** Three different landscaping companies treat lawns for weeds. Company A charges $35 per treatment and requires 3 treatments to get rid of weeds. Company B charges $30 per treatment and requires 4 treatments. Company C charges $50 per treatment and requires only two treatments to eliminate weeds. If you want to use the company that charges the least, which company should you choose?

6. **RECEIVING** Marc unloaded 7,200 bottles of water from delivery trucks today. If each truck contained 50 cases and each case contained 24 bottles of water, how many trucks did he unload?

Lesson 3–3

3-4 Practice

The Real Number System

Name all sets of numbers to which the real number belongs.

1. -9

2. $\sqrt{144}$

3. $\sqrt{35}$

4. $\dfrac{8}{11}$

5. 9.55

6. $5.\overline{3}$

7. $\dfrac{20}{5}$

8. $-\sqrt{44}$

Estimate each square root to the nearest tenth. Then graph the square root on a number line.

9. $\sqrt{7}$

10. $\sqrt{19}$

11. $-\sqrt{33}$

Replace each ● with $<, >$, or = to make a true sentence.

12. $\sqrt{8}$ ● 2.7

13. $\sqrt{15}$ ● 3.9

14. $5\dfrac{2}{5}$ ● $\sqrt{30}$

15. $2\dfrac{3}{10}$ ● $\sqrt{5.29}$

16. $\sqrt{9.8}$ ● $3.\overline{1}$

17. $8.\overline{2}$ ● $8\dfrac{2}{9}$

Order each set of numbers from least to greatest.

18. $\sqrt{10}, \sqrt{8}, 2.75, 2.\overline{8}$

19. $5.01, 5.0\overline{1}, 5.\overline{01}, \sqrt{26}$

20. $-\sqrt{12}, \sqrt{13}, -3.5, 3.5$

21. **ALGEBRA** The *geometric mean* of two numbers a and b is $\sqrt{ab}$. Find the geometric mean of 32 and 50.

22. **ART** The area of a square painting is 600 square inches. To the nearest hundredth inch, what is the perimeter of the painting?

3-5 Practice

The Pythagorean Theorem

Write an equation you could use to find the length of the missing side of each right triangle. Then find the missing length. Round to the nearest tenth if necessary.

1.

8 ft   10 ft

b ft

2.

26 in.   a ir

24 in.

3.

18 cm

c cm   15 cm

4.

a yd

14 yd   28 yd

5.

50 mm   c mm

50 mm

6.

c m   45 m

64 m
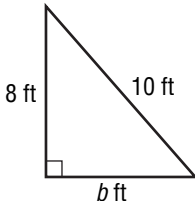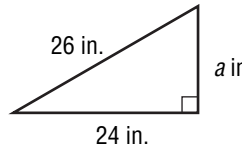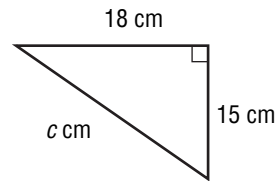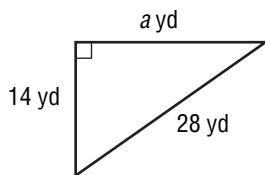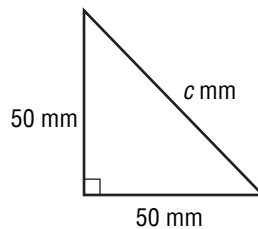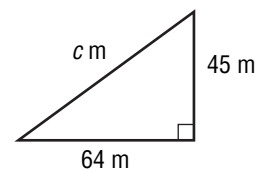
7. a, 65 cm; c, 95 cm

8. a, 16 yd; b, 22 yd

Determine whether each triangle with sides of given lengths is a right triangle.

9. 18 ft, 23 ft, 29 ft

10. 7 yd, 24 yd, 25 yd

11. The hypotenuse of a right triangle is 15 inches, and one of its legs is 11 inches. Find the length of the other leg.

12. A leg of a right triangle is 30 meters long, and the hypotenuse is 35 meters long. What is the length of the other leg?

13. **TELEVISIONS** The diagonal of a 27-inch television measures 27 inches. If the width of a 27-inch is 22 inches, calculate its height to the nearest inch.

3-6 Practice

Using The Pythagorean Theorem

Write an equation that can be used to answer the question. Then solve. Round to the nearest tenth if necessary.

1. How far is the ship from the lighthouse?

8 mi

6 mi

d
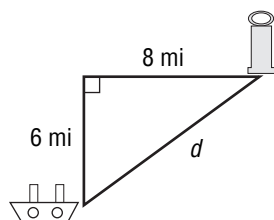
2. How long is the wire supporting the sign?

w

1.5 ft

2 ft

Open 24/7
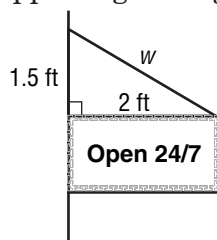
3. How far above the water is the person parasailing?

100 yd

p

80 yd
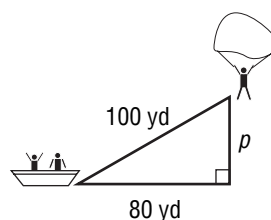
4. How wide is the pond?

95 ft

120 ft

w
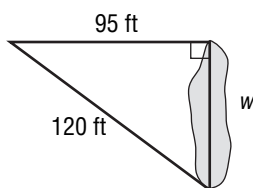
5. How high is the ramp?

21 ft

h

19 ft
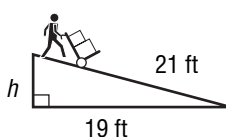
6. How high is the end of the ladder against the building?

h

13 ft

4 ft
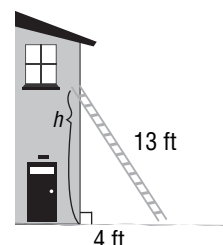
7. GEOGRAPHY   Suppose Birmingham, Huntsville, and Gadsden, Alabama, form a right triangle. What is the distance from Huntsville to Gadsden? Round to the nearest tenth if necessary.

Huntsville

98 mi

Gadsden

61 mi

Birmingham
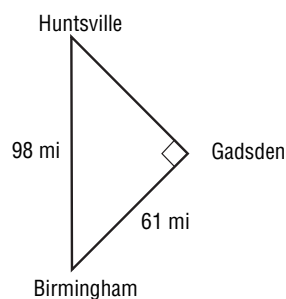
8. GEOMETRY   Find the diameter *d* of the circle in the figure at the right. Round to the nearest tenth if necessary.

18 ft

d

22 ft
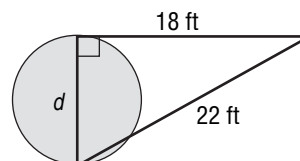
3-7 Practice

Distance on the Coordinate Plane

Name the ordered pair for each point.

1. A

2. B

3. C

4. D

5. E

6. F

7. G

8. H
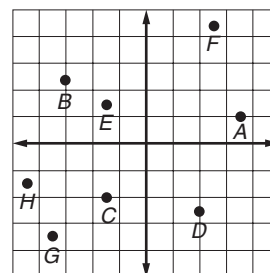
Graph and label each point.

9. $J\left(2\dfrac{1}{4}, \dfrac{1}{2}\right)$

10. $K\left(3, -1\dfrac{2}{3}\right)$

11. $M\left(-3\dfrac{3}{4}, 4\dfrac{1}{4}\right)$

12. $N\left(-3\dfrac{2}{5}, -2\dfrac{3}{5}\right)$

13. $P\left(-2.1, 1.8\right)$

14. $Q\left(1.75, -3.5\right)$
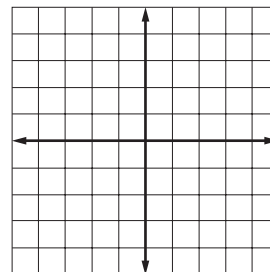
Graph each pair of ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

15. $(4, 3), (1, -1)$
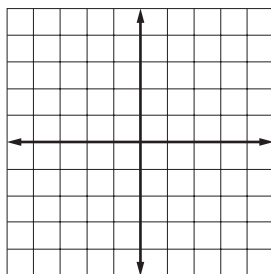
16. $(3, 2), (0, -4)$
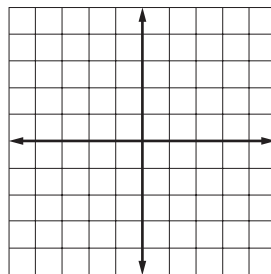
17. $(-4, 3.5), (2, 1.5)$
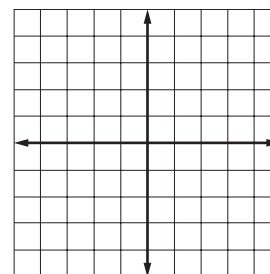
18. Find the distance between points R and S shown at the right. Round to the nearest tenth.

19. **GEOMETRY** If one point is located at $(-6, 2)$ and another point is located at $(6, -3)$, find the distance between the points.

Lesson 3–7
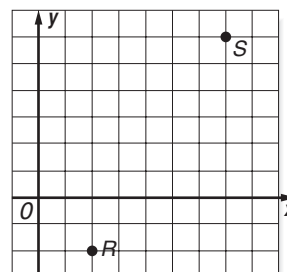
4-1 Practice

Ratios and Rates

Express each ratio in simplest form.

1. 32 out of 200 adults like opera

2. 20 picked out of 65 who tried out

3. 48 robins to 21 blackbirds seen

4. 10 rock musicians to 22 classical musicians in the concert

5. 2 feet long to 64 inches wide

6. 45 millimeters out of 10 centimeters

7. 10 ounces sugar for 1 pound apples

8. 2 quarts out of 4 gallons leaked out

Express each rate as a unit rate.

9. 110 inches of snow in 8 days

10. 38 feet in 25 seconds

11. 594 cars crossing the bridge in 3 hours

12. 366 miles on 12 gallons

13. SHOPPING An 8-ounce box of Crispy Crackers costs $1.59 and a 2-pound box costs $6.79. Which box is the better buy? Explain your reasoning.

14. ANIMALS Which animal listed in the table consumes the least amount of food compared to its body weight? Explain your reasoning.

Animal	Body Weight (lb)	Amount of Food per Day (lb)
African Elephant	12,000	500
Blue Whale	286,000	8,000
Koala	22	2
Komodo Dragon	300	240

Source: *Scholastic Book of World Records*

4-2 Practice

Proportional and Nonproportional Relationships

For Exercises 1–3, use a table of values to explain your reasoning.

1. **ANIMALS** The world's fastest fish, a sailfish, swims at a rate of 69 miles per hour. Is the distance a sailfish swims proportional to the number of hours it swims?

FOSSILS For Exercises 2 and 3, use the following information.

In July, a paleontologist found 368 fossils at a dig. In August, she found about 14 fossils per day.

2. Is the number of fossils the paleontologist found in August proportional to the number of days she spent looking for fossils that month?

3. Is the total number of fossils found during July and August proportional to the number of days the paleontologist spent looking for fossils in August?

Lesson 4–2

4-3 Practice

Solving Proportions

Solve each proportion.

1. $\dfrac{b}{5} = \dfrac{8}{16}$

2. $\dfrac{18}{x} = \dfrac{6}{10}$

3. $\dfrac{t}{5} = \dfrac{12}{80}$

4. $\dfrac{11}{10} = \dfrac{n}{14}$

5. $\dfrac{2.5}{35} = \dfrac{2}{d}$

6. $\dfrac{3.5}{18} = \dfrac{z}{36}$

7. $\dfrac{0.45}{4.2} = \dfrac{p}{14}$

8. $\dfrac{2.4}{6} = \dfrac{2.8}{s}$

9. $\dfrac{3.6}{k} = \dfrac{0.2}{0.5}$

10. **CLASSES** For every girl taking classes at the martial arts school, there are 3 boys who are taking classes at the school. If there are 236 students taking classes, write and solve a proportion to predict the number of boys taking classes at the school.

11. **BICYCLES** An assembly line worker at Rob's Bicycle factory adds a seat to a bicycle at a rate of 2 seats in 11 minutes. Write an equation relating the number of seats s to the number of minutes m. At this rate, how long will it take to add 16 seats? 19 seats?

12. **PAINTING** Lisa is painting a fence that is 26 feet long and 7 feet tall. A gallon of paint will cover 350 square feet. Write and solve a proportion to determine how many gallons of paint Lisa will need.

Lesson 4–3

4-4 Practice

Problem-Solving Investigation: Draw a Diagram

Mixed Problem Solving

Use the draw a diagram strategy to solve Exercises 1 and 2.

1. **SWIMMING** Jon is separating the width of the swimming pool into equal-sized lanes with rope. It took him 30 minutes to create 6 equal-sized lanes. How long would it take him to create 4 equal-sized lanes in a similar swimming pool?

2. **TRAVEL** Two planes are flying from San Francisco to Chicago, a distance of 1,800 miles. They leave San Francisco at the same time. After 30 minutes, one plane has traveled 25 more miles than the other plane. How much longer will it take the slower plane to get to Chicago than the faster plane if the faster plane is traveling at 500 miles per hour?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Look for a pattern.
• Use a Venn diagram.
• Draw a diagram.

3. **TALENT SHOW** In a solo singing and piano playing show, 18 people sang and 14 played piano. Six people both sang and played piano. How many people were in the singing and piano playing show?

4. **LETTERS** Suppose you have three strips of paper as shown. How many capital letters of the alphabet could you form using one or more of these three strips for each letter? List them according to the number of strips.

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

5. **CLOTHING** A store has 255 wool ponchos to sell. There are 112 adult-sized ponchos that sell for $45 each. The rest are kid-sized and sell for $32 each. If the store sells all the ponchos, how much money will the store receive?

6. **DINOSAURS** Brad mad a model of a *Stegosaurus*. If you multiply the model's length by 8 and subtract 4, you will find the length of an average *Stegosaurus*. If the actual *Stegosaurus* is 30 ft long, how long is Brad's model.

Lesson 4–4

4-5 Practice

Similar Polygons

Determine whether each pair of polygons is similar. Explain.

1.

5
13
12
15
17
8

2.

15
24
22.8
45
15
7.6
8
5
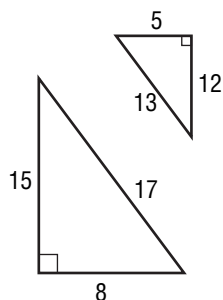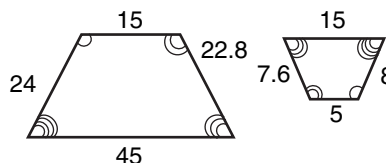
Each pair of polygons is similar. Write and solve a proportion to find each missing measure.

3.

4
4
10
5.6
x

4.

3
6
9
x
18
18
12
6

5.

6
4
4
6
4.5
x

6.

3.5
x
5
20
8
14
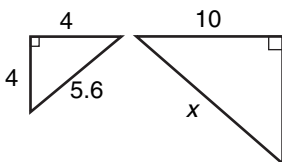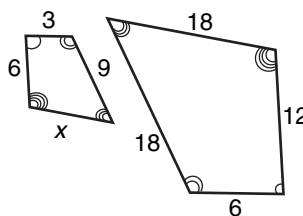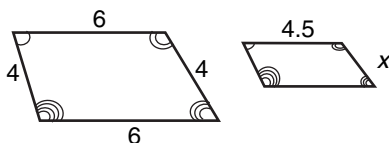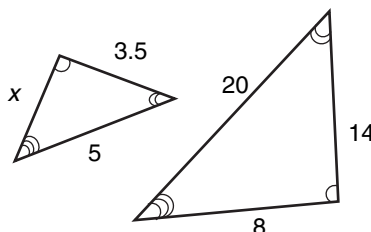
7. **TILES** A blue rectangular tile and a red rectangular tile are similar. The blue tile has a length of 10 inches and a perimeter of 30 inches. The red tile has a length of 6 inches. What is the perimeter of the red tile?

4-6 Practice

Dilations

Draw the image of the figure after the dilation with the given center and scale factor.

1. center: C, scale factor: 2
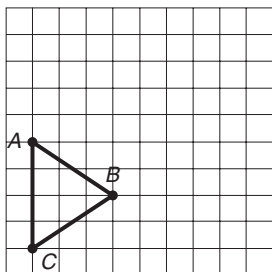
2. center: N, scale factor: $\dfrac{1}{2}$
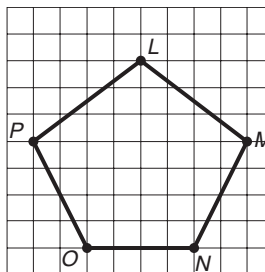
Find the coordinates of the vertices of polygon $F'G'H'J'$ after polygon $FGHJ$ is dilated using the given scale factor. Then graph polygon $FGHJ$ and polygon $F'G'H'J'$.

3. $F(-2, 2), G(2, 3), H(3, -2), J(-1, -3)$; scale factor $\dfrac{3}{4}$
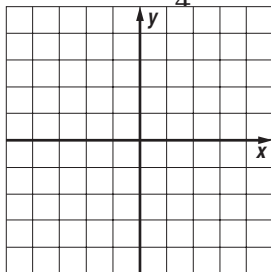
4. $F(-2, 2), G(2, 4), H(3, -3), J(-4, -4)$; scale factor 2
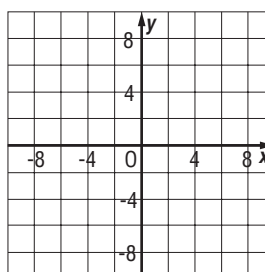
In the exercises below, figure $R'S'T'$ is a dilation of figure RST and figure $W'X'Y'Z'$ is a dilation of figure $WXYZ$. Find the scale factor of each dilation and classify it as an *enlargement* or as a *reduction*.

5.

6.
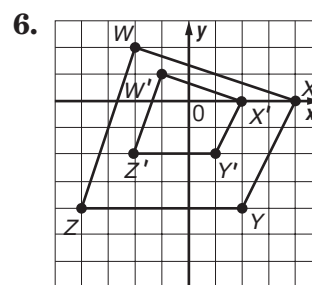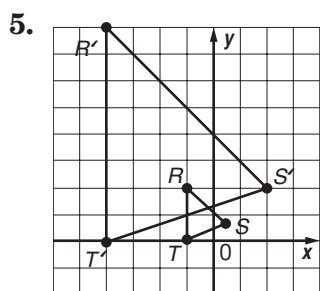
7. GLASS BLOWING The diameter of a vase is now 4 centimeters. If the diameter increases by a factor of $\dfrac{7}{3}$, what will be the diameter then?

Lesson 4–6

4-7 Practice

Scale Drawings and Models

LANDSCAPE PLANS For Exercises 1–4, use the drawing and an inch ruler to find the actual length and width of each section of the park. Measure to the nearest eighth of an inch.

1. Playground

2. Restrooms

3. Picnic Area

4. What is the scale factor of the park plan? Explain its meaning.

Key
1 in. = 68 ft

Lawn

Dog Run

Picnic Area

Playground

Restrooms
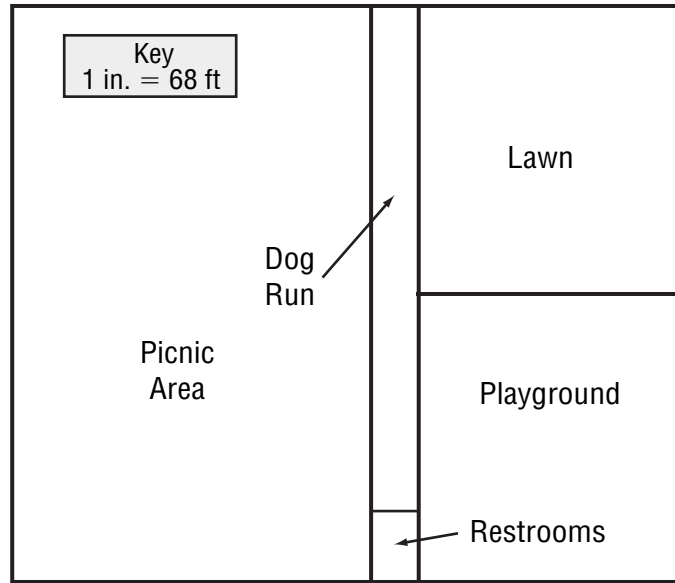
5. **SPIDERS** The smallest spider, the *Patu marples* of Samoa, is 0.43 millimeter long. A scale model of this spider is 8 centimeters long. What is the scale of the model? What is the scale factor of the model?

6. **ANIMALS** An average adult giraffe is 18 feet tall. A newborn giraffe is about 6 feet tall. Kayla is building a model of a mother giraffe and her newborn. She wants the model to be no more than 17 inches high. Choose an appropriate scale for a model of the giraffes. Then use it to find the height of the mother and the height of the newborn giraffe.

7. **TRAVEL** On a map, the distance between Charleston and Columbia, South Carolina, is 5 inches. If the scale of the map is $\frac{7}{8}$ inch = 20 miles, about how long would it take the Garcia family to drive from Charleston to Columbia if they drove 60 miles per hour?

4-8 Practice

Indirect Measurement

In Exercises 1-4, the triangles are similar. Write a proportion and solve the problem.

1. TREES How tall is Yori?

25 ft

h

←5 ft→

←——— 20 ft ———→
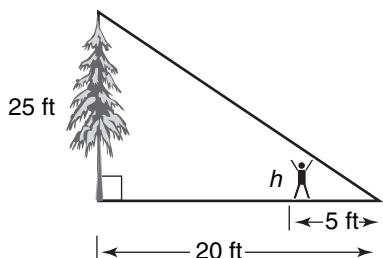
2. TREASURE HUNT How far is it from the hut to the gold coins?

Shovel

18 yd

Gold Coins

Hut x yd

Silver Coins   15 yd

12 yd

Jewels
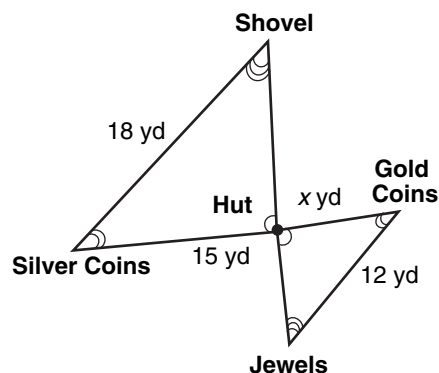
3. LAKE How deep is the water 31.5 feet from the shore? (Hint: $\triangle ABC \sim \triangle ADE$)

←——— 31.5 ft ———→

A 6 ft B D

2 ft

C d ft

E
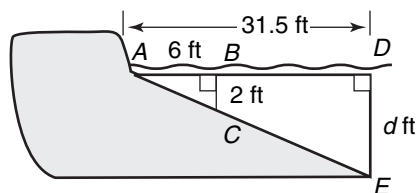
4. SURVEYING How far is it across the pond? (Hint: $\triangle RST \sim \triangle RUV$)

R

156 m

162.5 m

T S

325 m

V U

d m
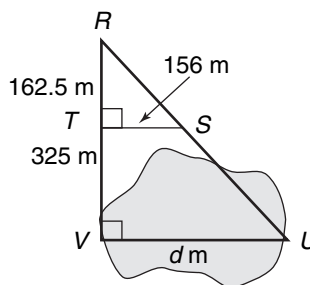
For Exercise 5, draw a diagram of the situation. Then write a proportion and solve the problem.

5. ARCH The Gateway Arch in St. Louis, Missouri is 630 feet tall. Suppose a 12-foot tall pole that is near the Arch casts a 5-foot shadow. How long is the Arch's shadow?

630 ft

12 ft

x 5 ft

Lesson 4–8
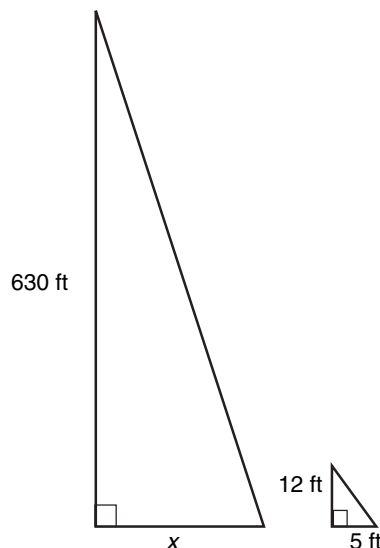
4-9 Practice

Rate of Change

SNOWFALL For Exercises 1–3, use the following information.

The amount of snow that fell during five time periods is shown in the table.

Time (P.M.)	2:00	2:10	2:20	2:30	2:40
Snowfall (in.)	3.8	5.1	5.5	7.8	8.3

1. Find the rate of change in inches of snow that fell per minute between 2:00 P.M. and 2:10 P.M.

2. Find the rate of change in inches of snow that fell per minute between 2:30 P.M. and 2:40 P.M.

3. Make a graph of the data. During which time period did the rate of snowfall increase the greatest? Explain your reasoning.

Snowfall Recorded
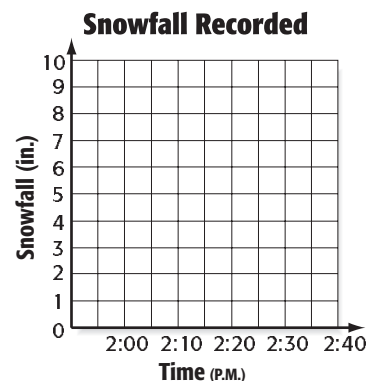
POPULATION For Exercises 4–7, use the the information below and at the right.

The graph shows the population of Washington, D.C., every ten years from 1950 to 2000.

4. Find the rate of change in population between 1950 and 1970.

5. Between which two 10-year periods did the population decrease at the fastest rate?

6. Find the rate of change in population between 1950 and 2000.

Population of Washington, D.C.
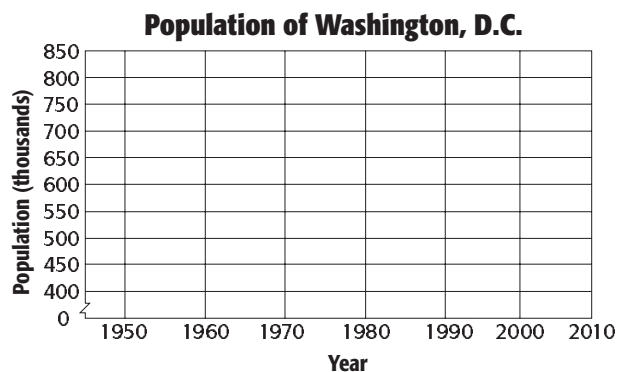
Source: U.S. Census Bureau

7. If the rate of change in population between 1950 and 2000 were to continue, what would you expect the population to be in 2010? Explain your reasoning.

Lesson 4–9

4-10 Practice

Constant Rate of Change

Determine whether the relationship between the two quantities
described in each table is linear. If so, find the constant rate of
change. If not, explain your reasoning.

1.   **Fabric Needed for Costumes**   2.   **Distance Traveled on Bike Trip**

Number of Costumes	2	4	6	8
Fabric (yd)	7	14	21	28

Day	1	2	3	4
Distance (mi)	21.8	43.6	68.8	90.6

For Exercises 3 and 4, refer to the graphs below.

3.   **Hawk Diving Toward Prey**   4.   **Book Sales**

a. Find the constant rate of change and
interpret its meaning.
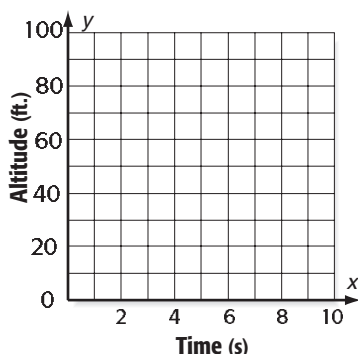
a. Find the constant rate of change and
interpret its meaning.

b. Determine whether a proportional
linear relationship exists between the
two quantities shown in the graph.
Explain your reasoning.

b. Determine whether a proportional
linear relationship exists between the
two quantities shown in the graph.
Explain your reasoning.

Lesson 4–10

5-1 Practice

Ratios and Percents

Write each ratio or fraction as a percent.

1. 47 out of 100

2. 115 per of 100

3. $\dfrac{33}{50}$

4. $\dfrac{11}{25}$

5. 9 out of 20

6. 85 out of 500

7. 3:5

8. 3:10

Write each percent as a fraction in simplest form.

9. 19%

10. 53%

11. 30%

12. 80%

13. 55%

14. 48%

15. 84%

16. 95%

17. GOVERNMENT Two out of 100 U.S. Senators are from Utah. Write this ratio as a percent.

18. ARCHITECTURE Four out of the world's 25 tallest buildings are located in Hong Kong. Write this ratio as a percent.

19. POPULATION According to a recent census, the population of Montana is about 0.3% of the United States population. Write this percent as a fraction in simplest form.

20. REASONING Which is greatest: $\dfrac{3}{4}$, 19:25, or 74%? Explain your reasoning.

21. GEOGRAPHY Five of the 50 U.S. states border the Pacific Ocean. What percent of the U.S. states border the Pacific Ocean?

5-2 Practice

Comparing Fractions, Decimals, and Percents

Write each percent as a decimal.

1. 70% **2.** 40% **3.** 135% **4.** 369%

5. 0.9% **6.** 52.5% **7.** 8% **8.** 3%

Write each decimal as a percent.

9. 0.73 **10.** 0.84 **11.** 0.375 **12.** 0.232

13. 0.005 **14.** 0.008 **15.** 4.11 **16.** 3.52

Write each fraction as a percent.

17. $\dfrac{13}{25}$ **18.** $\dfrac{19}{20}$ **19.** $\dfrac{5}{4}$ **20.** $\dfrac{9}{5}$

21. $\dfrac{3}{40}$ **22.** $\dfrac{7}{125}$ **23.** $\dfrac{5}{9}$ **24.** $\dfrac{1}{3}$

Order each set of numbers from least to greatest.

25. $\dfrac{2}{5}$, 0.5, 4%, $\dfrac{3}{10}$ **26.** 0.6, 6%, $\dfrac{3}{20}$, $\dfrac{4}{25}$

27. 93%, 0.96, $\dfrac{47}{50}$, $\dfrac{19}{20}$ **28.** 77%, $\dfrac{3}{4}$, $\dfrac{19}{25}$, 0.73

Replace ● with <, >, or = to make a true statement.

29. $\dfrac{1}{200}$ ● $\dfrac{1}{2}$% **30.** 2.24 ● $2\dfrac{2}{5}$% **31.** $\dfrac{7}{8}$ ● $\dfrac{7}{8}$ %

32. TEST SCORES On a science test, Ali answered 38 of the 40 questions correctly, Jamar answered $\dfrac{9}{10}$ of the questions correctly, and Paco answered 92.5% of the questions correctly. Write Ali's and Jamar's scores as percents and list the students in order from the least to the highest score.

5-3 Practice

Algebra: The Percent Proportion

Write a percent proportion and solve each problem. Round to the nearest tenth if necessary.

1. 6 is what percent of 24?

2. 125 is what percent of 375?

3. What is 20% of 80?

4. What is 14% of 440?

5. 28 is 35% of what number?

6. 63 is 63% of what number?

7. 16.24 is what percent of 14?

8. Find 350% of 49.

9. What percent of 120 is 24?

10. What percent of 84 is 6?

11. What is 7.5% of 225?

12. 9 is what percent of 660?

13. 110 is 21.1% of what number?

14. Find 6.4% of 72.

15. What percent of 160 is 1?

16. 83 is 12.5% of what number?

17. GAMES Before discarding, Carolee has 4 green cards, 3 red cards, 3 orange cards, and 1 gold card. If she discards the gold card, what percent of her remaining cards are red?

Lesson 5–3

5-4 Practice

Finding Percents Mentally

Compute mentally.

1. 50% of 72

2. 25% of 60

3. $12\frac{1}{2}$% of 88

4. $33\frac{1}{3}$% of 84

5. 60% of 25

6. 20% of 150

7. $37\frac{1}{2}$% of 80

8. $83\frac{1}{3}$% of 120

9. 10% of 85

10. 10% of 149

11. 1% of 99

12. 1% of 78.2

13. 4% of 110

14. 6% of 310

15. 10% of 15.5

16. 10% of 18.4

Replace each ● with <, >, or = to make a true statement.

17. $62\frac{1}{2}$% of 40 ● 40% of 60

18. 10% of 85 ● 1% of 850

19. POPULATION The state of New York has a population of about 20,000,000 people. About 25% of the population of New York is under 18 years old. How many people in New York are under 18 years old?

20. LIVESTOCK In 2004, there were about 60,000,000 pigs and hogs in the United States. About 10% of the pigs and hogs were in Minnesota. How many pigs and hogs were in Minnesota in 2004?

MUSEUMS For Exercises 21–23, use the following information.

The graph shows the percents of men, women, and children visiting a modern art exhibit at a local museum. Suppose 600 people visited the exhibit.

21. How many men visited the exhibit?

22. How many women visited the exhibit?

23. How many children visited the exhibit?

Museum Visitors

$16\frac{2}{3}$% Children

Men $33\frac{1}{3}$%

Women 50%

Lesson 5–4
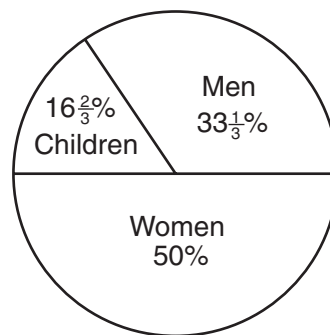
5-5 Practice

Problem-Solving Investigation: Reasonable Answers

Mixed Problem Solving

Use the reasonable answer strategy to solve Exercises 1 and 2.

1. **POPULATION** About 9.5% of the population of New Mexico is Native American. If the population of New Mexico is 1,874,614, would the number of Native Americans living in New Mexico be about 180,000, 360,000, or 900,000?

2. **HOMES** Mr. and Mrs. Whatley want to buy a new home for $245,000. The bank requires 20% of the price of the home as a down payment for the loan. Should the Whatleys plan to pay $5,000, $25,000, or $50,000 as the down payment?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Work Backward.
• Look for a pattern.
• Use Reasonable answers

3. **SPORTS** Three teams participating in a track meet have 25 members, 29 members, and 33 members. The coach of the hosting team wants to have three bottles of water for each athlete. If each case of water contains 24 bottles, should the coach buy 4, 12, or 20 cases of water?

4. **MONEY** After Latoya gave 35% of her allowance to her brother and 25% of her allowance to her sister, she had $12 left. How much was Latoya's allowance?

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your solution(s) and solve the problem.

5. **ELECTIONS** A county with 31,500 registered voters is buying new voting machines. State law requires that the county have one polling place for every 750 registered voters and 4 voting machines per polling place. How many new voting machines should the county order?

6. **GEOMETRY** Brandon is drawing a rectangle similar to the one below except that each side of his rectangle is $2\frac{1}{2}$ times longer. Find the area of Brandon's rectangle.

8 cm

2.4 cm
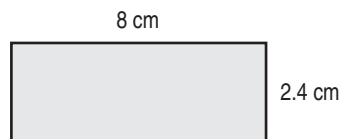
5-6 Practice

Percent and Estimation

Estimate.

1. 39% of 80   **2.** 66% of 72   **3.** 40% of 89   **4.** 75% of 35

5. 19% of 79   **6.** 72% of 51   **7.** 53% of 199   **8.** 23% of 162

9. 48.5% of 151   **10.** 76.5% of 303   **11.** 148% of 69   **12.** 226% of 81

Estimate each percent.

13. 8 out of 37   **14.** 4 out of 19   **15.** 10 out of 21   **16.** 29 out of 90

17. 7 out of 9   **18.** 29 out of 40   **19.** 9 out of 31   **20.** 11 out of 59

21. ANALYZE TABLES   The table gives the land area of one county in each state and the land area of the entire state. Estimate the percent of the land area of each state that is in the county. Then determine which county has the greatest percent of its state's land area. Round to the nearest tenth if necessary.

County	Land Area of County (square miles)	Land Area of Entire State (square miles)
Kent County, MD	279	9,774
Marion County, SC	489	30,109
Newport County, RI	104	1,045

Source: U.S. Census Bureau

Lesson 5–6

5-7 Practice

Algebra: The Percent Equation

Solve each problem using a percent equation.

1. Find 80% of 40.

2. What is 30% of 70?

3. What percent of 80 is 32?

4. 36 is what percent of 120?

5. 35% of what number is 84?

6. 95 is 50% of what number?

7. What number is 18% of 72?

8. Find 32% of 96.

9. 8 is what percent of 4,000?

10. What percent of 6,000 is 15?

11. 4% of what number is 7?

12. 85 is 10% of what number?

13. Find $3\frac{1}{2}$% of 250.

14. What is $7\frac{1}{4}$% of 56?

15. 560 is what percent of 420?

16. $2\frac{1}{5}$% of what number is 44?

17. VIDEO GAMES   A video game costs $55. If 7.5% sales tax is added, what is the total cost of the video game?

18. FOOTBALL   In the 2006 Super Bowl, Pittsburgh and Seattle each scored 7 points in the 4th quarter. Which team scored the higher percentage of their final score in the 4th quarter?

2006 Super Bowl

Team	Final Score
Pittsburgh	21
Seattle	10

Source: abcnews.com

Lesson 5–7

5-8 Practice

Percent of Change

Find each percent of change. Round to the nearest tenth if necessary. State whether the percent of change is an *increase* or *a decrease*.

1. original: 8 points
new: 10 points

2. original: 45 inches
new: 48 inches

3. original: $60
new: $48

4. original: $750
new: $690

5. original: 25 miles
new: 36 miles

6. original: 12 fouls
new: 8 fouls

Find the selling price for each item given the cost to the store and the percent of markup.

7. backpack: $14, 40% markup

8. soccer ball: $22, 35% markup

9. music CD: $9, 45% markup

10. sweatshirt: $27, 20% markup

Find the sale price of each item to the nearest cent.

11. book: $29, 25% off

12. sofa: $975, 30% off

13. jeans: $34.95, 40% off

14. stereo: $459.99, 15% off

Find each percent of change. Round to the nearest tenth if necessary.

15. What is the percent of markup on a $120 cell phone that sells for $149?

16. Find the percent of markup on a $50 pair of shoes that sells for $60.

17. Find the percent of discount on a $45 jacket that regularly sells for $75.

18. What is the percent of discount on a $290 television that regularly sells for $349?

5-9 Practice

Simple Interest

Find the simple interest to the nearest cent.

1. $350 at 5% for 4 years

2. $750 at 6.5% for 3 years

3. $925 at 4.75% for 3 months

4. $2,050 at 7.65% for 36 months

5. $1,000 at $5\frac{1}{2}$% for 18 months

6. $8,500 at $10\frac{3}{8}$% for $2\frac{1}{2}$ years

Find the total amount in each account to the nearest cent, assuming simple interest.

7. $1,500 at 6% for 5 years

8. $4,010 at 5.2% for 4 years

9. $925 at 7.25% for 6 months

10. $850 at 8.38% for 8 months

11. $16,000 at $3\frac{1}{4}$% for 42 months

12. $3,200 at $6\frac{2}{3}$% for $5\frac{1}{2}$ years

13. COINS   The value of a rare coin increased in value from $350 to $420 in only 6 months. Find the simple interest rate for the value of the coin.

14. HOUSING   Mrs. Landry bought a house for $35,000 in 1975. She sold the house for $161,000 in 2005. Find the simple interest rate for the value of the house.

15. CARS   Brent's older brother took out a 4-year loan for $16,000 to buy a car. If the simple interest rate was 8%, how much total will he pay for the car including interest?

16. MORTGAGE   The Fongs need to borrow $200,000 to purchase a home. A local bank is offering a 20-year mortgage at 6.75% interest, while an online lender is offering a 30-year mortgage at 5.25% interest. Assuming simple interest, which loan will result in the lower interest?

Lesson 5–9

6-1 Practice

Line and Angle Relationships

Find the value of x in each figure.

1.
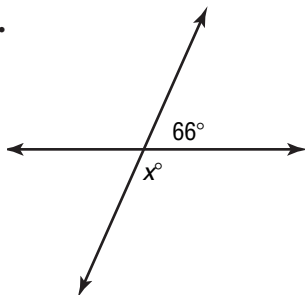
2.
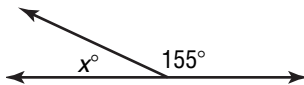
3.
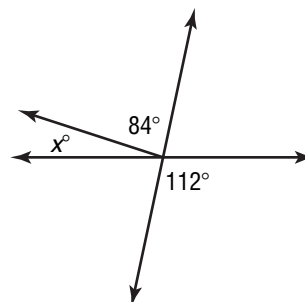
Classify each pair of angles as *alternate interior*, *alternate exterior*, or *corresponding*.

4. $\angle 1$ and $\angle 5$

5. $\angle 1$ and $\angle 6$

6. $\angle 4$ and $\angle 7$

7. $\angle 3$ and $\angle 5$

8. $\angle 2$ and $\angle 6$

9. $\angle 2$ and $\angle 8$
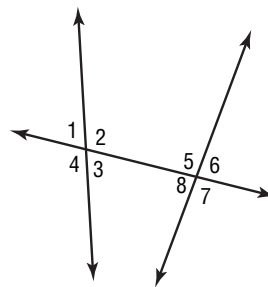
For Exercises 10–13, use the figure at the right and justify your answer.

10. Find $m\angle 7$ if $m\angle 6 = 132°$.

11. Find $m\angle 4$ if $m\angle 1 = 144°$.

12. Find $m\angle 5$ if $m\angle 3 = 47°$.

13. Find $m\angle 8$ if $m\angle 2 = 39°$.
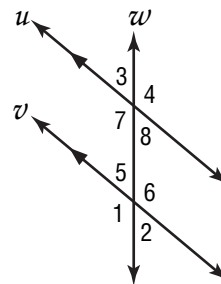
Find the measure of each angle if $j\|k$, $m\|n$, and $m\angle 6 = 35°$.

14. $m\angle 1$

15. $m\angle 16$

16. $m\angle 5$

17. $m\angle 11$

18. $m\angle 10$

19. $m\angle 13$
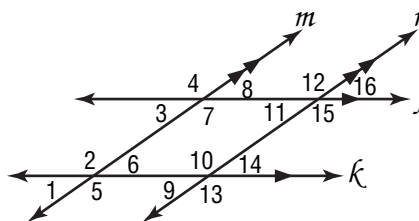
20. SYMBOLS The symbol at the right is an equal sign with a slash through it. It is used to represent *not equal to* in math, as in $1 \neq 2$. If $m\angle 3 = 78°$ and $\angle 2 \cong \angle 3$, classify the relationship between $\angle 2$ and $\angle 3$. Then find $m\angle 1$. Explain your reasoning.
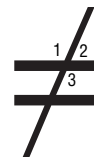
6-2 Practice

Problem-Solving Investigation: Use Logical Reasoning

Mixed Problem Solving

For Exercises 1 and 2, solve each problem using logical reasoning.

1. **NUMBER SENSE** Simplify each product of powers. Then use logical reasoning to simplify $10^{12} \times 0.1^4$, $10^5 \times 0.1^5$, and $10^{12} \times 0.1^{12}$.

Product of Powers	Simplified Form
$10^2 \times 0.1^2$	
$10^3 \times 0.1^3$	
$10^7 \times 0.1^7$	

2. **MEASUREMENT** You have a pen that is 6 inches long and a pencil that is 7 inches long. Explain how you can use the pen and pencil to draw a line segment that is 3 inches long.

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Look for a pattern.
• Draw a diagram.
• Use logical reasoning.

3. **SPORTS** At the end of a baseball game, the winning team had three more runs than their opponents. If they had scored 1 more run, they would have had twice as many as their opponents. How many runs did each team have?

4. **SHOPPING** Brittany bought five items at the grocery store for her mother. From the given clues, list the items from least expensive to most expensive.
   • The peanut butter cost less than the sliced turkey.
   • The sliced turkey cost half as much as the birthday cake.
   • The peanut butter cost $0.20 more than the milk.
   • The price of the lettuce was 40% of the price of the milk.

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your solution(s) and solve the problem.

5. **SOLAR SYSTEM** Jupiter is the largest planet in the solar system with a diameter of 88,736 miles. Saturn is the second largest planet with a diameter of 74,978 miles. How much greater is the diameter of Jupiter than the diameter of Saturn?

6. **TRAVEL** Mr. Bradley often flies from Chicago to San Francisco and back again, a total distance of 3,716 miles. If he made this trip 25 times last year, find the total distance Mr. Bradley traveled on these trips.

Lesson 6–2

6-3 Practice

Polygons

Find the sum of the measures of the interior angles of each polygon.

1. 13-gon   **2.** 16-gon   **3.** 17-gon

4. 18-gon   **5.** 20-gon   **6.** 25-gon

Find the measure of one interior angle in each regular polygon. Round to the nearest tenth if necessary.

7. pentagon   **8.** hexagon   **9.** 24-gon

ALGEBRA For Exercises 10 and 11, determine the angle measures in each polygon.

10.

11.
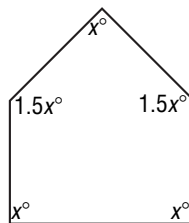
12. FLOORING A floor is tiled with a pattern consisting of regular octagons and squares as shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles.
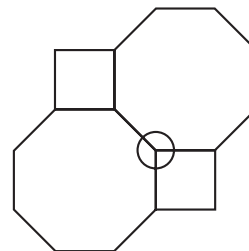
13. ART Jose is laying out a pattern for a stained glass window. So far he has placed the 13 regular polygons shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles.
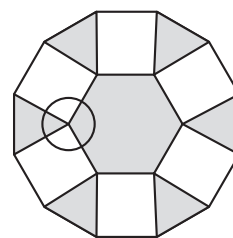
14. REASONING Vanessa's mother made a quilt using a pattern of repeating regular hexagons as shown. Will Vanessa be able to make a similar quilt with a pattern of repeating regular pentagons? Explain your reasoning.
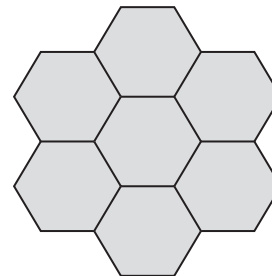
6-4 Practice

Congruent Polygons

Determine whether the polygons are congruent. If so, name the corresponding parts and write a congruence statement.

1.
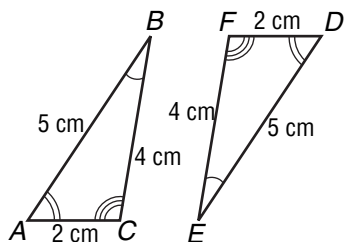
2.
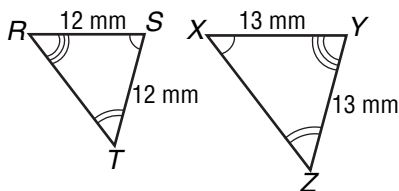
3.
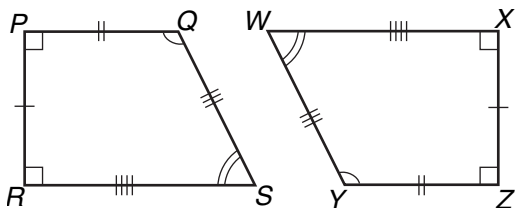
4.
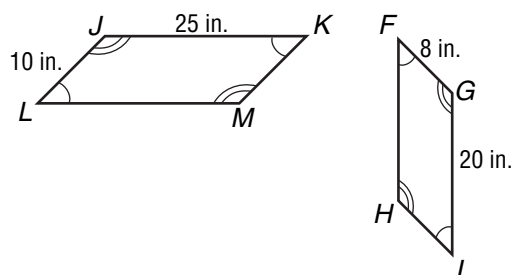
In the figure, △ABC ≅ △DEF. Find each measure.

5. *DF*

6. *DE*

7. $m\angle D$

8. $m\angle E$

In the figure, quadrilateral *PQRS* is congruent to quadrilateral *TUVW*. Find each measure.

9. *PQ*

10. *QR*

11. $m\angle U$

12. $m\angle V$
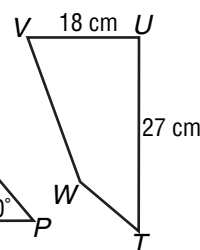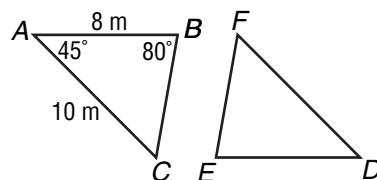
13. FLAGS The two flags flying on the pole are in the shape of triangles. If △*FGH* ≅ △*KLM*, $m\angle F = 80°$, and $m\angle H = 80°$, find $m\angle L$.
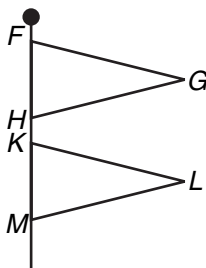
14. FLOORING Tevin designed custom tiles for his shower as shown. The tiles are congruent quadrilaterals. Write a congruence statement. Then find $m\angle J$ if $m\angle A = 90°$, $m\angle B = 60°$, and $m\angle D = 90°$.
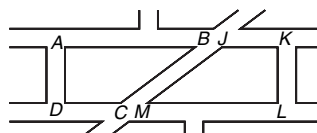
6-5 Practice

Symmetry

GEOMETRY For Exercises 1–6, complete parts a and b for each figure.

  a. Determine whether the figure has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.
  b. Determine whether the figure has rotational symmetry. Write *yes* or *no*. If *yes*, name its angle(s) of rotation.

1.

50°   50°
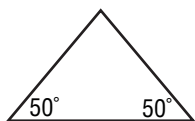
2.

3.
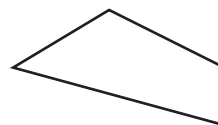
4.
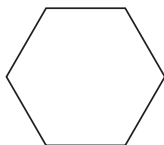
5.
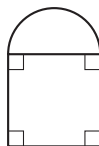
6.
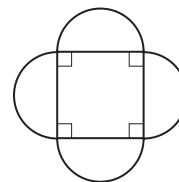
GREEK LETTERS For Exercises 7 and 8, use the Greek letters below.

  a. gamma   **b.** chi   **c.** psi   **d.** omega

Γ   X   Ψ   Ω

7. Determine whether each Greek letter has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.

8. Which of the Greek letters could be rotated and still look the same? If any, name the angle(s) of rotation.

9. **PATTERNS** Part of a pattern is shown at the right. Complete the pattern so that the entire pattern has rotational symmetry of 120° and 240°.

6-6 Practice

Reflections

Draw the image of the figure after a reflection across the given line.
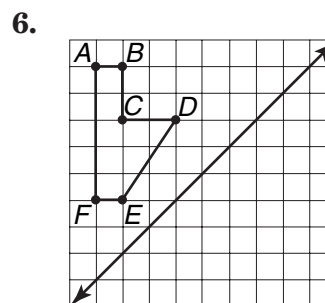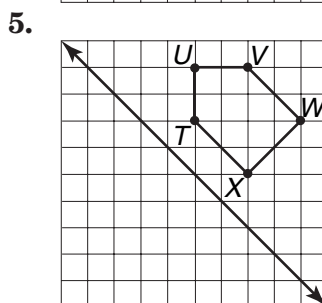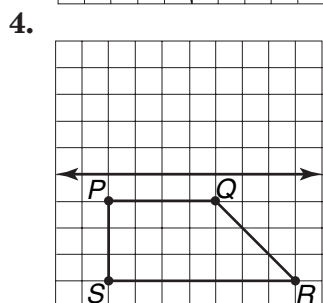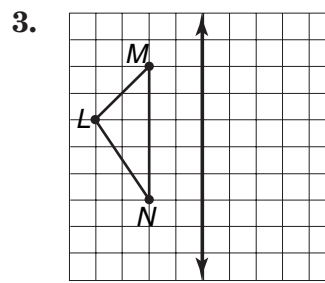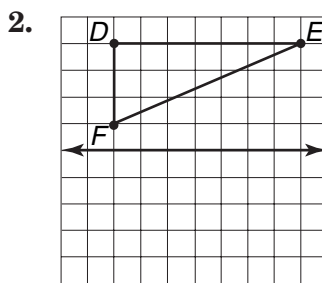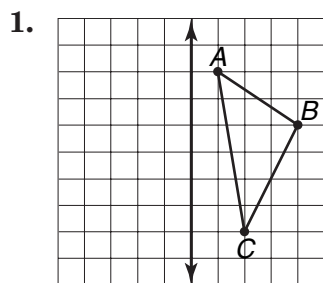
1.

2.

3.

4.

5.

6.

Graph the figure with the given vertices. Then graph the image of the figure after a refection over the given axis, and write the coordinates of the image's vertices.

7. triangle FGH with vertices $F(-1, 1)$, $G(-3, 3)$, and $H(-4, 2)$; x-axis
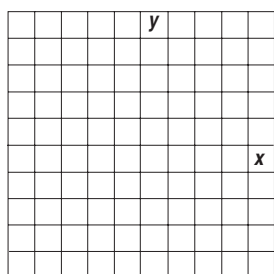
8. square $PQRS$ with vertices $P(2,-1)$, $Q(3,-2)$, $R(2,-3)$, and $S(1,-2)$; y-axis
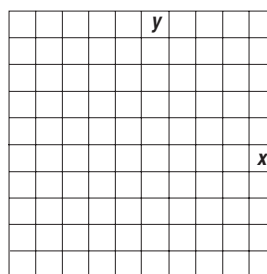
9. **GREEK ALPHABET** The Greek letter pi, Π, shown in the figure at the right, looks the same after a reflection over a vertical line. It does not look the same after a reflection over a horizontal line. Which of the Greek letters Γ, Φ, Θ, Z, Ω, and Ψ look the same after a reflection over a vertical line? Which look the same after a reflection over a horizontal line?
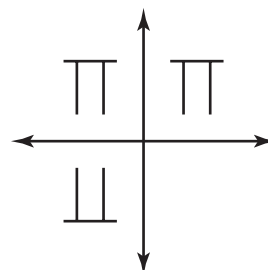
6-7 Practice

Translations

Draw the image of the figure after the indicated translation.

1. 3 units right and 2 units up
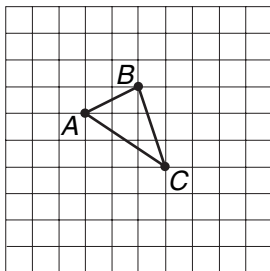
2. 5 units right and 3 units down
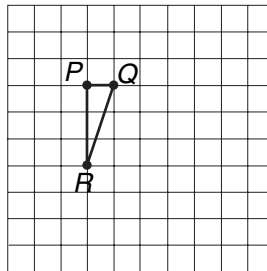
3. 2 units left and 1 unit up
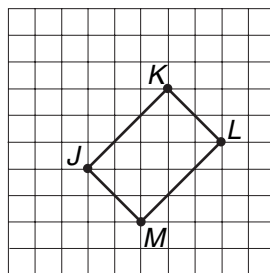
4. 4 units left and 2 units down
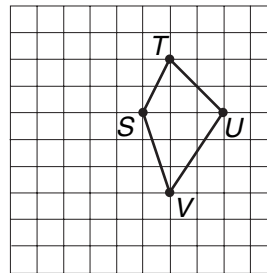
Graph the figure with the given vertices. Then graph the image of the figure after the indicated translation, and write the coordinates of its vertices.

5. $\triangle FGH$ with vertices $F(1, 3)$, $G(2, 4)$, and $H(3, 2)$; translated 3 units left and 1 unit down
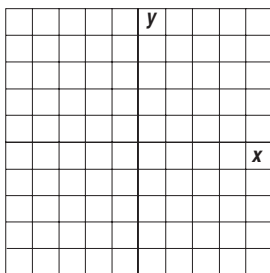
6. rectangle $PQRS$ with vertices $P(-4,-1)$, $Q(0, 1)$, $R(1,-1)$, and $S(-3,-3)$ translated 2 units right and 3 units up
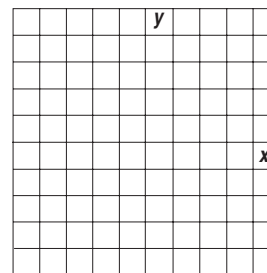
7. QUILTS The quilt design at the right is a traditional American design. Describe the minimum number of translations of the original pattern, A, needed to create the section shown.

8 in. A

8 in.

Lesson 6–7
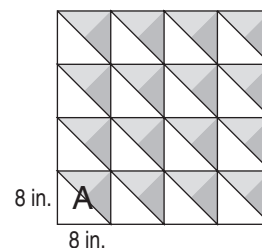
7-1   Practice

Circumference and Area of Circles

Find the circumference of each circle. Round to the nearest tenth.

1.

10 in.

2.

14 mm

3.

22 yd

4.

25 m
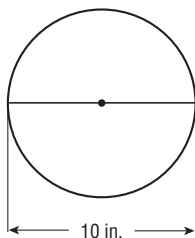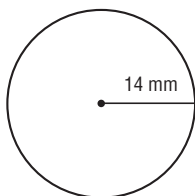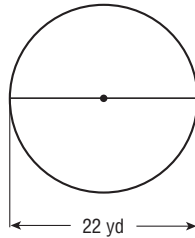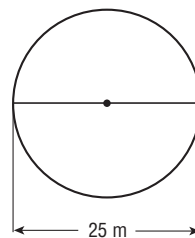
Find the area of each circle. Round to the nearest tenth.

5.

25 m

6.

8.5 ft

7.

6.75 mi

8.

5.25 cm
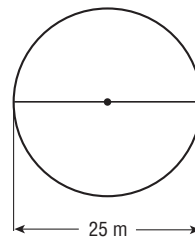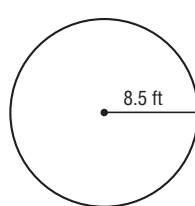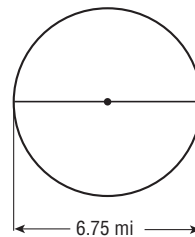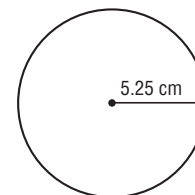
Find the circumference and area of each circle. Round to the nearest tenth.

9. The diameter is 8 centimeters.

10. The radius is 4.7 inches.

11. The radius is 0.9 feet.

12. The diameter is 6.8 kilometers.

Another approximate value for π is $\dfrac{22}{7}$. Use this value to find the circumference and area of each circle.

13. The diameter is 14 yards.

14. The radius is $1\dfrac{1}{6}$ millimeters.

15. WINDMILL   Each sail on a windmill is 5 meters in length. How much area do the wings cover as they turn from the force of the wind?

16. ALGEBRA   Find the radius of a circle if its area is 314 square miles.
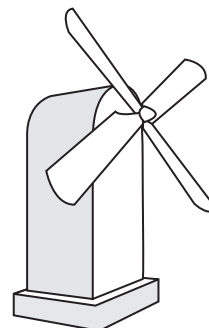
7-2 Practice

Problem-Solving Investigation: Solve a Simpler Problem

Mixed Problem Solving

Use the solve a simpler problem strategy to solve Exercises 1 and 2.

1. **ASSEMBLY** A computer company has two locations that assemble computers. One location assembles 13 computers in an hour and the other location assembles 12 computers in an hour. Working together, how long will it take both locations to assemble 80 computers?

2. **AREA** Determine the area of the shaded region if the radii of the six circles are 1, 2, 3, 4, 5, and 10 centimeters.
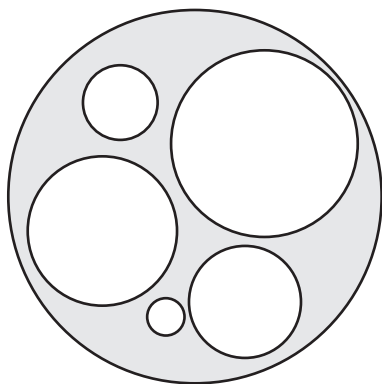
Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Look for a pattern.
• Use a Venn diagram.
• Reasonable answers
• Solve a simpler problem.

3. **NUMBER SENSE** Find the sum of all the even numbers from 2 to 50, inclusive.

4. **ANALYZE TABLES** Mr. Brown has $1,050 to spend on computer equipment. Does Mr. Brown have enough money to buy the computer, scanner, and software if a 20% discount is given and the sales tax is 5%? Explain.

Item	Cost
Computer	$899
Scanner	$54
Software	$278

Select the Operation

For Exercises 5 and 6, select the appropriate operation to solve the problem. Justify your solution and solve the problem.

5. **COPIER** The counter on a business copier read 18,678 at the beginning of the week and read 20,438 at the end of the week. If the business was in operation 40 hours that week, what was the average number of copies made each hour?

6. **HUMMINGBIRD** In normal flight a hummingbird can flap its wings 75 times each second. At this rate, how many times does a hummingbird flap it wings in a 20-minute flight?

7-3 Practice

Area of Composite Figures

Find the area of each figure. Round to the nearest tenth if necessary.

1.

12 mi
18 mi
5 mi
8 mi

2.

4.8 cm
3.6
1.1 cm
5.9 cm

3.

5 ft
4 ft

4.

8 m
6 m
10 m
6 m
20 m

5.

9 yd
8 yd

6.

12 in.
7 in.
4 in.
9 in.
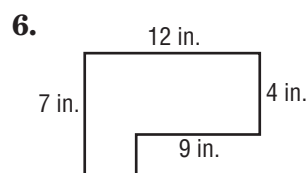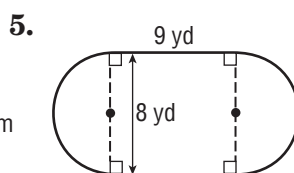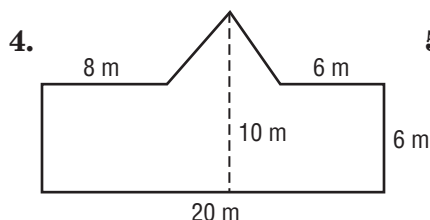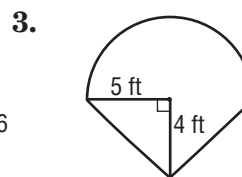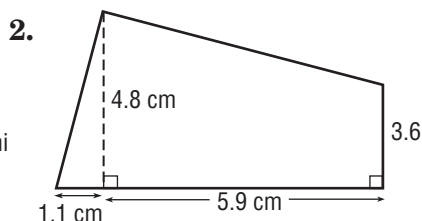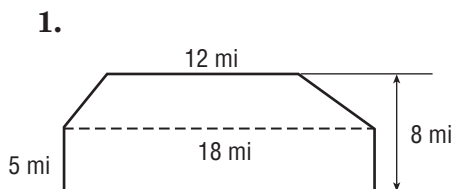
In each diagram, one square unit represents 10 square centimeters. Find the area of each figure. Round to the nearest tenth if necessary.

7.

8.
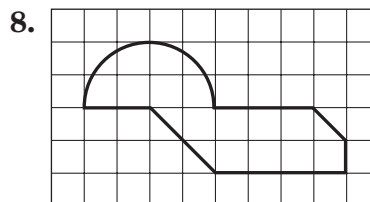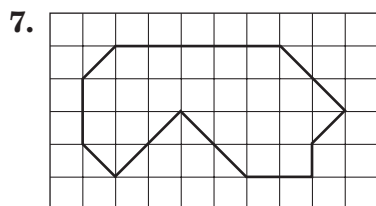
9. GAZEBO The Parks and Recreation department is building a gazebo in the local park with the dimensions shown in the figure. What is the area of the floor?

5 m
4 m
11 m
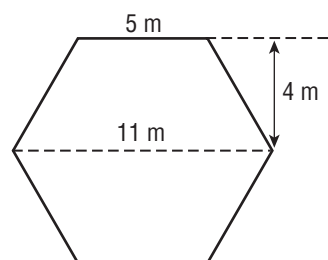
10. DECK The Pueyo family wants to paint the deck around their swimming pool with the dimensions shown in the figure. If a gallon covers 200 square feet, how many gallons of paint are needed to apply two coats of paint?

24 ft
12 ft
30 ft
24 ft
36 ft
18 ft

Lesson 7-3
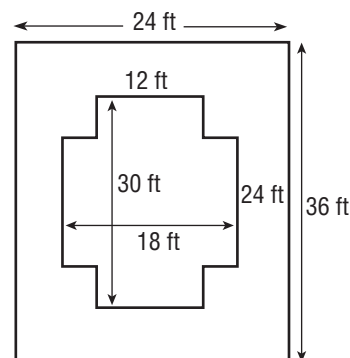
7-4 Practice

Three-Dimensional Figures

Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.
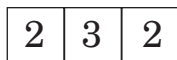
1.
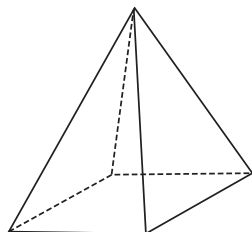
2.
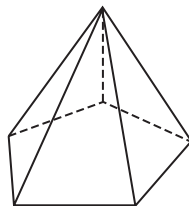
3.
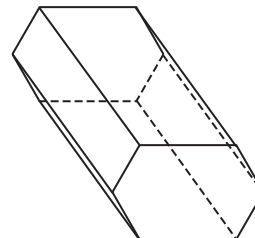
4. **FLAGS** The plans for the base of a flag pole are shown. Draw and label the top, front, and side views.
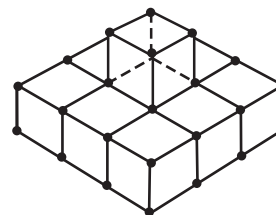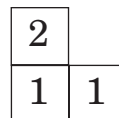
The top-count views of three-dimensional figures are shown. Draw each figure on isometric dot paper.
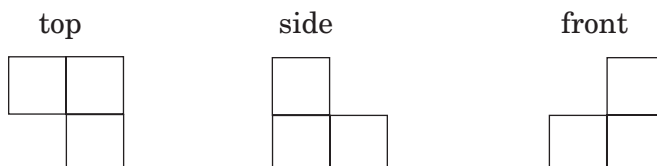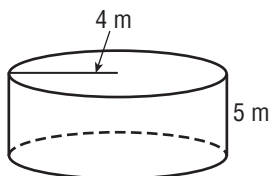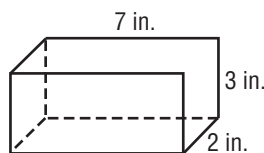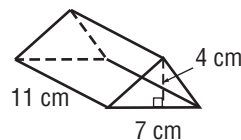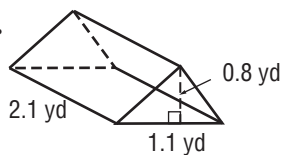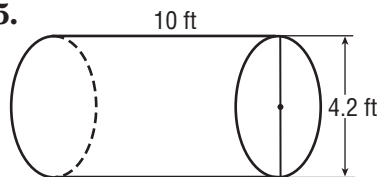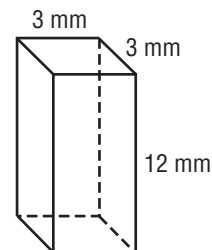
5. | 2 | 3 | 2 |

6.
| 2 | |
| 1 | 1 |

The top view, a side view, and the front view of a three-dimensional figure are shown. Draw the figure on isometric dot paper.

7.   top   side   front

Lesson 7-4

7-5 Practice

Volume of Prisms and Cylinders

Find the volume of each solid. Round to the nearest tenth if necessary.

1.

4 m

5 m

2.

7 in.

3 in.

2 in.

3.

4 cm

11 cm

7 cm

4.

0.8 yd

2.1 yd

1.1 yd

5.

10 ft

4.2 ft

6.

3 mm

3 mm

12 mm

7. rectangular prism: length, 10 m; width, 5 m; height, 5 m

8. triangular prism: base of triangle, 8 in; altitude, 8 in; height of prism, 6 in

9. cylinder: radius, 7 ft; height, 4 ft

10. cylinder: diameter, 6.4 cm; height, 4.9 cm

11. ALGEBRA Find the base of the triangle of a triangular prism with a height of 8 yards, altitude of 4 yards, and a volume of 16 cubic yards.

12. ALGEBRA Find the height of a cylinder with a diameter of 5 meters, and a volume of 49.1 cubic meters.

13. WATER TANK About 7.5 gallons of water occupy one cubic foot. About how many gallons of water are in a cylindrical water tank with dimensions shown in the figure?
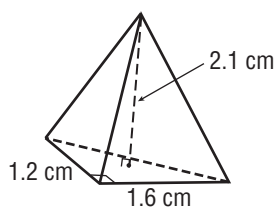
100 ft

40 ft
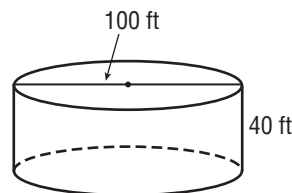
7-6 **Practice**

Volume of Pyramids, Cones, and Spheres

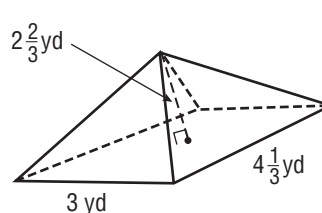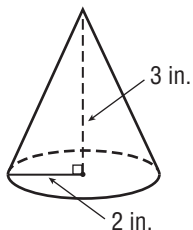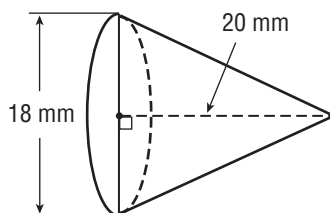**Find the volume of each pyramid. Round to the nearest tenth if necessary.**

1.

5 ft

3 ft

3 ft

2.

2.1 cm

1.2 cm

1.6 cm

3.

$2\frac{2}{3}$ yd

$4\frac{1}{3}$ yd

3 yd
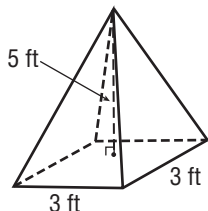
Find the volume of each cone. Round to the nearest tenth if necessary.
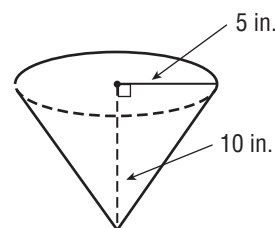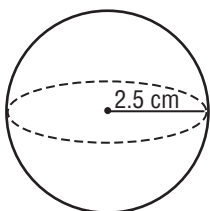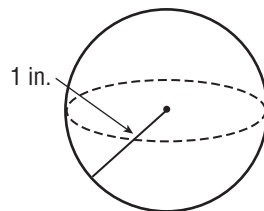
4.

3 in.

2 in.

5.

20 mm

18 mm

6.

5 in.

10 in.

Find the volume of each sphere. Round to the nearest tenth if necessary.
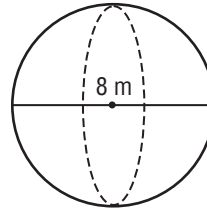
7.

2.5 cm

8.

1 in.

9.

8 m

Find the volume of each solid. Round to the nearest tenth if necessary.

10.

6 mm

2 mm

8 mm

8 mm

11.

2 ft

4 ft

5 ft

3 ft

12.

1.5 yd

2 yd

0.9 yd
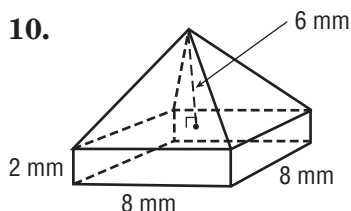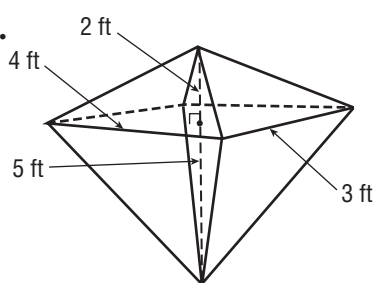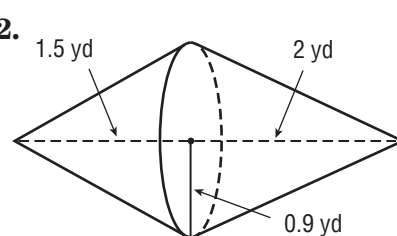
13. **PYRAMIDS** The Great Pyramid has an astounding volume of about 84,375,000 cubic feet above ground. At ground level the area of the base is about 562,500 square feet. What is the approximate height of the Great Pyramid?

14. **VOLUME** About how much more volume does a sphere with a radius of 4 inches have than a cone with a radius of 4 inches and a height 4 inches? Round to the nearest whole cubic inch.

7-7 Practice

Surface Area of Prisms and Cylinders

Find the lateral and total surface areas of each solid. Round to the nearest tenth if necessary.

1.

2.

3.

4.

5.

6.
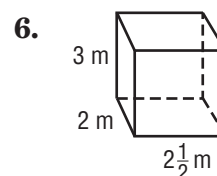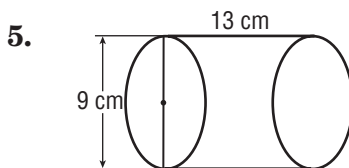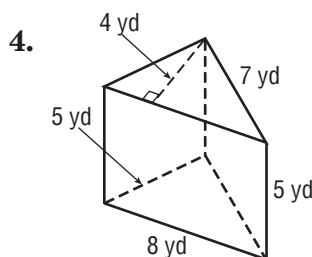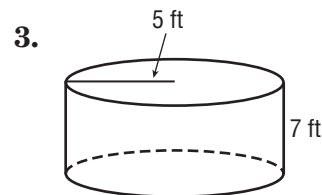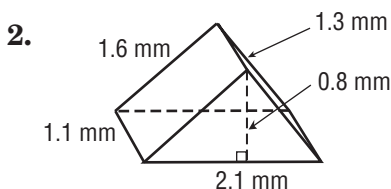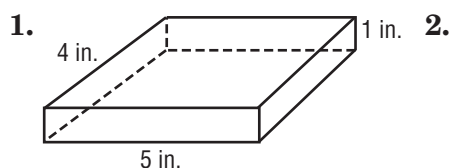
7. ALGEBRA   A rectangular prism has height 4 millimeters and width 5 millimeters. If the total surface area is 166 square millimeters, what is the length of the prism?

8. WATER   A cylindrical-shaped water storage tank with diameter 60 feet and height 20 feet needs to be painted on the outside. If the tank is on the ground, find the surface area that needs painting.

9. CONCRETE   Find the total surface area of the hollow concrete casing shown, including the interior.

Lesson 7-7
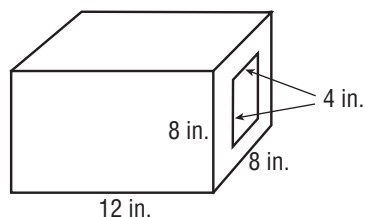
7-8 Practice

Surface Area of Pyramids

Find the lateral and total surface areas of each regular pyramid. Round to the nearest tenth if necessary.

1.

4.2 cm

2.1 cm   2.1 cm

2.

9 ft

8 ft

6.9 ft

8 ft

8 ft

3.

3 yd

3 yd

2.6 yd

3 yd

3 yd

4.

2 m

$1\frac{1}{4}$ m

$1\frac{1}{4}$ m

5.

20 mm

16 mm

16 mm

6.

25 in.

32 in.

32 in.
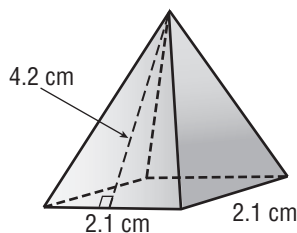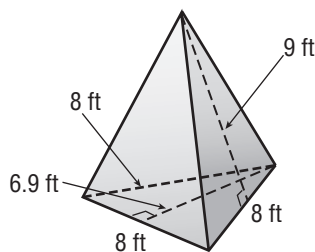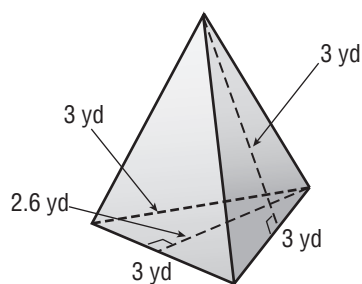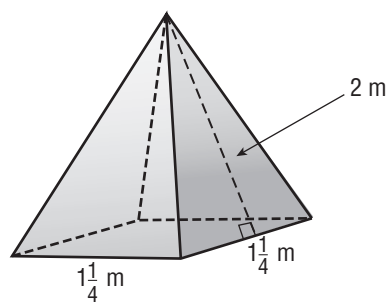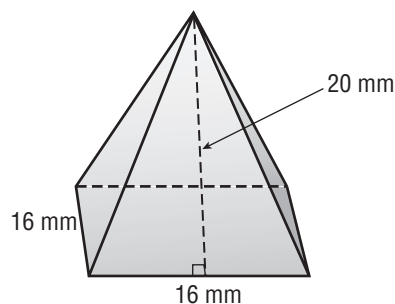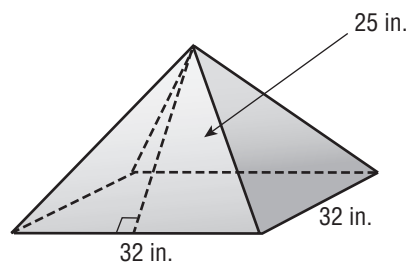
7. **ALGEBRA** A square pyramid has a lateral surface area of 20 square yards. If the slant height is 2 yards, what is the total surface area of the pyramid?

8. **PYRAMIDS** When the Great Pyramid was built, the slant height was about 610 feet and the length of the base was about 750 feet. Find the approximate lateral surface area of the Great Pyramid when it was built.

7-9 Practice

Similar Solids

Find the missing measure for each pair of similar solids. Round to the nearest tenth if necessary.

1.
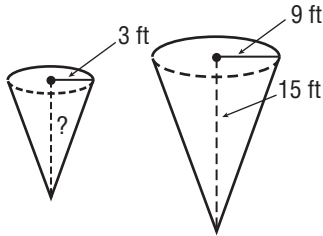
2.
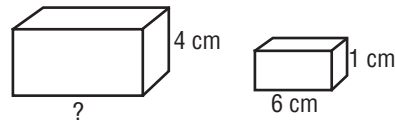
3.
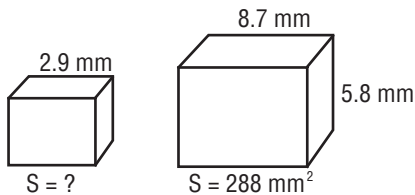
4.
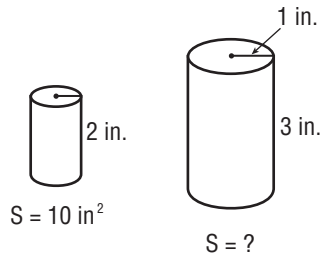
5.
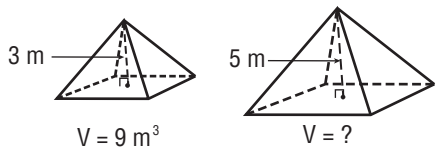
6.
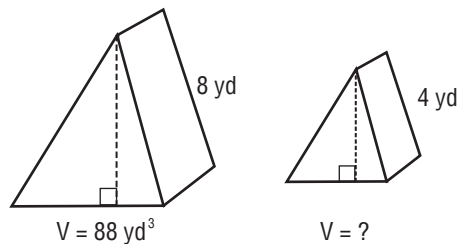
7. MODEL TRAINS   The caboose of an N scale model train is $4\frac{1}{2}$ inches long. In the N scale, 1 inch represents $13\frac{1}{2}$ feet. What is the length of the original caboose?

8. ALGEBRA   The volumes of two similar cylinders are 7 cubic meters and 56 cubic meters. Find their scale factor.

For Exercises 9-11, use the similar prisms shown.

9. Write the ratio of the surface areas and the ratio of the volumes of Prism B to Prism A.
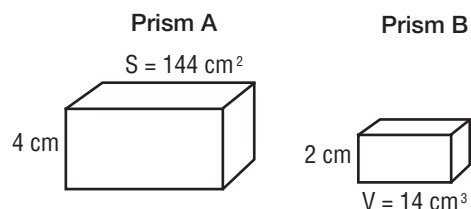
10. Find the surface area of prism B.

11. Find the volume of prism A.

8-1 **Practice**

Counting Outcomes

Draw a tree diagram to determine the number of possible outcomes.

1. A coin is tossed and one of the vowels A, E, I, O, and U is chosen at random.

2. Peanut butter comes in smooth or chunky and in small, regular, and family-size containers.

Use the Fundamental Counting Principle to find the number of possible outcomes.

3. A month of the year is picked at random and a coin is tossed.
4. A quarter and a dime are tossed and a number cube is rolled.
5. There are 8 true-false questions on a science quiz.

GIFT BASKETS For Exercises 6–9, use the following information.

Gina made gift baskets to sell at her electronics store. Each basket had a CD of either classical or jazz music, a DVD of a comedy or an action film, a video game or a financial software package, and a small, medium, or large T-shirt with her store's logo. An equal number of baskets of each possible combination were made.

6. How many different basket combinations were there?
7. Find the number of combinations that had a video game.
8. If a basket was chosen randomly, what is the probability that the basket contained an action film?
9. What is the probability of choosing a basket with classical music and a large T-shirt?

8-2 Practice

Permutations

Find each value.

1. $P(4, 2)$ 2. $P(8, 3)$ 3. $P(7, 5)$ 4. $P(9, 9)$

5. $P(10, 4)$ 6. $P(15, 5)$ 7. $P(50, 3)$ 8. $P(75, 2)$

LETTERS Each arrangement of the letters in the word *tripod* is placed on an index card. One index card is selected at random. Find each probability.

9. P(word begins with t)   10. P(word ends with od)

11. **ACCOUNT NUMBERS** A businessman assigns five-digit account numbers to each of his clients using only the digits 2, 3, 4, 5, 6, 7, 8, and 9. How many account numbers are available if no digit is repeated?

12. **GAMES** To win a particular game, a player must correctly answer questions in six different categories. In how many orders can the winning player answer the questions?

13. **GIFTS** Hannah bought 10 different DVDs. How many ways can she give each of her 4 best friends one of the DVDs as a gift?

14. **AUDITIONS** The director of the school play has asked 14 boys to try out for parts. In how many ways can she choose the first 5 boys to audition?

15. **SEATING** A classroom has 25 student desks. In how many different ways can the first 3 students entering the room choose a seat?

16. **VACATIONS** The Collinses have narrowed their possible vacation destinations to the ones shown at the right. In how many ways can they choose their vacations for the next three years from these destinations?

Vacation Destinations
Cancun, Mexico
Chicago, Illinois
New York, New York
Orlando, Florida
Paris, France
San Francisco, California
Seattle, Washington

Lesson 8–2

8-3 Practice

Combinations

1. How many different combinations of 3 books can be chosen from a list of 10 recommended books?

2. How many different combinations of 2 students can be chosen from a group of 30 students to carry the school banner in a parade?

3. How many four-topping sundaes can be made from the list of toppings at the right?

Sundae Toppings	
bananas	hot fudge
candy sprinkles	nuts
caramel sauce	pineapple
cherries	strawberries
chocolate chips	whipped cream
cookie pieces	

4. How many different ways can 5 people be chosen from the 12 people in a contest to receive identical prizes?

Determine whether each situation is a *permutation* or a *combination*. Then find the number of possible outcomes.

5. choosing 5 of the 20 books on a shelf to donate to the public library

6. choosing 6 out of 9 songs to be sung at different times in an assembly

7. choosing the locations of 5 sculptures in a museum from a selection of 10 sculptures

8. choosing 3 of 16 available spices to season a stew

ENTERTAINMENT For Exercises 9 and 10, use the following information.

Derek rented 8 movies but he only has time to watch half of them.

9. How many ways are there to watch half of the movies if order is important?

10. How many ways are there to watch half of the movies if order is not important?

11. GAMES Fifteen customers at a store want to buy the latest game system. The store only has 12 of the systems. Determine whether this situation represents a permutation or a combination. Then determine the number of ways the game systems can be distributed to the customers.

8-4 Practice

Probability of Composite Experiments

The two spinners at the right are spun. Find each probability.

1. P(4 and C)

2. P(1 and A)

3. P(even and C)

4. P(odd and A)
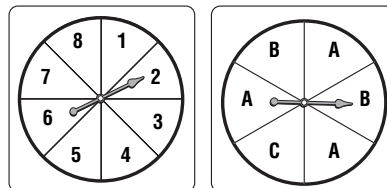
5. P(greater than 3 and B)

6. P(less than 5 and B)

GAMES There are 10 yellow, 6 green, 9 orange, and 5 red cards in a stack of cards turned face down. Once a card is selected, it is not replaced. Find each probability.

7. P(two yellow cards)

8. P(two green cards)

9. P(a yellow card and then a green card)

10. P(a red card and then an orange card)

11. P(two cards that are not orange)

12. P(two cards that are neither red nor green)

13. **OFFICE SUPPLIES** A store sells a box of highlighters that contains 4 yellow, 3 blue, 2 pink, and 1 green highlighter. What is the probability of randomly picking 1 blue and

    1 pink highlighter from the box?

14. **BASKETBALL** Angelina makes 70% of her free throws. What is the probability that she will make her next two free throws?

CAR RENTALS For Exercises 15 and 16, use the following information and the information in the table.

At a car rental office, 63% of the customers are men and 37% are women.

Car Requests	
Compact	25%
Full-size	37%
Convertible	10%
SUV	16%
Luxury	12%

15. What is the probability that the next customer will be a woman who requests a convertible?

16. What is the probability that the next customer will be a man who requests either a compact car or luxury car?

8-5 Practice

Experimental and Theoretical Probability

TELEPHONES For Exercises 1 and 2, use the following information.

Of the last 45 telephone calls received at a bank, 6 involved questions about Automatic Teller Machines (ATM) locations.

1. What is the probability that the next call will involve a question about the location of an ATM?

2. If 500 calls are received in one day, how many would you expect to be questions about ATM locations?

3. **ARCHERY** Julius hit the center of the target with 8 of his last 36 arrows. What is the experimental probability that he will hit the center with his next arrow?

DRINKS For Exercises 4 and 5, use the information about drinks ordered by 200 customers at a restaurant.

4. What is the probability that a customer ordered milk?

5. On a day when the restaurant has 800 customers, how many would you expect to order milk?

Drinks Ordered	
Drink	**Number**
Water	64
Milk	22
Coffee	35
Soft Drink	68
Other	11

6. **NEWSPAPERS** In the last 40 days, Mr. Neptune's newspaper has been delivered late 6 times. What is the experimental probability that it will be delivered late tomorrow?

TECHNOLOGY For Exercises 7 and 8, use the results of a survey of 80 teens at a school shown at the right.

7. What is the probability that a teen at the school owns a digital camera?

8. Out of 750 students at the school, how many would you expect to own a digital camera?

Technology Device	Number Who Own
Cell Phone	45
Digital Camera	32
DVD Player	65
Laptop Computer	18

8-6 **Practice**

Problem-Solving Investigation: Act It Out

Lesson 8–6

Mixed Problem Solving

For Exercises 1 and 2, use the act it out strategy.

1. **BILLS** Joaquin bought a DVD for $21. He gave the cashier two $20 bills. How many different combinations of $1, $5, and $10 bills can the cashier give him for change?

2. **TENNIS** Felix, Lolita, Tetsuo, Ling, and Maxine are on the school tennis team. When ranked from first to fifth, how many ways can they be ranked if Maxine is always first and Felix is always ranked above Tetsuo?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Work Backward.
• Look for a pattern.
• Use logical reasoning.
• Act it out.

3. **PUMPKINS** Mr. Greene harvested pumpkins for selling at four markets. He sold one-fifth of his crop at the first market, 40 at the second, 25% of the remaining at the third, and twice what he sold at the second at the forth market. If Mr. Greene has one pumpkin remaining, how many pumpkins did he sell?

4. **CHORES** Kimberley has the choice of washing the car, mowing the lawn, or raking leaves on Saturday and baking a cake, washing the dishes, or doing the laundry on Sunday. In how many ways can she choose one chore for each day?

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problems. Justify your solution(s) and solve the problem.

5. **FUND-RAISER** The drama club is selling 100 T-shirts for $15 each for a fund-raiser. The T-shirts cost a total of $623. If they sell all the T-shirts, how much money will be raised for the drama club?

6. **DELICATESSEN** A delicatessen offers the possibility of 180 kinds of sandwiches made with wheat, rye, white, or sourdough breads. If the delicatessen adds multi-grain bread to the menu, find the number of possible kinds of sandwiches the delicatessen now offers.

8-7 Practice

Simulations

1. **IDENTIFICATION** A bank randomly assigns a 4-digit personal identification number (PIN) to each customer opening an account. Each digit of the PIN can be 0 through 9. Describe a model that could be used to simulate the selection of a PIN.

2. **QUIZZES** Describe a model that you could use to answer a 15-question quiz, if five questions are true or false questions.

3. **STATE FAIR** At a state fair, there are 10 animal exhibits, 12 gardening exhibits, and 8 farm equipment exhibits. Describe a model that you could use to simulate randomly choosing an exhibit to visit.

4. **WEATHER** Suppose during springtime it rains about 40% of the time when school is dismissed for the day. Describe a model that could be used to simulate whether it will be raining when school is dismissed on a particular day during springtime.

COLLECTING For Exercises 5 and 6, use the following information.

Mr. Osborne randomly collects various memorabilia of 8 different sports.

5. Describe a model that could be used to simulate which sport would be collected. Explain.

6. How could this simulation be used to determine the sport of the next 20 memorabilia Mr. Osborne collects?

7. **EXPERIMENT** Suppose a lab rat enters the box with four openings as shown. If each decision about the direction is made at random, create a simulation to determine the probability that the lab rat will leave the box before going through 5 intersections.
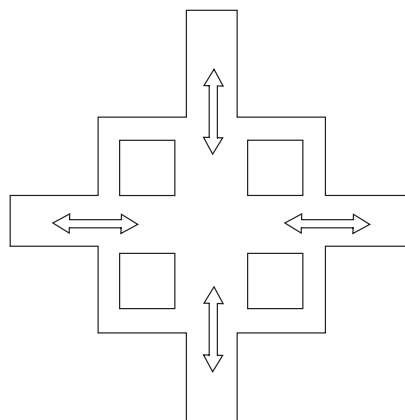
8-8 Practice

Using Sampling to Predict

Determine if each conclusion is valid. Then describe each sample.

1. To determine the most common injury cared for in an emergency room, a reporter goes to the same hospital every afternoon for one month during the summer and observes people entering the emergency room. She concludes that second degree sunburn is the most common injury.

2. To evaluate customer satisfaction, a grocery store gives double coupons to anyone who completes a survey as they enter the store. The store manager determines that customers are very satisfied with their shopping experience in his store.

3. To evaluate the integrity of underground water lines, the department of public works randomly selects 20 sites in each of 5 sectors of the city to unearth and observe the water lines. At 24 of the sites, the water lines needed repair. The department of public works concludes that one-fourth of underground water lines throughout the city need repair.

4. **DOWNLOADS** A guidance counselor asked students who owned mobile phones, which was the last type of download each one downloaded to their mobile phone. The results are shown in the table. If there are 420 students in the school, how many can be expected to download *ringtones*?

Mobile Phone Downloads	
Type	**Frequency**
Games	10
Ringtones	25
Screensavers	14
Music	36

DENTISTRY A survey is to be conducted to determine the reasons dental patients are hesitant to go to the dentist. Describe the sample and explain why each sampling method might not be valid.

5. Adults that are randomly selected from an office complex are asked to go online and fill out a questionnaire.

6. A randomly selected dentist asks his patients why they may be hesitant to go to a dentist.

7. Randomly selected dental patients from different age groups who are having a routine check-up are asked to write down their feelings.

9-1 Practice

Problem-Solving Investigation: Make a Table

Mixed Problem Solving

Use the make a table strategy to solve Exercises 1 and 2.

1. **LIZARDS** Biologists recorded the lengths of lizards they found in the desert. About what percent of the lizard lengths are from 3.0 to 6.9 inches?

Lengths of Lizards Found		
Length (in.)	Tally	Frequency
1.0–1.9	|||	3
2.0–2.9	||||	4
3.0–3.9	⊬	5
4.0–4.9	||||	4
5.0–5.9	||||	4
6.0–6.9	||	2
7.0–7.9	||	2

2. **BOOKS** The list below shows book prices for various books at a used book sale. Organize the data in a table using intervals $1.00–$1.99, $2.00–$2.99, $3.00–$3.99, and so on. What is the most common interval of book prices?

$3.78	$1.05	$6.52	$1.65	$4.99	$2.83
$1.52	$4.85	$4.64	$5.10	$3.09	$1.90
$6.29	$3.72	$6.50	$3.39	$2.55	$1.89
$3.22	$4.26	$5.29	$4.99	$1.10	$2.50

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Use the four-step plan.
• Use logical reasoning.
• Act it out.
• Make a table.

3. **ART FAIR** At the art fair, 95 artists exhibited their work. Of those 95 artists, 25 showed sculptures and 48 showed paintings. If 12 showed both sculptures and paintings, how many artists showed only sculptures or paintings?

4. **NUMBER CUBE** Jacy tossed a number cube several times and recorded the number shown after each toss. His results are listed below. Find the number that was tossed most frequently.

3	6	1	3	5	3	4	2	6
1	5	4	4	5	6	6	1	4
4	2	5	6	1	1	2	3	6

Select the Operation

For Exercise 5, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

5. **GEOGRAPHY** Finland has a land area of 117,943 square miles. If the total area of Finland is 130,128 square miles, what percent of Finland's total area is water, to the nearest tenth of a percent?

Lesson 9–1

9-2 **Practice**

Histograms

1. **GOVERNMENT** The list gives the year of birth for each state governor in the United States in 2005. Choose intervals and make a frequency table. Then construct a histogram to represent the data.

1944	1933	1957	1955	1947	1950	1946	1935
1953	1946	1953	1951	1956	1949	1950	1948
1952	1942	1955	1957	1947	1959	1960	1947
1970	1955	1948	1936	1952	1946	1947	1945
1950	1957	1942	1963	1940	1944	1942	1960
1954	1943	1950	1960	1951	1954	1947	1947
1945	1950						

Source: The National Governor's Association

Birth Years of U.S. State Governors, 2005

FOOTBALL For Exercises 2–5, use the histograms shown.

Scores of Winning Teams, 1960–2004
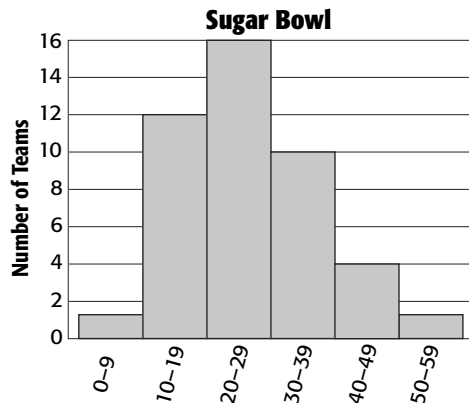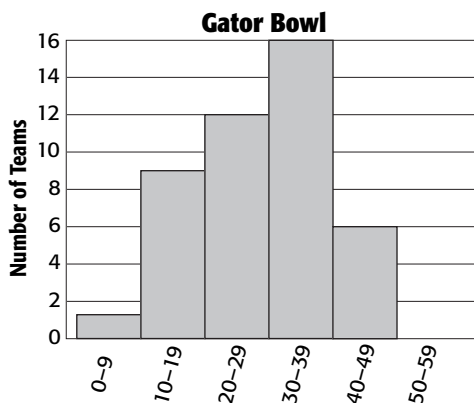
Source: *The World Almanac 2005*

2. Which bowl game had the higher winning team score?

3. In which bowl game was the winning team score in the interval 30-39 points more often?

4. Determine which bowl game has had a winning team score of at least 30 points more often.

5. What was the lowest winning team score in each bowl game? Explain.
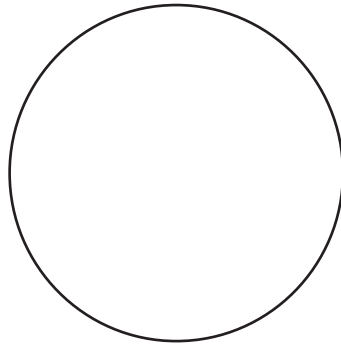
9-3 Practice

Circle Graphs

1. ENERGY Construct a circle graph for the data in the table.

U.S. Energy Sources
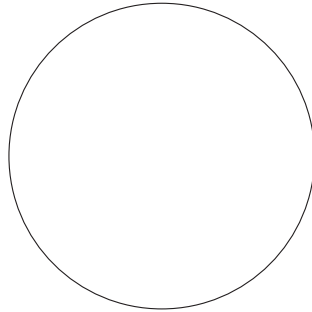
| U.S. Energy Sources	
Petroleum	39.2%
Natural Gas	23.7%
Coal	22.8%
Nuclear Power	8.4%
Hydropower	2.7%
Other	3.2%

Source: *The World Almanac for Kids 2005*

2. LITERATURE Construct a circle graph for the data in the histogram.

When Mark Twain's Major Works Were Published

When Mark Twain's Major Works Were Published
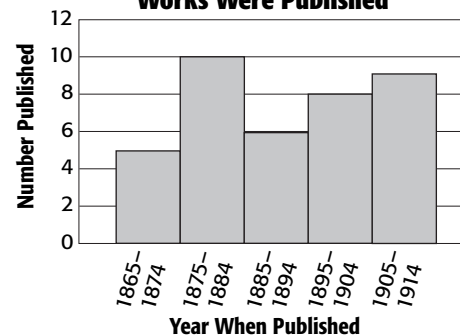
Source: wkipedia.org

GOLF For Exercises 3 and 4, use the circle graph at the right.

3. Find the percent of golf equipment buyers who are 65 years or older. Then find the measure in degrees of the angle of the 65 years and older section of the graph to the nearest tenth degree.

4. Describe the buyers of golf equipment.

Golf Equipment Buyers 2004

- 65 years and older x%
- under 14 years 4%
- 14–24 years 11%
- 25–34 years 22%
- 35–44 years 19%
- 45–64 years 32%
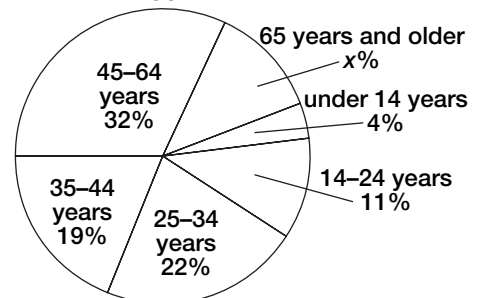
Source: National Sporting Goods Association
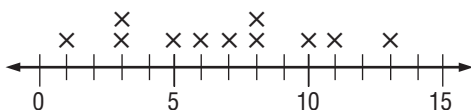
Lesson 9–3

9-4 Practice

Measures of Central Tendency and Range

Find the mean, median, mode, and range of each set of data. Round to the nearest tenth if necessary.

1. The prices, in dollars, of day packs
   37, 43, 41, 36, 43

2. Points on quizzes
   13, 6, 9, 8, 14, 5, 10, 7

3.

4.

For Exercises 5 and 6, select the appropriate measure of central tendency or range to describe the data in each table. Justify your reasoning. Sample answers are given.

5.

Known Mountains on Mars	
Mountain	**Height (km)**
Alba Patera	3
Arsia Mons	9
Ascraeus Mons	11
Olympus Mons	27
Pavonis Mons	7

Source: wikipedia.org

6.

Average Lengths of Wild Cats			
Cat	**Length**	**Cat**	**Length**
Cheetah	50.5 in.	Lion	102 in.
Eurasian Wildcat	24.3 in.	Puma	60 in.
Jaguar	57.5 in.	Serval	33.5 in.
Leopard	57 in.	Tiger	128 in.

Source: *Facts on File: Animal Fact File*

7. **MARS** Refer to the table of mountains on Mars in Exercise 5. Describe how the mean, median, mode, and range are each affected if the data for Olympus Mons is not included.

Lesson 9–4

9-5 Practice

Measures of Variation

WILD CATS For Exercises 1–4, use the data in the table.

1. What is the range of the data?

2. Find the median, the upper and lower quartiles, and the interquartile range of the data.

Average Birth Weights of Wild Cats			
Cat	**Weight (oz)**	**Cat**	**Weight (oz)**
Cheetah	7.5	Lion	48
Eurasian Wildcat	1.4	Puma	12
Jaguar	28	Serval	8.5
Leopard	17.5	Tiger	40

Source: *Facts on File: Animal Fact File*

3. Identify any outliers.

4. Use the measures of variation to describe the data in the table.

WORD For Exercises 5–8, use the data in the stem-and-leaf plot.

5. What is the range of the data?

6. Find the median, the upper and lower quartiles, and the interquartile range of the data.

Death Valley Average Monthly Precipitations

Stem	Leaf
0	5
1	0 1 2 2 3 4 8 9
2	
3	5
4	2 2

1|2 mean 0.12 in.

Source: weather.com

7. Identify any outliers.

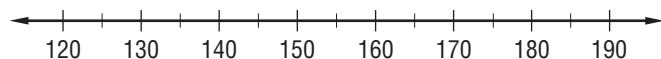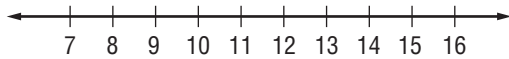8. Use the measures of variation to describe the data in the stem-and-leaf plot.

9-6 **Practice**

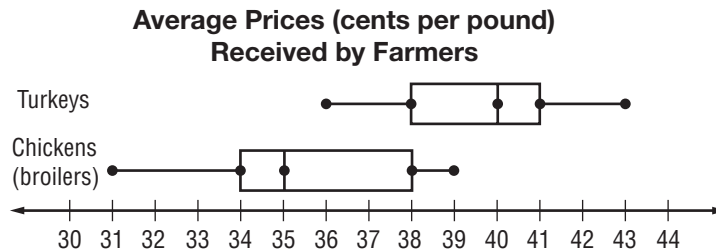### *Box-and-Whisker Plots*

Construct a box-and-whisker plot for each set of data.

1. Ages of children already signed up
for swimming classes:
10, 12, 9, 7, 10, 12, 14, 14, 10, 16

2. Prices, in dollars, of bicycles on sale:
150, 134, 132, 120, 145, 170, 125, 130,
145, 185, 140

7 8 9 10 11 12 13 14 15 16

120 130 140 150 160 170 180 190

POULTRY For Exercises 3–7, use the box-and-whisker plot below.

Average Prices (cents per pound)
Received by Farmers

Turkeys

Chickens
(broilers)

30 31 32 33 34 35 36 37 38 39 40 41 42 43 44

Source: *The World Almanac 2005*

3. How many outliers are in the data?

4. How do the range in chicken prices and the range in turkey prices
compare?

5. In the chicken prices, which quartiles show the greatest spread of data?

6. What percent of the data for the turkey prices is above the upper quartile
for the chicken prices?

7. In general, do farmers get higher prices for chickens or for turkeys?
Justify your reasoning.

9-7 Practice

Select an Appropriate Display

Select an appropriate type of display for each situation. Justify your reasoning.

1. prices of athletic shoes in the store arranged by intervals

2. the numbers of teens who spend Saturdays doing homework, playing, and/or doing chores

3. the number of each of four kinds of trees found in the forest

4. the spread of the run times for the first $\frac{1}{4}$ of the runners completing a marathon

**Select an appropriate type of display for each situation. Justify your reasoning. Then construct the display.**

5.

Heights of Mountains on the Moon	
Height	**Percent of the Mts.**
Less than 1 km	11.8%
1-2 km	17.7%
2-3 km	17.7%
3-4 km	35.3%
More than 4 km	17.7%

Source: wikipedia.com

6. **WORK** Jim worked 1 hour on Monday. On Tuesday, he worked 2 more hours than he worked on Monday. On Wednesday, he worked 2 more hours than he worked on Tuesday. The pattern continued through Friday.

Lesson 9-7

9-8 Practice

Misleading Graphs and Statistics

ENERGY For Exercises 1-3, use the graphs below that show the amount of energy the United States imported in 1970-2000. Determine which graph would be more appropriate to justify each of the following statements. Explain your reasoning.

U.S. Energy Imports 1970–2000

Source: *The World Almanac 2005*

U.S. Energy Imports 1970–2000
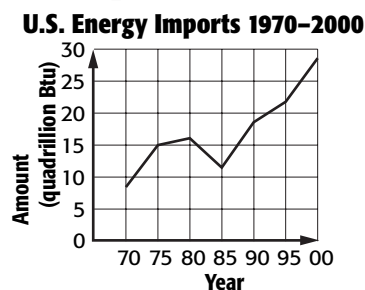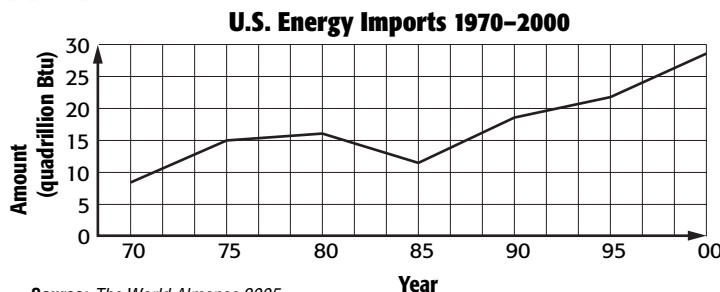
1. The amount of energy imports rose sharply between 1985 and 2000.

2. In general, the amount of energy imports grew gradually between 1970 and 2000.

3. There was a moderate decrease in the amount of imports from 1980 to 1985.

SPORTS The table gives the prices of volleyballs sold by a store. Predict which measure—mean, median, mode, or range—would be used to support each statement. Justify your reasoning.

4. Our volleyballs are inexpensive.

5. We have a wide variety of prices.

Prices of Volleyballs	
Volleyball A	$12.35
Volleyball B	$19.65
Volleyball C	$12.35
Volleyball D	$11.59
Volleyball E	$10.69

6. **GOLD** According to the information in the graph, Canada produced no gold in 2003. Determine if this statement is accurate. Justify your response.

Gold Production in 2003

Source: *The World Almanac 2005*

Lesson 9-8
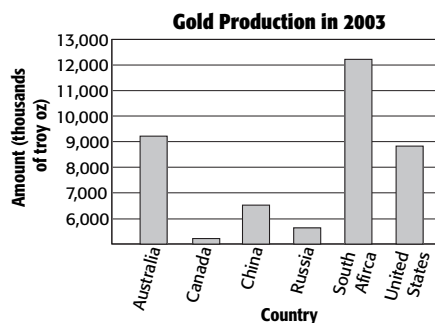
10-1 Practice

Simplifying Algebraic Expressions

Use the Distributive Property to rewrite each expression.

1. $6(z + 4)$

2. $-7(c + 2)$

3. $(d + 5)9$

4. $(h + 8)(-3)$

5. $5(y - 2)$

6. $3(6 - n)$

7. $-4(s - 4)$

8. $-9(2 - p)$

9. $2(3x + 1)$

10. $-5(4n - 5)$

11. $8(u - 2v)$

12. $3a(7b + 6c)$

Identify the terms, like terms, coefficients, and constants in each expression.

13. $4b + 7b + 5$

14. $8 + 6t - 3t + t$

15. $-5x + 4 - x - 1$

Simplify each expression.

16. $h + 6h$

17. $10k - k$

18. $3b + 8 + 2b$

19. $4 + 5v + v$

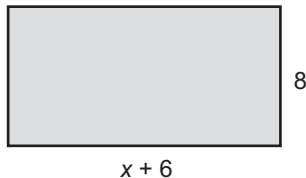**20.** $-2f + 3 - 2f - 8$

21. $-7s - 5 - 7s + 9$

22. $-\dfrac{3}{4}x - \dfrac{1}{3} + \dfrac{7}{8}x - \dfrac{1}{2}$
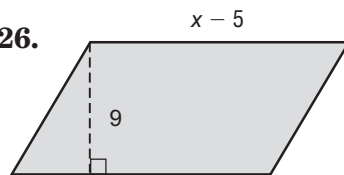
23. $5c - 3d - 12c + d$

24. $-y + 9z - 16y - 25z$

Write two equivalent expressions for the area of each figure.

25.

8

x + 6

26.

x − 5

9

27.

x + 1

20

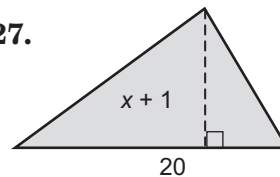**28. PAINTING** Mr. Torres paid $43 for supplies to paint his office. He paid one person $8 per hour to prepare the office to be painted and another person $10 per hour to paint the office. If both people worked h hours, write two expressions that you could use to represent the total cost of painting the office.

12

10-2 Practice

Solving Two-Step Equations

Solve each equation. Check your solution.

1. $3g + 5 = 17$ **2.** $9 = 4a + 13$ **3.** $13 = 5m - 2$

4. $-15 = 2t - 11$ **5.** $7k - 5 = -19$ **6.** $13 = 4x - 11$

7. $10 = \dfrac{z}{2} + 7$ **8.** $6 + \dfrac{n}{5} = -4$ **9.** $4 - 3y = 31$

10. $15 - 2b = -9$ **11.** $-\dfrac{1}{3}y - 6 = -11$ **12.** $16 - \dfrac{r}{7} = 21$

13. $30 = 5d - 8d$ **14.** $w + 3w = 20$ **15.** $5 - 7m + 9m = 11$

16. $-18 = 8x - 9 - 5x$ **17.** $25 = s + 13 - 4s$ **18.** $6a + 7 - a = -18$

19. $3(y + 5) = 21$ **20.** $7(p - 3) = 35$ **21.** $-48 = 6(v + 2)$

**22.** $\dfrac{k - 3}{4} = 10$ **23.** $\dfrac{z + 5}{7} = -3$ **24.** $\dfrac{9 + t}{12} = -3$

25. SHOPPING Mrs. Williams shops at a store that has an annual membership fee of $30. Today she paid her annual membership and bought several fruit baskets costing $15 each as gifts for her coworkers. Her total was $105. Solve the equation $15b + 30 = 105$ to find the number of fruit baskets Mrs. Williams purchased.

26. GAMES A card game has 50 cards. After dealing 7 cards to each player, Tupi has 15 cards left over. Solve the equation $50 - 7p = 15$ to find the number of players.

27. GEOMETRY Write an equation to represent the length of $\overline{PQ}$. Then find the value of y.
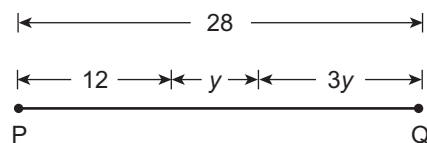
10-3 Practice

Writing Two-Step Equations

Translate each sentence into an equation.

1. Three more than eight times a number is equal to 19.

2. Twelve less than seven times a number is 16.

3. Four more than twice a number is −10.

4. Nine less than five times a number is equal to −30.

5. ART Ishi bought a canvas and 8 tubes of paint for $24.95. If the canvas cost $6.95, how much did each tube of paint cost?

6. ENGINEERING The world's two highest dams are both in Tajikistan. The Rogun dam is 35 meters taller than the Nurek dam. Together they are 635 meters tall. Find the height of the Nurek dam.

U.S. PRESIDENTS For Exercises 7 and 8, use the information at the right.

7. If you double President Reagan's age at the time of his first inauguration and subtract his age at the time he died, the result is 45 years. How old was President Reagan when he died?

President	Age at First Inauguration
J. Carter	52
R. Reagan	69
G. H. W. Bush	
W. Clinton	46
G. W. Bush	54

8. If you divide the age of the first President Bush when he was inaugurated by 2 and add 14 years, you get the age of President Clinton when he was first inaugurated. How old was President G. H. W. Bush when he was inaugurated?

9. GEOMETRY Find the value of x in the triangle at the right.
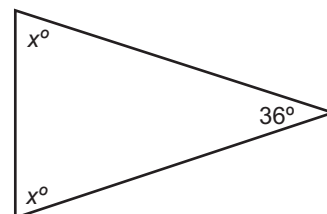
10. ALGEBRA Three consecutive integers can be represented by n, $n + 1$, and $n + 2$. If the sum of three consecutive integers is 57, what are the integers?

Lesson 10–3

10-4 **Practice**

Sequences

State whether each sequence is arithmetic. Write *yes* or *no*. If it is, state the common difference and write the next three terms.

1. 14, 22, 30, 38, 46, ...

2. 5, 25, 125, 625, 3,125

3. 81, 27, 9, 3, 1, ...

4. 10, 3, −4, −11, −18, ...

5. 3, 7, 12, 18, 25, ...

6. 2, $4\frac{1}{2}$, 7, $9\frac{1}{2}$, 12, ...

Write an expression that can be used to find the *n*th term of each sequence. Then find the next three terms.

7. 3, 6, 9, 12, ...

8. 9, 18, 27, 36, ...

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

10. $\frac{3}{7}, \frac{6}{7}, 1\frac{2}{7}, 1\frac{5}{7}$, ...

11. 7, 13, 19, 25, ...

12. 1, 6, 11, 16, ...

Write and solve an expresion to find the *n*th term of each arithmetic sequence.

13. 2, 5, 8, 11, ... ; $n = 10$

14. 18, 22, 26, 30, ... ; $n = 14$

15. 12, 6, 0, −6, ... ; $n = 20$

16. 47, 39, 31, 23, ... ; $n = 18$

17. 28, 41, 54, 67, ... ; $n = 100$

18. 74, 91, 108, 125, ... ; $n = 150$

AMUSEMENT PARKS For Exercises 19 and 20, use the following information.

An amusement park offers a daily pass for $42 or a season pass for $210.

Number of Amusement Park Visits	1	2	3	4	5
Total Cost with Daily Passes	$42	$84			
Total Cost with Season Pass	$210	$210			

19. Is the sequence formed by the total cost with daily passes arithmetic? Explain.

20. Is the sequence formed by the total cost with a season pass arithmetic? Explain.

Lesson 10–4

10-5 Practice

Solving Equations with Variables on Each Side

Solve each equation. Check your solution.

1. $9m + 14 = 2m$

2. $13x = 32 + 5x$

3. $8d - 25 = 3d$

4. $t - 27 = 4t$

5. $7p - 5 = 6p + 8$

6. $11z - 5 - = 9z + 7$

7. $12 - 5h = h + 6$

8. $4 - 7f = f - 12$

9. $-6y + 17 = 3y - 10$

10. $3x - 32 = -7x + 28$

11. $3.2a - 16 = 4a$

12. $16.8 - v = 6v$

Find each number.

13. Fourteen less than five times a number is three times the number. Define a variable, write an equation, and solve to find the number.

14. Twelve more than seven times a number equals the number less six. Define a variable, write an equation, and solve to find the number.

Write an equation to find the value of x so that each pair of polygons has the same perimeter. Then solve.

15.
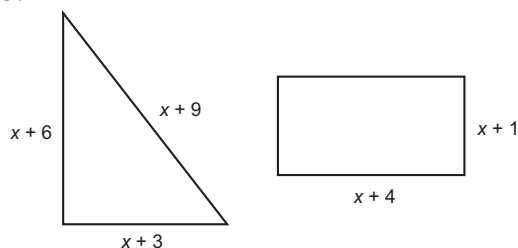
16.
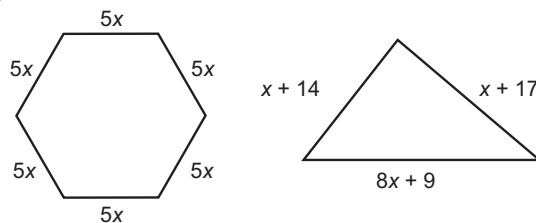
17. GOLF For an annual membership fee of $500, Mr. Bailey can join a country club that would allow him to play a round of golf for $35. Without the membership, the country club charges $55 for each round of golf. Write and solve an equation to determine how many rounds of golf Mr. Bailey would have to play for the cost to be the same with and without a membership.

18. MUSIC Marc has 45 CDs in his collection, and Andrea has 61. If Marc buys 4 new CDs each month and Andrea buys 2 new CDs each month, after how many months will Marc and Andrea have the same number of CDs?

10-6 Practice

Problem-Solving Investigation: Guess and Check

Mixed Problem Solving

For Exercises 1 and 2, solve using the guess and check strategy.

1. **NUMBER THEORY** A number is squared and the result is 676. Find the number.

2. **CRAFTS** Sabrina has 12 spools of ribbon. Each spool has either 3 yards of ribbon, 5 yards of ribbon, or 8 yards of ribbon. If Sabrina has a total of 68 yards of ribbon, how many spools of each length of ribbon does she have?

Use any strategy to solve Exercises 3–5. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Draw a diagram.
• Use reasonable answers.
• Make a table.
• Reasonable answers
• Guess and check.

3. **NUMBERS** Among all pairs of numbers with product 66, find the pair with the smallest sum.

4. **SHOPPING** You are buying a jacket that costs $69.95. If the sales tax rate is 7.75%, would it be more reasonable to expect the sales tax to be about $4.90 or $5.60?

5. **STATES** Of the 50 United States, 14 have coastlines on the Atlantic Ocean, 5 have coastlines on the Gulf of Mexico, and one state has coastlines on both. How many states do not have coastlines on either the Atlantic Ocean or the Gulf of Mexico?

Select the Operation

For Exercises 6 and 7, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

6. **TIME** Melissa spent $7\frac{1}{2}$ minutes of the last hour downloading songs from the Internet. What percent of the last hour did she spend downloading songs?

7. **VOLUNTEERING** Greg helps his mother deliver care baskets to hospital patients each Saturday. Last Saturday at noon they had three times as many baskets left to deliver as they had already delivered. If they were delivering a total of 64 baskets that day, how many had they delivered by noon?

Lesson 10–6

10-7 **Practice**

Inequalities

Write an inequality for each sentence.

1. JOBS Applicants with less than 5 years of experience must take a test.

2. FOOTBALL The home team needs more than 6 points to win.

3. VOTING The minimum voting age is 18.

4. GAMES You must answer at least 10 questions correctly to stay in the game.

5. DINING A tip of no less than 10% is considered acceptable.

6. MONEY The cost including tax is no more than $75.

For the given value, state whether the inequality is true or false.

7. $9 + b < 16, b = 8$

8. $14 - f > 8, f = 5$

9. $-5t < 24, t = 5$

10. $51 \le 3m, m = 17$

11. $\dfrac{z}{5} \le 7, z = 40$

12. $\dfrac{-28}{d} > 7, d = -4$

Graph each inequality on a number line.

13. $y > 5$

14. $h < 5$

15. $c \le 1$

16. $t \ge 2$

17. $x \ge 4$

18. $r < 9$

For Exercises 19 and 20, use the table that shows the literacy rate in several countries.

19. In which country or countries is the literacy rate less than 90%?

20. In which country or countries is the literacy rate at least 88%?

Country	Literacy Rate
Albania	87%
Jamaica	88%
Panama	93%
Senegal	40%

Source: infoplease.com

11-1 Practice

Functions

Find each function value.

1. $f(6)$ if $f(x) = 4x$ **2.** $f(8)$ if $f(x) = x + 11$ **3.** $f(3)$ if $f(x) = 2x + 4$

4. $f(5)$ if $f(x) = 3x - 2$ **5.** $f(-6)$ if $f(x) = 4x + 7$ **6.** $f(-14)$ if $f(x) = 2x - 3$

7. $f\left(\frac{2}{9}\right)$ if $f(x) = 3x + \frac{1}{3}$ **8.** $f\left(\frac{3}{4}\right)$ if $f(x) = 2x - \frac{1}{4}$ **9.** $f\left(\frac{4}{5}\right)$ if $f(x) = 4x - \frac{1}{5}$

Complete each function table. Then state the domain and range of the function.

10. $f(x) = 5x - 4$

x	$5x - 4$	$f(x)$
-4		
-1		
3		
6		

11. $f(x) = 2 - 3x$

x	$2 - 3x$	$f(x)$
-3		
0		
2		
5		

12. $f(x) = 6 + 2x$

x	$6 + 2x$	$f(x)$
-3		
-1		
1		
4		

13. $f(x) = x - 7$

x	$x - 7$	$f(x)$
-3		
-2		
5		
10		

14. $f(x) = 9x$

x	$9x$	$f(x)$
-6		
-4		
1		
3		

15. $f(x) = 3x + 5$

x	$3x + 5$	$f(x)$
-5		
-1		
2		
6		

16. JACKETS The school baseball team wants to have each player's name imprinted on the player's jacket. The cost is $75 plus $8.50 for each name. Write a function to represent the cost c for n names. What is the cost to have names imprinted on 25 jackets?

17. LEMONADE Gene sold 10 glasses of lemonade while setting up his lemonade stand. After opening, he sold an average of 20 glasses each hour. Write a function to represent the approximate number of glasses g sold after h hours. About when did he sell the 100th glass of lemonade?

11-2 Practice

Representing Linear Functions

Graph each function.

1. $y = 2x$
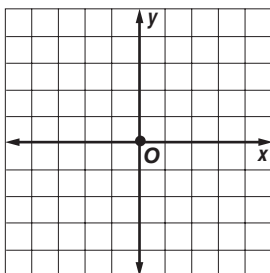
2. $y = -4x$
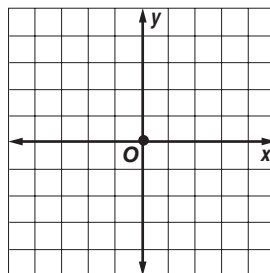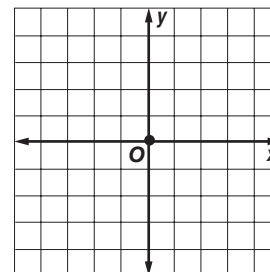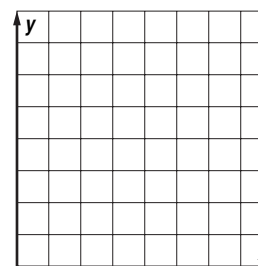
**3.** $y = x - 4$
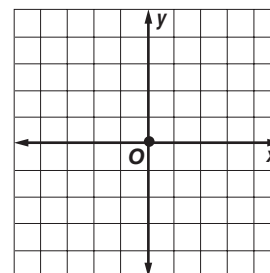
4. $y = x + 3$
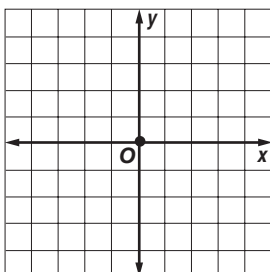
5. $y = 3x + 1$
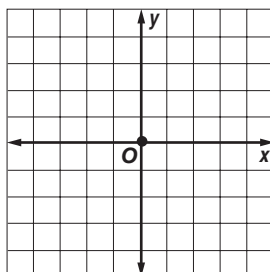
6. $y = \frac{1}{4}x + 2$

7. CARPENTRY Mrs. Valdez can assemble a chair in 1 day and a table in 4 days. Graph the function $1x + 4y = 20$ to determine how many of each type of furniture Mrs. Valdez can assemble in 20 days.

8. FITNESS A fitness center has set a goal to have 500 members. The fitness center already has 150 members and adds an average of 25 members per month. The function $f(x) = 25x + 150$ represents the membership after x months. Graph the function to determine the number of months it will take for the fitness center to reach its membership goal.

Lesson 11–2
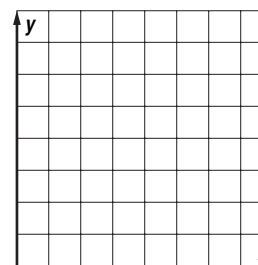
11-3 Practice

Slope

Find the slope of each line.

1.

2.

3.
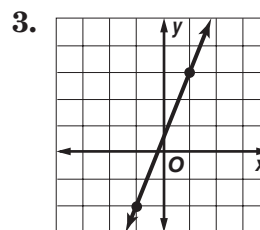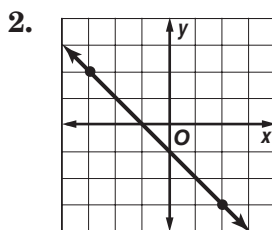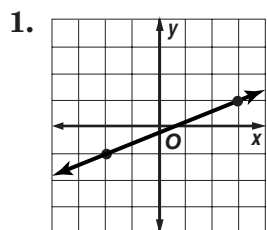
The points given in each table lie on a line. Find the slope of the line. Then graph the line.

4.

x	-1	1	3	5
y	-2	0	2	4
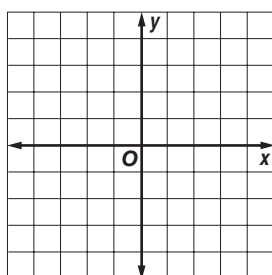
5.

x	-2	3	8	13
y	-2	-1	0	1
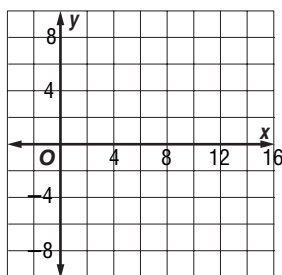
6.

x	-1	2	5	8
y	3	-1	-5	-9
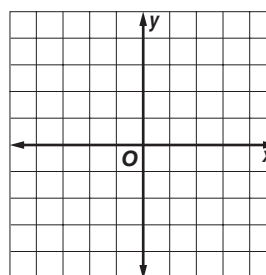
7. HOMES Find the slope of the roof of a home that rises 8 feet for every horizontal change of 24 feet.

8 ft
24 ft
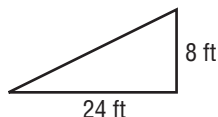
8. MOUNTAINS Find the slope of a mountain that descends 100 meters for every horizontal distance of 1,000 meters.

100 m
1,000 m
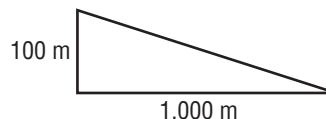
Find the slope of the line that passes through each pair of points.

9. $A(1, 3), B(4, 7)$

10. $C(3, 5), D(2, 6)$

11. $E(4, 0), F(5, 5)$

12. $P(-2, -5), R(2, 3)$
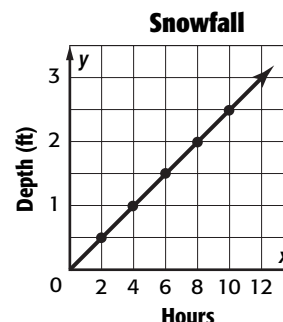
13. $S(-7, 4), T(5, 2)$

14. $V(9, -1), W(7, 6)$

SNOWFALL **For Exercises 15–17, use the graph at the right. It shows the depth in feet of snow after each two-hour period during a snowstorm.**

15. Find the slope of the line.

16. Does the graph show a constant rate of change? Explain.

17. If the graph is extended to the right, could you expect the slope to remain constant? Explain.

Snowfall

11-4 Practice

Direct Variation

1. **ADVERTISING** The number of vehicles a dealership sells is directly proportional to the money spent on advertising. How many vehicles does a dealership sell for each $1,000 spent on advertising?

Dealership Sales
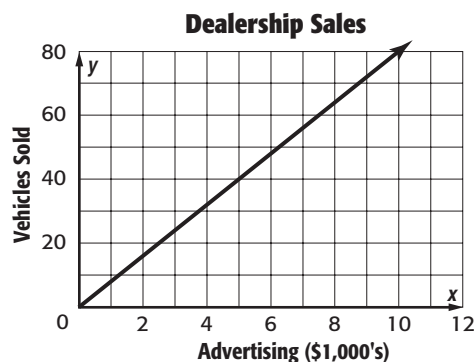
2. **SNOWMOBILES** Jerry rents snowmobiles to tourists. He charges $135 for 4 hours and $202.50 for 6 hours. What is the hourly rate Jerry charges to rent a snowmobile?

3. **SOLAR ENERGY** The power absorbed by a solar panel varies directly with its area. If an 8 square meter panel absorbs 8,160 watts of power, how much power does a 12 square meter solar panel absorb?

4. **INSECT CONTROL** Mr. Malone used 40 pounds of insecticide to cover 1,760 square feet of lawn and 60 pounds to cover an additional 2,640 square feet. How many pounds of insecticide would Mr. Malone need to cover his whole lawn of 4,480 square feet?

Determine whether each linear function is a direct variation. If so, state the constant of variation.

5.
Volume x	2	4	6	8
Mass y	10	20	30	40

6.
Gallons x	5	10	15	20
Miles y	95	190	285	380

7.
Time x	8	9	10	11
Temp y	68	71	74	77

8.
Age x	3	6	9	12
Height y	28	40	52	64

ALGEBRA If y varies directly with x, write an equation for the direct variation. Then find each value.

9. If $y = -5$ when $x = 2$, find y when $x = 8$.

10. Find y when $x = 1$, if $y = 3$ when $x = 2$.

11. If $y = -7$ when $x = -21$, what is the value of x when $y = 9$?

12. Find x when $y = 18$, if $y = 5$ when $x = 4$.

11-5 Practice

Slope-Intercept Form

State the slope and the *y*-intercept for the graph of each equation.

1. $y = 4x + 1$

2. $y = -3x + 5$

3. $-x + y = 4$

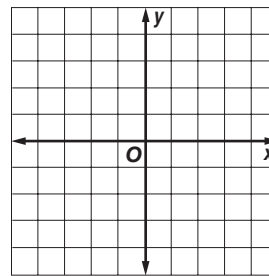**4.** $y = -\dfrac{5}{6}x - 3$

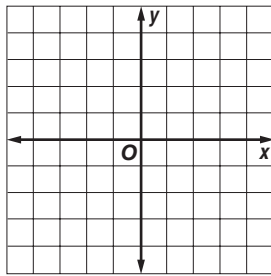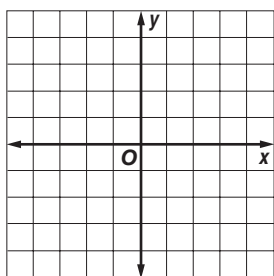**5.** $y + 3x = -7$

6. $y = \dfrac{1}{5}x + 2$

Graph each equation using the slope and the *y*-intercept.

7. $y = -2x + 2.5$

8. $y + x = -3$
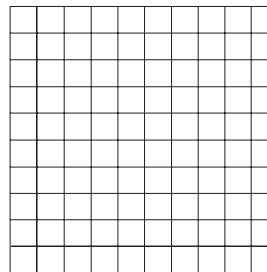
9. $1 = y - \dfrac{2}{3}x$

CAMPING For Exercises 10–12, use the following information.

The entrance fee to the national park is $15. A campsite fee is $15 per night. The total cost *y* for a camping trip for *x* nights can be represented by the equation $y = 15x + 15$.

10. Graph the equation.

11. Use the graph to find the total cost for 4 nights.
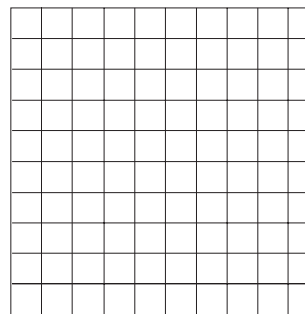
12. What do the slope and the *y*-intercept represent?

GEOMETRY For Exercises 13–15, use the diagram shown.

$x°$
$y°$
$x + y = 90°$
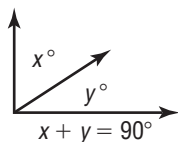
13. Write the equation in slope-intercept form.

14. Graph the equation.

15. Use the graph to find the value of *y* if $x = 30$.

11-6 Practice

Writing Linear Equations

Write an equation in slope-intercept form for each line given the slope and a point on the line.

1. slope $= -3$,
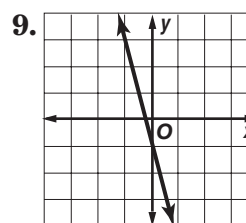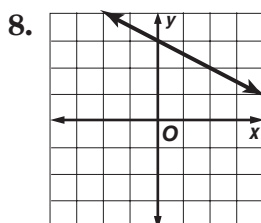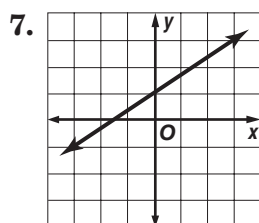y-intercept $= 8$

2. slope $= \dfrac{4}{5}$,
y-intercept $= -2$

3. slope $= 4$,
y-intercept $= 13$

4. slope $= -\dfrac{7}{2}$,
y-intercept $= 4$

5. slope $= -12$,
y-intercept $= -1$

6. slope $= -\dfrac{1}{5}$,
y-intercept $= -6$

Write an equation in slope-intercept form for each line.

7.

8.

9.

Write an equation in slope-intercept form for the line passing through the given points.

10. $G(4, -3), H(1, -4)$

11. $J(5, -4), K(-1, 1)$

12. $M(4, -2), N(-6, 5)$

13. HIGHWAY The table shows the cost of constructing different lengths of highways. Write an equation in slope-intercept form to represent the cost y of a highway of x length.

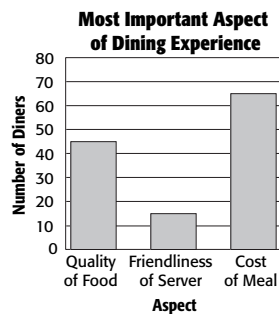| Length (mi)	Cost ($ millions)
3	78
5	120
10	225
14	309

14. EXPERIMENT During a science experiment, Raul recorded a temperature y after x minutes of starting the experiment. Write an equation in slope-intercept form to represent the temperature during the experiment.

Time (min)	Temperature (°C)
2	−27
4	−14
6	−1
8	12
10	25

11-7 Practice

Problem-Solving Investigation: Use a Graph

Mixed Problem Solving

For Exercises 1 and 2, solve by using a graph.

1. **RESTAURANTS** Diners were asked which aspect of a dining experience was the most important, the quality of food, the friendliness of the server, or the cost of the meal. The graph shows the results of the survey. How many diners were surveyed?

Most Important Aspect of Dining Experience

Number of Diners (y-axis): 0, 10, 20, 30, 40, 50, 60, 70, 80
Aspect (x-axis): Quality of Food, Friendliness of Server, Cost of Meal

2. **COMMUTING** Ms. Bonilla recorded the amount of time it took her to drive to work each morning. Make a graph of the data in the table. Does the earliest departure time have the least travel time?

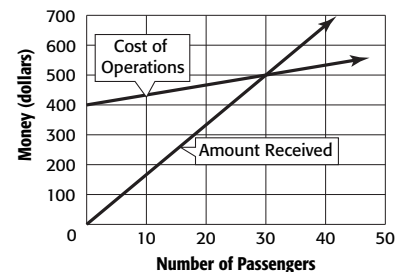| Day	Departure Time (A.M.)	Travel Time (min)
1st Week Monday	7:21	17
1st Week Tuesday	7:38	26
1st Week Wednesday	7:32	22
1st Week Thursday	7:20	15
1st Week Friday	7:35	22
2nd Week Monday	7:26	20
2nd Week Tuesday	7:25	18
2nd Week Wednesday	7:38	24
2nd Week Thursday	7:34	21
2nd Week Friday	7:23	17

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
- Use the four-step plan.
- Look for a pattern.
- Use a reasonable answer.
- Use a graph.

3. **FLORIST** Ms. Parker charges $29.95 for a bouquet of one dozen roses. Last year, she paid her supplier $4.50 per dozen roses. This year, she paid $3.25 more per dozen. How much less profit did she make this year on 20 dozen bouquets?

4. **TOUR BUS** One line in the graph shows the cost of operating a tour bus. The other line shows the amount of money received from the passengers. How many passengers must ride the tour bus to make a profit?

Money (dollars) (y-axis): 0, 100, 200, 300, 400, 500, 600, 700
Cost of Operations
Amount Received
Number of Passengers (x-axis): 10, 20, 30, 40, 50

Select the Operation

For Exercise 5, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

5. **TOWN MEETING** The Waynesville auditorium seats 375 people. In a survey of 50 residents, 6 stated that they plan to attend the next town hall meeting. If the town has 4,200 residents, how many would you expect to attend? Is the auditorium large enough?

Lesson 11-7

11-8 Practice

Scatter Plots

Explain whether the scatter plot of the data for each of the following shows a *positive, negative,* or *no* relationship.
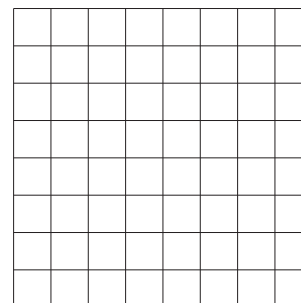
1.

2.

3.
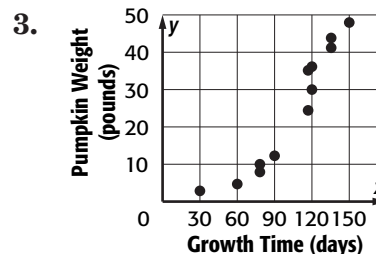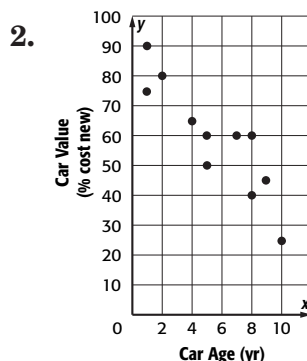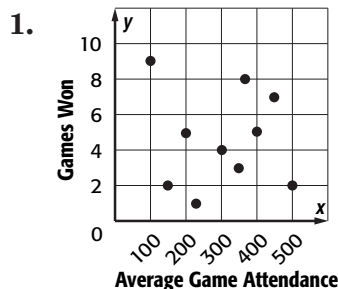
For Exercises 4–6, use the following table.

River Width (m)	15	18	20	28	30	32	38	40	42	45
Water Speed (km/h)	12.6	10.7	11.2	9.7	8.1	8.7	6.9	5.4	3.9	4.1

4. Draw a scatter plot for the data. Then draw a line of fit.

5. Write an equation for the line of fit.

**6.** Use your equation to estimate the speed of the water when the river is 50 meters wide.

Explain whether a scatter plot of the data for each of the following would show a *positive, negative,* or *no* relationship.

7. daily attendance at an outdoor carnival and the number of hours of rain

8. number of diagonals of a polygon and the number of sides of a polygon

12-1 Practice

Linear and Nonlinear Functions

Determine whether each graph, equation, or table represents a linear or nonlinear function. Explain.

1.

2.

3.

4.

5.

6.
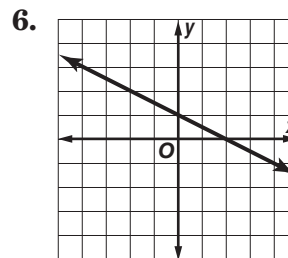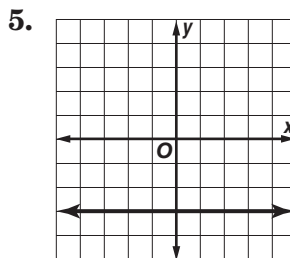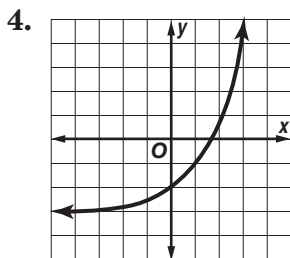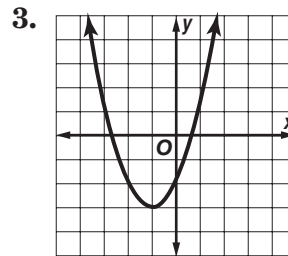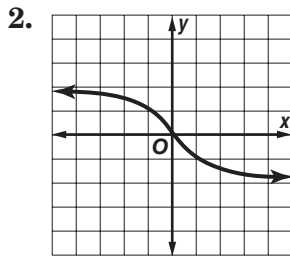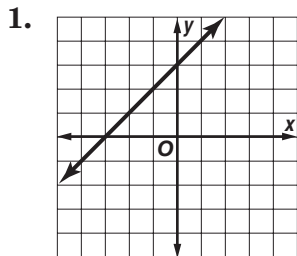
7. $y = 9 - x^2$

8. $y = -2.3x$

9. $y = \dfrac{x}{9}$

10. $y = \dfrac{3}{x}$

11. $2x + 3y = 6$

12. $2xy = 12$

13.

x	2	4	6	8
y	12	9	6	3

**14.**

x	1.5	3	4.5	6
y	2	4	8	16

15. MINIMUM WAGE The state of Washington has the highest hourly minimum wage in the United States. The graphic shows Washington's minimum wage from 1999 to 2006. Would you describe the yearly increase as linear or nonlinear? Explain your reasoning.
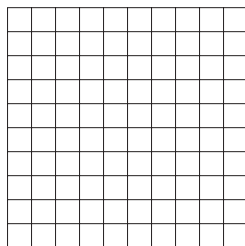

Washington's Minimum Wage

Source: Washington State Department of Labor and Industries

12-2 Practice

Graphing Quadratic Functions

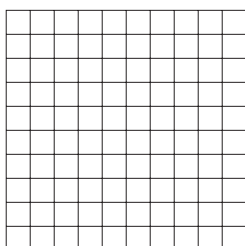**Graph each function.**

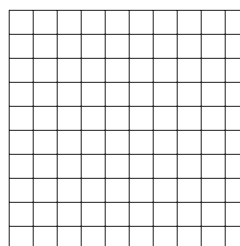**1.** $y = -x^2$
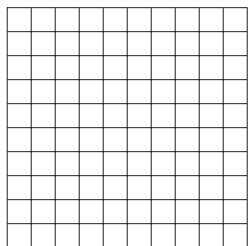
2. $y = -x^2$

3. $y = x^2 + 3$
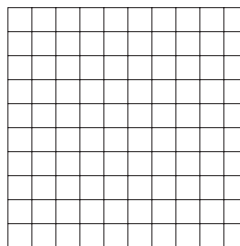
4. $y = -x^2 + 3$
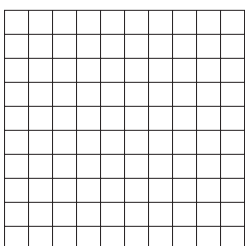
5. $y = x^2 - 5$
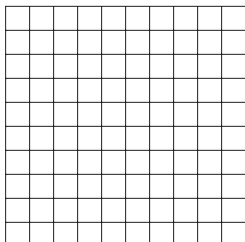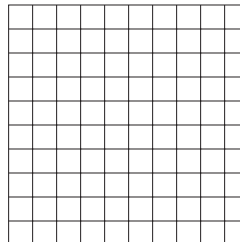
6. $y = 3x^2 - 4$
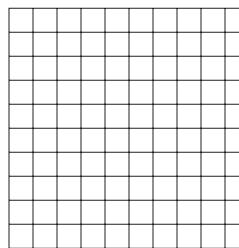
7. $y = 2.5x^2 - 3$
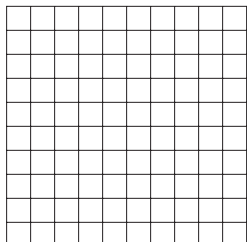
8. $y = -\dfrac{1}{3}x^2$

9. $y = -\dfrac{1}{2}x^2 + 2$

10. GEOMETRY The surface area of a cube is a function of the edge length a. Write a function for the surface area of a cube. Then graph the function in the first quadrant. Use your graph to estimate the edge length of a cube with a surface area of 150 square meters.

12-3 Practice

Simplifying Polynomials

Simplify each polynomial. If the polynomial cannot be simplified, write *simplest form*.

1. $5r + 3s - 8r + s$

2. $2c + 3d + 7 - 5c$

3. $6f + 3g - 1 - 2h$

4. $4x - 3y - 7y + 3x$

5. $5u + 2 + v - 3$

6. $2a + 2b + 5a - 8$

7. $t^2 + 2t - 3t$

8. $3k^2 + 2k - 1$

9. $5 - 2w^2 + 4w + w^2$

10. $9z^2 - 6z - 6z - 4$

11. $4m^2 + 7 - 3m + m - 5$

12. $p^2 + 6p + 9 + 4p^2 - 1$

13. $x^2 + 5x - 6 + x^2 - x + 2$

14. $8a^3 - 5a^2 + 3a - 9 - 4a^3 - 6a$

15. $2.5y^2 - 1.8y + 1.7y^2 + 4.4y$

16. $\frac{2}{3}n^2 - 3n - \frac{1}{3}n - 3n$

GEOMETRY Write the perimeter of each figure in simplest form.

17.
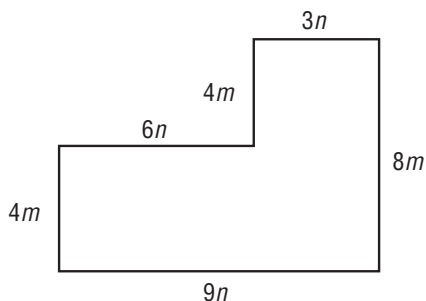
18.
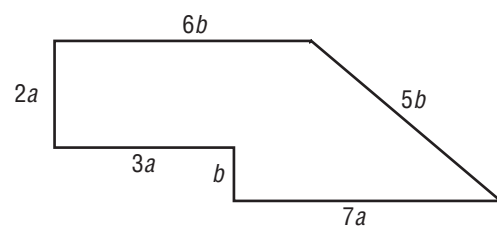
19. JOBS Walt mowed 2 lawns and washed 3 cars on Friday. He mowed 6 lawns and washed 4 cars on Saturday. If *m* represents the amount Walt gets paid for mowing a lawn and *w* represents the amount he gets paid for washing a car, write an expression in simplest form for the total amount of money Walt earned on Friday and Saturday.

Lesson 12–3

12-4 Practice

Adding Polynomials

Add.

1. $6y + 2$
(+) $3y + 5$

2. $7c^2 + 9$
(+) $4c^2 + 5$

3. $2t^2 + 5t - 1$
(+) $t^2 - 3t - 4$

4. $x^2 - 7x - 5$
(+) $3x^2 + 9x - 2$

5. $5r^2 + r - 8$
(+)$4r^2 \quad + 1$

6. $7d^2 - 4d - 6$
(+) $-2d^2 - 4d$

7. $(2z^2 + 3z) + (5z^2 - 3)$

8. $(-8g - 7) + (g^2 + 2g)$

9. $(9k^2 + k + 2) + (k^2 - 4k - 5)$

10. $(5x^2 - 6x - 4) + (x^2 + 8x + 4)$

11. $(-a^2 - 2a - 6) + (3a + 1)$

12. $(-4h^2 - h - 7) + (-4h^2 - 5h)$

13. $(4u^2 - u + 2) + (u^2 + u)$

14. $(7p^2 - 9p - 5) + (-p^2 - 8)$

Add. Then evaluate each sum if $a = 4$, $b = 2$, and $c = -7$.

15. $(-5a + 2b) + (3b - c)$

16. $(-6b^2 - 3c) + (2b^2 + 8c)$

17. CONTESTS Kendra earns points for each visitor she brings to the monthly science club meeting and for each book she brings to the meeting to donate to the school library. In September, she brought 2 visitors and donated 5 books. In October, she brought 1 visitor and donated 3 books. In November, she brought 4 visitors and donated 7 books. Let v be the number of points Kendra earns for each visitor and b the number of points she earns for each book. Write a polynomial expression to represent the number of points Kendra earned during the three months.

Lesson 12–4

12-5 **Practice**

Subtracting Polynomials

Subtract.

1. $\begin{array}{r} 5z + 9 \\ (-)\ 4z + 8 \\ \hline \end{array}$

2. $\begin{array}{r} 7f + 14 \\ (-)\ 3f + 11 \\ \hline \end{array}$

3. $\begin{array}{r} 6m^2 + 4m + 5 \\ (-)\ 3m^2 \quad\quad -1 \\ \hline \end{array}$

4. $\begin{array}{r} 8r^2 + r + 8 \\ (-)\ 3r^2 \quad +5 \\ \hline \end{array}$

5. $\begin{array}{r} 4y^2 + 9y + 6 \\ (-)\ 3y^2 + 7y + 2 \\ \hline \end{array}$

6. $\begin{array}{r} 12d^2 - 5d + 7 \\ (-)\ 6d^2 + d + 2 \\ \hline \end{array}$

7. $(2b^2 + 3b) - (-4b + 3)$

8. $(8g^2 - 5) - (2g + 7)$

9. $(j^2 + j + 2) - (j^2 - 2j - 3)$

10. $(5x^2 + 3x - 2) - (x^2 - 3x + 6)$

Subtract. Then evaluate the difference if $s = -6$ and $t = 9$.

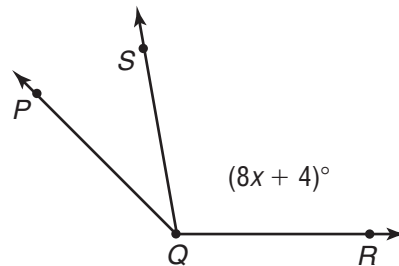11. $(5t + 1) - (2t + 4)$

12. $(4s - 3) - (3s + 7)$

13. $(-6s - 4) - (s - 8)$

14. $(3s + 4t) - (2s - 9)$

15. $(s + 6t) - (-3s + 5t)$

16. $(-3s - t) - (-8s + 6t)$

17. **GEOMETRY** The measure of $\angle PQR$ is $(11x + 3)°$. Write an expression that could be used to find the measure of $\angle PQS$. Then find the measure of $\angle PQS$ if $x = 12$.

S
P
$(8x + 4)°$
Q
R

18. **GAMES** In the first round of a game you answered 6 questions correctly earning x points each, and in the second round you answered 8 questions correctly earning y points each. However, in the first round you answered 4 questions incorrectly losing y points each, and in the second round you answered 2 questions incorrectly losing x points each. Write an expression that you could use to model your points at the end of the second round. Then find your points if $x = 5$ and $y = 10$.

12-6 Practice

Multiplying and Dividing Monomials

Multiply or divide. Express using exponents.

1. $5^9 \cdot 5^3$

2. $3^8 \cdot 3$

3. $c \cdot c^6$

4. $m^5 \cdot m^2$

5. $3x \cdot 4x^4$

6. $(2h^7)(7h)$

7. $-5d^6(8d^6)$

8. $(6k^5)(-k^4)$

9. $(-w)(-10w^3)$

10. $-7z^4(-3z^8)$

11. $\dfrac{5^9}{5^3}$

12. $\dfrac{3^8}{3}$

13. $\dfrac{b^6}{b^4}$

14. $\dfrac{g^{15}}{g^7}$

15. $\dfrac{18v^5}{9v}$

16. $\dfrac{24a^6}{6a^5}$

17. $bc^3(b^2c)$

18. $\dfrac{30s^7t}{5st}$

19. $3^5 \cdot 3 \cdot 3^4$

20. $3m^3n^2(8mn^3)$

21. $\dfrac{28p^5q^4}{14p^4q^3}$

22. $y^5 \cdot y^6 \div y^3$

23. $(9j^7k^4) \div (3j^6k)$

24. $(32x^9y^5) \div (16x^5y^3)$

25. CAR LOANS After making a down payment, Mr. Valle will make 6^2 monthly payments of 6^3 dollars each to pay for his new car. What is the total of the monthly payments?

26. BONUSES A company has set aside 10^7 dollars for annual employee bonuses. If the company has 10^4 employees and the money is divided equally among them, how much will each employee receive?

27. ACIDITY For each increase of one in pH level, the acidity of a substance is 10 times greater. The pH level of baking soda is 8, and the pH level of lye is 13. How many times greater is the alkalinity of lye than that of baking soda?

12-7 Practice

Problem-Solving Investigation: Make a Model

Mixed Problem Solving

For Exercises 1 and 2, solve using the make-a-model strategy.

1. QUILTS Mrs. Renoir has completed the interior portion of a quilt top measuring 4 feet by 6 feet. She is outlining this with squares measuring 4 inches on each side. How many such squares will she need?

2. GEOMETRY Kumiko has four plastic shapes, a circle, a square, a triangle, and a pentagon. In how many ways can she line up the four shapes if the circle cannot be next to the square?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
• Draw a diagram.
• Determine reasonable answers.
• Act it out.
• Make a model.

3. FOOTBALL The attendance at the first two football games of the season are shown in the table. Did the attendance increase by about 1% or about 10%?

Football Attendance

Game 1	5,049
Game 2	5,582

4. GAMES Jamal has a deck of 40 cards. After giving each player in the game an equal number of cards, he has four cards left over, which is not enough to give each player another card. How many players could be in the game?

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

5. CLOTHING Salome has 5 T-shirts, 3 pairs of jeans, and 2 pairs of sneakers. In how many ways can she choose one T-shirt, one pair of jeans, and one pair of sneakers to wear today?

6. NUMBER THEORY After adding 8 to a number and then dividing by 3, the result is 19. What is the number?

Lesson 12–7

12-8 Practice

Multiplying Monomials and Polynomials

Multiply.

1. $x(x + 4)$

2. $a(a - 6)$

3. $(4y - 1)(4y)$

4. $(3h + 2)(4h)$

5. $-8t(t + 4)$

6. $7u(2 - 6u)$

7. $3g(g^2 - 2)$

8. $-5z(3z^2 + 2)$

9. $b(b^2 + 3b + 4)$

10. $-p(2p^2 - 5p + 12)$

11. $-3n(5n^2 - n - 6)$

12. $12d(9d^2 - 7d + 1)$

13. $-w(6w - 9)$

14. $-8q(4q^2 - q - 5)$

15. $d(3d^3 - 4d)$

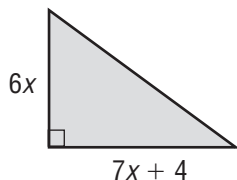16. $x^2(x + 8)$

17. $-5r(r^3 - 9)$

18. $-y(-4y^3 + 6y^2 - 5)$

19. **CLASSROOMS** A classroom has x rows of desks. Each row of desks has $3x - 4$ desks. Write two expressions for the total number of desks in the classroom.
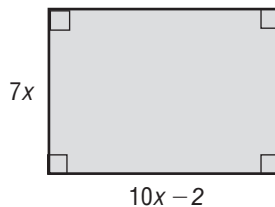
20. **SOCCER** The length ℓ of a soccer field is 36 meters more than the width w. Write two expressions for the area of the soccer field. Then find the area of the soccer field if it is 64 meters wide.

GEOMETRY Write an expression in simplest form for the area of each figure.

21.

6x

7x + 4

22.

7x

10x − 2

23.

x + 12

2x

6x − 3