

1-1**Skills Practice*****A Plan for Problem Solving***

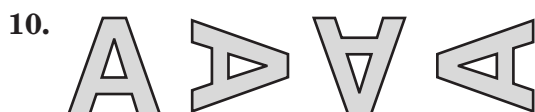
Use the four-step plan to solve each problem.

- 1. GAS MILEAGE** Each day Ernesto drives 52 miles. If he can drive 26 miles on one gallon of gasoline, how many days can he drive on 14 gallons of gasoline?
- 2. FIELD TRIP** A school policy requires that there be at least one chaperone for every 8 students on a field trip. How many chaperones are required for a field trip with 67 students?
- 3. EXERCISE** Trevor jogs every 3 days and swims every 4 days. How often does he jog and swim on the same day?
- 4. PRODUCE** At the local grocery store, lemons are 52 cents each and limes are 21 cents each. How many lemons and limes can you buy for exactly \$3.75?
- 5. PIZZA** The Chess Club sold 2,116 pizzas during a fundraiser that lasted for all of March, April, and May. How many pizzas did they sell per day?
- 6. GUPPIES** In January, Tate's fish tank had 12 guppies. In February, it had 18, and in March it had 24. How many guppies do you expect to be in Tate's fish tank in May?

Find a pattern in the list of numbers. Then find the next number in the list.

- 1860, 1890, 1920, 1950, 1980
- 1024, 256, 64, 16, 4

Draw the next two figures in each of the patterns below.



1-2**Skills Practice*****Variables, Expressions, and Properties*****Evaluate each expression.**

1. $10 \div 2 + 8$

2. $4(9) - 36 \div 3$

3. $24 - 12 \div 4$

4. $25 + 2 \cdot 8 \div 4$

5. $49 - (3^2 + 8 \cdot 3)$

6. $2(20 - 5) + \frac{34 - 14}{4}$

7. $(27 + 24)(27 - 24)$

8. $2^3 \div 4 + 3 \times 6$

9. $(4 + 4) \cdot 4 + 4 \div 4$

10. $3[(8 - 2) - 5] + 7$

11. $\frac{28 - 7}{4^2 - 13}$

12. $(15 - 9)^2 \div (5 + 4)$

Evaluate each expression if $n = 4$, $p = 3$, and $t = 6$.

13. $3n + p$

14. $t - 2p$

15. $3p - n + 4$

16. $(np)^2$

17. np^2

18. $5(2t - n)$

19. $p(n + t)$

20. $6t^2 - t$

21. $\frac{npt}{3}$

22. $4(pt - 3) \div n$

23. $\frac{p^2 + 4}{3t - 5}$

24. $\frac{pn^2}{t + 10}$

25. $n^2 - 3n + 8$

26. $2t^2 - t + 9$

Name the property shown by each statement.

27. $(4 + 5)3 = 4(3) + 5(3)$

28. $1 \cdot x^2 = x^2$

29. $2(bc) = (2b)c$

30. $(6 + 2) + 5 = 6 + (2 + 5)$

31. $2(bc) = 2(cb)$

32. $(4 + 5) + 0 = 4 + 5$

33. $13 + (5 + 10) = (5 + 10) + 13$

34. $3(7 - 2) = 3(7) - 3(2)$

1-3**Skills Practice*****Integers and Absolute Value*****Write an integer for each situation.**

- | | |
|-------------------------------|----------------------------------|
| 1. 3 strokes below par | 2. 10 strokes above par |
| 3. a 6-yard loss | 4. an 8-yard gain |
| 5. 12 centimeters longer | 6. 7 inches below normal |
| 7. \$5 off the original price | 8. a gain of 6 hours |
| 9. 2° above zero | 10. a loss of 15 pounds |
| 11. a \$35 withdrawal | 12. a \$75 deposit |
| 13. 1 mile above sea level | 14. 20 fathoms below the surface |

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

- | | | |
|---------------------|------------------------|-------------------------|
| 15. $-12 \bullet 4$ | 16. $-4 \bullet -5$ | 17. $-10 \bullet -8$ |
| 18. $3 \bullet -13$ | 19. $ -6 \bullet 6 $ | 20. $ -4 \bullet -5 $ |

Order each set of integers in each set from least to greatest.

- | | |
|---------------------------|-------------------------------|
| 21. $\{0, -6, 7, 2, -4\}$ | 22. $\{-1, -2, -3, 3, 2, 1\}$ |
|---------------------------|-------------------------------|

Evaluate each expression.

- | | | |
|--------------------|--------------------|---------------------|
| 23. $ -8 $ | 24. $ 31 $ | 25. $ -1 $ |
| 26. $- -256 $ | 27. $ 3 + -19 $ | 28. $ -12 + -13 $ |
| 29. $ 28 - -26 $ | 30. $ 28 + -26 $ | 31. $ 24 - -15 $ |

Evaluate each expression if $a = 3$, $b = 8$, and $c = -5$.

- | | | |
|---------------|---------------|----------------|
| 32. $ a + 5$ | 33. $ b - 2$ | 34. $2 c + b$ |
| 35. $a + a $ | 36. $ 3b $ | 37. $ a + 16 $ |

1-4**Skills Practice*****Adding Integers*****Add.**

1. $-2 + (-3)$

2. $4 + 7$

3. $-8 + 9$

4. $12 + (-3)$

5. $-27 + 18$

6. $-11 + (-13)$

7. $-44 + 26$

8. $44 + (-26)$

9. $-15 + (-51)$

10. $(-17) + (-13)$

11. $53 + (-28)$

12. $-86 + 77$

13. $10 + (-4) + 6$

14. $-16 + (-5) + 12$

15. $-2 + 17 + (-12)$

16. $-35 + (-31) + (-39)$

17. $8 + (-12) + 15 + (-13)$

18. $-23 + (-18) + 41 + (-17)$

Evaluate each expression if $a = -9$, $b = -12$, and $c = 8$.

19. $3 + a$

20. $b + 8$

21. $-6 + c$

22. $|a| + b$

23. $|a| + |c|$

24. $|b + c|$

1-5**Skills Practice*****Subtracting Integers*****Subtract.**

1. $6 - 7$

2. $12 - 8$

3. $-9 - 9$

4. $-17 - 18$

5. $-13 - (-25)$

6. $14 - (-19)$

7. $-25 - 15$

8. $21 - (-23)$

9. $-34 - (-11)$

10. $56 - 94$

11. $38 - (-39)$

12. $72 - 27$

13. $-36 - 47$

14. $-33 - (-68)$

15. $76 - 18$

16. $4 - |-6|$

17. $|-10| - |7|$

18. $|-52| - 49$

Evaluate each expression if $k = 8$, $m = -7$, and $p = -10$.

19. $k - 19$

20. $19 - m$

21. $p - 11$

22. $k - m$

23. $p - m$

24. $m - 3$

25. $m - k$

26. $k - m + 16$

27. $k - m - p$

1-6**Skills Practice*****Multiplying and Dividing Integers*****Multiply.**

1. $-2 \cdot 3$

2. $3(-3)$

3. $-4(-2)$

4. $5 \cdot 7$

5. $-9(-8)$

6. $-11 \cdot 12$

7. $15(-3)$

8. $-7(-13)$

9. $-5(2)(-7)$

10. $(-10)^2$

11. $6(8)(-3)$

12. $(-4)^3$

13. $(-9)^2$

14. $-1(-3)(-4)$

15. $(-10)^3$

16. $-3(-4)(-7)$

Divide.

17. $-15 \div 3$

18. $40 \div (-5)$

19. $-63 \div (-7)$

20. $76 \div 4$

21. $\frac{-56}{-4}$

22. $\frac{-48}{16}$

23. $\frac{-57}{-19}$

24. $\frac{75}{-5}$

Evaluate each expression if $a = -2$, $b = 5$, and $c = -6$.

25. abc

26. $2b + c$

27. $\frac{2b - c}{a}$

28. $ab - c$

29. $\frac{c}{a + b}$

30. $\frac{2a + c}{b}$

31. $b^2 - 5a$

32. $(-c)^2$

1-7**Skills Practice****Writing Equations**

Write each verbal phrase as an algebraic expression.

1. a number divided by 5
2. the sum of d and 7
3. the product of 10 and c
4. the difference of t and 1
5. the score increased by 8 points
6. the cost split among 4 people
7. the cost of 7 CDs at $\$d$ each
8. the height decreased by 2 inches
9. $\$500$ less than the sticker price
10. the total of Ben's score and 75
11. 2 hours more than the estimate
12. 25 times the number of students

Write each verbal sentence as an algebraic equation.

13. The sum of a number and 16 is equal to 45.
14. The product of 6 and m is 216.
15. The difference of 100 and x is 57.
16. The quotient of z and 10 is equal to 32.
17. $\$12$ less than the original price is $\$48$.
18. 17 more than some number is equal to 85.
19. The number of members divided by 6 is 15.
20. The total of Joshua's savings and $\$350$ is $\$925$.
21. -65 is 5 times a number.
22. The total area decreased by 75 square feet is 250 square feet.
23. The cost of 10 books at $\$d$ each is $\$159.50$.
24. Carla's height plus 4 inches is 68 inches.

1-8**Skills Practice****Problem-Solving Investigation: Work Backward**

Use the work backward strategy to solve each problem.

- SKATEBOARDS** On Monday, David's skateboard shop received its first shipment of skateboards. David sold 12 skateboards that day. On Thursday, he sold 9 skateboards. On Friday, he received a shipment of 30 more skateboards and sold 10 skateboards. He then had a total of 32 skateboards in his shop. How many skateboards were delivered on Monday?
- SHIPPING** An overseas cargo ship was being loaded. At the end of each day, a scale showed the total weight of the ship's cargo. On Monday, 48 tons of cargo were loaded onto the ship. On Tuesday, three times as much cargo was loaded on to the ship as on Monday. On Wednesday, 68 tons of cargo were loaded onto the ship. On Thursday, 0.75 as much cargo was loaded onto the ship as on Wednesday. On Friday, 120 tons of cargo were loaded onto the ship. At the end of the day on Friday, the scale showed that the ship was carrying 690 tons of cargo. How much cargo was the ship carrying when it first came into port on Monday?
- NUMBERS** Jana is thinking of a number. If she divides her number by 12 and then multiplies the quotient by 8, the result is 520. What number is Jana thinking of?
- JOGGING** Edmund is training for a marathon. He ran a certain number of miles on Monday. On Wednesday, he ran 2 more miles than on Monday. On Saturday, he ran twice as far as on Wednesday. On Sunday, he ran 6 miles less than on Saturday. He ran 8 miles on Sunday. How many miles did Edmund run on Monday?

Use the table to solve each problem.

Airline Schedule Minneapolis, MN to Dallas, TX		
Flight Number	Departure Time	Arrival Time
253	8:20 A.M.	10:37 A.M.
142	11:52 A.M.	1:45 P.M.
295	12:00 P.M.	3:30 P.M.

- Charles needs to take Flight 295. He needs 45 minutes to eat breakfast and pack. It takes 25 minutes to get to the airport. To be at the airport 90 minutes early, what is the latest time he can start eating breakfast?
- Mrs. Gonzales left her office at 7:25 a.m. She planned that it would take her 30 minutes to get to the airport, but the traffic was so heavy it took an additional 20 minutes. It takes 30 minutes to check her baggage and walk to the boarding gate. What is the first flight she can take to Dallas?

1-9**Skills Practice*****Solving Addition and Subtraction Equations***

Solve each equation. Check your solution.

1. $x + 3 = 4$

2. $y + 6 = 5$

3. $t - 2 = 2$

4. $z - 5 = 1$

5. $a + 4 = -3$

6. $h - 3 = -6$

7. $u - 4 = -1$

8. $8 + d = 14$

9. $19 = x + 7$

10. $17 = b - 8$

11. $-19 = z - 21$

12. $22 = y + 29$

13. $16 = 24 + p$

14. $-17 = 19 + x$

15. $f - 25 = 35$

16. $y + 37 = 59$

17. $s + 46 = 72$

18. $m + 65 = 11$

19. $r + 53 = -19$

20. $n - 75 = 42$

21. $g - 35 = -62$

22. $111 = x + 68$

23. $-54 = -32 + w$

24. $-27 + z = 47$

1-10**Skills Practice*****Solving Multiplication and Division Equations***

Solve each equation. Check your solution.

1. $\frac{u}{7} = 3$

2. $3c = 12$

3. $5x = -15$

4. $-7z = 49$

5. $\frac{n}{3} = -7$

6. $\frac{a}{-9} = -11$

7. $-14g = -56$

8. $\frac{t}{-12} = 11$

9. $18y = -144$

10. $135 = 9z$

11. $11d = -143$

12. $116 = -29k$

13. $\frac{w}{9} = 17$

14. $-14 = \frac{y}{-7}$

15. $-112 = -8v$

16. $17c = 136$

17. $-21a = -126$

18. $\frac{s}{-19} = 9$

19. $\frac{m}{-31} = -7$

20. $16q = 272$

21. $15 = \frac{z}{-14}$

22. $\frac{g}{-22} = -23$

23. $\frac{y}{25} = 16$

24. $47k = 517$

2-1**Skills Practice*****Rational Numbers***

Write each fraction or mixed number as a decimal.

1. $\frac{1}{10}$

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

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

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

5. $\frac{21}{50}$

6. $-3\frac{9}{20}$

7. $4\frac{9}{25}$

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

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

10. $-2\frac{4}{15}$

11. $\frac{5}{33}$

12. $7\frac{3}{11}$

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

13. 0.9

14. 0.7

15. 0.84

16. 0.92

17. -1.12

18. -5.05

19. 2.35

20. 8.85

21. $-0.\overline{1}$

22. $4.\overline{8}$

23. $6.\overline{7}$

24. $-8.\overline{4}$

2-2**Skills Practice****Comparing and Ordering Rational Numbers**

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

1. $\frac{1}{2}$ ● $\frac{3}{4}$

2. $\frac{1}{3}$ ● $\frac{1}{6}$

3. $\frac{2}{5}$ ● $\frac{3}{10}$

4. $\frac{2}{9}$ ● $\frac{1}{3}$

5. $\frac{3}{4}$ ● $\frac{9}{12}$

6. $\frac{3}{8}$ ● $\frac{2}{5}$

7. $-\frac{5}{6}$ ● $-\frac{6}{7}$

8. $-\frac{4}{9}$ ● $-\frac{5}{11}$

9. $\frac{5}{9}$ ● 0.55

10. 4.72 ● $4\frac{10}{13}$

11. $-2\frac{7}{15}$ ● -2.45

12. 5.25 ● $5.\overline{25}$

13. -1.62 ● $-1\frac{5}{8}$

14. $11\frac{4}{9}$ ● $11.\overline{4}$

15. $-1.\overline{27}$ ● $-1.2\overline{7}$

Order each set of rational numbers from least to greatest.

16. 0.3, 0.2, $\frac{1}{3}$, $\frac{2}{9}$

17. $1\frac{2}{5}$, $1\frac{2}{3}$, 1.55, 1.67

18. 2.7, $2\frac{1}{7}$, 3.13, $1\frac{9}{10}$

19. $\frac{1}{4}$, -1.7, 0.2, $-1\frac{3}{4}$

20. -2.21, -2.09, $-2\frac{1}{9}$, $-1\frac{10}{11}$

21. -3.1, 2.75, $1\frac{7}{8}$, $-\frac{2}{3}$

22. $6\frac{7}{8}$, $6\frac{15}{16}$, 6.9, 5.3

23. $-4\frac{1}{6}$, -4.19, -5.3, $-5\frac{1}{3}$

24. $5\frac{9}{11}$, 5.93, $5\frac{7}{20}$, 5.81

25. $-3\frac{1}{4}$, $-4\frac{1}{8}$, -3.65, $-3\frac{4}{11}$, -4.05

2-3**Skills Practice****Multiplying Positive and Negative Fractions****Multiply. Write in simplest form.**

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

2. $\frac{2}{9} \cdot \frac{7}{8}$

3. $\frac{5}{6} \cdot \frac{3}{11}$

4. $-\frac{4}{7} \cdot \frac{3}{10}$

5. $\frac{2}{9} \cdot \left(-\frac{3}{8}\right)$

6. $-\frac{3}{5} \cdot \left(-\frac{5}{9}\right)$

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

8. $\frac{4}{5} \cdot 4\frac{3}{8}$

9. $-\frac{2}{15} \cdot 5\frac{5}{6}$

10. $-1\frac{3}{7} \cdot 1\frac{1}{5}$

11. $-2\frac{1}{4} \cdot 1\frac{2}{3}$

12. $1\frac{9}{16} \cdot 2\frac{4}{5}$

13. $-3\frac{1}{7} \cdot \left(-1\frac{2}{11}\right)$

14. $2\frac{2}{3} \cdot \left(-2\frac{1}{4}\right)$

15. $\left(-\frac{4}{5}\right)\left(-\frac{4}{5}\right)$

ALGEBRA Evaluate each expression if $r = \frac{5}{6}$, $s = -\frac{1}{3}$, $t = \frac{4}{5}$, and $v = -\frac{3}{4}$.

16. rv

17. st

18. rs

19. stv

20. rst

21. rtv

ALGEBRA Evaluate each expression if $a = -\frac{5}{9}$, $b = -\frac{1}{5}$, $c = \frac{2}{3}$, and $d = \frac{3}{4}$.

22. ad

23. bc

24. abc

2-4**Skills Practice*****Dividing Positive and Negative Fractions***

Write the multiplicative inverse of each number.

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

2. $-\frac{4}{7}$

3. $-\frac{1}{12}$

4. 22

5. $\frac{9}{35}$

6. $-\frac{14}{17}$

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

8. $-1\frac{3}{13}$

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

10. $-3\frac{6}{11}$

11. $4\frac{8}{15}$

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

Divide. Write in simplest form.

13. $\frac{3}{7} \div \frac{3}{5}$

14. $\frac{2}{7} \div \frac{6}{7}$

15. $-\frac{5}{8} \div \frac{3}{4}$

16. $\frac{7}{9} \div \left(-\frac{14}{15}\right)$

17. $-\frac{4}{5} \div \frac{8}{9}$

18. $\frac{2}{11} \div \frac{4}{9}$

19. $1\frac{3}{4} \div 2\frac{1}{2}$

20. $-2\frac{3}{5} \div 1\frac{3}{10}$

21. $-3\frac{4}{7} \div \left(-1\frac{1}{14}\right)$

22. $\frac{10}{11} \div 5$

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

24. $3\frac{4}{15} \div 4\frac{2}{3}$

25. $9\frac{1}{3} \div 5\frac{3}{5}$

26. $-12\frac{3}{4} \div \left(-2\frac{5}{6}\right)$

27. $2\frac{4}{9} \div \left(-6\frac{2}{7}\right)$

28. $-11\frac{1}{5} \div 3\frac{1}{9}$

2-5**Skills Practice*****Adding and Subtracting Like Fractions*****Add or subtract. Write in simplest form.**

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

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

3. $\frac{7}{11} + \frac{3}{11}$

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

5. $-\frac{4}{9} + \frac{8}{9}$

6. $-\frac{5}{7} + \frac{2}{7}$

7. $\frac{7}{12} + \frac{5}{12}$

8. $\frac{1}{9} + \left(-\frac{4}{9}\right)$

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

10. $-\frac{9}{16} + \left(-\frac{3}{16}\right)$

11. $\frac{5}{8} - \frac{3}{8}$

12. $\frac{13}{19} - \frac{6}{19}$

13. $\frac{2}{7} - \frac{6}{7}$

14. $\frac{4}{15} - \frac{7}{15}$

15. $\frac{1}{9} - \left(-\frac{4}{9}\right)$

16. $\frac{3}{13} - \left(-\frac{11}{13}\right)$

17. $2\frac{3}{7} + 1\frac{2}{7}$

18. $1\frac{4}{15} + 4\frac{8}{15}$

19. $5\frac{6}{7} - 3\frac{2}{7}$

20. $6\frac{7}{12} - 3\frac{1}{12}$

21. $-2\frac{5}{11} - 7\frac{1}{11}$

22. $-4\frac{3}{8} - 2\frac{7}{8}$

23. $5\frac{2}{9} - 2\frac{4}{9}$

24. $8\frac{1}{5} - 4\frac{2}{5}$

2-6**Skills Practice*****Adding and Subtracting Unlike Fractions***

Add or subtract. Write in simplest form.

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

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

3. $\frac{7}{8} + \frac{1}{4}$

4. $\frac{3}{4} + \frac{2}{3}$

5. $\frac{6}{7} - \frac{3}{14}$

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

7. $\frac{1}{4} - \frac{5}{6}$

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

9. $-\frac{3}{7} - \frac{2}{3}$

10. $\frac{4}{7} - \left(-\frac{1}{2}\right)$

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

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

13. $3\frac{1}{6} + 4\frac{1}{4}$

14. $1\frac{1}{2} + \left(-1\frac{1}{5}\right)$

15. $2\frac{3}{4} + \left(-6\frac{3}{8}\right)$

16. $5\frac{1}{4} + \left(-2\frac{2}{3}\right)$

17. $-5\frac{1}{12} - 3\frac{2}{3}$

18. $-3\frac{3}{5} - \frac{9}{10}$

19. $-2\frac{1}{5} - 3\frac{3}{4}$

20. $2\frac{1}{3} - \left(-4\frac{5}{6}\right)$

21. $3\frac{2}{7} - \left(-4\frac{2}{3}\right)$

22. $5\frac{7}{9} - \left(-2\frac{1}{3}\right)$

23. $10\frac{2}{9} - \left(-3\frac{1}{3}\right)$

24. $-2\frac{1}{3} - \left(-5\frac{4}{5}\right)$

2-7**Skills Practice****Solving Equations with Rational Numbers**

Solve each equation. Check your solution.

1. $x + 2.62 = 6.37$

2. $y - 3.16 = 7.92$

3. $-3.38 = r - 9.76$

4. $s + \frac{5}{8} = \frac{7}{8}$

5. $-\frac{5}{6} = x - \frac{1}{3}$

6. $-\frac{4}{5} + z = \frac{1}{10}$

7. $3.4c = 6.8$

8. $-1.56 = 0.26w$

9. $12.8y = 6.4$

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

11. $\frac{4}{9} = \frac{8}{11}a$

12. $-\frac{2}{5}s = \frac{4}{15}$

13. $-\frac{2}{3} = \frac{3}{10}t$

14. $-\frac{4}{11}w = -\frac{19}{22}$

15. $5.1 = -1.7r$

16. $z - (-3.2) = 3.69$

17. $-2.11 = w - (-5.81)$

18. $\frac{w}{2.6} = 3.5$

19. $-\frac{x}{1.8} = 7.2$

20. $2\frac{1}{4}y = 3\frac{3}{8}$

21. $-2\frac{2}{5}f = -3\frac{1}{5}$

22. $1.5d = \frac{3}{8}$

23. $-7.5g = -6\frac{2}{3}$

24. $-2\frac{1}{5} = c - \left(-\frac{4}{5}\right)$

2-8

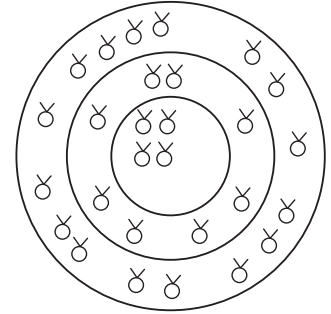
Skills Practice

Problem-Solving Investigation: Look for a Pattern

Look for a pattern. Then use the pattern to solve each problem.

- 1. YARN** A knitting shop is having a huge yarn sale. One skein sells for \$1.00, 2 skeins sell for \$1.50, and 3 skeins sell for \$2.00. If this pattern continues, how many skeins of yarn can you buy for \$5.00?

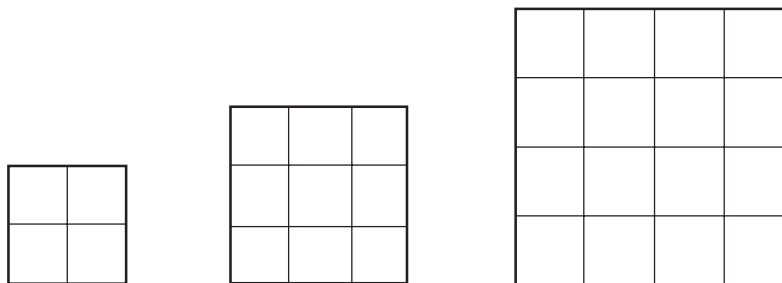
- 2. BIOLOGY** Biologists place sensors in 8 concentric circles to track the movement of grizzly bears throughout Yellowstone National Park. Four sensors are placed in the inner circle. Eight sensors are placed in the next circle. Sixteen sensors are placed in the third circle, and so on. If the pattern continues, how many sensors are needed in all?



- 3. HONOR STUDENTS** A local high school displays pictures of the honor students from each school year on the office wall. The top row has 9 pictures displayed. The next 3 rows have 7, 10, and 8 pictures displayed. The pattern continues to the bottom row, which has 14 pictures in it. How many rows of pictures are there on the office wall?

- 4. CHEERLEADING** The football cheerleaders will arrange themselves in rows to form a pattern on the football field at halftime. In the first five rows there are 12, 10, 11, 9, and 10 girls in each row. They will form a total of twelve rows. If the pattern continues, how many girls will be in the back row?

- 5. GEOMETRY** Find the perimeters of the next two figures in the pattern. The length of each side of each small square is 3 feet.



- 6. HOT TUBS** A hot tub holds 630 gallons of water when it is full. A hose fills the tub at a rate of 6 gallons every five minutes. How long will it take to fill the hot tub?

2-9**Skills Practice*****Powers and Exponents***

Write each expression using exponents.

1. $2 \cdot 2 \cdot 2 \cdot 2$

2. $9 \cdot 9$

3. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$

4. $x \cdot x \cdot x$

5. $c \cdot c \cdot c \cdot c \cdot c$

6. $s \cdot s \cdot s \cdot s \cdot s \cdot s \cdot s$

7. $5 \cdot 5 \cdot 5 \cdot 3 \cdot 3$

8. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 6 \cdot 6 \cdot 6$

9. $8 \cdot 8 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 8$

10. $a \cdot a \cdot b \cdot a \cdot b \cdot a \cdot a$

11. $m \cdot n \cdot n \cdot n \cdot m \cdot n$

12. $y \cdot x \cdot x \cdot y \cdot x \cdot y \cdot y$

Evaluate each expression.

13. 4^3

14. 2^5

15. 8^3

16. 5^4

17. 2^8

18. $2^3 \cdot 5^2$

19. $4^2 \cdot 3^4$

20. $2^6 \cdot 6^2$

21. $3^3 \cdot 7^3$

22. 2^{-3}

23. 8^{-2}

24. 7^{-4}

2-10**Skills Practice****Scientific Notation**

Write each number in standard form.

1. 6.7×10^1

2. 6.1×10^4

3. 1.6×10^3

4. 3.46×10^2

5. 2.91×10^5

6. 8.651×10^7

7. 3.35×10^{-1}

8. 7.3×10^{-6}

9. 1.49×10^{-7}

10. 4.0027×10^{-4}

11. 5.2277×10^{-3}

12. 8.50284×10^{-2}

Write each number in scientific notation.

13. 34

14. 273

15. 79,700

16. 6,590

17. 4,733,800

18. 2,204,000,000

19. 0.00916

20. 0.29

21. 0.00000571

22. 0.0008331

23. 0.0121

24. 0.00000018

3-1**Skills Practice****Square Roots****Find each square root.**

1. $\sqrt{16}$

2. $-\sqrt{9}$

3. $\sqrt{36}$

4. $\sqrt{196}$

5. $\sqrt{121}$

6. $-\sqrt{81}$

7. $-\sqrt{0.04}$

8. $\sqrt{289}$

9. $\sqrt{0.81}$

10. $-\sqrt{400}$

11. $\sqrt{\frac{16}{49}}$

12. $\sqrt{\frac{49}{100}}$

ALGEBRA Solve each equation.

13. $s^2 = 81$

14. $t^2 = 36$

15. $x^2 = 49$

16. $256 = z^2$

17. $900 = y^2$

18. $1,024 = h^2$

19. $c^2 = \frac{49}{64}$

20. $a^2 = \frac{25}{121}$

21. $\frac{1}{100} = d^2$

22. $\frac{144}{169} = r^2$

23. $b^2 = \frac{9}{441}$

24. $x^2 = \frac{121}{400}$

3-2**Skills Practice*****Estimating Square Roots*****Estimate to the nearest whole number.**

1. $\sqrt{5}$

2. $\sqrt{18}$

3. $\sqrt{10}$

4. $\sqrt{34}$

5. $\sqrt{53}$

6. $\sqrt{80}$

7. $\sqrt{69}$

8. $\sqrt{99}$

9. $\sqrt{120}$

10. $\sqrt{77}$

11. $\sqrt{171}$

12. $\sqrt{230}$

13. $\sqrt{147}$

14. $\sqrt{194}$

15. $\sqrt{290}$

16. $\sqrt{440}$

17. $\sqrt{578}$

18. $\sqrt{730}$

19. $\sqrt{1,010}$

20. $\sqrt{1,230}$

21. $\sqrt{8.42}$

22. $\sqrt{17.8}$

23. $\sqrt{11.5}$

24. $\sqrt{37.7}$

25. $\sqrt{23.8}$

26. $\sqrt{59.4}$

27. $\sqrt{97.3}$

28. $\sqrt{118.4}$

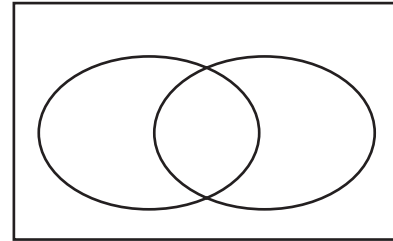
29. $\sqrt{84.35}$

30. $\sqrt{45.92}$

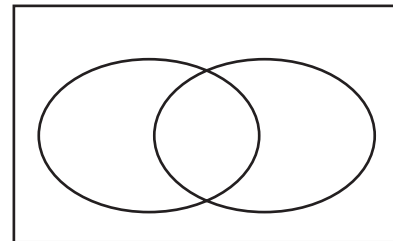
3-3 Skills Practice**Problem Solving Investigation: Use a Venn Diagram**

Use a Venn diagram to solve each problem.

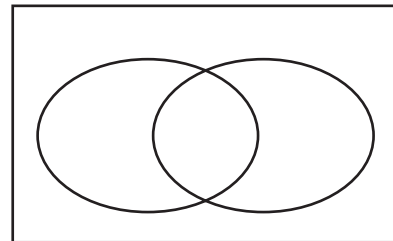
1. **PHONE SERVICE** Of the 5,750 residents of Homer, Alaska, 2,330 pay for landline phone service and 4,180 pay for cell phone service. One thousand seven hundred fifty pay for both landline and cell phone service. How many residents of Homer do not pay for any type of phone service?



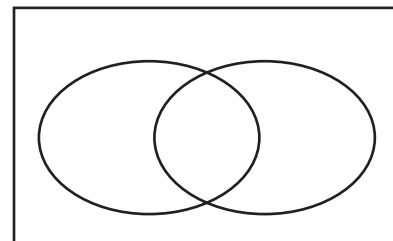
2. **BIOLOGY** Of the 2,890 ducks living in a particular wetland area, scientists find that 1,260 have deformed beaks, while 1,320 have deformed feet. Six hundred ninety of the birds have both deformed feet and beaks. How many of the ducks living in the wetland area have no deformities?



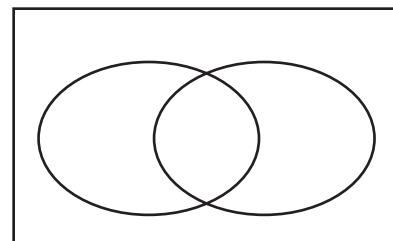
3. **FLU SYMPTOMS** The local health agency treated 890 people during the flu season. Three hundred fifty of the patients had flu symptoms, 530 had cold symptoms, and 140 had both cold and flu symptoms. How many of the patients treated by the health agency had no cold or flu symptoms?



4. **HOLIDAY DECORATIONS** During the holiday season, 13 homes on a certain street displayed lights and 8 displayed lawn ornaments. Five of the homes displayed both lights and lawn ornaments. If there are 32 homes on the street, how many had no decorations at all?



5. **LUNCHTIME** At the local high school, 240 students reported they have eaten the cafeteria's hot lunch, 135 said they have eaten the cold lunch, and 82 said they have eaten both the hot and cold lunch. If there are 418 students in the school, how many bring lunch from home?



3-4**Skills Practice*****The Real Number System***

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

1. 12

2. -15

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

4. 3.18

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

6. $9.\bar{3}$

7. $-2\frac{7}{9}$

8. $\sqrt{25}$

9. $\sqrt{3}$

10. $-\sqrt{64}$

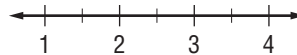
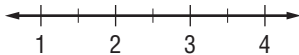
11. $-\sqrt{12}$

12. $\sqrt{13}$

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

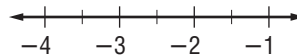
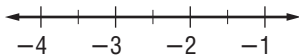
13. $\sqrt{5}$

14. $\sqrt{14}$



15. $-\sqrt{6}$

16. $-\sqrt{13}$



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

17. $1.7 \bullet \sqrt{3}$

18. $\sqrt{6} \bullet 2\frac{1}{2}$

19. $4\frac{2}{5} \bullet \sqrt{19}$

20. $4.\bar{8} \bullet \sqrt{24}$

21. $6\frac{1}{6} \bullet \sqrt{38}$

22. $\sqrt{55} \bullet 7.4\bar{2}$

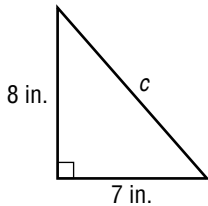
23. $2.1 \bullet \sqrt{4.41}$

24. $2.\bar{7} \bullet \sqrt{7.7}$

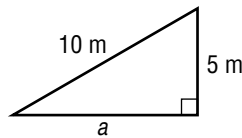
3-5**Skills Practice****The Pythagorean Theorem**

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.

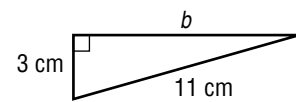
1.



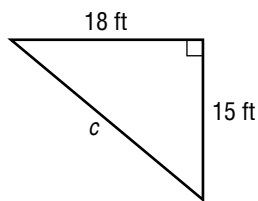
2.



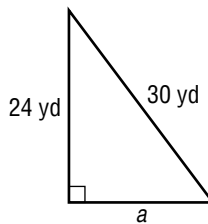
3.



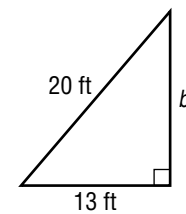
4.



5.



6.



7. $a = 1 \text{ m}, b = 3 \text{ m}$

8. $a = 2 \text{ in.}, c = 5 \text{ in.}$

9. $b = 4 \text{ ft}, c = 7 \text{ ft}$

10. $a = 4 \text{ km}, b = 9 \text{ km}$

11. $a = 10 \text{ yd}, c = 18 \text{ yd}$

12. $b = 18 \text{ ft}, c = 20 \text{ ft}$

13. $a = 5 \text{ yd}, b = 11 \text{ yd}$

14. $a = 12 \text{ cm}, c = 16 \text{ cm}$

15. $b = 22 \text{ m}, c = 25 \text{ m}$

16. $a = 21 \text{ ft}, b = 72 \text{ ft}$

17. $a = 36 \text{ yd}, c = 60 \text{ yd}$

18. $b = 25 \text{ mm}, c = 65 \text{ mm}$

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

19. 10 yd, 15 yd, 20 yd

20. 21 ft, 28 ft, 35 ft

21. 7 cm, 14 cm, 16 cm

22. 40 m, 42 m, 58 m

23. 24 in., 32 in., 38 in.

24. 15 mm, 18 mm, 24 mm

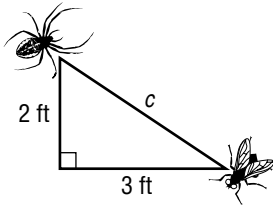
3-6

Skills Practice

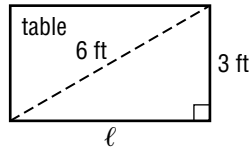
Using the Pythagorean Theorem

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

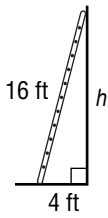
1. How far apart are the spider and the fly?



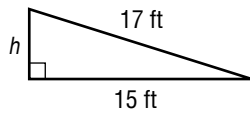
2. How long is the tabletop?



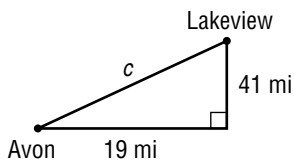
3. How high will the ladder reach?



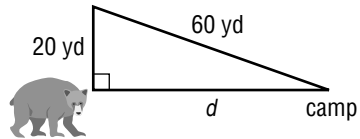
4. How high is the ramp?



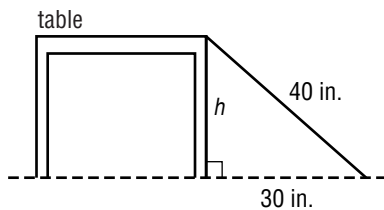
5. How far apart are the two cities?



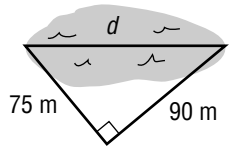
6. How far is the bear from camp?



7. How tall is the table?



8. How far is it across the pond?



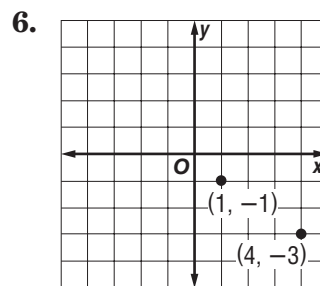
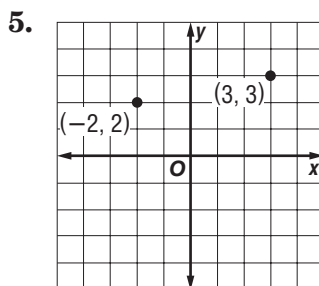
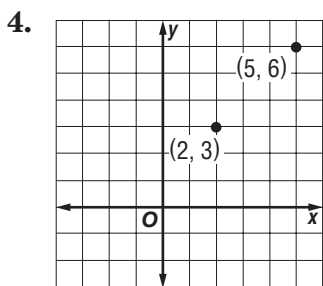
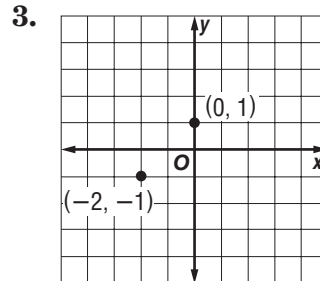
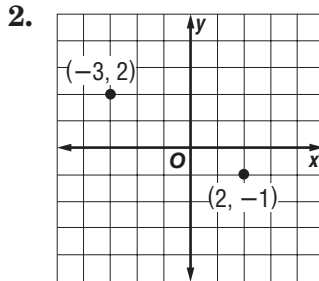
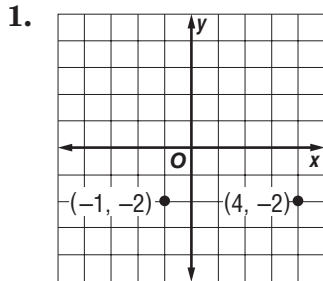
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Lesson 3-6

3-7 Skills Practice

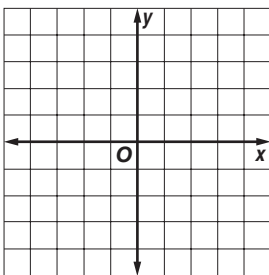
Distance on the Coordinate Plane

Find the distance between each pair of points whose coordinates are given. Round to the nearest tenth if necessary.

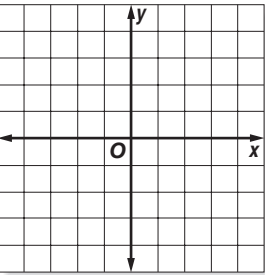


Graph each pair of ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

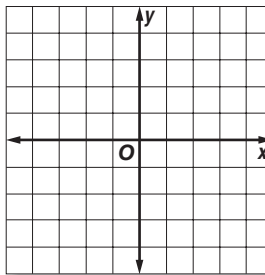
7. $(-3, 0), (3, -2)$



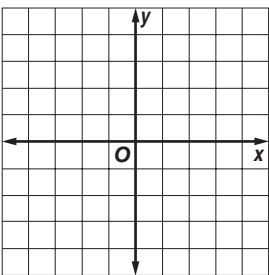
8. $(-4, -3), (2, 1)$



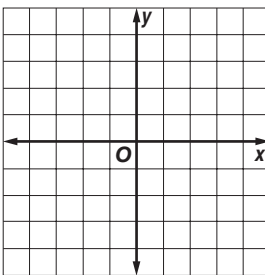
9. $(0, 2), (5, -2)$



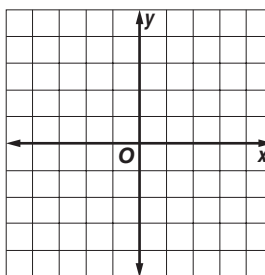
10. $(-2, 1), (-1, 2)$



11. $(0, 0), (-4, -3)$



12. $(-3, 4), (2, -3)$



4-1**Skills Practice*****Ratios and Rates*****Express each ratio in simplest form.**

1. 15 cats:50 dogs
2. 18 adults to 27 teens
3. 27 nurses to 9 doctors
4. 12 losses in 32 games
5. 50 centimeters:1 meter
6. 1 foot:1 yard
7. 22 players:2 teams
8. \$28:8 pounds
9. 8 completions:12 passes
10. 21 hired out of 105 applicants
11. 18 hours out of 1 day
12. 64 boys to 66 girls
13. 66 miles on 4 gallons
14. 48 wins:18 losses
15. 112 peanuts:28 cashews
16. 273 miles in 6 hours

Express each rate as a unit rate.

17. 96 students in 3 buses
18. \$9,650 for 100 shares of stock
19. \$21.45 for 13 gallons of gasoline
20. 125 meters in 10 seconds
21. 30.4 pounds of tofu in 8 weeks
22. 6.5 inches of rainfall in 13 days
23. 103.68 miles in 7.2 hours
24. \$94.99 for 7 pizzas

4-2 Skills Practice***Proportional and Nonproportional Relationships***

For Exercises 1–3, use the table of values. Write the ratios in the table to show the relationship between each set of values.

1. Number of Hours	1	2	3	4
Total Amount Earned	\$15	\$30	\$45	\$60
Ratios				

2. Number of Packages	1	2	3	4
Total Cost	\$11	\$20	\$29	\$38
Ratios				

3. Number of Classrooms	1	2	3	4
Total Students	24	48	72	92
Ratios				

For Exercises 4–8 use the table of values. Write *proportional* or *nonproportional*.

4. Number of Hours	1	2	3	4
Total Amount Earned	\$0.99	\$1.98	\$2.97	\$3.96

5. Number of Hours	1	2	3	4
Total Amount Earned	\$17.25	\$35.50	\$50.75	\$70

6. Number of Hours	1	2	3	4
Number of Pages Read in Book	37	73	109	145

7. Number of Lunches	1	2	3	4
Total Cost	\$2.75	\$5.50	\$8.25	\$11

8. Jack is ordering pies for a family reunion. Each pie costs \$4.50. For orders smaller than a dozen pies, there is a \$5 delivery charge. Is the cost proportional to the number of pies ordered?

4-3**Skills Practice*****Solving Proportions*****Determine whether each pair of ratios forms a proportion.**

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

2. $\frac{7}{3}, \frac{14}{6}$

3. $\frac{6}{8}, \frac{9}{12}$

4. $\frac{16}{9}, \frac{11}{6}$

5. $\frac{55}{10}, \frac{12}{2}$

6. $\frac{6}{8}, \frac{15}{20}$

7. $\frac{5}{9}, \frac{15}{27}$

8. $\frac{3}{18}, \frac{11}{66}$

9. $\frac{7}{11}, \frac{15}{23}$

10. $\frac{9}{13}, \frac{13}{17}$

11. $\frac{3}{42}, \frac{5}{70}$

12. $\frac{6}{7}, \frac{36}{49}$

Solve each proportion.

13. $\frac{4}{12} = \frac{y}{9}$

14. $\frac{6}{18} = \frac{4}{c}$

15. $\frac{7}{z} = \frac{84}{12}$

16. $\frac{5}{10} = \frac{8}{w}$

17. $\frac{x}{9} = \frac{4}{15}$

18. $\frac{6}{20} = \frac{y}{5}$

19. $\frac{5}{9} = \frac{6}{r}$

20. $\frac{8}{n} = \frac{10}{7}$

21. $\frac{d}{5} = \frac{12}{80}$

22. $\frac{y}{5} = \frac{13}{10}$

23. $\frac{2}{28} = \frac{p}{35}$

24. $\frac{11}{t} = \frac{100}{11}$

25. $\frac{1.2}{m} = \frac{3}{5}$

26. $\frac{0.9}{1.5} = \frac{a}{10}$

27. $\frac{3}{7} = \frac{k}{4.2}$

28. $\frac{6.3}{x} = \frac{18}{5}$

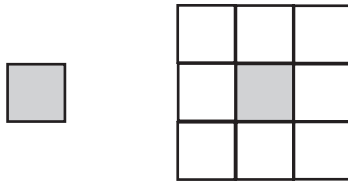
29. $\frac{3.6}{9} = \frac{b}{0.5}$

30. $\frac{14}{1.5} = \frac{4.2}{y}$

4-4**Skills Practice*****Problem-Solving Investigation: Draw a Diagram***

For Exercises 1–5, use the draw a diagram strategy to solve the problem.

- 1. AQUARIUM** An aquarium holds 60 gallons of water. After 6 minutes, the tank has 15 gallons of water in it. How many more minutes will it take to fill the tank?
- 2. TILING** Meredith has a set of ninety 1-inch tiles. If she starts with one tile, then surrounds it with a ring of tiles to create a larger square, how many surrounding rings can she make before she runs out of tiles?



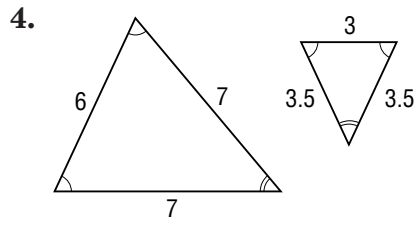
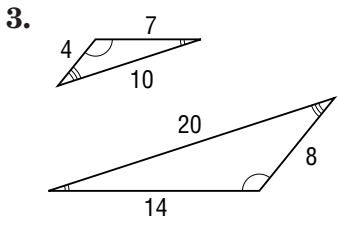
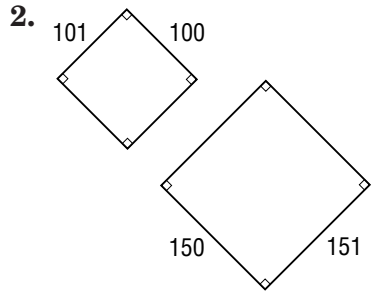
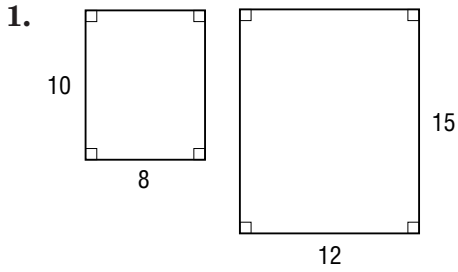
- 3. SEWING** Judith has a 30-yard by 1-yard roll of fabric. She needs to use 1.5 square yards to create one costume. How many costumes can she create?
- 4. DRIVING** It takes 3 gallons of gas to drive 102 miles. How many miles can be driven on 16 gallons of gas?
- 5. PACKING** Hector can fit 75 compact discs into 5 boxes. How many compact discs can he fit into 14 boxes?

4-5

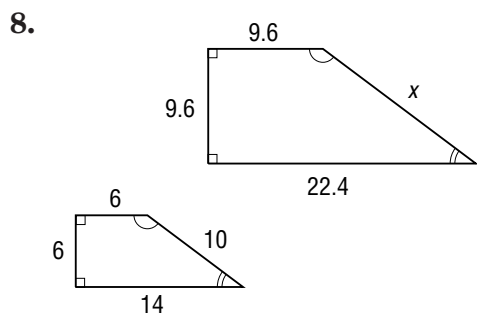
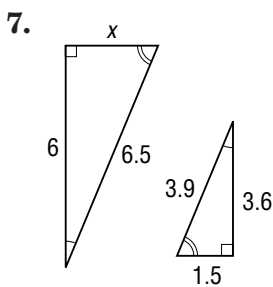
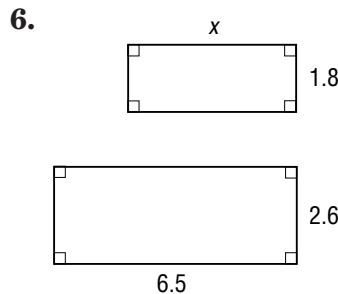
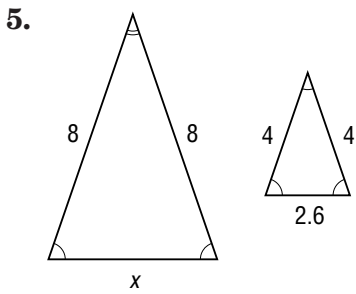
Skills Practice
Similar Polygons

Lesson 4-5

Determine whether each pair of polygons is similar. Explain.



Each pair of polygons is similar. Write a proportion to find each missing measure. Then solve.



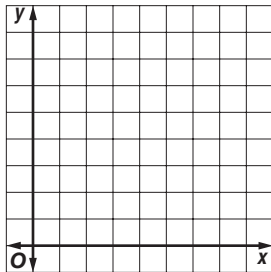
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4-6 Skills Practice

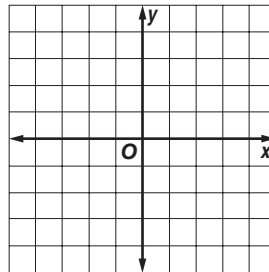
Dilations

Find the coordinates of the vertices of triangle $A'B'C'$ after triangle ABC is dilated using the given scale factor. Then graph triangle ABC and its dilation.

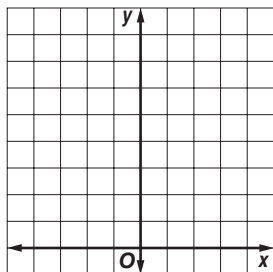
1. $A(1, 1), B(1, 3), C(3, 1)$; scale factor 3



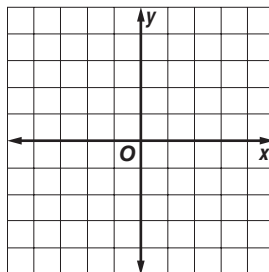
2. $A(-2, -2), B(-1, 2), C(2, 1)$; scale factor 2



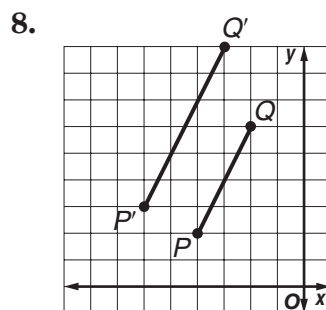
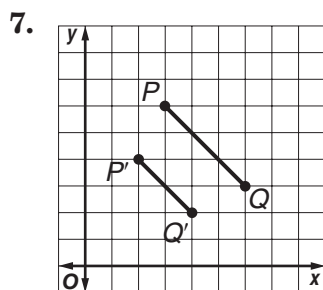
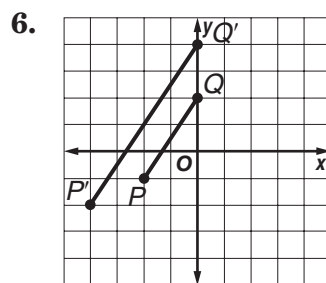
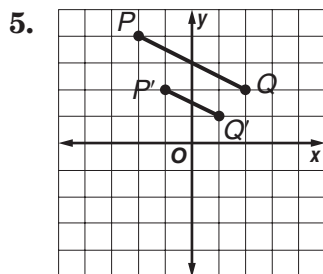
3. $A(-4, 6), B(2, 6), C(0, 8)$; scale factor $\frac{1}{2}$



4. $A(-3, -2), B(1, 2), C(2, -3)$; scale factor 1.5



Segment $P'Q'$ is a dilation of segment PQ . Find the scale factor of the dilation and classify it as an *enlargement* or a *reduction*.



4-7**Skills Practice****Scale Drawings and Models**

ARCHITECTURE The scale on a set of architectural drawings for a house is 1.5 inches = 2 feet. Find the length of each part of the house.

	Room	Drawing Length	Actual Length
1.	Living Room	15 inches	
2.	Dining Room	10.5 inches	
3.	Kitchen	$12\frac{3}{4}$ inches	
4.	Laundry Room	$8\frac{1}{4}$ inches	
5.	Hall	$13\frac{7}{8}$ inches	
6.	Garage	16.5 inches	

7. What is the scale factor of these drawings?

TOWN PLANNING For Exercises 8–11, use the following information.

As part of a downtown renewal project, businesses have constructed a scale model of the town square to present to the city commission for its approval. The scale of the model is 1 inch = 7 feet.

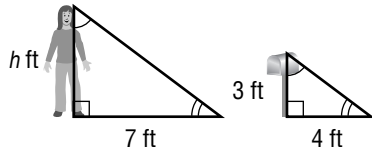
8. The courthouse is the tallest building in the town square. If it is $5\frac{1}{2}$ inches tall in the model, how tall is the actual building?
9. The business owners would like to install new lampposts that are each 12 feet tall. How tall are the lampposts in the model?
10. In the model, the lampposts are $3\frac{3}{7}$ inches apart. How far apart will they be when they are installed?
11. What is the scale factor?
12. **MAPS** On a map, two cities are $6\frac{1}{2}$ inches apart. The actual distance between the cities is 104 miles. What is the scale of the map?

4-8 Skills Practice

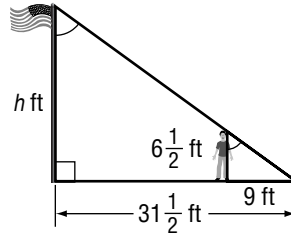
Indirect Measurement

Write a proportion and solve the problem.

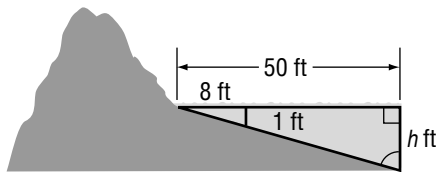
1. **HEIGHT** How tall is Becky?



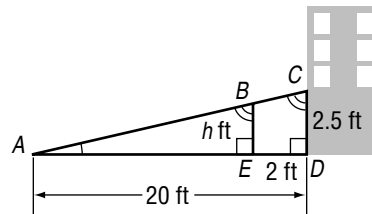
2. **FLAGS** How tall is the flagpole?



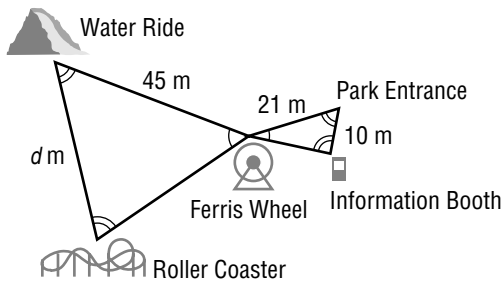
3. **BEACH** How deep is the water 50 feet from shore?



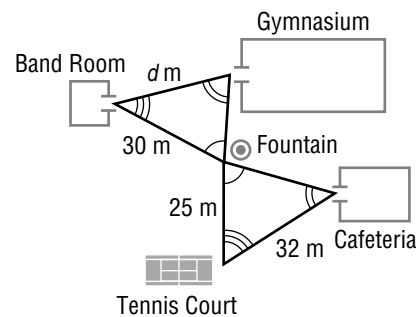
4. **ACCESSIBILITY** How high is the ramp when it is 2 feet from the building?
(Hint: $\triangle ABE \sim \triangle ACD$)



5. **AMUSEMENT PARKS** The triangles in the figure are similar. How far is the water ride from the roller coaster?
Round to the nearest tenth.



6. **CLASS CHANGES** The triangles in the figure are similar. How far is the entrance to the gymnasium from the band room?



4-9**Skills Practice****Rate of Change**

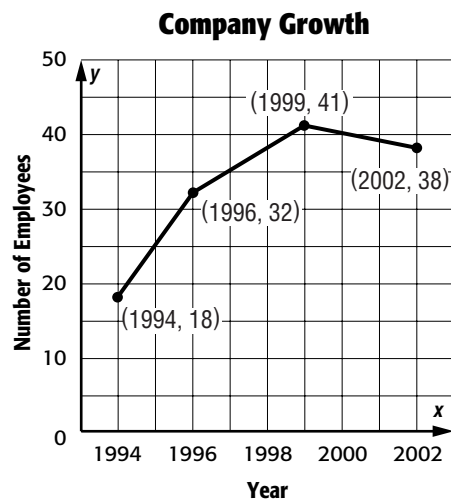
TEMPERATURE Use the table below that shows the high temperature of a city for the first part of August.

Date	1	5	14	15
High Temperature (°F)	85	93	102	102

- Find the rate of change in the high temperature between August 1 and August 5.
- Find the rate of change in the high temperature between August 5 and August 14.
- During which of these two time periods did the high temperature rise faster?
- Find the rate of change in the high temperature between August 14 and August 15. Then interpret its meaning.

COMPANY GROWTH Use the graph that shows the number of employees at a company between 1994 and 2002.

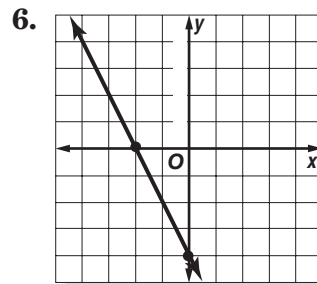
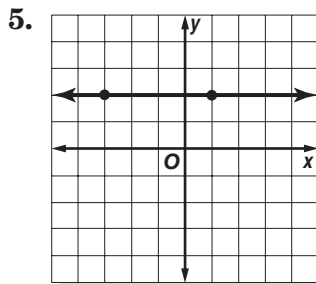
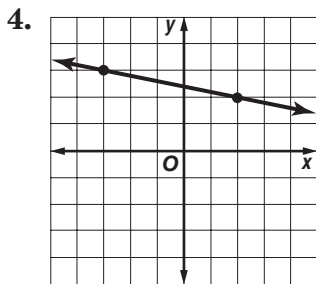
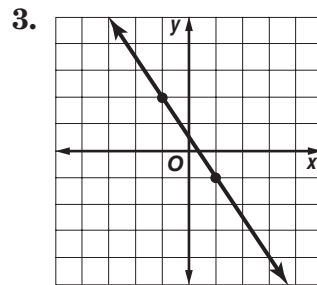
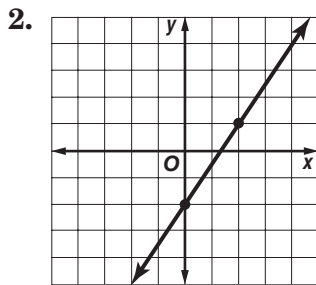
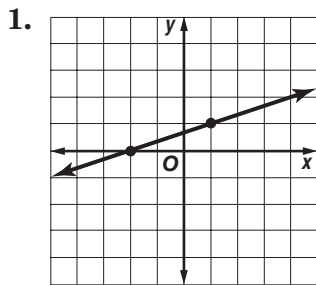
- Find the rate of change in the number of employees between 1994 and 1996.
- Find the rate of change in the number of employees between 1996 and 1999.
- During which of these two time periods did the number of employees grow faster?
- Find the rate of change in the number of employees between 1999 and 2002. Then interpret its meaning.



4-10 Skills Practice

Constant Rate of Change

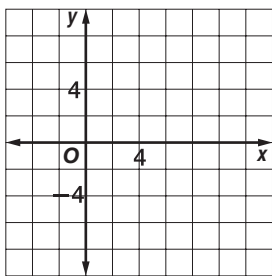
Find the rate of change for each line.



The points given in each table lie on a line. Find the rate of change for the line. Then graph the line.

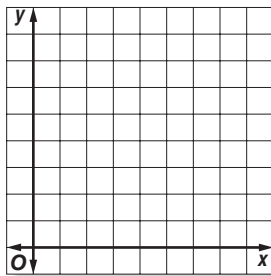
7.

x	0	3	6	9
y	1	2	3	4



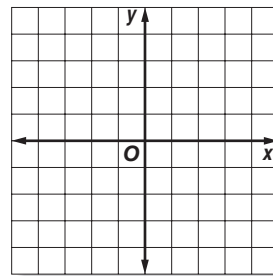
8.

x	1	3	5	7
y	6	5	4	3



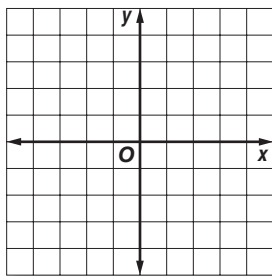
9.

x	-2	-1	0	1
y	2	1	0	-1



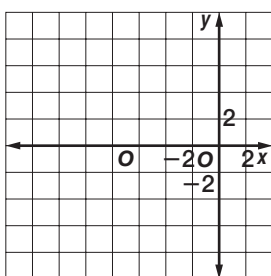
10.

x	-4	-2	0	2
y	3	3	3	3



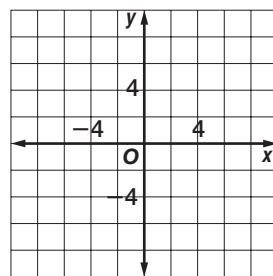
11.

x	-7	-5	-3	-1
y	-6	-3	0	3



12.

x	-8	-4	0	4
y	8	5	2	-1



5-1**Skills Practice*****Ratios and Percents*****Write each ratio or fraction as a percent.**

- | | |
|---------------------|---------------------|
| 1. 3 out of 100 | 2. 49 out of 100 |
| 3. 73 out of 100 | 4. 0.9 out of 100 |
| 5. 99 out of 100 | 6. 2:4 |
| 7. 2:10 | 8. 1:20 |
| 9. 19:25 | 10. 31:50 |
| 11. $\frac{8}{10}$ | 12. $\frac{3}{4}$ |
| 13. $\frac{7}{50}$ | 14. $\frac{13}{25}$ |
| 15. $\frac{19}{20}$ | 16. $\frac{3}{8}$ |

Write each percent as a fraction in simplest form.

- | | |
|---------|-----------|
| 17. 31% | 18. 51% |
| 19. 67% | 20. 89% |
| 21. 97% | 22. 50% |
| 23. 90% | 24. 26% |
| 25. 85% | 26. 36% |
| 27. 94% | 28. 48% |
| 29. 15% | 30. 92% |
| 31. 54% | 32. 12.5% |

5-2**Skills Practice*****Comparing Fractions, Decimals, and Percents*****Write each percent as a decimal.**

1. 50%

2. 13%

3. 26%

4. 41%

5. 79%

6. 9.1%

7. 17.5%

8. 33.4%

9. 91.5%

10. 122%

11. 282%

12. 331%

Write each decimal as a percent.

13. 0.6

14. 0.05

15. 0.17

16. 0.38

17. 0.81

18. 0.453

19. 0.572

20. 0.737

21. 0.061

22. 1.19

23. 1.47

24. 2.38

Write each fraction as a percent.

25. $\frac{9}{20}$

26. $\frac{2}{25}$

27. $\frac{5}{16}$

28. $\frac{33}{40}$

29. $\frac{3}{80}$

30. $\frac{13}{16}$

31. $\frac{17}{40}$

32. $\frac{59}{80}$

33. $\frac{14}{10}$

34. $\frac{28}{25}$

35. $\frac{9}{4}$

36. $\frac{33}{20}$

5-3**Skills Practice*****Algebra: The Percent Proportion***

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

1. 1 is what percent of 5?
2. What number is 25% of 40?
3. 30 is 60% of what number?
4. What percent of 8 is 6?
5. Find 15% of 20.
6. 33 is 33% of what number?
7. 15 is what percent of 150?
8. What number is 30% of 140?
9. 90 is 60% of what number?
10. What percent of 60 is 42?
11. Find 90% of 40.
12. 21 is 35% of what number?
13. 36 is what percent of 45?
14. What number is 75% of 44?
15. 12 is 40% of what number?
16. What percent of 40 is 15?
17. Find 5% of 80.
18. 45 is 60% of what number?
19. 46 is what percent of 69?
20. Find 55% of 120.
21. 11 is 44% of what number?
22. 19 is what percent of 20?
23. What number is 85% of 40?
24. 9 is 18% of what number?

5-4**Skills Practice*****Finding Percents Mentally*****Compute mentally.**

1. 50% of 40
2. 25% of 36
3. 10% of 60
4. 1% of 100
5. 20% of 15
6. 40% of 30
7. $33\frac{1}{3}\%$ of 21
8. $12\frac{1}{2}\%$ of 32
9. 75% of 28
10. 10% of 230
11. 90% of 30
12. $83\frac{1}{3}\%$ of 18
13. 1% of 300
14. $62\frac{1}{2}\%$ of 24
15. 60% of 45
16. 70% of 50
17. $16\frac{2}{3}\%$ of 48
18. 10% of 66
19. 30% of 70
20. 1% of 240
21. $66\frac{2}{3}\%$ of 51
22. 10% of 45
23. 1% of 73
24. 10% of 12.4
25. 1% of 18.9
26. 10% of 107
27. 1% of 153
28. $87\frac{1}{2}\%$ of 72
29. $83\frac{1}{3}\%$ of 54
30. $62\frac{1}{2}\%$ of 64

5-5**Skills Practice*****Problem-Solving Investigation: Reasonable Answers***

For Exercises 1–12, estimate and rewrite the problem to determine a reasonable answer.

1. 53% of 813

2. 27% of 456

3. 87% of 1,978

4. 11% of 176

5. 67% of 543

6. 8% of 697

7. 81% of 2,211

8. 48% of 762

9. 4% of 4,874

10. 23% of 584

11. 45% of 1,252

12. 32% of 620

For Exercises 13–24, estimate and rewrite the problem to determine a reasonable answer.

13. $\$54.87 + \28.97

14. $\$22.38 + \46.12

15. $\$94.67 + \17.78

16. $\$88.88 + \36.32

17. $\$7.87 + \48.31

18. $\$74.78 + \75.18

19. $\$37.42 + \85.01

20. $\$28.69 + \35.09

21. $\$108.24 + \127.95

22. $\$89.99 + \79.99

23. $\$217.87 + \186.65

24. $\$46.22 + \86.86

5-6**Skills Practice*****Percent and Estimation*****Estimate.**

1. 9% of 40

2. 20% of 16

3. 76% of 36

4. 31% of 80

5. 33% of 46

6. 26% of 79

7. 89% of 31

8. 42% of 54

9. 11% of 89

10. 79% of 66

11. 72% of 109

12. 19% of 116

Estimate each percent.

13. 6 out of 29

14. 7 out of 27

15. 12 out of 17

16. 44 out of 50

17. 4 out of 41

18. 9 out of 28

19. 9 out of 19

20. 10 out of 26

21. 29 out of 41

22. 37 out of 46

23. 17 out of 23

24. 7 out of 11

5-7**Skills Practice*****Algebra: The Percent Equation***

Solve each problem using the percent equation.

1. Find 50% of 40.
2. What is 90% of 20?
3. What percent of 64 is 16?
4. 24 is what percent of 30?
5. Find 20% of 55.
6. What is 60% of 45?
7. 16 is 40% of what number?
8. 70% of what number is 63?
9. What percent of 84 is 63?
10. 9 is what percent of 30?
11. 35 is 10% of what number?
12. 15% of what number is 24?
13. What percent of 2,000 is 4?
14. 5 is what percent of 1,000?
15. What percent of 3,000 is 9?
16. 16 is what percent of 4,000?
17. What percent of 2,000 is 14?
18. What is 120% of 20?
19. What percent of 5,000 is 20?
20. What is 140% of 60?
21. Find 250% of 40.
22. 2% of what number is 5?
23. Find 175% of 28.
24. 6% of what number is 21?
25. 12 is 10% of what number?
26. 5% of what number is 20?
27. 75 is 20% of what number?
28. 15% of what number is 42?

5-8**Skills Practice*****Percent of Change***

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

- | | | | |
|------------------------------|------------------------------|-----------------------------|----------------------------|
| 1. original: 4
new: 6 | 2. original: 35
new: 28 | 3. original: 80
new: 52 | 4. original: 45
new: 63 |
| 5. original: 120
new: 132 | 6. original: 210
new: 105 | 7. original: 84
new: 111 | 8. original: 91
new: 77 |

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

- | | |
|---------------------------------|-------------------------------------|
| 9. suit: \$200, 50% markup | 10. tire: \$50, 40% markup |
| 11. sport bag: \$40, 30% markup | 12. radio: \$120, 25% markup |
| 13. grill: \$85, 15% markup | 14. microwave: \$96, 20% markup |
| 15. chair: \$140, 45% markup | 16. camcorder: \$350, 33% markup |
| 17. camera: \$245, 10% markup | 18. diamond ring: \$470, 35% markup |

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

- | | |
|-----------------------------------|---------------------------------------|
| 19. shoes: \$70, 10% off | 20. artwork: \$250, 20% off |
| 21. speakers: \$180, 30% off | 22. bicycle: \$320, 25% off |
| 23. antique chest: \$179, 15% off | 24. pendant: \$93.50, 5% off |
| 25. sofa: \$749.95, 35% off | 26. oven: \$535.99, 20% off |
| 27. guitar: \$488.20, 25% off | 28. weight machine: \$919.70, 10% off |

5-9**Skills Practice*****Simple Interest*****Find the simple interest to the nearest cent.**

1. \$500 at 4% for 2 years
2. \$800 at 9% for 4 years
3. \$350 at 6.2% for 3 years
4. \$280 at 5.5% for 4 years
5. \$740 at 3.25% for 2 years
6. \$1,150 at 7.6% for 5 years
7. \$725 at 4.3% for $2\frac{1}{2}$ years
8. \$266 at 5.2% for 3 years
9. \$955 at 6.75% for $3\frac{1}{4}$ years
10. \$1,245 at 5.4% for 4 years
11. \$1,540 at 8.25% for 2 years
12. \$2,180 at 7.7% for $2\frac{1}{2}$ years
13. \$3,500 at 4.2% for $1\frac{3}{4}$ years
14. \$2,650 at 3.65% for $4\frac{1}{2}$ years

Find the total amount in each account to the nearest cent.

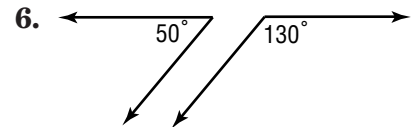
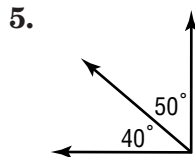
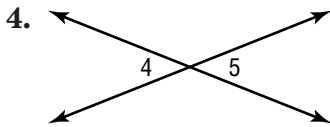
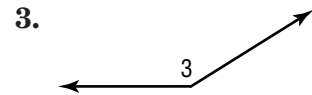
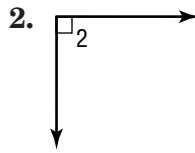
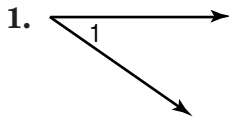
15. \$200 at 5% for 3 years
16. \$700 at 6% for 2 years
17. \$850 at 4% for 3 years
18. \$350 at 8% for 2 years
19. \$540 at 2.75% for 4 years
20. \$360 at 4.5% for 5 years
21. \$446 at 2.5% for 4 years
22. \$780 at 3.6% for 3 years
23. \$840 at 5.75% for $2\frac{1}{2}$ years
24. \$530 at 7.25% for $1\frac{3}{4}$ years
25. \$1,400 at 6.5% for 2 years
26. \$1,880 at 4.3% for $3\frac{1}{2}$ years
27. \$2,470 at 5.5% for 4 years
28. \$3,200 at 9.75% for $1\frac{1}{2}$ years
29. \$2,810 at 3.95% for $2\frac{1}{4}$ years
30. \$4,340 at 8.12% for $3\frac{1}{4}$ years

6-1

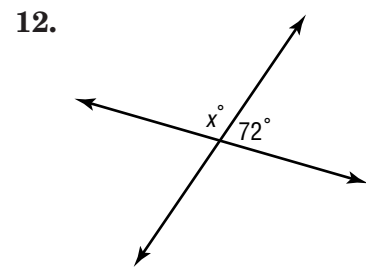
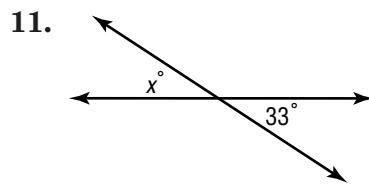
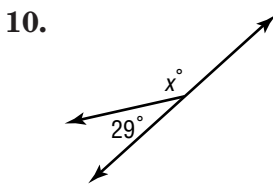
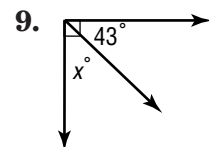
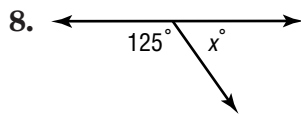
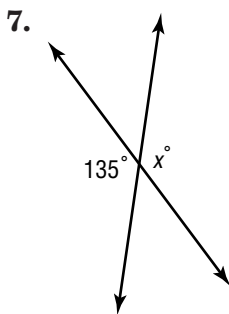
Skills Practice

Line and Angle Relationships

Classify each angle or angle pair using all names that apply.



Find the value of x in each figure.



For Exercises 13–22, use the figure at the right.

13. Find $m\angle 5$ if $m\angle 1 = 127^\circ$.

14. Find $m\angle 2$ if $m\angle 7 = 65^\circ$.

15. Find $m\angle 3$ if $m\angle 6 = 29^\circ$.

16. Find $m\angle 8$ if $m\angle 4 = 132^\circ$.

17. Find $m\angle 5$ if $m\angle 8 = 106^\circ$.

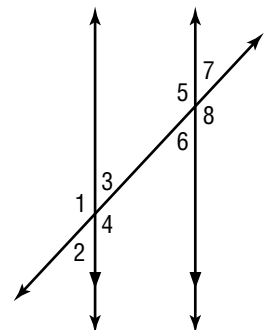
18. Find $m\angle 3$ if $m\angle 4 = 128^\circ$.

19. Find $m\angle 4$ if $m\angle 5 = 151^\circ$.

20. Find $m\angle 1$ if $m\angle 2 = 51^\circ$.

21. Find $m\angle 6$ if $m\angle 7 = 81^\circ$.

22. Find $m\angle 3$ if $m\angle 1 = 143^\circ$.



6-2**Skills Practice*****Problem-Solving Investigation: Use Logical Reasoning***

For Exercises 1–6, state whether the example uses *deductive* reasoning or *inductive* reasoning.

1. After checking the house numbers on several streets in your neighborhood, you discover that houses that face north always have an odd house number.
2. You determine the type of shape that a sticker is by examining its sides and angles.
3. You use a set of clues about how received higher or lower scores on a math test as compared with other students to place the students in order from lowest grade to highest grade.
4. You roll a number cube 1,000 times and discover that it lands on the number 4 twice as many times as the number 1.
5. You find a way to use 2 larger containers to measure out the exact amount for a smaller container.
6. You determine what types of shapes will be created by connecting the corners of a regular hexagon.

For Exercises 7–10, solve each problem using logical reasoning.

7. Use a 5-liter container and a 3-liter container to measure out 4 liters of water into a third container.
8. How can you create two right triangles and an isosceles trapezoid by drawing two straight lines through a square?
9. How can you arrange four squares with 6-inch sides to create a figure with a perimeter of 48 inches?
10. Use a 7-inch-long craft stick and a 4-inch-long eraser to draw a 10-inch line.

6-3**Skills Practice*****Polygons***

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

- | | |
|------------|-------------|
| 1. 13-gon | 2. 17-gon |
| 3. 18-gon | 4. 24-gon |
| 5. 32-gon | 6. 35-gon |
| 7. 21-gon | 8. 29-gon |
| 9. 54-gon | 10. 64-gon |
| 11. 81-gon | 12. 150-gon |

Find the measure of one interior angle of the given polygon. Round to the nearest hundredth if necessary.

- | | |
|------------------------|-------------|
| 13. heptagon (7-sided) | 14. 26-gon |
| 15. decagon (10-sided) | 16. 23-gon |
| 17. 37-gon | 18. 51-gon |
| 19. 48-gon | 20. 85-gon |
| 21. 72-gon | 22. 49-gon |
| 23. 66-gon | 24. 500-gon |

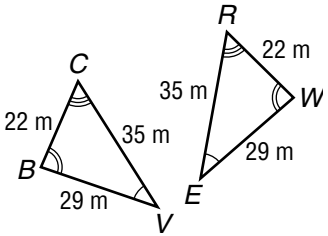
6-4

Skills Practice

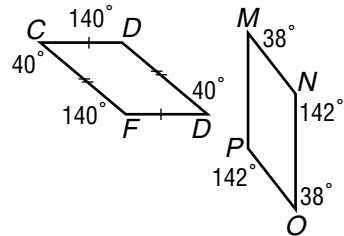
Congruent Polygons

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

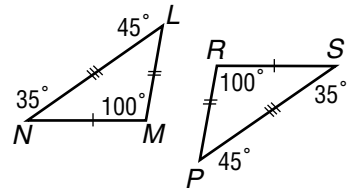
1.



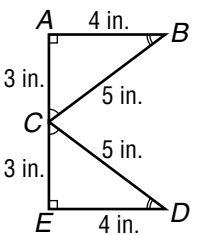
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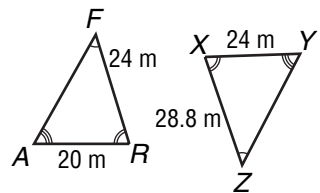
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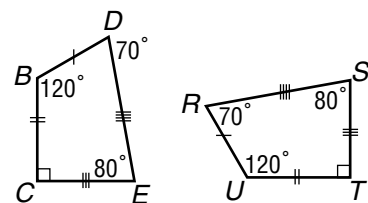
4.



5.

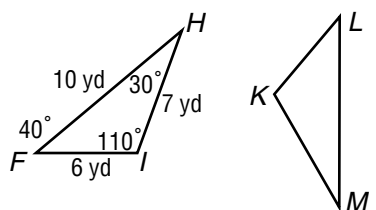


6.



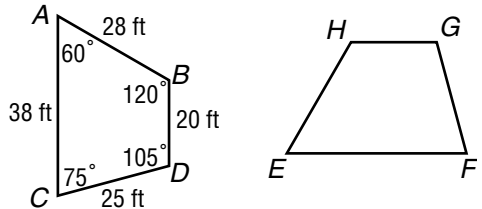
In the figure, $\triangle HFI \cong \triangle MLK$. Find each measure.

- 7. $m\angle M$
- 8. ML
- 9. $m\angle K$
- 10. KM



In the figure, quadrilateral $ACDB \cong$ quadrilateral $EFGH$. Find each measure.

- 11. $m\angle H$
- 12. EF
- 13. $m\angle F$
- 14. HG



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6-5

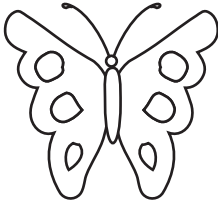
Skills Practice

Symmetry

For Exercises 1–12, 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 angles of rotation.

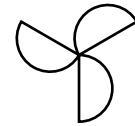
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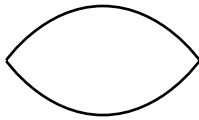
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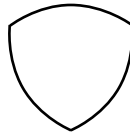
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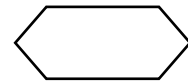
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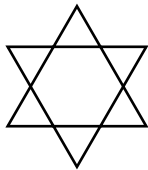
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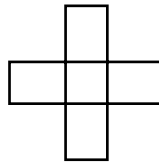
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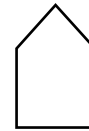
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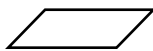
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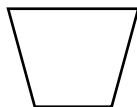
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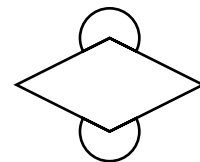
10.



11.



12.

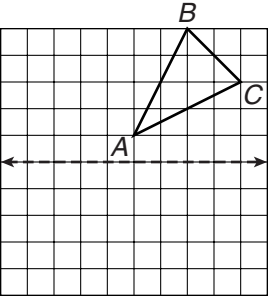


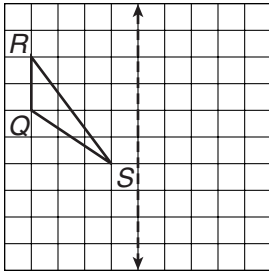
6-6

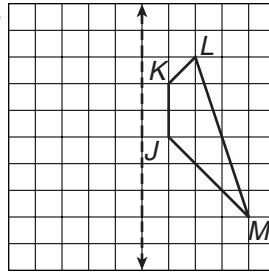
Skills Practice

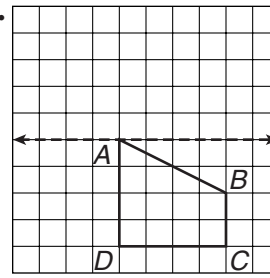
Reflections

Draw the image of the figure after a reflection over the given line.

1. 

2. 

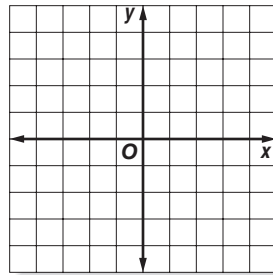
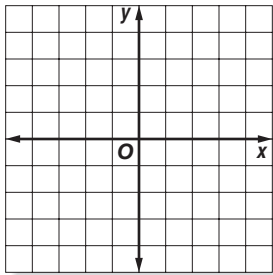
3. 

4. 

Graph the figure with the given vertices. Then graph the image of the figure after a reflection over the given axis and write the coordinates of its vertices.

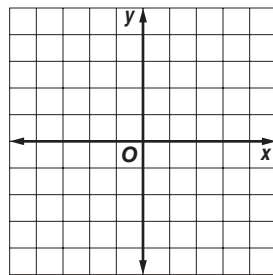
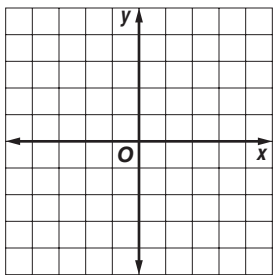
5. triangle ABC with vertices $A(1, 4)$, $B(4, 1)$, and $C(2, 5)$; x -axis

6. triangle DEF with vertices $D(-1, 2)$, $E(-3, 1)$, and $F(-4, 5)$; y -axis



7. trapezoid $WXYZ$ with vertices $W(2, 4)$, $X(2, -2)$, $Y(4, -1)$, and $Z(4, 3)$; y -axis

8. rhombus $QRST$ with vertices $Q(-1, 5)$, $R(-4, 3)$, $S(-1, 1)$, and $T(2, 3)$; x -axis

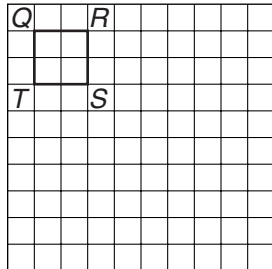
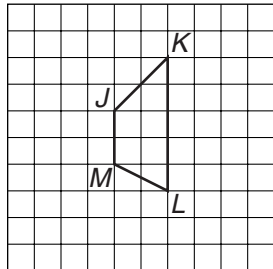
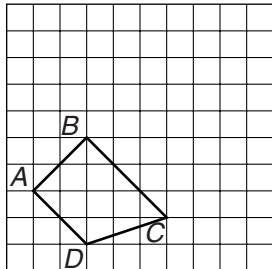
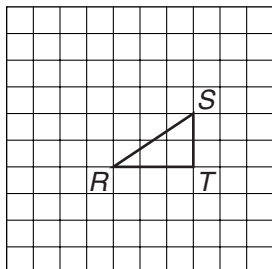


6-7 Skills Practice

Translations

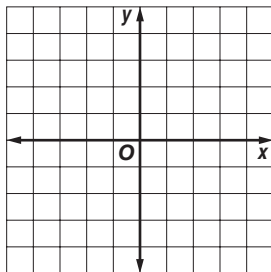
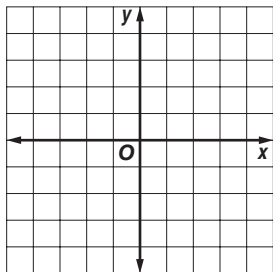
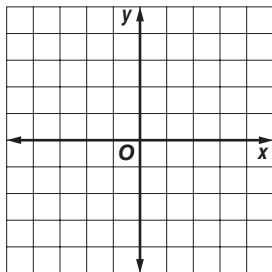
Draw the image of the figure after the indicated translation.

- 2 units left and 3 units up
- 4 units right and 1 unit up
- 1 unit left and 2 units down
- 5 units right and 3 units down

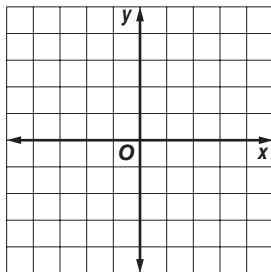
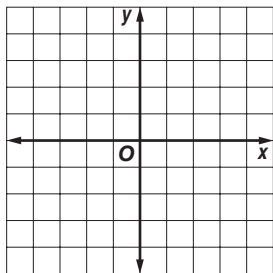
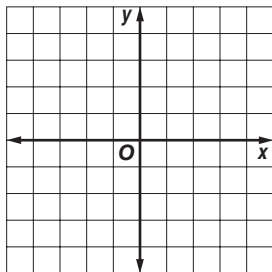


Graph the figure with the given vertices. Then graph the image of the figure after the indicated translation and write the coordinates of its vertices.

- triangle ABC with vertices $A(-3, -1)$, $B(-4, -4)$, and $C(-1, -2)$ translated 4 units right and 1 unit up
- triangle XYZ with vertices $X(1, -2)$, $Y(3, -5)$, and $Z(4, 1)$ translated 5 units left and 3 units up
- triangle EFG with vertices $E(1, 4)$, $F(-1, 1)$, and $G(2, -1)$ translated 3 units left and 1 unit down



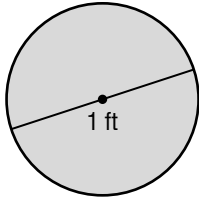
- rhombus $WXYZ$ with vertices $W(-4, 3)$, $X(-1, 1)$, $Y(2, 3)$, and $Z(-1, 5)$ translated 2 units right and 5 units down
- rectangle $QRST$ with vertices $Q(-2, -4)$, $R(-2, 1)$, $S(-4, 1)$, and $T(-4, -4)$ translated 3 units right and 3 units up
- trapezoid $BCDE$ with vertices $B(2, -1)$, $C(3, -3)$, $D(-3, -3)$, and $E(0, -1)$ translated 1 unit left and 4 units up



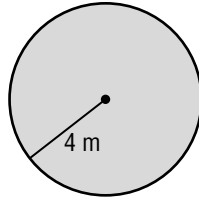
7-1**Skills Practice*****Circumference and Area of Circles***

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

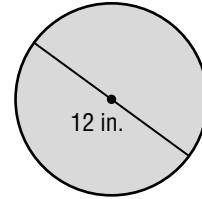
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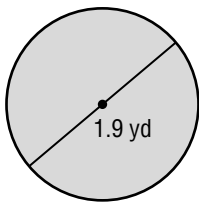
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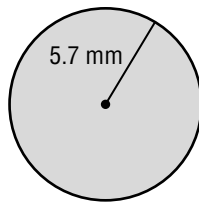
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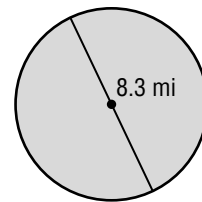
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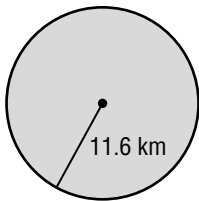
5.



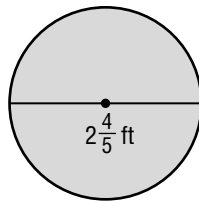
6.



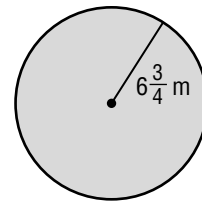
7.



8.



9.



10. The diameter is 7.7 feet.

11. The radius is 9.6 millimeters.

12. The radius is 3.8 meters.

13. The diameter is 17.4 yards.

14. The radius is 11.3 centimeters.

15. The diameter is $4\frac{3}{4}$ miles.16. The radius is $2\frac{1}{3}$ inches.17. The diameter is $7\frac{5}{8}$ feet.

18. The radius is 5.25 meters.

19. The diameter is $12\frac{3}{4}$ yards.

7-2**Skills Practice*****Problem-Solving Investigation: Solve a Simpler Problem***

For Exercises 1–3, rewrite the problem as a simpler problem.

1. Jerry has a square-shaped deep-dish pizza. What is the maximum number of pieces that can be made by using 6 cuts?
2. CDs come in packages of 25 and CD cases come in packages of 16. How many of each type of package will Lilly need to buy in order to make print 400 CDs and put them in cases with none left of either?
3. A restaurant has 10 triangular tables that can be pushed together in an alternating up-and-down pattern as shown below to form one long table for large parties. Each triangular table can seat 3 people per side. How many people can be seated at the combined tables?



For Exercises 4–15, rewrite to solve a simpler problem and solve. Find a reasonable answer.

4. 13×29

5. $48 + 32 + 87$

6. $74 \times (18 - 9)$

7. $33 \div 9$

8. $\frac{57}{113}$

9. $55 + 44 + 33$

10. 63×17

11. $532 - 389$

12. $78 \times 41 - 276$

13. $52 + 39 + 111$

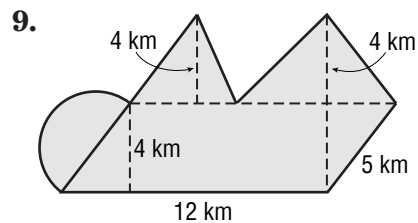
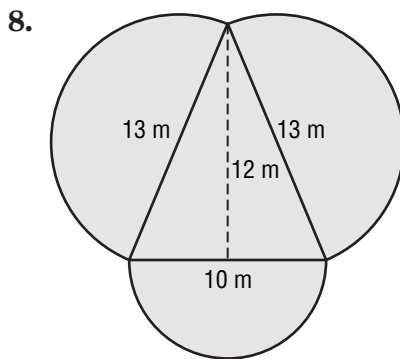
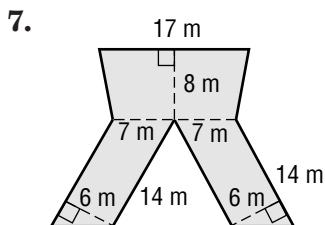
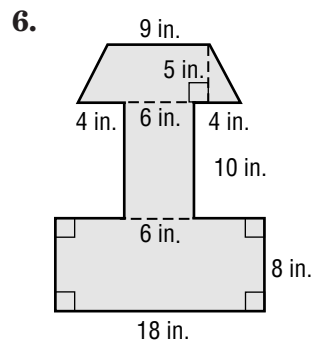
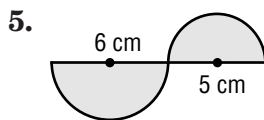
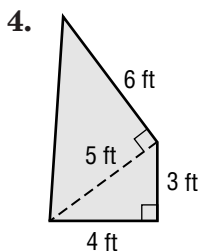
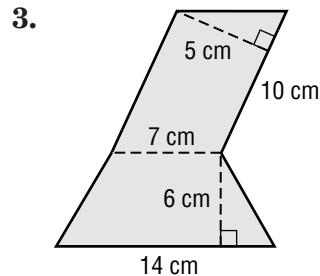
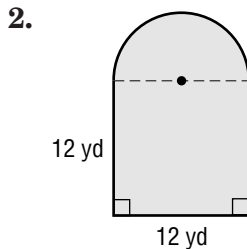
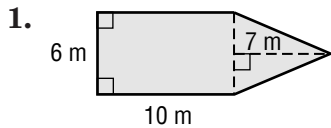
14. $452 - 377$

15. $67 \times 34 \times 12$

7-3 Skills Practice

Area of Composite Figures

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



10. What is the area of a figure formed using a semicircle with a diameter of 16 feet and a trapezoid with a height of 8 feet and bases of 12 feet and 14 feet?

11. What is the area of a figure formed using a rectangle with a length of 13 kilometers and a width of 7 kilometers and a triangle with a base of 14 kilometers and a height of 11 kilometers?

7-4 Skills Practice

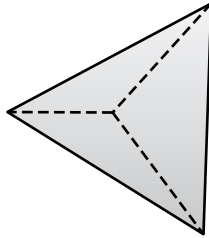
Three-Dimensional Figures

Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.

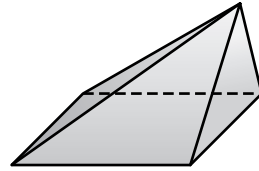
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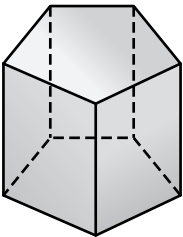
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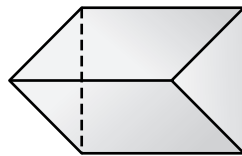
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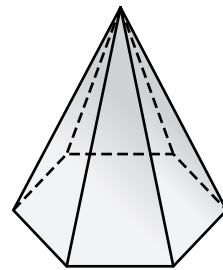
4.



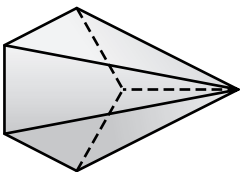
5.



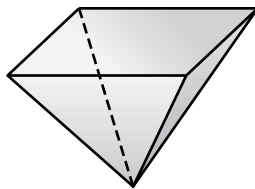
6.



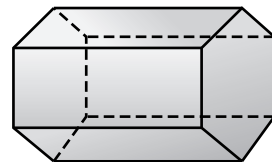
7.



8.



9.

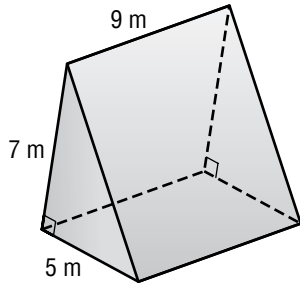


7-5 Skills Practice

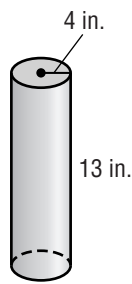
Volume of Prisms and Cylinders

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

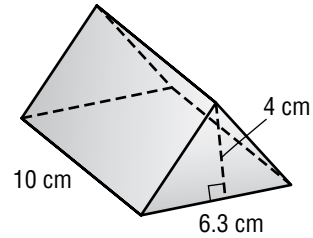
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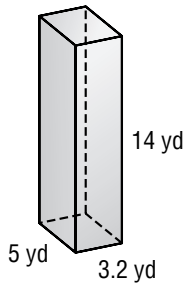
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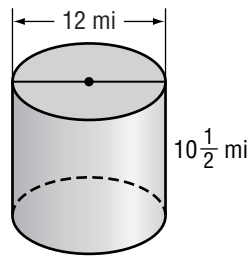
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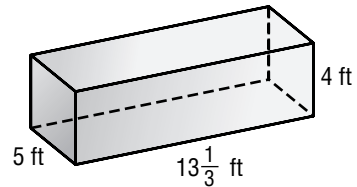
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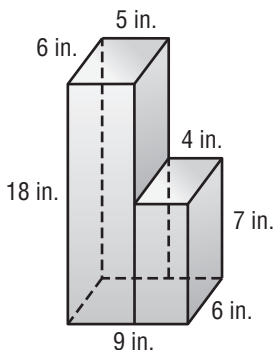


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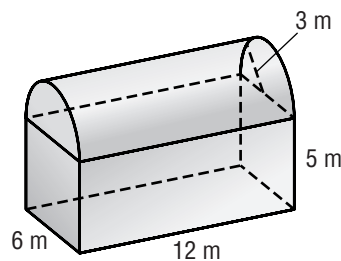


7. rectangular prism: length, 6 in.; width, 4 in.; height, 13 in.
8. triangular prism: base of triangle, 9 cm; altitude 1 cm; height of prism, 15 cm
9. rectangular prism: length, 3.6 mm; width, 4 mm; height, 15.5 mm
10. triangular prism: base of triangle, 6 yd; altitude 5.9 yd; height of prism, 12 yd
11. cylinder: diameter, 8 m; height, 16.2 m

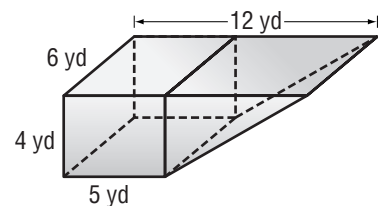
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13.



14.



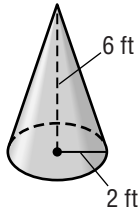
7-6

Skills Practice

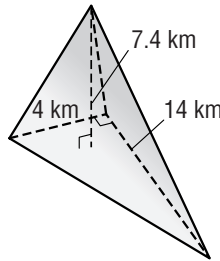
Volume of Pyramids, Cones, and Spheres

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

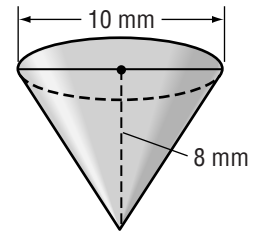
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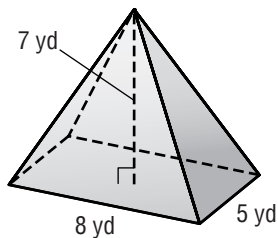
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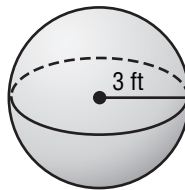
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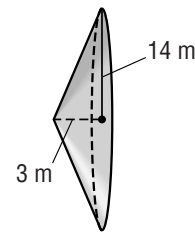
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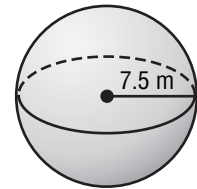
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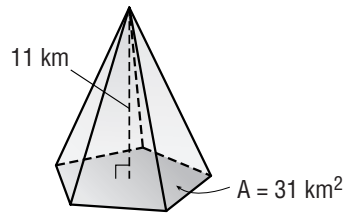
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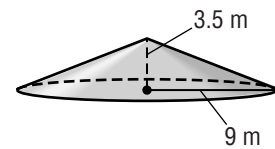
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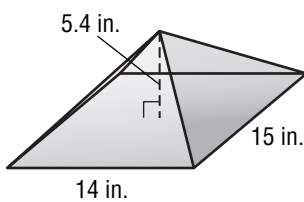
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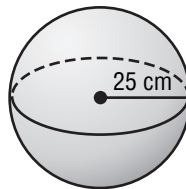
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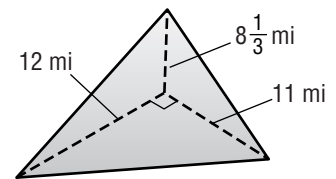
10.



11.



12.



13. cone: diameter, 10 cm; height, 12 cm

14. triangular pyramid: triangle base, 20 mm; triangle height, 22 mm; pyramid height, 14 mm

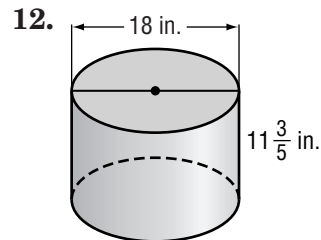
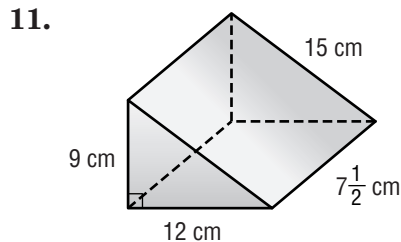
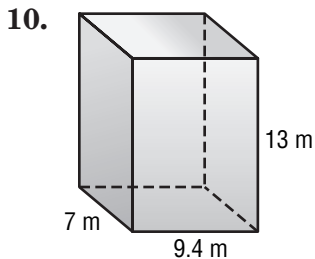
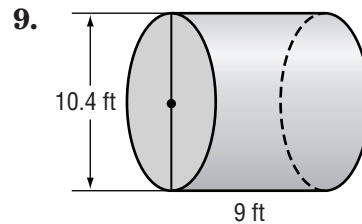
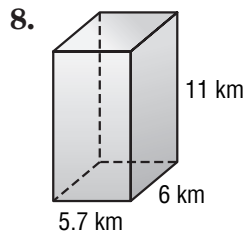
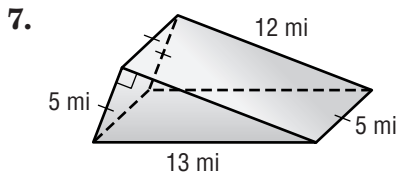
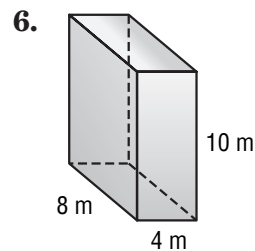
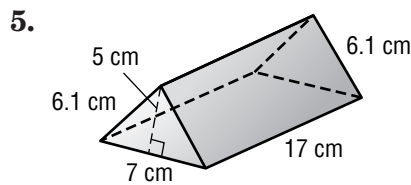
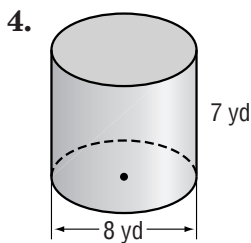
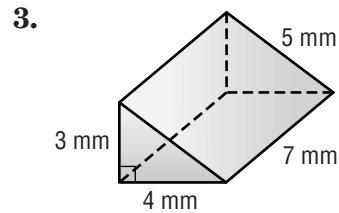
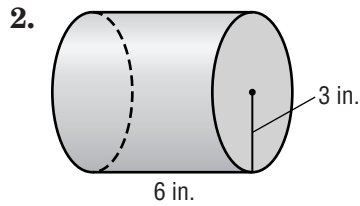
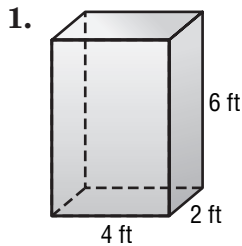
15. triangular pyramid: triangle base, 19 in.; triangle height, 21 in.; pyramid height, 9 in.

16. cone: radius, 9.7 ft; height, 18 ft

7-7 Skills Practice

Surface Area of Prisms and Cylinders

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



13. cube: edge length, 11 m

14. rectangular prism: length, 9 cm; width, 13 cm; height, 18.4 cm

15. cylinder: radius, 9.4 mm; height, 15 mm

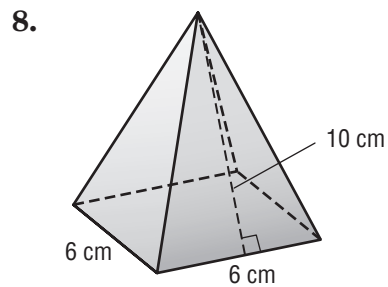
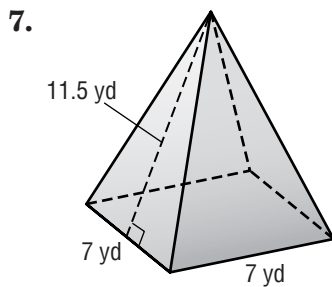
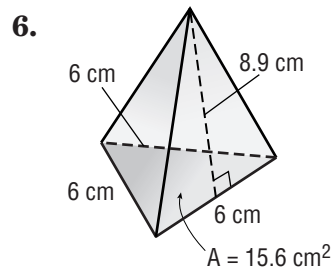
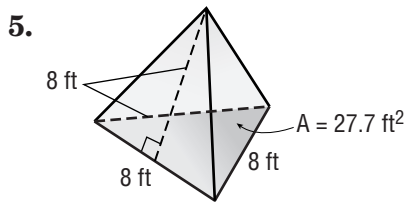
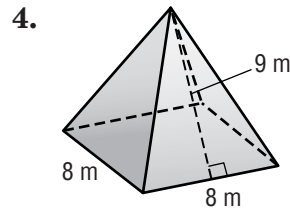
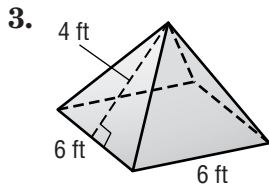
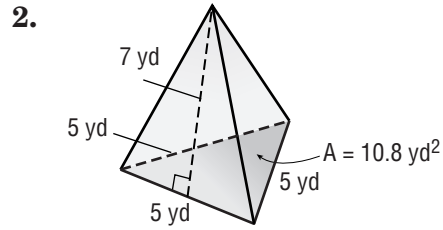
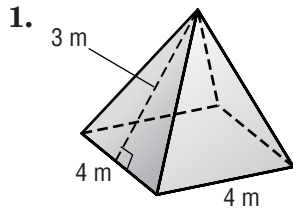
16. cylinder: diameter, 28 in.; height, 12.6 in.

7-8

Skills Practice

Surface Area of Pyramids

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



9. square pyramid: base side length, 4 cm; slant height, 7.3 cm

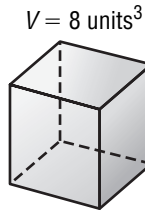
10. square pyramid: base side length, 5 yd; slant height, 12.7 yd

11. square pyramid: base side length, 26 in.; slant height, 8 in.

7-9**Skills Practice****Similar Solids**

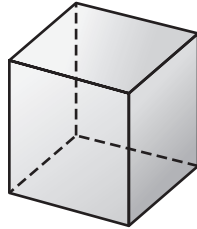
For Exercises 1–4, each pair of solids is similar. Find the volume of solid B.

1. solid A



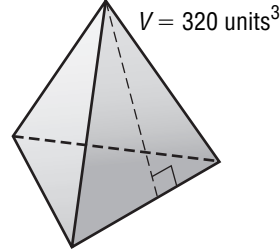
scale factor = 1.5

solid B



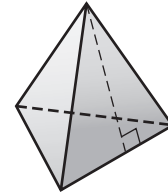
2.

solid A



scale factor = 2

solid B



3. solid A



scale factor = 2

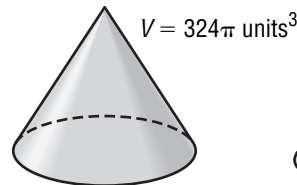
 $V = 4\pi \text{ cubic units}^3$

solid B



4.

solid A



scale factor = 1.5

solid B



For Exercises 5–12, find the measure of x . All pairs of figures are similar.

5. square pyramid A: base side = 6 in., slant height = 21 in.
square pyramid B: base side = x in., slant height = 7 in.
6. cone A: base radius = 8 cm, slant height = 20 cm
cone B: base radius = x cm, slant height = 15 cm
7. prism A: length = 14 ft, width = 12 ft, height = 6 ft
prism B: length = 3.5 ft, width = 3 ft, height = x ft
8. regular triangle pyramid A: base side = 3 in., height = 10 in.
regular triangle pyramid B: base side = x in., slant height = 25 in.
9. cylinder A: base radius = 13 cm, length = 8 cm
cylinder B: base radius = x cm, length = 24 cm
10. prism A: length = 7 ft, width = 15 ft, height = 8 ft
prism B: length = 21 ft, width = x ft, height = 24 ft
11. square pyramid A: base side = 5 in., height = 18 in.
square pyramid B: base side = x in., slant height = 9 in.
12. cone A: base radius = 16 m, height = 28 m
cone B: base radius = x m, height = 21 m

8-2**Skills Practice*****Permutations*****Find each value.**

1. $P(5, 4)$
2. $P(9, 3)$
3. $P(8, 4)$
4. $P(8, 8)$
5. $P(16, 3)$
6. $P(12, 5)$
7. $P(20, 3)$
8. $P(21, 4)$
9. $P(75, 3)$
10. $P(4, 4)$
11. $P(5, 5)$
12. $P(9, 9)$
13. How many ways can 5 friends line up for lunch in a cafeteria?
14. How many ways can you arrange the letters in the word *rainbow*?
15. Four employees of a company take a commuter van to work. In how many different orders can the driver pick up the four riders in the morning?
16. A bread recipe has 6 ingredients. How many ways can you place the first 4 ingredients in a bread maker?
17. How many ways can you arrange 8 books on a shelf?
18. Five students are finalists in a spelling bee. How many ways can they finish in first, second, and third place?
19. A flock of 9 pigeons lands on a telephone wire. How many ways can they arrange themselves on the wire?
20. How many even, four-digit numbers can you form from the digits 1, 2, 3, and 5 where no digit is used twice?

8-3**Skills Practice****Combinations**

Find each value.

1. $C(6, 4)$
2. $C(8, 2)$
3. $C(10, 3)$
4. $C(9, 4)$
5. $C(10, 6)$
6. $C(11, 3)$
7. $C(7, 5)$
8. $C(11, 6)$
9. $C(12, 5)$
10. $C(15, 4)$
11. $C(16, 2)$
12. $C(20, 4)$

For Exercises 13–18, determine whether each situation is a *permutation* or a *combination*.

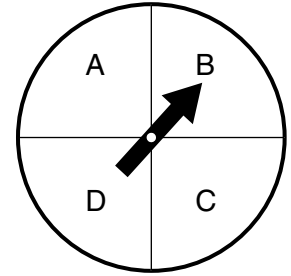
13. choosing the arrangement of 6 glass animals on a shelf
14. choosing 3 Chinese dishes from a menu
15. choosing 5 friends to invite to a birthday party
16. choosing a president, vice-president, treasurer, and secretary from the members of the student council
17. choosing 2 colors of paint from a paint chart to blend together for the walls in your room
18. choosing the order in which to watch 3 videotapes you rented from the video store
19. How many ways can a coach choose the 6 starting players from a volleyball team of 13 players?
20. How many ways can 4 textbooks be chosen from 8 textbooks in a locker?
21. You have 7 clean shirts in a laundry basket. How many ways can you fold 4 shirts and stack them in a drawer?
22. How many ways can a delegation of 4 students be chosen from a class of 22 students?
23. On her birthday, Yolanda brings cupcakes to school for her 28 classmates. How many ways can she hand out cupcakes to the first 3 students returning from recess?
24. How many three-card hands can be dealt from a deck of 52 cards?

8-4

Skills Practice

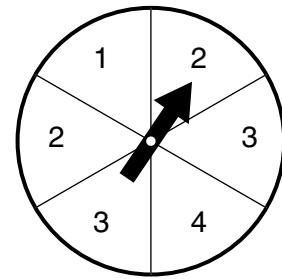
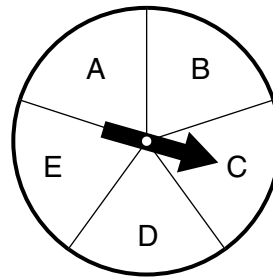
Probability of Composite Experiments

For Exercises 1–6, a number cube is rolled and the spinner at the right is spun. Find each probability.



1. $P(1 \text{ and } A)$
2. $P(\text{odd and } B)$
3. $P(\text{prime and } D)$
4. $P(\text{greater than } 4 \text{ and } C)$
5. $P(\text{less than } 3 \text{ and consonant})$
6. $P(\text{prime and consonant})$
7. What is the probability of spinning the spinner above 3 times and getting a vowel each time?
8. What is the probability of rolling a number cube 3 times and getting a number less than 3 each time?

Each spinner at the right is spun. Find each probability.



9. $P(A \text{ and } 2)$
10. $P(\text{vowel and even})$
11. $P(\text{consonant and } 1)$
12. $P(D \text{ and greater than } 1)$

There are 3 red, 1 blue, and 2 yellow marbles in a bag. Once a marble is selected, it is not replaced. Find each probability.

13. $P(\text{red and then yellow})$
14. $P(\text{blue and then yellow})$
15. $P(\text{red and then blue})$
16. $P(\text{two yellow marbles})$
17. $P(\text{two red marbles in a row})$
18. $P(\text{three red marbles})$

The face cards are removed from a standard deck of 52 cards, and the rest are set aside. Two cards are drawn at random from the face cards. Once a card is selected, it is not replaced. Find each probability.

19. $P(2 \text{ queens})$
20. $P(\text{jack and then king})$
21. $P(\text{black jack and then red queen})$
22. $P(\text{two black cards})$
23. $P(\text{black card and then red king})$
24. $P(\text{black jack and then black card})$

8-5**Skills Practice*****Experimental and Theoretical Probability***

Use the table that shows the results of rolling a number cube 50 times.

Result	Number of Times
1	6
2	10
3	8
4	7
5	10
6	9

- Based on the results, what is the probability of getting a five?
- Based on the results, how many fives would you expect to occur in 300 rolls?
- What is the theoretical probability of getting a five?
- Based on the theoretical probability, how many fives would you expect to occur in 300 rolls?
- Compare the theoretical probability to the experimental probability.

ARCHERY Use the following information.

In archery class, Jocelyn missed the target 5 times in 40 shots.

- What is the probability that her next shot will miss the target?
- In her next 160 shots, how many times would you expect Jocelyn to miss the target?

PETS For Exercises 8–11, use the results of a survey of 200 people shown at the right.

First Pet	Number
bird	32
cat	56
dog	66
rabbit	19
other	27

- What is the probability that a person says his or her first pet was a cat?
- Out of 500 people, how many would you expect to say a cat was his or her first pet?
- What is the probability that a person says his or her first pet was a bird?
- Out of 500 people, how many would you expect to say a bird was their first pet?
- FIGURE SKATING** At figure skating practice, Michelle successfully landed 15 out of 18 attempts at a double axel. What is the experimental probability that she will successfully land a double axel?

8-6**Skills Practice*****Problem-Solving Investigation: Act It Out***

For Exercises 1–7, use the act it out strategy to solve.

1. A piece on a game board moves forward 8 spaces on its first turn and moves backward 3 spaces on its second turn. If the pattern continues, how many turns will it take for the piece to move at least 30 spaces?
2. How many ways can you arrange 3 paintings in a row on a wall?
3. How many different combinations of nickels, dimes, and pennies can be used to make \$0.10?
4. A piece on a game board moves forward 6 spaces on its first turn and moves backward 5 spaces on its second turn. If the pattern continues, how many turns will it take for the piece to move at least 10 spaces?
5. Joey is taller than Greg, who is taller than Rick, who is taller than Mike. How many different ways can they stand in line so that the tallest person is always last?
6. How many different combinations of quarters, nickels, dimes, and pennies can be used to make \$0.25?
7. Roll a number cube 10 times and record the results. Repeat 3 times. Using your results, is there any way to predict which number the number cube will land?

	Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6	Roll 7	Roll 8	Roll 9	Roll 10
Set 1										
Set 2										
Set 3										

8-7**Skills Practice*****Simulations***

For Exercises 1–10, determine the number of outcomes that can happen with the given simulation.

1. spinning a spinner with 6 equal sections and tossing a coin
2. tossing four coins
3. rolling a number cube and tossing a coin
4. 1 marble chosen from a bag containing 11 red marbles and 4 blue marbles
5. two number cubes are rolled and the results are added together
6. spinning a spinner with 5 equal sections and spinning a number cube
7. 1 marble chosen from a bag containing 8 red marbles, 6 green marbles, and 5 blue marbles
8. 2 marbles chosen from a bag containing 10 red marbles, 8 green marbles, and 6 blue marbles
9. rolling a number cube and spinning a spinner with 4 equal sections
10. spinning a spinner with 8 equal sections and a spinner with 3 equal sections

For Exercises 11 and 12, describe a model that can be used to simulate the given situation.

11. **SALES** A music store has determined that 65% of customers who buy a compact disc buy a pop music compact disc. Describe a model that you could use to simulate a CD purchase. Answers will vary.
12. **SANDWICHES** A sandwich shop offers 6 different types of sandwiches on either white or black bread. If each type of sandwich and bread is equally likely to be chosen by a customer, describe a model that could be used to simulate the orders of the next 10 customers.

8-8**Skills Practice*****Using Sampling to Predict***

Describe each sample.

1. To evaluate the defect rate of its memory chips, an integrated circuit manufacturer tests every 100th chip off the production line.
2. Students who wish to represent the school at a school board meeting are asked to stop by the office after lunch.
3. To determine if the class understood the homework assignment, the math teacher checks the top 3 papers in the pile of collected homework.
4. To determine the representatives to the recess activities meeting, 2 students are selected at random from each homeroom.
5. A member of the cafeteria staff asks every fifth student leaving the cafeteria to rank 5 vegetables from most favorite to least favorite.
6. One bead for every member of the school orchestra is placed in a bag. All but 2 of the beads are white. Each member draws a bead from the bag, and the members who pick the non-white beads will represent the orchestra.
7. A real estate agent surveys people about their housing preferences at an open house for a luxury townhouse.
8. To determine the most popular children's programs, a television station asks parents to call in and complete a phone survey.
9. Two teachers from each school in the district are chosen at random to fill out a survey on classroom behavior.
10. Airline boarding passes are marked with red stars at random to decide which passengers should have their carry-on luggage inspected.
11. To determine how often people eat out, every tenth person entering a fast-food restaurant is surveyed.

9-1 Skills Practice

Problem-Solving Investigation: Make a Table

Make a table to solve each problem.

1. **SCIENCE** Ecology students investigated the number of chirps a cricket makes in 15 seconds. Their results are shown below. What is the most common number of chirps made by crickets in a 15-second interval?

30 31 30 32 32 31 30 30 30 31 30 32 31 30 30 31 32
 31 30 31 30 30 32 30 30 31 31 32 30 30 32 32 30 30



2. **SPORTS TRAINING** Thirty athletes were surveyed to determine how many hours per week they spend training for a marathon. Organize the data in a table using intervals 1–5, 6–10, 11–15, 16 or more. What is the most common interval of hours practiced in a week?

Interval	Tally	Frequency

3. **BOOKS** Mr. Whitney’s class listed the number of books each student read during the first grading period. The results are shown at the right. Find the number of books read that is listed most frequently.

0	3	6	5	6	3
2	8	4	3	3	4
7	5	3	7	8	2
2	9	6	9	7	4
7	5		1	0	

4. **GAS PRICES** A local news station researched the price of gas at 20 gas stations throughout the state and recorded the following results. Organize the data in a table using intervals \$1.99 or less, \$2–\$2.15, more than \$2.15. What is the most common interval of gas prices?

\$2.05 \$2.19 \$2.18 \$2.15 \$2.19 \$2.20 \$2.29 \$2.05 \$1.99 \$2.18
 \$2.19 \$2.08 \$2.00 \$2.16 \$2.19 \$1.99 \$2.21 \$2.20 \$2.00 \$2.16

Interval	Tally	Frequency

5. **ATTENDANCE** The number of days students in Ms. Roe’s class were absent are as follows.
 1 0 3 4 1 0 2 0 3 4 1 3 4 1 2 0 1 2 0 3
 4 1 3 4 1 2 0 1 2 4 3 1 2 2 2 1 3 1 1 2

What is the most frequent number of days absent?

9-2

Skills Practice

Histograms

1. **BASKETBALL** The frequency table at the right shows the average points per game for all NBA teams for the 2004–2005 season. Draw a histogram to represent the set of data.

Average Points per Game for NBA Teams, 2004–2005 Regular Season		
Points	Tally	Frequency
87–90.9		1
91–94.9		9
95–98.9		11
99–102.9		7
103–106.9		1
107–110.9		1

Average Points per Game for NBA Teams, 2004–2005 Regular Season

2. **GOLF** The frequency table at the right shows the score of the winner of the Masters golf tournament for the years 1950–2005. Draw a histogram to represent the set of data.

Score of the Winner of the Masters from 1950–2005		
Score	Tally	Frequency
266–270		1
271–275		7
276–280		29
281–285		12
286–290		6

Score of the Winner of the Masters from 1950–2005

3. **RAINFALL** The frequency table at the right shows the average annual precipitation for the 50 states. Draw a histogram to represent the set of data.

Average Annual Precipitation for the 50 States		
Precipitation (in.)	Tally	Frequency
0–11.9		4
12–23.9		9
24–35.9		8
36–47.9		22
48–59.9		4
60–71.9		3

Average Annual Precipitation for the 50 States

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Lesson 9–2

9-3 Skills Practice

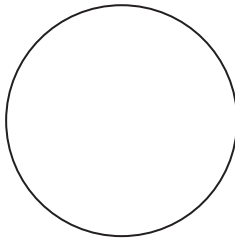
Circle Graphs

Construct a circle graph for each set of data.

1.

U.S. Energy Consumption, 2004	
Type	Percent
Commercial	18%
Transportation	28%
Residential	21%
Industrial	33%

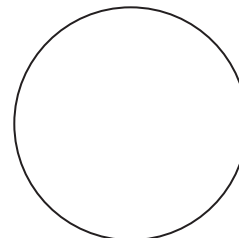
U.S. Energy Consumption, 2004



2.

Type of Trucks Sold in U.S., 2005	
Type	Percent
Compact Pickup	9%
Van	15%
Full-Size Pickup	27%
SUV	45%
Medium/Heavy	4%

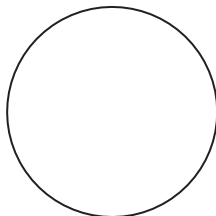
Type of Trucks Sold in U.S., 2005



3.

Davis Cup Winner, 1981–2004	
Country	Wins
Australia	4
France	3
Germany	3
Spain	2
Sweden	6
U.S.	5
Russia	1

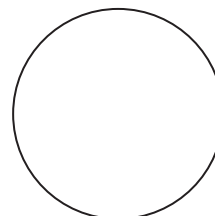
Davis Cup Winner, 1981–2004



4.

Top 5 Largest American Indian Tribes, 2000	
Tribe	Number (thousands)
Cherokee	730
Navajo	298
Latin American Indian	181
Choctaw	159
Sioux	153

Top 5 Largest American Indian Tribes, 2000



9-4**Skills 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. 4, 7, 1

2. 2, 1, 2, 3, 2

3. 6, 8, 7, 6, 1

4. 14, 24, 9, 12, 27

5. 16, 12, 23, 24, 16, 27

6. 22, 7, 26, 32, 38, 7

7. 14, 9, 22, 14, 22, 18

8. 36, 35, 36, 32, 35, 36

9. 13, 15, 11, 9, 14, 11, 12

10. 2.4, 2.8, 1.4, 1.7, 2.5, 2.9, 1.5

11. 9, 15, 6, 5, 11, 14, 4, 11

12. 25, 27, 24, 22, 21, 23, 27, 25

13. 35, 26, 33, 32, 26, 27, 29, 30

14. 15, 14, 28, 17, 24, 25, 24, 28, 21

15. 14, 18, 11, 16, 21, 15, 22, 15, 21

16. 5.9, 8.4, 4.2, 4.7, 3.4, 2.8, 1.6, 2.1, 7.5

17. 14, 18, 14, 15, 15, 19, 14, 12, 17, 9

18. 33, 26, 24, 27, 24, 28, 38, 29, 29, 24

19. 17, 25, 15, 19, 14, 21, 21, 15, 17, 24

20. 4.2, 1.7, 6.8, 7.3, 2.1, 5.5, 8.7, 7.6, 3.3, 7.3

9-5**Skills Practice*****Measures of Variation***

Find the range, median, upper and lower quartiles, interquartile range, and any outliers for each set of data.

1. 15, 17, 10, 12, 19, 20, 16
2. 52, 72, 89, 21, 58, 42, 75
3. 20, 23, 18, 21, 4, 17, 15
4. 24, 37, 32, 39, 35, 42, 44, 28
5. 48, 56, 72, 47, 43, 36, 47, 14
6. 116, 107, 105, 113, 112, 123, 115, 108
7. 2.2, 2.6, 2.5, 3.6, 2.9, 2.8, 2.2, 2.4
8. 59, 72, 57, 51, 62, 77, 73, 64, 54
9. 81, 79, 88, 67, 89, 87, 85, 83, 83
10. 132, 116, 108, 113, 126, 120, 131, 112, 126
11. 6.3, 6.7, 6.2, 4.9, 6.7, 6.6, 5.3, 6.3, 6.4
12. 22, 27, 25, 11, 29, 28, 41, 26, 28, 23
13. 90, 88, 72, 85, 92, 95, 93, 86, 92, 91
14. 107, 114, 124, 108, 117, 106, 107, 109, 117, 115
15. 8.3, 8.5, 9.5, 8.7, 8.9, 8.3, 8.6, 8.8, 8.9, 8.7
16. 42, 36, 58, 47, 34, 43, 54, 49, 48, 41, 38
17. 8.3, 9.0, 8.1, 9.5, 8.2, 8.9, 9.4, 7.9, 8.3, 8.4, 8.0
18. 15, 16, 18, 9, 18, 17, 19, 19, 10, 12, 15, 13, 16

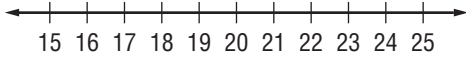
9-6

Skills Practice

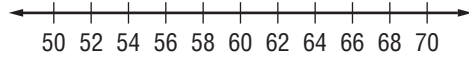
Box-and-Whisker Plots

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

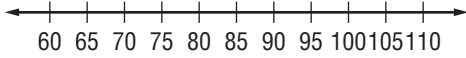
1. 23, 21, 20, 22, 24, 17, 15



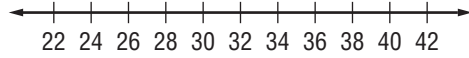
2. 54, 61, 64, 68, 60, 53, 66



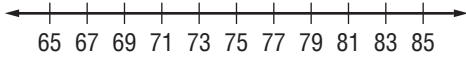
3. 61, 96, 97, 87, 84, 91, 98, 86



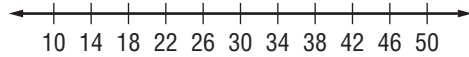
4. 27, 35, 35, 32, 26, 34, 36, 27, 38



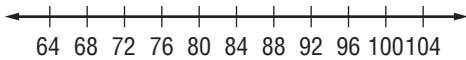
5. 67, 74, 78, 69, 78, 70, 67, 72, 69



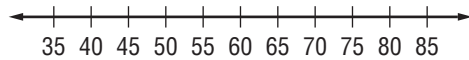
6. 39, 41, 30, 14, 44, 40, 48, 39, 40, 36



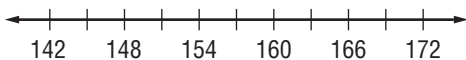
7. 86, 83, 98, 99, 81, 86, 95, 84, 79, 90



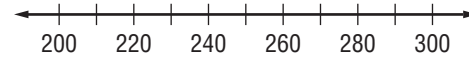
8. 45, 58, 78, 57, 58, 55, 61, 47, 52, 40, 46



9. 169, 163, 153, 166, 149, 148, 146,
145, 152, 163, 152



10. 245, 250, 205, 240, 250, 275, 260, 295,
255, 225, 250



9-7**Skills Practice****Select an Appropriate Display**

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

- energy usage in your home for the past year, categorized by month
- exam scores for a whole class, arranged in intervals
- sales of a leading brand of toothpaste for the last 10 years
- average weight of a pet dog, categorized by breed
- runs scored by individual members of a baseball team, as compared to the team total
- ages of all 40 employees of a small company

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

7.

Points per Game by Shaquille O'Neal, 1998–2005	
Season	Points per Game
97–98	28.3
98–99	26.3
99–00	29.7
00–01	28.7
01–02	27.2
02–03	27.5
03–04	21.5
04–05	22.9

8.

Share of Workers by Commute Time, 2000	
Commute Time	Percent of Workers
Less than 15 min	30%
15–29 min	36%
30–39 min	16%
40–59 min	11%
60 min or more	7%

9-8

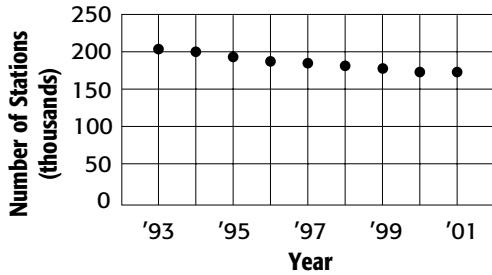
Skills Practice

Misleading Graphs and Statistics

1. Which graph could you use to indicate that the number of gas stations has greatly decreased since 1993? Justify your reasoning.

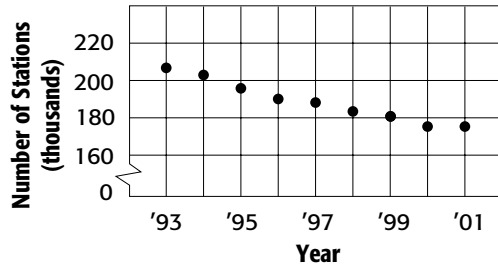
Graph A

Gas Stations in the U.S.



Graph B

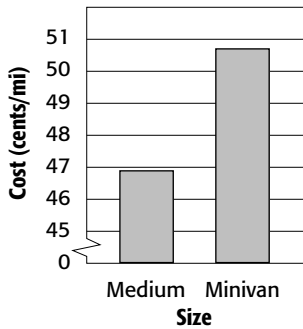
Gas Stations in the U.S.



2. Which graph would you use to indicate that the average operating expenses for a minivan are much greater than for a medium-size car? Justify your reasoning.

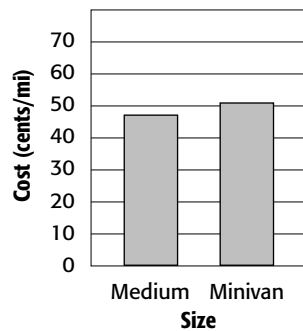
Graph A

Operating Expenses for U.S. Vehicles, 2001



Graph B

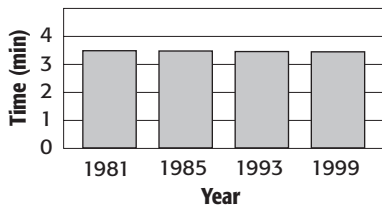
Operating Expenses for U.S. Vehicles, 2001



3. Which graph would you use to indicate that the world record for the one mile run has decreased greatly since 1981? Justify your reasoning.

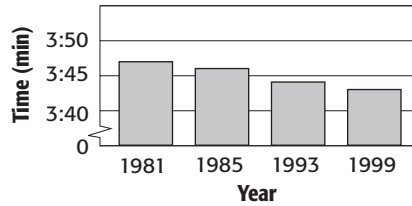
Graph A

World Records for 1-Mile Run



Graph B

World Records for 1-Mile Run



10-1**Skills Practice*****Simplifying Algebraic Expressions***

Use the Distributive Property to rewrite each expression.

1. $4(j + 4)$

2. $5(n + 2)$

3. $(c + 9)3$

4. $2(w - 8)$

5. $(s - 7)7$

6. $-4(e + 6)$

7. $(b + 3)(-7)$

8. $-8(v - 7)$

9. $(2n + 3)6$

10. $5(c + d)$

11. $-7(3x - 1)$

12. $(e - f)3$

13. $2(-3m + 1)$

14. $(2b - 3)(-9)$

15. $-5(s + 7)$

16. $(t + 7)3$

17. $6(-2v + 4)$

18. $(m - n)(-3)$

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

19. $4e + 7e + 5$

20. $5 - 4x - 8$

21. $-3h - 2h + 6h + 9$

22. $7 - 5y + 2 + 1$

23. $9k + 7 - k + 4$

24. $4z + 3 - 2z - z$

Simplify each expression.

25. $3t + 6t$

26. $4r + r$

27. $7f - 2f$

28. $9a - 8a$

29. $5c + 8c$

30. $2g - 5g$

31. $8k + 3 + 4k$

32. $7m - 5m - 6$

33. $9 - 6x + 5$

34. $7p - 1 - 9p + 5$

35. $-b - 3b + 8b + 4$

36. $5h - 6 - 8 + 7h$

37. $8b + 6 - 8b + 1$

38. $t - 5 - 2t + 5$

39. $4w - 5w + w$

40. $6m - 7 + 2m + 7$

41. $5f - 7f + f$

42. $12y - 8 + 4y + y$

43. $9a + 5 - 7a - 2a$

44. $6g - 7g + 13$

45. $7x + 6 - 9x - 3$

10-2**Skills Practice*****Solving Two-Step Equations***

Solve each equation. Check your solution.

1. $3n + 4 = 7$

2. $9 = 2s + 1$

3. $4c - 6 = 2$

4. $-4 = 2t - 2$

5. $3f - 12 = -3$

6. $8 = 4v + 12$

7. $5d - 6 = 9$

8. $2k + 12 = -4$

9. $-5 = 3m - 14$

10. $0 = 8z + 8$

11. $9a - 2 = -2$

12. $-8 + 4s = -16$

13. $-1 = 4 - 5x$

14. $5 = 9 - 2x$

15. $-2x + 12 = 14$

16. $1 - x = 8$

17. $-2 = -x + 4$

18. $11 = 2 - 3x$

19. $12 - 3x = 6$

20. $-6x + 5 = 17$

21. $13 = 18 - 5x$

22. $4x + 2x + 2 = 26$

23. $-18 = 9y - 5y + 10$

24. $-24 = 6a - 15 - 5a$

25. $3z - 17 + 2z = 13$

26. $22 = 4 + 8e - 2e$

27. $-15 = 9r + 1 - 7r$

28. $8k - 8 + k = 10$

29. $-27 = 2c - 7 - 6c$

30. $11 = 18 + 3f + 4f$

10-3 Skills Practice***Writing Two-Step Equations***

Translate each sentence into an equation. Then find each number.

1. Four more than twice a number is 8.
2. Three more than four times a number is 15.
3. Five less than twice a number is 7.
4. One less than four times a number is 11.
5. Seven more than the quotient of a number and 2 is 10.
6. Six less than six times a number is 12.
7. Five less than the quotient of a number and 3 is -7 .
8. Seven more than twice a number is 1.
9. The difference between 5 times a number and 3 is 12.
10. Nine more than three times a number is -6 .
11. Nine more than the quotient of a number and 4 is 12.
12. Four less than the quotient of a number and 3 is -10 .
13. Nine less than six times a number is -15 .
14. Three less than the quotient of a number and 6 is 1.
15. Eight more than the quotient of a number and 5 is 3.
16. The difference between twice a number and 11 is -23 .

10-4 Skills 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. 1, 5, 9, 13, 17, ...

2. -3, -6, -12, -24, -48, ...

3. 2, 5, 8, 11, 14, ...

4. 1, 6, 16, 31, 51, ...

5. 3, 7, 11, 15, 19, ...

6. 4, 9, 14, 19, 24, ...

7. 1, -3, 9, -27, 81, ...

8. 1, 2, 1, 2, 1, ...

9. 7, 4, 1, -2, -5, ...

10. -4, 4, -4, 4, -4, ...

11. -5, 10, -20, 40, -80, ...

12. 22, 25, 28, 31, 34, ...

13. 0, -2, -5, -9, -14, ...

14. 4, 12, 36, 108, 324, ...

15. -2, 10, -50, 250, -1,250, ...

16. -80, -76, -72, -68, -64, ...

17. 448, 224, 112, 56, 28, ...

18. 2, 2, 4, 12, 48, ...

19. $3, 6\frac{1}{2}, 10, 13\frac{1}{2}, 17, \dots$

20. 81, 27, 9, 3, 1, ...

10-5 Skills Practice***Solving Equations with Variables on Each Side*****Solve each equation. Check your solution.**

1. $3w + 6 = 4w$

2. $a + 18 = 7a$

3. $8c = 5c + 21$

4. $11d + 10 = 6d$

5. $2e = 4e - 16$

6. $7v = 2v - 20$

7. $4n - 6 = 10n$

8. $2y + 27 = 5y$

9. $8h = 6h - 14$

10. $18 - 2g = 4g$

11. $4x - 9 = 6x - 13$

12. $5c - 15 = 2c + 6$

13. $t + 10 = 7t - 14$

14. $8z + 6 = 7z + 4$

15. $2e - 12 = 7e + 8$

16. $9k + 6 = 8k + 13$

17. $2d + 10 = 6d - 10$

18. $-2a - 9 = 6a + 15$

19. $8 - 3k = 3k + 2$

20. $7t - 4 = 10t + 14$

21. $3c - 15 = 17 - c$

22. $14 + 3n = 5n - 6$

23. $3y + 5.2 = 2 - 5y$

24. $10b - 2 = 7b - 7.4$

25. $2m - 2 = 6m - 4$

26. $3g + 5 = 7g + 4$

27. $4s - 1 = 8 - 2s$

28. $9w + 3 = 4w - 9$

29. $6z - 7 = 2z - 2$

30. $3 - a = 4a + 12$

10-6 Skills Practice***Problem-Solving Investigation: Guess and Check***

Use the guess and check strategy to solve each problem.

- 1. NUMBER THEORY** A number cubed is 1,728. What is the number?

- 2. MONEY** Jackson has exactly \$43 in \$1, \$5, and \$10 bills. If he has 8 bills, how many of each bill does he have?

- 3. NUMBERS** Jona is thinking of two numbers. One number is 18 more than twice the other number. The sum of the numbers is 48. What two numbers is Jona thinking of?

- 4. PACKAGES** The packages in a mail driver's truck weigh a total of 950 pounds. The large packages weigh 20 pounds each and the small packages weigh 10 pounds each. If he has 10 more large packages than small packages, how many large and small packages are on the truck?

- 5. NUMBER THEORY** One number is twice the other. The sum of the numbers is 246. What are the two numbers?

- 6. MOVIE RENTALS** A movie rental store rented 3 times as many DVDs as videos. DVDs rent for \$5 a day and videos rent for \$3 a day. If the total rental income for a weekend was \$2,160, how many DVDs and videos did the store rent?

10-7**Skills Practice*****Inequalities*****Write an inequality for each sentence.**

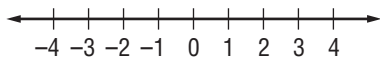
- SPORTS** You need to score at least 30 points to take the lead.
- SEASONS** There are less than 12 hours of daylight each day in winter.
- TRAVEL** The bus seats at most 60 people.
- MONEY** The coupon is good for any item that costs less than \$10.
- TESTS** A score of at least 92 on the test is considered an A.
- HEALTH** The baby weighed more than 7 pounds at birth.
- DRIVING** Victor drives less than 12,000 miles per year.
- TRAVEL** Your waiting time will be 18 minutes or less.
- SCHOOL TRIPS** At least 15 students must sign up for the school trip.

For the given value, state whether each inequality is *true* or *false*.

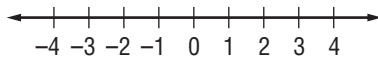
- | | |
|---------------------------------|----------------------------------|
| 10. $y + 2 < 8, y = 3$ | 11. $12 > u - 1, u = 14$ |
| 12. $p + 5 \geq -6, p = 1$ | 13. $-6 < a - 3, a = -1$ |
| 14. $4s \leq 15, s = 4$ | 15. $-5 > 1 - d, d = -9$ |
| 16. $-2 - g \geq -7, g = 5$ | 17. $\frac{k}{3} > 4, k = 12$ |
| 18. $4 < \frac{-10}{z}, z = -2$ | 19. $\frac{12}{m} \geq 3, m = 4$ |

Graph each inequality on a number line.

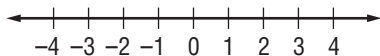
20. $v \geq 3$



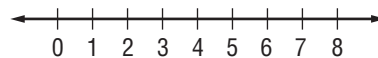
22. $n \leq -3$



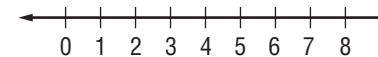
24. $r > -1$



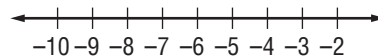
21. $b > 5$



23. $w < 4$



25. $h \geq -7$



11-1 Skills Practice**Functions****Find each function value.**

1. $f(2)$ if $f(x) = x + 4$ 2. $f(9)$ if $f(x) = x - 8$ 3. $f(3)$ if $f(x) = 2x + 2$
4. $f(6)$ if $f(x) = 2x - 5$ 5. $f(-7)$ if $f(x) = 3x + 6$ 6. $f(8)$ if $f(x) = 3x - 10$
7. $f(-5)$ if $f(x) = 4x + 2$ 8. $f(-3)$ if $f(x) = -4x - 4$ 9. $f(-4)$ if $f(x) = -5x - 3$

Complete each function table.

10. $f(x) = x + 7$

x	$x + 7$	$f(x)$
-1		
0		
1		
2		

11. $f(x) = x - 13$

x	$x - 13$	$f(x)$
-2		
-1		
2		
3		

12. $f(x) = 2x + 8$

x	$2x + 8$	$f(x)$
-3		
-1		
0		
4		

13. $f(x) = 2x - 3$

x	$2x - 3$	$f(x)$
-2		
2		
5		
8		

14. $f(x) = 3x + 4$

x	$3x + 4$	$f(x)$
-4		
-2		
1		
3		

15. $f(x) = 7 - 3x$

x	$7 - 3x$	$f(x)$
-3		
-1		
3		
5		

16. $f(x) = 4x + 5$

x	$4x + 5$	$f(x)$
-4		
-1		
2		
6		

17. $f(x) = 1 - 4x$

x	$1 - 4x$	$f(x)$
-2		
0		
3		
5		

18. $f(x) = 6x - 2$

x	$6x - 2$	$f(x)$
-5		
-3		
2		
7		

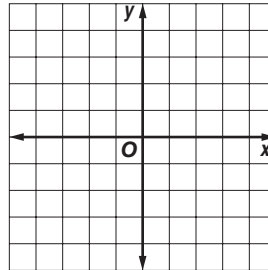
11-2 Skills Practice

Representing Linear Functions

Complete the function table. Then graph the function.

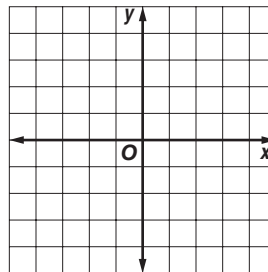
1. $y = x + 4$

x	$x + 4$	y	(x, y)
-2			
-1			
0			
1			



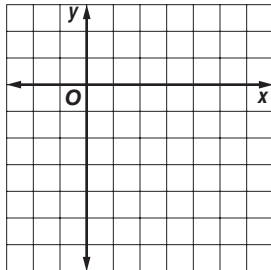
2. $y = 2x - 1$

x	$2x - 1$	y	(x, y)
-1			
0			
1			
2			

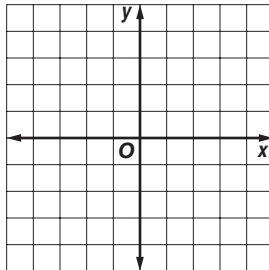


Graph each function.

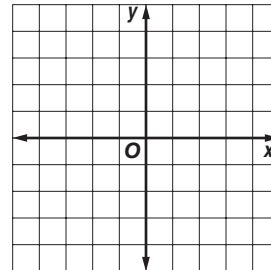
3. $y = x - 6$



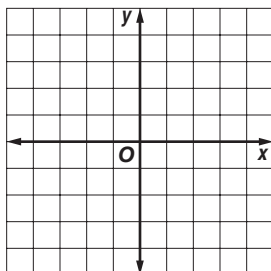
4. $y = 2x - 3$



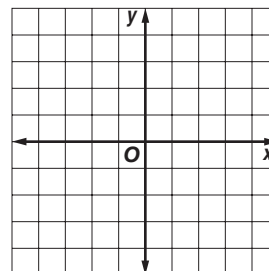
5. $y = 1 - x$



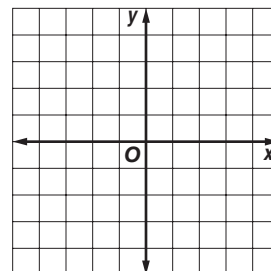
6. $y = 3x + 2$



7. $y = \frac{x}{2} + 2$



8. $y = \frac{x}{3} - 1$



11-3**Skills Practice*****Slope***

Find the slope of the line that passes through each pair of points.

1. $A(-2, -4), B(2, 4)$
2. $C(0, 2), D(-2, 0)$
3. $E(3, 4), F(4, -2)$
4. $G(-3, -1), H(-2, -2)$
5. $I(0, 6), J(-1, 1)$
6. $K(0, -2), L(2, 4)$
7. $O(1, -3), P(2, 5)$
8. $Q(1, 0), R(3, 0)$
9. $S(0, 4), T(1, 0)$
10. $U(1, 3), V(1, 5)$
11. $W(2, -2), X(-1, 1)$
12. $Y(-5, 0), Z(-2, -4)$
13. $A(2, -1), B(-4, -4)$
14. $C(-2, 2), D(-4, 2)$
15. $E(-1, -4), F(-3, 0)$
16. $G(7, 4), H(2, 0)$
17. $K(2, -2), L(2, -3)$
18. $M(-1, -1), N(-4, -5)$
19. $O(5, -3), P(-3, 4)$
20. $Q(-1, -3), R(1, 2)$
21. $W(3, -5), X(1, 1)$
22. $Y(2, 2), Z(-5, -4)$
23. $C(0, -2), D(3, -2)$
24. $G(-3, 5), H(-3, 2)$

11-4 Skills Practice***Direct Variation***

For Exercises 1–3, determine whether each linear function is a direct variation. If so, state the constant of variation.

1.

Price x	\$5	\$10	\$15	\$20
Tax y	\$0.41	\$0.82	\$1.23	\$1.64

2.

Hours x	11	12	13	14
Distance y (miles)	154	167	180	194

3.

Age x	8	9	10	11
Grade y	3	4	5	6

For Exercises 4–12, y varies directly with x . Write an equation for the direct variation. Then find each value.

4. If $y = 8$ when $x = 3$, find y when $x = 45$.
5. If $y = -4$ when $x = 10$, find y when $x = 2$.
6. If $y = 27$ when $x = 8$, find y when $x = 11$.
7. Find y when $x = 12$ if $y = 2$ when $x = 5$.
8. Find y when $x = 3$ if $y = -4$ when $x = -9$.
9. Find y when $x = -6$ if $y = 15$ when $x = -5$.
10. If $y = 20$ when $x = 8$, what is the value of x when $y = -2$?
11. If $y = -30$ when $x = 15$, what is the value of x when $y = 60$?
12. If $y = 42$ when $x = 15$, what is the value of x when $y = 70$?

11-5

Skills Practice
Slope-Intercept Form

State the slope and y-intercept of the graph of each equation.

1. $y = x + 4$

2. $y = 2x - 2$

3. $y = 3x - 1$

4. $y = -x + 3$

5. $y = \frac{1}{2}x - 5$

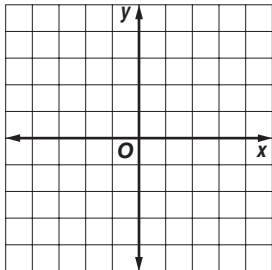
6. $y = -\frac{1}{3}x + 4$

7. $y - 2x = -1$

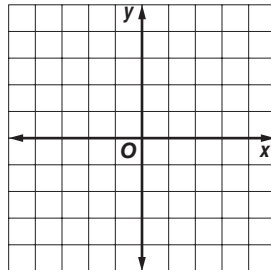
8. $y + 4x = 2$

9. $y = \frac{3}{2}x - 3$

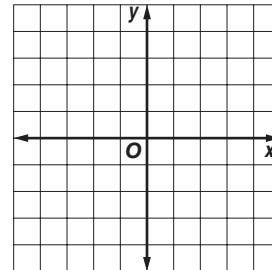
10. Graph a line with a slope of 1 and a y-intercept of -4.



11. Graph a line with a slope of 2 and a y-intercept of -3.

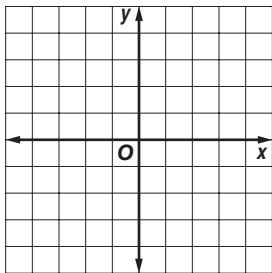


12. Graph a line with a slope of $\frac{1}{3}$ and a y-intercept of 1.

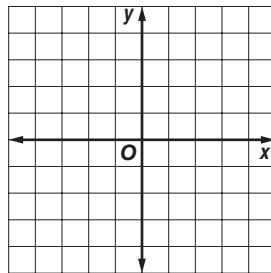


Graph each equation using the slope and y-intercept.

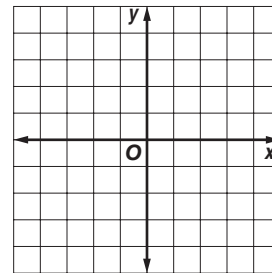
13. $y = 3x - 3$



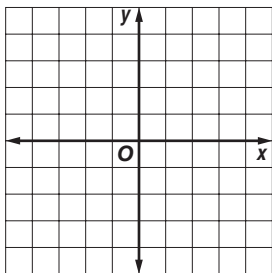
14. $y = -x + 1$



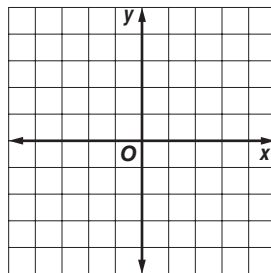
15. $y = \frac{1}{2}x - 2$



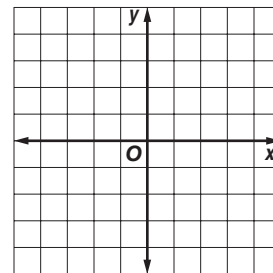
16. $y = 4x - 2$



17. $y = -\frac{3}{2}x + 1$



18. $y = \frac{2}{3}x - 3$

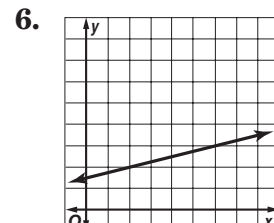
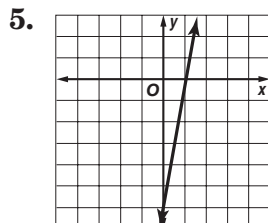
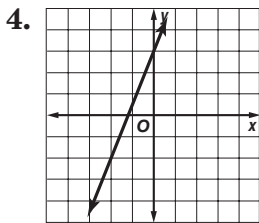
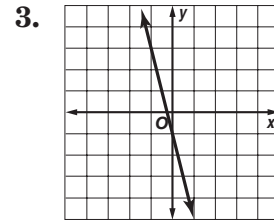
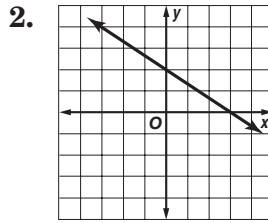
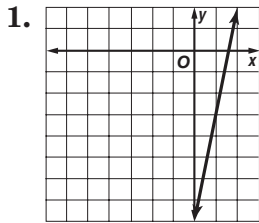


11-6

Skills Practice

Writing Linear Equations

Write an equation in slope-intercept form for each line.



Write an equation in slope-intercept form for each line given the slope and a point on the line.

7. slope = 4, y-intercept = 6

8. slope = 1, y-intercept = 0

9. slope = $\frac{1}{5}$, y-intercept = 2

10. slope = -3, y-intercept = 5

11. slope = 0, y-intercept = 0

12. slope = $2\frac{1}{4}$, y-intercept = 3

13. slope = 1, y-intercept = -5

14. slope = $\frac{4}{3}$, y-intercept = 1

15. slope = 1.8, y-intercept = 0.6

16. slope = -1, y-intercept = $-\frac{2}{3}$

17. slope = -6, y-intercept = 30

18. slope = 0, y-intercept = 5

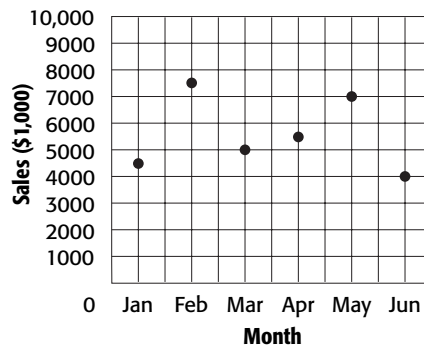
19. slope = -1, y-intercept = -4

20. slope = 1, y-intercept = 88

11-7 Skills Practice

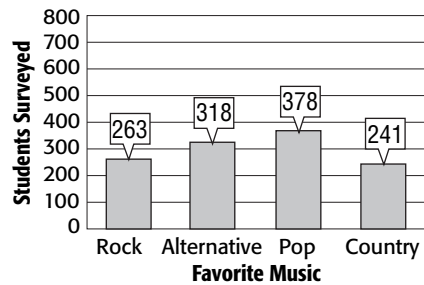
Problem-Solving Investigation: Use a Graph

For Exercises 1–3, use the graph at the right. The graph shows the monthly sales for Wilson’s Flower Shop.



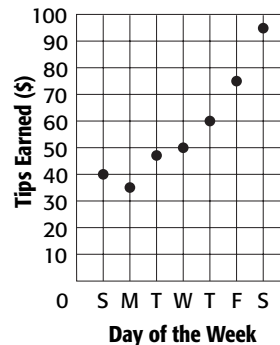
1. During which month were sales highest?
2. During which month were sales lowest?
3. Between which two months did sales increase the most?

For Exercises 4–8, use the graph at the right. The graph shows the results of a survey of students’ favorite types of music.



4. Which type of music received the most votes?
5. How many more votes did alternative receive than rock?
6. How many total students were surveyed?
7. How many more students voted for pop than country?
8. If the survey were expanded to 6,000 students, about how many would be expected to vote for alternative as their favorite type of music?

For Exercises 9–12, use the graph at the right. Each point on the graph shows the amount in tips that Rachael received and the day that the tips were earned.



9. What was the lowest amount that Rachael was tipped?
10. What was the highest total amount that Rachael was tipped in one day?
11. On which day were Rachael’s tips highest overall?
12. Is the correlation between tips earned and day of the week positive, negative, or none?

11-8**Skills Practice*****Scatter Plots***

Explain whether the scatter plot of the data for the following shows a *positive, negative, or no* relationship.

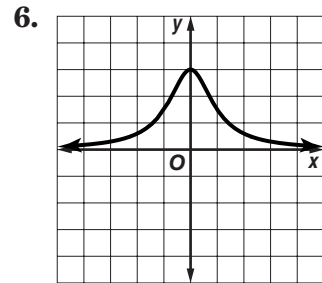
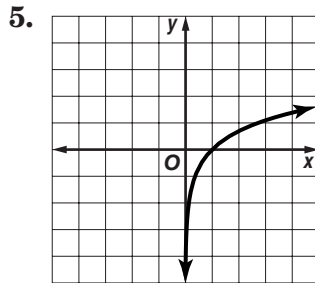
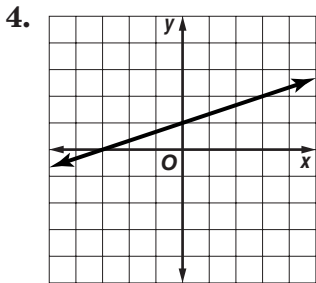
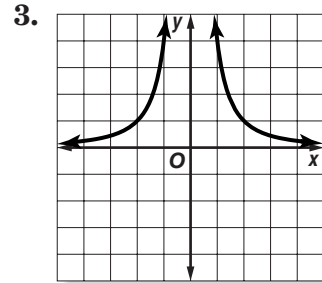
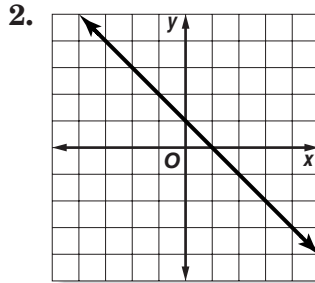
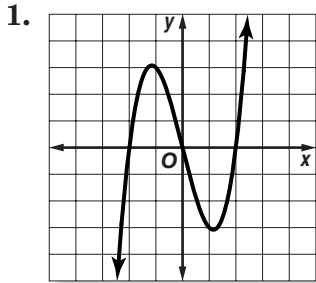
1. rotations of a bicycle tire and distance traveled on the bicycle
2. number of pages printed by an inkjet printer and the amount of ink in the cartridge
3. age of a child and the child's shoe size
4. number of letters in a person's first name and the person's height
5. shots attempted and points made in a basketball game
6. year and winning time in the 100-meter dash in the Olympics
7. diameter of the trunk of a tree and the height of the tree
8. number of a bank account and the amount of money in the bank account
9. length of a taxi ride and the amount of the fare
10. daily high temperature and the amount of clothing a person wears
11. a person's age and a person's street address
12. outside temperature and the cost of air conditioning
13. the age of a car and how many people fit inside of it
14. inches of rainfall in the last 30 days and the water level in a reservoir
15. miles ridden on a bicycle tire and thickness of the tire tread
16. population of a U.S. state and the number of U.S. senators a state has

12-1

Skills Practice

Linear and Nonlinear Functions

Determine whether each graph, equation, or table represents a *linear* or *nonlinear* function. Explain.



7. $y = 2x$

8. $y = 3x^2 + 5$

9. $y = \frac{6}{x}$

10. $y = x^3 + 7$

11. $y = -6$

12. $y = -\frac{5x}{2}$

13.

x	1	2	3	4
y	5	7	9	11

14.

x	-2	0	2	4
y	0	1	3	9

15.

x	-1	0	1	2
y	8	4	0	-4

16.

x	2	3	4	5
y	3	5	8	12

17.

x	-2	1	4	7
y	-4	1	6	11

18.

x	3	6	9	12
y	10	6	3	1

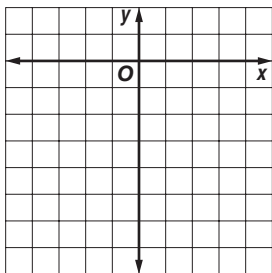
12-2

Skills Practice

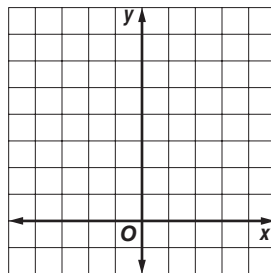
Graphing Quadratic Functions

Graph each function.

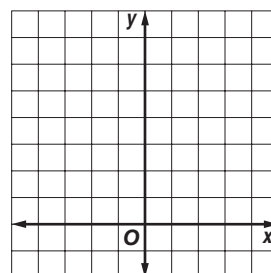
1. $y = -4x^2$



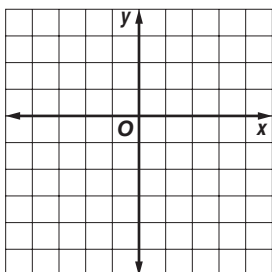
2. $y = 1.5x^2$



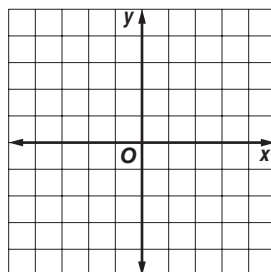
3. $y = x^2 + 4$



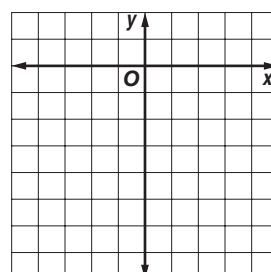
4. $y = x^2 - 5$



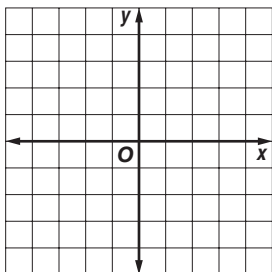
5. $y = -x^2 + 3$



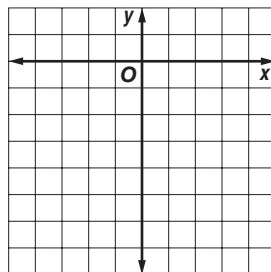
6. $y = -x^2 - 1$



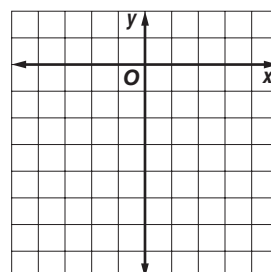
7. $y = 2x^2 - 3$



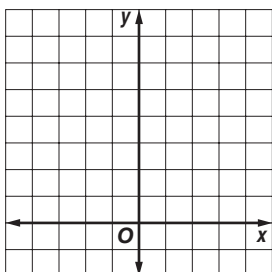
8. $y = -2x^2 + 1$



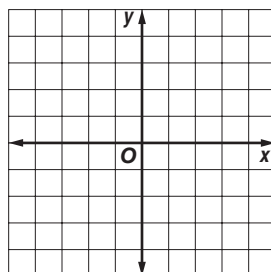
9. $y = -2x^2 - 2$



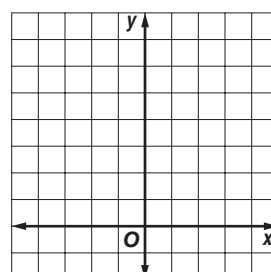
10. $y = 3x^2 + 1$



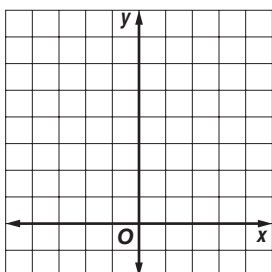
11. $y = -3x^2 + 3$



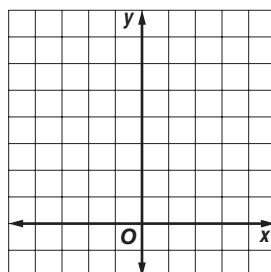
12. $y = 0.5x^2 + 2$



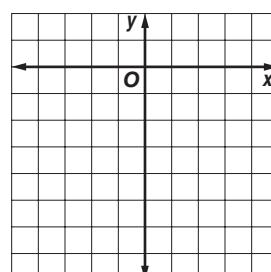
13. $y = 1.5x^2 - 1$



14. $y = 2.5x^2 + 1$



15. $y = -0.5x^2 - 1$



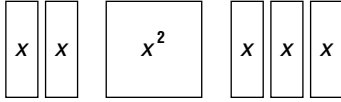
12-3

Skills Practice

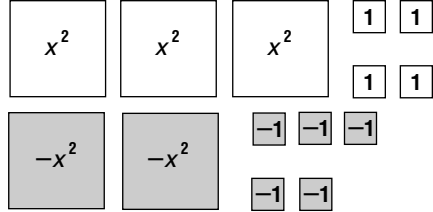
Simplifying Polynomials

Simplify each polynomial. If the polynomial cannot be simplified, write *simplest form*.

1. $2x + x^2 + 3x$



2. $3x^2 + 4 - 2x^2 - 5$



3. $2s + 3d + 3s + 2d$

4. $3f - 5g - f - 2g$

5. $-3h + 6k + 2 - 2k$

6. $5z + x + 9$

7. $2c - 4v + 5c - 3$

8. $-5n - 6m + 2 + 6m$

9. $w^2 + 3 - 5$

10. $2e^2 - 3e + 6e$

11. $3r + 2r^2 - 4r^2$

12. $5t^2 - 6t - 8$

13. $4y^2 - 6y - y^2 + 3$

14. $2u^2 + 5u + 9 - 8u$

15. $-p^2 - 2p + 4 - 2p^2 + 2$

16. $7a^2 + 5a + 1 + 3a^2 - 8a$

17. $2s^2 - 7s - 6 - 2s + 4$

18. $-3d^2 + 5d - 8 + 2d^2 - d + 5$

19. $2f^2 + 3f + 8 + 4f + f^2 + 6$

20. $-6k^2 - 4k + 5 - 3k^2 + 7k + 6$

12-4**Skills Practice****Adding Polynomials****Add.**

$$\begin{array}{r} 1. \quad 3c + 4 \\ (+) 5c + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 3r^2 + 8 \\ (+) r^2 + 4 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 4s^2 + s - 4 \\ (+) 3s^2 - 5s + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 2d^2 - 2d + 4 \\ (+) 6d^2 - d + 6 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad h^2 - 3h + 4 \\ (+) \quad 5h + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 6k^2 + 8k + 7 \\ (+) -2k^2 \quad - 4 \\ \hline \end{array}$$

$$7. (6c + 2) + (3c + 4)$$

$$8. (5v - 5) + (-v + 8)$$

$$9. (4b^2 - 2) + (-7b^2 + 3)$$

$$10. (-8n^2 + 4n) + (3n^2 - 5n)$$

$$11. (7w^2 - 2w - 4) + (-6w^2 - 2w + 6)$$

$$12. (9e^2 + 4e - 3) + (-7e^2 + 5e + 3)$$

$$13. (-r^2 - 2r + 5) + (-7r^2 + 5r - 4)$$

$$14. (-2t^2 - 2) + (-5t^2 - 2t - 1)$$

$$15. (9y^2 - 7y - 6) + (3y + 8)$$

$$16. (8p^2 + 4p) + (-5p^2 + 2p + 3)$$

$$17. (3u^2 + 7) + (-8u^2 - 1)$$

$$18. (z + 2) + (z^2 - 9z)$$

$$19. (-7s^2 + 3s - 1) + (-s^2 - s + 1)$$

$$20. (-4a^2 - 2) + (6a^2 + 3a - 8)$$

Add. Then evaluate each sum if $x = 3$, $y = -2$, and $z = 4$.

$$21. (4x + 5y) + (2x - 3y)$$

$$22. (-3x + 4z) + (2y - x)$$

$$23. (z - 2x) + (-8z + y)$$

$$24. (2x - 4y) + (3x - 6z)$$

12-5**Skills Practice****Subtracting Polynomials****Subtract.**

1.
$$\begin{array}{r} 5w + 6 \\ (-) 3w + 2 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 7r + 9 \\ (-) 4r - 6 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 5t^2 + 9t + 5 \\ (-) 2t^2 + 4t + 9 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 6y^2 + 3y + 2 \\ (-) y^2 + 2y - 6 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 9a^2 + 2a + 5 \\ (-) 4a^2 \quad + 1 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 8d^2 + 4d + 5 \\ (-) 7d^2 \quad - 1 \\ \hline \end{array}$$

7. $(8f + 7) - (4f + 3)$

8. $(9g + 6) - (3g - 1)$

9. $(7h + 9) - (-2h + 6)$

10. $(5k^2 + 5) - (-2k + 3)$

11. $(8z^2 - 4) - (7z + 1)$

12. $(9x^2 + 11x + 5) - (7x^2 + 2x + 3)$

13. $(4c^2 + 5c + 2) - (c^2 - 3c - 4)$

14. $(3v^2 + 4v + 6) - (7v^2 + 2v - 1)$

15. $(6b^2 - 4b + 9) - (5b^2 + 3b - 4)$

16. $(8n^2 + 7n - 5) - (-n^2 + 2n - 3)$

Subtract. Then evaluate the difference if $x = 4$ and $y = -6$.

17. $(6x + 5) - (3x + 1)$

18. $(3x + 9y) - (5x + 7y)$

19. $(-2y - x) - (-3y + 1)$

20. $(7x + 3) - (4y + x)$

21. $(5x - 6) - (-8y - 3x)$

22. $(-2y + 9) - (6x + y)$

12-6**Skills Practice*****Multiplying and Dividing Monomials*****Multiply or divide. Express using exponents.**

1. $2^7 \cdot 2^2$

2. $4^2 \cdot 4^4$

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

4. $k^8 \cdot k$

5. $t^7 \cdot t^6$

6. $2w^2 \cdot 5w^2$

7. $3e^3 \cdot 7e^3$

8. $4r^4(-4r^3)$

9. $(-6t^7)(5t^2)$

10. $7y^3 \cdot 6y$

11. $(3u^5)(-9u^6)$

12. $(-2p^7)(-8p^3)$

13. $(5c^4)(-7c)$

14. $(8z^7)(3z^6)$

15. $(-3l^2w^3)(2lw^4)$

16. $\frac{2^9}{2^3}$

17. $\frac{3^8}{3^4}$

18. $\frac{5^9}{5^2}$

19. $\frac{8^7}{8}$

20. $\frac{b^{12}}{b^5}$

21. $\frac{12n^5}{4n^2}$

22. $\frac{14m^3}{7m^2}$

23. $\frac{9r^8}{3r^4}$

24. $\frac{24t^9}{6t^3}$

25. $\frac{18y^6}{2y}$

26. $a^4c^6(a^2c)$

27. $\frac{15x^8y^4}{3x^5y^2}$

28. $\frac{-21s^6t^3}{3s^2t}$

29. $\frac{34v^7}{2v^3}$

30. $\frac{4^2q^5}{2q^2}$

12-7**Skills Practice*****Problem-Solving Investigation: Make a Model***

Make a model to solve each problem.

- 1. SHIPPING** A spice distributor is making boxes in which to pack cylindrical spice containers. The diameter of each container is 2 inches. The height of each container is 4 inches. If they place 4 rows with 3 containers in each row in a box, what is the volume of the box?
- 2. SEWING** Jordan has a bread basket in the shape of a rectangular prism that measures 12 inches high, 18 inches long, and 16 inches wide. She wants to cover the inside of the basket with a 50-inch by 20-inch piece of fabric. Does Jordan have enough fabric to cover the inside of the basket? Explain your answer.
- 3. BEADS** Elsa is making a wooden box for sorting and storing her bead collection. The outer dimensions of the box are 10 inches by 10 inches. She wants to make 100 compartments that are approximately 1-inch squares. How many horizontal and vertical dividers will Elsa need to make the compartments?
- 4. ARRANGING TABLES** Donna is arranging four tables to make seating for her party guests. Standing alone, each table will seat 4 people on each side and 2 people at each end. She can either place the tables end-to-end to make one long table or she can separate the tables into four individual tables. How many more guests can she seat if she separates the tables than if she places them end-to-end?
- 5. MAKING FRAMES** Julian is making pictures frames by gluing square tiles onto the wooden sides. The wooden sides measure 8 inches wide by 10 inches long by 1 inch wide. If he glues a 1-inch square tile at every corner and covers the remainder of the wood sides with $\frac{1}{2}$ -inch square tiles, how many of each size tile does Julian need to make 4 frames?

Use any strategy to solve each problem.

- 6. QUIZ SCORES** Mandy answered 10 questions out of 12 correctly on her math quiz. How many questions must she answer correctly to get the same score on a quiz with 30 questions?
- 7. NUMBER THEORY** There are two numbers. One number is 4 less than three times the other number. Find the two numbers.
- 8. GARDENING** Justin helped his dad in the yard 3 times as long as Paula. Paula helped her dad 2 hours less than Carly. Carly helped her dad in the yard 4 hours. How many hours did Justin help his dad?

12-8**Skills Practice*****Multiplying Monomials and Polynomials*****Multiply.**

1. $z(z + 3)$

2. $x(x - 5)$

3. $(c + 6)c$

4. $b(2b + 3)$

5. $4n(3n - 2)$

6. $(6m + 4)3m$

7. $-5a(3a + 5)$

8. $(8s - 1)(-2s)$

9. $6d(5 + 3d)$

10. $-h(7 + 12h)$

11. $(1 + 5k)(5k)$

12. $(3 - w)(4w)$

13. $2r(5r^2 + 3)$

14. $3y(6y^2 - 9)$

15. $-7p(3p^2 - 4)$

16. $2a(a^2 + 3a + 5)$

17. $d(8d^2 - 4d - 6)$

18. $3g(7g^2 - 5g + 3)$

19. $-8h(4h^2 + 2h + 1)$

20. $-5k(4k^2 - k - 6)$

21. $-6z(2z^2 + 9z + 7)$

22. $10c(7c^2 - 3c - 6)$

23. $12c(-3c^2 + 5c - 4)$

24. $-15d(-d^2 - 3d + 2)$

25. $(7e^2 + 3e - 6)(-4e)$

26. $-3t(8 - 6t + 15t^2)$

27. $-9u(7u^2 - 2u - 4)$

28. $6w(-2 - 6w - 9w^2)$

29. $(-3s^2 - 9)(-11s)$

30. $(-7 + 5z - 3z^2)(5z)$

31. $-12t(-4t^2 + 5t - 6)$

32. $9q(-4q^2 + 7q - 10)$

33. $(7 - 12n + 11n^2)(-6n)$

34. $2f^2(7f - 8)$

35. $-3x(7x^4 - 2)$

36. $(3 - 5h^3)(-4h)$