

1-1 Skills Practice***Variables and Expressions***

Write an algebraic expression for each verbal expression.

1. the sum of a number and 10

2. 15 less than k

3. the product of 18 and q

4. 6 more than twice m

5. 8 increased by three times a number

6. the difference of 17 and 5 times a number

7. the product of 2 and the second power of y

8. 9 less than g to the fourth power

Evaluate each expression.

9. 8^2

10. 3^4

11. 5^3

12. 3^3

13. 10^2

14. 2^4

15. 7^2

16. 4^4

17. 7^3

18. 11^3

Write a verbal expression for each algebraic expression.

19. $9a$

20. 5^2

21. $c + 2d$

22. $4 - 5h$

23. $2b^2$

24. $7x^3 - 1$

25. $p^4 + 6q$

26. $3n^2 - x$

1-2 Skills Practice

Order of Operations

Evaluate each expression.

1. $(5 + 4) \cdot 7$

2. $(9 - 2) \cdot 3$

3. $4 + 6 \cdot 3$

4. $28 - 5 \cdot 4$

5. $12 + 2 \cdot 2$

6. $(3 + 5) \cdot 5 + 1$

7. $9 + 4(3 + 1)$

8. $2 + 3 \cdot 5 + 4$

9. $30 - 5 \cdot 4 + 2$

10. $10 + 2 \cdot 6 + 4$

11. $14 \div 7 \cdot 5 - 3^2$

12. $6 \div 3 \cdot 7 + 2^3$

13. $4[30 - (10 - 2) \cdot 3]$

14. $5 + [30 - (6 - 1)^2]$

15. $2[12 + (5 - 2)^2]$

16. $[8 \cdot 2 - (3 + 9)] + [8 - 2 \cdot 3]$

Evaluate each expression if $x = 6$, $y = 8$, and $z = 3$.

17. $xy + z$

18. $yz - x$

19. $2x + 3y - z$

20. $2(x + z) - y$

21. $5z + (y - x)$

22. $5x - (y + 2z)$

23. $x^2 + y^2 - 10z$

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

25. $\frac{y + xz}{2}$

26. $\frac{3y + x^2}{z}$

1-3 Skills Practice**Open Sentences**

Find the solution of each equation if the replacement sets are $A = \{4, 5, 6, 7, 8\}$ and $B = \{9, 10, 11, 12, 13\}$.

1. $5a - 9 = 26$

2. $4a - 8 = 16$

3. $7a + 21 = 56$

4. $3b + 15 = 48$

5. $4b - 12 = 28$

6. $\frac{36}{b} - 3 = 0$

Find the solution of each equation using the given replacement set.

7. $\frac{1}{2} + x = \frac{5}{4}; \left\{ \frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4} \right\}$

8. $x + \frac{2}{3} = \frac{13}{9}; \left\{ \frac{4}{9}, \frac{5}{9}, \frac{2}{3}, \frac{7}{9} \right\}$

9. $\frac{1}{4}(x + 2) = \frac{5}{6}; \left\{ \frac{2}{3}, \frac{3}{4}, \frac{5}{4}, \frac{4}{3} \right\}$

10. $0.8(x + 5) = 5.2; \{1.2, 1.3, 1.4, 1.5\}$

Solve each equation.

11. $10.4 - 6.8 = x$

12. $y = 20.1 - 11.9$

13. $\frac{46 - 15}{3 + 28} = a$

14. $c = \frac{6 + 18}{31 - 25}$

15. $\frac{2(4) + 4}{3(3 - 1)} = b$

16. $\frac{6(7 - 2)}{3(8) + 6} = n$

Find the solution set for each inequality using the given replacement set.

17. $a + 7 < 13; \{3, 4, 5, 6, 7\}$

18. $9 + y < 17; \{7, 8, 9, 10, 11\}$

19. $x - 2 \leq 2; \{2, 3, 4, 5, 6, 7\}$

20. $2x > 12; \{0, 2, 4, 6, 8, 10\}$

21. $4b + 1 > 12; \{0, 3, 6, 9, 12, 15\}$

22. $2c - 5 \leq 11; \{8, 9, 10, 11, 12, 13\}$

23. $\frac{y}{2} \geq 5; \{4, 6, 8, 10, 12\}$

24. $\frac{x}{3} > 2; \{3, 4, 5, 6, 7, 8\}$

1-4 Skills Practice***Identity and Equality Properties***

Name the property used in each equation. Then find the value of n .

1. $n + 0 = 19$

2. $1 \cdot n = 8$

3. $28 \cdot n = 0$

4. $0 + n = 22$

5. $\frac{1}{4} \cdot n = 1$

6. $n \cdot 9 = 9$

7. $5 = n + 5$

8. $2 \cdot n = 2 \cdot 3$

9. $2(9 - 3) = 2(n)$

10. $(7 \cdot 3) + 4 = n + 4$

11. $5 + 4 = n + 4$

12. $n = 14 \cdot 0$

13. $3n = 1$

14. $11 - (18 \div 2) = 11 - n$

Evaluate each expression. Name the property used in each step.

15. $7(16 \div 4^2)$

16. $2[5 - (15 \div 3)]$

17. $4 - 3[7 - (2 \cdot 3)]$

18. $4[8 - (4 \cdot 2)] + 1$

19. $6 + 9[10 - 2(2 + 3)]$

20. $2(6 \div 3 - 1) \cdot \frac{1}{2}$

1-5 Skills Practice***The Distributive Property***

Rewrite each expression using the Distributive Property. Then simplify.

1. $4(3 + 5)$

2. $2(6 + 10)$

3. $5(7 - 4)$

4. $(6 - 2)8$

5. $(a + 7)2$

6. $7(h - 10)$

7. $3(m + n)$

8. $(x - y)6$

9. $2(x - y + 1)$

10. $3(a + b - 1)$

Use the Distributive Property to find each product.

11. $5 \cdot 89$

12. $9 \cdot 99$

13. $15 \cdot 104$

14. $15\left(2\frac{1}{3}\right)$

15. $12\left(1\frac{1}{4}\right)$

16. $8\left(3\frac{1}{8}\right)$

Simplify each expression. If not possible, write *simplified*.

17. $2x + 8x$

18. $17g + g$

19. $16m - 10m$

20. $12p - 8p$

21. $2x^2 + 6x^2$

22. $7a^2 - 2a^2$

23. $3y^2 - 2y$

24. $2(n + 2n)$

25. $4(2b - b)$

26. $3q^2 + q - q^2$

1-6 Skills Practice***Commutative and Associative Properties*****Evaluate each expression.**

1. $16 + 8 + 14 + 12$

2. $36 + 23 + 14 + 7$

3. $32 + 14 + 18 + 11$

4. $5 \cdot 3 \cdot 4 \cdot 3$

5. $2 \cdot 4 \cdot 5 \cdot 3$

6. $5 \cdot 7 \cdot 10 \cdot 4$

7. $1.7 + 0.8 + 1.3$

8. $1.6 + 0.9 + 2.4$

9. $4\frac{1}{2} + 6 + 5\frac{1}{2}$

Simplify each expression.

10. $2x + 5y + 9x$

11. $a + 9b + 6a$

12. $2p + 3q + 5p + 2q$

13. $r + 3s + 5r + s$

14. $5m^2 + 3m + m^2$

15. $6k^2 + 6k + k^2 + 9k$

16. $2a + 3(4 + a)$

17. $5(7 + 2g) + 3g$

Write an algebraic expression for each verbal expression. Then simplify, indicating the properties used.18. three times the sum of a and b increased by a 19. twice the sum of p and q increased by twice the sum of $2p$ and $3q$

1-7**Skills Practice*****Logical Reasoning and Counterexamples***

Identify the hypothesis and conclusion of each statement.

1. If it is Sunday, then mail is not delivered.
2. If you are hiking in the mountains, then you are outdoors.
3. If $6n + 4 > 58$, then $n > 9$.

Identify the hypothesis and conclusion of each statement. Then write the statement in if-then form.

4. Martina works at the bakery every Saturday.
5. Ivan only runs early in the morning.
6. A polygon that has five sides is a pentagon.

Determine whether a valid conclusion follows from the statement *If Hector scores an 85 or above on his science exam, then he will earn an A in the class for the given condition. If a valid conclusion does not follow, write no valid conclusion and explain why.*

7. Hector scored an 86 on his science exam.
8. Hector did not earn an A in science.
9. Hector scored 84 on the science exam.
10. Hector studied 10 hours for the science exam.

Find a counterexample for each statement.

11. If the car will not start, then it is out of gas.
12. If the basketball team has scored 100 points, then they must be winning the game.
13. If the Commutative Property holds for addition, then it holds for subtraction.
14. If $2n + 3 < 17$, then $n \leq 7$.

1-8

Skills Practice
Number Systems

Find each square root. If necessary, round to the nearest hundredth.

1. $\sqrt{144}$

2. $-\sqrt{36}$

3. $\pm\sqrt{0.25}$

4. $-\sqrt{\frac{49}{100}}$

5. $\pm\sqrt{17}$

6. $\sqrt{2.25}$

Name the set or sets of numbers to which each real number belongs.

7. $-\frac{28}{7}$

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

9. $\sqrt{29}$

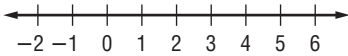
10. $\sqrt{196}$

11. $\frac{9}{13}$

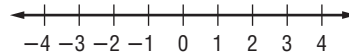
12. $\sqrt{1.8}$

Graph each solution set.

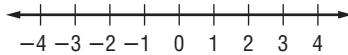
13. $x > -1$



14. $x \leq 1$



15. $x < 1.5$



16. $x \geq -2.5$



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

17. $\frac{4}{9} \bullet 0.\bar{4}$

18. $0.\overline{09} \bullet \frac{1}{90}$

19. $6.\overline{23} \bullet \sqrt{39}$

20. $\frac{1}{8} \bullet \frac{1}{\sqrt{8}}$

Write each set of numbers in order from least to greatest.

21. $\sqrt{5}, 2.\overline{36}, \frac{7}{3}$

22. $\frac{2}{9}, 0.\overline{21}, \sqrt{0.05}$

23. $-\sqrt{12}, -3.\overline{48}, -\sqrt{11}$

24. $0.\overline{43}, \frac{\sqrt{6}}{5}, \frac{3}{7}$

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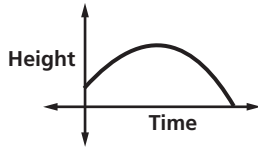
Lesson 1-8

1-9

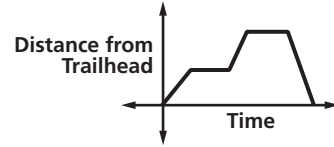
Skills Practice

Functions and Graphs

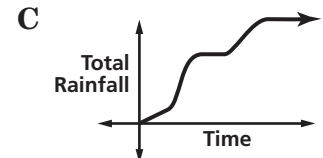
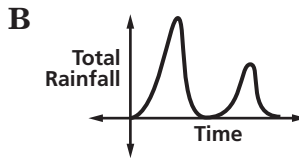
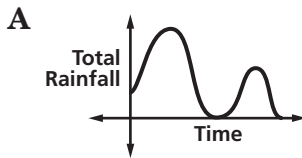
1. The graph below represents the path of a football thrown in the air. Describe what is happening in the graph.



2. The graph below represents a puppy exploring a trail. Describe what is happening in the graph. Is the function discrete or continuous?



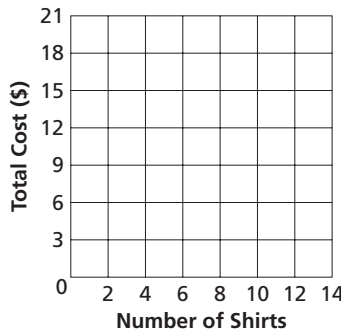
3. **WEATHER** During a storm, it rained lightly for a while, then poured heavily, and then stopped for a while. Then it rained moderately for a while before finally ending. Which graph represents this situation?



LAUNDRY For Exercises 4–7, use the table that shows the charges for washing and pressing shirts at a cleaners.

Number of Shirts	2	4	6	8	10	12
Total Cost (\$)	3	6	9	12	15	18

- Identify the independent and dependent variables.
- Write the ordered pairs the table represents.
- Draw a graph of the data.



7. Use the data to predict the cost for washing and pressing 16 shirts.

2-1 Skills Practice**Writing Equations****Translate each sentence into an equation.**

- Two added to three times a number m is the same as 18.
- Twice a increased by the cube of a equals b .
- Seven less than the sum of p and q is as much as 6.
- The sum of x and its square is equal to y times z .
- Four times the sum of f and g is identical to six times g .

Translate each sentence into a formula.

- The perimeter P of a square equals four times the length of a side s .
- The area A of a square is the length of a side s squared.
- The perimeter P of a triangle is equal to the sum of the lengths of sides a , b , and c .
- The area A of a circle is pi times the radius r squared.
- The volume V of a rectangular prism equals the product of the length ℓ , the width w , and the height h .

Translate each equation into a verbal sentence.

- $g + 10 = 3g$
- $2p + 4q = 20$
- $4(a + b) = 9a$
- $8 - 6x = 4 + 2x$
- $\frac{1}{2}(f + y) = f - 5$
- $s^2 - n^2 = 2b$

Write a problem based on the given information.

- c = cost per pound of plain coffee beans
 $c + 3$ = cost per pound of flavored coffee beans
 $2c + (c + 3) = 21$
- p = cost of dinner
 $0.15p$ = cost of a 15% tip
 $p + 0.15p = 23$

2-2 Skills Practice***Solving Equations by Using Addition and Subtraction***

Solve each equation. Then check your solution.

1. $y - 7 = 8$

2. $w + 14 = -8$

3. $p - 4 = 6$

4. $-13 = 5 + x$

5. $98 = b + 34$

6. $y - 32 = -1$

7. $s + (-28) = 0$

8. $y + (-10) = 6$

9. $-1 = s + (-19)$

10. $j - (-17) = 36$

11. $14 = d + (-10)$

12. $u + (-5) = -15$

13. $11 = -16 + y$

14. $c - (-3) = 100$

15. $47 = w - (-8)$

16. $x - (-74) = -22$

17. $4 - (-h) = 68$

18. $-56 = 20 - (-e)$

Write an equation for each problem. Then solve the equation and check your solution.

19. A number decreased by 14 is -46 . Find the number.

20. Thirteen subtracted from a number is -5 . Find the number.

21. The sum of a number and 67 is equal to -34 . Find the number.

22. What number minus 28 equals -2 ?

23. A number plus -73 is equal to 27. What is the number?

24. A number plus -17 equals -1 . Find the number.

25. What number less 5 is equal to -39 ?

2-3 Skills Practice***Solving Equations by Using Multiplication and Division***

Solve each equation. Then check your solution.

1. $12z = 108$

2. $-7t = 49$

3. $18e = -216$

4. $-22 = 11v$

5. $-6d = -42$

6. $96 = -24a$

7. $\frac{c}{4} = 16$

8. $\frac{a}{16} = 9$

9. $-84 = \frac{d}{3}$

10. $-\frac{d}{7} = -13$

11. $\frac{t}{4} = -13$

12. $31 = -\frac{1}{6}n$

13. $-6 = \frac{2}{3}z$

14. $\frac{2}{7}q = -4$

15. $\frac{5}{9}p = -10$

16. $\frac{a}{10} = \frac{2}{5}$

17. $-0.4b = 5.2$

18. $1.6m = -4$

Write an equation for each problem. Then solve the equation.

19. The opposite of a number is -9 . What is the number?

20. Fourteen times a number is -42 . Find the number.

21. Eight times a number equals 128. What is the number?

22. Negative twelve times a number equals -132 . Find the number.

23. Negative eighteen times a number is -54 . What is the number?

24. One sixth of a number is -17 . Find the number.

25. Negative three fifths of a number is -15 . What is the number?

2-4 Skills Practice**Solving Multi-Step Equations****Solve each problem by working backward.**

1. A number is divided by 2, and then the quotient is added to 8. The result is 33. Find the number.
2. Two is subtracted from a number, and then the difference is divided by 3. The result is 30. Find the number.
3. A number is multiplied by 2, and then the product is added to 9. The result is 49. What is the number?
4. **ALLOWANCE** After Ricardo received his allowance for the week, he went to the mall with some friends. He spent half of his allowance on a new paperback book. Then he bought himself a snack for \$1.25. When he arrived home, he had \$5.00 left. How much was his allowance?

Solve each equation. Then check your solution.

5. $5x + 3 = 23$

6. $4 = 3a - 14$

7. $2y + 5 = 19$

8. $6 + 5c = -29$

9. $8 - 5w = -37$

10. $18 - 4v = 42$

11. $\frac{n}{3} - 8 = -2$

12. $5 + \frac{x}{4} = 1$

13. $-\frac{h}{3} - 4 = 13$

14. $-\frac{d}{6} + 12 = -7$

15. $\frac{a}{5} - 2 = 9$

16. $\frac{w}{7} + 3 = -1$

17. $\frac{3}{4}q - 7 = 8$

18. $\frac{2}{3}g + 6 = -12$

19. $\frac{5}{2}z - 8 = -3$

20. $\frac{4}{5}m + 2 = 6$

21. $\frac{c - 5}{4} = 3$

22. $\frac{b + 1}{3} = 2$

Write an equation and solve each problem.

23. Twice a number plus four equals 6. What is the number?
24. Sixteen is seven plus three times a number. Find the number.
25. Find two consecutive integers whose sum is 35.
26. Find three consecutive integers whose sum is 36.

2-5 Skills Practice**Solving Equations with the Variable on Each Side****Justify each step.**

1. $4k - 3 = 2k + 5$

$4k - 3 - 2k = 2k + 5 - 2k$

$2k - 3 = 5$

$2k - 3 + 3 = 5 + 3$

$2k = 8$

$\frac{2k}{2} = \frac{8}{2}$

$k = 4$

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____

2. $2(8u + 2) = 3(2u - 7)$

$16u + 4 = 6u - 21$

$16u + 4 - 6u = 6u - 21 - 6u$

$10u + 4 = -21$

$10u + 4 - 4 = -21 - 4$

$10u = -25$

$\frac{10u}{10} = \frac{-25}{10}$

$u = -2.5$

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____
 g. _____

Solve each equation. Then check your solution.

3. $2m + 12 = 3m - 31$

4. $2h - 8 = h + 17$

5. $7a - 3 = 3 - 2a$

6. $4n - 12 = 12 - 4n$

7. $4x - 9 = 7x + 12$

8. $-6y - 3 = 3 - 6y$

9. $5 + 3r = 5r - 19$

10. $-9 + 8k = 7 + 4k$

11. $8q + 12 = 4(3 + 2q)$

12. $3(5j + 2) = 2(3j - 6)$

13. $6(-3v + 1) = 5(-2v - 2)$

14. $-7(2b - 4) = 5(-2b + 6)$

15. $3(8 - 3t) = 5(2 + t)$

16. $2(3u + 7) = -4(3 - 2u)$

17. $8(2f - 2) = 7(3f + 2)$

18. $5(-6 - 3d) = 3(8 + 7d)$

19. $6(w - 1) = 3(3w + 5)$

20. $7(-3y + 2) = 8(3y - 2)$

21. $\frac{2}{3}v - 6 = 6 - \frac{2}{3}v$

22. $\frac{1}{2} - \frac{5}{8}x = \frac{7}{8}x + \frac{7}{2}$

2-6 Skills Practice**Ratios and Proportions**

Use cross products to determine whether each pair of ratios forms a proportion. Write *yes* or *no*.

1. $\frac{4}{5}, \frac{20}{25}$

2. $\frac{5}{9}, \frac{7}{11}$

3. $\frac{6}{7}, \frac{24}{28}$

4. $\frac{8}{9}, \frac{72}{81}$

5. $\frac{7}{16}, \frac{42}{90}$

6. $\frac{13}{19}, \frac{26}{38}$

7. $\frac{3}{14}, \frac{21}{98}$

8. $\frac{12}{17}, \frac{50}{85}$

Solve each proportion. If necessary, round to the nearest hundredth.

9. $\frac{1}{a} = \frac{2}{14}$

10. $\frac{5}{b} = \frac{3}{9}$

11. $\frac{9}{g} = \frac{15}{10}$

12. $\frac{3}{a} = \frac{1}{6}$

13. $\frac{6}{z} = \frac{3}{5}$

14. $\frac{5}{e} = \frac{35}{21}$

15. $\frac{12}{7} = \frac{36}{s}$

16. $\frac{6}{23} = \frac{y}{69}$

17. $\frac{42}{56} = \frac{6}{f}$

18. $\frac{7}{b} = \frac{1}{9}$

19. $\frac{10}{14} = \frac{30}{m}$

20. $\frac{11}{15} = \frac{n}{60}$

21. $\frac{9}{c} = \frac{27}{39}$

22. $\frac{5}{12} = \frac{20}{g}$

23. $\frac{4}{21} = \frac{s}{84}$

24. $\frac{22}{x} = \frac{11}{30}$

25. BOATING Hue's boat used 5 gallons of gasoline in 4 hours. At this rate, how many gallons of gasoline will the boat use in 10 hours?

2-7 Skills Practice***Percent of Change***

State whether each percent of change is a percent of increase or a percent of decrease. Then find each percent of change. Round to the nearest whole percent.

1. original: 25
new: 10

2. original: 50
new: 75

3. original: 55
new: 50

4. original: 25
new: 28

5. original: 50
new: 30

6. original: 90
new: 95

7. original: 48
new: 60

8. original: 60
new: 45

Find the total price of each item.

9. dress: \$69.00
tax: 5%

10. binder: \$14.50
tax: 7%

11. hardcover book: \$28.95
tax: 6%

12. groceries: \$47.52
tax: 3%

13. filler paper: \$6.00
tax: 6.5%

14. shoes: \$65.00
tax: 4%

15. basketball: \$17.00
tax: 6%

16. concert tickets: \$48.00
tax: 7.5%

Find the discounted price of each item.

17. backpack: \$56.25
discount: 20%

18. monitor: \$150.00
discount: 50%

19. CD: \$15.99
discount: 20%

20. shirt: \$25.50
discount: 40%

21. sleeping bag: \$125
discount: 25%

22. coffee maker: \$102.00
discount: 45%

2-8 Skills Practice***Solving Equations and Formulas***

Solve each equation or formula for the variable specified.

1. $7t = x$, for t

2. $e = wp$, for p

3. $q - r = r$, for r

4. $4m - n = m$, for m

5. $7a - b = 15a$, for a

6. $-5c + d = 2c$, for c

7. $x - 2y = 1$, for y

8. $m + 3n = 1$, for n

9. $7f + g = 5$, for f

10. $ax - c = b$, for x

11. $rt - 2n = y$, for t

12. $bc + 3g = 2k$, for c

13. $kn + 4f = 9v$, for n

14. $8c + 6j = 5p$, for c

15. $\frac{x - c}{2} = d$, for x

16. $\frac{x - c}{2} = d$, for c

17. $\frac{p + 9}{5} = q$, for p

18. $\frac{b - 4z}{7} = a$, for b

Write an equation and solve for the variable specified.

19. Five more than a number g is six less than twice a number h . Solve for g .

20. One fourth of a number q is three more than three times a number w . Solve for q .

21. Eight less than a number s is three more than four times a number t . Solve for s .

2-9 Skills Practice**Weighted Averages****SEASONING** For Exercises 1–4, use the following information.

A health food store sells seasoning blends in bulk. One blend contains 20% basil. Sheila wants to add pure basil to some 20% blend to make 16 ounces of her own 30% blend. Let b represent the amount of basil Sheila should add to the 20% blend.

1. Complete the table representing the problem.

	Ounces	Amount of Basil
20% Basil Blend		
100% Basil		
30% Basil Blend		

2. Write an equation to represent the problem.
3. How many ounces of basil should Sheila use to make the 30% blend?
4. How many ounces of the 20% blend should she use?

HIKING For Exercises 5–7, use the following information.

At 7:00 A.M., two groups of hikers begin 21 miles apart and head toward each other. The first group, hiking at an average rate of 1.5 miles per hour, carries tents, sleeping bags, and cooking equipment. The second group, hiking at an average rate of 2 miles per hour, carries food and water. Let t represent the hiking time.

5. Copy and complete the table representing the problem.

	r	t	$d = rt$
First group of hikers			
Second group of hikers			

6. Write an equation using t that describes the distances traveled.
7. How long will it be until the two groups of hikers meet?

SALES For Exercises 8 and 9, use the following information.

Sergio sells a mixture of Virginia peanuts and Spanish peanuts for \$3.40 per pound. To make the mixture, he uses Virginia peanuts that cost \$3.50 per pound and Spanish peanuts that cost \$3.00 per pound. He mixes 10 pounds at a time.

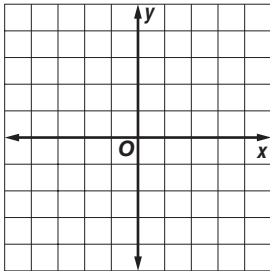
8. How many pounds of Virginia peanuts does Sergio use?
9. How many pounds of Spanish peanuts does Sergio use?

3-1 Skills Practice

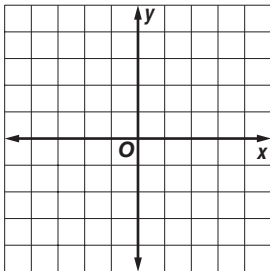
Representing Relations

Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

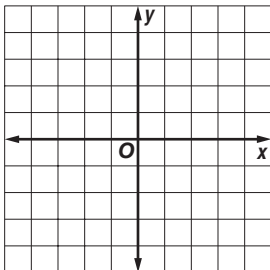
1. $\{(-1, -1), (1, 1), (2, 1), (3, 2)\}$



2. $\{(0, 4), (-4, -4), (-2, 3), (4, 0)\}$



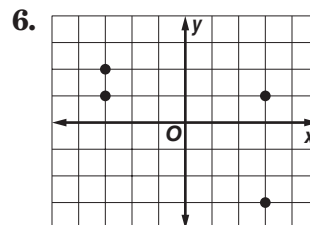
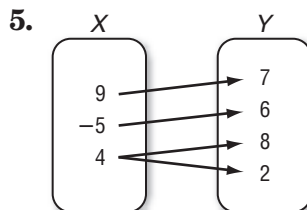
3. $\{(3, -2), (1, 0), (-2, 4), (3, 1)\}$



Express the relation shown in each table, mapping, or graph as a set of ordered pairs. Then write the inverse of the relation.

4.

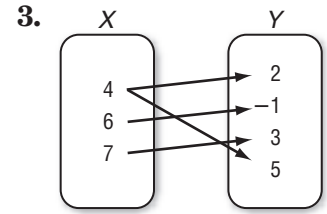
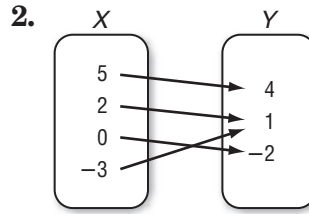
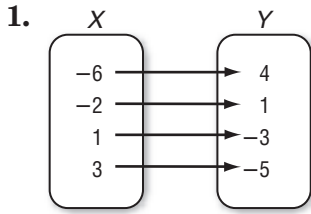
x	y
3	-5
-4	3
7	6
1	-2



3-2 Skills Practice

Representing Functions

Determine whether each relation is a function.



4.

x	y
4	-5
-1	-10
0	-9
1	-7
9	1

5.

x	y
2	7
5	-3
3	5
-4	-2
5	2

6.

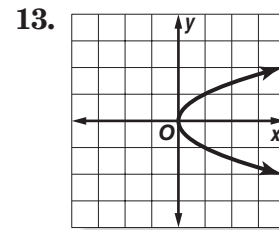
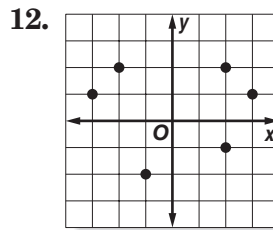
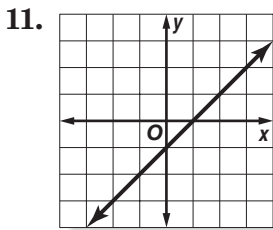
x	y
3	7
-1	1
1	0
3	5
7	3

7. $\{(2, 5), (4, -2), (3, 3), (5, 4), (-2, 5)\}$

8. $\{(6, -1), (-4, 2), (5, 2), (4, 6), (6, 5)\}$

9. $y = 2x - 5$

10. $y = 11$



If $f(x) = 3x + 2$ and $g(x) = x^2 - x$, find each value.

14. $f(4)$

15. $f(8)$

16. $f(-2)$

17. $g(2)$

18. $g(-3)$

19. $g(-6)$

20. $f(2) + 1$

21. $f(1) - 1$

22. $g(2) - 2$

23. $g(-1) + 4$

24. $f(x + 1)$

25. $g(3b)$

3-3 Skills Practice

Linear Functions

Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. $xy = 6$

2. $y = 2 - 3x$

3. $5x = y - 4$

4. $y = 2x + 5$

5. $y = -7 + 6x$

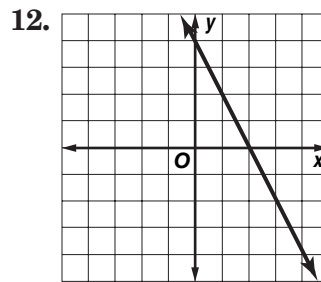
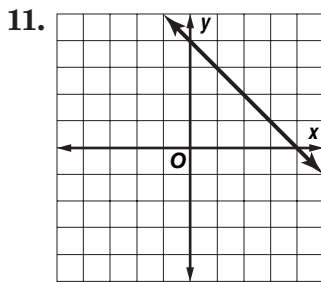
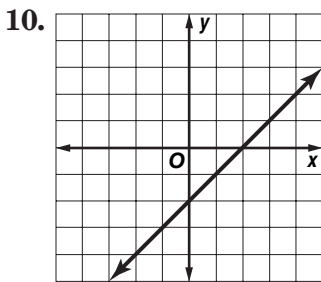
6. $y = 3x^2 + 1$

7. $y - 4 = 0$

8. $5x + 6y = 3x + 2$

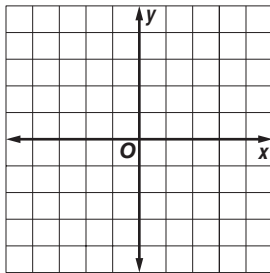
9. $\frac{1}{2}y = 1$

Determine the x -intercept and y -intercept of each graph.

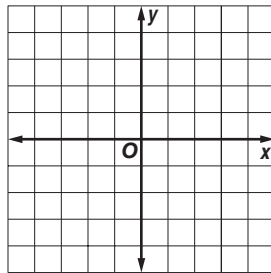


Graph each equation by making a table.

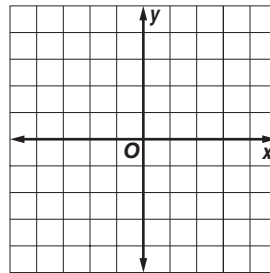
13. $y = 4$



14. $y = 3x$

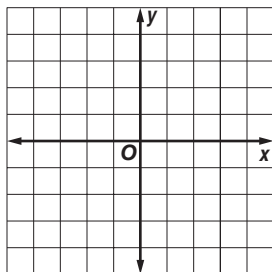


15. $y = x + 4$

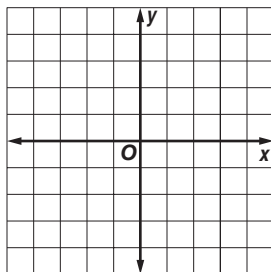


Graph each equation by using the x -intercept and y -intercept.

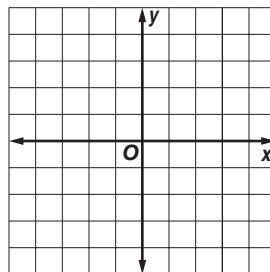
16. $x - y = 3$



17. $10x = -5y$



18. $4x = 2y + 6$



3-4 Skills Practice

Arithmetic Sequences

Determine whether each sequence is an arithmetic sequence. If it is, state the common difference.

1. 4, 7, 9, 12, ...

2. 15, 13, 11, 9, ...

3. 7, 10, 13, 16, ...

4. -6, -5, -3, -1, ...

5. -5, -3, -1, 1, ...

6. -9, -12, -15, -18, ...

Find the next three terms of each arithmetic sequence.

7. 3, 7, 11, 15, ...

8. 22, 20, 18, 16, ...

9. -13, -11, -9, -7, ...

10. -2, -5, -8, -11, ...

11. 19, 24, 29, 34, ...

12. 16, 7, -2, -11, ...

Find the n th term of each arithmetic sequence described.

13. $a_1 = 6, d = 3, n = 12$

14. $a_1 = -2, d = 5, n = 11$

15. $a_1 = 10, d = -3, n = 15$

16. $a_1 = -3, d = -3, n = 22$

17. $a_1 = 24, d = 8, n = 25$

18. $a_1 = 8, d = -6, n = 14$

19. 8, 13, 18, 23, ... for $n = 17$

20. -10, -3, 4, 11, ... for $n = 12$

21. 12, 10, 8, 6, ... for $n = 16$

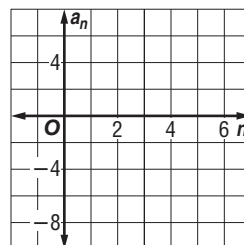
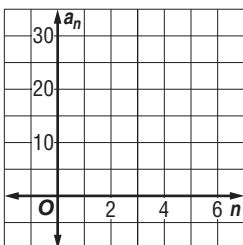
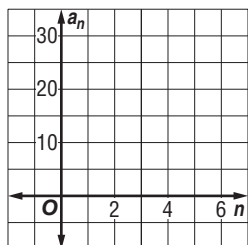
22. 12, 7, 2, -3, ... for $n = 25$

Write an equation for the n th term of each arithmetic sequence. Then graph the first five terms of the sequence.

23. 7, 13, 19, 25, ...

24. 30, 26, 22, 18, ...

25. -7, -4, -1, 2, ...



3-5 Skills Practice

Describing Number Patterns

Find the next two items for each pattern. Then find the 19th figure in the pattern.



Find the next three terms in each sequence.

3. 1, 4, 10, 19, 31, ...

4. 15, 14, 16, 15, 17, 16, ...

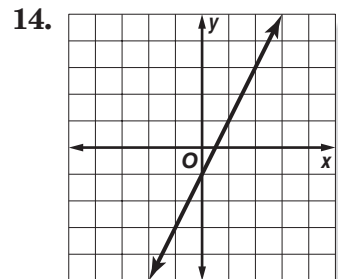
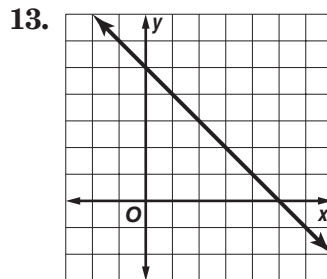
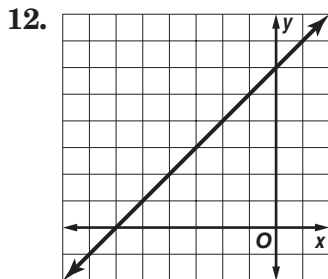
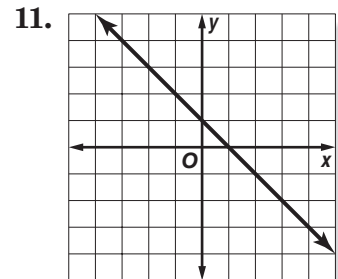
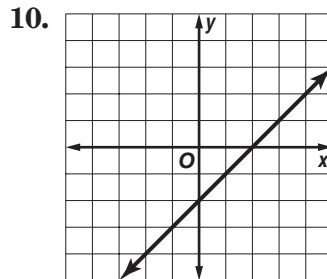
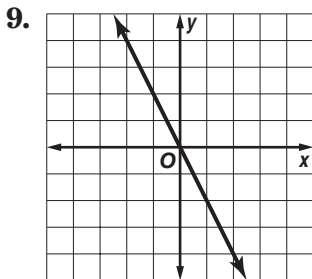
5. 29, 28, 26, 23, 19, ...

6. 2, 3, 2, 4, 2, 5, ...

7. $x, x - 1, x - 2, \dots$

8. $y, 4y, 9y, 16y, \dots$

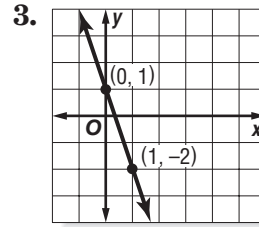
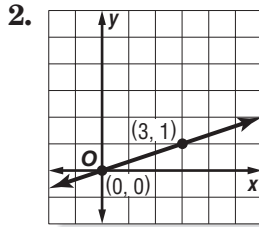
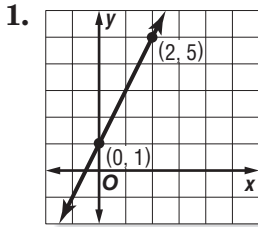
Write an equation in function notation for each relation.



4-1 Skills Practice

Rate of Change and Slope

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



4. $(2, 5), (3, 6)$

5. $(6, 1), (-6, 1)$

6. $(4, 6), (4, 8)$

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

8. $(2, 5), (-3, -5)$

9. $(9, 8), (7, -8)$

10. $(-5, -8), (-8, 1)$

11. $(-3, 10), (-3, 7)$

12. $(17, 18), (18, 17)$

13. $(-6, -4), (4, 1)$

14. $(10, 0), (-2, 4)$

15. $(2, -1), (-8, -2)$

16. $(5, -9), (3, -2)$

17. $(12, 6), (3, -5)$

18. $(-4, 5), (-8, -5)$

19. $(-5, 6), (7, -8)$

Find the value of r so the line that passes through each pair of points has the given slope.

20. $(r, 3), (5, 9), m = 2$

21. $(5, 9), (r, -3), m = -4$

22. $(r, 2), (6, 3), m = \frac{1}{2}$

23. $(r, 4), (7, 1), m = \frac{3}{4}$

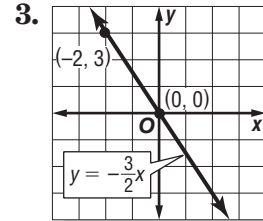
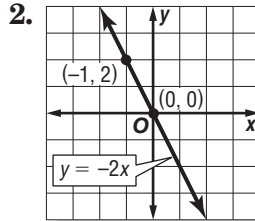
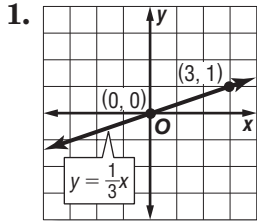
24. $(5, 3), (r, -5), m = 4$

25. $(7, r), (4, 6), m = 0$

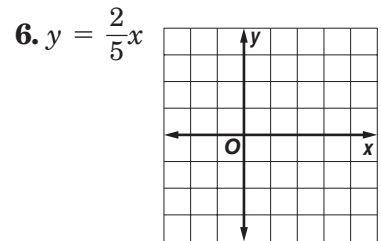
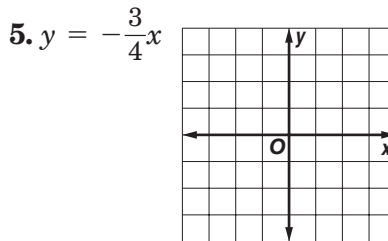
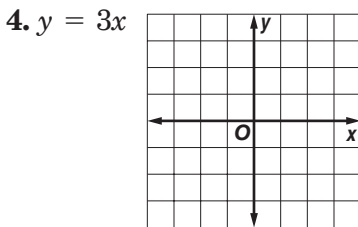
4-2 Skills Practice

Slope and Direct Variation

Name the constant of variation for each equation. Then determine the slope of the line that passes through each pair of points.



Graph each equation.



Write a direct variation equation that relates x and y . Assume that y varies directly as x . Then solve.

7. If $y = -8$ when $x = -2$, find x when $y = 32$.

8. If $y = 45$ when $x = 15$, find x when $y = 15$.

9. If $y = -4$ when $x = 2$, find y when $x = -6$.

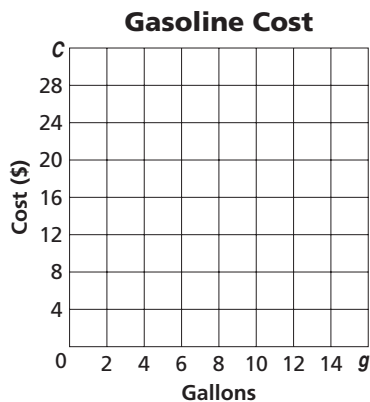
10. If $y = -9$ when $x = 3$, find y when $x = -5$.

11. If $y = 4$ when $x = 16$, find y when $x = 6$.

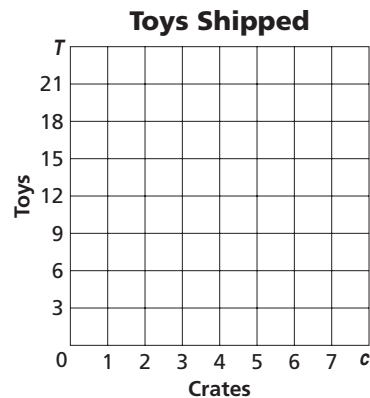
12. If $y = 12$ when $x = 18$, find x when $y = -16$.

Write a direct variation equation that relates the variables. Then graph the equation.

13. **TRAVEL** The total cost C of gasoline is \$1.80 times the number of gallons g .



14. **SHIPPING** The number of delivered toys T is 3 times the total number of crates c .



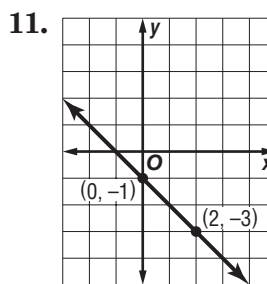
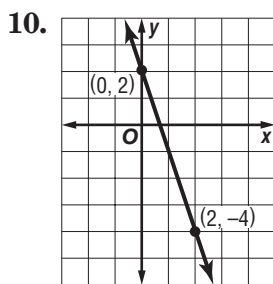
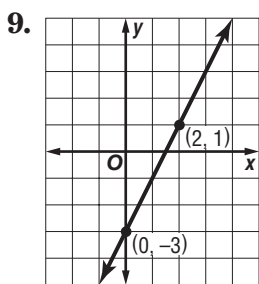
4-3 Skills Practice

Graphing Equations in Slope-Intercept Form

Write an equation of the line with the given slope and y-intercept.

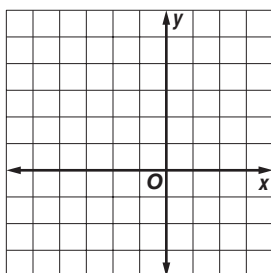
- | | |
|-------------------------------|-------------------------------|
| 1. slope: 5, y-intercept: -3 | 2. slope: -2, y-intercept: 7 |
| 3. slope: -6, y-intercept: -2 | 4. slope: 7, y-intercept: 1 |
| 5. slope: 3, y-intercept: 2 | 6. slope: -4, y-intercept: -9 |
| 7. slope: 1, y-intercept: -12 | 8. slope: 0, y-intercept: 8 |

Write an equation of the line shown in each graph.

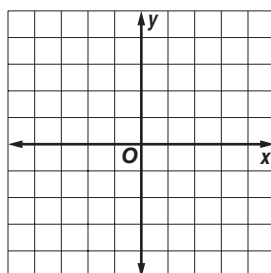


Graph each equation.

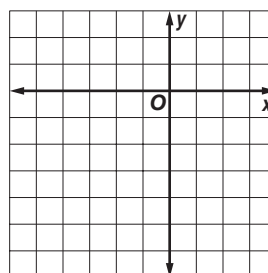
12. $y = x + 4$



13. $y = -2x - 1$



14. $x + y = -3$



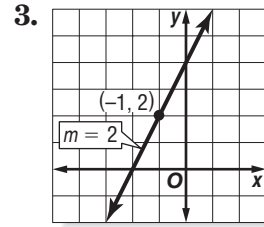
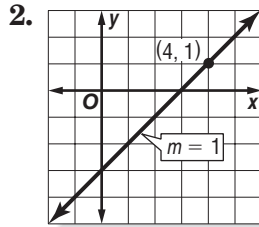
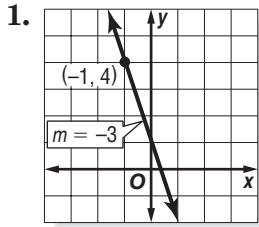
Write a linear equation in slope-intercept form to model each situation.

- A video store charges \$10 for a rental card plus \$2 per rental.
- A Norfolk pine is 18 inches tall and grows at a rate of 1.5 feet per year.
- A Cairn terrier weighs 30 pounds and is on a special diet to lose 2 pounds per month.
- An airplane at an altitude of 3000 feet descends at a rate of 500 feet per mile.

4-4 Skills Practice

Writing Equations in Slope-Intercept Form

Write an equation of the line that passes through each point with the given slope.



4. $(1, 9), m = 4$

5. $(4, 2), m = -2$

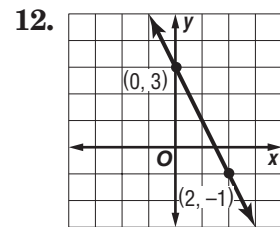
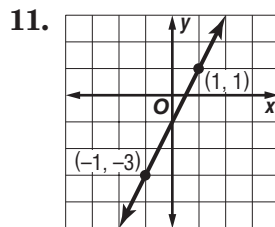
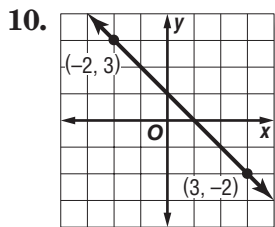
6. $(2, -2), m = 3$

7. $(3, 0), m = 5$

8. $(-3, -2), m = 2$

9. $(-5, 4), m = -4$

Write an equation of the line that passes through each pair of points.



13. $(1, 3), (-3, -5)$

14. $(1, 4), (6, -1)$

15. $(1, -1), (3, 5)$

16. $(-2, 4), (0, 6)$

17. $(3, 3), (1, -3)$

18. $(-1, 6), (3, -2)$

Write an equation of the line that has each pair of intercepts.

19. x -intercept: -3 , y -intercept: 6

20. x -intercept: 3 , y -intercept: 3

21. x -intercept: 1 , y -intercept: 2

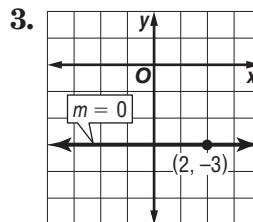
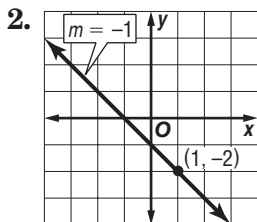
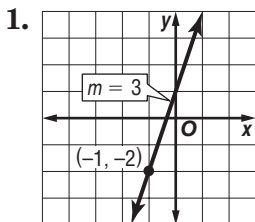
22. x -intercept: 2 , y -intercept: -4

23. x -intercept: -4 , y -intercept: -8

24. x -intercept: -1 , y -intercept: 4

4-5 Skills Practice**Writing Equations in Point-Slope Form**

Write the point-slope form of an equation for a line that passes through each point with the given slope.



4. $(3, 1), m = 0$

5. $(-4, 6), m = 8$

6. $(1, -3), m = -4$

7. $(4, -6), m = 1$

8. $(3, 3), m = \frac{4}{3}$

9. $(-5, -1), m = -\frac{5}{4}$

Write each equation in standard form.

10. $y + 1 = x + 2$

11. $y + 9 = -3(x - 2)$

12. $y - 7 = 4(x + 4)$

13. $y - 4 = -(x - 1)$

14. $y - 6 = 4(x + 3)$

15. $y + 5 = -5(x - 3)$

16. $y - 10 = -2(x - 3)$

17. $y - 2 = -\frac{1}{2}(x - 4)$

18. $y + 11 = \frac{1}{3}(x + 3)$

Write each equation in slope-intercept form.

19. $y - 4 = 3(x - 2)$

20. $y + 2 = -(x + 4)$

21. $y - 6 = -2(x + 2)$

22. $y + 1 = -5(x - 3)$

23. $y - 3 = 6(x - 1)$

24. $y - 8 = 3(x + 5)$

25. $y - 2 = \frac{1}{2}(x + 6)$

26. $y + 1 = -\frac{1}{3}(x + 9)$

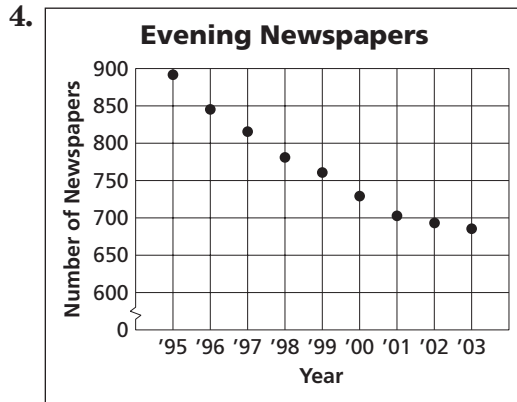
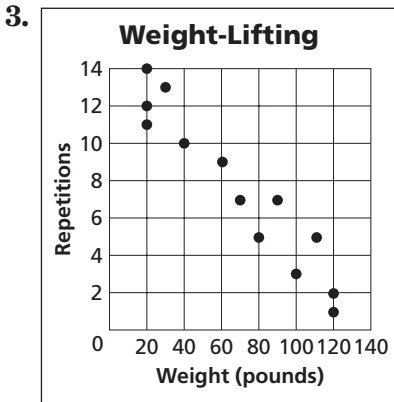
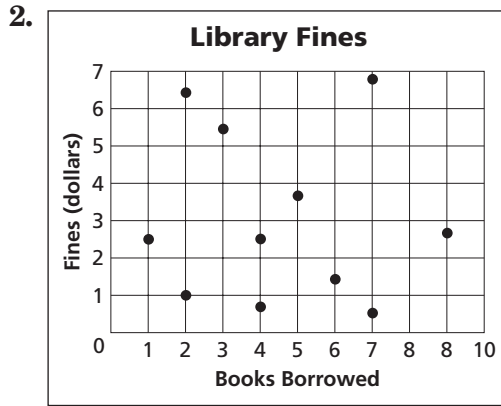
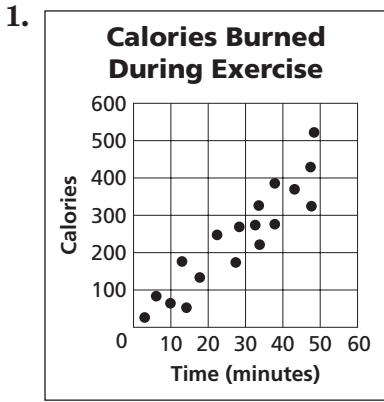
27. $y - \frac{1}{2} = x + \frac{1}{2}$

4-6

Skills Practice

Statistics: Scatter Plots and Lines of Fit

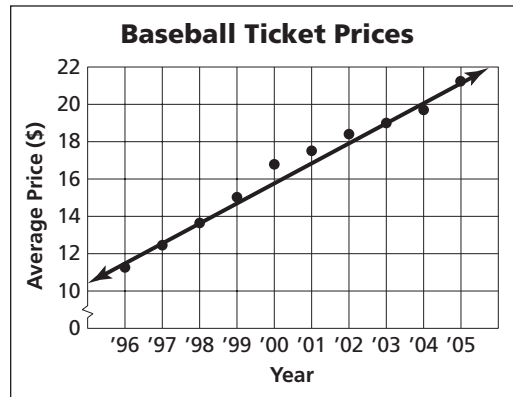
Determine whether each graph shows a *positive correlation*, a *negative correlation*, or *no correlation*. If there is a positive or negative correlation, describe its meaning in the situation.



Source: Editor & Publisher

BASEBALL For Exercises 5–7, use the scatter plot that shows the average price of a major-league baseball ticket from 1991 to 2005.

- Determine what relationship, if any, exists in the data. Explain.
- Use the points (1998, 13.60) and (2003, 19.00) to write the slope-intercept form of an equation for the line of fit shown in the scatter plot.
- Predict the price of a ticket in 2009.

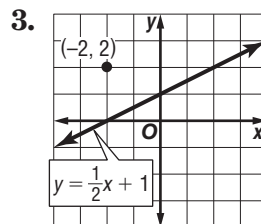
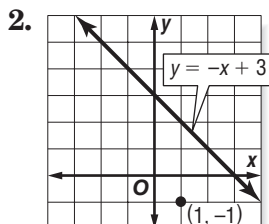
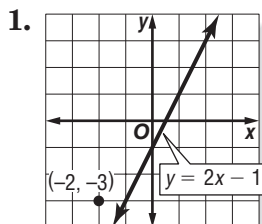


Source: Team Marketing Report, Chicago

4-7 Skills Practice

Geometry: Parallel and Perpendicular Lines

Write the slope-intercept form of an equation of the line that passes through the given point and is parallel to the graph of each equation.



4. $(3, 2), y = 3x + 4$

5. $(-1, -2), y = -3x + 5$

6. $(-1, 1), y = x - 4$

7. $(1, -3), y = -4x - 1$

8. $(-4, 2), y = x + 3$

9. $(-4, 3), y = \frac{1}{2}x - 6$

10. $(4, 1), y = -\frac{1}{4}x + 7$

11. $(-5, -1), 2y = 2x - 4$

12. $(3, -1), 3y = x + 9$

Write the slope-intercept form of an equation of the line that passes through the given point and is perpendicular to the graph of each equation.

13. $(-3, -2), y = x + 2$

14. $(4, -1), y = 2x - 4$

15. $(-1, -6), x + 3y = 6$

16. $(-4, 5), y = -4x - 1$

17. $(-2, 3), y = \frac{1}{4}x - 4$

18. $(0, 0), y = \frac{1}{2}x - 1$

19. $(3, -3), y = \frac{3}{4}x + 5$

20. $(-5, 1), y = -\frac{5}{3}x - 7$

21. $(0, -2), y = -7x + 3$

22. $(2, 3), 2x + 10y = 3$

23. $(-2, 2), 6x + 3y = -9$

24. $(-4, -3), 8x - 2y = 16$

5-1 Skills Practice

Graphing Systems of Equations

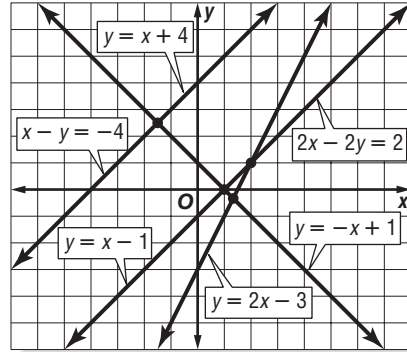
Use the graph at the right to determine whether each system has *no* solution, *one* solution, or *infinitely many* solutions.

1. $y = x - 1$
 $y = -x + 1$

2. $x - y = -4$
 $y = x + 4$

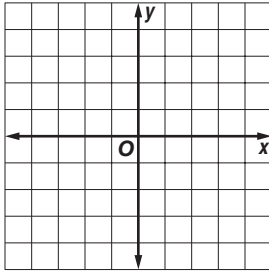
3. $y = x + 4$
 $2x - 2y = 2$

4. $y = 2x - 3$
 $2x - 2y = 2$

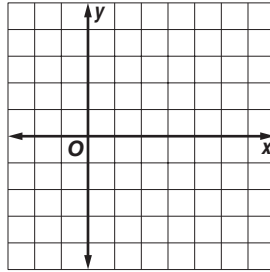


Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.

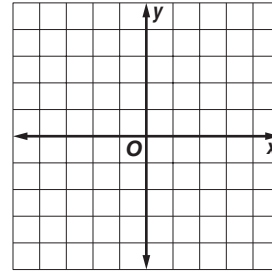
5. $2x - y = 1$
 $y = -3$



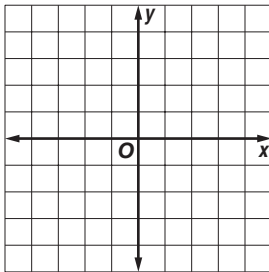
6. $x = 1$
 $2x + y = 4$



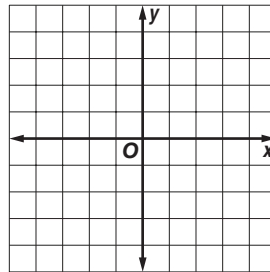
7. $3x + y = -3$
 $3x + y = 3$



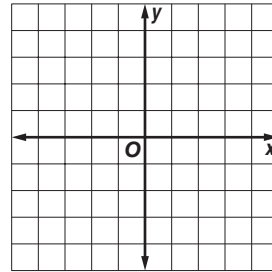
8. $y = x + 2$
 $x - y = -2$



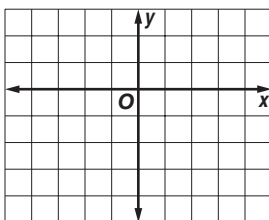
9. $x + 3y = -3$
 $x - 3y = -3$



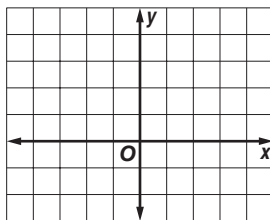
10. $y - x = -1$
 $x + y = 3$



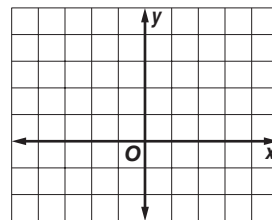
11. $x - y = 3$
 $x - 2y = 3$



12. $x + 2y = 4$
 $y = -\frac{1}{2}x + 2$



13. $y = 2x + 3$
 $3y = 6x - 6$



5-2 Skills Practice**Substitution**

Use substitution to solve each system of equations. If the system does *not* have exactly one solution, state whether it has *no* solution or *infinitely many* solutions.

1. $y = 4x$
 $x + y = 5$

2. $y = 2x$
 $x + 3y = -14$

3. $y = 3x$
 $2x + y = 15$

4. $x = -4y$
 $3x + 2y = 20$

5. $y = x - 1$
 $x + y = 3$

6. $x = y - 7$
 $x + 8y = 2$

7. $y = 4x - 1$
 $y = 2x - 5$

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

9. $2x - 3y = 21$
 $y = 3 - x$

10. $y = 5x - 8$
 $4x + 3y = 33$

11. $x + 2y = 13$
 $3x - 5y = 6$

12. $x + 5y = 4$
 $3x + 15y = -1$

13. $3x - y = 4$
 $2x - 3y = -9$

14. $x + 4y = 8$
 $2x - 5y = 29$

15. $x - 5y = 10$
 $2x - 10y = 20$

16. $5x - 2y = 14$
 $2x - y = 5$

17. $2x + 5y = 38$
 $x - 3y = -3$

18. $x - 4y = 27$
 $3x + y = -23$

19. $2x + 2y = 7$
 $x - 2y = -1$

20. $2.5x + y = -2$
 $3x + 2y = 0$

5-3 Skills Practice***Elimination Using Addition and Subtraction***

Use elimination to solve each system of equations.

$$\begin{aligned} 1. \quad x - y &= 1 \\ x + y &= 3 \end{aligned}$$

$$\begin{aligned} 2. \quad -x + y &= 1 \\ x + y &= 11 \end{aligned}$$

$$\begin{aligned} 3. \quad x + 4y &= 11 \\ x - 6y &= 11 \end{aligned}$$

$$\begin{aligned} 4. \quad -x + 3y &= 6 \\ x + 3y &= 18 \end{aligned}$$

$$\begin{aligned} 5. \quad 3x + 4y &= 19 \\ 3x + 6y &= 33 \end{aligned}$$

$$\begin{aligned} 6. \quad x + 4y &= -8 \\ x - 4y &= -8 \end{aligned}$$

$$\begin{aligned} 7. \quad 3a + 4b &= 2 \\ 4a - 4b &= 12 \end{aligned}$$

$$\begin{aligned} 8. \quad 3c - d &= -1 \\ -3c - d &= 5 \end{aligned}$$

$$\begin{aligned} 9. \quad 2x - 3y &= 9 \\ -5x - 3y &= 30 \end{aligned}$$

$$\begin{aligned} 10. \quad x - y &= 4 \\ 2x + y &= -4 \end{aligned}$$

$$\begin{aligned} 11. \quad 3m - n &= 26 \\ -2m - n &= -24 \end{aligned}$$

$$\begin{aligned} 12. \quad 5x - y &= -6 \\ -x + y &= 2 \end{aligned}$$

$$\begin{aligned} 13. \quad 6x - 2y &= 32 \\ 4x - 2y &= 18 \end{aligned}$$

$$\begin{aligned} 14. \quad 3x + 2y &= -19 \\ -3x - 5y &= 25 \end{aligned}$$

$$\begin{aligned} 15. \quad 7m + 4n &= 2 \\ 7m + 2n &= 8 \end{aligned}$$

$$\begin{aligned} 16. \quad 2x - 5y &= -28 \\ 4x + 5y &= 4 \end{aligned}$$

17. The sum of two numbers is 28 and their difference is 4. What are the numbers?

18. Find the two numbers whose sum is 29 and whose difference is 15.

19. The sum of two numbers is 24 and their difference is 2. What are the numbers?

20. Find the two numbers whose sum is 54 and whose difference is 4.

21. Two times a number added to another number is 25. Three times the first number minus the other number is 20. Find the numbers.

5-4 Skills Practice***Elimination Using Multiplication***

Use elimination to solve each system of equations.

$$\begin{aligned} 1. \quad x + y &= -9 \\ 5x - 2y &= 32 \end{aligned}$$

$$\begin{aligned} 2. \quad 3x + 2y &= -9 \\ x - y &= -13 \end{aligned}$$

$$\begin{aligned} 3. \quad 2x + 5y &= 3 \\ -x + 3y &= -7 \end{aligned}$$

$$\begin{aligned} 4. \quad 2x + y &= 3 \\ -4x - 4y &= -8 \end{aligned}$$

$$\begin{aligned} 5. \quad 4x - 2y &= -14 \\ 3x - y &= -8 \end{aligned}$$

$$\begin{aligned} 6. \quad 2x + y &= 0 \\ 5x + 3y &= 2 \end{aligned}$$

$$\begin{aligned} 7. \quad 5x + 3y &= -10 \\ 3x + 5y &= -6 \end{aligned}$$

$$\begin{aligned} 8. \quad 2x + 3y &= 14 \\ 3x - 4y &= 4 \end{aligned}$$

$$\begin{aligned} 9. \quad 2x - 3y &= 21 \\ 5x - 2y &= 25 \end{aligned}$$

$$\begin{aligned} 10. \quad 3x + 2y &= -26 \\ 4x - 5y &= -4 \end{aligned}$$

$$\begin{aligned} 11. \quad 3x - 6y &= -3 \\ 2x + 4y &= 30 \end{aligned}$$

$$\begin{aligned} 12. \quad 5x + 2y &= -3 \\ 3x + 3y &= 9 \end{aligned}$$

13. Two times a number plus three times another number equals 13. The sum of the two numbers is 7. What are the numbers?

14. Four times a number minus twice another number is -16 . The sum of the two numbers is -1 . Find the numbers.

Determine the best method to solve each system of equations. Then solve the system.

$$\begin{aligned} 15. \quad 2x + 3y &= 10 \\ 5x + 2y &= -8 \end{aligned}$$

$$\begin{aligned} 16. \quad 8x - 7y &= 18 \\ 3x + 7y &= 26 \end{aligned}$$

$$\begin{aligned} 17. \quad y &= 2x \\ 3x + 2y &= 35 \end{aligned}$$

$$\begin{aligned} 18. \quad 3x + y &= 6 \\ 3x + y &= 3 \end{aligned}$$

$$\begin{aligned} 19. \quad 3x - 4y &= 17 \\ 4x + 5y &= 2 \end{aligned}$$

$$\begin{aligned} 20. \quad y &= 3x + 1 \\ 3x - y &= -1 \end{aligned}$$

5-5 Skills Practice***Applying Systems of Linear Equations***

Determine the best method to solve each system of equations. Then solve the system.

1. $5x + 3y = 16$
 $3x - 5y = -4$

2. $3x - 5y = 7$
 $2x + 5y = 13$

3. $y = 3x - 24$
 $5x - y = 8$

4. $-11x - 10y = 17$
 $5x - 7y = 50$

5. $4x + y = 24$
 $5x - y = 12$

6. $6x - y = -145$
 $x = 4 - 2y$

7. VEGETABLE STAND A roadside vegetable stand sells pumpkins for \$5 each and squashes for \$3 each. One day they sold 6 more squash than pumpkins, and their sales totaled \$98. Write and solve a system of equations to find how many pumpkins and squash they sold?

8. INCOME Ramiro earns \$20 per hour during the week and \$30 per hour for overtime on the weekends. One week Ramiro earned a total of \$650. He worked 5 times as many hours during the week as he did on the weekend. Write and solve a system of equations to determine how many hours of overtime Ramiro worked on the weekend.

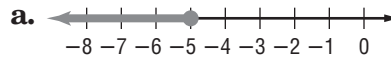
9. BASKETBALL Anya makes 14 baskets during her game. Some of these baskets were worth 2-points and others were worth 3-points. In total, she scored 30 points. Write and solve a system of equations to find how 2-points baskets she made.

6-1 Skills Practice

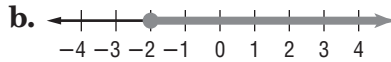
Solving Inequalities by Addition and Subtraction

Match each inequality with its corresponding graph.

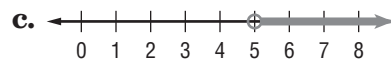
1. $x + 11 > 16$



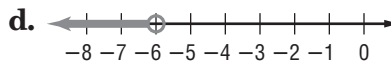
2. $x - 6 < 1$



3. $x + 2 \leq -3$



4. $x + 3 \geq 1$

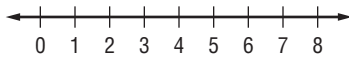


5. $x - 1 < -7$

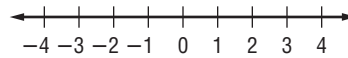


Solve each inequality. Then check your solution, and graph it on a number line.

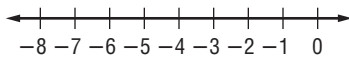
6. $d - 5 \leq 1$



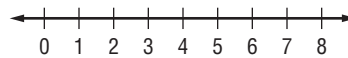
7. $s + 9 < 8$



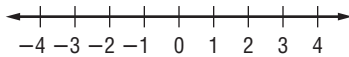
8. $a - 7 > -13$



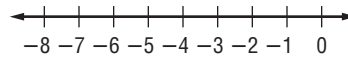
9. $w - 1 < 4$



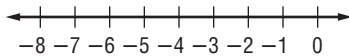
10. $4 \geq k + 3$



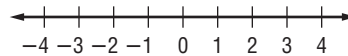
11. $-9 \leq b - 4$



12. $-2 \geq x + 4$



13. $2y < y + 2$



Define a variable, write an inequality, and solve each problem. Then check your solution.

14. A number decreased by 10 is greater than -5 .
15. A number increased by 1 is less than 9.
16. Seven more than a number is less than or equal to -18 .
17. Twenty less than a number is at least 15.
18. A number plus 2 is at most 1.

6-2 Skills Practice***Solving Inequalities by Multiplication and Division*****Match each inequality with its corresponding statement.**

- | | |
|--------------------------|------------------------------------------------------------|
| 1. $3n < 9$ | a. Three times a number is at most nine. |
| 2. $\frac{1}{3}n \geq 9$ | b. One third of a number is no more than nine. |
| 3. $3n \leq 9$ | c. Negative three times a number is more than nine. |
| 4. $-3n > 9$ | d. Three times a number is less than nine. |
| 5. $\frac{1}{3}n \leq 9$ | e. Negative three times a number is at least nine. |
| 6. $-3n \geq 9$ | f. One third of a number is greater than or equal to nine. |

Solve each inequality. Then check your solution.

- | | | | |
|----------------------------|-----------------------|----------------------------|----------------------------|
| 7. $14g > 56$ | 8. $11w \leq 77$ | 9. $20b \geq -120$ | 10. $-8r < 16$ |
| 11. $-15p \leq -90$ | 12. $\frac{s}{4} < 9$ | 13. $\frac{a}{9} \geq -15$ | 14. $-\frac{p}{7} > -9$ |
| 15. $-\frac{t}{12} \geq 6$ | 16. $5z < -90$ | 17. $-13m > -26$ | 18. $\frac{k}{5} \leq -17$ |
| 19. $-y < 36$ | 20. $-16c \geq -224$ | 21. $-\frac{h}{10} \leq 2$ | 22. $12 > \frac{d}{12}$ |

Define a variable, write an inequality, and solve each problem. Then check your solution.

23. Four times a number is greater than -48 .
24. One eighth of a number is less than or equal to 3 .
25. Negative twelve times a number is no more than 84 .
26. Negative one sixth of a number is less than -9 .
27. Eight times a number is at least 16 .

6-3 Skills Practice**Solving Multi-Step Inequalities****Justify each indicated step.**

1. $\frac{3}{4}t - 3 \geq -15$

$\frac{3}{4}t - 3 + 3 \geq -15 + 3$ a. ?

$\frac{3}{4}t \geq -12$

$\frac{4}{3}\left(\frac{3}{4}\right)t \geq \frac{4}{3}(-12)$ b. ?

$t \geq -16$

2. $5(k + 8) - 7 \leq 23$

$5k + 40 - 7 \leq 23$ a. ?

$5k + 33 \leq 23$

$5k + 33 - 33 \leq 23 - 33$ b. ?

$5k \leq -10$

$\frac{5k}{5} \leq \frac{-10}{5}$ c. ?

$k \leq -2$

Solve each inequality. Then check your solution.

3. $-2b + 4 > -6$

4. $3x + 15 \leq 21$

5. $\frac{d}{2} - 1 \geq 3$

6. $\frac{2}{5}a - 4 < 2$

7. $-\frac{t}{5} + 7 > -4$

8. $\frac{3}{4}j - 10 \geq 5$

9. $-\frac{2}{3}f + 3 < -9$

10. $2p + 5 \geq 3p - 10$

11. $4k + 15 > -2k + 3$

12. $2(-3m - 5) \geq -28$

13. $-6(w + 1) < 2(w + 5)$

14. $2(q - 3) + 6 \leq -10$

Define a variable, write an inequality, and solve each problem. Then check your solution.

15. Four more than the quotient of a number and three is at least nine.

16. The sum of a number and fourteen is less than or equal to three times the number.

17. Negative three times a number increased by seven is less than negative eleven.

18. Five times a number decreased by eight is at most ten more than twice the number.

19. Seven more than five sixths of a number is more than negative three.

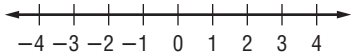
20. Four times the sum of a number and two increased by three is at least twenty-seven.

6-4 Skills Practice

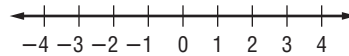
Solving Compound Inequalities

Graph the solution set of each compound inequality.

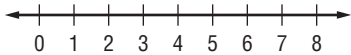
1. $b > 3$ or $b \leq 0$



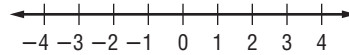
2. $z \leq 3$ and $z \geq -2$



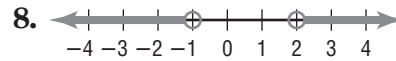
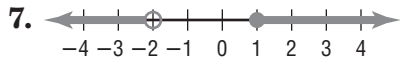
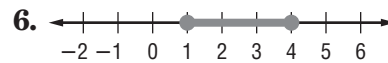
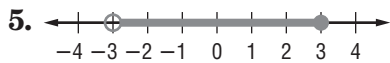
3. $k > 1$ and $k > 5$



4. $y < -1$ or $y \geq 1$

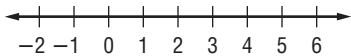


Write a compound inequality for each graph.

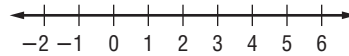


Solve each compound inequality. Then graph the solution set.

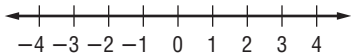
9. $m + 3 \geq 5$ and $m + 3 < 7$



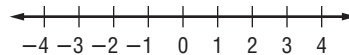
10. $y - 5 < -4$ or $y - 5 \geq 1$



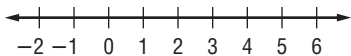
11. $4 < f + 6$ and $f + 6 < 5$



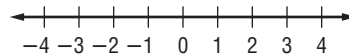
12. $w + 3 \leq 0$ or $w + 7 \geq 9$



13. $-6 < b - 4 < 2$



14. $p - 2 \leq -2$ or $p - 2 > 1$



Define a variable, write an inequality, and solve each problem. Then check your solution.

15. A number plus one is greater than negative five and less than three.

16. A number decreased by two is at most four or at least nine.

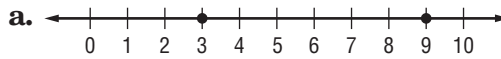
17. The sum of a number and three is no more than eight or is more than twelve.

6-5 Skills Practice

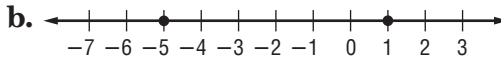
Solving Open Sentences Involving Absolute Value

Match each open sentence with the graph of its solution set.

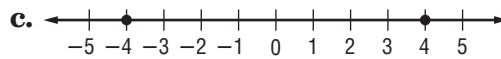
1. $|x| = 4$



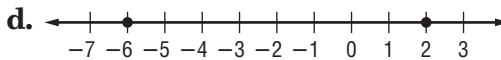
2. $|x - 6| = 3$



3. $|2x + 4| = 8$



4. $|x + 2| = 3$

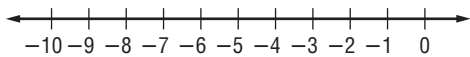


Express each statement as an open sentence using absolute value.

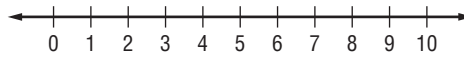
- 5. Jordan's highest and lowest test scores are 7 percentage points from 89%.
- 6. The normal human body temperature varies 1.5°F from the average 98.6°F .
- 7. Last year, 224 students attended the Homecoming game. This year, the Student Council expects student attendance to be within 36 of the previous years' attendance.

Solve each open sentence. Then graph the solution set.

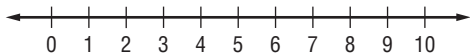
8. $|d + 5| = 1$



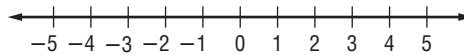
9. $|2f - 9| = 1$



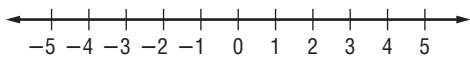
10. $|g - 4| = 3$



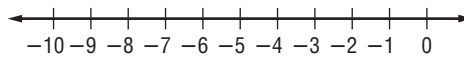
11. $|w + 3| = 1$



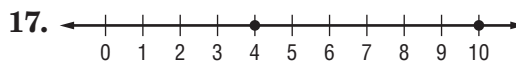
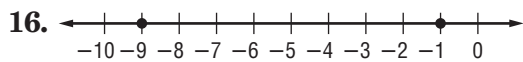
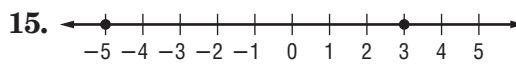
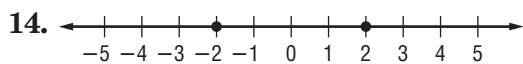
12. $|3s| = 12$



13. $|c + 6| = 2$



For each graph, write an open sentence involving absolute value.

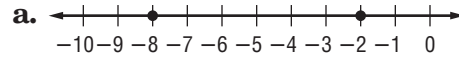


6-6 Skills Practice

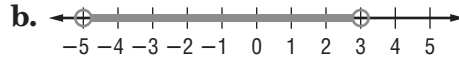
Solving Inequalities Involving Absolute Value

Match each open sentence with the graph of its solution set.

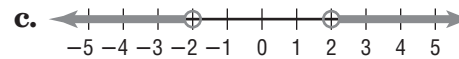
1. $|x| > 2$



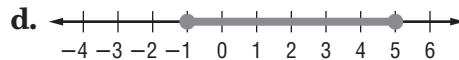
2. $|x + 5| \geq 3$



3. $|x - 2| \leq 3$



4. $|x + 1| < 4$



Express each statement using an inequality involving absolute value. Do *not* solve.

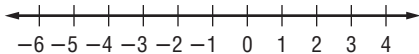
5. The weatherman predicted that the temperature would be within 3° of 52°F .

6. Serena will make the B team if she scores within 8 points of the team average of 92.

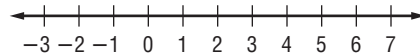
7. The dance committee expects attendance to number within 25 of last year's 87 students.

Solve each open sentence. Then graph the solution set.

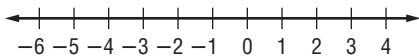
8. $|s + 1| \leq 5$



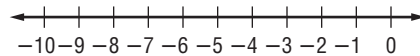
9. $|c - 3| < 1$



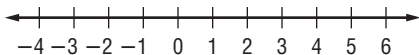
10. $|n + 2| \geq 1$



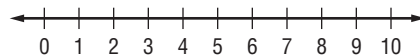
11. $|t + 6| > 4$



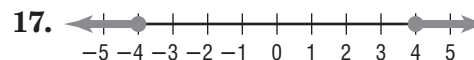
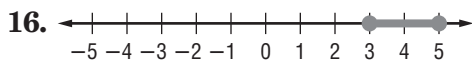
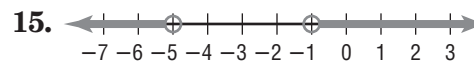
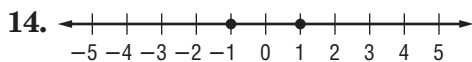
12. $|w - 2| > 2$



13. $|k - 5| \leq 4$



For each graph, write an open sentence involving absolute value.



6-7 Skills Practice

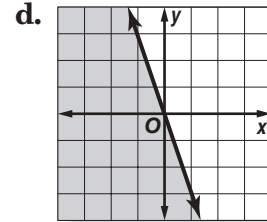
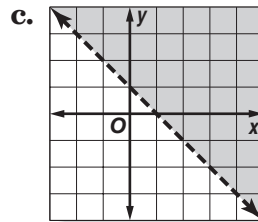
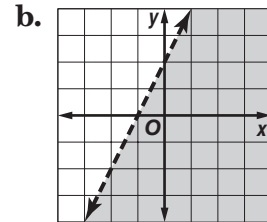
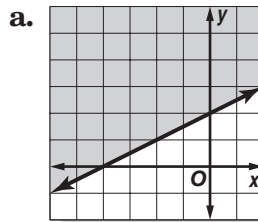
Graphing Inequalities in Two Variables

Determine which ordered pairs are part of the solution set for each inequality.

1. $y > 3x$, $\{(1, 5), (1, 0), (-1, 0), (5, 1)\}$
2. $y \geq x + 3$, $\{(2, -3), (-2, -1), (1, 6), (3, 4)\}$
3. $y < x - 1$, $\{(3, 1), (-2, -4), (4, -2), (-3, 3)\}$

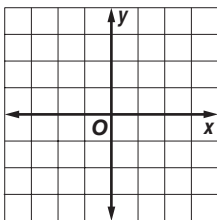
Match each inequality with its graph.

4. $y - 2x < 2$
5. $y \leq -3x$
6. $2y - x \geq 4$
7. $x + y > 1$

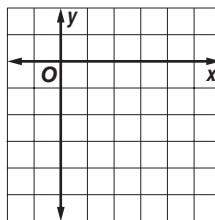


Graph each inequality.

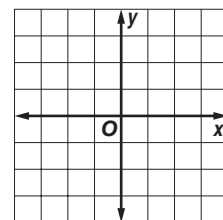
8. $y < -1$



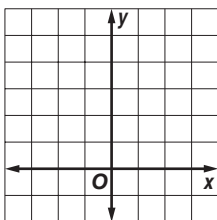
9. $y \geq x - 5$



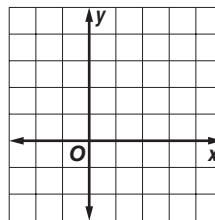
10. $y > 3x$



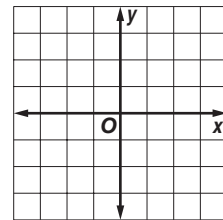
11. $y \leq 2x + 4$



12. $y + x > 3$



13. $y - x \geq 1$

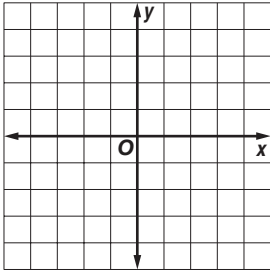


6-8 Skills Practice

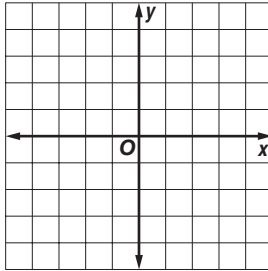
Graphing Systems of Inequalities

Solve each system of inequalities by graphing.

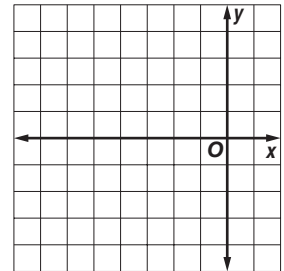
1. $x > -1$
 $y \leq -3$



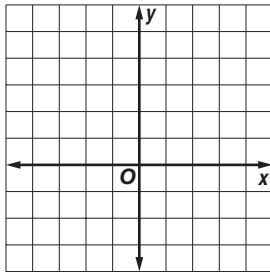
2. $y > 2$
 $x < -2$



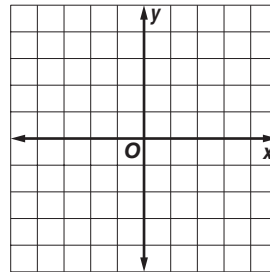
3. $y > x + 3$
 $y \leq -1$



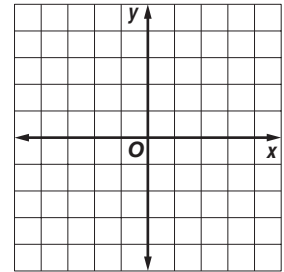
4. $x < 2$
 $y - x \leq 2$



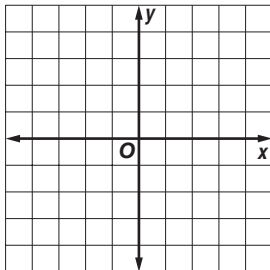
5. $x + y \leq -1$
 $x + y \geq 3$



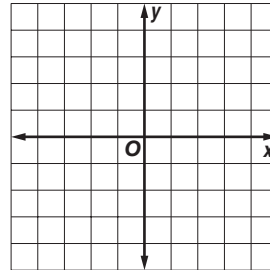
6. $y - x > 4$
 $x + y > 2$



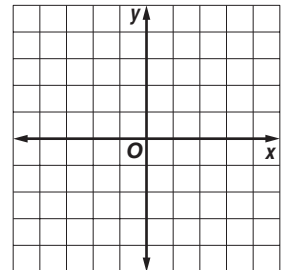
7. $y > x + 1$
 $y \geq -x + 1$



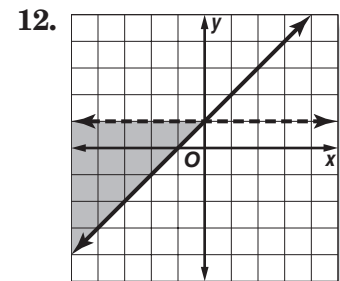
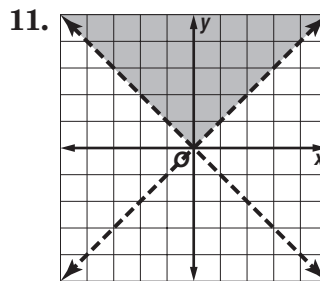
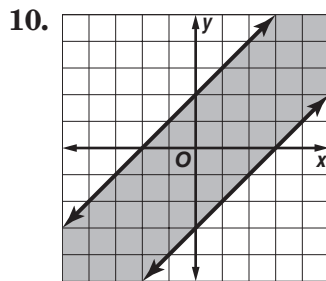
8. $y \geq -x + 2$
 $y < 2x - 2$



9. $y < 2x + 4$
 $y \geq x + 1$



Write a system of inequalities for each graph.



7-1 Skills Practice**Multiplying Monomials**

Determine whether each expression is a monomial. Write *yes* or *no*. Explain.

1. 11

2. $a - b$

3. $\frac{p^2}{q^2}$

4. y

5. j^3k

6. $2a + 3b$

Simplify.

7. $a^2(a^3)(a^6)$

8. $x(x^2)(x^7)$

9. $(y^2z)(yz^2)$

10. $(\ell^2k^2)(\ell^3k)$

11. $(e^2f^4)(e^2f^2)$

12. $(cd^2)(c^3d^2)$

13. $(2x^2)(3x^5)$

14. $(5a^7)(4a^2)$

15. $(4xy^3)(3x^3y^5)$

16. $(7a^5b^2)(a^2b^3)$

17. $(-5m^3)(3m^8)$

18. $(-2c^4d)(-4cd)$

19. $(10^2)^3$

20. $(p^3)^{12}$

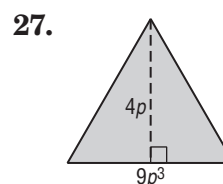
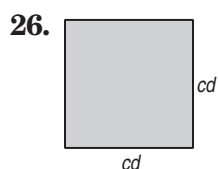
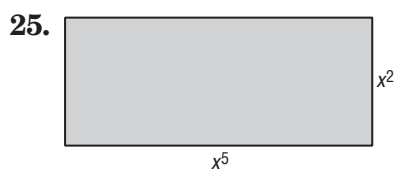
21. $(-6p)^2$

22. $(-3y)^3$

23. $(3pq^2)^2$

24. $(2b^3c^4)^2$

GEOMETRY Express the area of each figure as a monomial.



7-2 Skills Practice***Dividing Monomials***

Simplify. Assume that no denominator is equal to zero.

1. $\frac{6^5}{6^4}$

2. $\frac{9^{12}}{9^8}$

3. $\frac{x^4}{x^2}$

4. $\frac{r^3s^2}{r^3s^4}$

5. $\frac{m}{m^3}$

6. $\frac{9d^7}{3d^6}$

7. $\frac{12n^5}{36n}$

8. $\frac{w^4u^3}{w^4u}$

9. $\frac{a^3b^5}{ab^2}$

10. $\frac{m^7n^2}{m^3n^2}$

11. $\frac{-21w^5u^2}{7w^4u^5}$

12. $\frac{32x^3y^2z^5}{-8xyz^2}$

13. $\left(\frac{4p^7}{7s^2}\right)^2$

14. 4^{-4}

15. 8^{-2}

16. $\left(\frac{5}{3}\right)^{-2}$

17. $\left(\frac{9}{11}\right)^{-1}$

18. $\frac{h^3}{h^{-6}}$

19. $k^0(k^4)(k^{-6})$

20. $k^{-1}(\ell^{-6})(m^3)$

21. $\frac{f^{-7}}{f^4}$

22. $\left(\frac{16p^5q^2}{2p^3q^3}\right)^0$

23. $\frac{f^{-5}g^4}{h^{-2}}$

24. $\frac{15x^6y^{-9}}{5xy^{-11}}$

25. $\frac{-15w^0u^{-1}}{5u^3}$

26. $\frac{48x^6y^7z^5}{-6xy^5z^6}$

7-3 Skills Practice**Polynomials**

State whether each expression is a polynomial. If the expression is a polynomial, identify it as a *monomial*, a *binomial*, or a *trinomial*.

1. $5mn + n^2$

2. $4by + 2b - by$

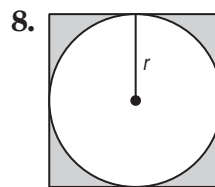
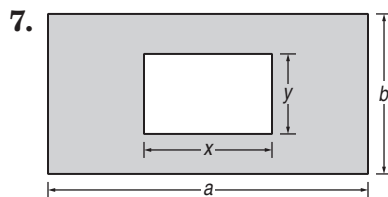
3. -32

4. $\frac{3x}{7}$

5. $5x^2 - 3x^{-4}$

6. $2c^2 + 8c + 9 - 3$

GEOMETRY Write a polynomial to represent the area of each shaded region.



Find the degree of each polynomial.

9. 12

10. $3r^4$

11. $b + 6$

12. $4a^3 - 2a$

13. $5abc - 2b^2 + 1$

14. $8x^5y^4 - 2x^8$

Arrange the terms of each polynomial so that the powers of x are in ascending order.

15. $3x + 1 + 2x^2$

16. $5x - 6 + 3x^2$

17. $9x^2 + 2 + x^3 + x$

18. $-3 + 3x^3 - x^2 + 4x$

19. $7r^5x + 21r^4 - r^2x^2 - 15x^3$

20. $3a^2x^4 + 14a^2 - 10x^3 + ax^2$

Arrange the terms of each polynomial so that the powers of x are in descending order.

21. $x^2 + 3x^3 + 27 - x$

22. $25 - x^3 + x$

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

24. $x^2 + 64 - x + 7x^3$

25. $2cx + 32 - c^3x^2 + 6x^3$

26. $13 - x^3y^3 + x^2y^2 + x$

7-4 Skills Practice***Adding and Subtracting Polynomials*****Find each sum or difference.**

1. $(2x + 3y) + (4x + 9y)$

2. $(6s + 5t) + (4t + 8s)$

3. $(5a + 9b) - (2a + 4b)$

4. $(11m - 7n) - (2m + 6n)$

5. $(m^2 - m) + (2m + m^2)$

6. $(x^2 - 3x) - (2x^2 + 5x)$

7. $(d^2 - d + 5) - (2d + 5)$

8. $(2e^2 - 5e) + (7e - 3e^2)$

9. $(5f + g - 2) + (-2f + 3)$

10. $(6k^2 + 2k + 9) + (4k^2 - 5k)$

11. $(x^3 - x + 1) - (3x - 1)$

12. $(b^2 + ab - 2) - (2b^2 + 2ab)$

13. $(7z^2 + 4 - z) - (-5 + 3z^2)$

14. $(5 + 4n + 2m) + (-6m - 8)$

15. $(4t^2 + 2) + (-4 + 2t)$

16. $(3g^3 + 7g) - (4g + 8g^3)$

17. $(2a^2 + 8a + 4) - (a^2 - 3)$

18. $(3x^2 - 7x + 5) - (-x^2 + 4x)$

19. $(7z^2 + z + 1) - (-4z + 3z^2 - 3)$

20. $(2c^2 + 7c + 4) + (c^2 + 1 - 9c)$

21. $(n^2 + 3n + 2) - (2n^2 - 6n - 2)$

22. $(a^2 + ab - 3b^2) + (b^2 + 4a^2 - ab)$

23. $(\ell^2 - 5\ell - 6) + (2\ell^2 + 5 + \ell)$

24. $(2m^2 + 5m + 1) - (4m^2 - 3m - 3)$

25. $(x^2 - 6x + 2) - (-5x^2 + 7x - 4)$

26. $(5b^2 - 9b - 5) + (b^2 - 6 + 2b)$

27. $(2x^2 - 6x - 2) + (x^2 + 4x) + (3x^2 + x + 5)$

7-5 Skills Practice***Multiplying a Polynomial by a Monomial*****Find each product.**

1. $a(4a + 3)$

2. $-c(11c + 4)$

3. $x(2x - 5)$

4. $2y(y - 4)$

5. $-3n(n^2 + 2n)$

6. $4h(3h - 5)$

7. $3x(5x^2 - x + 4)$

8. $7c(5 - 2c^2 + c^3)$

9. $-4b(1 - 9b - 2b^2)$

10. $6y(-5 - y + 4y^2)$

11. $2m^2(2m^2 + 3m - 5)$

12. $-3n^2(-2n^2 + 3n + 4)$

Simplify.

13. $w(3w + 2) + 5w$

14. $f(5f - 3) - 2f$

15. $-p(2p - 8) - 5p$

16. $y^2(-4y + 5) - 6y^2$

17. $2x(3x^2 + 4) - 3x^3$

18. $4a(5a^2 - 4) + 9a$

19. $4b(-5b - 3) - 2(b^2 - 7b - 4)$

20. $3m(3m + 6) - 3(m^2 + 4m + 1)$

Solve each equation.

21. $3(a + 2) + 5 = 2a + 4$

22. $2(4x + 2) - 8 = 4(x + 3)$

23. $5(y + 1) + 2 = 4(y + 2) - 6$

24. $4(b + 6) = 2(b + 5) + 2$

25. $6(m - 2) + 14 = 3(m + 2) - 10$

26. $3(c + 5) - 2 = 2(c + 6) + 2$

7-6 Skills Practice

Multiplying Polynomials

Find each product.

1. $(m + 4)(m + 1)$

2. $(x + 2)(x + 2)$

3. $(b + 3)(b + 4)$

4. $(t + 4)(t - 3)$

5. $(r + 1)(r - 2)$

6. $(z - 5)(z + 1)$

7. $(3c + 1)(c - 2)$

8. $(2x - 6)(x + 3)$

9. $(d - 1)(5d - 4)$

10. $(2\ell + 5)(\ell - 4)$

11. $(3n - 7)(n + 3)$

12. $(q + 5)(5q - 1)$

13. $(3b + 3)(3b - 2)$

14. $(2m + 2)(3m - 3)$

15. $(4c + 1)(2c + 1)$

16. $(5a - 2)(2a - 3)$

17. $(4h - 2)(4h - 1)$

18. $(x - y)(2x - y)$

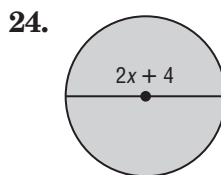
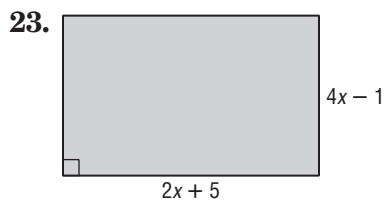
19. $(e + 4)(e^2 + 3e - 6)$

20. $(t + 1)(t^2 + 2t + 4)$

21. $(k + 4)(k^2 + 3k - 6)$

22. $(m + 3)(m^2 + 3m + 5)$

GEOMETRY Write an expression to represent the area of each figure.



7-7**Skills Practice*****Special Products*****Find each product.**

1. $(n + 3)^2$

2. $(x + 4)(x + 4)$

3. $(y - 7)^2$

4. $(t - 3)(t - 3)$

5. $(b + 1)(b - 1)$

6. $(a - 5)(a + 5)$

7. $(p - 4)^2$

8. $(z + 3)(z - 3)$

9. $(\ell + 2)(\ell + 2)$

10. $(r - 1)(r - 1)$

11. $(3g + 2)(3g - 2)$

12. $(2m - 3)(2m + 3)$

13. $(6 + u)^2$

14. $(r + s)^2$

15. $(3q + 1)(3q - 1)$

16. $(c - e)^2$

17. $(2k - 2)^2$

18. $(w + 3h)^2$

19. $(3p - 4)(3p + 4)$

20. $(t + 2u)^2$

21. $(x - 4y)^2$

22. $(3b + 7)(3b - 7)$

23. $(3y - 3g)(3y + 3g)$

24. $(s^2 + r^2)^2$

25. $(2k + m^2)^2$

26. $(3u^2 - n)^2$

27. GEOMETRY The length of a rectangle is the sum of two whole numbers. The width of the rectangle is the difference of the same two whole numbers. Using these facts, write a verbal expression for the area of the rectangle.

8-1 Skills Practice***Monomials and Factoring***

Find the factors of each number. Then classify each number as *prime* or *composite*.

1. 10

2. 31

3. 16

4. 52

5. 38

6. 105

Find the prime factorization of each integer.

7. -16

8. 20

9. 24

10. 36

11. 112

12. -72

Factor each monomial completely.

13. $10a^4$

14. $-27x^3y^2$

15. $28pq^2$

16. $44m^2ns^3$

Find the GCF of each set of monomials.

17. 12, 18

18. 20, 27

19. 30, 48

20. 24, 81

21. 20, 36, 64

22. 42, 60, 78

23. $16c$, $21b^2d$

24. $18a$, $48a^4$

25. $32xyz$, $48xy^4$

26. $12m^3n^2$, $44mn^3$

8-2 Skills Practice**Factoring Using the Distributive Property****Factor each polynomial.**

1. $7x + 49$

2. $8m - 6$

3. $5a^2 - 15$

4. $10q - 25q^2$

5. $8ax - 56a$

6. $81r + 48rs$

7. $t^2h + 3t$

8. $a^2b^2 + a$

9. $x + x^2y + x^3y^2$

10. $3p^2q^2 + 6pq + p$

11. $4a^2b^2 + 16ab + 12a$

12. $10m^3n^3 - 2mn^2 + 14mn$

13. $x^2 + 3x + x + 3$

14. $b^2 - 2b + 3b - 6$

15. $2s^2 + 2s + 3s + 3$

16. $2a^2 - 4a + a - 2$

17. $6t^2 - 4t - 3t + 2$

18. $9x^2 - 3xy + 6x - 2y$

Solve each equation. Check your solutions.

19. $x(x - 8) = 0$

20. $b(b + 12) = 0$

21. $(m - 3)(m + 5) = 0$

22. $(a - 9)(2a + 1) = 0$

23. $x^2 - 5x = 0$

24. $y^2 + 3y = 0$

25. $3a^2 = 6a$

26. $2x^2 = 3x$

8-3 Skills Practice**Factoring Trinomials: $x^2 + bx + c$** **Factor each trinomial.**

1. $t^2 + 8t + 12$

2. $n^2 + 7n + 12$

3. $p^2 + 9p + 20$

4. $h^2 + 9h + 18$

5. $n^2 + 3n - 18$

6. $x^2 + 2x - 8$

7. $y^2 - 5y - 6$

8. $g^2 + 3g - 10$

9. $s^2 + 4s - 12$

10. $x^2 - x - 12$

11. $w^2 - w - 6$

12. $y^2 - 6y + 8$

13. $x^2 - 8x + 15$

14. $b^2 - 9b + 8$

15. $c^2 - 15c + 56$

16. $-4 - 3m + m^2$

Solve each equation. Check your solutions.

17. $x^2 - 6x + 8 = 0$

18. $b^2 - 7b + 12 = 0$

19. $m^2 + 5m + 6 = 0$

20. $d^2 + 7d + 10 = 0$

21. $y^2 - 2y - 24 = 0$

22. $p^2 - 3p = 18$

23. $h^2 + 2h = 35$

24. $a^2 + 14a = -45$

25. $n^2 - 36 = 5n$

26. $w^2 + 30 = 11w$

8-4 Skills Practice**Factoring Trinomials: $ax^2 + bx + c$**

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write *prime*.

1. $2x^2 + 5x + 2$

2. $3n^2 + 5n + 2$

3. $2s^2 + 9s - 5$

4. $3g^2 - 7g + 2$

5. $2t^2 - 11t + 15$

6. $2x^2 + 3x - 6$

7. $2y^2 + y - 1$

8. $4h^2 + 8h - 5$

9. $4x^2 - 3x - 3$

10. $4b^2 + 15b - 4$

11. $9p^2 + 6p - 8$

12. $6q^2 - 13q + 6$

13. $3a^2 + 30a + 63$

14. $10w^2 - 19w - 15$

Solve each equation. Check your solutions.

15. $2x^2 + 7x + 3 = 0$

16. $3w^2 + 14w + 8 = 0$

17. $3n^2 - 7n + 2 = 0$

18. $5d^2 - 22d + 8 = 0$

19. $6h^2 + 8h + 2 = 0$

20. $8p^2 - 16p = 10$

21. $9y^2 + 18y - 12 = 6y$

22. $4a^2 - 16a = -15$

23. $10b^2 - 15b = 8b - 12$

24. $6d^2 + 21d = 10d + 35$

8-5 Skills Practice**Factoring Differences of Squares**

Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

1. $a^2 - 4$

2. $n^2 - 64$

3. $1 - 49c^2$

4. $-16 + p^2$

5. $k^2 + 25$

6. $36 - 100w^2$

7. $t^2 - 81u^2$

8. $4h^2 - 25g^2$

9. $64m^2 - 9y^2$

10. $4c^2 - 5d^2$

11. $-49r^2 + 4t^2$

12. $8x^2 - 72p^2$

13. $20q^2 - 5r^2$

14. $32a^2 - 50b^2$

Solve each equation by factoring. Check your solutions.

15. $16x^2 - 9 = 0$

16. $25p^2 - 16 = 0$

17. $36q^2 - 49 = 0$

18. $81 - 4b^2 = 0$

19. $16d^2 = 4$

20. $18a^2 = 8$

21. $s^2 - \frac{9}{25} = 0$

22. $k^2 - \frac{49}{64} = 0$

23. $\frac{1}{25}h^2 - 16 = 0$

24. $\frac{1}{16}y^2 = 81$

8-6 Skills Practice***Perfect Squares and Factoring*****Determine whether each trinomial is a perfect square trinomial. If so, factor it.**

1. $c^2 - 6c + 9$

2. $r^2 + 4r + 4$

3. $g^2 - 14g + 49$

4. $2w^2 - 4w + 9$

5. $4d^2 - 4d + 1$

6. $9n^2 + 30n + 25$

Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

7. $2x^2 - 72$

8. $6b^2 + 11b + 3$

9. $36t^2 - 24t + 4$

10. $4h^2 - 56$

11. $17a^2 - 24ac$

12. $q^2 - 14q + 36$

13. $y^2 + 24y + 144$

14. $6d^2 - 96$

15. $4k^2 + 12k + 9$

16. $6x^2 + 28x - 10$

Solve each equation. Check your solutions.

17. $x^2 - 18x + 81 = 0$

18. $4p^2 + 4p + 1 = 0$

19. $9g^2 - 12g + 4 = 0$

20. $y^2 - 16y + 64 = 81$

21. $4n^2 - 17 = 19$

22. $x^2 + 30x + 150 = -75$

23. $(k + 2)^2 = 16$

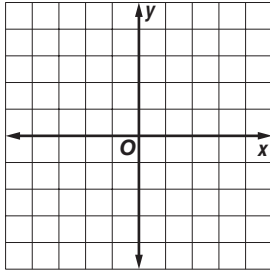
24. $(m - 4)^2 = 7$

9-1 Skills Practice

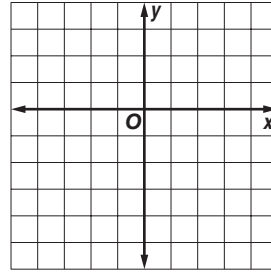
Graphing Quadratic Functions

Use a table of values to graph each function.

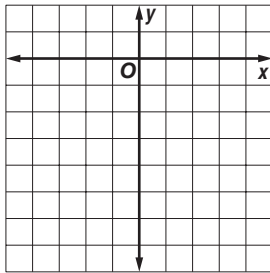
1. $y = x^2 - 4$



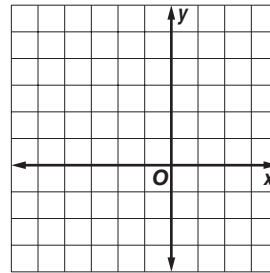
2. $y = -x^2 + 3$



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

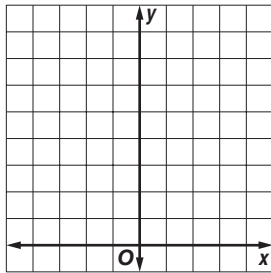


4. $y = -x^2 - 4x + 1$

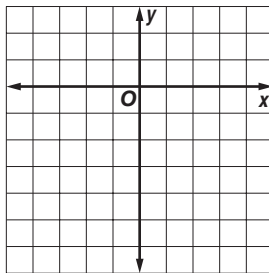


Write the equation of the axis of symmetry, and find the coordinates of the vertex of the graph of each function. Identify the vertex as a maximum or minimum. Then graph the function.

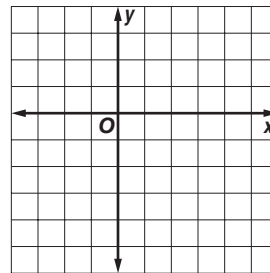
5. $y = 2x^2$



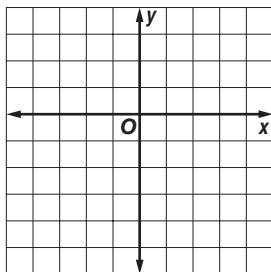
6. $y = x^2 - 2x - 5$



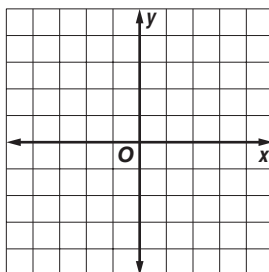
7. $y = -x^2 + 4x - 1$



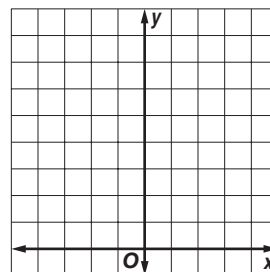
8. $y = -x^2 - 2x + 2$



9. $y = 2x^2 + 4x - 2$



10. $y = -2x^2 - 4x + 6$

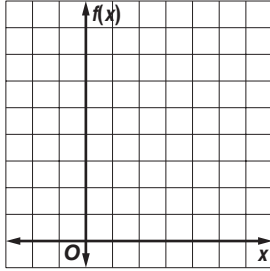


9-2 Skills Practice

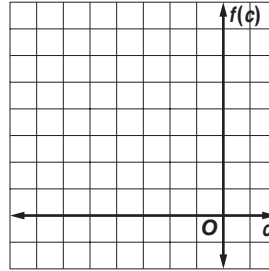
Solving Quadratic Equations by Graphing

Solve each equation by graphing.

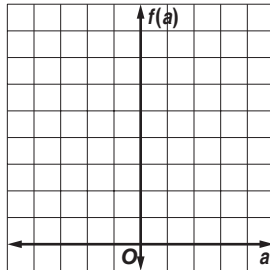
1. $x^2 - 2x + 3 = 0$



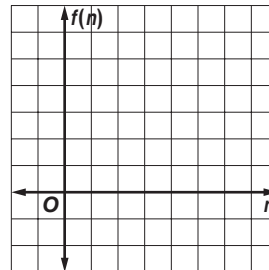
2. $c^2 + 6c + 8 = 0$



3. $a^2 - 2a = -1$

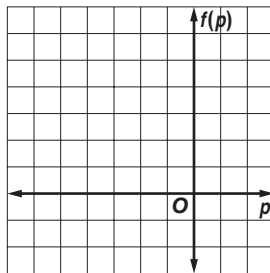


4. $n^2 - 7n = -10$

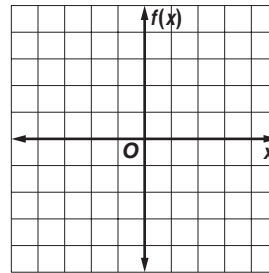


Solve each equation by graphing. If integral roots cannot be found, estimate the roots by stating the consecutive integers between which the roots lie.

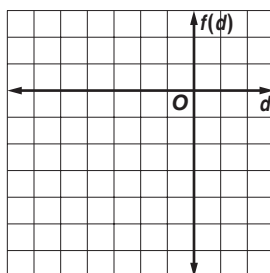
5. $p^2 + 4p + 2 = 0$



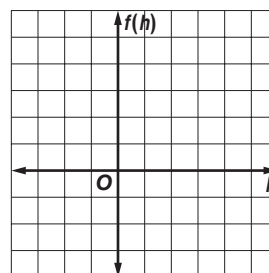
6. $x^2 + x - 3 = 0$



7. $d^2 + 6d = -3$



8. $h^2 + 1 = 4h$



9-3 Skills Practice***Solving Quadratic Equations by Completing the Square***

Solve each equation by taking the square root of each side. Round to the nearest tenth if necessary.

1. $c^2 - 12c + 36 = 4$

2. $w^2 - 10w + 25 = 16$

3. $b^2 + 16b + 64 = 9$

4. $y^2 + 2y + 1 = 3$

5. $r^2 + 4r + 4 = 7$

6. $a^2 - 8a + 16 = 12$

Find the value of c that makes each trinomial a perfect square.

7. $g^2 + 6g + c$

8. $y^2 + 4y + c$

9. $a^2 - 14a + c$

10. $n^2 - 2n + c$

11. $s^2 - 18s + c$

12. $p^2 + 20p + c$

Solve each equation by completing the square. Round to the nearest tenth if necessary.

13. $x^2 + 4x - 12 = 0$

14. $v^2 - 8v + 15 = 0$

15. $q^2 + 6q = 7$

16. $r^2 - 2r = 15$

17. $m^2 - 14m + 30 = 6$

18. $b^2 + 12b + 21 = 10$

19. $z^2 - 4z + 1 = 0$

20. $y^2 - 6y + 4 = 0$

21. $r^2 - 8r + 10 = 0$

22. $p^2 - 2p = 5$

23. $2a^2 + 20a = -2$

24. $0.5g^2 + 8g = -7$

9-4 Skills Practice***Solving Quadratic Equations by Using the Quadratic Formula***

Solve each equation by using the Quadratic Formula. Round to the nearest tenth if necessary.

1. $u^2 - 49 = 0$

2. $n^2 - n - 20 = 0$

3. $s^2 - 5s - 36 = 0$

4. $b^2 + 11b + 30 = 0$

5. $c^2 - 7c = -3$

6. $p^2 + 4p = -1$

7. $a^2 - 9a + 22 = 0$

8. $x^2 + 6x + 3 = 0$

9. $2x^2 + 5x - 7 = 0$

10. $2h^2 - 3h = -1$

11. $2p^2 + 5p + 4 = 0$

12. $2g^2 + 7g = 9$

13. $3t^2 + 2t - 3 = 0$

14. $3x^2 - 7x - 6 = 0$

State the value of the discriminant for each equation. Then determine the number of real roots of the equation.

15. $q^2 + 4q + 3 = 0$

16. $m^2 + 2m + 1 = 0$

17. $a^2 - 4a + 10 = 0$

18. $w^2 - 6w + 7 = 0$

19. $z^2 - 2z - 7 = 0$

20. $y^2 - 10y + 25 = 0$

21. $2d^2 + 5d - 8 = 0$

22. $2s^2 + 6s + 12 = 0$

23. $2u^2 - 4u + 10 = 0$

24. $3h^2 + 7h + 3 = 0$

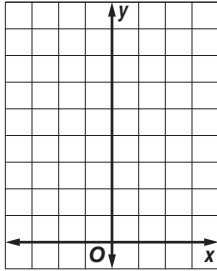
9-5

Skills Practice

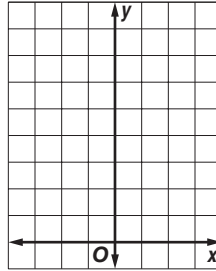
Exponential Functions

Graph each function. State the y -intercept. Then use the graph to determine the approximate value of the given expression. Use a calculator to confirm the value.

1. $y = 2^x; 2^{2.3}$

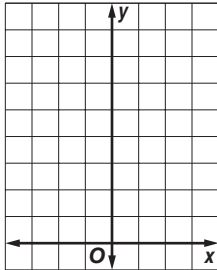


2. $y = \left(\frac{1}{3}\right)^x; \left(\frac{1}{3}\right)^{-1.6}$

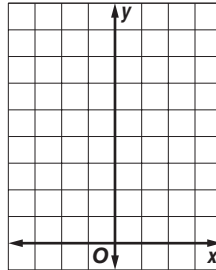


Graph each function. State the y -intercept.

3. $y = 3(2^x)$



4. $y = 3^x + 2$



Determine whether the data in each table display exponential behavior. Explain why or why not.

5.

x	-3	-2	-1	0
y	9	12	15	18

6.

x	0	5	10	15
y	20	10	5	2.5

7.

x	4	8	12	16
y	20	40	80	160

8.

x	50	30	10	-10
y	90	70	50	30

9-6 Skills Practice***Growth and Decay***

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

The population of New York City increased from 8,008,278 in 2000 to 8,168,388 in 2005. The annual rate of population increase for the period was about 0.4%. **Source:** www.nyc.gov

1. Write an equation for the population t years after 2000.
2. Use the equation to predict the population of New York City in 2015.

SAVINGS For Exercises 3 and 4, use the following information.

The Fresh and Green Company has a savings plan for its employees. If an employee makes an initial contribution of \$1000, the company pays 8% interest compounded quarterly.

3. If an employee participating in the plan withdraws the balance of the account after 5 years, how much will be in the account?
4. If an employee participating in the plan withdraws the balance of the account after 35 years, how much will be in the account?
5. **HOUSING** Mr. and Mrs. Boyce bought a house for \$96,000 in 1995. The real estate broker indicated that houses in their area were appreciating at an average annual rate of 4%. If the appreciation remained steady at this rate, what was the value of the Boyce's home in 2005?

MANUFACTURING For Exercises 6 and 7, use the following information.

Zeller Industries bought a piece of weaving equipment for \$60,000. It is expected to depreciate at an average rate of 10% per year.

6. Write an equation for the value of the piece of equipment after t years.
7. Find the value of the piece of equipment after 6 years.
8. **FINANCES** Kyle saved \$500 from a summer job. He plans to spend 10% of his savings each week on various forms of entertainment. At this rate, how much will Kyle have left after 15 weeks?
9. **TRANSPORTATION** Tiffany's mother bought a car for \$9000 five years ago. She wants to sell it to Tiffany based on a 15% annual rate of depreciation. At this rate, how much will Tiffany pay for the car?

10-1**Skills Practice*****Simplifying Radical Expressions*****Simplify.**

1. $\sqrt{28}$

2. $\sqrt{40}$

3. $\sqrt{72}$

4. $\sqrt{99}$

5. $\sqrt{2} \cdot \sqrt{10}$

6. $\sqrt{5} \cdot \sqrt{60}$

7. $3\sqrt{5} \cdot \sqrt{5}$

8. $\sqrt{6} \cdot 4\sqrt{24}$

9. $2\sqrt{3} \cdot 3\sqrt{15}$

10. $\sqrt{16b^4}$

11. $\sqrt{81c^2d^4}$

12. $\sqrt{40x^4y^6}$

13. $\sqrt{75m^5n^2}$

14. $\sqrt{\frac{5}{3}}$

15. $\sqrt{\frac{1}{6}}$

16. $\sqrt{\frac{6}{7}} \cdot \sqrt{\frac{1}{3}}$

17. $\sqrt{\frac{q}{12}}$

18. $\sqrt{\frac{4h}{5}}$

19. $\sqrt{\frac{12}{b^2}}$

20. $\sqrt{\frac{45}{4m^4}}$

21. $\frac{2}{4 + \sqrt{5}}$

22. $\frac{3}{2 - \sqrt{3}}$

23. $\frac{5}{7 + \sqrt{7}}$

24. $\frac{4}{3 - \sqrt{2}}$

10-2 Skills Practice**Operations with Radical Expressions****Simplify.**

1. $7\sqrt{7} - 2\sqrt{7}$

2. $3\sqrt{13} + 7\sqrt{13}$

3. $6\sqrt{5} - 2\sqrt{5} + 8\sqrt{5}$

4. $\sqrt{15} + 8\sqrt{15} - 12\sqrt{15}$

5. $12\sqrt{c} - 9\sqrt{c}$

6. $9\sqrt{6a} - 11\sqrt{6a} + 4\sqrt{6a}$

7. $\sqrt{44} - \sqrt{11}$

8. $\sqrt{28} + \sqrt{63}$

9. $4\sqrt{3} + 2\sqrt{12}$

10. $8\sqrt{54} - 4\sqrt{6}$

11. $\sqrt{27} + \sqrt{48} + \sqrt{12}$

12. $\sqrt{72} + \sqrt{50} - \sqrt{8}$

13. $\sqrt{180} - 5\sqrt{5} + \sqrt{20}$

14. $2\sqrt{24} + 4\sqrt{54} + 5\sqrt{96}$

15. $5\sqrt{8} + 2\sqrt{20} - \sqrt{8}$

16. $2\sqrt{13} + 4\sqrt{2} - 5\sqrt{13} + \sqrt{2}$

Find each product.

17. $\sqrt{2}(\sqrt{8} + \sqrt{6})$

18. $\sqrt{5}(\sqrt{10} - \sqrt{3})$

19. $\sqrt{6}(3\sqrt{2} - 2\sqrt{3})$

20. $3\sqrt{3}(2\sqrt{6} + 4\sqrt{10})$

21. $(4 + \sqrt{3})(4 - \sqrt{3})$

22. $(2 - \sqrt{6})^2$

23. $(\sqrt{8} + \sqrt{2})(\sqrt{5} + \sqrt{3})$

24. $(\sqrt{6} + 4\sqrt{5})(4\sqrt{3} - \sqrt{10})$

10-3 Skills Practice**Radical Equations**

Solve each equation. Check your solution.

1. $\sqrt{f} = 7$

2. $\sqrt{-x} = 5$

3. $\sqrt{5p} = 10$

4. $\sqrt{4y} = 6$

5. $2\sqrt{2} = \sqrt{u}$

6. $3\sqrt{5} = \sqrt{-n}$

7. $\sqrt{g} - 6 = 3$

8. $\sqrt{5a} + 2 = 0$

9. $\sqrt{2c - 1} = 5$

10. $\sqrt{3k - 2} = 4$

11. $\sqrt{x + 4} - 2 = 1$

12. $\sqrt{4x - 4} - 4 = 0$

13. $\frac{\sqrt{d}}{3} = 4$

14. $\sqrt{\frac{m}{3}} = 3$

15. $x = \sqrt{x + 2}$

16. $d = \sqrt{12 - d}$

17. $\sqrt{6x - 9} = x$

18. $\sqrt{6p - 8} = p$

19. $\sqrt{x + 5} = x - 1$

20. $\sqrt{8 - c} = c - 8$

21. $\sqrt{r - 3} + 5 = r$

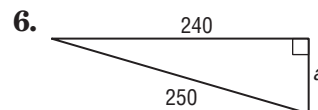
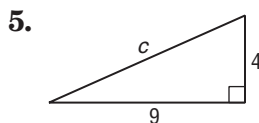
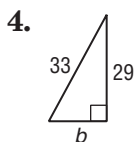
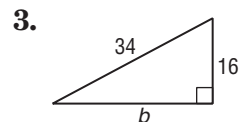
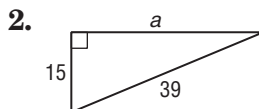
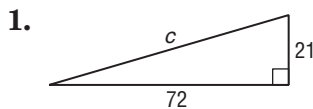
22. $\sqrt{y - 1} + 3 = y$

23. $\sqrt{5n + 4} = n + 2$

24. $\sqrt{3z - 6} = z - 2$

10-4 Skills Practice**The Pythagorean Theorem**

Find the length of each missing side. If necessary, round to the nearest hundredth.



If c is the measure of the hypotenuse of a right triangle, find each missing measure. If necessary, round to the nearest hundredth.

7. $a = 21, b = 28, c = ?$

8. $a = 6, c = 10, b = ?$

9. $a = 15, b = 36, c = ?$

10. $a = 16, c = 20, b = ?$

11. $a = 5, b = 12, c = ?$

12. $b = 6, c = 12, a = ?$

13. $a = 11, b = 4, c = ?$

14. $a = 8, b = 10, c = ?$

15. $a = 19, b = \sqrt{39}, c = ?$

16. $a = \sqrt{12}, b = 6, c = ?$

17. $c = \sqrt{130}, a = 7, b = ?$

18. $a = \sqrt{6}, b = \sqrt{19}, c = ?$

Determine whether the following side measures form right triangles. Justify your answer.

19. 7, 24, 25

20. 15, 30, 34

21. 16, 28, 32

22. 18, 24, 30

23. 15, 36, 39

24. 5, 7, $\sqrt{74}$

10-5 Skills Practice***The Distance Formula***

Find the distance between each pair of points with the given coordinates. Express answers in simplest radical form and as decimal approximations rounded to the nearest hundredth if necessary.

1. $(9, 7), (1, 1)$

2. $(5, 2), (8, -2)$

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

4. $(7, 2), (-5, 7)$

5. $(-6, 3), (10, 3)$

6. $(3, 3), (-2, 3)$

7. $(-1, -4), (-6, 0)$

8. $(-2, 4), (5, 8)$

9. $(-3, 4), (-2, 8)$

10. $(5, -6), (7, -9)$

11. $(4, 2), (8, 6)$

12. $(5, 2), (3, 10)$

13. $(12, -1), (4, -11)$

14. $(-3, -1), (-11, 3)$

15. $(9, 3), (6, -6)$

16. $(0, -4), (8, 4)$

Find the possible values of a if the points with the given coordinates are the indicated distance apart.

17. $(-2, -5), (a, 7); d = 13$

18. $(8, -2), (5, a); d = 3$

19. $(4, a), (1, 6); d = 5$

20. $(a, 3), (5, -1); d = 5$

21. $(1, 1), (a, 1); d = 4$

22. $(2, a), (2, 3); d = 10$

23. $(a, 2), (-3, 3); d = \sqrt{2}$

24. $(-5, 3), (-3, a); d = \sqrt{5}$

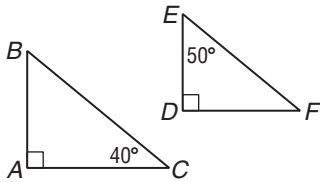
10-6

Skills Practice
Similar Triangles

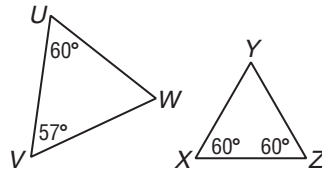
Lesson 10-6

Determine whether each pair of triangles is similar. Justify your answer.

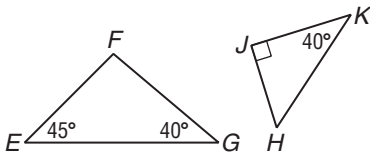
1.



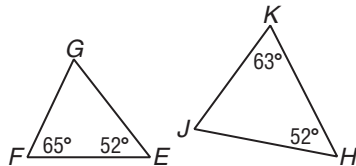
2.



3.



4.



For each set of measures given, find the measures of the missing sides if $\triangle PQR \sim \triangle STU$.

5. $r = 4, s = 6, t = 3, u = 2$

6. $t = 8, p = 21, q = 14, r = 7$

7. $p = 15, q = 10, r = 5, s = 6$

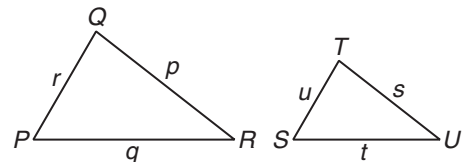
8. $p = 48, s = 16, t = 8, u = 4$

9. $q = 6, s = 2, t = \frac{3}{2}, u = \frac{1}{2}$

10. $p = 3, q = 2, r = 1, u = \frac{1}{3}$

11. $p = 14, q = 7, u = 2.5, t = 5$

12. $r = 6, s = 3, t = \frac{21}{8}, u = \frac{9}{4}$

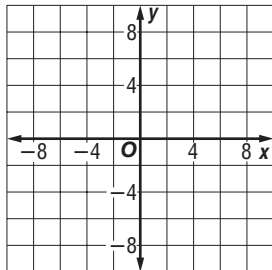


11-1 Skills Practice

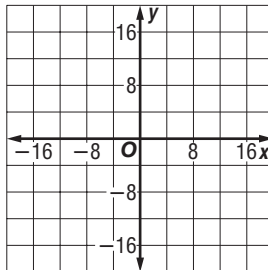
Inverse Variation

Graph each variation if y varies inversely as x .

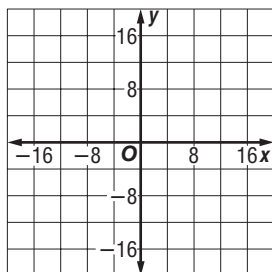
1. $y = 2$ when $x = 5$



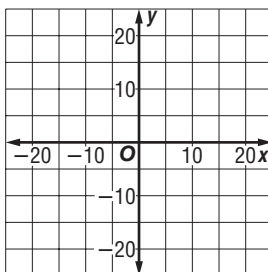
2. $y = -6$ when $x = -6$



3. $y = -4$ when $x = -12$



4. $y = 15$ when $x = 3$



Write an inverse variation equation that relates x and y . Assume that y varies inversely as x . Then solve.

5. If $y = 4$ when $x = 8$,
find y when $x = 2$.

6. If $y = -7$ when $x = 3$,
find y when $x = -3$.

7. If $y = -6$ when $x = -2$,
find y when $x = 4$.

8. If $y = -24$ when $x = -3$,
find x when $y = -6$.

9. If $y = 15$ when $x = 1$,
find x when $y = -3$.

10. If $y = 48$ when $x = -4$,
find y when $x = 6$.

11. If $y = 34$ when $x = 4$,
find y when $x = -17$.

12. If $y = 72$ when $x = -3$,
find y when $x = 36$.

13. If $y = 4$ when $x = 1.5$,
find x when $y = 5$.

14. If $y = 20$ when $x = 5.2$,
find x when $y = 10$.

15. If $y = -4$ when $x = \frac{1}{2}$, find x when $y = 2$.

16. If $y = 12$ when $x = \frac{1}{3}$, find x when $y = -8$.

11-2 Skills Practice

Rational Expressions

State the excluded values for each rational expression.

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

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

3. $\frac{k+2}{k^2-4}$

4. $\frac{3x+15}{x^2-25}$

5. $\frac{y^2-9}{y^2+3y-18}$

6. $\frac{b^2-2b-8}{b^2+7b+10}$

Simplify each expression. State the excluded values of the variables.

7. $\frac{21bc}{28bc^2}$

8. $\frac{12m^2n}{24mn^3}$

9. $\frac{16x^3y^2}{36x^5y^3}$

10. $\frac{8a^2b^3}{40a^3b}$

11. $\frac{n+6}{3n+18}$

12. $\frac{4x-4}{4x+4}$

13. $\frac{y^2-64}{y+8}$

14. $\frac{y^2-7y-18}{y-9}$

15. $\frac{z+1}{z^2-1}$

16. $\frac{x+6}{x^2+2x-24}$

17. $\frac{2d+10}{d^2-2d-35}$

18. $\frac{3s-9}{s^2-7s+12}$

19. $\frac{t^2+5t+6}{t^2+6t+8}$

20. $\frac{a^2+3a-4}{a^2+2a-8}$

21. $\frac{x^2+10x+24}{x^2-2x-24}$

22. $\frac{b^2-6b+9}{b^2-9b+18}$

11-3 Skills Practice***Multiplying Rational Expressions*****Find each product.**

1. $\frac{14}{c^2} \cdot \frac{c^5}{2c}$

2. $\frac{3m^2}{2n} \cdot \frac{n^2}{12}$

3. $\frac{2a^2b}{b^2c} \cdot \frac{b}{a}$

4. $\frac{2x^2y}{3x^2y} \cdot \frac{3xy}{4y}$

5. $\frac{3(4m - 6)}{18n} \cdot \frac{9n^2}{2(4m - 6)}$

6. $\frac{4(n + 2)}{n(n - 2)} \cdot \frac{n - 2}{n + 2}$

7. $\frac{(y - 3)(y + 3)}{4} \cdot \frac{8}{y + 3}$

8. $\frac{(x - 2)(x + 2)}{x(8x + 3)} \cdot \frac{2(8x + 3)}{x - 2}$

9. $\frac{(a - 7)(a + 7)}{a(a + 5)} \cdot \frac{a + 5}{a + 7}$

10. $\frac{4(b + 4)}{(b - 4)(b - 3)} \cdot \frac{b - 3}{b + 4}$

11. $\frac{x^2 - 4}{5} \cdot \frac{x + 2}{x - 2}$

12. $\frac{1 - c^2}{12} \cdot \frac{4}{1 - c}$

13. $\frac{y^2 - 36}{y^2 - 25} \cdot \frac{y + 5}{y - 6}$

14. $\frac{a + 2}{a^2 - a - 6} \cdot \frac{a - 3}{a + 1}$

15. $\frac{x + 4}{x} \cdot \frac{x^2}{x^2 + 5x + 4}$

16. $\frac{x^2 + x - 20}{x^2} \cdot \frac{x}{x + 5}$

17. $\frac{y^2 + 2y + 1}{y - 1} \cdot \frac{3y - 3}{y + 1}$

18. $\frac{2n + 12}{n - 2} \cdot \frac{n^2 - 8n + 12}{n + 6}$

Find each product.

19. $\frac{30 \text{ miles}}{1 \text{ hour}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}}$

20. $\frac{200 \text{ dollars}}{1 \text{ ton}} \cdot \frac{100 \text{ cents}}{1 \text{ dollar}} \cdot \frac{1 \text{ ton}}{2000 \text{ pounds}} \cdot \frac{1 \text{ pound}}{16 \text{ ounces}}$

11-4 Skills Practice**Dividing Rational Expressions****Find each quotient.**

1. $\frac{c^3}{d^3} \div \frac{d^3}{c^3}$

2. $\frac{x^3}{y^2} \div \frac{x^3}{y}$

3. $\frac{6e^3}{4f^2} \div \frac{2e^2}{12f^2}$

4. $\frac{4m^3}{np^2} \div \frac{2m}{np}$

5. $\frac{3b+3}{b+2} \div (b+1)$

6. $\frac{x-5}{x+3} \div (x-5)$

7. $\frac{c^2-4}{c} \div (c+2)$

8. $\frac{b^2-25}{2b} \div (b-5)$

9. $\frac{x+1}{x+5} \div \frac{2x+2}{x+4}$

10. $\frac{2n+6}{n-4} \div \frac{n+3}{n-4}$

11. $\frac{3a+6}{a-2} \div \frac{a+2}{4a-8}$

12. $\frac{5y+15}{y+6} \div \frac{2y+6}{y-3}$

Complete.

13. $108 \text{ ft}^2 = \text{___ yd}^2$

14. $0.2 \text{ m}^2 = \text{___ cm}^2$

15. $26 \text{ m/s} = \text{___ km/h}$

16. $930 \text{ gal/h} = \text{___ qt/min}$

Find each quotient.

17. $\frac{x^2-x-12}{6} \div \frac{x+3}{x-4}$

18. $\frac{a^2-5a-6}{3} \div \frac{a-6}{a+1}$

19. $\frac{m^2+2m+1}{10m-10} \div \frac{m+1}{20}$

20. $\frac{y^2+10y+25}{3y-9} \div \frac{y+5}{y-3}$

21. $\frac{b+4}{b^2-8b+16} \div \frac{2b+8}{b-8}$

22. $\frac{6x+6}{x-1} \div \frac{x^2+3x+2}{2x-2}$

11-5 Skills Practice

Dividing Polynomials

Find each quotient.

1. $(20x^2 + 12x) \div (4x)$

2. $(18n^2 + 6n) \div (3n)$

3. $(b^2 - 12b + 5) \div (2b)$

4. $(8r^2 + 5r - 20) \div (4r)$

5. $\frac{12p^3q^2 + 18p^2q - 6pq}{6p^2q}$

6. $\frac{15k^2u - 10ku + 25u^2}{5ku}$

7. $(x^2 - 5x - 6) \div (x - 6)$

8. $(a^2 - 10a + 16) \div (a - 2)$

9. $(n^2 - n - 20) \div (n + 4)$

10. $(y^2 + 4y - 21) \div (y - 3)$

11. $(h^2 - 6h + 9) \div (h - 2)$

12. $(b^2 + 5b - 2) \div (b + 6)$

13. $(y^2 + 6y + 1) \div (y + 2)$

14. $(m^2 - 2m - 5) \div (m - 3)$

15. $\frac{2c^2 - 5c - 3}{2c + 1}$

16. $\frac{2r^2 + 6r - 20}{2r - 4}$

17. $\frac{x^3 - 3x^2 - 6x - 20}{x - 5}$

18. $\frac{p^3 - 4p^2 + p + 6}{p - 2}$

19. $\frac{n^3 - 6n - 2}{n + 1}$

20. $\frac{y^3 - y^2 - 40}{y - 4}$

11-6 Skills Practice***Rational Expressions with Like Denominators*****Find each sum.**

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

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

3. $\frac{3k}{14} + \frac{5k}{14}$

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

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

6. $\frac{g+2}{4} + \frac{g-8}{4}$

7. $\frac{2q}{q+2} + \frac{3}{q+2}$

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

9. $\frac{u-2}{u+1} + \frac{4u+7}{u+1}$

10. $\frac{2y-2}{y-4} + \frac{y+1}{y-4}$

11. $\frac{2b+1}{b+3} + \frac{5b-4}{b+3}$

12. $\frac{5d-3}{d-1} + \frac{2d-4}{d-1}$

Find each difference.

13. $\frac{6x}{5} - \frac{3x}{5}$

14. $\frac{7n}{10} - \frac{3n}{10}$

15. $\frac{8a}{11} - \frac{7a}{11}$

16. $\frac{3p}{2} - \frac{p}{2}$

17. $\frac{t+3}{7} - \frac{t}{7}$

18. $\frac{c+8}{4} - \frac{c+6}{4}$

19. $\frac{y-6}{4} - \frac{y+2}{4}$

20. $\frac{4}{m+7} - \frac{-2}{m+7}$

21. $\frac{x}{x-1} - \frac{1}{x-1}$

22. $\frac{3r}{r+3} - \frac{r}{r+3}$

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

24. $\frac{5a}{a-4} - \frac{7}{4-a}$

11-7 Skills Practice***Rational Expressions with Unlike Denominators*****Find the LCM for each pair of expressions.**

1. $4x^2y, 12xy^2$

2. $n + 2, n - 3$

3. $2r - 1, r + 4$

4. $t + 4, 4t + 16$

5. $x^2 - 2x - 3, (x - 3)^2$

6. $c^2 + 2c - 8, c - 2$

Find each sum.

7. $\frac{3}{y} + \frac{4}{y^2}$

8. $\frac{3}{8a^2} + \frac{5}{2a}$

9. $\frac{m+3}{2m} + \frac{m-2}{m}$

10. $\frac{5}{y+2} + \frac{1}{y-6}$

11. $\frac{b}{b-1} + \frac{2}{b-4}$

12. $\frac{k}{k-5} + \frac{k-1}{k+5}$

13. $\frac{3x+15}{x^2-25} + \frac{x}{x+5}$

14. $\frac{x-3}{x^2-4x+4} + \frac{x+2}{x-2}$

Find each difference.

15. $\frac{5}{4r} - \frac{2}{r^2}$

16. $\frac{5x}{3y^2} - \frac{2x}{9y}$

17. $\frac{x}{x+2} - \frac{4}{x-1}$

18. $\frac{d-1}{d-2} - \frac{3}{d+5}$

19. $\frac{a}{2a-1} - \frac{2}{a+3}$

20. $\frac{-5}{s+4} - \frac{-4}{s^2+4s}$

21. $\frac{6}{b^2-1} - \frac{b}{b+1}$

22. $\frac{2u}{u^2+3u-4} - \frac{u-1}{u^2+8u+16}$

11-8 Skills Practice**Mixed Expressions and Complex Fractions**

Write each mixed expression as a rational expression.

1. $6 + \frac{4}{h}$

2. $7 + \frac{6}{p}$

3. $4b + \frac{b}{c}$

4. $8q - \frac{2q}{r}$

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

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

7. $b^2 + \frac{12}{b+3}$

8. $m - \frac{6}{m-7}$

9. $2a + \frac{a-2}{a}$

10. $4r - \frac{r+9}{2r}$

Simplify each expression.

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

12. $\frac{3\frac{2}{3}}{5\frac{2}{5}}$

13. $\frac{\frac{r}{s^2}}{\frac{r^2}{s}}$

14. $\frac{\frac{a^2}{b^3}}{\frac{a}{b}}$

15. $\frac{\frac{x^2y}{c}}{\frac{xy^3}{c^2}}$

16. $\frac{\frac{s-2}{s+3}}{\frac{s-2}{3}}$

17. $\frac{\frac{w+4}{w}}{w^2-16}$

18. $\frac{\frac{x^2-1}{x}}{x-1}$

19. $\frac{\frac{b^2-4}{b^2+7b+10}}{b-2}$

20. $\frac{\frac{k^2+5k+6}{k^2-9}}{k+2}$

21. $\frac{\frac{g+\frac{12}{g+8}}{g+6}}$

22. $\frac{p+\frac{9}{p-6}}{p-3}$

11-9 Skills Practice**Solving Rational Equations**

Solve each equation. State any extraneous solutions.

1. $\frac{5}{c} = \frac{2}{c+3}$

2. $\frac{3}{q} = \frac{5}{q+4}$

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

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

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

6. $\frac{b-2}{b} = \frac{b+4}{b+2}$

7. $\frac{3m}{2} - \frac{1}{4} = \frac{10m}{8}$

8. $\frac{7g}{9} + \frac{1}{3} = \frac{5g}{6}$

9. $\frac{2a+5}{6} - \frac{2a}{3} = -\frac{1}{2}$

10. $\frac{s-3}{10} + \frac{s-5}{5} = \frac{1}{2}$

11. $\frac{c+2}{c} + \frac{c+3}{c} = 7$

12. $\frac{3b-4}{b} - \frac{b-7}{b} = 1$

13. $\frac{m-4}{m} - \frac{m-11}{m+4} = \frac{1}{m}$

14. $\frac{f+2}{f} - \frac{f+1}{f+5} = \frac{1}{f}$

15. $\frac{r+3}{r-1} - \frac{r}{r-3} = 0$

16. $\frac{u+1}{u-2} - \frac{u}{u+1} = 0$

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

18. $\frac{5}{s-4} - \frac{s}{2s-8} = 1$

19. $\frac{2}{4-t} + \frac{t^2}{t-4} = -1$

20. $\frac{2-q}{q-1} + \frac{q^2}{1-q} = 2$

21. $\frac{b-5}{b+2} - 2 = \frac{-4}{b+2}$

22. $\frac{3}{2a} + \frac{2a}{a-3} = 2$

12-1 Skills Practice***Sampling and Bias***

Identify each sample, suggest a population from which it was selected, and state whether it is *unbiased* (random) or *biased*. If unbiased, classify the sample as *simple*, *stratified*, or *systematic*. If biased, classify as *convenience* or *voluntary response*.

- 1. LANDSCAPING** A homeowner is concerned about the quality of the topsoil in the back yard. The back yard is divided into 5 equal sections, and then a 1-inch plug of topsoil is randomly removed from each of the 5 sections. The soil is taken to a nursery and analyzed for mineral content.
- 2. HEALTH** A hospital's administration is interested in opening a gym on the premises for all its employees. They ask each member of the night-shift emergency room staff if he or she would use the gym, and if so, what hours the employee would prefer to use it.
- 3. POLITICS** A senator wants to know her approval rating among the constituents in her state. She sends questionnaires to the households of 1000 registered voters in her party.
- 4. MANUFACTURING** A company that produces motherboards for computers randomly selects 25 boxed motherboards out of a shipment of 1500, and then tests each selected motherboard to see that it meets specifications.
- 5. GOVERNMENT** The first 100 people entering a county park on Thursday are asked their opinions on a proposed county ordinance that would allow dogs in county parks to go unleashed in certain designated areas.
- 6. MUSIC** To determine the music preferences of their customers, the owners of a music store ask 10 customers who have expressed interest to participate in an in-store interview in which they listen to new CDs from artists in all music categories.
- 7. LIBRARIES** A community library asks every tenth patron who enters the library to name the type or genre of book he or she is most likely to borrow. They conduct the interviews from opening to closing on three days of the week. They will use the data for new acquisitions.
- 8. COMPUTERS** To determine the number of students who use computers at home, the high school office chooses 10 students at random from each grade, and then interviews the students.

12-2 Skills Practice***Counting Outcomes***

Draw a tree diagram to show the sample space for each event. Determine the number of possible outcomes.

1. planting a garden with roses, zinnias, or cosmos, in yellow, red, orange, or purple

2. selecting monogrammed or plain stationery, in white or buff, with lined or unlined envelopes

Find the value of each expression.

3. $1!$

4. $3!$

5. $6!$

6. $9!$

7. Two dice are rolled. How many outcomes are possible?

8. If students can choose between 7 elective subjects, 6 class periods, and 5 teachers, how many elective classes are possible?

9. How many different ways can a carpenter build a bookcase using one each of 4 types of wood, 3 stains, 5 widths, and 6 heights?

12-3 Skills Practice***Permutations and Combinations***

Determine whether each situation involves a *permutation* or *combination*. Explain your reasoning.

- dinner guests seated around a table
- a pattern of different widths of bars and spaces for a bar code
- selecting two yellow marbles out of a sack of yellow and blue marbles
- placing one can of each of 15 different types of soup along a store shelf
- selecting four candles from a box of ten
- the placement of the top ten finishers in a school's spelling bee
- choosing two colors of paint out of twenty to paint the walls and trim of a bedroom
- choosing a set of twelve pencils from a selection of thirty-six

Evaluate each expression.

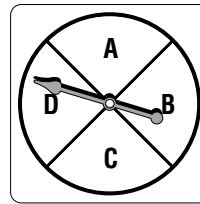
- | | | |
|------------------|--------------------------|--------------------------|
| 9. ${}_5P_2$ | 10. ${}_6P_4$ | 11. ${}_7P_3$ |
| 12. ${}_9P_4$ | 13. ${}_7P_5$ | 14. ${}_5P_3$ |
| 15. ${}_6C_2$ | 16. ${}_9C_7$ | 17. ${}_8C_4$ |
| 18. ${}_7C_5$ | 19. ${}_{12}C_2$ | 20. ${}_{13}C_7$ |
| 21. ${}_{11}C_2$ | 22. ${}_5P_4$ | 23. ${}_{14}C_5$ |
| 24. ${}_{11}C_6$ | 25. $({}_4P_2)({}_3P_2)$ | 26. $({}_8C_6)({}_5P_1)$ |

12-4 Skills Practice***Probability of Compound Events***

A bag contains 2 green, 9 brown, 7 yellow, and 4 blue marbles. Once a marble is selected, it is not replaced. Find each probability.

1. $P(\text{brown, then yellow})$
2. $P(\text{green, then blue})$
3. $P(\text{yellow, then yellow})$
4. $P(\text{blue, then blue})$
5. $P(\text{green, then not blue})$
6. $P(\text{brown, then not green})$

A die is rolled and a spinner like the one at the right is spun. Find each probability.



7. $P(4 \text{ and } A)$
8. $P(\text{an even number and } C)$
9. $P(2 \text{ or } 5 \text{ and } B \text{ or } D)$
10. $P(\text{a number less than } 5 \text{ and } B, C, \text{ or } D)$

One card is drawn from a standard deck of 52 cards. Find each probability.

11. $P(\text{jack or ten})$
12. $P(\text{red or black})$
13. $P(\text{queen or club})$
14. $P(\text{red or ace})$
15. $P(\text{diamond or black})$
16. $P(\text{face card or spade})$

Tiles numbered 1 through 20 are placed in a box. Tiles numbered 11 through 30 are placed in a second box. The first tile is randomly drawn from the first box. The second tile is randomly drawn from the second box. Find each probability.

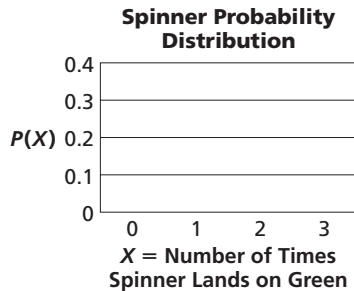
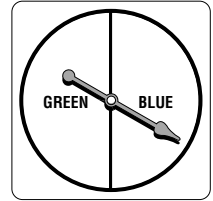
17. $P(\text{both are greater than } 15)$
18. The first tile is odd and the second tile is less than 25.
19. The first tile is a multiple of 6 and the second tile is a multiple of 4.
20. The first tile is less than 15 and the second tile is even or greater than 25.

12-5 Skills Practice

Probability Distributions

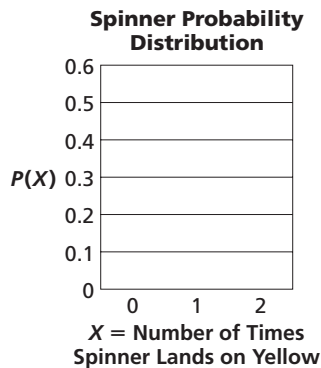
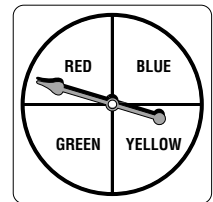
For Exercises 1–3, the spinner shown is spun three times.

- Write the sample space with all possible outcomes.
- Find the probability distribution X , where X represents the number of times the spinner lands on green for $X = 0, X = 1, X = 2,$ and $X = 3$.
- Make a probability histogram.



For Exercises 4–7, the spinner shown is spun two times.

- Write the sample space with all possible outcomes.
- Find the probability distribution X , where X represents the number of times the spinner lands on yellow for $X = 0, X = 1,$ and $X = 2$.
- Make a probability histogram.



BUSINESS For Exercises 7–9, use the table that shows the probability distribution of the number of minutes a customer spends at the express checkout at a supermarket.

$X =$ Minutes	1	2	3	4	5+
Probability	0.09	0.13	0.28	0.32	0.18

- Show that this is a valid probability distribution.
- What is the probability that a customer spends less than 3 minutes at the checkout?
- What is the probability that the customer spends at least 4 minutes at the checkout?

12-6 Skills Practice**Probability Simulations**

For Exercises 1–3, use a standard deck of 52 cards. Select a card at random, record the suit of the card (heart, diamond, club, or spade), and then replace the card. Repeat this procedure 26 times.

1. Based on your results, what is the experimental probability of selecting a heart?
2. Based on your results, what is the experimental probability of selecting a diamond or a spade?
3. Compare your results to the theoretical probabilities.
4. There are 3 siblings in the Bencievenga family. What could you use to simulate the genders of the 3 siblings?
5. A random survey of 23 students revealed that 2 students walk to school, 12 ride the bus, 6 drive a car, and 3 ride with a parent or other adult. What could you use for a simulation to determine the probability that a student selected at random uses any one type of transportation?

BIOLOGY For Exercises 6–9, use the following information.

Stephen conducted a survey of the students in his classes to observe the distribution of eye color. The table shows the results of his survey.

Eye Color	Blue	Brown	Green	Hazel
Number	12	58	2	8

6. Find the experimental probability distribution for each eye color.
7. Based on the survey, what is the experimental probability that a student in Stephen's classes has blue or green eyes?
8. Based on the survey, what is the experimental probability that a student in Stephen's classes does *not* have green or hazel eyes?
9. If the distribution of eye color in Stephen's grade is similar to the distribution in his classes, about how many of the 360 students in his grade would be expected to have brown eyes?