

Chapter 2

Section 2.1 Practice

1. a. The numerical coefficient of t is 1, since t is $1t$.

- b. The numerical coefficient of $-7x$ is -7 .

- c. The numerical coefficient of $-\frac{w}{5}$ is $-\frac{1}{5}$,

since $-\frac{w}{5}$ means $-\frac{1}{5} \cdot w$.

- d. The numerical coefficient of $43x^4$ is 43.

- e. The numerical coefficient of $-b$ is -1 , since $-b$ is $-1b$.

2. a. $-4xy$ and $5yx$ are like terms, since $xy = yx$ by the commutative property.

- b. $5q$ and $-3q^2$ are unlike terms, since the exponents on q are not the same.

- c. $3ab^2$, $-2ab^2$, and $43ab^2$ are like terms, since each variable and its exponent match.

- d. y^5 and $\frac{y^5}{2}$ are like terms, since the exponents on y are the same.

3. a. $-3y + 11y = (-3 + 11)y = 8y$

- b. $4x^2 + x^2 = 4x^2 + 1x^2 = (4 + 1)x^2 = 5x^2$

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

- d. $20y^2 + 2y^2 - y^2 = 20y^2 + 2y^2 - 1y^2$
 $= (20 + 2 - 1)y^2$
 $= 21y^2$

4. a. $3y + 8y - 7 + 2 = (3 + 8)y + (-7 + 2) = 11y - 5$

- b. $6x - 3 - x - 3 = 6x - 1x + (-3 - 3)$
 $= (6 - 1)x + (-3 - 3)$
 $= 5x - 6$

- c. $\frac{3}{4}t - t = \frac{3}{4}t - 1t = \left(\frac{3}{4} - 1\right)t = -\frac{1}{4}t$

- d. $9y + 3.2y + 10 + 3 = (9 + 3.2)y + (10 + 3)$
 $= 12.2y + 13$

- e. $5z - 3z^4$
 These two terms cannot be combined because they are unlike terms.

5. a. $3(2x - 7) = 3(2x) + 3(-7) = 6x - 21$

- b. $-5(x - 0.5z - 5)$
 $= -5(x) + (-5)(-0.5z) + (-5)(-5)$
 $= -5x + 2.5z + 25$

- c. $-(2x - y + z - 2)$
 $= -1(2x - y + z - 2)$
 $= -1(2x) - 1(-y) - 1(z) - 1(-2)$
 $= -2x + y - z + 2$

6. a. $4(9x + 1) + 6 = 36x + 4 + 6 = 36x + 10$

- b. $-7(2x - 1) - (6 - 3x) = -14x + 7 - 6 + 3x$
 $= -11x + 1$

- c. $8 - 5(6x + 5) = 8 - 30x - 25 = -30x - 17$

7. "Subtract $7x - 1$ from $2x + 3$ " translates to
 $(2x + 3) - (7x - 1) = 2x + 3 - 7x + 1 = -5x + 4$

8. a.

Three

added to

double a number

 $\downarrow$ $\downarrow$ $\downarrow$
 3 $+$ $2x$
 or $2x + 3$

- b.

the sum of 5 and a number

subtracted from

six

- ↓ ↓ ↓
- $$(5 + x) \quad - \quad 6 \quad = 5 + x - 6$$
- $$(5 + x) - 6 = 5 + x - 6 = x - 1$$
- c.

two

times

the sum of 3 and a number

increased by

4

- ↓ ↓ ↓ ↓ ↓
- $$2 \quad \cdot \quad (3 + x) \quad + \quad 4$$
- $$2(3 + x) + 4 = 6 + 2x + 4 = 2x + 10$$
- d.

a number

added to

half the number

added to

5 times the number

- ↓ ↓ ↓ ↓ ↓
- $$x \quad + \quad \frac{1}{2}x \quad + \quad 5x$$
- $$x + \frac{1}{2}x + 5x = \frac{13}{2}x$$

Vocabulary, Readiness & Video Check 2.1

- $23y^2 + 10y - 6$ is called an expression while $23y^2$, $10y$, and -6 are each called a term.
- To simplify $x + 4x$, we combine like terms.
- The term y has an understood numerical coefficient of 1.
- The terms $7z$ and $7y$ are unlike terms and the terms $7z$ and $-z$ are like terms.
- For the term $-\frac{1}{2}xy^2$, the number $-\frac{1}{2}$ is the numerical coefficient.
- $5(3x - y)$ equals $15x - 5y$ by the distributive property.
- Although these terms have exactly the same variables, the exponents on each are not exactly the same—the exponents on x differ in each term.
- distributive property
- -1
- The sum of 5 times a number and -2 , plus 7 times the number; $5x + (-2) + 7x$; because there are like terms.

Exercise Set 2.1

2. The numerical coefficient of $3x$ is 3.
4. The numerical coefficient of $-y$ is -1 , since $-y = -1y$.
6. The numerical coefficient of $1.2xyz$ is 1.2.
8. $-2x^2y$ and $6xy$ are unlike terms, since the exponents on x are not the same.
10. ab^2 and $-7ab^2$ are like terms, since each variable and its exponent match.
12. $7.4p^3q^2$ and $6.2p^3q^2r$ are unlike terms, since the exponents on r are not the same.
14. $3x + 2x = (3 + 2)x = 5x$
16. $c - 7c + 2c = (1 - 7 + 2)c = -4c$
18. $6g + 5 - 3g - 7 = 6g - 3g + 5 - 7$
 $= (6 - 3)g - 2$
 $= 3g - 2$
20. $a + 3a - 2 - 7a = a + 3a - 7a - 2$
 $= (1 + 3 - 7)a - 2$
 $= -3a - 2$
22. $8p + 4 - 8p - 15 = (8p - 8p) + (4 - 15)$
 $= (8 - 8)p + (-11)$
 $= 0p - 11$
 $= -11$
24. $7.9y - 0.7 - y + 0.2 = 7.9y - y - 0.7 + 0.2$
 $= (7.9 - 1)y - 0.5$
 $= 6.9y - 0.5$
26. $8h + 13h - 6 + 7h - h = 8h + 13h + 7h - h - 6$
 $= (8 + 13 + 7 - 1)h - 6$
 $= 27h - 6$
28. $8x^3 + x^3 - 11x^3 = (8 + 1 - 11)x^3 = -2x^3$
30. $0.4y - 6.7 + y - 0.3 - 2.6y$
 $= 0.4y + y - 2.6y - 6.7 - 0.3$
 $= (0.4 + 1 - 2.6)y - 7.0$
 $= -1.2y - 7$
32. $7(r - 3) = 7(r) - 7(3) = 7r - 21$
34. $-4(y + 6) = -4(y) + (-4)(6) = -4y - 24$
36. $9(z + 7) - 15 = 9z + 63 - 15 = 9z + 48$
38. $-2(4x - 3z - 1) = -2(4x) - (-2)(3z) - (-2)(1)$
 $= -8x + 6z + 2$
40. $-(y + 5z - 7) = -y - 5z + 7$
42. $4(2x - 3) - 2(x + 1) = 8x - 12 - 2x - 2$
 $= 6x - 14$
44.
$$\begin{array}{rcc} 3y - 5 & \text{added} & y + 16 \\ & \text{to} & \\ \downarrow & \downarrow & \downarrow \\ (3y - 5) & + & (y + 16) = 3y + y - 5 + 16 \\ & & = 4y + 11 \end{array}$$
46.
$$\begin{array}{rcc} 12 + x & \text{minus} & 4x - 7 \\ \downarrow & \downarrow & \downarrow \\ (12 + x) & - & (4x - 7) = 12 + x - 4x + 7 \\ & & = 12 + 7 + x - 4x \\ & & = 19 - 3x \end{array}$$
48.
$$\begin{array}{rcc} 2m - 6 & \text{minus} & m - 3 \\ \downarrow & \downarrow & \downarrow \\ (2m - 6) & - & (m - 3) = 2m - 6 - m + 3 \\ & & = 2m - m - 6 + 3 \\ & & = m - 3 \end{array}$$
50. $7c - 8 - c = 7c - c - 8 = (7 - 1)c - 8 = 6c - 8$
52. $5y - 14 + 7y - 20y = 5y + 7y - 20y - 14$
 $= (5 + 7 - 20)y - 14$
 $= -8y - 14$
54. $-3(2x + 5) - 6x = -3(2x) + (-3)(5) - 6x$
 $= -6x - 15 - 6x$
 $= -6x - 6x - 15$
 $= -12x - 15$
56. $2(6x - 1) - (x - 7) = 12x - 2 - x + 7$
 $= 11x + 5$
58. $8y - 2 - 3(y + 4) = 8y - 2 - 3y - 12 = 5y - 14$
60. $-11c - (4 - 2c) = -11c - 4 + 2c = -9c - 4$
62. $(8 - 5y) - (4 + 3y) = 8 - 5y - 4 - 3y = -8y + 4$
64. $2.8w - 0.9 - 0.5 - 2.8w = 2.8w - 2.8w - 0.9 - 0.5$
 $= -1.4$

$$\begin{aligned}
 66. \quad \frac{1}{5}(9y+2) + \frac{1}{10}(2y-1) &= \frac{9}{5}y + \frac{2}{5} + \frac{2}{10}y - \frac{1}{10} \\
 &= \frac{9}{5}y + \frac{1}{5}y + \frac{2}{5} - \frac{1}{10} \\
 &= \frac{10}{5}y + \frac{4}{10} - \frac{1}{10} \\
 &= 2y + \frac{3}{10}
 \end{aligned}$$

$$68. \quad 8 + 4(3x - 4) = 8 + 12x - 16 = -8 + 12x$$

$$70. \quad 0.2(k + 8) - 0.1k = 0.2k + 1.6 - 0.1k = 0.1k + 1.6$$

$$72. \quad 14 - 11(5m + 3n) = 14 - 55m - 33n$$

$$\begin{aligned}
 74. \quad 7(2x + 5) - 4(x + 2) - 20x &= 14x + 35 - 4x - 8 - 20x \\
 &= 14x - 4x - 20x + 35 - 8 \\
 &= -10x + 27
 \end{aligned}$$

$$\begin{aligned}
 76. \quad \frac{1}{3}(9x - 6) - (x - 2) &= 3x - 2 - x + 2 \\
 &= 2x
 \end{aligned}$$

$$\begin{array}{rcl}
 78. \quad \begin{array}{l} \text{The difference} \\ \text{of a number} \\ \text{and 2} \end{array} & \begin{array}{l} \text{divided} \\ \text{by} \end{array} & 5 \\
 \downarrow & \downarrow & \downarrow \\
 (x - 2) & \div & 5 = \frac{x - 2}{5}
 \end{array}$$

$$\begin{array}{rcl}
 80. \quad 8 & \text{more than} & \text{triple a number} \\
 \downarrow & \downarrow & \downarrow \\
 8 & + & 3x
 \end{array}$$

$$\begin{array}{rcl}
 82. \quad \text{eleven} & \text{increased} & \text{two-thirds of} \\
 & \text{by} & \text{a number} \\
 \downarrow & \downarrow & \downarrow \\
 11 & + & \frac{2}{3}x
 \end{array}$$

$$\begin{array}{rcl}
 84. \quad \begin{array}{l} 9 \text{ times a} \\ \text{number} \end{array} & \text{subtract} & \begin{array}{l} 3 \text{ times the} \\ \text{number and 10} \end{array} \\
 \downarrow & \downarrow & \downarrow \\
 9x & - & (3x + 10) \\
 9x - (3x + 10) & = & 9x - 3x - 10 = 6x - 10
 \end{array}$$

86. Six times the difference of a number and 5

$$\begin{array}{ccc} \downarrow & & \downarrow \\ 6 & \cdot & (x-5) \\ 6(x-5) = 6x - 30 \end{array}$$

88. half a number minus the product of the number and 8

$$\begin{array}{ccc} \downarrow & & \downarrow \\ \frac{1}{2}x & - & 8x \\ \frac{1}{2}x - 8x = -7.5x \end{array}$$

90. twice a number added to -1 added to 5 times the number added to -12
- $$\begin{array}{ccccccc} \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 2x & + & -1 & + & 5x & + & -12 \\ 2x + (-1) + 5x + (-12) = 7x - 13 \end{array}$$

92. $gh - h^2 = 0(-4) - (-4)^2 = 0 - 16 = -16$

94. $x^3 - x^2 + 4 = (-3)^3 - (-3)^2 + 4$
 $= -27 - 9 + 4$
 $= -32$

96. $x^3 - x^2 - x = (-2)^3 - (-2)^2 - (-2)$
 $= -8 - 4 + 2$
 $= -10$

98. $5 + (3x - 1) + (2x + 5) = 5 + 3x - 1 + 2x + 5$
 $= 5x + 9$
 The perimeter is $(5x + 9)$ centimeters.

100. 2 cylinders $\not\cong$ 3 cubes
 2 cubes + 2 cubes $\not\cong$ 3 cubes
 4 cubes $\neq$ 3 cubes: Not balanced

102. 1 cylinder $\not\cong$ 1 cone + 1 cube
 2 cubes $\not\cong$ 1 cube + 1 cube
 2 cubes $=$ 2 cubes: Balanced

104. answers may vary

106. $5x + 10(3x) + 25(30x - 1) = 5x + 30x + 750x - 25$
 $= 785x - 25$
 The total value is $(785x - 25)\phi$.

108. no; answers may vary

$$110. \quad 4m^4p^2 + m^4p^2 - 5m^2p^4 = 5m^4p^2 - 5m^2p^4$$

$$\begin{aligned} 112. \quad & 9y^2 - (6xy^2 - 5y^2) - 8xy^2 \\ & = 9y^2 - 6xy^2 + 5y^2 - 8xy^2 \\ & = 14y^2 - 14xy^2 \end{aligned}$$

$$\begin{aligned} 114. \quad & -(7c^3d - 8c) - 5c - 4c^3d \\ & = -7c^3d + 8c - 5c - 4c^3d \\ & = -11c^3d + 3c \end{aligned}$$

Section 2.2 Practice

$$1. \quad x + 3 = -5$$

$$x + 3 - 3 = -5 - 3$$

$$x = -8$$

$$\text{Check: } x + 3 = -5$$

$$-8 + 3 \stackrel{?}{=} -5$$

$$-5 = -5$$

The solution is -8 .

$$2. \quad y - 0.3 = -2.1$$

$$y - 0.3 + 0.3 = -2.1 + 0.3$$

$$y = -1.8$$

$$\text{Check: } y - 0.3 = -2.1$$

$$-1.8 - 0.3 \stackrel{?}{=} -2.1$$

$$-2.1 = -2.1$$

The solution is -1.8 .

$$3. \quad 8x - 5x - 3 + 9 = x + x + 3 - 7$$

$$3x + 6 = 2x - 4$$

$$3x + 6 - 2x = 2x - 4 - 2x$$

$$x + 6 = -4$$

$$x + 6 - 6 = -4 - 6$$

$$x = -10$$

Check:

$$8x - 5x - 3 + 9 = x + x + 3 - 7$$

$$8(-10) - 5(-10) - 3 + 9 \stackrel{?}{=} -10 + (-10) + 3 - 7$$

$$-80 + 50 - 3 + 9 \stackrel{?}{=} -10 + (-10) + 3 - 7$$

$$-24 = -24$$

The solution is -10 .

$$4. \quad 2 = 4(2a - 3) - (7a + 4)$$

$$2 = 4(2a) + 4(-3) - 7a - 4$$

$$2 = 8a - 12 - 7a - 4$$

$$2 = a - 16$$

$$2 + 16 = a - 16 + 16$$

$$18 = a$$

Check by replacing a with 18 in the original equation.

$$5. \quad \frac{4}{5}x = 16$$

$$\frac{5}{4} \cdot \frac{4}{5}x = \frac{5}{4} \cdot 16$$

$$\left(\frac{5}{4} \cdot \frac{4}{5}\right)x = \frac{5}{4} \cdot 16$$

$$1x = 20$$

$$x = 20$$

$$\text{Check: } \frac{4}{5}x = 16$$

$$\frac{4}{5} \cdot 20 \stackrel{?}{=} 16$$

$$16 = 16$$

The solution is 20.

$$6. \quad 8x = -96$$

$$\frac{8x}{8} = \frac{-96}{8}$$

$$x = -12$$

$$\text{Check: } 8x = -96$$

$$8(-12) \stackrel{?}{=} -96$$

$$-96 = -96$$

The solution is -12 .

$$7. \quad \frac{x}{5} = 13$$

$$5 \cdot \frac{x}{5} = 5 \cdot 13$$

$$x = 65$$

$$\text{Check: } \frac{x}{5} = 13$$

$$\frac{65}{5} \stackrel{?}{=} 13$$

$$13 = 13$$

The solution is 65.

$$8. \quad 6b - 11b = 18 + 2b - 6 + 9$$

$$-5b = 21 + 2b$$

$$-5b - 2b = 21 + 2b - 2b$$

$$-7b = 21$$

$$\frac{-7b}{-7} = \frac{21}{-7}$$

$$b = -3$$

Check by replacing b with -3 in the original equation. The solution is -3 .

$$9. \quad \text{a. The other number is } 9 - 2 = 7.$$

$$\text{b. The other number is } 9 - x.$$

$$\text{c. The other piece has length } (9 - x) \text{ feet.}$$

10. Let x = first integer.
 $x + 2$ = second even integer.
 $x + 4$ = third even integer.
 $x + (x + 2) + (x + 4) = 3x + 6$

Vocabulary, Readiness & Video Check 2.2

- The difference between an equation and an expression is that an equation contains an equal sign, whereas an expression does not.
- Equivalent equations are equations that have the same solution.
- A value of the variable that makes the equation a true statement is called a solution of the equation.
- The process of finding the solution of an equation is called solving the equation for the variable.
- By the addition property of equality, $x = -2$ and $x + 10 = -2 + 10$ are equivalent equations.
- By the addition property of equality, $x = -7$ and $x - 5 = -7 - 5$ are equivalent equations.
- By the multiplication property of equality,
 $y = \frac{1}{2}$ and $5 \cdot y = 5 \cdot \frac{1}{2}$ are equivalent equations.
- By the multiplication property of equality,
 $9x = -63$ and $\frac{9x}{9} = \frac{-63}{9}$ are equivalent equations.
- The equations $x = \frac{1}{2}$ and $\frac{1}{2} = x$ are equivalent equations. The statement is true.
- The equations $\frac{z}{4} = 10$ and $4 \cdot \frac{z}{4} = 10$ are not equivalent equations. The statement is false.
- The addition property of equality means that if we have an equation, we can add the same real number to both sides of the equation and have an equivalent equation.
- We can multiply both sides of an equation by any nonzero number and have an equivalent equation.

13. addition property; multiplication property; answers may vary

14. $(x + 1) + (x + 3) = 2x + 4$

Exercise Set 2.2

- $x + 14 = 25$
 $x + 14 - 14 = 25 - 14$
 $x = 11$
 Check: $x + 14 = 25$
 $11 + 14 \stackrel{?}{=} 25$
 $25 = 25$
 The solution is 11.
- $y - 9 = 1$
 $y - 9 + 9 = 1 + 9$
 $y = 10$
 Check: $y - 9 = 1$
 $10 - 9 \stackrel{?}{=} 1$
 $1 = 1$
 The solution is 10.
- $8 + z = -8$
 $8 - 8 + z = -8 - 8$
 $z = -16$
 Check: $8 + z = -8$
 $8 + (-16) \stackrel{?}{=} -8$
 $-8 = -8$
 The solution is -16.
- $t - 9.2 = -6.8$
 $5 - 9.2 + 9.2 = -6.8 + 9.2$
 $t = 2.4$
 Check: $t - 9.2 = -6.8$
 $2.4 - 9.2 \stackrel{?}{=} -6.8$
 $-6.8 = -6.8$
 The solution is 2.4.
- $2x = x - 5$
 $2x - x = x - x - 5$
 $x = -5$
 Check: $2x = x - 5$
 $2(-5) \stackrel{?}{=} -5 - 5$
 $-10 = -10$
 The solution is -5.

$$\begin{aligned}
 12. \quad & 9x + 5.5 = 10x \\
 & 9x - 9x + 5.5 = 10x - 9x \\
 & \quad 5.5 = x \\
 \text{Check:} \quad & 9x + 5.5 = 10x \\
 & 9(5.5) + 5.5 \stackrel{?}{=} 10(5.5) \\
 & 49.5 + 5.5 \stackrel{?}{=} 55 \\
 & \quad 55 = 55 \\
 & \text{The solution is } 5.5.
 \end{aligned}$$

$$\begin{aligned}
 14. \quad & 18x - 9 = 19x \\
 & 18x - 18x - 9 = 19x - 18x \\
 & \quad -9 = x \\
 \text{Check:} \quad & 18x - 9 = 19x \\
 & 18(-9) - 9 \stackrel{?}{=} 19(-9) \\
 & -162 - 9 \stackrel{?}{=} -171 \\
 & -171 = 171 \\
 & \text{The solution is } -9.
 \end{aligned}$$

$$\begin{aligned}
 16. \quad & 7y + 2 = 2y + 4y + 2 \\
 & 7y + 2 = 6y + 2 \\
 & 7y + 2 - 6y = 6y + 2 - 6y \\
 & \quad y + 2 = 2 \\
 & y + 2 - 2 = 2 - 2 \\
 & \quad y = 0 \\
 & \text{The solution is } 0.
 \end{aligned}$$

$$\begin{aligned}
 18. \quad & 4c + 8 - c = 8 + 2c \\
 & 3c + 8 = 8 + 2c \\
 & 3c - 2c + 8 = 8 + 2c - 2c \\
 & \quad c + 8 = 8 \\
 & c + 8 - 8 = 8 - 8 \\
 & \quad c = 0 \\
 & \text{The solution is } 0.
 \end{aligned}$$

$$\begin{aligned}
 20. \quad & 3n + 2n = 7 + 4n \\
 & 5n = 7 + 4n \\
 & 5n - 4n = 7 + 4n - 4n \\
 & \quad n = 7 \\
 & \text{The solution is } 7.
 \end{aligned}$$

$$\begin{aligned}
 22. \quad & 10 = 8(3y - 4) - 23y + 20 \\
 & 10 = 24y - 32 - 23y + 20 \\
 & 10 = y - 12 \\
 & 10 + 12 = y - 12 + 12 \\
 & 22 = y \\
 & \text{The solution is } 22.
 \end{aligned}$$

$$\begin{aligned}
 24. \quad & -7x = -49 \\
 & \frac{-7x}{-7} = \frac{-49}{-7} \\
 & \quad x = 7 \\
 & \text{The solution is } 7.
 \end{aligned}$$

$$\begin{aligned}
 26. \quad & -2x = 0 \\
 & \frac{-2x}{-2} = \frac{0}{-2} \\
 & \quad x = 0 \\
 & \text{The solution is } 0.
 \end{aligned}$$

$$\begin{aligned}
 28. \quad & -y = 8 \\
 & \frac{-y}{-1} = \frac{8}{-1} \\
 & \quad y = -8 \\
 & \text{The solution is } -8.
 \end{aligned}$$

$$\begin{aligned}
 30. \quad & -y + 4y = 33 \\
 & 3y = 33 \\
 & \frac{3y}{3} = \frac{33}{3} \\
 & \quad y = 11 \\
 & \text{The solution is } 11.
 \end{aligned}$$

$$\begin{aligned}
 32. \quad & \frac{3}{4}n = -15 \\
 & \frac{4}{3}\left(\frac{3}{4}n\right) = \frac{4}{3}(-15) \\
 & \quad n = -20 \\
 & \text{The solution is } -20.
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & \frac{1}{8}v = \frac{1}{4} \\
 & 8\left(\frac{1}{8}v\right) = 8\left(\frac{1}{4}\right) \\
 & \quad v = 2 \\
 & \text{The solution is } 2.
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & \frac{d}{15} = 2 \\
 & 15\left(\frac{d}{15}\right) = 15(2) \\
 & \quad d = 30 \\
 & \text{The solution is } 30.
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & \frac{f}{-5} = 0 \\
 & -5\left(\frac{f}{-5}\right) = -5(0) \\
 & \quad f = 0 \\
 & \text{The solution is } 0.
 \end{aligned}$$

40. Answers may vary

$$\begin{aligned}
 42. \quad & 3x - 1 = 26 \\
 & 3x - 1 + 1 = 26 + 1 \\
 & 3x = 27 \\
 & \frac{3x}{3} = \frac{27}{3} \\
 & x = 9
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & 3x - 1 = 26 \\
 & 3(9) - 1 \stackrel{?}{=} 26 \\
 & 27 - 1 \stackrel{?}{=} 26 \\
 & 26 = 26
 \end{aligned}$$

The solution is 9.

$$\begin{aligned}
 44. \quad & -x + 4 = -24 \\
 & -x + 4 - 4 = -24 - 4 \\
 & -x = -28 \\
 & x = 28 \\
 \text{Check: } & -x + 4 = -24 \\
 & -(28) + 4 \stackrel{?}{=} -24 \\
 & -28 + 4 \stackrel{?}{=} -24 \\
 & -24 = -24
 \end{aligned}$$

The solution is 28.

$$\begin{aligned}
 46. \quad & 8t + 5 = 5 \\
 & 8t + 5 - 5 = 5 - 5 \\
 & 8t = 0 \\
 & \frac{8t}{8} = \frac{0}{8} \\
 & t = 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & 8t + 5 = 5 \\
 & 8(0) + 5 \stackrel{?}{=} 5 \\
 & 0 + 5 \stackrel{?}{=} 5 \\
 & 5 = 5
 \end{aligned}$$

The solution is 0.

$$\begin{aligned}
 48. \quad & -10y + 15 = 5 \\
 & -10y + 15 - 15 = 5 - 15 \\
 & -10y = -10 \\
 & \frac{-10y}{-10} = \frac{-10}{-10} \\
 & y = 1
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & -10y + 15 = 5 \\
 & -10 \cdot 1 + 15 \stackrel{?}{=} 5 \\
 & -10 + 15 \stackrel{?}{=} 5 \\
 & 5 = 5
 \end{aligned}$$

The solution is 1.

$$\begin{aligned}
 50. \quad & 2 + 0.4p = 2 \\
 & 2 - 2 + 0.4p = 2 - 2 \\
 & 0.4p = 0 \\
 & \frac{0.4p}{0.4} = \frac{0}{0.4} \\
 & p = 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & 2 + 0.4p = 2 \\
 & 2 + 0.4 \cdot 0 \stackrel{?}{=} 2 \\
 & 2 + 0 \stackrel{?}{=} 2 \\
 & 2 = 2
 \end{aligned}$$

The solution is 0.

$$\begin{aligned}
 52. \quad & -3n - \frac{1}{3} = \frac{8}{3} \\
 & -3n - \frac{1}{3} + \frac{1}{3} = \frac{8}{3} + \frac{1}{3} \\
 & -3n = \frac{9}{3} \\
 & -3n = 3 \\
 & \frac{-3n}{-3} = \frac{3}{-3} \\
 & n = -1
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & -3n - \frac{1}{3} = \frac{8}{3} \\
 & -3(-1) - \frac{1}{3} \stackrel{?}{=} \frac{8}{3} \\
 & 3 - \frac{1}{3} \stackrel{?}{=} \frac{8}{3} \\
 & \frac{9}{3} - \frac{1}{3} \stackrel{?}{=} \frac{8}{3} \\
 & \frac{8}{3} = \frac{8}{3}
 \end{aligned}$$

The solution is -1.

$$\begin{aligned}
 54. \quad & \frac{b}{4} - 1 = -7 \\
 & \frac{b}{4} - 1 + 1 = -7 + 1 \\
 & \frac{b}{4} = -6 \\
 & 4\left(\frac{b}{4}\right) = 4(-6) \\
 & b = -24
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } & \frac{b}{4} - 1 = -7 \\
 & \frac{-24}{4} - 1 \stackrel{?}{=} -7 \\
 & -6 - 1 \stackrel{?}{=} -7 \\
 & -7 = -7
 \end{aligned}$$

The solution is -24.

$$56. \quad 12 = 3j - 4$$

$$12 + 4 = 3j - 4 + 4$$

$$16 = 3j$$

$$\frac{16}{3} = \frac{3j}{3}$$

$$\frac{16}{3} = j$$

$$\text{Check: } 12 = 3j - 4$$

$$12 \stackrel{?}{=} 3 \cdot \frac{16}{3} - 4$$

$$12 \stackrel{?}{=} 16 - 4$$

$$12 = 12$$

$$\text{The solution is } \frac{16}{3}.$$

$$58. \quad 4a + 1 + a - 11 = 0$$

$$5a - 10 = 0$$

$$5a - 10 + 10 = 0 + 10$$

$$5a = 10$$

$$\frac{5a}{5} = \frac{10}{5}$$

$$a = 2$$

$$\text{Check: } 4a + 1 + a - 11 = 0$$

$$4 \cdot 2 + 1 + 2 - 11 \stackrel{?}{=} 0$$

$$8 + 1 + 2 - 11 \stackrel{?}{=} 0$$

$$0 = 0$$

$$\text{The solution is } 2.$$

$$60. \quad 12x + 30 + 8x - 6 = 10$$

$$20x + 24 = 10$$

$$20x + 24 - 24 = 10 - 24$$

$$20x = -14$$

$$\frac{20x}{20} = \frac{-14}{20}$$

$$x = -\frac{7}{10}$$

$$\text{Check: } 12x + 30 + 8x - 6 = 10$$

$$12\left(-\frac{7}{10}\right) + 30 + 8\left(-\frac{7}{10}\right) - 6 \stackrel{?}{=} 10$$

$$-\frac{84}{10} + 24 - \frac{56}{10} \stackrel{?}{=} 10$$

$$-\frac{140}{10} + 24 \stackrel{?}{=} 10$$

$$-14 + 24 \stackrel{?}{=} 10$$

$$10 = 10$$

$$\text{The solution is } -\frac{7}{10}.$$

$$62. \quad -\frac{3}{4}x = 9$$

$$-\frac{4}{3}\left(-\frac{3}{4}x\right) = -\frac{4}{3} \cdot 9$$

$$x = -12$$

$$\text{Check: } -\frac{3}{4}x = 9$$

$$-\frac{3}{4}(-12) \stackrel{?}{=} 9$$

$$9 = 9$$

$$\text{The solution is } -12.$$

$$64. \quad 19 = 0.4x - 0.9x - 6$$

$$19 = -0.5x - 6$$

$$19 + 6 = -0.5x - 6 + 6$$

$$25 = -0.5x$$

$$\frac{25}{-0.5} = \frac{-0.5x}{-0.5}$$

$$-50 = x$$

$$\text{Check: } 19 = 0.4x - 0.9x - 6$$

$$19 \stackrel{?}{=} 0.4(-50) - 0.9(-50) - 6$$

$$19 \stackrel{?}{=} -20 + 45 - 6$$

$$19 = 19$$

$$\text{The solution is } -50.$$

$$66. \quad t - 6t = -13 + t - 3t$$

$$-5t = -2t - 13$$

$$-5t + 2t = -2t + 2t - 13$$

$$-3t = -13$$

$$\frac{-3t}{-3} = \frac{-13}{-3}$$

$$t = \frac{13}{3}$$

$$\text{Check: } t - 6t = -13 + t - 3t$$

$$\frac{13}{3} - 6 \cdot \frac{13}{3} \stackrel{?}{=} -13 + \frac{13}{3} - 3 \cdot \frac{13}{3}$$

$$\frac{13}{3} - \frac{78}{3} \stackrel{?}{=} -\frac{39}{3} + \frac{13}{3} - \frac{39}{3}$$

$$-\frac{65}{3} = -\frac{65}{3}$$

$$\text{The solution is } \frac{13}{3}.$$

$$68. \quad 0.1x - 0.6x - 6 = 19$$

$$-0.5x - 6 = 19$$

$$-0.5x - 6 + 6 = 19 + 6$$

$$-0.5x = 25$$

$$\frac{-0.5x}{-0.5} = \frac{25}{-0.5}$$

$$x = -50$$

Check: $0.1x - 0.6x - 6 = 19$
 $0.1(-50) - 0.6(-50) - 6 \stackrel{?}{=} 19$
 $-5 + 30 - 6 \stackrel{?}{=} 19$
 $19 = 19$

The solution is -50 .

70. $-5 - 6y + 6 = 19$
 $-6y + 1 = 19$
 $-6y + 1 - 1 = 19 - 1$
 $-6y = 18$
 $\frac{-6y}{-6} = \frac{18}{-6}$
 $y = -3$

Check: $-5 - 6y + 6 = 19$
 $-5 - 6(-3) + 6 \stackrel{?}{=} 19$
 $-5 + 18 + 6 \stackrel{?}{=} 19$
 $19 = 19$

The solution is -3 .

72. $4b - 8 - b = 10b - 3b$
 $3b - 8 = 7b$
 $3b - 3b - 8 = 7b - 3b$
 $-8 = 4b$
 $\frac{-8}{4} = \frac{4b}{4}$
 $-2 = b$

Check: $4b - 8 - b = 10b - 3b$
 $4(-2) - 8 - (-2) \stackrel{?}{=} 10(-2) - 3(-2)$
 $-8 - 8 + 2 \stackrel{?}{=} -20 + 6$
 $-14 = -14$

The solution is -2 .

74. $-3 = -5(4x + 3) + 21x$
 $-3 = -20x - 15 + 21x$
 $-3 = x - 15$
 $-3 + 15 = x - 15 + 15$
 $12 = x$

Check: $-3 = -5(4x + 3) + 21x$
 $-3 \stackrel{?}{=} -5(4 \cdot 12 + 3) + 21 \cdot 12$
 $-3 \stackrel{?}{=} -5(48 + 3) + 252$
 $-3 \stackrel{?}{=} -5(51) + 252$
 $-3 \stackrel{?}{=} -255 + 252$
 $-3 = -3$

The solution is 12 .

76. The other number is $13 - y$.

78. The length of the other piece is $(5 - x)$ feet.

80. The complement of the angle x° is $(90 - x)^\circ$.

82. The length of the computer desk is

$$\left(m + 1\frac{1}{2}\right) \text{ feet.}$$

84. The length of I-90 is $(m + 178.5)$ miles.

86. If the length of the Missouri River is r miles and the Mississippi River is 200 miles shorter, then the length of the Mississippi River is $(r - 200)$ miles.

88. The weight of the Hoba West meteorite is $3y$ kilograms.

90. Sum = first integer + second integer
+ third integer + fourth integer.

$$\begin{aligned} \text{Sum} &= x + (x + 2) + (x + 4) + (x + 6) \\ &= x + x + 2 + x + 4 + x + 6 \\ &= 4x + 12 \end{aligned}$$

92. Sum = 20 + second integer.

$$\begin{aligned} \text{Sum} &= 20 + (x + 1) \\ &= 20 + x + 1 \\ &= x + 21 \end{aligned}$$

94. Let x be an odd integer.

Then $x + 2$ is the next odd integer.

$$x + (x + 2) + x + (x + 2) = 4x + 4$$

96. $-7y + 2y - 3(y + 1) = -7y + 2y - 3y - 3 = -8y - 3$

98. $-(3a - 3) + 2a - 6 = -3a + 3 + 2a - 6 = -a - 3$

100. $(-2)^4 = (-2)(-2)(-2)(-2) = 16$
 $-2^4 = -2 \cdot 2 \cdot 2 \cdot 2 = -16$
 $(-2)^4 > -2^4$

102. $(-4)^3 = (-4)(-4)(-4) = -64$
 $-4^3 = -4 \cdot 4 \cdot 4 = -64$
 $(-4)^3 = -4^3$

104. $360 - (x + 3x + 5x) = 360 - (9x) = 360 - 9x$
The fourth angle is $(360 - 9x)^\circ$.

106. Answers may vary

108. $a + 9 = 15$
 $a + 9 + (-9) = 15 + (-9)$
 $a = 6$

The answer is -9 .

110. Answers may vary

112. Answers may vary

$$\begin{array}{rcl}
 114. & \underline{\hspace{1cm}} & x = 10 \\
 & \underline{\hspace{1cm}} & \cdot \frac{1}{2} = 10 \\
 & \underline{\hspace{1cm}} & \cdot \frac{1}{2} \cdot 2 = 10 \cdot 2 \\
 & \underline{\hspace{1cm}} & = 20
 \end{array}$$

116. $9x = 13.5$

$$\begin{array}{r}
 9x = 13.5 \\
 \underline{9 = 9} \\
 x = 1.5
 \end{array}$$

Each dose should be 1.5 milliliters.

118. Check $a = 6.3$.

$$\begin{array}{rcl}
 3(a + 4.6) & = & 5a + 2.5 \\
 3(6.3 + 4.6) & \stackrel{?}{=} & 5(6.3) + 2.5 \\
 3(10.9) & \stackrel{?}{=} & 31.5 + 2.5 \\
 32.7 & = & 34
 \end{array}$$

Not a solution

120. $4.95y = -31.185$

$$\begin{array}{r}
 4.95y = -31.185 \\
 \underline{4.95 = 4.95} \\
 y = -6.3
 \end{array}$$

122. $0.06y + 2.63 = 2.5562$

$$\begin{array}{rcl}
 0.06y + 2.63 - 2.63 & = & 2.5562 - 2.63 \\
 0.06y & = & -0.0738 \\
 \underline{0.06y = -0.0738} & & \\
 \underline{0.06 = 0.06} & & \\
 y & = & -1.23
 \end{array}$$

Section 2.3 Practice

1. $2(4a - 9) + 3 = 5a - 6$

$$8a - 18 + 3 = 5a - 6$$

$$8a - 15 = 5a - 6$$

$$8a - 15 - 5a = 5a - 6 - 5a$$

$$3a - 15 = -6$$

$$3a - 15 + 15 = -6 + 15$$

$$3a = 9$$

$$\frac{3a}{3} = \frac{9}{3}$$

$$a = 3$$

Check: $2(4a - 9) + 3 = 5a - 6$

$$2[4(3) - 9] + 3 \stackrel{?}{=} 5(3) - 6$$

$$2(12 - 9) + 3 \stackrel{?}{=} 15 - 6$$

$$2(3) + 3 \stackrel{?}{=} 9$$

$$6 + 3 \stackrel{?}{=} 9$$

$$9 = 9$$

The solution is 3 or the solution set is $\{3\}$.

2. $7(x - 3) = -6x$

$$7x - 21 = -6x$$

$$7x - 21 - 7x = -6x - 7x$$

$$-21 = -13x$$

$$\underline{-21 = -13x}$$

$$\underline{-13 = -13}$$

$$\frac{21}{13} = x$$

Check: $7(x - 3) = -6x$

$$7\left(\frac{21}{13} - 3\right) \stackrel{?}{=} -6\left(\frac{21}{13}\right)$$

$$7\left(\frac{21}{13} - \frac{39}{13}\right) \stackrel{?}{=} -\frac{126}{13}$$

$$7\left(-\frac{18}{13}\right) \stackrel{?}{=} -\frac{126}{13}$$

$$-\frac{126}{13} = -\frac{126}{13}$$

The solution is $\frac{21}{13}$.

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

$$15\left(\frac{3}{5}x - 2\right) = 15\left(\frac{2}{3}x - 1\right)$$

$$15\left(\frac{3}{5}x\right) - 15(2) = 15\left(\frac{2}{3}x\right) - 15(1)$$

$$9x - 30 = 10x - 15$$

$$9x - 30 - 9x = 10x - 15 - 9x$$

$$-30 = x - 15$$

$$-30 + 15 = x - 15 + 15$$

$$-15 = x$$

Check: $\frac{3}{5}x - 2 = \frac{2}{3}x - 1$

$$\frac{3}{5} \cdot -15 - 2 \stackrel{?}{=} \frac{2}{3} \cdot -15 - 1$$

$$-9 - 2 \stackrel{?}{=} -10 - 1$$

$$-11 = -11$$

The solution is -15 .

$$\begin{aligned}
 4. \quad & \frac{4(y+3)}{3} = 5y - 7 \\
 & 3 \cdot \frac{4(y+3)}{3} = 3 \cdot (5y - 7) \\
 & 4(y+3) = 3(5y - 7) \\
 & 4y + 12 = 15y - 21 \\
 & 4y + 12 - 4y = 15y - 21 - 4y \\
 & 12 = 11y - 21 \\
 & 12 + 21 = 11y - 21 + 21 \\
 & 33 = 11y \\
 & \frac{33}{11} = \frac{11y}{11} \\
 & 3 = y
 \end{aligned}$$

To check, replace y with 3 in the original equation. The solution is 3.

$$\begin{aligned}
 5. \quad & 0.35x + 0.09(x + 4) = 0.30(12) \\
 & 100[0.35x + 0.09(x + 4)] = 100[0.30(12)] \\
 & 35x + 9(x + 4) = 3(12) \\
 & 35x + 9x + 36 = 36 \\
 & 44x + 36 = 36 \\
 & 44x + 36 - 36 = 36 - 36 \\
 & 44x = 0 \\
 & \frac{44x}{44} = \frac{0}{44} \\
 & x = 0
 \end{aligned}$$

To check, replace x with 0 in the original equation. The solution is 0.

$$\begin{aligned}
 6. \quad & 4(x + 4) - x = 2(x + 11) + x \\
 & 4x + 16 - x = 2x + 22 + x \\
 & 3x + 16 = 3x + 22 \\
 & 3x + 16 - 3x = 3x + 22 - 3x \\
 & 16 = 22
 \end{aligned}$$

There is no solution.

$$\begin{aligned}
 7. \quad & 12x - 18 = 9(x - 2) + 3x \\
 & 12x - 18 = 9x - 18 + 3x \\
 & 12x - 18 = 12x - 18 \\
 & 12x - 18 + 18 = 12x - 18 + 18 \\
 & 12x = 12x \\
 & 12x - 12x = 12x - 12x \\
 & 0 = 0
 \end{aligned}$$

The solution is all real numbers.

4. Not a solution ($-11.9 \neq -60.1$)

5. Solution ($17,061 = 17,061$)

6. Solution ($-316 = -316$)

Vocabulary, Readiness & Video Check 2.3

1. $x = -7$ is an equation.

2. $x - 7$ is an expression.

3. $4y - 6 + 9y + 1$ is an expression.

4. $4y - 6 = 9y + 1$ is an equation.

5. $\frac{1}{x} - \frac{x-1}{8}$ is an expression.

6. $\frac{1}{x} - \frac{x-1}{8} = 6$ is an equation.

7. $0.1x + 9 = 0.2x$ is an equation.

8. $0.1x^2 + 9y - 0.2x^2$ is an expression.

9. 3; distributive property, addition property of equality, multiplication property of equality

10. Because both sides have more than one term, you need to apply the distributive property to make sure you multiply every single term in the equation by the LCD.

11. The number of decimal places in each number helps you determine what power of 10 you can multiply through by so you are no longer dealing with decimals.

12. When solving a linear equation and all variable terms, subtract out:

a. If you have a true statement, then the equation has all real numbers as a solution.

b. If you have a false statement, then the equation has no solution.

Graphing Calculator Explorations

1. Solution ($-24 = -24$)

2. Solution ($-4 = -4$)

3. Not a solution ($19.4 \neq 10.4$)

Exercise Set 2.3

2. $-3x+1=-2(4x+2)$
 $-3x+1=-8x-4$
 $-3x+1-1=-8x-4-1$
 $-3x=-8x-5$
 $-3x+8x=-8x-5+8x$
 $5x=-5$
 $\frac{5x}{5}=\frac{-5}{5}$
 $x=-1$
4. $15x-5=7+12x$
 $15x-5+5=7+12x+5$
 $15x=12+12x$
 $15x-12x=12+12x-12x$
 $3x=12$
 $\frac{3x}{3}=\frac{12}{3}$
 $x=4$
6. $-(5x-10)=5x$
 $-5x+10=5x$
 $-5x+10+5x=5x+5x$
 $10=10x$
 $\frac{10}{10}=\frac{10x}{10}$
 $1=x$
8. $3(2-5x)+4(6x)=12$
 $6-15x+24x=12$
 $6+9x=12$
 $6-6+9x=12-6$
 $9x=6$
 $\frac{9x}{9}=\frac{6}{9}$
 $x=\frac{2}{3}$
10. $-4(n-4)-23=-7$
 $-4n+16-23=-7$
 $-4n-7=-7$
 $-4n-7+7=-7+7$
 $-4n=0$
 $\frac{-4n}{-4}=\frac{0}{-4}$
 $n=0$
12. $5-6(2+b)=b-14$
 $5-12-6b=b-14$
 $-7-6b=b-14$
 $-7-6b-b=b-b-14$
 $-7-7b=-14$
 $-7+7-7b=-14+7$
 $-7b=-7$
 $\frac{-7b}{-7}=\frac{-7}{-7}$
 $b=1$
14. $6y-8=-6+3y+13$
 $6y-8=3y+7$
 $6y-3y-8=3y-3y+7$
 $3y-8=7$
 $3y-8+8=7+8$
 $3y=15$
 $\frac{3y}{3}=\frac{15}{3}$
 $y=5$
16. $-7n+5=8n-10$
 $-7n+5-5=8n-10-5$
 $-7n=8n-15$
 $-7n-8n=8n-15-8n$
 $-15n=-15$
 $\frac{-15n}{-15}=\frac{-15}{-15}$
 $n=1$
18. $\frac{4}{5}x-\frac{8}{5}=-\frac{16}{5}$
 $5\left(\frac{4}{5}x-\frac{8}{5}\right)=5\left(-\frac{16}{5}\right)$
 $4x-8=-16$
 $4x-8+8=-16+8$
 $4x=-8$
 $\frac{4x}{4}=\frac{-8}{4}$
 $x=-2$

$$\begin{aligned}
 20. \quad & \frac{2}{9}x - \frac{1}{3} = 1 \\
 & 9\left(\frac{2}{9}x - \frac{1}{3}\right) = 9(1) \\
 & 2x - 3 = 9 \\
 & 2x - 3 + 3 = 9 + 3 \\
 & 2x = 12 \\
 & \frac{2x}{2} = \frac{12}{2} \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 22. \quad & 0.40x + 0.06(30) = 9.8 \\
 & 100[0.40x + 0.06(30)] = 100(9.8) \\
 & 40x + 6(30) = 980 \\
 & 40x + 180 = 980 \\
 & 40x + 180 - 180 = 980 - 180 \\
 & 40x = 800 \\
 & \frac{40x}{40} = \frac{800}{40} \\
 & x = 20
 \end{aligned}$$

$$\begin{aligned}
 24. \quad & \frac{3(y+3)}{5} = 2y + 6 \\
 & 5\left[\frac{3(y+3)}{5}\right] = 5[2y + 6] \\
 & 3(y+3) = 10y + 30 \\
 & 3y + 9 = 10y + 30 \\
 & 3y - 10y + 9 = 10y - 10y + 30 \\
 & -7y + 9 = 30 \\
 & -7y + 9 - 9 = 30 - 9 \\
 & -7y = 21 \\
 & \frac{-7y}{-7} = \frac{21}{-7} \\
 & y = -3
 \end{aligned}$$

$$\begin{aligned}
 26. \quad & \frac{5}{2}x - 1 = x + \frac{1}{4} \\
 & 4\left(\frac{5}{2}x - 1\right) = 4\left(x + \frac{1}{4}\right) \\
 & 10x - 4 = 4x + 1 \\
 & 10x - 4x - 4 = 4x - 4x + 1 \\
 & 6x - 4 = 1 \\
 & 6x - 4 + 4 = 1 + 4 \\
 & 6x = 5 \\
 & \frac{6x}{6} = \frac{5}{6} \\
 & x = \frac{5}{6}
 \end{aligned}$$

$$\begin{aligned}
 28. \quad & 0.60(z - 300) + 0.05z = 0.70z - 205 \\
 & 100[0.60(z - 300) + 0.05z] = 100[0.70z - 205] \\
 & 60(z - 300) + 5z = 70z - 20,500 \\
 & 60z - 18,000 + 5z = 70z - 20,500 \\
 & 65z - 18,000 = 70z - 20,500 \\
 & 65z - 70z - 18,000 = 70z - 70z - 20,500 \\
 & -5z - 18,000 = -20,500 \\
 & -5z - 18,000 + 18,000 = -20,500 + 18,000 \\
 & -5z = -2500 \\
 & \frac{-5z}{-5} = \frac{-2500}{-5} \\
 & z = 500
 \end{aligned}$$

$$\begin{aligned}
 30. \quad & 14x + 7 = 7(2x + 1) \\
 & 14x + 7 = 14x + 7 \\
 & 14x + 7 - 14x = 14x + 7 - 14x \\
 & 7 = 7 \\
 & \text{All real numbers are solutions.}
 \end{aligned}$$

$$\begin{aligned}
 32. \quad & \frac{x}{3} - 2 = \frac{x}{3} \\
 & 3\left(\frac{x}{3} - 2\right) = 3\left(\frac{x}{3}\right) \\
 & x - 6 = x \\
 & x - x - 6 = x - x \\
 & -6 = 0 \\
 & \text{There is no solution.}
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & 2(x - 5) = 2x + 10 \\
 & 2x - 10 = 2x + 10 \\
 & 2x - 2x - 10 = 2x - 2x + 10 \\
 & -10 = 10 \\
 & \text{There is no solution.}
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & -5(4y - 3) + 2 = -20y + 17 \\
 & -20y + 15 + 2 = -20y + 17 \\
 & -20y + 17 = -20y + 17 \\
 & -20y + 17 + 20y = -20y + 17 + 20y \\
 & 17 = 17 \\
 & \text{All real numbers are solutions.}
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & \frac{4(5 - w)}{3} = -w \\
 & 3\left[\frac{4(5 - w)}{3}\right] = 3(-w) \\
 & 4(5 - w) = -3w \\
 & 20 - 4w = -3w \\
 & 20 - 4w + 4w = -3w + 4w \\
 & 20 = w
 \end{aligned}$$

$$\begin{aligned}
 40. \quad & -(4a-7)-5a=10+a \\
 & -4a+7-5a=10+a \\
 & -9a+7=10+a \\
 & -9a-a+7=10+a-a \\
 & -10a+7=10 \\
 & -10a+7-7=10-7 \\
 & -10a=3 \\
 & \frac{-10a}{-10}=\frac{3}{-10} \\
 & a=-\frac{3}{10}
 \end{aligned}$$

$$\begin{aligned}
 42. \quad & 9x+3(x-4)=10(x-5)+7 \\
 & 9x+3x-12=10x-50+7 \\
 & 12x-12=10x-43 \\
 & 12x-12+12=10x-43+12 \\
 & 12x=10x-31 \\
 & 12x-10x=10x-31-10x \\
 & 2x=-31 \\
 & \frac{2x}{2}=\frac{-31}{2} \\
 & x=-\frac{31}{2}
 \end{aligned}$$

$$\begin{aligned}
 44. \quad & \frac{5(x-1)}{4}=\frac{3(x+1)}{2} \\
 & 4\left[\frac{5(x-1)}{4}\right]=4\left[\frac{3(x+1)}{2}\right] \\
 & 5(x-1)=6(x+1) \\
 & 5x-5=6x+6 \\
 & 5x-6x-5=6x-6x+6 \\
 & -x-5=6 \\
 & -x-5+5=6+5 \\
 & -x=11 \\
 & \frac{-x}{-1}=\frac{11}{-1} \\
 & x=-11
 \end{aligned}$$

$$\begin{aligned}
 46. \quad & 0.9x-4.1=0.4 \\
 & 10(0.9x-4.1)=10(0.4) \\
 & 9x-41=4 \\
 & 9x-41+41=4+41 \\
 & 9x=45 \\
 & \frac{9x}{9}=\frac{45}{9} \\
 & x=5
 \end{aligned}$$

$$\begin{aligned}
 48. \quad & 3(2x-1)+5=6x+2 \\
 & 6x-3+5=6x+2 \\
 & 6x+2=6x+2 \\
 & 6x-6x+2=6x-6x+2 \\
 & 2=2
 \end{aligned}$$

All real numbers are solutions.

$$\begin{aligned}
 50. \quad & 4(4y+2)=2(1+6y)+8 \\
 & 16y+8=2+12y+8 \\
 & 16y+8=10+12y \\
 & 16y+8-8=10+12y-8 \\
 & 16y=2+12y \\
 & 16y-12y=2+12y-12y \\
 & 4y=2 \\
 & \frac{4y}{4}=\frac{2}{4} \\
 & y=\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 52. \quad & \frac{7}{8}x+\frac{1}{4}=\frac{3}{4}x \\
 & 8\left(\frac{7}{8}x+\frac{1}{4}\right)=8\left(\frac{3}{4}x\right) \\
 & 7x+2=6x \\
 & 7x+2-7x=6x-7x \\
 & 2=-x \\
 & \frac{2}{-1}=\frac{-x}{-1} \\
 & -2=x
 \end{aligned}$$

$$\begin{aligned}
 54. \quad & \frac{x}{5}-7=\frac{x}{3}-5 \\
 & 15\left(\frac{x}{5}-7\right)=15\left(\frac{x}{3}-5\right) \\
 & 3x-105=5x-75 \\
 & 3x-105-3x=5x-75-3x \\
 & -105=2x-75 \\
 & -105+75=2x-75+75 \\
 & -30=2x \\
 & \frac{-30}{2}=\frac{2x}{2} \\
 & -15=x
 \end{aligned}$$

$$\begin{aligned}
 56. \quad & 4(2+x)+1=7x-3(x-2) \\
 & 8+4x+1=7x-3x+6 \\
 & 9+4x=4x+6 \\
 & 9+4x-4x=4x-4x+6 \\
 & 9=6
 \end{aligned}$$

There is no solution.

$$\begin{aligned}
 58. \quad & -0.01(5x+4) = 0.04 - 0.01(x+4) \\
 & 100[-0.01(5x+4)] = 100[0.04 - 0.01(x+4)] \\
 & \quad -(5x+4) = 4 - 1(x+4) \\
 & \quad -5x-4 = 4 - x-4 \\
 & \quad -5x-4 = -x \\
 & \quad -5x+x-4 = -x+x \\
 & \quad -4x-4 = 0 \\
 & \quad -4x-4+4 = 0+4 \\
 & \quad -4x = 4 \\
 & \quad \frac{-4x}{-4} = \frac{4}{-4} \\
 & \quad x = -1
 \end{aligned}$$

$$\begin{aligned}
 60. \quad & 3 - \frac{1}{2}x = 5x - 8 \\
 & 2\left(3 - \frac{1}{2}x\right) = 2(5x - 8) \\
 & \quad 6 - x = 10x - 16 \\
 & \quad 6 - x + x = 10x - 16 + x \\
 & \quad 6 = 11x - 16 \\
 & \quad 6 + 16 = 11x - 16 + 16 \\
 & \quad 22 = 11x \\
 & \quad \frac{22}{11} = \frac{11x}{11} \\
 & \quad 2 = x
 \end{aligned}$$

$$\begin{aligned}
 62. \quad & 7n + 5 = 10n - 10 \\
 & 7n + 5 - 5 = 10n - 10 - 5 \\
 & \quad 7n = 10n - 15 \\
 & 7n - 10n = 10n - 15 - 10n \\
 & \quad -3n = -15 \\
 & \quad \frac{-3n}{-3} = \frac{-15}{-3} \\
 & \quad n = 5
 \end{aligned}$$

$$\begin{aligned}
 64. \quad & 0.2x - 0.1 = 0.6x - 2.1 \\
 & 10(0.2x - 0.1) = 10(0.6x - 2.1) \\
 & \quad 2x - 1 = 6x - 21 \\
 & 2x - 6x - 1 = 6x - 6x - 21 \\
 & \quad -4x - 1 = -21 \\
 & \quad -4x - 1 + 1 = -21 + 1 \\
 & \quad -4x = -20 \\
 & \quad \frac{-4x}{-4} = \frac{-20}{-4} \\
 & \quad x = 5
 \end{aligned}$$

$$\begin{aligned}
 66. \quad & 0.03(2m+7) = 0.06(5+m) - 0.09 \\
 & 100[0.03(2m+7)] = 100[0.06(5+m) - 0.09] \\
 & \quad 3(2m+7) = 6(5+m) - 9 \\
 & \quad 6m+21 = 30+6m-9 \\
 & \quad 6m+21 = 21+6m \\
 & \quad 6m-6m+21 = 21+6m-6m \\
 & \quad 21 = 21
 \end{aligned}$$

All real numbers are solutions.

$$\begin{array}{rclcl}
 68. & 3 & \text{times} & \text{a number} & \\
 & \downarrow & \downarrow & \downarrow & \\
 & 3 & \cdot & x & = 3x
 \end{array}$$

$$\begin{array}{rclcl}
 70. & 8 & \text{minus} & \text{twice} & \\
 & \downarrow & \downarrow & \downarrow & \\
 & 8 & - & 2x &
 \end{array}$$

$$\begin{array}{rclcl}
 72. & \text{the quotient} & & \text{the difference} & \\
 & \text{of } -12 & \text{and} & \text{of a number} & \\
 & & & \text{and 3} & \\
 & \downarrow & \downarrow & \downarrow & \\
 & -12 & \div & (x-3) & = \frac{-12}{x-3}
 \end{array}$$

$$\begin{aligned}
 74. \quad & x + (7x - 9) = x + 7x - 9 = 8x - 9 \\
 & \text{The total length is } (8x - 9) \text{ feet.}
 \end{aligned}$$

$$\begin{aligned}
 76. \quad \text{a.} \quad & x + 3 = x + 5 \\
 & x + 3 - x = x + 5 - x \\
 & \quad 3 = 5 \\
 & \text{There is no solution.}
 \end{aligned}$$

b. answers may vary

c. answers may vary

$$\begin{aligned}
 78. \quad & 3x + 1 = 3x + 2 \\
 & 3x + 1 - 3x = 3x + 2 - 3x \\
 & \quad 1 = 2 \\
 & \text{There is no solution. The answer is b.}
 \end{aligned}$$

$$\begin{aligned}
 80. \quad & x - 11x - 3 = -10x - 1 - 2 \\
 & \quad -10x - 3 = -10x - 3 \\
 & -10x - 3 + 10x = -10x - 3 + 10x \\
 & \quad -3 = -3 \\
 & \text{All real numbers are solutions. The answer is a.}
 \end{aligned}$$

$$\begin{aligned}
 82. \quad & -x + 15 = x + 15 \\
 & -x + 15 + x = x + 15 + x \\
 & 15 = 2x + 15 \\
 & 15 - 15 = 2x + 15 - 15 \\
 & 0 = 2x \\
 & \frac{0}{2} = \frac{2x}{2} \\
 & 0 = x
 \end{aligned}$$

The answer is c.

84. answers may vary

86. a. Since the perimeter is the sum of the lengths of the sides, $x + 2x + 1 + 3x - 2 = 35$.

$$\begin{aligned}
 b. \quad & 6x - 1 = 35 \\
 & 6x - 1 + 1 = 35 + 1 \\
 & 6x = 36 \\
 & \frac{6x}{6} = \frac{36}{6} \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 c. \quad & 2x + 1 = 2(6) + 1 = 13 \\
 & 3x - 2 = 3(6) - 2 = 16 \\
 & \text{The lengths are } x = 6 \text{ meters,} \\
 & 2x + 1 = 13 \text{ meters and } 3x - 2 = 16 \text{ meters.}
 \end{aligned}$$

88. answers may vary

$$\begin{aligned}
 90. \quad & 1000(x + 40) = 100(16 + 7x) \\
 & 1000x + 40,000 = 1600 + 700x \\
 & 1000x + 40,000 - 700x = 1600 + 700x - 700x \\
 & 300x + 40,000 = 1600 \\
 & 300x + 40,000 - 40,000 = 1600 - 40,000 \\
 & 300x = -38,400 \\
 & \frac{300x}{300} = \frac{-38,400}{300} \\
 & x = -128
 \end{aligned}$$

$$\begin{aligned}
 92. \quad & 0.127x - 2.685 = 0.027x - 2.38 \\
 & 1000(0.127x - 2.685) = 1000(0.027x - 2.38) \\
 & 127x - 2685 = 27x - 2380 \\
 & 127x - 27x - 2685 = 27x - 27x - 2380 \\
 & 100x - 2685 = -2380 \\
 & 100x - 2685 + 2685 = -2380 + 2685 \\
 & 100x = 305 \\
 & \frac{100x}{100} = \frac{305}{100} \\
 & x = 3.05
 \end{aligned}$$

$$\begin{aligned}
 94. \quad & t^2 - 6t = t(8 + t) \\
 & t^2 - 6t = 8t + t^2 \\
 & t^2 - t^2 - 6t = 8t + t^2 - t^2 \\
 & -6t = 8t \\
 & -6t + 6t = 8t + 6t \\
 & 0 = 14t \\
 & \frac{0}{14} = \frac{14t}{14} \\
 & 0 = t
 \end{aligned}$$

$$\begin{aligned}
 96. \quad & y^2 - 4y + 10 = y(y - 5) \\
 & y^2 - 4y + 10 = y^2 - 5y \\
 & y^2 - y^2 - 4y + 10 = y^2 - y^2 - 5y \\
 & -4y + 10 = -5y \\
 & -4y + 5y + 10 = -5y + 5y \\
 & y + 10 = 0 \\
 & y + 10 - 10 = -10 \\
 & y = -10
 \end{aligned}$$

Integrated Review

$$\begin{aligned}
 1. \quad & x - 10 = -4 \\
 & x - 10 + 10 = -4 + 10 \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & y + 14 = -3 \\
 & y + 14 - 14 = -3 - 14 \\
 & y = -17
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 9y = 108 \\
 & \frac{9y}{9} = \frac{108}{9} \\
 & y = 12
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & -3x = 78 \\
 & \frac{-3x}{-3} = \frac{78}{-3} \\
 & x = -26
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & -6x + 7 = 25 \\
 & -6x + 7 - 7 = 25 - 7 \\
 & -6x = 18 \\
 & \frac{-6x}{-6} = \frac{18}{-6} \\
 & x = -3
 \end{aligned}$$

$$\begin{aligned}
 6. \quad 5y - 42 &= -47 \\
 5y - 42 + 42 &= -47 + 42 \\
 5y &= -5 \\
 \frac{5y}{5} &= \frac{-5}{5} \\
 y &= -1
 \end{aligned}$$

$$\begin{aligned}
 7. \quad \frac{2}{3}x &= 9 \\
 \frac{3}{2}\left(\frac{2}{3}x\right) &= \frac{3}{2}(9) \\
 x &= \frac{27}{2}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad \frac{4}{5}z &= 10 \\
 \frac{5}{4}\left(\frac{4}{5}z\right) &= \frac{5}{4}(10) \\
 z &= \frac{25}{2}
 \end{aligned}$$

$$\begin{aligned}
 9. \quad \frac{r}{-4} &= -2 \\
 -4\left(\frac{r}{-4}\right) &= -4(-2) \\
 r &= 8
 \end{aligned}$$

$$\begin{aligned}
 10. \quad \frac{y}{-8} &= 8 \\
 -8\left(\frac{y}{-8}\right) &= -8(8) \\
 y &= -64
 \end{aligned}$$

$$\begin{aligned}
 11. \quad 6 - 2x + 8 &= 10 \\
 -2x + 14 &= 10 \\
 -2x + 14 - 14 &= 10 - 14 \\
 -2x &= -4 \\
 \frac{-2x}{-2} &= \frac{-4}{-2} \\
 x &= 2
 \end{aligned}$$

$$\begin{aligned}
 12. \quad -5 - 6y + 6 &= 19 \\
 -6y + 1 &= 19 \\
 -6y + 1 - 1 &= 19 - 1 \\
 -6y &= 18 \\
 \frac{-6y}{-6} &= \frac{18}{-6} \\
 y &= -3
 \end{aligned}$$

$$\begin{aligned}
 13. \quad 2x - 7 &= 2x - 27 \\
 2x - 2x - 7 &= 2x - 2x - 27 \\
 -7 &= -27 \\
 \text{There is no solution.}
 \end{aligned}$$

$$\begin{aligned}
 14. \quad 3 + 8y &= 8y - 2 \\
 3 + 8y - 8y &= 8y - 8y - 2 \\
 3 &= -2 \\
 \text{There is no solution.}
 \end{aligned}$$

$$\begin{aligned}
 15. \quad -3a + 6 + 5a &= 7a - 8a \\
 2a + 6 &= -a \\
 2a - 2a + 6 &= -a - 2a \\
 6 &= -3a \\
 \frac{6}{-3} &= \frac{-3a}{-3} \\
 -2 &= a
 \end{aligned}$$

$$\begin{aligned}
 16. \quad 4b - 8 - b &= 10b - 3b \\
 3b - 8 &= 7b \\
 3b - 3b - 8 &= 7b - 3b \\
 -8 &= 4b \\
 \frac{-8}{4} &= \frac{4b}{4} \\
 -2 &= b
 \end{aligned}$$

$$\begin{aligned}
 17. \quad -\frac{2}{3}x &= \frac{5}{9} \\
 -\frac{3}{2}\left(-\frac{2}{3}x\right) &= -\frac{3}{2}\left(\frac{5}{9}\right) \\
 x &= -\frac{5}{6}
 \end{aligned}$$

$$\begin{aligned}
 18. \quad -\frac{3}{8}y &= -\frac{1}{16} \\
 -\frac{8}{3}\left(-\frac{3}{8}y\right) &= -\frac{8}{3}\left(-\frac{1}{16}\right) \\
 y &= \frac{1}{6}
 \end{aligned}$$

$$\begin{aligned}
 19. \quad 10 &= -6n + 16 \\
 10 - 16 &= -6n + 16 - 16 \\
 -6 &= -6n \\
 \frac{-6}{-6} &= \frac{-6n}{-6} \\
 1 &= n
 \end{aligned}$$

$$\begin{aligned}
 20. \quad & -5 = -2m + 7 \\
 & -5 - 7 = -2m + 7 - 7 \\
 & -12 = -2m \\
 & \frac{-12}{-2} = \frac{-2m}{-2} \\
 & 6 = m
 \end{aligned}$$

$$\begin{aligned}
 21. \quad & 3(5c - 1) - 2 = 13c + 3 \\
 & 15c - 3 - 2 = 13c + 3 \\
 & 15c - 5 = 13c + 3 \\
 & 15c - 13c - 5 = 13c - 13c + 3 \\
 & 2c - 5 = 3 \\
 & 2c - 5 + 5 = 3 + 5 \\
 & 2c = 8 \\
 & \frac{2c}{2} = \frac{8}{2} \\
 & c = 4
 \end{aligned}$$

$$\begin{aligned}
 22. \quad & 4(3t + 4) - 20 = 3 + 5t \\
 & 12t + 16 - 20 = 3 + 5t \\
 & 12t - 4 = 3 + 5t \\
 & 12t - 5t - 4 = 3 + 5t - 5t \\
 & 7t - 4 = 3 \\
 & 7t - 4 + 4 = 3 + 4 \\
 & 7t = 7 \\
 & \frac{7t}{7} = \frac{7}{7} \\
 & t = 1
 \end{aligned}$$

$$\begin{aligned}
 23. \quad & \frac{2(z + 3)}{3} = 5 - z \\
 & 3 \left[\frac{2(z + 3)}{3} \right] = 3(5 - z) \\
 & 2z + 6 = 15 - 3z \\
 & 2z + 3z + 6 = 15 - 3z + 3z \\
 & 5z + 6 = 15 \\
 & 5z + 6 - 6 = 15 - 6 \\
 & 5z = 9 \\
 & \frac{5z}{5} = \frac{9}{5} \\
 & z = \frac{9}{5}
 \end{aligned}$$

$$\begin{aligned}
 24. \quad & \frac{3(w + 2)}{4} = 2w + 3 \\
 & 4 \left[\frac{3(w + 2)}{4} \right] = 4(2w + 3) \\
 & 3w + 6 = 8w + 12 \\
 & 3w - 8w + 6 = 8w - 8w + 12 \\
 & -5w + 6 = 12 \\
 & -5w + 6 - 6 = 12 - 6 \\
 & -5w = 6 \\
 & \frac{-5w}{-5} = \frac{6}{-5} \\
 & w = -\frac{6}{5}
 \end{aligned}$$

$$\begin{aligned}
 25. \quad & -2(2x - 5) = -3x + 7 - x + 3 \\
 & -4x + 10 = -4x + 10 \\
 & -4x + 4x + 10 = -4x + 4x + 10 \\
 & 10 = 10
 \end{aligned}$$

All real numbers are solutions.

$$\begin{aligned}
 26. \quad & -4(5x - 2) = -12x + 4 - 8x + 4 \\
 & -20x + 8 = -20x + 8 \\
 & -20x + 20x + 8 = -20x + 20x + 8 \\
 & 8 = 8
 \end{aligned}$$

All real numbers are solutions.

$$\begin{aligned}
 27. \quad & 0.02(6t - 3) = 0.04(t - 2) + 0.02 \\
 & 100[0.02(6t - 3)] = 100[0.04(t - 2) + 0.02] \\
 & 2(6t - 3) = 4(t - 2) + 2 \\
 & 12t - 6 = 4t - 8 + 2 \\
 & 12t - 6 = 4t - 6 \\
 & 12t - 4t - 6 = 4t - 4t - 6 \\
 & 8t - 6 = -6 \\
 & 8t - 6 + 6 = -6 + 6 \\
 & 8t = 0 \\
 & \frac{8t}{8} = \frac{0}{8} \\
 & t = 0
 \end{aligned}$$

$$\begin{aligned}
 28. \quad & 0.03(m+7) = 0.02(5-m) + 0.03 \\
 & 100[0.03(m+7)] = 100[0.02(5-m) + 0.03] \\
 & 3(m+7) = 2(5-m) + 3 \\
 & 3m + 21 = 10 - 2m + 3 \\
 & 3m + 21 = 13 - 2m \\
 & 3m + 2m + 21 = 13 - 2m + 2m \\
 & 5m + 21 = 13 \\
 & 5m + 21 - 21 = 13 - 21 \\
 & 5m = -8 \\
 & \frac{5m}{5} = \frac{-8}{5} \\
 & m = -\frac{8}{5} = -1.6
 \end{aligned}$$

$$\begin{aligned}
 29. \quad & -3y = \frac{4(y-1)}{5} \\
 & 5(-3y) = 5\left[\frac{4(y-1)}{5}\right] \\
 & -15y = 4y - 4 \\
 & -15y - 4y = 4y - 4y - 4 \\
 & -19y = -4 \\
 & \frac{-19y}{-19} = \frac{-4}{-19} \\
 & y = \frac{4}{19}
 \end{aligned}$$

$$\begin{aligned}
 30. \quad & -4x = \frac{5(1-x)}{6} \\
 & 6(-4x) = 6\left[\frac{5(1-x)}{6}\right] \\
 & -24x = 5 - 5x \\
 & -24x + 5x = 5 - 5x + 5x \\
 & -19x = 5 \\
 & \frac{-19x}{-19} = \frac{5}{-19} \\
 & x = -\frac{5}{19}
 \end{aligned}$$

$$\begin{aligned}
 31. \quad & \frac{5}{3}x - \frac{7}{3} = x \\
 & 3\left(\frac{5}{3}x - \frac{7}{3}\right) = 3(x) \\
 & 5x - 7 = 3x \\
 & 5x - 5x - 7 = 3x - 5x \\
 & -7 = -2x \\
 & \frac{-7}{-2} = \frac{-2x}{-2} \\
 & \frac{7}{2} = x
 \end{aligned}$$

$$\begin{aligned}
 32. \quad & \frac{7}{5}n + \frac{3}{5} = -n \\
 & 5\left(\frac{7}{5}n + \frac{3}{5}\right) = 5(-n) \\
 & 7n + 3 = -5n \\
 & 7n - 7n + 3 = -5n - 7n \\
 & 3 = -12n \\
 & \frac{3}{-12} = \frac{-12n}{-12} \\
 & -\frac{1}{4} = n
 \end{aligned}$$

$$\begin{aligned}
 33. \quad & 9(3x-1) = -4 + 49 \\
 & 27x - 9 = 45 \\
 & 27x - 9 + 9 = 45 + 9 \\
 & 27x = 54 \\
 & \frac{27x}{27} = \frac{54}{27} \\
 & x = 2
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & 12(2x+1) = -6 + 66 \\
 & 24x + 12 = 60 \\
 & 24x + 12 - 12 = 60 - 12 \\
 & 24x = 48 \\
 & \frac{24x}{24} = \frac{48}{24} \\
 & x = 2
 \end{aligned}$$

$$\begin{aligned}
 35. \quad & \frac{1}{10}(3x-7) = \frac{3}{10}x + 5 \\
 & 10\left[\frac{1}{10}(3x-7)\right] = 10\left(\frac{3}{10}x + 5\right) \\
 & 3x - 7 = 3x + 50 \\
 & 3x - 7 - 3x = 3x + 50 - 3x \\
 & -7 = 50
 \end{aligned}$$

There is no solution.

$$\begin{aligned}
 36. \quad & \frac{1}{7}(2x-5) = \frac{2}{7}x + 1 \\
 & 7\left[\frac{1}{7}(2x-5)\right] = 7\left(\frac{2}{7}x + 1\right) \\
 & 2x - 5 = 2x + 7 \\
 & 2x - 5 - 2x = 2x + 7 - 2x \\
 & -5 = 7
 \end{aligned}$$

There is no solution.

$$\begin{aligned}
 37. \quad & 5 + 2(3x - 6) = -4(6x - 7) \\
 & 5 + 6x - 12 = -24x + 28 \\
 & 6x - 7 = -24x + 28 \\
 & 6x - 7 + 24x = -24x + 28 + 24x \\
 & 30x - 7 = 28 \\
 & 30x - 7 + 7 = 28 + 7 \\
 & 30x = 35 \\
 & \frac{30x}{30} = \frac{35}{30} \\
 & x = \frac{7}{6}
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & 3 + 5(2x - 4) = -7(5x + 2) \\
 & 3 + 10x - 20 = -35x - 14 \\
 & 10x - 17 = -35x - 14 \\
 & 10x - 17 + 35x = -35x - 14 + 35x \\
 & 45x - 17 = -14 \\
 & 45x - 17 + 17 = -14 + 17 \\
 & 45x = 3 \\
 & \frac{45x}{45} = \frac{3}{45} \\
 & x = \frac{1}{15}
 \end{aligned}$$

Section 2.4 Practice

1. Let
- x
- = the number.

$$\begin{aligned}
 3x - 6 &= 2x + 3 \\
 3x - 6 - 2x &= 2x + 3 - 2x \\
 x - 6 &= 3 \\
 x - 6 + 6 &= 3 + 6 \\
 x &= 9
 \end{aligned}$$

The number is 9.

2. Let
- x
- = the number.

$$\begin{aligned}
 3x - 4 &= 2(x - 1) \\
 3x - 4 &= 2x - 2 \\
 3x - 4 - 2x &= 2x - 2 - 2x \\
 x - 4 &= -2 \\
 x - 4 + 4 &= -2 + 4 \\
 x &= 2
 \end{aligned}$$

The number is 2.

3. Let
- x
- = the length of short piece,
-
- then
- $4x$
- = the length of long piece.

$$\begin{aligned}
 x + 4x &= 45 \\
 5x &= 45 \\
 \frac{5x}{5} &= \frac{45}{5} \\
 x &= 9
 \end{aligned}$$

$$4x = 4(9) = 36$$

The short piece is 9 inches and the long piece is 36 inches.

4. Let
- x
- = number of Republican governors, then
-
- $x - 9$
- = number of Democratic governors.

$$\begin{aligned}
 x + x - 9 &= 49 \\
 2x - 9 &= 49 \\
 2x - 9 + 9 &= 49 + 9 \\
 2x &= 58 \\
 \frac{2x}{2} &= \frac{58}{2} \\
 x &= 29
 \end{aligned}$$

$$x - 9 = 20$$

There were 29 Republican and 20 Democratic governors.

- 5.
- x
- = degree measure of first angle
-
- $3x$
- = degree measure of second angle
-
- $x + 55$
- = degree measure of third angle

$$\begin{aligned}
 x + 3x + (x + 55) &= 180 \\
 5x + 55 &= 180 \\
 5x + 55 - 55 &= 180 - 55 \\
 5x &= 125 \\
 \frac{5x}{5} &= \frac{125}{5} \\
 x &= 25
 \end{aligned}$$

$$3x = 3(25) = 75$$

$$x + 55 = 25 + 55 = 80$$

The measures of the angles are 25° , 75° , and 80° .

6. Let
- x
- = the first even integer, then
-
- $x + 2$
- = the second even integer, and
-
- $x + 4$
- = the third even integer.

$$\begin{aligned}
 x + (x + 2) + (x + 4) &= 144 \\
 3x + 6 &= 144 \\
 3x + 6 - 6 &= 144 - 6 \\
 3x &= 138 \\
 \frac{3x}{3} &= \frac{138}{3} \\
 x &= 46
 \end{aligned}$$

$$x + 2 = 46 + 2 = 48$$

$$x + 4 = 46 + 4 = 50$$

The integers are 46, 48, and 50.

Vocabulary, Readiness & Video Check 2.4

1. $2x$; $2x - 31$

2. $3x$; $3x + 17$

3. $x + 5$; $2(x + 5)$

4. $x - 11$; $7(x - 11)$

5. $20 - y$; $\frac{20 - y}{3}$ or $(20 - y) \div 3$

6. $-10 + y$; $\frac{-10+y}{9}$ or $(-10 + y) \div 9$
7. in the statement of the application
8. The original application asks for the measure of two supplementary angles. The solution of $x = 43$ only gives us the measure of one of the angles.
9. That the 3 angle measures are consecutive even integers and that they sum to 180° .

Exercise Set 2.4

2. Let x = the number.

$$\begin{aligned} 3x - 1 &= 2x \\ 3x - 1 - 3x &= 2x - 3x \\ 3x - 1 - 3x &= 2x - 3x \\ -1 &= -x \\ \frac{-1}{-1} &= \frac{-x}{-1} \\ 1 &= x \end{aligned}$$

The number is 1.

4. Let x = the number.

$$\begin{aligned} 4x + (-2) &= 5x + (-2) \\ 4x - 2 &= 5x - 2 \\ 4x - 2 + 2 &= 5x - 2 + 2 \\ 4x &= 5x \\ 4x - 4x &= 5x - 4x \\ 0 &= x \end{aligned}$$

The number is 0.

6. Let x = the number.

$$\begin{aligned} 5[x + (-1)] &= 6(x - 5) \\ 5x + 5(-1) &= 6x + 6(-5) \\ 5x - 5 &= 6x - 30 \\ 5x - 5x - 5 &= 6x - 5x - 30 \\ -5 &= x - 30 \\ -5 + 30 &= x - 30 + 30 \\ 25 &= x \end{aligned}$$

The number is 25.

8. Let x = the number.

$$\begin{aligned} 2(x - 4) &= x - \frac{1}{4} \\ 2x - 8 &= x - \frac{1}{4} \\ 4(2x - 8) &= 4\left(x - \frac{1}{4}\right) \\ 8x - 32 &= 4x - 1 \\ 8x - 4x - 32 &= 4x - 4x - 1 \\ 4x - 32 &= -1 \\ 4x - 32 + 32 &= -1 + 32 \\ 4x &= 31 \\ \frac{4x}{4} &= \frac{31}{4} \end{aligned}$$

The number is $\frac{31}{4}$.

10. The sum of the three lengths is 46 feet.

$$\begin{aligned} x + 3x + 2 + 7x &= 46 \\ 11x + 2 &= 46 \\ 11x + 2 - 2 &= 46 - 2 \\ 11x &= 44 \\ \frac{11x}{11} &= \frac{44}{11} \\ x &= 4 \end{aligned}$$

$$3x = 3(4) = 12$$

$$2 + 7x = 2 + 7(4) = 2 + 28 = 30$$

The lengths are 4 feet, 12 feet, and 30 feet.

12. Let x be the length of the shorter piece. Then $3x$ is the length of the 2nd piece and the 3rd piece. The sum of the lengths is 21 feet.

$$\begin{aligned} x + 3x + 3x &= 21 \\ 7x &= 21 \\ \frac{7x}{7} &= \frac{21}{7} \\ x &= 3 \end{aligned}$$

$$3x = 3(3) = 9$$

The shorter piece is 3 feet and the longer pieces are each 9 feet.

- 14.

$$\begin{aligned} x + 22,857 + x &= 39,547 \\ 2x + 22,857 &= 39,547 \\ 2x + 22,857 - 22,857 &= 39,547 - 22,857 \\ 2x &= 16,690 \\ \frac{2x}{2} &= \frac{16,690}{2} \\ x &= 8345 \end{aligned}$$

In 2010, 8345 screens were located in smaller sites.

- 16.** Let x be the measure of the smaller angle. Then $2x - 15$ is the measure of the larger angle. The sum of the four angles is 360° .

$$2x + 2(2x - 15) = 360$$

$$2x + 4x - 30 = 360$$

$$6x - 30 = 360$$

$$6x - 30 + 30 = 360 + 30$$

$$6x = 390$$

$$\frac{6x}{6} = \frac{390}{6}$$

$$x = 65$$

$$2x - 15 = 2(65) - 15 = 130 - 15 = 115$$

Two angles measure 65° and two angles measure 115° .

- 18.** Three consecutive integers:

Integer: x

Next integers: $x + 1, x + 2$

Sum of the second and third consecutive integers, simplified: $(x + 1) + (x + 2) = 2x + 3$

- 20.** Three consecutive odd integers:

Odd integer: x

Next integers: $x + 2, x + 4$

Sum of the three consecutive odd integers, simplified: $x + (x + 2) + (x + 4) = 3x + 6$

- 22.** Four consecutive integers:

Integer: x

Next integers: $x + 1, x + 2, x + 3$

Sum of the first and fourth consecutive integers, simplified: $x + (x + 3) = 2x + 3$

- 24.** Three consecutive even integers:

Even integer: x

Next integers: $x + 2, x + 4$

Sum of the three consecutive even integers, simplified: $x + (x + 2) + (x + 4) = 3x + 6$

- 26.** Let x = the number of one room and $x + 2$ = the number of the other.

$$x + x + 2 = 654$$

$$2x + 2 = 654$$

$$2x + 2 - 2 = 654 - 2$$

$$2x = 652$$

$$\frac{2x}{2} = \frac{652}{2}$$

$$x = 326$$

$$x + 2 = 326 + 2 = 328$$

The room numbers are 326 and 328.

- 28.** Let x = code for Mali Republic, $x + 2$ = code for Cote d'Ivoire, and $x + 4$ = code for Niger.

$$x + x + 2 + x + 4 = 675$$

$$3x + 6 = 675$$

$$3x + 6 - 6 = 675 - 6$$

$$3x = 669$$

$$\frac{3x}{3} = \frac{669}{3}$$

$$x = 223$$

$$x + 2 = 223 + 2 = 225$$

$$x + 4 = 223 + 4 = 227$$

The codes are: 223 for Mali, 225 for Cote d'Ivoire, 227 for Niger.

- 30.** Let x represent the weight of the Armanty meteorite. Then $3x$ represents the weight of the Hoba West meteorite.

$$x + 3x = 88$$

$$4x = 88$$

$$\frac{4x}{4} = \frac{88}{4}$$

$$x = 22$$

$$3x = 3(22) = 66$$

The Armanty meteorite weighs 22 tons and the Hoba West meteorite weighs 66 tons.

- 32.** Let x be the measure of the shorter piece. Then $5x + 1$ is the measure of the longer piece. The measures sum to 25 feet.

$$x + 5x + 1 = 25$$

$$6x + 1 = 25$$

$$6x + 1 - 1 = 25 - 1$$

$$6x = 24$$

$$\frac{6x}{6} = \frac{24}{6}$$

$$x = 4$$

$$5x + 1 = 5(4) + 1 = 20 + 1 = 21$$

The pieces measure 4 feet and 21 feet.

- 34.** Let x = the number.

$$9 = 2x - 10$$

$$9 + 10 = 2x - 10 + 10$$

$$19 = 2x$$

$$\frac{19}{2} = \frac{2x}{2}$$

$$\frac{19}{2} = x$$

The number is $\frac{19}{2}$.

36. Let x = species of grasshoppers,
then $20x$ = species of beetles.

$$x + 20x = 420,000$$

$$21x = 420,000$$

$$\frac{21x}{21} = \frac{420,000}{21}$$

$$x = 20,000$$

$$20x = 20(20,000) = 400,000$$

There are 400,000 species of beetles and
20,000 species of grasshoppers.

38. Let x = the measure of the smallest angle,
 $x + 2$ = the measure of the second,
 $x + 4$ = the measure of the third, and
 $x + 6$ = the measure of the fourth.

$$x + x + 2 + x + 4 + x + 6 = 360$$

$$4x + 12 = 360$$

$$4x + 12 - 12 = 360 - 12$$

$$4x = 348$$

$$\frac{4x}{4} = \frac{348}{4}$$

$$x = 87$$

$$x + 2 = 87 + 2 = 89$$

$$x + 4 = 87 + 4 = 91$$

$$x + 6 = 87 + 6 = 93$$

The angles are 87° , 89° , 91° , and 93° .

40. Let x = first odd integer,
then $x + 2$ = next odd integer,
and $x + 4$ = third consecutive odd integer.

$$x + (x + 2) + (x + 4) = 51$$

$$3x + 6 = 51$$

$$3x + 6 - 6 = 51 - 6$$

$$3x = 45$$

$$\frac{3x}{3} = \frac{45}{3}$$

$$x = 15$$

$$x + 2 = 15 + 2 = 17$$

$$x + 4 = 15 + 4 = 19$$

The code is 15, 17, 19.

42. Let x = the number.

$$2(x + 6) = 3(x + 4)$$

$$2x + 12 = 3x + 12$$

$$2x + 12 - 12 = 3x + 12 - 12$$

$$2x = 3x$$

$$2x - 2x = 3x - 2x$$

$$0 = x$$

The number is 0.

44. Let x = the measure of the first angle
then $2x - 3$ = the measure of the other.

$$x + 2x - 3 = 90$$

$$3x - 3 = 90$$

$$3x - 3 + 3 = 90 + 3$$

$$3x = 93$$

$$\frac{3x}{3} = \frac{93}{3}$$

$$x = 31$$

$$2x - 3 = 2(31) - 3 = 59$$

The angles are 31° and 59° .

$$\begin{aligned} 46. \quad \frac{1}{5} + 2x &= 3x - \frac{4}{5} \\ \frac{1}{5} + 2x - 2x &= 3x - \frac{4}{5} - 2x \\ \frac{1}{5} &= x - \frac{4}{5} \\ \frac{1}{5} + \frac{4}{5} &= x - \frac{4}{5} + \frac{4}{5} \\ \frac{5}{5} &= x \\ 1 &= x \end{aligned}$$

The number is 1.

48. Let x = the number.

$$\frac{3}{4} + 3x = 2x - \frac{1}{2}$$

$$4\left(\frac{3}{4} + 3x\right) = 4\left(2x - \frac{1}{2}\right)$$

$$3 + 12x = 8x - 2$$

$$3 + 12x - 8x = 8x - 2 - 8x$$

$$3 + 4x = -2$$

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

$$4x = -5$$

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

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

The number is $-\frac{5}{4}$.

50. Let x = floor space of Empire State Building,
then $3x$ = floor space of the Pentagon.

$$x + 3x = 8700$$

$$4x = 8700$$

$$\frac{4x}{4} = \frac{8700}{4}$$

$$x = 2175$$

$$3x = 3(2175) = 6525$$

The Empire State Building has

2175 thousand square feet and the Pentagon has
6525 thousand square feet.

52. Let
- x
- = the number.

$$\begin{aligned}\frac{7}{8} \cdot x &= \frac{1}{2} \\ \frac{8}{7} \cdot \frac{7}{8} x &= \frac{8}{7} \cdot \frac{1}{2} \\ x &= \frac{4}{7}\end{aligned}$$

The number is $\frac{4}{7}$.

54. Let
- x
- = first integer (smallest piece)
-
- then
- $x + 2$
- = second integer (middle piece)
-
- and
- $x + 4$
- = third integer (longest piece)

$$x + (x + 2) + (x + 4) = 48$$

$$3x + 6 = 48$$

$$3x + 6 - 6 = 48 - 6$$

$$3x = 42$$

$$\frac{3x}{3} = \frac{42}{3}$$

$$x = 14$$

$$x + 2 = 14 + 2 = 16$$

$$x + 4 = 14 + 4 = 18$$

The pieces measure 14 inches, 16 inches, and 18 inches.

56. Let
- x
- = smallest angle, then
- $4x$
- = largest angles.

$$x + 4x + 4x = 180$$

$$9x = 180$$

$$\frac{9x}{9} = \frac{180}{9}$$

$$x = 20$$

$$4x = 4(20) = 80$$

The angles measure 20° , 80° , and 80° .

58. Let
- x
- = length of first piece,
-
- then
- $5x$
- = length of second piece,
-
- and
- $6x$
- = length of third piece.

$$x + 5x + 6x = 48$$

$$12x = 48$$

$$\frac{12x}{12} = \frac{48}{12}$$

$$x = 4$$

$$5x = 5(4) = 20$$

$$6x = 6(4) = 24$$

The first piece is 4 feet, the second piece is 20 feet, and the third piece is 24 feet.

60. The bars ending between 20 and 25 represent the albums Led Zeppelin:
- Led Zeppelin IV*
- , Pink Floyd:
- The Wall*
- , and AC/DC:
- Back in Black*
- , so these albums sold between \$20 and \$25 million.

62. Let
- x
- represent the sales of AC/DC. Then
- $x + 7$
- is the sales of Eagles.

$$x + x + 7 = 51$$

$$2x + 7 = 51$$

$$2x + 7 - 7 = 51 - 7$$

$$2x = 44$$

$$\frac{2x}{2} = \frac{44}{2}$$

$$x = 22$$

$$x + 7 = 22 + 7 = 29$$

Eagles: *Their Greatest Hits* had sales of \$29 million and AC/DC: *Back in Black* had sales of \$22 million.

64. answers may vary

66. Replace
- B
- by 14 and
- h
- by 22.

$$\frac{1}{2} Bh = \frac{1}{2} (14)(22) = 7(22) = 154$$

68. Replace
- r
- by 15 and
- t
- by 2.

$$r \cdot t = 15 \cdot 2 = 30$$

70. Let
- x
- be the measure of the first angle. Then
- $2x$
- is the measure of the second angle and
- $5x$
- is the measure of the third angle. The measures sum to
- 180°
- .

$$x + 2x + 5x = 180$$

$$8x = 180$$

$$\frac{8x}{8} = \frac{180}{8}$$

$$x = 22.5$$

$$2x = 2(22.5) = 45$$

$$5x = 5(22.5) = 112.5$$

Yes, the triangle exists and has angles that measure 22.5° , 45° , and 112.5° .

72. One blink every 5 seconds is
- $\frac{1 \text{ blink}}{5 \text{ sec}}$
- .

There are $60 \cdot 60 = 3600$ seconds in one hour.

$$\frac{1 \text{ blink}}{5 \text{ sec}} \cdot 3600 \text{ sec} = 720 \text{ blinks}$$

The average eye blinks 720 times each hour.

$$16 \cdot 720 = 11,520$$

The average eye blinks 11,520 times while awake for a 16-hour day.

$$11,520 \cdot 365 = 4,204,800$$

The average eye blinks 4,204,800 times in one year.

74. answers may vary

76. answers may vary

78. Measurements may vary. Rectangle (b) best approximates the shape of a golden rectangle.

Section 2.5 Practice

1. Let $d = 580$ and $r = 5$.

$$\begin{aligned}d &= r \cdot t \\580 &= 5t \\ \frac{580}{5} &= \frac{5t}{5} \\116 &= t\end{aligned}$$

It takes 116 seconds or 1 minute 56 seconds.

2. Let $l = 40$ and $P = 98$.

$$\begin{aligned}P &= 2l + 2w \\98 &= 2 \cdot 40 + 2w \\98 &= 80 + 2w \\98 - 80 &= 80 + 2w - 80 \\18 &= 2w \\ \frac{18}{2} &= \frac{2w}{2} \\9 &= w\end{aligned}$$

The dog run is 9 feet wide.

3. Let $C = 8$.

$$\begin{aligned}F &= \frac{9}{5}C + 32 \\F &= \frac{9}{5} \cdot 8 + 32 \\F &= \frac{72}{5} + \frac{160}{5} \\F &= \frac{232}{5} = 46.4\end{aligned}$$

The equivalent temperature is 46.4°F .

4. Let w = width of sign, then

$$\begin{aligned}5w + 3 &= \text{length of sign.} \\P &= 2l + 2w \\66 &= 2(5w + 3) + 2w \\66 &= 10w + 6 + 2w \\66 &= 12w + 6 \\66 - 6 &= 12w + 6 - 6 \\60 &= 12w \\ \frac{60}{12} &= \frac{12w}{12} \\5 &= w\end{aligned}$$

$$5w + 3 = 5(5) + 3 = 28$$

The sign has length 28 inches and width 5 inches.

5. $I = Prt$

$$\begin{aligned}\frac{I}{P} &= \frac{Prt}{P} \\ \frac{I}{P} &= r \text{ or } r = \frac{I}{Pt}\end{aligned}$$

6. $H = 5as + 10a$

$$\begin{aligned}H - 10a &= 5as + 10a - 10a \\H - 10a &= 5as \\ \frac{H - 10a}{5a} &= \frac{5as}{5a} \\ \frac{H - 10a}{5a} &= s \text{ or } s = \frac{H - 10a}{5a}\end{aligned}$$

7. $N = F + d(n - 1)$

$$\begin{aligned}N - F &= F + d(n - 1) - F \\N - F &= d(n - 1) \\ \frac{N - F}{n - 1} &= \frac{d(n - 1)}{n - 1} \\ \frac{N - F}{n - 1} &= d \text{ or } d = \frac{N - F}{n - 1}\end{aligned}$$

8. $A = \frac{1}{2}a(b + B)$

$$\begin{aligned}2 \cdot A &= 2 \cdot \frac{1}{2}a(b + B) \\2A &= a(b + B) \\2A &= ab + aB \\2A - ab &= ab + aB - ab \\2A - ab &= aB \\ \frac{2A - ab}{a} &= \frac{aB}{a} \\ \frac{2A - ab}{a} &= B \text{ or } B = \frac{2A - ab}{a}\end{aligned}$$

Vocabulary, Readiness & Video Check 2.5

1. A formula is an equation that describes known relationships among quantities.
2. This is a distance, rate, and time problem. The distance is given in miles and the time is given in hours, so the rate that we are finding must be in miles per hour (mph).
3. To show that the process of solving this equation for x —dividing both sides by 5, the coefficient of x —is the same process used to solve a formula for a specific variable. Treat whatever is multiplied by that specific variable as the coefficient—the coefficient is all the factors except that specific variable.

Exercise Set 2.5

2. Let
- $d = 195$
- and
- $t = 3$
- .

$$d = rt$$

$$195 = r(3)$$

$$\frac{195}{3} = \frac{3r}{3}$$

$$65 = r$$

4. Let
- $l = 14$
- ,
- $w = 8$
- , and
- $h = 3$
- .

$$V = lwh$$

$$V = 14(8)(3)$$

$$V = 336$$

6. Let
- $A = 60$
- ,
- $B = 7$
- , and
- $b = 3$
- .

$$A = \frac{1}{2}h(B + b)$$

$$60 = \frac{1}{2}h(7 + 3)$$

$$2(60) = 2\left[\frac{1}{2}h(10)\right]$$

$$120 = 10h$$

$$\frac{120}{10} = \frac{10h}{10}$$

$$12 = h$$

8. Let
- $V = 45$
- , and
- $h = 5$
- .

$$V = \frac{1}{3}Ah$$

$$45 = \frac{1}{3}A(5)$$

$$3(45) = 3\left[\frac{1}{3}(5A)\right]$$

$$135 = 5A$$

$$\frac{135}{5} = \frac{5A}{5}$$

$$27 = A$$

10. Let
- $r = 4.5$
- , and
- $\pi \approx 3.14$
- .

$$A = \pi r^2$$

$$A \approx 3.14(4.5)^2$$

$$A \approx 3.14(20.25)$$

$$A \approx 63.6$$

12. Let
- $I = 1,056,000$
- ,
- $R = 0.055$
- , and
- $T = 6$
- .

$$I = PRT$$

$$1,056,000 = P(0.055)(6)$$

$$1,056,000 = 0.33P$$

$$\frac{1,056,000}{0.33} = \frac{0.33P}{0.33}$$

$$3,200,000 = P$$

14. Let
- $r = 3$
- and
- $\pi \approx 3.14$
- .

$$V = \frac{4}{3}\pi r^3$$

$$V \approx \frac{4}{3}(3.14)(3)^3$$

$$V \approx \frac{4}{3}(3.14)(27)$$

$$V \approx \frac{4}{3}(84.78)$$

$$V \approx 113.0$$

($V \approx 113.1$ using a calculator.)

- 16.
- $A = \pi ab$

$$\frac{A}{\pi a} = \frac{\pi ab}{\pi a}$$

$$\frac{A}{\pi a} = b$$

- 18.
- $T = mnr$

$$\frac{T}{mr} = \frac{mnr}{mr}$$

$$\frac{T}{mr} = n$$

- 20.
- $-x + y = 13$

$$-x + x + y = 13 + x$$

$$y = 13 + x$$

- 22.
- $A = P + PRT$

$$A - P = P - P + PRT$$

$$A - P = PRT$$

$$\frac{A - P}{PR} = \frac{PRT}{PR}$$

$$\frac{A - P}{PR} = T$$

- 24.
- $D = \frac{1}{4}fk$

$$4D = 4\left(\frac{1}{4}fk\right)$$

$$4D = fk$$

$$\frac{4D}{4} = \frac{fk}{4}$$

$$\frac{4D}{4} = k$$

- 26.
- $PR = x + y + z + w$

$$PR - (x + y + w) = x + y + z + w - (x + y + w)$$

$$PR - x - y - w = x + y + z + w - x - y - w$$

$$PR - x - y - w = z$$

28. $S = 4lw + 2wh$

$$S - 4lw = 4lw - 4lw + 2wh$$

$$S - 4lw = 2wh$$

$$\frac{S - 4lw}{2w} = \frac{2wh}{2w}$$

$$\frac{S - 4lw}{2w} = h$$

30. Use $A = lw$ when $A = 52,400$ and $l = 400$.

$$A = lw$$

$$52,400 = 400 \cdot w$$

$$\frac{52,400}{400} = \frac{400w}{400}$$

$$131 = w$$

The width of the sign is 131 feet.

32. a. $A = \frac{1}{2}bh$
 $A = \frac{1}{2} \cdot 36 \cdot 27$
 $A = 486$

$$P = l_1 + l_2 + l_3$$

$$P = 27 + 36 + 45$$

$$P = 108$$

$$A = 486$$

The area is 486 square feet and the perimeter is 108 feet.

- b. The fence has to do with perimeter because it is located around the edge of the property. The grass seed has to do with area because it is located in the middle of the property.

34. a. $A = bh$
 $A = 9.3(7)$
 $A = 65.1$

$$P = 2l_1 + 2l_2$$

$$P = 2(11.7) + 2(9.3)$$

$$P = 23.4 + 18.6$$

$$P = 42$$

The area is 65.1 square feet and the perimeter is 42 feet.

- b. The border has to do with the perimeter because it surrounds the edge. The paint has to do with the area because it covers the wall.

36. Let $C = -5$.

$$F = \frac{9}{5}(-5) + 32 = -9 + 32 = 23$$

The equivalent temperature is 23°F.

38. Let $P = 400$ and $l = 2w - 10$.

$$P = 2l + 2w$$

$$400 = 2(2w - 10) + 2w$$

$$400 = 4w - 20 + 2w$$

$$400 = 6w - 20$$

$$400 + 20 = 6w - 20 + 20$$

$$420 = 6w$$

$$\frac{420}{6} = \frac{6w}{6}$$

$$70 = w$$

$$l = 2w - 10 = 2(70) - 10 = 140 - 10 = 130$$

The length is 130 meters.

40. Let x = the measure of each of the two equal sides, and $x - 2$ = the measure of the third.

$$x + x + x - 2 = 22$$

$$3x - 2 = 22$$

$$3x - 2 + 2 = 22 + 2$$

$$3x = 24$$

$$\frac{3x}{3} = \frac{24}{3}$$

$$x = 8$$

$$x - 2 = 8 - 2 = 6$$

The shortest side is 6 feet.

42. Let $d = 700$ and $r = 55$.

$$d = rt$$

$$700 = 55t$$

$$\frac{700}{55} = \frac{55t}{55}$$

$$\frac{700}{55} = t$$

$$t = \frac{700}{55} = \frac{140}{11} = 12\frac{8}{11}$$

The trip will take $12\frac{8}{11}$ hours.

44. Let $r = 4$ and $h = 3$. Use $\pi \approx 3.14$.

$$V = \pi r^2 h$$

$$V \approx (3.14)(4)^2(3)$$

$$\approx (3.14)(16)(3)$$

$$\approx 150.72$$

Let x = number of goldfish and volume per fish = 2.

$$150.72 = 2x$$

$$\frac{150.72}{2} = \frac{2x}{2}$$

$$75.36 = x$$

75 goldfish can be placed in the tank.

ISM: Beginning and Intermediate Algebra

Chapter 2: Equations, Inequalities, and Problem Solving

46. Use
- $N = 94$
- .

$$T = 50 + \frac{N - 40}{4}$$

$$T = 50 + \frac{94 - 40}{4}$$

$$T = 50 + \frac{54}{4}$$

$$T = 50 + 13.5$$

$$T = 63.5$$

The temperature is 63.5° Fahrenheit.

48. Use
- $T = 65$
- .

$$T = 50 + \frac{N - 40}{4}$$

$$65 = 50 + \frac{N - 40}{4}$$

$$65 - 50 = 50 + \frac{N - 40}{4} - 50$$

$$15 = \frac{N - 40}{4}$$

$$4 \cdot 15 = 4 \cdot \frac{N - 40}{4}$$

$$60 = N - 40$$

$$60 + 40 = N - 40 + 40$$

$$100 = N$$

There are 100 chirps per minute.

50. As the air temperature of their environment decreases, the number of cricket chirps per minute
- decreases
- .

52. Let
- $A = 20$
- , and
- $b = 5$
- .

$$A = \frac{1}{2}bh$$

$$20 = \frac{1}{2}(5)h$$

$$2(20) = 2\left(\frac{5}{2}h\right)$$

$$40 = 5h$$

$$\frac{40}{5} = \frac{5h}{5}$$

$$8 = h$$

The height is 8 feet.

54. Let
- $r = 4000$
- . Use
- $\pi \approx 3.14$
- .

$$C = 2\pi r \approx 2(3.14)(4000)$$

$$C \approx 25,120$$

The length of rope is 25,120 miles.

- 56.
- $x + (2x - 8) + (3x - 12) = 82$

$$6x - 20 = 82$$

$$6x - 20 + 20 = 82 + 20$$

$$6x = 102$$

$$\frac{6x}{6} = \frac{102}{6}$$

$$x = 17$$

$$2x - 8 = 2(17) - 8 = 26$$

$$3x - 12 = 3(17) - 12 = 39$$

The lengths are 17 feet, 26 feet, and 39 feet.

- 58.
- $A = 3990$
- and
- $w = 57$
- .

$$A = lw$$

$$3990 = l \cdot 57$$

$$\frac{3990}{57} = \frac{57l}{57}$$

$$70 = l$$

The length is 70 feet.

60. Let
- x
- = the length of a side of the square and
- $2x - 15$
- = the length of a side of the triangle.

$$P(\text{triangle}) = P(\text{square})$$

$$3(2x - 15) = 4x$$

$$6x - 45 = 4x$$

$$6x - 4x - 45 = 4x - 4x$$

$$2x - 45 = 0$$

$$2x - 45 + 45 = 45$$

$$2x = 45$$

$$\frac{2x}{2} = \frac{45}{2}$$

$$x = 22.5$$

$$2x - 15 = 2(22.5) - 15 = 45 - 15 = 30$$

The side of the triangle is 30 units and the side of the square is 22.5 units.

62. Let
- $d = 150$
- and
- $r = 45$
- .

$$d = rt$$

$$150 = 45t$$

$$\frac{150}{45} = \frac{45t}{45}$$

$$\frac{150}{45} = t$$

$$t = \frac{150}{45} = \frac{10}{3}$$

The trip will take $\frac{10}{3} = 3\frac{1}{3}$ hours or 3 hours

20 minutes.

He should arrive at 7:20 A.M.