Solutions Manual for Beginning and Intermediate Algebra 5th Edition by Martin Gay ISN 1256776181 9780321785121

Solutions Manual

Test Bank

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 $-\dfrac{w}{5}$ is $-\dfrac{1}{5}$, since $-\dfrac{w}{5}$ means $-\dfrac{1}{5} \cdot w$.

   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.

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

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

   e. $5z - 3z^4$

   d. y^5 and $\dfrac{y^5}{2}$ 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. $5x - 3x^2 + 8x^2 = 5x + (-3 + 8)x^2 = 5x + 5x^2$

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

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

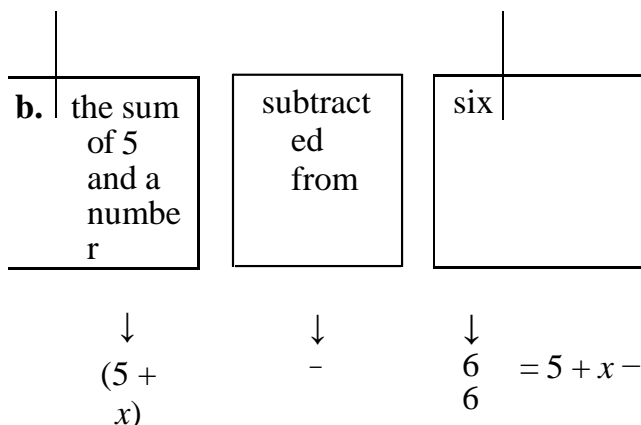**7.** "Subtract $7x - 1$ from $2x + 3$" translates to $(2x + 3) - (7x - 1) = 2x + 3 - 7x + 1 = -5x + 4$

d. $20y^2 + 2y^2 - y^2 = 20y^2 + 2y^2 - 1y^2$

$\quad\quad\quad\quad = (20 + 2 - 1)y^2$

$\quad\quad\quad\quad = 21y^2$

8. a. Three added   to   double a   number

$$\downarrow \quad\quad \downarrow \quad\quad \downarrow$$
$$3 \quad\quad + \quad\quad 2x$$

or $2x + 3$

34

b. the sum of 5 and a number | subtracted from | six

$$\downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow$$

$$(5 + x) \qquad - \qquad 6 \quad = 5 + x - 6$$

$$(5 + x) - 6 = 5 + x - 6 = x - 1$$

c. two | times | the sum of 3 and a number | increased by | 4

$$\downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow$$

$$2 \qquad \cdot \qquad (3 + x) \qquad + \qquad 4$$

$$2(3 + x) + 4 = 6 + 2x + 4 = 2x + 10$$

d. a number | added to | half number | added | 5 the number

$$\downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow$$

$$x \qquad + \qquad \frac{1}{2}x \qquad + \qquad 5x$$

$$x + \frac{1}{2}x + 5x = \frac{13}{2}x$$
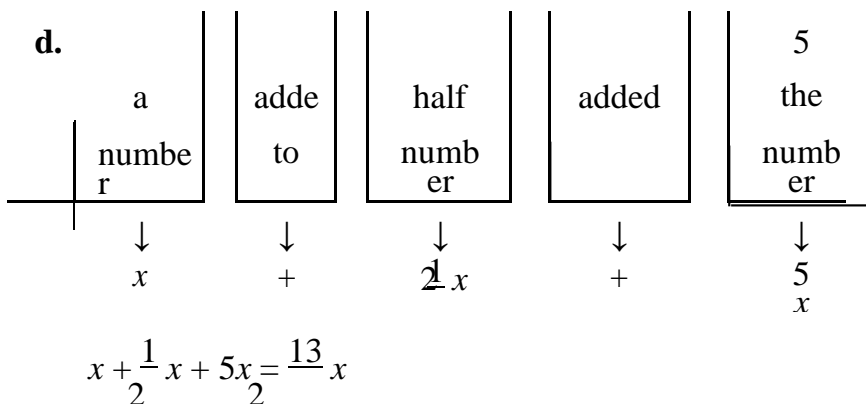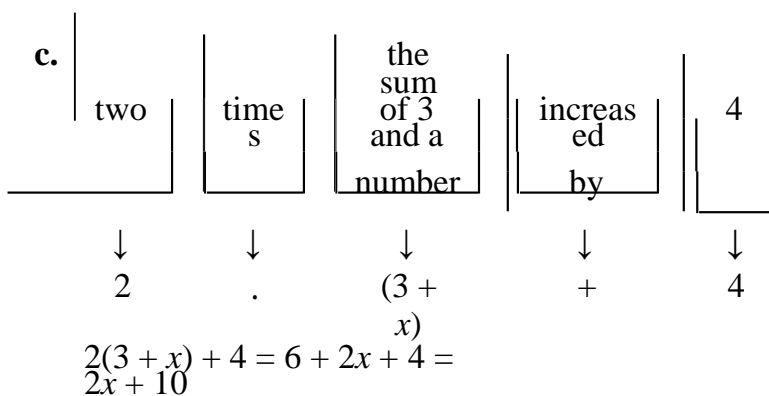
Vocabulary, Readiness & Video Check 2.1

1. $23y^2 + 10y - 6$ is called an <u>expression</u> while $23y^2$, $10y$, and -6 are each called a <u>term</u>.

2. To simplify $x + 4x$, we <u>combine like terms</u>.

3. The term y has an understood <u>numerical coefficient</u> of 1.

4. The terms $7z$ and $7y$ are <u>unlike</u> terms and the terms $7z$ and $-z$ are <u>like</u> terms.

5. For the term $-\dfrac{1}{2}xy^2$, the number $-\dfrac{1}{2}$ is the numerical coefficient.

6. $5(3x - y)$ equals $15x - 5y$ by the <u>distributive</u> property.

7. 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.

8. distributive property

9. -1

10. 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. $-2x^2 y$ 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. $7.4\, p^3 q^2$ and $6.2\, p^3 q^2 r$ 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. $a + 3a - 2 - 7a = a + 3a - 7a - 2$
$$= (1 + 3 - 7)a - 2$$
$$= -3a - 2$$

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. $3y - 5$ added to $y + 16$

$$(3y - 5) \;+\; (y + 16) = 3y + y - 5 + 16$$
$$= 4y + 11$$

46. $12 + x$ minus $4x - 7$

$$(12 + x) \;-\; (4x - 7) = 12 + x - 4x + 7$$
$$= 12 + 19 - 3x$$

48. $2m - 6$ minus $m - 3$

22. $8p + 4 - 8p - 15 = (8p - 8p) + (4 - 15)$
$$= (8 - 8)p + (-11)$$

$$= 0\,p - 11$$
$$= -11$$

24. $7.9\,y - 0.7 - y + 0.2 = 7.9\,y - y - 0.7 + 0.2$

$$= (7.9 - 1)\,y - 0.5$$
$$= 6.9\,y - 0.5$$

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. $0.4y - 6.7 + y - 0.3 - 2.6y$

$$= 0.4y + y - 2.6y - 6.7 - 0.3$$
$$= (0.4 + 1 - 2.6)y - 7.0$$
$$= -1.2y - 7$$

$$(2m - 6) \quad - \quad (m - 3) = 2m - 6 - m + 3$$
$$= 2m - m - 6 + 3$$
$$= m - 3$$

50. $7c - 8 - c = 7c - c - 8 = (7 - 1)c - 8 = 6c - 8$

52. $5y - 14 + 7y - 20y = 5y + 7y - 20y - 14$

$$= (5 + 7 - 20)y - 14$$
$$= -8\,y - 14$$

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. $8\,y - 2 - 3(\,y + 4) = 8y - 2 - 3y - 12 = 5y - 14$

32. $7(r - 3) = 7(r) - 7(3) = 7r - 21$

60. $-11c - (4 - 2c) = -11c - 4 + 2c =$

$-9c - 4$

62. $(8 - 5 y) - (4 + 3 y) = 8 - 5 y - 4 - 3y = -8 y + 4$

64. $2.8w - 0.9 - 0.5 - 2.8w = 2.8w - 2.8w - 0.9 - 0.5$

$= -1.4$

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

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

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

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

74.
$$7(2x + 5) - 4(x + 2) - 20x = 14x + 35 - 4x - 8 - 20x$$
$$= 14x - 4x - 20x + 35 - 8$$
$$= -10x + 27$$

76.
$$\frac{1}{3}(9x - 6) - (x - 2) = 3x - 2 - x + 2$$
$$= 2x$$

78.

The difference of a number	divided by	5
and 2		
↓	↓	↓
$(x-2)$	$\div$	$5 = \dfrac{x-2}{5}$

80.

8 more than		triple a number
↓	↓	↓
8	+	$3x$

82.

eleven	increased by	two-thirds of a number
↓	↓	↓
11	+	$\dfrac{2}{3}x$

84.

9 times a number	subtract	3 times the
		number

$9x$ number and 10

$$\downarrow \qquad \downarrow$$
$$- \qquad (3x + 10)$$

$$9x - (3x + 10) = 9x - 3x - 10 = 6x - 10$$

.37

86.

Six	times	the difference	of a number	and 5
↓	↓		↓	
6	·		$(x-5)$	

$6(x-5) = 6x - 30$

88.

half a	minus	the product
of number		the number
and 8		
↓	↓	↓
$\frac{1}{2}x$	$-$	$8x$ · 2

$\frac{1}{2}x - 8x = -7.5x$

90.

twice a	added	-1	add	5 times	added	-1
number	to		ed to	the number	d to	2
↓	↓	↓	↓	↓	↓	↓
$2x$	$+$	-1	$+$	$5x$	$+$	$-1\frac{1}{2}$

$2x + (-1) + 5x + (-12) = 7x - 13$

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	3
cubes	2 cubes + 2	
cubes		3

cubes

        4 cubes = 3 cubes: Not balanced

102. 1 cylinder   1 cone
   +1 cube 2 cubes   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 $(785x - 25)$¢.

108. no; answers may vary

11 $4m^4 p^2 + m^4 p^2 - 5m^2 p^4 = 5m^4$

0. $p^2 - 5m^2 p^4$

**11
2.** $9y^2 - (6xy^2 - 5y^2) - 8xy^2$
$= 9y^2 - 6xy^2 + 5y^2 - 8xy^2$

$= 14y^2$
$-14xy^2$

114. $-(7c^3 d - 8c) - 5c - 4c^3 d$
$= -7c^3 d + 8c - 5c - 4c^3 d$
$= -11c^3 d + 3c$

Section 2.2 Practice

1.　$x + 3 = -5$
$x + 3 - 3 = -5 - 3$
$x = -8$

Check: $x + 3 = -5$
$-8 + 3 \ -5$
$-5 = -5$

The solution is -8.

2.　$y - 0.3 = -2.1$
$y - 0.3 + 0.3 = -2.1 + 0.3$

$y = -1.8$

Check:　$y - 0.3 = -2.1$
$-1.8 - 0.3 - 2.1$
$-2.1 = -2.1$

The solution is -1.8.

3. $8x - 5x - 3 + 9 = x + x + 3 - 7$
$3x + 6 = 2x - 4$
$3x + 6 - 2x = 2x - 4$

5.　$\dfrac{4}{5} x = 16$

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

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

$\mathop{\rlap{/}{4}}\ \mathop{\rlap{/}{5}}\ ^{4}$

$1x = 20$
$x = 20$
Check: $\dfrac{4}{5} x = 16$
$\dfrac{4}{5} \cdot 20 \ 16$

$16 = 16$
$x = -10$

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

The solution is 20.

6. $8x = -96$

$$\frac{8x}{8} = \frac{-96}{8}$$
$$x = -12$$

C
h
e
c
k
:

8
x

=

$$-96$$
$$8(-12) -$$
$$96$$
$$-96 = -96$$
The solution is -12.

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

$$5 \cdot \frac{x}{5} = 5 \cdot 13$$
$$x = 65$$
Check: $\frac{x}{5} = 13$

$$\frac{65}{5} \quad 13$$
$$13 = 13$$
The solution is 65.

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

$8(-10) - 5(-10) - 3 + 9$	$-10 + (-10) + 3 - 7$
$-80 + 50 - 3 + 9$	$-10 + (-10) + 3 - 7$

$$-24 = -24$$
The solution is -10.

4. $2 = 4(2a - 3) - (7a + 4)$
$$2 = 4(2a) + 4(-3) - 7a - 4$$
$$2 = 8a - 12 - 7a - 4$$
$$2 = a - 16$$
$$2 + 16 = a - 16 + 16$$
$$18 = a$$

8. $6b - 11b = 18 + 2b - 6 + 9$
$$-5b = 21 + 2b$$
$$-5b - 2b = 21 + 2b - 2b$$
$$-7b = 21$$
$$\frac{-7b}{-7} = \frac{21}{-7}$$
Check by replacing a with 18 in the original equation.

$$b = -3$$

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

.39

9. **a.** The other number is $9 - 2 = 7$.

b. The other number is $9 - x$.

c. The other piece has length $(9 - x)$ 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

1. The difference between an equation and an expression is that an <u>equation</u> contains an equal sign, whereas an <u>expression</u> does not.

2. <u>Equivalent</u> equations are equations that have the same solution.

3. A value of the variable that makes the equation a true statement is called a <u>solution</u> of the equation.

4. The process of finding the solution of an

equation is called <u>solving</u> the equation for the variable.

5. By the <u>addition</u> property of equality, $x = -2$ and

$x + 10 = -2 + 10$ are equivalent equations.

6. By the <u>addition</u> property of equality, $x = -7$ and
$x - 5 = -7 - 5$ are equivalent equations.

7. By the <u>multiplication</u> property of equality,

$\frac{y}{1} =$ and $5 \cdot \frac{1}{5} \cdot \frac{y}{1} =$ are equivalent equations.
   2   2

8. By the <u>multiplication</u> property of equality,
$9x = -63$ and $\frac{9x}{9} = \frac{-63}{9}$

13. addition property; multiplication property; answers may vary

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

Exercise Set 2.2

2. $x + 14 = 25$
$x + 14 - 14 = 25 - 14$
$x = 11$

Check: $x + 14 = 25$
$11 + 14 \ 25$
$25 = 25$

The solution is 11.

4. $y - 9 = 1$
$y - 9 + 9 = 1 + 9$
$y = 10$

Check: $y - 9 = 1$
$10 - 9 \ 1$
$1 = 1$

The solution is 10.

6. $8 + z = -8$
$8 - 8 + z = -8 - 8$
$z = -16$
Check: $8 + z = -8$
$8 + (-16) - 8$

$-8 =$
-8 The solution is -16.

8. $t - 9.2 = -6.8$

equations.

are equivalent

$5-9.2+9.2=-6.8+9.2$

$t = 2.4$

Check: $t - 9.2 = -6.8$

$2.4 - 9.2 - 6.8$

$-6.8 = -6.8$

9. The equations $x = \dfrac{1}{2}$ an $\dfrac{1}{d} = x$ are equivalent

equations. The statement is true.

The solution is 2.4.

10. The equations $\dfrac{z}{4} = 10$ and $4 \cdot \dfrac{z}{4} = 10$ are not

equivalent equations. The statement is false.

10. $2x = x - 5$

$2x - x = x - x - 5$

$x = -5$

Check: $2x =$

$x - 5 \ 2(-5)$

$-5-5$

$-10 = -10$

The solution is -5.

11. 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.

12. We can multiply both sides of an equation by any nonzero number and have an equivalent equation.

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12. $9x + 5.5 = 10x$

$9x - 9x + 5.5 = 10x - 9x$

$5.5 = x$

Check: $9x + 5.5 = 10x$

$9(5.5) + 5.5 \qquad 10(5.5)$

$49.5 + 5.5 \quad 55$

$55 = 55$

The solution is 5.5.

14. $18x - 9 = 19x$

$18x - 18x - 9 = 19x - 18x$

$-9 = x$

Check: $18x - 9 = 19x$

$18(-9) - 9 \quad 19(-9)$

$-162 - 9 \quad -171$

$-171 = 171$

The solution is -9.

16. $7y + 2 = 2y + 4y + 2$

$7y + 2 = 6y + 2$

$7y + 2 - 6y = 6y + 2$

$\qquad - 6y$

$y + 2 = 2$

$y + 2 - 2 = 2 - 2$

$y = 0$

The solution is 0.

18. $4c + 8 - c = 8 + 2c$

$3c + 8 = 8 + 2c$

$3c - 2c + 8 = 8 + 2c - 2c$

$c + 8 = 8$

$c + 8 - 8 = 8 - 8$

$c = 0$

The solution is 0.

26. $-2x = 0$

$\dfrac{-2x}{-2} = \dfrac{0}{-2}$

$x = 0$

The solution is 0.

28. $-y = 8$

$\dfrac{-y}{-1} = \dfrac{8}{-1}$

$y = -8$

The solution is -8.

30. $-y + 4y = 33$

$3y = 33$

$\dfrac{3y}{3} = \dfrac{33}{3}$

$y = 11$

The solution is 11.

32. $\dfrac{3}{4}n = -15$

$\dfrac{4}{3}\left(\dfrac{3}{4}n\right) = \dfrac{4}{3}$

$= \dfrac{4}{3}(-15)$

$n = -20$

The solution is -20.

34. $\dfrac{1}{8}v = \dfrac{1}{4}$

$8\left(\dfrac{1}{8}v\right) = 8\left(\dfrac{1}{4}\right)$

$v = 2$

20. $3n + 2n = 7 + 4n$ The solution is 2.

$$-4n = 7 + 4n$$
$$-4n \quad n$$
$$n \qquad = 7$$

The solution is 7.

$$5n = 7 + 4n$$

22.

$$10 = 8(3y - 4) - 23y + 20$$
$$10 = 24y - 32 - 23y + 20$$
$$10 = y - 12$$
$$10 + 12 = y - 12 + 12$$
$$22 = y$$

The solution is 22.

24. $-7x = -49$

$$\frac{-7x}{-7} = \frac{-49}{-7}$$
$$x = 7$$

The solution is 7.

36.

$$15\left(\frac{d}{2}\right) = 15\left(\frac{d}{15}\right)$$

$$d = 30$$

The solution is 30.

38.

$$-5\left(\frac{-f}{5}\right) = -5(0)$$

$$f = 0$$

The solution is 0.

40. Answers may vary

.41

42. $3x - 1 = 26$
$3x - 1 + 1 = 26 + 1$
$3x = 27$

$$\frac{3x}{3} = \frac{27}{3}$$

$x = 9$
Check: $3x - 1 = 26$
$3(9) - 1 \; 26$
$27 - 1 \; 26$
$26 = 26$
The solution is 9.

50. $2 + 0.4p = 2$
$2 - 2 + 0.4p = 2 - 2$
$0.4p = 0$

$$\frac{0.4p}{0.4} = \frac{0}{0.4}$$

$p = 0$
Check: $2 + 0.4p = 2$
$2 + 0.4 \cdot 02$
$2 + 0 \; 2$
$2 = 2$
The solution is 0.

44. $-x + 4 = -24$
$-x + 4 - 4 = -24$
-4
$-x = -28$
$x = 28$

Check: $-x + 4 =$
-24
$(28) + 4 \; -$
24
$-28 + 4 \; -$
24

$-24 =$
-24
The solution is 28.

52. $-3n = \dfrac{1}{3} \stackrel{=}{=} \dfrac{8}{3}$
$-3n - \dfrac{1}{3} + \dfrac{1}{3} \stackrel{=}{=} \dfrac{8}{3} + \dfrac{1}{3}$

$-3n = \dfrac{9}{}$

$-3n = \dfrac{3}{3}$

$-3n = 3$

$-3 \quad -3$

$n = -1$
Chec k: $-3n - \dfrac{1}{3} = \dfrac{8}{3}$
$-3(-1) - \dfrac{1}{3} \dfrac{8}{3}$
$1 \quad 8$

$3 - \dfrac{}{3} \; \dfrac{}{3}$

$5 = 5$
The solution is 0.

46. $8t + 5 = 5$
$8t + 5 - 5 = 5 - 5$
$8t = 0$

$$\frac{8t}{8} = \frac{0}{8}$$

$t = 0$
Check: $8t + 5 = 5$
$8(0) + 5 \; 5$
$0 + 5 \; 5$

-15

$= -10$

4 $-10y + 15 = 5$

8. $-10y + 15 - 15 = 5$

$-10y$

$$\frac{-10y}{} = \frac{-10}{}$$

5
4.

$\dfrac{9}{-1}$

$\dfrac{8}{3}$

$\dfrac{3}{3}$

$\dfrac{3}{8}$

$=$

$\dfrac{8}{3}$

3

The solution is −1.

_b_

−

1

=

−

7

_b_   4

−

1

+

1

=

−

7

+

1

Check:

$-10 \quad -10$

$y = 1$

4

−
1
0

$\dfrac{b}{4} = -6$

$4\left(\dfrac{b}{4}\right) = 4(-6)$

| |

y

$b = -24$

+
1
5

=

5
−
1
0

.
1
+

1
5

5
−
1
0

+

1
5

5
5

=

5

The solution is 1.

Check: $\dfrac{b}{4} - 1 = -7$

$\dfrac{-24}{4} - 1 \; -7$

$-6 - 1 \; -7$

$-7 = -7$

The solution is −24.

56. $12 = 3j - 4$

$12 + 4 = 3j - 4$

$+ 4$

$16 = 3j$

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

$3 \quad 3$

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

Check: $12 = 3j - 4$

$12 \quad 3 \cdot \dfrac{16}{4} -$

3

$12 \quad 16 -$

4

$12 = 12$

The solution is $\dfrac{16}{3}$.

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

$5a - 10 = 0$

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

$5a = 10$

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

$a = 2$

Check: $4a + 1 + a - 11 = 0$

$4 \cdot 2 + 1 + 2 - 11 \qquad 0$

$8 + 1 + 2 - 11 \quad 0$

$0 = 0$

The solution is 2.

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

$20x + 24 = 10$

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

$20x = -14$

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

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

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

$x = -12$

Chec $-\dfrac{3}{4}x = 9$

k: $-\dfrac{3}{4}(-12) \quad 9$

$9 = 9$

The solution is -12.

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

$19 = -0.5x - 6$

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

$25 = -0.5x$

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

$-0.5 \quad -0.5$

$-50 = x$

Check: $19 = 0.4x - 0.9x - 6$

$19 \quad 0.4(-50) - 0.9(-50) - 6$

$19 \quad -20 + 45 - 6$

$19 = 19$

The solution is -50.

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

$-5t = -2t - 13$

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

-13

$-3t = -13$

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

$x = -\dfrac{7}{10}$ Che

c k

:

$12x + 30 + 8x - 6$

$= 10\ 12\left(-\dfrac{7}{7}\right)$

$+30 + 8\quad -\dfrac{7}{7}$

$-6\qquad 10$

Check:

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

$$t - 6t$$
$$= -13$$
$$+ t - 3t$$

$$\frac{13}{\frac{13}{3}} - 6 \cdot \frac{13}{\frac{13}{3}} - 13 + \frac{13}{3} - 3 \cdot \frac{13}{3}$$

3

3

3

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

$$\frac{78}{3} \quad 3 \qquad -\frac{39}{3} + \frac{13}{3} - \frac{39}{3}$$

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

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

$$-\frac{84}{19} + 24 - \frac{56}{19}$$
1

0
10

$$-\frac{140}{10} + 24$$
1

0

$$-14 + 24 \; 10$$
$$10 = 10$$

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

68. $0.1x - 0.6x - 6 = 19$
$$-0.5x - 6 = 19$$
$$-0.5x - 6 + 6 = 19 + 6$$
$$-0.5x = 25$$
$$\frac{-0.5x}{-0.5} = \frac{25}{-0.5}$$
$$x = -50$$

.43

Check: $0.1x - 0.6x - 6 = 19$

$0.1(-50) - 0.6(-50) - 6$ 19

$-5 + 30 - 6 \ 19$

$19 =$

The solution is 19

-50.

7
0. $-5 - 6y + 6 =$
          19

$-6y + 1 = 19$

$-6y + 1 - 1 = 19$
-1

$-6y = 18$

$\dfrac{-6y}{-6} = \dfrac{18}{-6}$

$y = -3$

Chec $-5 - 6y + 6 = 19$
k: $-5 - 6(-3) + 6$
               19
         $-5 + 18 + 6 \ 19$
               $19 = 19$

The solution is -3.

72. $4b - 8 - b = 10b - 3b$

$3b - 8 = 7b$

$3b - 3b - 8 = 7b - 3b$

$-8 = 4b$

$\dfrac{-8}{4} = \dfrac{4b}{4}$

$-2 = b$

Check: $4b - 8 - b = 10b - 3b$

$4(-2) - 8 - (-2) \ 10(-2) - 3(-2)$

$-8 - 8 + 2 \ -20 + 6$

$-14 = -14$

The solution is -2.

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

$-3 = -20x - 15 + 21x$

82. The length of the computer desk is $\left(m + 1\dfrac{1}{2} \right)$ 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.
Sum $= x + (x + 2) + (x + 4) + (x + 6)$
$= x + x + 2 + x + 4 + x + 6$

$= 4x + 12$

92. Sum $= 20 +$ second integer. Sum $= 20 + (x + 1)$
$= 20 + x + 1$
$= x + 21$

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

100. $(-2)^4 = (-2)(-2)(-2)(-2) = 16$

$-3 = x - 15$

$-3 + 15 = x - 15 + 15$

$$12 = x$$

2.

Check: $-3 = -5(4x + 3) + 21x$
$$-3 \;\; -5(4 \cdot 12 + 3) + 21 \cdot 12$$
$$-3 \;\; -5(48 + 3) + 252$$
$$-3 \;\; -5(51) + 252$$

$$-3 \;\; -255 + 252$$
$$-3 = -3$$

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 $(90 - x)°$.

10 $-2^4 = -2 \cdot 2 \cdot 2 \cdot 2 = -16$
$(-2)^4 > -2^4$

$(-4)^3 = (-4)(-4)(-4) = -64$

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

104. $360 - (x + 3x + 5x) = 360 - (9x) = 360 - 9x$

The fourth angle is $(360 - 9x)°$.

106. Answers may vary

108. $\quad a + 9 = 15$
$a + 9 + (-9) = 15 + (-9)$
$\quad\quad a = 6$
The answer is -9.

110. Answers may vary

44 .

112. Answers may vary

114. $\_\_x = 10$

$\cdot \dfrac{1}{2} = 10$

$\dfrac{\_\_ 1}{\cdot 2} \cdot \dfrac{1}{2} \cdot 2 = 10$

$2 = 20$

$\_\_$

116. $9x = 13.5$

$\dfrac{9x}{9} = \dfrac{13.5}{9}$

$x = 1.5$

Each dose should be 1.5 milliliters.

118. Check $a = 6.3$.

$3(a + 4.6) = 5a + 2.5$

$3(6.3 + 4.6)$

21

$3(10.9)\ 31.5 + 2.5$

$32.7 = 34$

Not a solution

120. $4.95\,y = -31.185$

$\dfrac{4.95\,y}{4.95} = \dfrac{-31.185}{4.95}$

$y = -6.3$

122. $0.06\,y + 2.63 =$

Check: $2(4a$

$-9) + 3 = 5a - 6$

$2[4(3) - 9] + 3$

$5(3) - 6$

$2(12 - 9) + 3$ $15 - 6$

$2(3) + 3\ 9$

$6 + 3\ 9$

$9 = 1$

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

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

$7x - 21 = -6x$

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

$-21 = -13x$

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

$\dfrac{1}{3}$
$\dfrac{2}{1}$

$\dfrac{\_\_}{13} = x$

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

$5(6.3) + 2.5 \left(\dfrac{21}{} \right)$

$\dfrac{7}{-3} \left(\dfrac{1}{3} \right) - 6 \left(\dfrac{}{13} \right)$

$7^{|}\ \underline{21}\_\ \ \_\underline{126}$

2.5562

$0.06\,y + 2.63 - 2.63 = 2.5562$

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

$$\Big|\ \Big\backslash_{13}\quad\Big/_{13}\quad\Big|\Big/\ \Big\backslash_{13}$$

$$7\left(-\frac{18}{13}\right)_{13}\ -\frac{126}{}$$

$$\begin{array}{c}1\\2\\6\\1\\2\\6\end{array}$$

$$\overline{\ }\\2\\.\\6\\3$$

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

$$0.06\,y = -0.0738$$
$$\frac{0.06\,y}{0.06} = \frac{-0.0738}{0.06}$$
$$0.0$$

$$\frac{6}{y} = -1.23$$

Section 2.3
Practice

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

$$8a - 18 + 3 = 5a - 6$$
$$8a - 15 = 5a - 6$$
$$8a - 15 - 5a = 5a - 6 - 5a$$
$$3a - 15 = -6$$
$$3a - 15 + 15 = -6 + 15$$

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

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

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

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

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

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

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

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

$$\frac{3}{5} \cdot -15 - 2 = \frac{2}{3} \cdot -15 - 1$$
$$-9 - 2 = -10 - 1$$
$$-11 = -11$$

The solution is -15.

.45

4. $\dfrac{4(y+3)}{3} = 5y - 7$

$3 \cdot \dfrac{4(y+3)}{3} = 3 \cdot (5y - 7)$

$4(y+3) = 3(5y - 7)$

$4y + 12 = 15y - 21$

$4y + 12 - 4y = 15y - 21 - 4y$

$12 = 11y - 21$

$12 + 21 = 11y - 21 + 21$

$33 = 11y$

$\dfrac{33}{11} = \dfrac{11y}{11}$

$3 = y$

To check, replace y with 3 in
the original

equation. The solution is 3.

5. $0.35x + 0.09(x+4) = 0.30(12)$

$100[0.35x + 0.09(x+4)] = 100[0.03(12)]$

$35x + 9(x+4) = 3(12)$

$35x + 9x + 36 = 36$

$44x + 36 = 36$

$44x + 36 - 36 = 36 - 36$

$44x = 0$

$\dfrac{44x}{44} = \dfrac{0}{44}$

$x = 0$

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

6. $4(x+4) - x = 2(x+11) + x$

$4x + 16 - x = 2x + 22 + x$

$3x + 16 = 3x + 22$

$3x + 16 - 3x = 3x + 22 - 3x$

$16 = 22$

There is no solution.

7. $12x - 18 = 9(x-2) + 3x$

$12x - 18 = 9x - 18 + 3x$

$12x - 18 = 12x - 18$

$12x - 18 + 18 = 12x - 18 + 18$

$12x = 12x$

$12x - 12x = 12x - 12x$

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

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

$0 = 0$

The solution is all real numbers.

Graphing Calculator Explorations

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

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

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

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 <u>all real numbers</u> as a solution.

   b. If you have a false statement, then the equation has <u>no</u> solution.

46   .

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. $3(2-5x)+4(6x) = 12$

$6-15x+24x = 12$

$6+9x = 12$

$6-6+9x = 12-6$

-6

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. $5\left(\frac{4}{5}x-\frac{3}{5}\right) = -\frac{16}{5} \cdot 5$

$9x = 6$

$- \underline{16}$)

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

$$x = \frac{2}{3}$$

10. $-4(n-4)-23=-7$
$-4n+16-23=-7$
$-4n-7=$
-7

$-4n-7+7=-7+7$
$-4n=0$
$$\frac{-4n}{-4} = \frac{0}{-4}$$
$n=0$

$|\backslash_{55}|)$ $|\backslash_5|)$

$4x-8=-16$
$4x-8+8=-16+8$
$4x=-8$

$$\frac{4x}{4} = \frac{-8}{4}$$
$x=-2$

.47

20. $\dfrac{2}{9}x - \dfrac{1}{3} = 1$

$$9\left(\dfrac{2}{9}x - \dfrac{1}{3}\right) = 9(1)$$

$$2x - 3 = 9$$
$$2x - 3 + 3 = 9 + 3$$
$$2x = 12$$
$$\dfrac{2x}{2} = \dfrac{12}{2}$$
$$x = 6$$

22. $0.40x + 0.06(30) = 9.8$

$$100[0.40x + 0.06(30)] = 100(9.8)$$
$$40x + 6(30) = 980$$

$$40x + 180 = 980$$

$$40x + 180 - 180 = 980 - 180$$
$$40x = 800$$
$$\dfrac{40x}{40} = \dfrac{800}{40}$$
$$x = 20$$

24. $\dfrac{3(y+3)}{5} = 2y + 6$

$$5\left[\dfrac{3(y+3)}{5}\right] = 5[2y+6]$$

$$3(y+$$
$$3y + 9 = 10y + 30$$
$$3y - 10y + 9 = 10y - 10y + 30$$
$$-7y + 9 = 30$$
$$-7y + 9 - 9 = 30 - 9$$
$$-7y = 21$$
$$\dfrac{-7y}{-7} = \dfrac{21}{-7}$$

$$y = -3$$

26. $\dfrac{5}{2}x - 1 = x + \dfrac{1}{4}$

$$4\left(\dfrac{5}{2}x - 1\right) = 4\left(x + \dfrac{1}{4}\right)$$

28. $0.60(z - 300) + 0.05z = 0.70z - 205$

$$100[0.60(z-300)+0.05z] = 100[0.70z - 205]$$
$$60(z-300) + 5z = 70z - 20{,}500$$

$$60z - 18{,}000 + 5z = 70z - 20{,}500$$
$$65z - 18{,}000 = 70z - 20{,}500$$
$$65z - 70z - 18{,}000 = 70z - 70z - 20{,}500$$
$$-5z - 18{,}000 = -20{,}500$$
$$-5z - 18{,}000 + 18{,}000 = -20{,}500 + 18{,}000$$
$$-5z = -2500$$
$$\dfrac{-5z}{-5} = \dfrac{-2500}{-5}$$
$$z = 500$$

30. $14x + 7 = 7(2x + 1)$

$$14x + 7 = 14x + 7$$

$$14x + 7 - 14x = 14x + 7 - 14x$$
$$7 = 7$$

All real numbers are solutions.

32. $\dfrac{x}{3} - 2 = \dfrac{x}{3}$

$$3\left(\dfrac{x}{3} - 2\right) = 3\left(\dfrac{x}{3}\right)$$

$$x - 6 = x$$
$$x - x - 6 = x - x$$

$$-6 = 0$$

There is no solution.

34. $2(x - 5) = 2x + 10$
$$2x - 10 = 2x + 10$$
$$2x - 2x - 10 = 2x - 2x + 10$$
$$-10 = 10$$
There is no solution.

36. $-5(4y - 3) + 2 = -20y + 17$
$$-20y + 15 + 2 = -20y + 17$$
$$-20y + 17 = -20y + 17$$

$$-20y + 17 + 20y = -20y + 17 + 20y$$
$$17 = 17$$

All real numbers are solutions.

$$10x - 4 = 4x + 1$$
$$10x - 4x - 4 = 4x -$$

$$4x + 1$$
$$6x - 4 = 1$$
$$6x - 4 + 4 = 1 + 4$$

38.

$$\frac{4(5-w)}{6x} = 5$$

$$\frac{6x}{\frac{5}{6}} = \frac{}{6}$$

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

6

$$-w$$

$$3\left[\frac{4(5-w)}{3}\right] = 3(-w)$$

$$4(5-w) = -3w$$

$$20 - 4w = -3w$$

$$20 - 4w + 4w = -3w$$

$$+ 4w$$

$$20 = w$$

48 .

40. $-(4a-7)-5a=10+a$

$-4a+7-5a=10+a$

$-9a+7=10+a$

$-9a-a+7=10+a$

$-a$

$-10a+7=10$

$-10a+7-7=10-7$

$-10a=3$

$\dfrac{-10a}{}=\dfrac{3}{}$

$\dfrac{}{-10}\quad\dfrac{}{-10}$

$a=-\dfrac{3}{10}$

42. $9x+3(x-4)=10(x-5)+7$

$9x+3x-12=10x-50+7$

$12x-12=10x-43$

$12x-12+12=10x-$

$43+12$

$12x=10x-31$

$12x-10x=10x-$

$31-10x$

$2x=-31$

$\dfrac{2x}{2}=\dfrac{-31}{2}$

$x=-\dfrac{31}{2}$

44. $\dfrac{5(x-1)}{4}=\dfrac{3(x+1)}{2}$

$4\left\lceil\dfrac{5(x-1)}{4}\right\rceil=4\left\lceil\dfrac{3(x+1)}{2}\right\rceil$

$5(x-1)=6(x+1)$

$5x-5=6x+6$

$5x-6x-5=6x-6x$

$+6$

$-x-5+5=6+5$

48. $3(2x-1)+5=6x+2$

$6x-3+5=6x+2$

$6x+2=6x+2$

$6x-6x+2=6x-6x+2$

$2=2$

All real numbers are solutions.

50. $4(4y+2)=2(1+6y)+8$

$16y+8=2+12y+8$

$16y+8=10+12y$

$16y+8-8=10+12y$

-8

$16y=2+12y$

$16y-12y=2+12y$

$-12y$

$4y=2$

$\dfrac{4y}{4}=\dfrac{2}{4}$

$y=\dfrac{1}{2}$

52. $\dfrac{7}{8}x+\dfrac{1}{4}=\dfrac{3}{4}x$

$8\left(\dfrac{7}{8}x+\dfrac{1}{4}\right)=8\left(\dfrac{3}{4}x\right)$

$7x+2=6x$

$7x+2-7x=6x-7x$

$2=-x$

$\dfrac{2}{-1}=\dfrac{-x}{-1}$

$-2=x$

54. $15\left(\dfrac{x}{5}-\dfrac{7}{3}\right)=15\left(\dfrac{x}{5}-5\right)$

$-x = 11$

$$\begin{pmatrix} 5 \end{pmatrix} \begin{pmatrix} 3 \end{pmatrix}$$

$$\frac{-x}{-1} = \frac{11}{-1}$$
$$x = -11$$

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

$3x - 105 = 5x - 75$
$3x - 105 - 3x = 5x - 75 - 3x$
$-105 = 2x - 75$
$-105 + 75 = 2x - 75 + 75$
$-30 = 2x$
$$\frac{-30}{2} = \frac{2x}{2}$$
$-15 = x$

56. $4(2 + x) + 1 = 7x - 3(x - 2)$
$8 + 4x + 1 = 7x - 3x + 6$
$9 + 4x = 4x + 6$
$9 + 4x - 4x = 4x - 4x + 6$
$9 = 6$

There is no solution.

.49

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

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

62. $7n + 5 = 10n - 10$
$$7n + 5 - 5 = 10n - 10 - 5$$
$$7n = 10n - 15$$
$$7n - 10n = 10n - 15 - 10n$$
$$-3n = -15$$
$$\frac{-3n}{-3} = \frac{-15}{-3}$$
$$n = 5$$

66.
$$0.03(2m+7) = 0.06(5+m) - 0.09$$
$$100[0.03(2m+7)] = 100[0.06(5+m) - 0.09]$$
$$3(2m+7) = 6(5+m) - 9$$
$$6m + 21 = 30 + 6m - 9$$
$$6m + 21 = 21 + 6m$$
$$6m - 6m + 21 = 21 + 6m - 6m$$
$$21 = 21$$
All real numbers are solutions.

68.

3	times	a number
↓	↓	↓
3	·	x	= $3x$

70.

8	minus	twice a number
↓	↓	↓
8	−	$2x$

72. the quotient of −12 and 3 ↓ -12

the difference of a number and 3

↓	↓	↓	$\frac{-12}{}$

64.
$$10(0.2x - 0.1) = 10(0.6x - 2.1)$$
$$0.2x - 0.1 = 0.6x - 2.1$$

$$2x - 1 = 6x - 21$$
$$2x - 6x - 1 = 6x - 6x - 21$$
$$-4x - 1 = -21$$

$$-4x - 1 + 1 = -21 + 1$$
$$-4x = -20$$
$$\frac{-4x}{} = \frac{-20}{}$$

$$\frac{-12}{3)^2} \quad \overset{\div}{=} \quad (x - x - 3$$

74. $x + (7x - 9) =$
$x + 7x - 9 = 8x - 9$
The total length is $(8x - 9)$ feet.

76. a. $x + 3 = x + 5$
$x + 3 - x = x + 5 - x$

$-4 \quad -4$

$x = 5$
answer is a.

$3 = 5$
There is no solution.

b. answers may vary

c. answers may vary

78. $3x + 1 = 3x + 2$
$3x + 1 - 3x = 3x + 2 - 3x$
$1 = 2$
There is no solution. The answer is b.

80. $x - 11x - 3 = -10x - 1 - 2$
$-10x - 3 = -10x - 3$
$-10x - 3 + 10x = -10x - 3 + 10x$

$-3 = -3$

All real numbers are solutions. The

·

82. $-x + 15 = x + 15$
$-x+15+x=x+15+x$
$15=2x$

$15 -15 = 2x +15 -15$
$0 = 2x$

$\dfrac{0}{2} = \dfrac{2x}{2}$
$0 = x$

The answer is c.

84. answers may vary

86. a. Since the perimeter is the sum of the lengths

of the sides, $x + 2x + 1 + 3x - 2 = 35$.

b. $6x -1 = 35$
$6x -1+ 1 = 35 +1$
$6x = 36$
$\dfrac{6x}{6} = \dfrac{36}{6}$

c. $2x + 1 = 2(6) + 1 = 13$
$3x - 2 = 3(6) - 2 = 16$
The lengths are $x = 6$ meters,
$2x + 1 = 13$ meters and $3x - 2 = 16$ meters.

88. answers may vary
$x = 6$
90. $1000(x + 40) = 100(16 + 7x)$
$1000x + 40,000 = 1600 + 700x$

$1000x+40,000-700x=1600+700x-700x$
$300x + 40,000 = 1600$
$300x+40,000-40,000=1600$
$-40,000$

$300x = -38,$
400
$\dfrac{300x}{300} = \dfrac{-38,}{400}$
$\dfrac{400}{300}$

94. $t^2 -6t = t(8+t)$
$t^2 - 6t = 8t + t^2$

$t^2 - t^2 - 6t = 8t^2 + t^2$
$-6t = 8t$

$-6t + 6t = 8t + 6t$
$0 = 14t$
$\dfrac{0}{14} = \dfrac{14t}{14}$
$0 = t$

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

$y^2 - 4y +10 = y^2 - 5 y$

$y^2 - y^2 -4y+10 = y^2 - y^2 -5y$
$-4 y +10 = -5 y$
$-4 y + 5 y +10 = -5 y + 5 y$
$y +10 = 0$
$y+10-10 = -10$
$y = -10$

Integrated Review

1. $x -10 = -4$
$x - 10 + 10 = -4 + 10$
$x = 6$

2. $y +14 = -3$
$y + 14 - 14 = -3 - 14$
$y = -17$

3. $9y = 108$
$\dfrac{9y}{9} = \dfrac{108}{9}$

$x = -128$

92. $0.127x - 2.685 = 0.027x - 2.38$

$$\frac{9}{9} \quad \frac{9}{12}$$
$$y = 12$$

4. $-3x = 78$

$$\frac{-3x}{-3} = \frac{78}{-3}$$
$$—$$

$$1000(0.127x - 2.685) =$$
$$1000(0.027x - 2.38)$$
$$127x - 2685 = 27x - 2380$$
$$127x - 27x - 2685 = 27x - 27x -$$

$$2380$$
$$100x - 2685 = -2380$$

$$100x - 2685 + 2685 = -2380 + 2685$$
$$100x = 305$$

$$\frac{100x}{100} = \frac{305}{100}$$
$$\quad 10$$
$$0$$
$$x = 3.05$$

$$x = -26$$

5. $\quad -6x + 7 = 25$
$$-6x + 7 - 7 = 25 - 7$$
$$-6x = 18$$

$$\frac{-6x}{-6} = \frac{18}{-6}$$

$$x = -3$$

.51

6.
$$5y - 42 = -47$$
$$5y - 42 + 42 = -47 + 42$$
$$5y = -5$$
$$\frac{5y}{5} = \frac{-5}{5}$$
$$y = -1$$

7.
$$\frac{2}{3}x = 9$$
$$\frac{3}{2}\left(\frac{2}{3}x\right) = \frac{3}{2}(9)$$
$$x = \frac{27}{2}$$

8.
$$\frac{4}{5}z = 10$$
$$\frac{5}{4}\left(\frac{4}{5}z\right) = \frac{5}{4}(10)$$
$$z = \frac{25}{2}$$

9.
$$\frac{r}{-4} = -2$$
$$-4\left(\frac{r}{-4}\right) = -4(-2)$$
$$r = 8$$

10.
$$\frac{y}{-8} = 8$$
$$-8\left(\frac{y}{-8}\right) = -8(8)$$
$$y = -64$$

13.
$$2x - 7 = 2x - 27$$
$$2x - 2x - 7 = 2x - 2x - 27$$
$$-7 = -27$$
There is no solution.

14.
$$3 + 8y = 8y - 2$$
$$3 + 8y - 8y = 8y - 8y - 2$$
$$3 = -2$$
There is no solution.

15. $-3a + 6 + 5a = 7a - 8a$
$$2a + 6 = -a$$
$$2a - 2a + 6 = -a - 2a$$
$$6 = -3a$$
$$\frac{6}{-3} = \frac{-3a}{-3}$$
$$-2 = a$$

16. $4b - 8 - b = 10b - 3b$
$$3b - 8 = 7b$$
$$3b - 3b - 8 = 7b - 3b$$
$$-8 = 4b$$
$$\frac{-8}{4} = \frac{4b}{4}$$
$$-2 = b$$

17.
$$\frac{2}{3}x = \frac{5}{9}$$
$$-\frac{3}{2}\left(-\frac{2}{3}x\right) = -\frac{3}{2}\left(\frac{5}{9}\right)$$
$$x = -\frac{5}{6}$$

18.
$$-\frac{3}{ }y = -\frac{1}{ }$$

11. $6 - 2x + 8 = 10$
$-2x + 14 = 10$

$-2x + 14 - 14 = 10 - 14$
$-2x = -4$
$\dfrac{-2x}{-2} = \dfrac{-4}{-2}$
$x = 2$

12. $-5 - 6y + 6 = 19$
$-6y + 1 = 19$

$-6y + 1 - 1 = 19 - 1$
$-6y = 18$
$\dfrac{-6y}{-6} = \dfrac{18}{=}$

$-\dfrac{8}{3}\left(-\dfrac{3}{8}y\ \begin{matrix}8\\ \\8\end{matrix}\right) = -\dfrac{8}{3}\left(\begin{matrix}16\\-\dfrac{1}{16}\end{matrix}\right)$

$y = \dfrac{1}{6}$

19. $10 = -6n + 16$
$10 - 16 = -6n + 16 - 16$

$-6 = -6n$
$\dfrac{-6}{=} \dfrac{-6n}{=}$

$-6 \quad -6$
$1 = n$

$$\begin{array}{cc} -6 & -6 \\ y = & -3 \end{array}$$

..

20.
$$-5 = -2m + 7$$
$$-5 - 7 = -2m + 7$$
$$\quad\quad -7$$
$$-12 =$$
$$-2m$$

$$\frac{2}{-1} \frac{-2m}{=}$$
$$-2 \quad -2$$
$$6 = m$$

21. $3(5c - 1) - 2 = 13c + 3$
$$15c - 3 - 2 = 13c + 3$$
$$15c - 5 = 13c + 3$$
$$15c - 13c - 5 = 13c - 13c + 3$$
$$2c - 5 = 3$$
$$2c - 5 + 5 = 3 + 5$$
$$2c = 8$$

$$\frac{2c}{2} = \frac{8}{2}$$
$$c = 4$$

22. $4(3t + 4) - 20 = 3 + 5t$
$$12t + 16 - 20 = 3 + 5t$$
$$12t - 4 = 3 + 5t$$
$$12t - 5t - 4 = 3 + 5t - 5t$$
$$7t - 4 = 3$$
$$7t - 4 + 4 = 3 + 4$$
$$7t = 7$$
$$\frac{7t}{7} = \frac{7}{7}$$

$$\frac{7}{7} = \frac{7}{7}$$
$$t = 1$$

23. $\dfrac{2(z+3)}{z} = 5 -$

$$3\left[\frac{2(z+3)}{z}\right] = 3(5 -$$
$$\left[\quad 3 \quad\right]$$
$$2z + 6 = 15 - 3z$$
$$2z + 3z + 6 = 15 - 3z + 3z$$
$$5z + 6 = 15$$
$$5z + 6 - 6 = 15 - 6$$

24. $\dfrac{3(w+2)}{4} = 2w + 3$

$$4\left[\frac{3(w+2)}{4}\right] = 4(2w + 3)$$

$$3w + 6 = 8w + 12$$
$$3w - 8w + 6 = 8w - 8w + 12$$
$$-5w + 6 = 12$$
$$-5w + 6 - 6 = 12 - 6$$
$$-5w = 6$$
$$\frac{-5w}{-5} = \frac{6}{-5}$$
$$w = -\frac{6}{5}$$

25.
$$-2(2x - 5) = -3x + 7 - x + 3$$
$$-4x + 10 = -4x + 10$$
$$-4x + 4x + 10 = -4x + 4x + 10$$
$$10 = 10$$

26.
All real numbers are solutions.

$$-4(5x - 2) = -12x + 4 - 8x + 4$$
$$-20x + 8 = -20x + 8$$
$$-20x + 20x + 8 = -20x + 20x + 8$$
$$8 = 8$$
All real numbers are solutions.

27. $\quad 0.02(6t - 3) = 0.04(t - 2) + 0.02$
$$100[0.02(6t - 3)] = 100[0.04(t - 2) + 0.02]$$
$$2(6t - 3) = 4(t - 2) + 2$$
$$12t - 6 = 4t - 8 + 2$$
$$12t - 6 = 4t - 6$$
$$12t - 4t - 6 = 4t - 4t - 6$$
$$5z = 9$$
$$\frac{5z}{5} = \frac{9}{5}$$
$$z = \frac{9}{5}$$

$$8t - 6 = -6$$
$$8t - 6 + 6 = -6 + 6$$
$$8t = 0$$

$$\frac{8t}{8} = \frac{0}{8}$$
$$t = 0$$

.53

$$8t - 6 = -6$$
$$8t - 6 + 6 = -6 + 6$$
$$8t = 0$$

$$\frac{8t}{8} = \frac{0}{8}$$
$$t = 0$$

28. $0.03(m+7) = 0.02(5-m) + 0.03$

$100[0.03(m+7)] = 100[0.02(5-m) + 0.03]$

$3(m+7) = 2(5-m) + 3$

$3m+21 = 10-2m+3$

$3m+21 = 13-2m$

$3m+2m+21 = 13-2m+2m$

$5m+21 = 13$

$5m+21-21 = 13-21$

$5m = -8$

$\dfrac{5m}{5} = \dfrac{-8}{5}$

$m = -\dfrac{8}{5} = -1.6$

29. $-3y = \dfrac{4(y-1)}{5}$

$5(-3y) = 5\left[\dfrac{4(y-1)}{5}\right]$

$-15y = 4y-4$

$-15y-4y = 4y-4y-4$

$-19y = -4$

$\dfrac{-19y}{-19} = \dfrac{-4}{-19}$

$y = \dfrac{4}{19}$

30. $-4x = \dfrac{5(1-x)}{6}$

$6(-4x) = 6\left[\dfrac{5(1-x)}{6}\right]$

$-24x = 5-5x$

32. $\dfrac{7}{5}n + \dfrac{3}{5} = -n$

$5\left(\dfrac{7}{5}n + \dfrac{3}{5}\right) = 5(-n)$

$7n+3 = -5n$

$7n-7n+3 = -5n-7n$

$3 = -12n$

$\dfrac{3}{-12} = \dfrac{-12n}{-12}$

$-\dfrac{1}{4} = n$

33. $9(3x-1) = -4+49$

$27x-9 = 45$

$27x-9+9 = 45+9$

$27x = 54$

$\dfrac{27x}{27} = \dfrac{54}{27}$

$x = 2$

34. $12(2x+1) = -6+66$

$24x+12 = 60$

$24x+12-12 = 60-12$

$24x = 48$

$\dfrac{24x}{24} = \dfrac{48}{24}$

$x = 2$

35. $\dfrac{1}{10}(3x-7) = \dfrac{3}{10}x+5$

$10\left[\dfrac{1}{10}(3x-7)\right] = 10\left(\dfrac{3}{10}x+5\right)$

$4x + 5x = 5 - 5x$

$-19x = 5$
$\underline{-19x} = \underline{5}$

$\left[\begin{matrix} 3x \\ 10 \end{matrix} \right.$

$3x - 7 = 3x + 50$
$3x - 7 - 3x = 3x + 50$

$-$

3

$$-19 \quad -19$$

$$x = \frac{-5}{19}$$

31. $\frac{5}{7}x - = x$

$$\left| \frac{3}{5} \cdot \frac{3}{7} \right|$$

$$3 \left| \frac{}{3}x - \frac{}{3} \right| =$$
$$3(x)$$

$$5x - 7 = 3x$$
$$5x - 5x - 7 = 3x$$
$$-5x$$
$$-7 = -2x$$
$$\underline{-7} = \underline{-2x}$$

$$x$$
$$-7 = 50$$

There is no solution.

$$\frac{1}{3}(2x - \quad \frac{2}{}x + 1$$

6. $5) =$

$$\left\lceil \frac{7}{1} \quad \right\rceil \, ^7\!\left(\frac{}{2} \right)$$

$$7 \left\| 7 \frac{(2x}{2x} - 5) \right\| = 7 \Big|_{7} \, x + 1 \Big|$$

$$5 = 2x + 7$$
$$2x - 5 - 2x = 2x + 7 -$$
$$2x$$

$$-5 = 7$$

There is no solution.

$$\frac{-2}{7} = x^{-2}$$

37. $5 + 2(3x - 6) = -4(6x - 7)$

$$5 + 6x - 12 = -24x + 28$$
$$6x - 7 = -24x + 28$$
$$6x - 7 + 24x = -24x + 28 + 24x$$
$$30\,x - 7 = 28$$
$$30\,x - 7 + 7 = 28 + 7$$
$$30x = 35$$
$$\frac{30x}{30} = \frac{35}{30}$$
$$x = \frac{7}{6}$$

38. $3 + 5(2x - 4) = -7(5x + 2)$

$$3 + 10x - 20 = -35x - 14$$
$$10x - 17 = -35x - 14$$
$$10x - 17 + 35x = -35x - 14 + 35x$$
$$45x - 17 = -14$$
$$45x - 17 + 17 = -14 + 17$$
$$45x = 3$$

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

$$x = \frac{1}{15}$$

Section 2.4 Practice

1. Let x = the number.
$$3x - 6 = 2x + 3$$
$$3x - 6 - 2\,x = 2x + 3 - 2x$$
$$x - 6 = 3$$
$$x - 6 + 6 = 3 + 6$$
$$x = 9$$
The number
is 9.

2. Let x = the number.
$$3x - 4 = 2(x - 1)$$
$$3x - 4 = 2x - 2$$
$$3x - 4 - 2x = 2x - 2 - 2x$$
$$x - 4 = -2$$

4. Let x = number of Republican governors, then
$x - 9$ = number of Democratic governors.
$$x + x - 9 = 49$$
$$2x - 9 = 49$$
$$2x - 9 + 9 = 49 + 9$$
$$2x = 58$$
$$\frac{2x}{2} = \frac{58}{2}$$
$$x = 29$$
$$x - 9 = 20$$

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 $x + 3x + (x + 55) = 180$
$$5x + 55 = 180$$
$$5x + 55 - 55 = 180 - 55$$
$$5x = 125$$
$$\frac{5x}{5} = \frac{125}{5}$$
$$x - 4 + 4 = -2 + 4$$
$$x = 2 \text{ The number}$$
is 2.

3. Let x = the length of short piece, then $4x$ = the length of long piece. $x + 4x = 45$
$$5x = 45$$
$$\frac{5x}{5} = \frac{45}{5}$$
$$x = 9$$
$$4x = 4(9) = 36$$

$$x = 25$$
$$3x = 3(25) = 75$$
$$x + 55 = 25 + 55 = 80$$

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.
$$x + (x + 2) + (x + 4) = 144$$
$$3x + 6 = 144$$
$$3x + 6 - 6 = 144 - 6$$

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

$$3x = 138$$
$$\frac{3x}{3} = \frac{138}{3}$$
$$x = 46$$
$$x + 2 = 46 + 2 = 48$$
$$x + 4 = 46 + 4 = 50$$
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. $20 - y$; $\frac{20}{-y}$ or $(20 - y) \div 3$

.55

6. $-10 + y; \dfrac{-10 + y}{9}$ 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 $180°$.

8. Let $x =$ the number.
$$2(x-4) = x$$
$$2x - 8 = x - \dfrac{1}{4}$$
$$4(2x - 8) + 4 \cdot x$$
$$8x - 32 = 4x$$
$$5x - 5x - 5 = 6x - 5x$$

Exercise Set 2.4

2. Let $x =$ the number.
$$3x - 1 = 2x$$
$$3x - 1 - 3x = 2x - 3x$$
$$3x - 1 - 3x = 2x - 3x$$
$$-1 = -x$$
$$\dfrac{-1}{-1} = \dfrac{-x}{-1}$$
$$1 = x$$
The number is 1.

4. Let $x =$ the number.
$$4x + (-2) = 5x + (-2)$$
$$4x - 2 = 5x - 2$$
$$4x - 2 + 2 = 5x - 2 + 2$$
$$4x = 5x$$
$$4x - 4x = 5x$$
$$-4x \ 0 = x$$
The number is 0.

6. Let $x =$ the number. $5[x + (-1)] = 6(x - 5)$
$$5x + 5(-1) = 6x + 6(-5)$$
$$5x - 5 = 6x - 30$$

$$8x - 4x - 32 = 4x - 4x$$
$$-1$$
$$4x - 32 = -1$$
$$4x - 32 + 32 = -1 +$$
$$32$$
$$4x = 31$$
$$\frac{4x}{4} = \frac{31}{4}$$

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

$$-30$$
$$-5 = x - 30$$
$$-5 + 30 = x - 30 + 30$$
$$25 = x$$

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

x

$+$

3
x

$+$

2

$+$

7
x

$=$

4
6

The number is 25.

.

.

$$11x + 2 = 46$$

$$11x + 2 - 2 = 46 - 2$$
$$11x = 44$$

$$\frac{11x}{11} = \frac{44}{11}$$
$$x = 4$$
$$3x = 3(4) = 12$$
$$2 + 7x = 2 + 7(4) = 2 + 28 = 30$$
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.
$$x + 3x + 3x = 21$$
$$7x = 21$$

$$\frac{7x}{7} = \frac{21}{7}$$
$$x = 3$$
$$3x = 3(3) = 9$$
The shorter piece is 3 feet and the longer pieces are each 9 feet.

$$x + 22{,}857 + x =$$

14 $39{,}547 \; 2x + 22{,}857$
$$= 39{,}547$$
$$2x + 22{,}857 - 22{,}857 = 39{,}547 - 22{,}857$$
$$2x = 16{,}690$$
$$\frac{2x}{2} = \frac{16{,}690}{2}$$
$$x = 8345$$
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 $360°$.

$$2x + 2(2x - 15) = 360$$
$$2x + 4x - 30 = 360$$
$$6x - 30 = 360$$
$$6x - 30 + 30 = 360 + 30$$
$$6x = 390$$

$$\frac{6}{6} \quad \frac{6}{6}$$
$$x = 65$$
$$2x - 15 = 2(65) - 15 = 130 - 15 = 115$$

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

$$x + x + 2 =$$
$$654 \quad 2x + 2$$
$$= 654$$
$$2x + 2 - 2 = 654 - 2$$
$$2x = 652$$
$$\frac{2x}{2} = \frac{652}{2}$$
$$x = 326$$

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.

28. Let x = code for Mali

Republic, $x + 2$ = code
for Cote d'Ivoire, and
$x + 4$ = code for Niger.
$$x+x+2+x+4=675$$
$$3x+6=675$$
$$3x + 6 - 6 = 675 - 6$$
$$3x=669$$
$$\frac{3x}{}=\frac{669}{}$$

$$x=223$$
$x + 2 = 223 + 2 = 225$
$x + 4 = 223 + 4 = 227$
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.
$$x+3x=$$
$$88$$
$$4x=$$
$$88$$
$$\frac{4x}{4}=\frac{88}{4}$$

$x + 2 = 326 + 2 = 328$
The room numbers are 326 and 328.

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

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.
$$9 = 2x-10$$
$$9 + 10 = 2x -10 + 10$$
$$19=2x$$
$$\frac{19}{2}=\frac{2x}{2}$$
$$19$$

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

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

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.

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

$$4x + 12 = 360$$
$$4x + 12 - 12 = 360$$
$$4x \overset{-12}{=} 348$$
$$\frac{4x}{4} = \frac{348}{4}$$
$$x = 87$$

$x + 2 = 87 + 2$
$= 89$
$x + 4 = 87 + 4$
$= 91$
$x + 6 = 87 + 6$
$= 93$

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.

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

$3x + 6 = 51$

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

$3x = 45$

$x + 2x - 3 =$

$90\ 3x - 3$

$= 90$

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

$3x = 93$

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

$x = 31$

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

The angles are 31° and 59°.

46. $\dfrac{1}{5} + 2x = 3x - \dfrac{4}{5}$

$\dfrac{1}{5} + 2x - 2x = 3x - \dfrac{4}{5} - 2x$

$\dfrac{1}{5} = x - \dfrac{4}{5}$

$\dfrac{1}{5} + \dfrac{4}{5} = x - \dfrac{4}{5} + \dfrac{4}{5}$

$\dfrac{5}{5} = x$

$1 = x$

The number is 1.

48. Let x = the number.

$\dfrac{x}{2} + 3x = 2x - \dfrac{1}{2}$

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

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

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

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

$$3 + 4x = -2$$

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

$$4x = -5$$

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

$$x = 15$$

$x + 2 = 15 + 2 = 17$
$x + 4 = 15 + 4 = 19$
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.

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

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.

$$\frac{7}{8} \cdot x = \frac{1}{2}$$

$$\frac{8}{7} \cdot \frac{7}{8} \cdot x = \frac{8}{7} \cdot \frac{1}{2}$$

$$x = \frac{4}{7}$$

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

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°.

1 blink

72. One blink every 5 seconds is $\frac{5}{12} \cdot \frac{}{12} \quad \frac{5}{sec}$

$$12x = 48$$

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

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

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

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.

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

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

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 $r = 5$.
$$d = r \cdot t$$
$$580 = 5t$$
$$\frac{580}{5} = \frac{5t}{5}$$
$$116 = t$$

5.

$$=$$

$$P$$

$$r$$

It takes 116 seconds or 1 minute 56 seconds.

2. Let $l = 40$ and $P = 98$.
$$P = 2l + 2w \quad 98 = 2 \cdot 40 + 2w$$

$$98 = 80 + 2w$$
$$98 - 80 = 80 + 2w$$
$$\quad\quad -80$$
$$18 = 2w$$

$$\frac{18}{2} = \frac{2w}{2}$$
$$9 = w$$

The dog run is 9 feet wide.

3. Let $C = 8$.
$$F = \frac{9}{5}C + 32$$
$$F = \frac{9}{5} \cdot 8 + 32$$
$$F = \frac{72}{5} + \frac{160}{5}$$
$$F = \frac{232}{5} = 46.4$$

The equivalent temperature is 46.4°F.

$$\frac{t\,I}{Prt} =$$

$$\frac{Prt}{Pt} = \frac{I}{Pt}$$

$$\frac{I}{Pt} = r \text{ or } r = \frac{I}{Pt}$$

6. $H = 5as + 10a$
$$H - 10a = 5as + 10a - 10a$$
$$H - 10a =$$
$$5as \quad \frac{H - 10a}{5a} = \frac{5as}{5a}$$

$$\frac{H - 10a}{5a} = s \text{ or } s = \frac{H - 10a}{5a}$$

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

$$N - F = F + d(n - 1)$$
$$-F \quad N - F = d(n - 1)$$

$$\frac{N - F}{n - 1} = \frac{d(n - 1)}{n - 1}$$

$$\frac{N - F}{n - 1} = d \text{ or } d = \frac{N - F}{n - 1}$$

8. $A = \frac{1}{2}a(b + B)$
$$2 \cdot A = 2 \cdot \frac{1}{2}a(b + B)$$
$$2A = a(b + B)$$
$$2A = ab + aB$$
$$2A - ab = ab + aB$$
$$\quad\quad - ab$$
$$2A - ab = aB$$
$$\frac{2A - ab}{a} = \frac{aB}{a}$$

$$\frac{2A - ab}{a} \overset{=}{} \frac{a}{ab} \qquad 2A -$$

$$\frac{}{-a-} = B \text{ or } B = \frac{}{-a-}$$

4. Let w = width of sign, then $5w + 3$ = length of sign.

$$P = 2l + 2w$$
$$66 = 2(5w + 3) + 2w$$
$$66 = 10w + 6 + 2w$$
$$66 = 12w + 6$$
$$66 - 6 = 12w + 6 - 6$$
$$60 = 12w$$
$$\frac{60}{12} = \frac{12w}{12}$$
$$5 = w$$
$$5w + 3 = 5(5) + 3 = 28$$

The sign has length 28 inches and width 5 inches.

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.

60 .

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 $h = 5$.

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

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

$$3(45) = 3 \left[\frac{1}{3} (5 A) \right]$$
$$135 = 5A$$

$$\frac{135}{5} = \frac{5A}{5}$$
$$27 = A$$

14. Let $r = 3$ and $\pi \approx 3.14$.
$$V = \frac{4}{3} \pi r^3$$

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

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

$$V \approx 113.0$$
$$(V \approx 113.1 \text{ using a calculator.})$$

16. $A = \pi ab$
$$\frac{A}{\pi ab} = \frac{\pi a}{\pi a}$$
$$\frac{A}{\pi a} = b$$

18. $T =$
$$\frac{mnr}{mnr} \, T$$

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

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.

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

$$D = \frac{1}{fk}$$

4

$A = \pi r^2$

$A \approx$

$3.14(4.5)^2$

$A \approx$

$3.14(20.25)$

$A \approx 63.6$

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

$I = PRT$

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

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

.

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

$4D = 4\left(\dfrac{|\;|\;\;1}{4}fk\right)|\;|$

$4D = fk$

$4D \quad fk$

$\dfrac{\overline{f} = \overline{f}}{}$

$\dfrac{4D}{k_f} =$

26

$PR = x + y + z + w$

$0.33 \quad 0.33$

$3,200,000 = P + w)$

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

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

.61

28. $S = 4lw + 2wh$

$S - 4lw = 4lw - 4lw +$

$2wh \; S - 4lw = 2wh$

$\dfrac{S - 4lw}{} = \dfrac{2wh}{}$

$2w$

$\quad\quad 2$

$w \; \dfrac{S - 4lw}{} = h$

$= h$

$\dfrac{}{w}$

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

$\quad A = lw$

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

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

$131 = w$

The width of the sign is 131 feet.

32. a. $A = \dfrac{1}{2} bh$ $P = l_1 + l_2 + l_3$

$\quad\quad\quad\quad\quad\quad\quad P =$

$A = \dfrac{1}{} \cdot 36 \cdot$ $27 + 36 +$

$\quad\quad\quad\quad\quad 45$

$\quad 27$ $P = 108$

$\quad\quad 2$

$A = 486$

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. $A = bh$

$A =$

$9.3(7)$

$A =$

$\quad 65$

$\quad .1$

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

$P = 2l + 2w$

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

$400 = 4w - 20 + 2w$

$400 = 6w - 20$

$400 + 20 = 6w - 20$

$\quad\quad\quad\quad + 20$

$420 = 6w$

$\dfrac{420}{\;} \; \dfrac{6w}{\;}$

$\dfrac{}{6} = \dfrac{}{6}$

$70 = w$

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

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.

$x + x + x - 2 = 22$

$3x - 2 = 22$

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

$3x = 24$

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

$x = 8$

$x - 2 = 8 -$

The $2 = 6$ is 6 feet.

shortest side

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

$d = rt$

$700 = 55t$

$P = 2l_1 + 2l_2$

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

$P = 23.4 + 18.6$

$P = 42$

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

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

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

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.

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.

.

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 $b = 5$.

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

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

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

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

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 $r = 45$.
$$d = rt$$

$$150 = 45t$$
$$\frac{150}{45} = \frac{45t}{45}$$
The height is 8 feet.

54. Let $r = 4000$.

Use $\pi \approx 3.14$.

$C = 2\pi r \approx$

$2(3.14)(4000$

$) \; C \approx 25{,}120$

$$\frac{1}{50} = \frac{4}{5}$$

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

$$t =$$

-

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

The trip will take $10 =$
20 minutes. $\quad 3$

—

$3\frac{1}{3}$ hours   ~~or 3~~
hours

The length of rope is 25,120 miles.   He should arrive at 7:20 A.M.

.63