

Chapter 3

Prerequisite Skills (p. 130)

- In the expression $3x + 7 + 7x$, $3x$ and $7x$ are like terms.
- The reciprocal of $\frac{5}{8}$ is $\frac{8}{5}$.
- $5x - (6 - x) = 5x - 6 + x = 6x - 6$
- $3(x - 9) - 16 = 3x - 27 - 16 = 3x - 43$
- $23 + 4(x + 2) = 23 + 4x + 8 = 4x + 31$
- $x(7 + x) + 9x^2 = 7x + x^2 + 9x^2 = 10x^2 + 7x$
- $54\% = 0.54$
- $99\% = 0.99$
- $12.5\% = 0.125$
- $150\% = 1.5$
- $P = 2\ell + 2w = 2(16) + 2(7) = 32 + 14 = 46$
The perimeter is 46 feet.
- $P = 2\ell + 2w = 2(20) + 2(14) = 40 + 28 = 68$
The perimeter is 68 centimeters.
- $P = 2\ell + 2w = 2(11) + 2(4) = 22 + 8 = 30$
The perimeter is 30 inches.

Lesson 3.1

Investigating Algebra Activity 3.1 (pp. 132–133)

- $x + 2 = 6$
- $7 = x + 6$
- $x + 3 = 9$
 $x = 6$
- $x + 2 = 7$
 $x = 5$
- $x + 8 = 8$
 $x = 0$
- $x + 3 = 7$
 $x = 4$
- $x + 2 = 12$
 $x = 10$
- $x + 7 = 12$
 $x = 15$
- $15 = x + 5$
 $10 = x$
- $13 = x + 10$
 $3 = x$
- $4x = 4$
- $7 = 3x$
- $2x = 10$
 $x = 5$
- $3x = 12$
 $x = 4$
- $3x = 18$
 $x = 6$
- $4x = 16$
 $x = 4$
- $6 = 2x$
 $3 = x$
- $12 = 4x$
 $3 = x$
- $20 = 5x$
 $4 = x$
- $21 = 7x$
 $3 = x$
- $x + 2 = 5$
 $x + 2 - 2 = 5 - 2$
 $x = 3$
Original equation
Subtract 2 from each side.
Simplify. Solution is 3.
- $2x = 12$
 $\frac{2x}{2} = \frac{12}{2}$
 $x = 6$
To solve $12x = 180$, divide each side by 12.
 $12x = 180$
 $\frac{12x}{12} = \frac{180}{12}$
 $x = 15$

3.1 Guided Practice (pp. 135–137)

- $y + 7 = 10$
 $y + 7 - 7 = 10 - 7$
 $y = 3$
Check:
 $3 + 7 \stackrel{?}{=} 10$
 $10 = 10$
- $x - 5 = 3$
 $x - 5 + 5 = 3 + 5$
 $x = 8$
Check:
 $8 - 5 \stackrel{?}{=} 3$
 $3 = 3$
- $q - 11 = -5$
 $q - 11 + 11 = -5 + 11$
 $q = 6$
Check:
 $6 - 11 \stackrel{?}{=} -5$
 $-5 = -5$
- $6 = t - 2$
 $6 + 2 = t - 2 + 2$
 $8 = t$
Check:
 $6 \stackrel{?}{=} 8 - 2$
 $6 = 6$
- $4x = 48$
 $\frac{4x}{4} = \frac{48}{4}$
 $x = 12$
Check:
 $4(12) \stackrel{?}{=} 48$
 $48 = 48$
- $-65 = -5y$
 $\frac{-65}{-5} = \frac{-5y}{-5}$
 $13 = y$
Check:
 $-65 \stackrel{?}{=} -5(13)$
 $-65 = -65$
- $6w = -54$
 $\frac{6w}{6} = \frac{-54}{6}$
 $w = -9$
Check:
 $6(-9) \stackrel{?}{=} -54$
 $-54 = -54$
- $24 = -8n$
 $\frac{24}{-8} = \frac{-8n}{-8}$
 $-3 = n$
Check:
 $24 \stackrel{?}{=} -8(-3)$
 $24 = 24$
- $\frac{t}{-3} = 9$
 $-3 \cdot \frac{t}{-3} = -3 \cdot 9$
 $t = -27$
Check:
 $\frac{-27}{-3} \stackrel{?}{=} 9$
 $9 = 9$
- $6 = \frac{c}{7}$
 $7(6) = 7\left(\frac{c}{7}\right)$
 $42 = c$
Check:
 $6 \stackrel{?}{=} \frac{42}{7}$
 $6 = 6$
- $13 = \frac{z}{-2}$
 $-2(13) = -2\left(\frac{z}{-2}\right)$
 $-26 = z$
Check:
 $13 \stackrel{?}{=} \frac{-26}{-2}$
 $13 = 13$
- $\frac{a}{5} = -11$
 $5\left(\frac{a}{5}\right) = 5(-11)$
 $a = -55$
Check:
 $\frac{-55}{5} \stackrel{?}{=} -11$
 $-11 = -11$

Chapter 3, continued

13. $\frac{5}{6}w = 10$

$$\frac{6}{5}\left(\frac{5}{6}w\right) = \frac{6}{5}(10)$$

$$w = 12$$

Check:

$$\frac{5}{6}(12) \stackrel{?}{=} 10$$

$$10 = 10$$

15. $9 = -\frac{3}{4}m$

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

$$-12 = m$$

Check:

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

$$9 = 9$$

17. $d = rt$

$$100 = 10.1t$$

$$\frac{100}{10.1} = \frac{10.1t}{10.1}$$

$$9.9 = t$$

It would take Crawford 9.9 seconds.

3.1 Exercises (pp. 137–140)

Skill Practice

1. Two operations that undo each other are called *inverse operations*.

2. You would use the division property of equality to solve $14x = 35$ because dividing each side by 14 would give you an equivalent equation and the value of x .

3. $x + 5 = 8$

$$x + 5 - 5 = 8 - 5$$

$$x = 3$$

Check:

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

$$8 = 8$$

5. $11 = f + 6$

$$11 - 6 = f + 6 - 6$$

$$5 = f$$

Check:

$$11 \stackrel{?}{=} 5 + 6$$

$$11 = 11$$

7. $6 = 9 + h$

$$6 - 9 = 9 - 9 + h$$

$$-3 = h$$

Check:

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

$$6 = 6$$

14. $\frac{2}{3}p = 14$

$$\frac{3}{2}\left(\frac{2}{3}p\right) = \frac{3}{2}(14)$$

$$p = 21$$

Check:

$$\frac{2}{3}(21) \stackrel{?}{=} 14$$

$$14 = 14$$

16. $-8 = -\frac{4}{5}v$

$$-\frac{5}{4}(-8) = -\frac{5}{4}\left(-\frac{4}{5}v\right)$$

$$10 = v$$

Check:

$$-8 \stackrel{?}{=} -\frac{4}{5}(10)$$

$$-8 = -8$$

9. $y - 4 = 3$

$$y - 4 + 4 = 3 + 4$$

$$y = 7$$

Check:

$$7 - 4 \stackrel{?}{=} 3$$

$$3 = 3$$

11. $14 = k - 3$

$$14 + 3 = k - 3 + 3$$

$$17 = k$$

Check:

$$14 \stackrel{?}{=} 17 - 3$$

$$14 = 14$$

13. $-2 = n - 6$

$$-2 + 6 = n - 6 + 6$$

$$4 = n$$

Check:

$$-2 \stackrel{?}{=} 4 - 6$$

$$-2 = -2$$

15. C; $-8 = d - 13$

$$-8 + 13 = d - 13 + 13$$

$$5 = d$$

16. A; $22 + v = -65$

$$22 + v - 22 = -65 - 22$$

$$v = -87$$

17. $5g = 20$

$$\frac{5g}{5} = \frac{20}{5}$$

$$g = 4$$

Check:

$$5(4) \stackrel{?}{=} 20$$

$$20 = 20$$

19. $48 = 8c$

$$\frac{48}{8} = \frac{8c}{8}$$

$$6 = c$$

Check:

$$48 \stackrel{?}{=} 8(6)$$

$$48 = 48$$

21. $15 = -h$

$$\frac{15}{-1} = \frac{-h}{-1}$$

$$-15 = h$$

Check:

$$15 \stackrel{?}{=} -(-15)$$

$$15 = 15$$

10. $t - 5 = 7$

$$t - 5 + 5 = 7 + 5$$

$$t = 12$$

Check:

$$12 - 5 \stackrel{?}{=} 7$$

$$7 = 7$$

12. $6 = w - 7$

$$6 + 7 = w - 7 + 7$$

$$13 = w$$

Check:

$$6 \stackrel{?}{=} 13 - 7$$

$$6 = 6$$

14. $-11 = b - 9$

$$-11 + 9 = b - 9 + 9$$

$$-2 = b$$

Check:

$$-11 \stackrel{?}{=} -2 - 9$$

$$-11 = -11$$

18. $-4q = 52$

$$\frac{-4q}{-4} = \frac{52}{-4}$$

$$q = -13$$

Check:

$$-4(-13) \stackrel{?}{=} 52$$

$$52 = 52$$

20. $-108 = 9j$

$$\frac{-108}{9} = \frac{9j}{9}$$

$$-12 = j$$

Check:

$$-108 \stackrel{?}{=} 9(-12)$$

$$-108 = -108$$

22. $187 = -17r$

$$\frac{187}{-17} = \frac{-17r}{-17}$$

$$-11 = r$$

Check:

$$187 \stackrel{?}{=} -17(-11)$$

$$187 = 187$$

Chapter 3, continued

23. $\frac{y}{3} = 5$

$$3\left(\frac{y}{3}\right) = 3(5)$$

$$y = 15$$

Check:

$$\frac{15}{3} \stackrel{?}{=} 5$$

$$5 = 5$$

25. $8 = \frac{x}{6}$

$$6(8) = 6\left(\frac{x}{6}\right)$$

$$48 = x$$

Check:

$$8 \stackrel{?}{=} \frac{48}{6}$$

$$8 = 8$$

27. $-11 = \frac{z}{-2}$

$$-2(-11) = -2\left(\frac{z}{-2}\right)$$

$$22 = z$$

Check:

$$-11 \stackrel{?}{=} \frac{22}{-2}$$

$$-11 = -11$$

29. To keep the equation equivalent, 3.8 needed to be subtracted from the left side and right side, not added to the right side.

$$x + 3.8 = 2.3$$

$$x + 3.8 - 3.8 = 2.3 - 3.8$$

$$x = -1.5$$

30. To keep the equation equivalent, each side needed to be multiplied by 3. The error was that the right side was divided by 3.

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

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

$$x = 81$$

31. $b - 0.4 = 3.1$ Check:

$$b - 0.4 + 0.4 = 3.1 + 0.4 \quad 3.5 - 0.4 \stackrel{?}{=} 3.1$$

$$b = 3.5$$

$$3.1 = 3.1$$

32. $-3.2 + z = -7.4$

$$-3.2 + z + 3.2 = -7.4 + 3.2$$

$$z = -4.2$$

Check: $-3.2 + (-4.2) \stackrel{?}{=} -7.4$

$$-7.4 = -7.4$$

24. $\frac{m}{2} = 14$

$$\frac{2m}{2} = 2(14)$$

$$m = 28$$

Check:

$$\frac{28}{2} \stackrel{?}{=} 14$$

$$14 = 14$$

26. $7 = \frac{t}{-7}$

$$-7(7) = -7\left(\frac{t}{-7}\right)$$

$$-49 = t$$

Check:

$$7 \stackrel{?}{=} \frac{-49}{-7}$$

$$7 = 7$$

28. $-3 = \frac{d}{14}$

$$14(-3) = 14\left(\frac{d}{14}\right)$$

$$-42 = d$$

Check:

$$-3 \stackrel{?}{=} \frac{-42}{14}$$

$$-3 = -3$$

33. $-5.7 = w - 4.6$

$$-5.7 + 4.6 = w - 4.6 + 4.6$$

$$-1.1 = w$$

34. $-6.1 = p + 2.2$

$$-6.1 - 2.2 = p + 2.2 - 2.2$$

$$-8.3 = p$$

35. $8.2 = -4g$

$$\frac{8.2}{-4} = \frac{-4g}{-4}$$

$$-2.05 = g$$

Check:

$$8.2 \stackrel{?}{=} -4(-2.05)$$

$$8.2 = 8.2$$

37. $\frac{3}{4} = \frac{1}{8} + v$

$$\frac{3}{4} - \frac{1}{8} = \frac{1}{8} + v - \frac{1}{8}$$

$$\frac{5}{8} = v$$

Check:

$$\frac{3}{4} \stackrel{?}{=} \frac{1}{8} + \frac{5}{8}$$

$$\frac{3}{4} = \frac{3}{4}$$

39. $-0.12 = \frac{y}{-0.5}$

$$-0.5(-0.12) = -0.5\left(\frac{y}{-0.5}\right)$$

$$0.06 = y$$

Check:

$$-0.12 \stackrel{?}{=} \frac{0.06}{-0.5}$$

$$-0.12 = -0.12$$

41. $\frac{1}{3}c = 32$

$$\frac{3}{1}\left(\frac{1}{3}c\right) = \frac{3}{1}(32)$$

$$c = 96$$

Check:

$$\frac{1}{3}(96) \stackrel{?}{=} 32$$

$$32 = 32$$

43. $\frac{3}{2}k = 18$

$$\frac{2}{3}\left(\frac{3}{2}k\right) = \frac{2}{3}(18)$$

$$k = 12$$

Check:

$$\frac{3}{2}(12) \stackrel{?}{=} 18$$

$$18 = 18$$

Check:

$$-5.7 \stackrel{?}{=} -1.1 - 4.6$$

$$-5.7 = -5.7$$

Check:

$$-6.1 \stackrel{?}{=} -8.3 + 2.2$$

$$-6.1 = -6.1$$

36. $-3.3a = 19.8$

$$\frac{-3.3a}{-3.3} = \frac{19.8}{-3.3}$$

$$a = -6$$

Check:

$$-3.3(-6) \stackrel{?}{=} 19.8$$

$$19.8 = 19.8$$

38. $\frac{n}{4.6} = -2.5$

$$4.6\left(\frac{n}{4.6}\right) = 4.6(-2.5)$$

$$n = -11.5$$

Check:

$$\frac{-11.5}{4.6} \stackrel{?}{=} -2.5$$

$$-2.5 = -2.5$$

40. $\frac{1}{2}m = 21$

$$\frac{2}{1}\left(\frac{1}{2}m\right) = \frac{2}{1}(21)$$

$$m = 42$$

Check:

$$\frac{1}{2}(42) \stackrel{?}{=} 21$$

$$21 = 21$$

42. $-7 = \frac{1}{5}x$

$$\frac{5}{1}(-7) = \frac{5}{1}\left(\frac{1}{5}x\right)$$

$$-35 = x$$

Check:

$$-7 \stackrel{?}{=} \frac{1}{5}(-35)$$

$$-7 = -7$$

44. $-21 = -\frac{3}{5}t$

$$-\frac{5}{3}(-21) = -\frac{5}{3}\left(-\frac{3}{5}t\right)$$

$$35 = t$$

Check:

$$-21 \stackrel{?}{=} -\frac{3}{5}(35)$$

$$-21 = -21$$

Chapter 3, continued

$$45. \quad -\frac{2}{7}v = 16$$

$$-\frac{7}{2}\left(-\frac{2}{7}v\right) = -\frac{7}{2}(16)$$

$$v = -56$$

Check:

$$-\frac{2}{7}(-56) \stackrel{?}{=} 16$$

$$16 = 16$$

$$47. \quad \frac{1}{3}y = \frac{1}{5}$$

$$\frac{3}{1}\left(\frac{1}{3}y\right) = \frac{3}{1}\left(\frac{1}{5}\right)$$

$$y = \frac{3}{5}$$

Check:

$$\frac{1}{3}\left(\frac{3}{5}\right) \stackrel{?}{=} \frac{1}{5}$$

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

$$49. \quad A = \ell w$$

$$54 = 12x$$

$$\frac{54}{12} = \frac{12x}{12}$$

$$4.5 = x$$

The width is 4.5 inches.

$$50. \quad A = \frac{1}{2}bh$$

$$72 = \frac{1}{2}(16)x$$

$$72 = 8x$$

$$\frac{72}{8} = \frac{8x}{8}$$

$$9 = x$$

The height is 9 centimeters.

$$51. \quad 4a = 6$$

$$\frac{4a}{4} = \frac{6}{4}$$

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

$$b = a - 2$$

$$b = \frac{3}{2} - 2$$

$$b = -\frac{1}{2}$$

$$52. \quad a - 6.7 = 3.1$$

$$a - 6.7 + 6.7 = 3.1 + 6.7$$

$$a = 9.8$$

$$b = 5a$$

$$b = 5(9.8)$$

$$b = 49$$

$$46. \quad \frac{8}{5}x = \frac{4}{15}$$

$$\frac{5}{8}\left(\frac{8}{5}x\right) = \frac{5}{8}\left(\frac{4}{15}\right)$$

$$x = \frac{1}{6}$$

Check:

$$\frac{8}{5}\left(\frac{1}{6}\right) \stackrel{?}{=} \frac{4}{15}$$

$$\frac{4}{15} = \frac{4}{15}$$

$$48. \quad -\frac{4}{3} = \frac{2}{3}z$$

$$\frac{3}{2}\left(-\frac{4}{3}\right) = \frac{3}{2}\left(\frac{2}{3}z\right)$$

$$-2 = z$$

Check:

$$-\frac{4}{3} \stackrel{?}{=} \frac{2}{3}(-2)$$

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

Problem Solving

$$53. \quad \text{Let } d = \text{maximum depth in 1999}$$

$$d - 9.9 = 1036.7$$

$$d - 9.9 + 9.9 = 1036.7 + 9.9$$

$$d = 1046.6$$

The maximum depth in 1999 was 1046.6 feet.

$$54. \quad \text{Let } t = \text{thickness of pendant}$$

$$20t = 50$$

$$\frac{20t}{20} = \frac{50}{20}$$

$$t = 2.5$$

Each pendant should be 2.5 millimeters thick.

$$55. \quad A = \ell w$$

$$187 = 17w$$

$$\frac{187}{17} = \frac{17w}{17}$$

$$11 = w$$

The width of the trampoline is 11 feet.

$$56. \quad \text{Let } w = \text{weight of occupant}$$

$$55 + w = 300$$

$$55 + w - 55 = 300 - 55$$

$$w = 245$$

The maximum weight of a wheelchair occupant is 245 pounds.

$$57. \quad \text{a. Let } b = \text{all species of birds}$$

$$\frac{4}{7}b = 200$$

b. Solve the equation part (a).

$$\frac{4}{7}b = 200$$

$$\frac{7}{4}\left(\frac{4}{7}b\right) = \frac{7}{4}(200)$$

$$b = 350 \text{ species of birds}$$

Because $600 > 350$, there are more species of plants than birds.

$$58. \quad \text{Answers will vary.}$$

$$15x = 135$$

$$\frac{15x}{15} = \frac{135}{15}$$

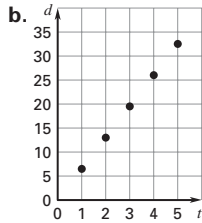
$$x = 9$$

$$59. \quad \text{a. } d = rt$$

$$d = 6.5t$$

t (sec)	1	2	3	4	5
d (ft)	6.5	13	19.5	26	32.5

Chapter 3, continued



It takes the jellyfish 4 seconds to travel 26 feet.

c. $26 = 6.5t$

$$\frac{26}{6.5} = \frac{6.5t}{6.5}$$

$$4 = t$$

60. a. Let a = area of 1 tatami mat

$$81 = 4.5a$$

$$\frac{81}{4.5} = \frac{4.5a}{4.5}$$

$$18 = a$$

The area of one tatami mat is 18 square feet.

b. $A = \ell w$

$$18 = \ell(3)$$

$$\frac{18}{3} = \frac{\ell(3)}{3}$$

$$6 = \ell$$

The length is 6 feet.

61. a. Let h = number of hits

$$\frac{h}{524} = 0.326$$

$$524\left(\frac{h}{524}\right) = 524(0.326)$$

$$h = 170.82$$

Mueller had about 171 hits.

b. Let w = number of hits Wells had

$$w - 44 = 171$$

$$w - 44 + 44 = 171 + 44$$

$$w = 215$$

Vernon Wells had 215 hits.

c. No, if Wells had the same at bats as Mueller, he would have had a batting average of $\frac{215}{524} \approx 0.410$. For Mueller to have a higher batting average, Wells had to have more at bats, not fewer, than Mueller.

62. $\ell = 1.9w$

$$\frac{\ell}{1.9} = \frac{1.9w}{1.9}$$

$$\frac{\ell}{1.9} = w$$

$$A = \ell w = \ell\left(\frac{\ell}{1.9}\right) = 9.5\left(\frac{9.5}{1.9}\right) = 47.5$$

The area of the flag is 47.5 square feet.

63. Let c = cost per pound

$$(2.1 - 0.3)c = 4.68$$

$$1.8c = 4.68$$

$$\frac{1.8c}{1.8} = \frac{4.68}{1.8}$$

$$c = 2.6$$

The strawberries cost \$2.60 per pound.

Mixed Review

64. $k + 4$

65. $8x$

66. $\frac{40}{y}$

67. $2w - 10$

68. $y = x + 9$

69. $y = 3x$

x	-1	0	1	2
y	8	9	10	11

Range: 8, 9, 10, 11

x	-4	-2	0	2
y	-12	-6	0	6

Range: -12, -6, 0, 6

70. $-9x + 15x = (-9 + 15)x = 6x$

71. $5x - 4x = (5 - 4)x = x$ 72. $12 + 3x - 3x = 12$

73. $5x + 8 - x - 2 = 5x - x + 8 - 2$
 $= (5 - 1)x + (8 - 2)$
 $= 4x + 6$

74. $7.1x - 2.6x = (7.1 - 2.6)x = 4.5x$

75. $-0.7x + 11.3x = (-0.7 + 11.3)x = 10.6x$

Lesson 3.2

3.2 Guided Practice (pp. 141-143)

1. $5x + 9 = 24$

Check:

$$5x + 9 - 9 = 24 - 9$$

$$5(3) + 9 \stackrel{?}{=} 24$$

$$5x = 15$$

$$15 + 9 \stackrel{?}{=} 24$$

$$\frac{5x}{5} = \frac{15}{5}$$

$$24 = 24$$

$$x = 3$$

2. $4y - 4 = 16$

Check:

$$4y - 4 + 4 = 16 + 4$$

$$4(5) - 4 \stackrel{?}{=} 16$$

$$4y = 20$$

$$20 - 4 \stackrel{?}{=} 16$$

$$y = 5$$

$$16 = 16$$

3. $-1 = \frac{z}{3} - 7$

Check:

$$-1 + 7 = \frac{z}{3} - 7 + 7$$

$$-1 \stackrel{?}{=} \frac{18}{3} - 7$$

$$6 = \frac{z}{3}$$

$$-1 \stackrel{?}{=} 6 - 7$$

$$6(3) = \frac{z}{3}(3)$$

$$-1 = -1$$

$$18 = z$$

Chapter 3, continued

4. $4w + 2w = 24$

$$6w = 24$$

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

$$w = 4$$

5. $8t - 3t = 35$

$$5t = 35$$

$$\frac{5t}{5} = \frac{35}{5}$$

$$t = 7$$

6. $-16 = 5d - 9d$

$$-16 = -4d$$

$$4 = d$$

7. $y = -2x + 5$

$$11 = -2x + 5$$

$$11 - 5 = -2x - 5 + 5$$

$$6 = -2x$$

$$\frac{6}{-2} = \frac{-2x}{-2}$$

$$-3 = x$$

9. $P = 2117 + 64d$

$$5317 = 2117 + 64d$$

$$5317 - 2117 = 2117 + 64d - 2117$$

$$3200 = 64d$$

$$\frac{3200}{64} = \frac{64d}{64}$$

$$50 = d$$

The diver's depth is 50 feet.

10. Let h = hours worked

$$53 = 8h + 13$$

$$53 - 13 = 8h + 13 - 13$$

$$40 = 8h$$

$$\frac{40}{8} = \frac{8h}{8}$$

$$5 = h$$

Kim worked 5 hours.

3.2 Exercises (pp. 144–146)

Skill Practice

1. To solve the equation $2x + 3 = 20$, you would begin by combining $2x$ and $3x$ because they are *like terms*.

2. Subtract 7 from each side of the equation to get $4x = 8$. Divide each side of the equation by 4 to get $x = 2$.

3. $3x + 7 = 19$

$$3x + 7 - 7 = 19 - 7$$

$$3x = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

4. $5h + 4 = 19$

$$5h + 4 - 4 = 19 - 4$$

$$5h = 15$$

$$\frac{5h}{5} = \frac{15}{5}$$

$$h = 3$$

Check:

$$4(4) + 2(4) \stackrel{?}{=} 24$$

$$16 + 8 \stackrel{?}{=} 24$$

$$24 = 24$$

Check:

$$8(7) - 3(7) \stackrel{?}{=} 35$$

$$56 - 21 \stackrel{?}{=} 35$$

$$35 = 35$$

Check:

$$-16 \stackrel{?}{=} 5(4) - 9(4)$$

$$-16 \stackrel{?}{=} 20 - 36$$

$$-16 = -16$$

8. $y = 4x - 4$

$$3 = 4x - 4$$

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

$$7 = 4x$$

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

$$1.75 = x$$

Check:

$$3(4) + 7 \stackrel{?}{=} 19$$

$$12 + 7 \stackrel{?}{=} 19$$

$$19 = 19$$

5. $7d - 1 = 13$

$$7d - 1 + 1 = 13 + 1$$

$$7d = 14$$

$$\frac{7d}{7} = \frac{14}{7}$$

$$d = 2$$

Check:

$$7(2) - 1 \stackrel{?}{=} 13$$

$$14 - 1 \stackrel{?}{=} 13$$

$$13 = 13$$

7. $10 = 7 - m$

$$10 - 7 = 7 - m - 7$$

$$3 = -m$$

$$\frac{3}{-1} = \frac{-m}{-1}$$

$$-3 = m$$

Check:

$$10 \stackrel{?}{=} 7 - (-3)$$

$$10 = 10$$

9. $\frac{a}{3} + 4 = 6$

$$\frac{a}{3} + 4 - 4 = 6 - 4$$

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

$$3\left(\frac{a}{3}\right) = 3(2)$$

$$a = 6$$

Check:

$$\frac{6}{3} + 4 \stackrel{?}{=} 6$$

$$2 + 4 \stackrel{?}{=} 6$$

$$6 = 6$$

11. $\frac{b}{2} - 9 = 11$

$$\frac{b}{2} - 9 + 9 = 11 + 9$$

$$\frac{b}{2} = 20$$

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

$$b = 40$$

Check:

$$\frac{40}{2} - 9 \stackrel{?}{=} 11$$

$$20 - 9 \stackrel{?}{=} 11$$

$$11 = 11$$

Check:

$$5(3) + 4 \stackrel{?}{=} 19$$

$$15 + 4 \stackrel{?}{=} 19$$

$$19 = 19$$

6. $2g - 13 = 3$

$$2g - 13 + 13 = 3 + 13$$

$$2g = 16$$

$$\frac{2g}{2} = \frac{16}{2}$$

$$g = 8$$

Check:

$$2(8) - 13 \stackrel{?}{=} 3$$

$$16 - 13 \stackrel{?}{=} 3$$

$$3 = 3$$

8. $11 = 12 - q$

$$11 - 12 = 12 - q - 12$$

$$-1 = -q$$

$$\frac{-1}{-1} = \frac{-q}{-1}$$

$$1 = q$$

Check:

$$11 \stackrel{?}{=} 12 - 1$$

$$11 = 11$$

10. $17 = \frac{w}{5} + 13$

$$17 - 13 = \frac{w}{5} + 13 - 13$$

$$4 = \frac{w}{5}$$

$$5(4) = 5\left(\frac{w}{5}\right)$$

$$20 = w$$

Check:

$$17 \stackrel{?}{=} \frac{20}{5} + 13$$

$$17 \stackrel{?}{=} 4 + 13$$

$$17 = 17$$

12. $-6 = \frac{z}{4} - 3$

$$-6 + 3 = \frac{z}{4} - 3 + 3$$

$$-3 = \frac{z}{4}$$

$$4(-3) = 4\left(\frac{z}{4}\right)$$

$$-12 = z$$

Check:

$$-6 \stackrel{?}{=} \frac{-12}{4} - 3$$

$$-6 \stackrel{?}{=} -3 - 3$$

$$-6 = -6$$

Chapter 3, continued

13. $7 = \frac{5}{6}c - 8$

$$7 + 8 = \frac{5}{6}c - 8 + 8$$

$$15 = \frac{5}{6}c$$

$$\frac{6}{5}(15) = \frac{6}{5}\left(\frac{5}{6}c\right)$$

$$18 = c$$

Check:

$$7 \stackrel{?}{=} \frac{5}{6}(18) - 8$$

$$7 \stackrel{?}{=} 15 - 8$$

$$7 = 7$$

15. $8y + 3y = 44$

$$11y = 44$$

$$\frac{11y}{11} = \frac{44}{11}$$

$$y = 4$$

Check:

$$8(4) + 3(4) \stackrel{?}{=} 44$$

$$32 + 12 \stackrel{?}{=} 44$$

$$44 = 44$$

17. $11x - 9x = 18$

$$2x = 18$$

$$\frac{2x}{2} = \frac{18}{2}$$

$$x = 9$$

Check:

$$11(9) - 9(9) \stackrel{?}{=} 18$$

$$99 - 81 \stackrel{?}{=} 18$$

$$18 = 18$$

19. $-32 = -5k + 13k$

$$-32 = 8k$$

$$\frac{-32}{8} = \frac{8k}{8}$$

$$-4 = k$$

Check:

$$-32 \stackrel{?}{=} -5(-4) + 13(-4)$$

$$-32 \stackrel{?}{=} 20 - 52$$

$$-32 = -32$$

21. D; subtract 6 from each side to isolate the variable.

22. The error is that $3x$ and 7 cannot be combined because they are not like terms. 7 should be subtracted from each side giving you $-3x = 5$. Then divide each side by -3 giving you $x = -\frac{5}{3}$.

23. The first step should be combining $-2x$ and x because they are like terms, not dividing by -2 . Combining like terms gives you $-x = 10$. Then divide each side by -1 to get $x = -10$.

14. $10 = \frac{2}{7}n + 4$

$$10 - 4 = \frac{2}{7}n + 4 - 4$$

$$6 = \frac{2}{7}n$$

$$\frac{7}{2}(6) = \frac{7}{2}\left(\frac{2}{7}n\right)$$

$$21 = n$$

Check:

$$10 \stackrel{?}{=} \frac{2}{7}(21) + 4$$

$$10 \stackrel{?}{=} 6 + 4$$

$$10 = 10$$

16. $2p + 7p = 54$

$$9p = 54$$

$$\frac{9p}{9} = \frac{54}{9}$$

$$p = 6$$

Check:

$$2(6) + 7(6) \stackrel{?}{=} 54$$

$$12 + 42 \stackrel{?}{=} 54$$

$$54 = 54$$

18. $36 = 9x - 3x$

$$36 = 6x$$

$$\frac{36}{6} = \frac{6x}{6}$$

$$6 = x$$

Check:

$$36 \stackrel{?}{=} 9(6) - 3(6)$$

$$36 \stackrel{?}{=} 54 - 18$$

$$36 = 36$$

20. $6 = -7f + 4f$

$$6 = -3f$$

$$\frac{6}{-3} = \frac{-3f}{-3}$$

$$-2 = f$$

Check:

$$6 \stackrel{?}{=} -7(-2) + 4(-2)$$

$$6 \stackrel{?}{=} 14 + (-8)$$

$$6 \stackrel{?}{=} 14 - 8$$

$$6 = 6$$

24. $y = 3x + 7$

$$-8 = 3x + 7$$

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

$$-15 = 3x$$

$$\frac{-15}{3} = \frac{3x}{3}$$

$$-5 = x$$

26. $y = 10x - 9$

$$11 = 10x - 9$$

$$11 + 9 = 10x - 9 + 9$$

$$20 = 10x$$

$$\frac{20}{10} = \frac{10x}{10}$$

$$2 = x$$

27. $5.6 = 1.1p + 1.2$

$$5.6 - 1.2 = 1.1p + 1.2 - 1.2$$

$$4.4 = 1.1p$$

$$\frac{4.4}{1.1} = \frac{1.1p}{1.1}$$

$$4 = p$$

28. $7.2y + 4.7 = 62.3$

$$7.2y + 4.7 - 4.7 = 62.3 - 4.7$$

$$7.2y = 57.6$$

$$\frac{7.2y}{7.2} = \frac{57.6}{7.2}$$

$$y = 8$$

29. $1.2j - 4.3 = 1.7$

$$1.2j - 4.3 + 4.3 = 1.7 + 4.3$$

$$1.2j = 6$$

$$\frac{1.2j}{1.2} = \frac{6}{1.2}$$

$$j = 5$$

30. $16 - 2.4d = -8$

$$16 - 2.4d - 16 = -8 - 16$$

$$-2.4d = -24$$

$$\frac{-2.4d}{-2.4} = \frac{-24}{-2.4}$$

$$d = 10$$

31. $14.4m - 5.1 = 2.1$

$$14.4m - 5.1 + 5.1 = 2.1 + 5.1$$

$$14.4m = 7.2$$

$$\frac{14.4m}{14.4} = \frac{7.2}{14.4}$$

$$m = 0.5$$

32. $-5.3 = 2.2y - 8.6$

$$-5.3 + 8.6 = 2.2y - 8.6 + 8.6$$

$$3.3 = 2.2y$$

$$\frac{3.3}{2.2} = \frac{2.2y}{2.2}$$

$$1.5 = y$$

25. $y = 2x + 4$

$$-10 = 2x + 4$$

$$-10 - 4 = 2x + 4 - 4$$

$$-14 = 2x$$

$$\frac{-14}{2} = \frac{2x}{2}$$

$$-7 = x$$

Check:

$$5.6 \stackrel{?}{=} 1.1(4) + 1.2$$

$$5.6 \stackrel{?}{=} 4.4 + 1.2$$

$$5.6 = 5.6$$

Check:

$$7.2(8) + 4.7 \stackrel{?}{=} 62.3$$

$$57.6 + 4.7 \stackrel{?}{=} 62.3$$

$$62.3 = 62.3$$

Check:

$$1.2(5) - 4.3 \stackrel{?}{=} 1.7$$

$$6 - 4.3 \stackrel{?}{=} 1.7$$

$$1.7 = 1.7$$

Check:

$$16 - 2.4(10) \stackrel{?}{=} -8$$

$$16 - 24 \stackrel{?}{=} -8$$

$$-8 = -8$$

Check:

$$14.4(0.5) - 5.1 \stackrel{?}{=} 2.1$$

$$7.2 - 5.1 \stackrel{?}{=} 2.1$$

$$2.1 = 2.1$$

Check:

$$-5.3 \stackrel{?}{=} 2.2(1.5) - 8.6$$

$$-5.3 \stackrel{?}{=} 3.3 - 8.6$$

$$-5.3 = -5.3$$

Chapter 3, continued

33. $\frac{c}{5.3} + 8.3 = 11.3$ Check:
 $\frac{c}{5.3} + 8.3 - 8.3 = 11.3 - 8.3$ $\frac{15.9}{5.3} + 8.3 \stackrel{?}{=} 11.3$
 $\frac{c}{5.3} = 3$ $3 + 8.3 \stackrel{?}{=} 11.3$
 $5.3\left(\frac{c}{5.3}\right) = 5.3(3)$ $11.3 = 11.3$
 $c = 15.9$

34. $3.2 + \frac{x}{2.5} = 4.6$ Check:
 $3.2 + \frac{x}{2.5} - 3.2 = 4.6 - 3.2$ $3.2 + \frac{3.5}{2.5} \stackrel{?}{=} 4.6$
 $\frac{x}{2.5} = 1.4$ $3.2 + 1.4 \stackrel{?}{=} 4.6$
 $2.5\left(\frac{x}{2.5}\right) = 2.5(1.4)$ $4.6 = 4.6$
 $x = 3.5$

35. $-1.2 = \frac{z}{4.6} - 2.7$ Check:
 $-1.2 + 2.7 = \frac{z}{4.6} - 2.7 + 2.7$ $-1.2 \stackrel{?}{=} \frac{6.9}{4.6} - 2.7$
 $1.5 = \frac{z}{4.6}$ $-1.2 \stackrel{?}{=} 1.5 - 2.7$
 $4.6(1.5) = 4.6\left(\frac{z}{4.6}\right)$ $-1.2 = -1.2$
 $6.9 = z$

36. $3x + 2 = 5$ $3x + 2 = 8$
 $3x + 2 - 2 = 5 - 2$ $3x + 2 - 2 = 8 - 2$
 $3x = 3$ $3x = 6$
 $\frac{3x}{3} = \frac{3}{3}$ $\frac{3x}{3} = \frac{6}{3}$
 $x = 1$ $x = 2$
 $3x + 2 = 11$
 $3x + 2 - 2 = 11 - 2$
 $3x = 9$
 $\frac{3x}{3} = \frac{9}{3}$
 $x = 3$

The solution to the equation $3x + 2 = 14$ is $x = 4$. As the right side of the equation increases by 3 and x is multiplied by 3, each solution increases by 1.

Problem Solving

37. Let n = number of classes
 $24n + 15 = 687$
 $24n + 15 - 15 = 687 - 15$
 $24n = 672$
 $\frac{24n}{24} = \frac{672}{24}$
 $n = 28$

The student took 28 classes.

38. Let h = hours of labor
 $32h + 76 = 124$
 $32h + 76 - 76 = 124 - 76$
 $32h = 48$
 $\frac{32h}{32} = \frac{48}{32}$
 $h = 1.5$

It took 1.5 hours to repair the car.

39. Let x = number of half-side advertisements
 $2000 + 800x = 6000$
 $2000 + 800x - 2000 = 6000 - 2000$
 $800x = 4000$
 $\frac{800x}{800} = \frac{4000}{800}$
 $x = 5$

The museum can have 5 half-side advertisements.

40. B; $99 = 7x + 4x$

41. First, figure out how much you would pay per month for a guitar that costs \$542 by letting x equal the monthly payment and solving the equation.

$$542 = 6x + 50$$

$$542 - 50 = 6x + 50 - 50$$

$$492 = 6x$$

$$\frac{492}{6} = \frac{6x}{6}$$

$$82 = x$$

Because a guitar that costs \$542 would have a monthly payment of \$82 and you can afford to pay up to \$90 per month, you can afford the guitar.

42. a. $y = 1600x + 2,896,112$

b. $4,756,505 = 1600x + 2,896,112$

$$4,756,505 - 2,896,112 = 1600x + 2,896,112$$

$$- 2,896,112$$

$$1,860,393 = 1600x$$

$$\frac{1,860,393}{1600} = \frac{1600x}{1600}$$

$$1162.75 = x$$

After 1163 days the landfill will reach capacity.

c. $1600(1200) + 2,900,000 \stackrel{?}{=} 4,756,505$

$$1,920,000 + 2,900,000 \stackrel{?}{=} 4,756,505$$

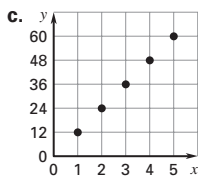
$$4,820,000 \approx 4,756,505$$

Chapter 3, continued

43. a. $y = 5x + 7x$

b.

Hours	1	2	3	4	5
Marissa's upgrades	5	10	15	20	25
Ryan's upgrades	7	14	21	28	35
Total upgrades	12	24	36	48	60



It would take about 4.5 hours to upgrade all of the computers.

44. The restaurant serves a total of $400 + 120 = 520$ customers per day. To find after how many days x the restaurant will have served 2600 customers, solve the equation $2600 = 520x$.

$$2600 = 520x$$

$$\frac{2600}{520} = \frac{520x}{520}$$

$$5 = x$$

The restaurant will have served 2600 customers in 5 days.

45. Let $t =$ time

$$14.6t - 11.3t = 660$$

$$3.3t = 660$$

$$t = 200$$

The faster runner will be exactly one lap ahead of the other runner in 200 seconds.

Mixed Review

46. $14 + (-6) = 8$

47. $-7 + (-13) = -20$

48. $16 - 21 = 16 + (-21) = -5$

49. $-9 - (-10) = -9 + 10 = 1$

50. $(3a)(-3a)(a) = -9a^3$

51. $-2(-12)(2t) = 48t$

52. $2(9z + 4) = 18z + 8$

53. $-3(5b - 8) = -15b + 24$

54. $(2k - 7)(-5) = -10k + 35$

55. $x + 9 = 2$

56. $m + 2 = 5$

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

$$m + 2 - 2 = 5 - 2$$

$$x = -7$$

$$m = 3$$

Check:

$$-7 + 9 \stackrel{?}{=} 2$$

$$2 = 2$$

Check:

$$3 + 2 \stackrel{?}{=} 5$$

$$5 = 5$$

57. $y - 18 = 12$

$$y - 18 + 18 = 12 + 18$$

$$y = 30$$

Check:

$$30 - 18 \stackrel{?}{=} 12$$

$$12 = 12$$

58. $-7r = 56$

$$\frac{-7r}{-7} = \frac{56}{-7}$$

$$r = -8$$

Check:

$$-7(-8) \stackrel{?}{=} 56$$

$$56 = 56$$

59. $30s = 1200$

$$\frac{30s}{30} = \frac{1200}{30}$$

$$s = 40$$

Check:

$$30(40) \stackrel{?}{=} 1200$$

$$1200 = 1200$$

60. $-\frac{1}{9}c = -8$

$$-\frac{9}{1}\left(-\frac{1}{9}c\right) = -\frac{9}{1}(-8)$$

$$c = 72$$

Check:

$$-\frac{1}{9}(72) \stackrel{?}{=} -8$$

$$-8 = -8$$

Problem Solving Workshop 3.2 (p. 147)

1. Method 1: Let $x =$ team members who are not club members

$$775 = 600 + 25x$$

$$775 - 600 = 600 + 25x - 600$$

$$175 = 25x$$

$$\frac{175}{25} = \frac{25x}{25}$$

$$7 = x$$

7 team members are not club members.

Method 2:

Team members not club members	Total amount paid
0	\$600
1	\$625
2	\$650
3	\$675
4	\$700
5	\$725
6	\$750
7	\$775

The table shows that the total amount paid is \$775 when there are 7 team members who aren't club members.

Chapter 3, continued

2.	Number of team members	Amount each would pay (\$)
	2	300
	3	200
	4	150
	5	120
	6	100
	7	85.71
	8	75

There must be 8 players on your team for you to pay \$75 plus another \$25 for not being a club member.

3. Method 1: Let c = number of chairs

$$370 = 220 + 35c$$

$$370 - 220 = 220 + 35c - 220$$

$$150 = 35c$$

$$\frac{150}{35} = \frac{35c}{35}$$

$$4.3 = c$$

You can buy 4 chairs.

Method 2:

Number of chairs	Total (\$) cost
1	255
2	290
3	325
4	360
5	395

The table shows that you can afford 4 chairs but not 5.

Lesson 3.3

3.3 Guided Practice (pp. 149–150)

1. $9d - 2d + 4 = 32$

$$7d + 4 = 32$$

$$7d = 28$$

$$d = 4$$

Check:

$$9(4) - 2(4) + 4 \stackrel{?}{=} 32$$

$$36 - 8 + 4 \stackrel{?}{=} 32$$

$$32 = 32$$

2. $2w + 3(w + 4) = 27$

$$2w + 3w + 12 = 27$$

$$5w + 12 = 27$$

$$5w = 15$$

$$w = 3$$

Check:

$$2(3) + 3(3 + 4) \stackrel{?}{=} 27$$

$$6 + 3(7) \stackrel{?}{=} 27$$

$$6 + 21 \stackrel{?}{=} 27$$

$$27 = 27$$

3. $6x - 2(x - 5) = 46$

$$6x - 2x + 10 = 46$$

$$4x + 10 = 46$$

$$4x = 36$$

$$x = 9$$

Check:

$$6(9) - 2(9 - 5) \stackrel{?}{=} 46$$

$$54 - 2(4) \stackrel{?}{=} 46$$

$$54 - 8 \stackrel{?}{=} 46$$

$$46 = 46$$

4. $\frac{3}{4}(z - 6) = 12$

$$\frac{4}{3} \cdot \frac{3}{4}(z - 6) = \frac{4}{3}(12)$$

$$z - 6 = 16$$

$$z = 22$$

Check:

$$\frac{3}{4}(22 - 6) \stackrel{?}{=} 12$$

$$\frac{3}{4}(16) \stackrel{?}{=} 12$$

$$12 = 12$$

5. $\frac{2}{5}(3r + 4) = 10$

$$\frac{5}{2} \cdot \frac{2}{5}(3r + 4) = \frac{5}{2}(10)$$

$$3r + 4 = 25$$

$$3r = 21$$

$$r = 7$$

Check:

$$\frac{2}{5}(3 \cdot 7 + 4) \stackrel{?}{=} 10$$

$$\frac{2}{5}(21 + 4) \stackrel{?}{=} 10$$

$$\frac{2}{5}(25) \stackrel{?}{=} 10$$

$$10 = 10$$

6. $-\frac{4}{5}(4a - 1) = 28$

$$-\frac{5}{4}\left(-\frac{4}{5}\right)(4a - 1) = -\frac{5}{4}(28) \quad -\frac{4}{5}[4 \cdot (-8.5) - 1] \stackrel{?}{=} 28$$

$$4a - 1 = -35$$

$$-\frac{4}{5}(-34 - 1) \stackrel{?}{=} 28$$

$$4a = -34$$

$$-\frac{4}{5}(-35) \stackrel{?}{=} 28$$

$$a = -8.5$$

$$28 = 28$$

7. $2500 = 25(288 - x)$

$$2500 = 7200 - 25x$$

$$-4700 = -25x$$

$$188 = x$$

The cranes were not flying for 188 hours of the migration.

3.3 Exercises (pp. 150–153)

Skill Practice

1. The reciprocal of the fraction $\frac{3}{5}$ is $\frac{5}{3}$.

2. Use the distributive property to multiply $(4y - 7)$ by 3, giving you $12y - 21 = 6$.

Add 21 to each side, giving you $12y = 27$. Divide each side by 12 to get $y = 2.25$.

3. $p + 2p - 3 = 6$

$$3p - 3 = 6$$

$$3p = 9$$

$$p = 3$$

Check:

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

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

$$6 = 6$$

4. $12v + 14 + 10v = 80$

$$22v + 14 = 80$$

$$22v = 66$$

$$v = 3$$

Check:

$$12(3) + 14 + 10(3) \stackrel{?}{=} 80$$

$$36 + 14 + 30 \stackrel{?}{=} 80$$

$$80 = 80$$

Chapter 3, continued

5. $11w - 9 - 7w = 15$

$$4w - 9 = 15$$

$$4w = 24$$

$$w = 6$$

Check:

$$11(6) - 9 - 7(6) \stackrel{?}{=} 15$$

$$66 - 9 - 42 \stackrel{?}{=} 15$$

$$15 = 15$$

7. $6c - 8 - 2c = -16$

$$4c - 8 = -16$$

$$4c = -8$$

$$c = -2$$

8. $9 = 7z - 13z - 21$

$$9 = -6z - 21$$

$$30 = -6z$$

$$-5 = z$$

9. $-2 = 3y - 18 - 5y$

$$-2 = -2y - 18$$

$$16 = -2y$$

$$-8 = y$$

10. $23 = -4m + 2 + m$

$$23 = -3m + 2$$

$$21 = -3m$$

$$-7 = m$$

11. $35 = -5 + 2x - 7x$

$$35 = -5 - 5x$$

$$40 = -5x$$

$$-8 = x$$

12. $3 + 4(z + 5) = 31$

$$3 + 4z + 20 = 31$$

$$4z + 23 = 31$$

$$4z = 8$$

$$z = 2$$

13. $14 + 2(4g - 3) = 40$

$$14 + 8g - 6 = 40$$

$$8g + 8 = 40$$

$$8g = 32$$

$$g = 4$$

Check:

$$14 + 2(4 \cdot 4 - 3) \stackrel{?}{=} 40$$

$$14 + 2(16 - 3) \stackrel{?}{=} 40$$

$$14 + 2(13) \stackrel{?}{=} 40$$

$$14 + 26 \stackrel{?}{=} 40$$

$$40 = 40$$

6. $5a + 3 - 3a = -7$

$$2a - 3 = -7$$

$$2a = -10$$

$$a = -5$$

Check:

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

$$-25 + 3 + 15 \stackrel{?}{=} -7$$

$$-7 = -7$$

Check:

$$6(-2) - 8 - 2(-2) \stackrel{?}{=} -16$$

$$-12 - 8 + 4 \stackrel{?}{=} -16$$

$$-16 = -16$$

Check:

$$9 \stackrel{?}{=} 7(-5) - 13(-5) - 21$$

$$9 \stackrel{?}{=} -35 + 65 - 21$$

$$9 = 9$$

Check:

$$-2 \stackrel{?}{=} 3(-8) - 18 - 5(-8)$$

$$-2 \stackrel{?}{=} -24 - 18 + 40$$

$$-2 = -2$$

Check:

$$23 \stackrel{?}{=} -4(-7) + 2 + (-7)$$

$$23 \stackrel{?}{=} 28 + 2 - 7$$

$$23 = 23$$

Check:

$$35 \stackrel{?}{=} -5 + 2(-8) - 7(-8)$$

$$35 \stackrel{?}{=} -5 - 16 + 56$$

$$35 = 35$$

Check:

$$3 + 4(2 + 5) \stackrel{?}{=} 31$$

$$3 + 4(7) \stackrel{?}{=} 31$$

$$3 + 28 \stackrel{?}{=} 31$$

$$31 = 31$$

14. $5m + 2(m + 1) = 23$

$$5m + 2m + 2 = 23$$

$$7m + 2 = 23$$

$$7m = 21$$

$$m = 3$$

Check:

$$5(3) + 2(3 + 1) \stackrel{?}{=} 23$$

$$5(3) + 2(4) \stackrel{?}{=} 23$$

$$15 + 8 \stackrel{?}{=} 23$$

$$23 = 23$$

15. $5h + 2(11 - h) = -5$

$$5h + 22 - 2h = -5$$

$$3h + 22 = -5$$

$$3h = -27$$

$$h = -9$$

Check:

$$5(-9) + 2[11 - (-9)] \stackrel{?}{=} -5$$

$$-45 + 2(20) \stackrel{?}{=} -5$$

$$-45 + 40 \stackrel{?}{=} -5$$

$$-5 = -5$$

16. $27 = 3c - 3(6 - 2c)$

$$27 = 3c - 18 + 6c$$

$$27 = 9c - 18$$

$$45 = 9c$$

$$5 = c$$

Check:

$$27 \stackrel{?}{=} 3(5) - 3(6 - 2.5)$$

$$27 \stackrel{?}{=} 15 - 3(6 - 10)$$

$$27 \stackrel{?}{=} 15 - 3(-4)$$

$$27 \stackrel{?}{=} 15 + 12$$

$$27 = 27$$

17. $-3 = 12y - 5(2y - 7)$

$$-3 = 12y - 10y + 35$$

$$-3 = 2y + 35$$

$$-38 = 2y$$

$$-19 = y$$

Check:

$$-3 \stackrel{?}{=} 12(-19) - 5(2(-19) - 7)$$

$$-3 \stackrel{?}{=} -228 - 5(-38 - 7)$$

$$-3 \stackrel{?}{=} -228 - 5(-45)$$

$$-3 \stackrel{?}{=} -228 + 225$$

$$-3 = -3$$

18. C; $7v - (6 - 2v) = 12$

$$7v - 6 + 2v = 12$$

$$9v - 6 = 12$$

$$9v = 18$$

$$v = 2$$

19. $\frac{1}{3}(d + 3) = 5$

$$\frac{3}{1} \cdot \frac{1}{3}(d + 3) = \frac{3}{1}(5)$$

$$d + 3 = 15$$

$$d = 12$$

Check:

$$\frac{1}{3}(12 + 3) \stackrel{?}{=} 5$$

$$\frac{1}{3}(15) \stackrel{?}{=} 5$$

$$5 = 5$$

20. $\frac{3}{2}(x - 5) = -6$

$$\frac{2}{3} \cdot \frac{3}{2}(x - 5) = \frac{2}{3}(-6)$$

$$x - 5 = -4$$

$$x = 1$$

Check:

$$\frac{3}{2}(1 - 5) \stackrel{?}{=} -6$$

$$\frac{3}{2}(-4) \stackrel{?}{=} -6$$

$$-6 = -6$$

21. $\frac{4}{3}(7 - n) = 12$

$$\frac{3}{4} \cdot \frac{4}{3}(7 - n) = \frac{3}{4}(12)$$

$$7 - n = 9$$

$$-n = 2$$

$$n = -2$$

22. $4 = \frac{2}{9}(4y - 2)$

$$\frac{9}{2}(4) = \frac{9}{2} \cdot \frac{2}{9}(4y - 2)$$

$$18 = 4y - 2$$

$$20 = 4y$$

$$5 = y$$

Chapter 3, continued

Check:

$$\frac{4}{3}[7 - (-2)] \stackrel{?}{=} 12$$

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

$$12 = 12$$

23. $-32 = \frac{8}{7}(3w - 1)$

$$\frac{7}{8}(-32) = \frac{7}{8} \cdot \frac{8}{7}(3w - 1)$$

$$-28 = 3w - 1$$

$$-27 = 3w$$

$$-9 = w$$

Check:

$$-32 \stackrel{?}{=} \frac{8}{7}[3(-9) - 1]$$

$$-32 \stackrel{?}{=} \frac{8}{7}(-27 - 1)$$

$$-32 \stackrel{?}{=} \frac{8}{7}(-28)$$

$$-32 = -32$$

- 25.** The error was made when using the distributive property. -3 times -6 is 18 , not -18 .

$$5x - 3(x - 6) = 2$$

$$5x - 3x + 18 = 2$$

$$2x + 18 = 2$$

$$2x = -16$$

$$x = -8$$

- 26.** The error is that the left side was multiplied by the reciprocal of the fraction $\frac{1}{2}$, but the right side was multiplied by $\frac{1}{2}$.

$$\frac{1}{2}(2x - 10) = 4$$

$$\frac{2}{1} \cdot \frac{1}{2}(2x - 10) = \frac{2}{1} \cdot 4$$

$$2x - 10 = 8$$

$$2x = 18$$

$$x = 9$$

27. $8.9 + 1.2(3a - 1) = 14.9$

$$8.9 + 3.6a - 1.2 = 14.9$$

$$3.6a + 7.7 = 14.9$$

$$3.6a = 7.2$$

$$a = 2$$

Check:

$$8.9 + 1.2(3 \cdot 2 - 1) \stackrel{?}{=} 14.9$$

$$8.9 + 1.2(6 - 1) \stackrel{?}{=} 14.9$$

$$8.9 + 1.2(5) \stackrel{?}{=} 14.9$$

$$8.9 + 6 \stackrel{?}{=} 14.9$$

$$14.9 = 14.9$$

Check:

$$4 \stackrel{?}{=} \frac{2}{9}(4 \cdot 5 - 2)$$

$$4 \stackrel{?}{=} \frac{2}{9}(20 - 2)$$

$$4 \stackrel{?}{=} \frac{2}{9}(18)$$

$$4 = 4$$

24. $-14 = \frac{2}{5}(9 - 2b)$

$$\frac{5}{2}(-14) = \frac{5}{2} \cdot \frac{2}{5}(9 - 2b)$$

$$-35 = 9 - 2b$$

$$-44 = -2b$$

$$22 = b$$

Check:

$$-14 \stackrel{?}{=} \frac{2}{5}(9 - 2 \cdot 22)$$

$$-14 \stackrel{?}{=} \frac{2}{5}(9 - 44)$$

$$-14 \stackrel{?}{=} \frac{2}{5}(-35)$$

$$-14 = -14$$

28. $-11.2 + 4(2.1 + q) = -0.8$

$$-11.2 + 8.4 + 4q = -0.8$$

$$-2.8 + 4q = -0.8$$

$$4q = 2$$

$$q = 0.5$$

Check:

$$-11.2 + 4(2.1 + 0.5) \stackrel{?}{=} -0.8$$

$$-11.2 + 4(2 \cdot 6) \stackrel{?}{=} -0.8$$

$$-11.2 + 10.4 \stackrel{?}{=} -0.8$$

$$-0.8 = -0.8$$

29. $1.3t + 3(t + 8.2) = 37.5$

$$1.3t + 3t + 24.6 = 37.5$$

$$4.3t + 24.6 = 37.5$$

$$4.3t = 12.9$$

$$t = 3$$

Check:

$$1.3(3) + 3(3 + 8.2) \stackrel{?}{=} 37.5$$

$$3.9 + 3(11.2) \stackrel{?}{=} 37.5$$

$$3.9 + 33.6 \stackrel{?}{=} 37.5$$

$$37.5 = 37.5$$

31. $0.5 = 4.1x - 2(1.3x - 4)$

$$0.5 = 4.1x - 2.6x + 8$$

$$0.5 = 1.5x + 8$$

$$-7.5 = 1.5x$$

$$-5 = x$$

Check:

$$0.5 \stackrel{?}{=} 4.1(-5) - 2[1.3(-5) - 4]$$

$$0.5 \stackrel{?}{=} -20.5 - 2(-6.5 - 4)$$

$$0.5 \stackrel{?}{=} -20.5 - 2(-10.5)$$

$$0.5 \stackrel{?}{=} -20.5 + 21$$

$$0.5 = 0.5$$

32. $8.7 = 3.5m - 2.5(5.4 - 6m)$

$$8.7 = 3.5m - 13.5 + 15m$$

$$8.7 = 18.5m - 13.5$$

$$22.2 = 18.5m$$

$$1.2 = m$$

Check:

$$8.7 \stackrel{?}{=} 3.5(1.2) - 2.5(5.4 - 6 \cdot 1.2)$$

$$8.7 \stackrel{?}{=} 4.2 - 2.5(5.4 - 7.2)$$

$$8.7 \stackrel{?}{=} 4.2 - 2.5(-1.8)$$

$$8.7 \stackrel{?}{=} 4.2 + 4.5$$

$$8.7 = 8.7$$

33. $x + 4 + 4x + 10(x - 1) = 24$

$$5x + 4 + 10x - 10 = 24$$

$$15x - 6 = 24$$

$$15x = 30$$

$$x = 2$$

Chapter 3, continued

34. $2(x + 3) + 2(2x - 6) = 26$

$$2x + 6 + 4x - 12 = 26$$

$$6x - 6 = 26$$

$$6x = 32$$

$$x = 5\frac{1}{3}$$

35. By using the perimeter formula $P = 2\ell + 2w$, we can solve for the width of the rectangle. Let w represent the width and substitute $(3.5 + w)$ for the length.

$$2\ell + 2w = P$$

$$2(3.5 + w) + 2w = 31$$

$$7 + 2w + 2w = 31$$

$$7 + 4w = 31$$

$$4w = 24$$

$$w = 6$$

The width is 6 inches and the length is $6 + 3.5$, or 9.5 inches.

36. a. $9(x - 4) = 72$ b. $8(x + 5) = 60$

$$x - 4 = 8$$

$$x + 5 = 7.5$$

$$x = 12$$

$$x = 2.5$$

You should use this method when both sides of the equation can be evenly divided by the number outside the parentheses.

37. $2n + (2n + 2) + (2n + 4) = 54$

$$6n + 6 = 54$$

$$6n = 48$$

$$n = 8$$

First integer is $2n = 2 \cdot 8 = 16$. The integers are 16, 18, and 20.

Problem Solving

38. Let t = number of tickets.

$$32.50t + 3.30t + 5.90 = 220.70$$

$$35.80t + 5.90 = 220.70$$

$$35.80t = 214.80$$

$$t = 6$$

There were 6 tickets purchased.

39. Let x = space between posters.

$$3 + 2 + x + 2 + x + 2 + 3 = 13.5$$

$$2x + 12 = 13.5$$

$$2x = 1.5$$

$$x = 0.75$$

You should leave 0.75 feet between the posters.

40. Let t = time for front crawl.

$$500 = 45t + 35(12 - t)$$

$$500 = 45t + 420 - 35t$$

$$500 = 10t + 420$$

$$80 = 10t$$

$$8 = t$$

You spent 8 minutes swimming the front crawl.

41. a. Let t = time Busk crew spent working.

$$137t + 115(t - 0.75) = 8473$$

$$137t + 115t - 86.25 = 8473$$

$$252t - 86.25 = 8473$$

$$252t = 8559.25$$

$$t = 33.97$$

It took about 34 months to complete the tunnel.

- b. $d = rt$

$$921 = 3r$$

$$307 = r$$

The remainder of the tunnel was completed at a rate of 307 feet per month.

- c. Before the merge, they were working at a rate of $115 + 137 = 252$ feet per month. After the merge, they were working at a rate of 307 feet per month (see part(b).) The tunnel was being completed more rapidly after the merge.

42. a. $y = 74.5x + 750$

$$y = 27.50x + 17x + 30x + 750$$

$$2314.50 = 74.5x + 750$$

$$1564.5 = 74.5x$$

$$21 = x$$

The roof has about 21 squares.

b.

Number of squares	Total cost (\$)
5	1122.50
10	1495
15	1867.50
20	2240
25	2612.50

The answer in part (a), 21 squares, makes sense because the total cost is slightly more than the total cost to shingle 20 squares.

43. Let q = number of quarters.

$$0.25q + 0.10(q + 7) = 2.80$$

$$0.25q + 0.10q + 0.7 = 2.80$$

$$0.35q + 0.7 = 2.80$$

$$0.35q = 2.1$$

$$q = 6$$

The person has 6 quarters and $6 + 7 = 13$ dimes.

Mixed Review

44. $x - y = -7 - 2 = -9$

45. $x - (-y) = -4 - (-5) = 1$

46. $\frac{x - 9}{4} = \frac{9 - 9}{4} = \frac{0}{4} = 0$

47. $\frac{4y + 7}{3} = \frac{4(5) + 7}{3} = \frac{20 + 7}{3} = \frac{27}{3} = 9$

Chapter 3, continued

48. $5x + 1 = 26$

$$5x = 25$$

$$x = 5$$

49. $-x + 4 = 13$

$$-x = 9$$

$$\frac{-x}{-1} = \frac{9}{-1}$$

$$x = -9$$

50. $3x - 5 = -14$

$$3x = -9$$

$$\frac{3x}{3} = \frac{-9}{3}$$

$$x = -3$$

Check:

$$3(-3) - 5 \stackrel{?}{=} -14$$

$$-9 - 5 \stackrel{?}{=} -14$$

$$-14 = -14$$

52. $\frac{x}{3} - 4 = 1$

$$\frac{x}{3} = 5$$

$$3\left(\frac{x}{3}\right) = 3(5)$$

$$x = 15$$

Check:

$$\frac{15}{3} - 4 \stackrel{?}{=} 1$$

$$5 - 4 \stackrel{?}{=} 1$$

$$1 = 1$$

54. $11x + 5x = 48$

$$16x = 48$$

$$\frac{16x}{16} = \frac{48}{16}$$

$$x = 3$$

55. $-4x + 11x = -28$

$$7x = -28$$

$$x = -4$$

56. $\frac{2}{5}x - \frac{3}{5}x = -7$

$$-\frac{1}{5}x = -7$$

$$-\frac{5}{1}\left(-\frac{1}{5}x\right) = -\frac{5}{1}(-7)$$

$$x = 35$$

Check:

$$5(5) + 1 \stackrel{?}{=} 26$$

$$25 + 1 \stackrel{?}{=} 26$$

$$26 = 26$$

Check:

$$-(-9) + 4 \stackrel{?}{=} 13$$

$$9 + 4 \stackrel{?}{=} 13$$

$$13 = 13$$

51. $3 - 2x = 19$

$$-2x = 16$$

$$\frac{-2x}{-2} = \frac{16}{-2}$$

$$x = -8$$

Check:

$$3 - 2(-8) \stackrel{?}{=} 19$$

$$3 + 16 \stackrel{?}{=} 19$$

$$19 = 19$$

53. $8 + \frac{x}{4} = -\frac{3}{4}$

$$\frac{x}{4} = -\frac{35}{4}$$

$$4\left(\frac{x}{4}\right) = 4\left(-\frac{35}{4}\right)$$

$$x = -35$$

Check:

$$8 + \left(-\frac{35}{4}\right) \stackrel{?}{=} -\frac{3}{4}$$

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

Check:

$$11(3) + 5(3) \stackrel{?}{=} 48$$

$$33 + 15 \stackrel{?}{=} 48$$

$$48 = 48$$

Check:

$$-4(-4) + 11(-4) \stackrel{?}{=} -28$$

$$16 - 44 \stackrel{?}{=} -28$$

$$-28 = -28$$

Check:

$$\frac{2}{5}(35) - \frac{3}{5}(35) \stackrel{?}{=} -7$$

$$14 - 21 \stackrel{?}{=} -7$$

$$-7 = -7$$

Quiz 3.1-3.3 (p. 153)

1. $x + 9 = 7$

$$x = -2$$

Check:

$$-2 + 9 \stackrel{?}{=} 7$$

$$7 = 7$$

3. $-7b = -56$

$$b = 8$$

4. $\frac{z}{4} = 6$

$$4\left(\frac{z}{4}\right) = 4(6)$$

$$z = 24$$

Check:

$$\frac{24}{4} \stackrel{?}{=} 6$$

$$6 = 6$$

6. $9w - 4 = 14$

$$9w = 18$$

$$w = 2$$

Check:

$$9(2) - 4 \stackrel{?}{=} 14$$

$$18 - 4 \stackrel{?}{=} 14$$

$$14 = 14$$

8. $66 = 4m + 7m$

$$66 = 11m$$

$$6 = m$$

Check:

$$66 \stackrel{?}{=} 4(6) + 7(6)$$

$$66 \stackrel{?}{=} 24 + 42$$

$$66 = 66$$

10. $2v + 5v - 8 = 13$

$$7v - 8 = 13$$

$$7v = 21$$

$$v = 3$$

11. $2a - 6(a - 4) = -4$

$$2a - 6a + 24 = -4$$

$$-4a + 24 = -4$$

$$-4a = -28$$

$$a = 7$$

2. $y - 5 = -11$

$$y = -6$$

Check:

$$-6 - 5 \stackrel{?}{=} -11$$

$$-11 = -11$$

Check:

$$-7(8) \stackrel{?}{=} -56$$

$$-56 = -56$$

5. $-\frac{4}{3}t = -12$

$$-\frac{3}{4}\left(-\frac{4}{3}t\right) = -\frac{3}{4}(-12)$$

$$t = 9$$

Check:

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

$$-12 = -12$$

7. $23 = 1 - d$

$$22 = -d$$

$$-22 = d$$

Check:

$$23 \stackrel{?}{=} 1(-22)$$

$$23 \stackrel{?}{=} 1 + 22$$

$$23 = 23$$

9. $-104 = -5p - 3p$

$$-104 = -8p$$

$$13 = p$$

Check:

$$-104 \stackrel{?}{=} -5(13) - 3(13)$$

$$-104 \stackrel{?}{=} -65 - 39$$

$$-104 = -104$$

Check:

$$2(3) + 5(3) - 8 \stackrel{?}{=} 13$$

$$6 + 15 - 8 \stackrel{?}{=} 13$$

$$21 - 8 \stackrel{?}{=} 13$$

$$13 = 13$$

Check:

$$2(7) - 6(7 - 4) \stackrel{?}{=} -4$$

$$14 - 6(3) \stackrel{?}{=} -4$$

$$14 - 18 \stackrel{?}{=} -4$$

$$-4 = -4$$

Chapter 3, continued

$$12. \quad \frac{6}{5}(5 - 4g) = -18 \quad \text{Check:}$$

$$\frac{5}{6} \cdot \frac{6}{5}(5 - 4g) = \frac{5}{6}(-18) \quad \frac{6}{5}(5 - 4 \cdot 5) \stackrel{?}{=} -18$$

$$5 - 4g = -15 \quad \frac{6}{5}(5 - 20) \stackrel{?}{=} -18$$

$$-4g = -20 \quad \frac{6}{5}(-15) \stackrel{?}{=} -18$$

$$g = 5 \quad -18 = -18$$

13. Let d = number of DVDs.

$$11d + 6.95 = 50.95$$

$$11d = 44$$

$$d = 4$$

Dan purchased 4 DVDs.

Lesson 3.4

3.4 Guided Practice (pp. 155–156)

1. $24 - 3m = 5m$ Check:
 $24 = 8m$ $24 - 3(3) \stackrel{?}{=} 5(3)$
 $3 = m$ $24 - 9 \stackrel{?}{=} 15$
 $15 = 15$

2. $20 + c = 4c - 7$ Check:
 $20 = 3c - 7$ $20 + 9 \stackrel{?}{=} 4(9) - 7$
 $27 = 3c$ $29 \stackrel{?}{=} 36 - 7$
 $9 = c$ $29 = 29$

3. $9 - 3k = 17 - 2k$ Check:
 $9 = 17 + k$ $9 - 3(-8) \stackrel{?}{=} 17 - 2(-8)$
 $-8 = k$ $9 + 24 \stackrel{?}{=} 17 + 16$
 $33 = 33$

4. $5z - 2 = 2(3z - 4)$ Check:
 $5z - 2 = 6z - 8$ $5(6) - 2 \stackrel{?}{=} 2(3 \cdot 6 - 4)$
 $-2 = z - 8$ $30 - 2 \stackrel{?}{=} 2(18 - 4)$
 $6 = z$ $28 \stackrel{?}{=} 2(14)$
 $28 = 28$

5. $3 - 4a = 5(a - 3)$ Check:
 $3 - 4a = 5a - 15$ $3 - 4(2) \stackrel{?}{=} 5(2 - 3)$
 $3 = 9a - 15$ $3 - 8 \stackrel{?}{=} 5(-1)$
 $18 = 9a$ $-5 = -5$
 $2 = a$

6. $8y - 6 = \frac{2}{3}(6y + 15)$ Check:
 $8y - 6 = 4y + 10$ $8(4) - 6 \stackrel{?}{=} \frac{2}{3}(6 \cdot 4 + 15)$
 $4y - 6 = 10$ $32 - 6 \stackrel{?}{=} \frac{2}{3}(24 + 15)$
 $4y = 16$ $26 \stackrel{?}{=} \frac{2}{3}(39)$
 $y = 4$ $26 = 26$

7. $50 + 6x = 2(67 - 4x)$
 $50 + 6x = 134 - 8x$
 $50 + 14x = 134$
 $14x = 84$
 $x = 6$

The number of new cars sold will be twice the number of used cars sold in 6 years.

8. $9z + 12 = 9(z + 3)$
 $9z + 12 = 9z + 27$
 $12 \neq 27$

The equation has no solution.

9. $7w + 1 = 8w + 1$
 $1 = w + 1$
 $0 = w$

10. $3(2a + 2) = 2(3a + 3)$
 $6a + 6 = 6a + 6$

The statement $6a + 6 = 6a + 6$ is true for all values of a .
 The solution is all real numbers.

3.4 Exercises (pp. 157–159)

Skill Practice

1. An equation that is true for all values of the variable is called an *identity*.

2. The equation $4x + 3 = 4x + 1$ has no solution because 4 times any number plus 3 cannot equal 4 times the same number plus 1.
 $4x + 3 = 4x + 1$
 $4x - 4x + 3 = 4x - 4x + 1$
 $3 \neq 1$

3. $8t + 5 = 6t + 1$ 4. $k + 1 = 3k - 1$
 $2t + 5 = 1$ $1 = 2k - 1$
 $2t = -4$ $2 = 2k$
 $t = -2$ $1 = k$

Check: Check:
 $8(-2) + 5 \stackrel{?}{=} 6(-2) + 1$ $1 + 1 \stackrel{?}{=} 3(1) - 1$
 $-16 + 5 \stackrel{?}{=} -12 + 1$ $2 \stackrel{?}{=} 3 - 1$
 $-11 = -11$ $2 = 2$

5. $8c + 5 = 4c - 11$ 6. $8 + 4m = 9m - 7$
 $4c + 5 = -11$ $8 = 5m - 7$
 $4c = -16$ $15 = 5m$
 $c = -4$ $3 = m$

Check: Check:
 $8(-4) + 5 \stackrel{?}{=} 4(-4) - 11$ $8 + 4(3) \stackrel{?}{=} 9(3) - 7$
 $-32 + 5 \stackrel{?}{=} -16 - 11$ $8 + 12 \stackrel{?}{=} 27 - 7$
 $-27 = -27$ $20 = 20$

7. $10b + 18 = 8b + 4$ Check:
 $2b + 18 = 4$ $10(-7) + 18 \stackrel{?}{=} 8(-7) + 4$
 $2b = -14$ $-70 + 18 \stackrel{?}{=} -56 + 4$
 $b = -7$ $-52 = -52$

Chapter 3, continued

8. $19 - 13p = -17p - 5$

$$19 + 4p = -5$$

$$4p = -24$$

$$p = -6$$

Check:

$$19 - 13(-6) \stackrel{?}{=} -17(-6) - 5$$

$$19 + 78 \stackrel{?}{=} 102 - 5$$

$$97 = 97$$

9. $9a = 6(a + 4)$

$$9a = 6a + 24$$

$$3a = 24$$

$$a = 8$$

Check:

$$9(8) \stackrel{?}{=} 6(8 + 4)$$

$$72 \stackrel{?}{=} 6(12)$$

$$72 = 72$$

10. $5h - 7 = 2(h + 1)$

$$5h - 7 = 2h + 2$$

$$3h - 7 = 2$$

$$3h = 9$$

$$h = 3$$

Check:

$$5(3) - 7 \stackrel{?}{=} 2(3 + 1)$$

$$15 - 7 \stackrel{?}{=} 2(4)$$

$$8 = 8$$

11. $3(d + 12) = 8 - 4d$

$$3d + 36 = 8 - 4d$$

$$7d + 36 = 8$$

$$7d = -28$$

$$d = -4$$

Check:

$$3(-4 + 12) \stackrel{?}{=} 8 - 4(-4)$$

$$3(8) \stackrel{?}{=} 8 + 16$$

$$24 = 24$$

12. $7(r + 7) = 5r + 59$

$$7r + 49 = 5r + 59$$

$$2r + 49 = 59$$

$$2r = 10$$

$$r = 5$$

Check:

$$7(5 + 7) \stackrel{?}{=} 5(5) + 59$$

$$7(12) \stackrel{?}{=} 25 + 59$$

$$84 = 84$$

13. $40 + 14j = 2(-4j - 13)$

$$40 + 14j = -8j - 26$$

$$40 + 22j = -26$$

$$22j = -66$$

$$j = -3$$

Check:

$$40 + 14(-3) \stackrel{?}{=} 2(-4(-3) - 13)$$

$$40 - 42 \stackrel{?}{=} 2(12 - 13)$$

$$-2 \stackrel{?}{=} 2(-1)$$

$$-2 = -2$$

14. $5(n + 2) = \frac{3}{5}(5 + 10n)$

$$5n + 10 = 3 + 6n$$

$$10 = 3 + n$$

$$7 = n$$

Check:

$$5(7 + 2) \stackrel{?}{=} \frac{3}{5}(5 + 10 \cdot 7)$$

$$5(9) \stackrel{?}{=} \frac{3}{5}(5 + 70)$$

$$45 \stackrel{?}{=} \frac{3}{5}(75)$$

$$45 = 45$$

15. C;

$$8x + 2x = 15x - 10$$

$$10x = 15x - 10$$

$$-5x = -10$$

$$x = 2$$

16. D;

$$4y + y + 1 = 7(y - 1)$$

$$5y + 1 = 7y - 7$$

$$1 = 2y - 7$$

$$8 = 2y$$

$$4 = y$$

17. First use the distributive property to get

$$6z - 15 = 2z + 13.$$

Then subtract $2z$ from each side to get $4z - 15 = 13$.

Next add 15 to each side to get $4z = 28$. Finally, divide each side by 4 to get $z = 7$.

18. $w + 3 = w + 6$

$$3 \neq 6$$

no solution

19. $16d = 22 + 5d$

$$11d = 22$$

$$d = 2$$

20. $8z = 4(2z + 1)$

$$8z = 8z + 4$$

$$0 \neq 4$$

no solution

21. $12 + 5v = 2v - 9$

$$12 + 3v = -9$$

$$3v = -21$$

$$v = -7$$

22. $22x + 70 = 17x - 95$

$$5x + 70 = -95$$

$$5x = -165$$

$$x = -33$$

23. $2 - 15n = 5(-3n + 2)$

$$2 - 15n = -15n + 10$$

$$2 \neq 10$$

no solution

24. $12y + 6 = 6(2y + 1)$

$$12y + 6 = 12y + 6$$

The equation is an identity, so the solution is all real numbers.

25. $5(1 + 4m) = 2(3 + 10m)$

$$5 + 20m = 6 + 20m$$

$$5 \neq 6$$

no solution

26. $2(3g + 2) = \frac{1}{2}(12g + 8)$

$$6g + 4 = 6g + 4$$

The equation is an identity, so the solution is all real numbers.

27. The error is that the distributive property was not used correctly on the left side of the equation.

$$3(x + 5) = 3x + 15$$

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

The equation is an identity, so the solution is all real numbers.

28. The solution is not only zero. This equation is true for all values of y , making it an identity.

29. *Sample answer:* $5x + 4 = 5x$; the number $5x$ cannot be equal to 4 more than itself.

Chapter 3, continued

30. $8w - 8 - 6w = 4w - 7$

$$2w - 8 = 4w - 7$$

$$-8 = 2w - 7$$

$$-1 = 2w$$

$$-\frac{1}{2} = w$$

31. $3x - 4 = 2x + 8 - 5x$

$$3x - 4 = 8 - 3x$$

$$6x - 4 = 8$$

$$6x = 12$$

$$x = 2$$

32. $-15c + 7c + 1 = 3 - 8c$

$$-8c + 1 = 3 - 8c$$

$$-8c + 1 + 8c = 3 - 8c + 8c$$

$$1 \neq 3$$

no solution

33. $\frac{3}{2} + \frac{3}{4}a = \frac{1}{4}a - \frac{1}{2}$

$$\frac{3}{2} + \frac{1}{2}a = -\frac{1}{2}$$

$$\frac{1}{2}a = -2$$

$$\frac{2}{1} \cdot \frac{1}{2}a = \frac{2}{1}(-2)$$

$$a = -4$$

34. $\frac{5}{8}m - \frac{3}{8} = \frac{1}{2}m + \frac{7}{8}$

$$\frac{1}{8}m - \frac{3}{8} = \frac{7}{8}$$

$$\frac{1}{8}m = \frac{5}{4}$$

$$\frac{8}{1} \cdot \frac{1}{8}m = \frac{8}{1} \cdot \frac{5}{4}$$

$$m = 10$$

35. $n - 10 = \frac{5}{6}n - 7 - \frac{1}{3}n$

$$n - 10 = \frac{1}{2}n - 7$$

$$\frac{1}{2}n - 10 = -7$$

$$\frac{1}{2}n = 3$$

$$\frac{2}{1} \cdot \frac{1}{2}n = \frac{2}{1} \cdot 3$$

$$n = 6$$

36. $3.7b + 7 = 8.1b - 19.4$

$$7 = 4.4b - 19.4$$

$$26.4 = 4.4b$$

$$6 = b$$

37. $6.2h + 5 - 1.4h = 4.8h + 5$

$$4.8h + 5 = 4.8h + 5$$

The equation is an identity, so the solution is all real numbers.

38. $0.7z + 1.9 + 0.1z = 5.5 - 0.4z$

$$0.8z + 1.9 = 5.5 - 0.4z$$

$$1.2z + 1.9 = 5.5$$

$$1.2z = 3.6$$

$$z = 3$$

39. $5.4t + 14.6 - 10.1t = 12.8 - 3.5t - 0.6$

$$-4.7t + 14.6 = 12.2 - 3.5t$$

$$14.6 = 12.2 + 1.2t$$

$$2.4 = 1.2t$$

$$2 = t$$

40. $\frac{1}{8}(5y + 64) = \frac{1}{4}(20 + 2y)$

$$\frac{5}{8}y + 8 = 5 + \frac{1}{2}y$$

$$\frac{1}{8}y + 8 = 5$$

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

$$\frac{8}{1} \cdot \frac{1}{8}y = \frac{8}{1}(-3)$$

$$y = -24$$

41. $14 - \frac{1}{5}(j - 10) = \frac{2}{5}(25 + j)$

$$14 - \frac{1}{5}j + 2 = 10 + \frac{2}{5}j$$

$$16 - \frac{1}{5}j = 10 + \frac{2}{5}j$$

$$16 = 10 + \frac{3}{5}j$$

$$6 = \frac{3}{5}j$$

$$\frac{5}{3} \cdot 6 = \frac{5}{3} \cdot \frac{3}{5}j$$

$$10 = j$$

42. $5(1.2k + 6) = 7.1k + 34.4$

$$6k + 30 = 7.1k + 34.4$$

$$30 = 1.1k + 34.4$$

$$-4.4 = 1.1k$$

$$-4 = k$$

43. $-0.25(4v - 8) = 0.5(4 - 2v)$

$$-v + 2 = 2 - v$$

$$2 - v = 2 - v$$

The equation is an identity, so the solution is all real numbers.

44. $6x = 8x - 10$

$$-2x = -10$$

$$x = 5$$

$$\text{Perimeter} = 4(6x) = 4(6 \cdot 5) = 120 \text{ units}$$

45. $3x + 6 = 5x$

$$6 = 2x$$

$$3 = x$$

$$\text{Perimeter} = 4(5x) = 4(5 \cdot 3) = 60 \text{ units}$$

46. $4x - 2 = 3x + 7$

$$x - 2 = 7$$

$$x = 9$$

$$\text{Perimeter} = 4(4x - 2)$$

$$= 4(4 \cdot 9 - 2)$$

$$= 4(36 - 2)$$

$$= 4(34)$$

$$= 136 \text{ units}$$

Chapter 3, continued

47. $a(2x + 3) = 9x + 12 - x$

$$a(2x + 3) = 8x + 12$$

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

$$a = 4$$

48. $10x - 35 + 3ax = 5ax - 7a$

$$5(2x - 7) + 3ax = 5ax - 7a$$

$$5(2x - 7) = 2ax - 7a$$

$$5(2x - 7) = a(2x - 7)$$

$$a = 5$$

Problem Solving

49. Let n = number of nights.

$$35n + 45 = 40n$$

$$45 = 5n$$

$$9 = n$$

After 9 nights, the total cost is the same for members and nonmembers.

50. Let m = number of months.

$$42.95m = 60 = 57.95m$$

$$60 = 15m$$

$$4 = m$$

After 4 months, Dan and Sydney will have paid the same amount.

51. Let x = number of years.

$$555 + 33x = 3(230 - 2x)$$

$$555 + 33x = 690 - 6x$$

$$555 + 39x = 690$$

$$39x = 135$$

$$x \approx 3.46$$

In about 4 years, there will be 3 times as many students taking Spanish as French.

52. a. Let x = number of visits.

$$360 + 4x = 10x + 6x$$

$$360 + 4x = 16x$$

$$360 = 12x$$

$$30 = x$$

The total cost for a member and a nonmember will be the same after 30 visits.

Number of visits	Cost for Members (\$)	Cost for Non-members (\$)
5	380	80
10	400	160
15	420	240
20	440	320
25	460	400
30	480	480
35	500	560

The total cost for a member and a nonmember will be the same (\$480) after 30 visits.

53. a. $23.4t = 24(t - 0.3)$

$$23.4t = 24t - 7.2$$

$$-0.6t = -7.2$$

$$t = 12$$

The sheepdog would catch up to the collie after 12 seconds.

b. $d = rt$

$$2(51) = 23.4t$$

$$102 = 23.4t$$

$$4.4 \approx t$$

It takes the collie about 4.4 seconds to run the last leg.

c. The sheepdog does not catch up and pass the collie because it takes 12 seconds for the sheepdog to catch up to the collie and it only takes the collie 4.4 seconds to complete the last leg.

54. $l = w + 12, P = 7w$

$$P = 2l + 2w$$

$$7w = 2(w + 12) + 2w$$

$$7w = 2w + 24 + 2w$$

$$7w = 4w + 24$$

$$3w = 24$$

$$w = 8$$

$$l = 8 + 12 = 20$$

The width is 8 units, and the length is 20 units.

55. $l = 3w - 4, P = 2w + 22$

$$P = 2l + 2w$$

$$2w + 22 = 2(3w - 4) + 2w$$

$$2w + 22 = 6w - 8 + 2w$$

$$2w - 22 = 8w - 8$$

$$22 = 6w - 8$$

$$30 = 6w$$

$$5 = w$$

$$l = 3(5) - 4 = 15 - 4 = 11$$

The width is 5 units, and the length is 11 units.

Chapter 3, continued

Mixed Review

56. $\frac{5}{15} = \frac{1}{3}$

57. $\frac{10}{12} = \frac{5}{6}$

58. $\frac{4}{14} = \frac{2}{7}$

59. $\frac{18}{48} = \frac{3}{8}$

60. $\frac{w}{3} = 6$

61. $\frac{x}{18} = 2$

$$3\left(\frac{w}{3}\right) = 3(6)$$

$$18\left(\frac{x}{18}\right) = 18(2)$$

$$w = 18$$

$$x = 36$$

62. $-11 = \frac{m}{4}$

63. $12 = \frac{z}{-9}$

$$4(-11) = 4\left(\frac{m}{4}\right)$$

$$-9(12) = -9\left(\frac{z}{-9}\right)$$

$$-44 = m$$

$$-108 = z$$

64. Let
- y
- = total rushing yards.

$$22 = \frac{y}{12}$$

$$12(22) = 12\left(\frac{y}{12}\right)$$

$$264 = y$$

The player had a total of 264 rushing yards.

3.4 Spreadsheet Activity (p. 160)

1. $15x + 6 = 6x + 24$

2. $8x - 17 = 5x + 70$

$$x = 2$$

$$x = 29$$

3. $18 - 2(x + 3) = x$

$$x = 4$$

4. a. Check student's spreadsheet.

b. The difference between the left and right sides changes signs between possible answers 3 and 4.

c. The solution is 3.5 because the left side and right side both equal 21.7 with that solution.

Mixed Review of Problem Solving (p. 161)

1. a. $C = 0.25 + 0.07(t - 1)$

b. $2 = 0.25 + 0.07t - 0.07$

$$2 = 0.07t + 0.18$$

$$1.82 = 0.07t$$

$$26 = t$$

The duration of the call is 26 minutes.

2. Let
- x
- = weight of cat.

$$162 + x = 175$$

$$x = 13$$

The cat weighs 13 pounds.

3. a. Let
- g
- = number of games.

$$3.75g = 15$$

$$g = 4$$

Paul can bowl 4 games.

- b.
- $3.75g + 1.50 = 15$

$$3.75g = 13.5$$

$$g = 3.6$$

Brandon can bowl 3 games.

- c. If Paul only bowls 3 games, it will cost him

$\$3.75(3) = \11.75 . He will have $\$15 - 11.25 = \3.75 left over. So he will have enough to buy the pizza and soda.

- 4.
- $10(x - 1) + 4x + 14 + 22 = 82$

$$10x - 10 + 4x + 14 + 22 = 82$$

$$14x + 26 = 82$$

$$14x = 56$$

$$x = 4$$

5. Without a break, the time it would take to make 100 cranes is

$$\frac{100 \text{ cranes}}{40 \text{ cranes/h}} = 2.5 \text{ hours.}$$

If you spent 3 hours total, the time spent not making cranes is $3 - 2.5 = 0.5$ hour.

6. Let
- v
- = number of visits.

$$22.50v + 90 = 45.00v$$

$$90 = 22.5v$$

$$4 = v$$

The cost of a ticket with the pass, \$22.50, times the number of visits plus the \$90 for the pass must equal the cost of a ticket without the pass, \$45.00, times the same number of visits. So the costs will be the same after 4 visits.

7. Let
- x
- = elevation before eruption.

$$x - 1313 = 8364$$

$$x = 9677$$

The elevation of the volcano before the eruption was 9677 feet. This value minus the decrease in elevation from the 1980 eruption must equal the current elevation of 8364 feet.

8. a. Let
- b
- = number of bulbs.

$$24 = 0.6b$$

$$40 = b$$

Jen purchased 40 bulbs.

- b.
- $30 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} = 360 \text{ in.}$

$$\frac{360}{40} = 9$$

She should place the bulbs 9 inches apart.

Chapter 3, continued

c. Let b = number of bulbs.

$$6b = 360$$

$$b = 60$$

To plant the bulbs 6 inches apart, she would need a total of 60 bulbs. Because she already has 40 bulbs, she would need $60 - 40 = 20$ more bulbs.

9. *Sample answer:*

$$4x + 15 = 47$$

$$4x = 32$$

$$x = 8$$

Lesson 3.5

3.5 Guided Practice (pp. 162–164)

1. $\frac{44}{52} = \frac{11}{13}$

2. $\frac{44}{44 + 52} = \frac{44}{96} = \frac{11}{24}$

3. $\frac{w}{35} = \frac{4}{7}$

Check:

$$35 \cdot \frac{w}{35} = 35 \cdot \frac{4}{7}$$

$$\frac{20}{35} \stackrel{?}{=} \frac{4}{7}$$

$$w = \frac{140}{7}$$

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

$$w = 20$$

4. $\frac{9}{2} = \frac{m}{12}$

Check:

$$12 \cdot \frac{9}{2} = 12 \cdot \frac{m}{12}$$

$$\frac{9}{2} \stackrel{?}{=} \frac{54}{12}$$

$$\frac{108}{2} = m$$

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

$$54 = m$$

5. $\frac{z}{54} = \frac{5}{9}$

Check:

$$54 \cdot \frac{z}{54} = 54 \cdot \frac{5}{9}$$

$$\frac{30}{54} \stackrel{?}{=} \frac{5}{9}$$

$$z = \frac{270}{9}$$

$$\frac{5}{9} = \frac{5}{9}$$

$$z = 30$$

6. $\frac{5}{125} = \frac{x}{1029}$

$$1029 \cdot \frac{5}{125} = 1029 \cdot \frac{x}{1029}$$

$$\frac{5145}{125} = x$$

$$41.16 = x$$

The elevator travels from the lobby to the observation level in 41.16 seconds.

7. $\frac{2}{5} = \frac{x}{25}$

$$25 \cdot \frac{2}{5} = 25 \cdot \frac{x}{25}$$

$$\frac{50}{5} = x$$

$$10 = x$$

It is likely that 10 blue moons will occur in the next 25 years.

3.5 Exercises (pp. 165–167)

Skill Practice

1. A proportion is an equation that states that two ratios are equal.

2. *Sample Answer:* $\frac{3}{8}$; 3:8, 3 to 8

3. no; 14 to 18 = 7 to 9

4. yes

5. yes

6. no; 28 to 32 = 7 to 8

7. $\frac{2}{5} = \frac{x}{3}$

Check:

$$3 \cdot \frac{2}{5} = 3 \cdot \frac{x}{3}$$

$$\frac{2}{5} \stackrel{?}{=} \frac{6}{5}$$

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

$$\frac{2}{5} \stackrel{?}{=} \frac{6}{5}$$

$$\frac{2}{5} = \frac{2}{5}$$

8. $\frac{4}{1} = \frac{z}{16}$

Check:

$$16 \cdot \frac{4}{1} = 16 \cdot \frac{z}{16}$$

$$\frac{4}{1} \stackrel{?}{=} \frac{64}{16}$$

$$64 = z$$

$$4 = 4$$

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

Check:

$$8 \cdot \frac{c}{8} = 8 \cdot \frac{11}{4}$$

$$\frac{22}{8} \stackrel{?}{=} \frac{11}{4}$$

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

$$\frac{11}{4} = \frac{11}{4}$$

$$c = 22$$

10. $\frac{36}{12} = \frac{x}{2}$

Check:

$$2 \cdot \frac{36}{12} = 2 \cdot \frac{x}{2}$$

$$\frac{36}{12} \stackrel{?}{=} \frac{6}{2}$$

$$\frac{72}{12} = x$$

$$\frac{6}{2} = \frac{6}{2}$$

$$6 = x$$

11. $\frac{16}{7} = \frac{m}{21}$

Check:

$$21 \cdot \frac{16}{7} = 21 \cdot \frac{m}{21}$$

$$\frac{16}{7} \stackrel{?}{=} \frac{48}{21}$$

$$\frac{336}{7} = m$$

$$\frac{16}{7} = \frac{16}{7}$$

$$48 = m$$

12. $\frac{k}{9} = \frac{10}{18}$

Check:

$$9 \cdot \frac{k}{9} = 9 \cdot \frac{10}{18}$$

$$\frac{5}{9} \stackrel{?}{=} \frac{10}{18}$$

$$k = \frac{90}{18}$$

$$\frac{5}{9} = \frac{5}{9}$$

$$k = 5$$

Chapter 3, continued

13. $\frac{5}{8} = \frac{t}{24}$ Check:

$$24 \cdot \frac{5}{8} = 24 \cdot \frac{t}{24} \quad \frac{5}{8} \stackrel{?}{=} \frac{15}{24}$$

$$\frac{120}{8} = t \quad \frac{5}{8} = \frac{5}{8}$$

$$15 = t$$

14. $\frac{d}{5} = \frac{80}{100}$ Check:

$$5 \cdot \frac{d}{5} = 5 \cdot \frac{80}{100} \quad \frac{4}{5} \stackrel{?}{=} \frac{80}{100}$$

$$d = \frac{400}{100} \quad \frac{4}{5} = \frac{4}{5}$$

$$d = 4$$

15. $\frac{v}{20} = \frac{8}{4}$ Check:

$$20 \cdot \frac{v}{20} = 20 \cdot \frac{8}{4} \quad \frac{40}{20} \stackrel{?}{=} \frac{8}{4}$$

$$v = \frac{160}{4} \quad \frac{8}{4} = \frac{8}{4}$$

$$v = 40$$

16. $\frac{r}{60} = \frac{40}{50}$ Check:

$$60 \cdot \frac{r}{60} = 60 \cdot \frac{40}{50} \quad \frac{48}{60} \stackrel{?}{=} \frac{40}{50}$$

$$r = \frac{2400}{50} \quad \frac{4}{5} = \frac{4}{5}$$

$$r = 48$$

17. $\frac{16}{48} = \frac{n}{36}$ Check:

$$36 \cdot \frac{16}{48} = 36 \cdot \frac{n}{36} \quad \frac{16}{48} \stackrel{?}{=} \frac{12}{36}$$

$$\frac{576}{48} = n \quad \frac{1}{3} = \frac{1}{3}$$

$$12 = n$$

18. $\frac{49}{98} = \frac{s}{112}$ Check:

$$112 \cdot \frac{49}{98} = 112 \cdot \frac{s}{112} \quad \frac{49}{98} \stackrel{?}{=} \frac{56}{112}$$

$$\frac{5488}{98} = s \quad \frac{1}{2} = \frac{1}{2}$$

$$56 = s$$

19. C; 20. B;

$$\frac{8}{5} = \frac{x}{20} \quad \frac{z}{15} = \frac{28}{35}$$

$$20 \cdot \frac{8}{5} = 20 \cdot \frac{x}{20} \quad 15 \cdot \frac{z}{15} = 15 \cdot \frac{28}{35}$$

$$\frac{160}{5} = x \quad z = \frac{420}{35}$$

$$32 = x \quad z = 12$$

21. Both sides of the equation need to be multiplied by 6, not $\frac{1}{6}$.

$$\frac{3}{4} = \frac{x}{6}$$

$$6 \cdot \frac{3}{4} = 6 \cdot \frac{x}{6}$$

$$\frac{18}{4} = x$$

$$\frac{9}{2} = x$$

22. To keep both sides of the equation equal, you must multiply both sides by the same number. The right side should be multiplied by 10, not 20.

$$\frac{m}{10} = \frac{50}{20}$$

$$10 \cdot \frac{m}{10} = 10 \cdot \frac{50}{20}$$

$$m = \frac{500}{20}$$

$$m = 25$$

23. $\frac{3}{8} = \frac{x}{32}$

$$32 \cdot \frac{3}{8} = 32 \cdot \frac{x}{32}$$

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

$$12 = x$$

25. $\frac{x}{4} = \frac{8}{16}$

$$4 \cdot \frac{x}{4} = 4 \cdot \frac{8}{16}$$

$$x = \frac{32}{16}$$

$$x = 2$$

27. $\frac{b}{10} = \frac{7}{2}$

$$10 \cdot \frac{b}{10} = 10 \cdot \frac{7}{2}$$

$$b = \frac{70}{2}$$

$$b = 35$$

29. $\frac{12}{18} = \frac{d}{27}$

$$27 \cdot \frac{12}{18} = 27 \cdot \frac{d}{27}$$

$$\frac{324}{18} = d$$

$$18 = d$$

24. $\frac{5}{7} = \frac{a}{49}$

$$49 \cdot \frac{5}{7} = 49 \cdot \frac{a}{49}$$

$$\frac{245}{7} = a$$

$$35 = a$$

26. $\frac{y}{20} = \frac{9}{5}$

$$20 \cdot \frac{y}{20} = 20 \cdot \frac{9}{5}$$

$$y = \frac{180}{5}$$

$$y = 36$$

28. $\frac{4}{12} = \frac{n}{3}$

$$3 \cdot \frac{4}{12} = 3 \cdot \frac{n}{3}$$

$$\frac{12}{12} = n$$

$$1 = n$$

30. $\frac{t}{21} = \frac{40}{28}$

$$21 \cdot \frac{t}{21} = 21 \cdot \frac{40}{28}$$

$$t = \frac{840}{28}$$

$$t = 30$$

Chapter 3, continued

$$31. \quad \frac{b}{0.5} = \frac{9}{2.5}$$

Check:

$$0.5\left(\frac{b}{0.5}\right) = 0.5\left(\frac{9}{2.5}\right)$$

$$\frac{1.8}{0.5} \stackrel{?}{=} \frac{9}{2.5}$$

$$b = \frac{4.5}{2.5}$$

$$3.6 = 3.6$$

$$b = 1.8$$

$$32. \quad \frac{1.1}{1.2} = \frac{n}{3.6}$$

Check:

$$3.6\left(\frac{1.1}{1.2}\right) = 3.6\left(\frac{n}{3.6}\right)$$

$$\frac{1.1}{1.2} \stackrel{?}{=} \frac{3.3}{3.6}$$

$$\frac{3.96}{1.2} = n$$

$$0.917 = 0.917$$

$$3.3 = n$$

$$33. \quad \frac{2.1}{7.7} = \frac{v}{8.8}$$

Check:

$$8.8\left(\frac{2.1}{7.7}\right) = 8.8\left(\frac{v}{8.8}\right)$$

$$\frac{2.1}{7.7} \stackrel{?}{=} \frac{2.4}{8.8}$$

$$\frac{18.48}{7.7} = v$$

$$0.273 = 0.273$$

$$2.4 = v$$

$$34. \quad \frac{36}{54} = \frac{2x}{6}$$

Check:

$$6\left(\frac{36}{54}\right) = 6\left(\frac{2x}{6}\right)$$

$$\frac{36}{54} \stackrel{?}{=} \frac{2(2)}{6}$$

$$\frac{216}{54} = 2x$$

$$\frac{36}{54} \stackrel{?}{=} \frac{4}{6}$$

$$4 = 2x$$

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

$$2 = x$$

$$35. \quad \frac{3a}{4} = \frac{36}{12}$$

Check:

$$4\left(\frac{3a}{4}\right) = 4\left(\frac{36}{12}\right)$$

$$\frac{3(4)}{4} \stackrel{?}{=} \frac{36}{12}$$

$$3a = \frac{144}{12}$$

$$\frac{12}{4} \stackrel{?}{=} \frac{36}{12}$$

$$3a = 12$$

$$3 = 3$$

$$a = 4$$

$$36. \quad \frac{10h}{108} = \frac{5}{9}$$

Check:

$$108\left(\frac{10h}{108}\right) = 108\left(\frac{5}{9}\right)$$

$$\frac{10(6)}{108} \stackrel{?}{=} \frac{5}{9}$$

$$10h = \frac{540}{9}$$

$$\frac{60}{108} \stackrel{?}{=} \frac{5}{9}$$

$$10h = 60$$

$$\frac{5}{9} = \frac{5}{9}$$

$$h = 6$$

$$37. \quad \frac{6r}{10} = \frac{36}{15}$$

Check:

$$10\left(\frac{6r}{10}\right) = 10\left(\frac{36}{15}\right)$$

$$\frac{6(4)}{10} \stackrel{?}{=} \frac{36}{15}$$

$$6r = \frac{360}{15}$$

$$\frac{24}{10} \stackrel{?}{=} \frac{36}{15}$$

$$6r = 24$$

$$2.4 = 2.4$$

$$r = 4$$

$$38. \quad \frac{12}{42} = \frac{4w}{56}$$

Check:

$$56\left(\frac{12}{42}\right) = 56\left(\frac{4w}{56}\right)$$

$$\frac{12}{42} \stackrel{?}{=} \frac{4(4)}{56}$$

$$\frac{672}{42} = 4w$$

$$\frac{12}{42} \stackrel{?}{=} \frac{16}{56}$$

$$16 = 4w$$

$$\frac{2}{7} = \frac{2}{7}$$

$$4 = w$$

$$39. \quad \frac{m+3}{8} = \frac{40}{64}$$

Check:

$$8\left(\frac{m+3}{8}\right) = 8\left(\frac{40}{64}\right)$$

$$\frac{2+3}{8} \stackrel{?}{=} \frac{40}{64}$$

$$m+3 = \frac{320}{64}$$

$$\frac{5}{8} \stackrel{?}{=} \frac{40}{64}$$

$$m+3 = 5$$

$$\frac{5}{8} = \frac{5}{8}$$

$$m = 2$$

$$40. \quad \frac{5}{13} = \frac{k-4}{39}$$

Check:

$$39\left(\frac{5}{13}\right) = 39\left(\frac{k-4}{39}\right)$$

$$\frac{5}{13} \stackrel{?}{=} \frac{19-4}{39}$$

$$\frac{195}{13} = k-4$$

$$\frac{5}{13} \stackrel{?}{=} \frac{15}{39}$$

$$15 = k-4$$

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

$$19 = k$$

$$41. \quad \frac{7}{112} = \frac{c-3}{8}$$

Check:

$$8\left(\frac{7}{112}\right) = 8\left(\frac{c-3}{8}\right)$$

$$\frac{7}{112} \stackrel{?}{=} \frac{3.5-3}{8}$$

$$\frac{56}{112} = c-3$$

$$0.0625 \stackrel{?}{=} \frac{0.5}{8}$$

$$0.5 = c-3$$

$$0.0625 = 0.0625$$

$$3.5 = c$$

$$42. \quad \frac{6+n}{60} = \frac{15}{90}$$

Check:

$$60\left(\frac{6+n}{60}\right) = 60\left(\frac{15}{90}\right)$$

$$\frac{6+4}{60} \stackrel{?}{=} \frac{15}{90}$$

$$6+n = \frac{900}{90}$$

$$\frac{10}{60} \stackrel{?}{=} \frac{15}{90}$$

$$6+n = 10$$

$$\frac{1}{6} = \frac{1}{6}$$

$$n = 4$$

$$43. \text{ Yes. Sample answer: } \frac{3}{6} = \frac{4}{8}$$

Both $\frac{3}{6}$ and $\frac{4}{8}$ simplify to $\frac{1}{2}$, therefore they form a proportion.

Chapter 3, continued

44. Yes; multiply both sides of the equation by b to get

$$b \cdot \frac{a}{b} = b \cdot \frac{c}{d}$$

$$a = \frac{bc}{d}$$

Then divide both sides by c to get

$$\frac{a}{c} = \frac{bc}{dc}$$

$$\frac{a}{c} = \frac{b}{d}$$

Problem Solving

45. $\frac{\text{number from Kentucky}}{\text{total}} = \frac{6}{435} = \frac{2}{145}$

46. $30 - 16 = 14$ girls

$$\frac{\text{girls}}{\text{boys}} = \frac{14}{16} = \frac{7}{8}$$

47. $\frac{\text{small pizzas}}{\text{large pizzas}} = \frac{96}{240} = \frac{2}{5}$

48. $\frac{\text{medium pizzas}}{\text{large pizzas}} = \frac{144}{240} = \frac{3}{5}$

49. $\frac{\text{large pizzas}}{\text{all pizzas}} = \frac{240}{96 + 144 + 240} = \frac{240}{480} = \frac{1}{2}$

50. $\frac{7}{10} = \frac{x}{30}$

$$30\left(\frac{7}{10}\right) = 30\left(\frac{x}{30}\right)$$

$$\frac{210}{10} = x$$

$$21 = x$$

The students can read 21 pages in 30 minutes.

51. $\frac{10}{4} = \frac{x}{18}$

$$18\left(\frac{10}{4}\right) = 18\left(\frac{x}{18}\right)$$

$$\frac{180}{4} = x$$

$$45 = x$$

The team will score 45 goals in the remaining games.

52. a. $\frac{1.85}{1} = \frac{x}{38}$

$$38\left(\frac{1.85}{1}\right) = 38\left(\frac{x}{38}\right)$$

$$70.3 = x$$

The length is 70.3 feet.

Width (ft)	Length (ft)
20	37
25	46.25
30	55.5
35	64.75
40	74

The answer in part (a) is reasonable because the table shows that when the width is between 35 and 40 feet, the length is between 64.75 and 74 feet. The answer of 70.3 feet is in this range.

53. a. $\frac{\text{snowboarders}}{\text{all}} = \frac{10}{10 + 13} = \frac{10}{23}$

b. $\frac{10}{23} = \frac{x}{253}$

$$253\left(\frac{10}{23}\right) = 253\left(\frac{x}{253}\right)$$

$$\frac{2530}{23} = x$$

$$110 = x$$

There were 110 lift tickets sold to snowboarders.

c. $\frac{\text{rented}}{\text{all}} = \frac{4}{4 + 7} = \frac{4}{11}$

$$\frac{4}{11} = \frac{x}{110}$$

$$110\left(\frac{4}{11}\right) = 110\left(\frac{x}{110}\right)$$

$$\frac{440}{11} = x$$

$$40 = x$$

There were 40 snowboarders who rented snowboards.

54. a. $\frac{10}{3} = \frac{x}{11}$

b. $\frac{5}{2} = \frac{x}{14}$

c. $\frac{10}{3} = \frac{x}{11}$

$$11\left(\frac{10}{3}\right) = 11\left(\frac{x}{11}\right)$$

$$\frac{110}{3} = x$$

$$36.67 = x$$

You will have to wait 36.67 minutes.

$$\frac{5}{4} = \frac{x}{14}$$

$$14\left(\frac{5}{4}\right) = 14\left(\frac{x}{14}\right)$$

$$\frac{70}{2} = x$$

$$35 = x$$

Your friend will have to wait 35 minutes. By solving both proportions, we see that your friend has a shorter wait and will be able to purchase tickets first.

Chapter 3, continued

55. Let x = distance slower car travels.

$$\frac{x}{30} = \frac{x + 15}{50}$$

$$50\left(\frac{x}{30}\right) = 50\left(\frac{x + 15}{50}\right)$$

$$\frac{50x}{30} = x + 15$$

$$30\left(\frac{50x}{30}\right) = 30(x + 15)$$

$$50x = 30x + 450$$

$$20x = 450$$

$$x = 22.5$$

$$22.5 + 15 = 37.5$$

The slower car travels 22.5 miles, and the faster car travels 37.5 miles.

Mixed Review

56. The pairing is not a function because the input 2 is paired with both -1 and -2 .

57. The pairing is a function because each input is paired with exactly one output.

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

domain: 0, 2, 4, 6

range: 1, 2, 3, 4

60. $y = x + 2$

domain: 0, 1, 2, 3

range: 2, 3, 4, 5

61. $-2y = 18$

$$y = -9$$

Check:

$$-2(-9) \stackrel{?}{=} 18$$

$$18 = 18$$

63. $56 = 7(z + 5)$

$$56 = 7z + 35$$

$$21 = 7z$$

$$3 = z$$

Check:

$$56 \stackrel{?}{=} 7(3 + 5)$$

$$56 \stackrel{?}{=} 7(8)$$

$$56 = 56$$

65. $5(c - 12) = 2c$

$$5c - 60 = 2c$$

$$-60 = -3c$$

$$20 = c$$

Check:

$$5(20 - 12) \stackrel{?}{=} 2(20)$$

$$5(8) \stackrel{?}{=} 2(20)$$

$$40 = 40$$

59. $y = x - 1$

domain: 2, 3, 4, 5, 6

range: 1, 2, 3, 4, 5

62. $20x = 40$

$$x = 2$$

Check:

$$20(2) \stackrel{?}{=} 40$$

$$40 = 40$$

64. $16(r + 3) = -48$

$$16r + 48 = -48$$

$$16r = -96$$

$$r = -6$$

Check:

$$16(-6 + 3) \stackrel{?}{=} -48$$

$$16(-3) \stackrel{?}{=} -48$$

$$-48 = -48$$

66. $b + 11 = 3(b - 1)$

$$b + 11 = 3b - 3$$

$$11 = 2b - 3$$

$$14 = 2b$$

$$7 = b$$

Check:

$$7 + 11 \stackrel{?}{=} 3(7 - 1)$$

$$18 \stackrel{?}{=} 3(6)$$

$$18 = 18$$

Lesson 3.6

3.6 Guided Practice (pp. 169–170)

1. $\frac{4}{a} = \frac{24}{30}$

$$4(30) = 24a$$

$$120 = 24a$$

$$5 = a$$

2. $\frac{3}{x} = \frac{2}{x - 6}$

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

$$3x - 18 = 2x$$

$$-18 = -x$$

$$18 = x$$

3. $\frac{m}{5} = \frac{m - 6}{4}$

$$4m = 5(m - 6)$$

$$4m = 5m - 30$$

$$-m = -30$$

$$m = 30$$

4. $\frac{8}{100} = \frac{x}{260}$

$$8(260) = 100x$$

$$2080 = 100x$$

$$20.8 = x$$

The seal should be fed 20.8 pounds of food per day.

5. distance on map = 2.4 cm

$$\frac{1}{85} = \frac{2.4}{d}$$

$$1(d) = 85(2.4)$$

$$d = 204$$

The actual distance between Columbus and Cleveland is about 204 kilometers.

6. $\frac{1}{600} = \frac{1.6}{x}$

$$x = 600(1.6)$$

$$x = 960 \text{ ft}$$

The actual length of the *Queen Elizabeth II* is about 960 feet.

3.6 Exercises (pp. 171–173)

Skill Practice

- In a proportion, a *cross product* is the product of the numerator of one ratio and the denominator of the other ratio.
- Measure the distance in centimeters in the drawing and then substitute the value in the proportion

$$\frac{1}{3} = \frac{\text{distance in drawing}}{\text{actual distance}}$$

Chapter 3, continued

3. $\frac{2}{3} = \frac{4}{x}$
 $2x = 3(4)$
 $2x = 12$
 $x = 6$
- Check:
 $\frac{2}{3} \stackrel{?}{=} \frac{4}{6}$
 $2(6) \stackrel{?}{=} 4(3)$
 $12 = 12$
4. $\frac{3}{y} = \frac{15}{35}$
 $15y = 3(35)$
 $15y = 105$
 $y = 7$
- Check:
 $\frac{3}{7} \stackrel{?}{=} \frac{15}{35}$
 $3(35) \stackrel{?}{=} 7(15)$
 $105 = 105$
5. $\frac{13}{6} = \frac{52}{z}$
 $13z = 6(52)$
 $13z = 312$
 $z = 24$
- Check:
 $\frac{13}{6} \stackrel{?}{=} \frac{52}{24}$
 $13(24) \stackrel{?}{=} 6(52)$
 $312 = 312$
6. $\frac{10}{45} = \frac{v}{27}$
 $10(27) = 45v$
 $270 = 45v$
 $6 = v$
- Check:
 $\frac{10}{45} \stackrel{?}{=} \frac{6}{27}$
 $10(27) \stackrel{?}{=} 45(6)$
 $270 = 270$
7. $\frac{5m}{6} = \frac{10}{12}$
 $12(5m) = 6(10)$
 $60m = 60$
 $m = 1$
- Check:
 $\frac{5(1)}{6} \stackrel{?}{=} \frac{10}{12}$
 $5(1)(12) \stackrel{?}{=} 6(10)$
 $60 = 60$
8. $\frac{3k}{27} = \frac{2}{3}$
 $3(3k) = 2(27)$
 $9k = 54$
 $k = 6$
- Check:
 $\frac{3(6)}{27} \stackrel{?}{=} \frac{2}{3}$
 $\frac{18}{27} \stackrel{?}{=} \frac{2}{3}$
 $54 = 54$
9. $-\frac{49}{7} = \frac{a+7}{6}$
 $-49(6) = 7(a+7)$
 $-294 = 7a + 49$
 $-343 = 7a$
 $-49 = a$
- Check:
 $-\frac{49}{7} \stackrel{?}{=} \frac{-49+7}{6}$
 $-\frac{49}{7} \stackrel{?}{=} \frac{-42}{6}$
 $-7 = -7$
10. $\frac{6}{t+4} = \frac{42}{77}$
 $6(77) = 42(t+4)$
 $462 = 42t + 168$
 $294 = 42t$
 $7 = t$
- Check:
 $\frac{6}{7+4} \stackrel{?}{=} \frac{42}{77}$
 $6(77) \stackrel{?}{=} 42(7+4)$
 $462 \stackrel{?}{=} 42(11)$
 $462 = 462$
11. $\frac{8}{12} = \frac{r}{r+1}$
 $8(r+1) = 12r$
 $8r + 8 = 12r$
 $8 = 4r$
 $2 = r$
- Check:
 $\frac{8}{12} \stackrel{?}{=} \frac{2}{2+1}$
 $8(2+1) \stackrel{?}{=} 12(2)$
 $8(3) \stackrel{?}{=} 12(2)$
 $24 = 24$
12. $\frac{n}{n-12} = \frac{9}{5}$
 $5n = 9(n-12)$
 $5n = 9n - 108$
 $-4n = -108$
 $n = 27$
- Check:
 $\frac{27}{27-12} \stackrel{?}{=} \frac{9}{5}$
 $27(5) \stackrel{?}{=} 9(27-12)$
 $135 \stackrel{?}{=} 9(15)$
 $135 = 135$
13. $\frac{11}{w} = \frac{33}{w+24}$
 $11(w+24) = 33w$
 $11w + 264 = 33w$
 $264 = 22w$
 $12 = w$
- Check:
 $\frac{11}{12} \stackrel{?}{=} \frac{33}{12+24}$
 $11(12+24) \stackrel{?}{=} 12(33)$
 $11(36) \stackrel{?}{=} 12(33)$
 $396 = 396$
14. $\frac{18}{d+13} = \frac{6}{d-13}$
 $18(d-13) = 6(d+13)$
 $18d - 234 = 6d + 78$
 $12d - 234 = 78$
 $12d = 312$
 $d = 26$
- Check:
 $\frac{18}{26+13} \stackrel{?}{=} \frac{6}{26-13}$
 $6(26+13) \stackrel{?}{=} 18(26-13)$
 $6(39) \stackrel{?}{=} 18(13)$
 $234 = 234$
15. B;
16. D;
- $\frac{15}{-2h} = \frac{5}{12}$
 $15(12) = -2h(5)$
 $180 = -10h$
 $-18 = h$
- $\frac{7}{s-14} = \frac{21}{s+18}$
 $7(s+18) = 21(s-14)$
 $7s + 126 = 21s - 294$
 $126 = 14s - 294$
 $420 = 14s$
 $30 = s$
17. The cross products property states that the product of the numerator of one ratio and the denominator of the other can be used to solve a proportion, not the numerator of one and the numerator of the other.
- $\frac{4}{3} = \frac{16}{x}$
 $4x = 3(16)$
 $4x = 48$
 $x = 12$

Chapter 3, continued

18. The error occurred in cross multiplying 14 and $b + 2$. Distribute the 14 to both b and 2.

$$\frac{18}{14} = \frac{b+2}{b}$$

$$18b = 14(b+2)$$

$$18b = 14b + 28$$

$$4b = 28$$

$$b = 7$$

19. $\frac{7}{3} = \frac{2x+5}{x}$

$$7x = 3(2x+5)$$

$$7x = 6x + 15$$

$$x = 15$$

Check:

$$\frac{7}{3} \stackrel{?}{=} \frac{2 \cdot 15 + 5}{15}$$

$$\frac{7}{3} \stackrel{?}{=} \frac{30 + 5}{15}$$

$$\frac{7}{3} \stackrel{?}{=} \frac{35}{15}$$

$$\frac{7}{3} = \frac{7}{3}$$

20. $\frac{a}{9a-2} = \frac{1}{8}$

$$8a = 1(9a-2)$$

$$8a = 9a - 2$$

$$-a = -2$$

$$a = 2$$

21. $\frac{24}{5+z} = \frac{4}{z-1}$

$$24(z-1) = 4(5z+4)$$

$$24z - 24 = 20z + 16$$

$$4z - 24 = 16$$

$$4z = 40$$

$$z = 10$$

22. $\frac{c-8}{-2} = \frac{11-4c}{11}$

$$11(c-8) = -2(11-4c)$$

$$11c - 88 = -22 + 8c$$

$$3c - 88 = -22$$

$$3c = 66$$

$$c = 22$$

23. $\frac{k-8}{7+k} = \frac{-1}{5}$

$$5(k-8) = -1(7+k)$$

$$5k - 40 = -7 - k$$

$$6k - 40 = -7$$

$$6k = 33$$

$$k = 5.5$$

Check:

$$\frac{2}{9(2)-2} \stackrel{?}{=} \frac{1}{8}$$

$$2(8) \stackrel{?}{=} (9 \cdot 2 - 2)$$

$$16 \stackrel{?}{=} 18 - 2$$

$$16 = 16$$

Check:

$$\frac{24}{5(10)+4} \stackrel{?}{=} \frac{4}{10-1}$$

$$\frac{24}{54} \stackrel{?}{=} \frac{4}{9}$$

$$24(9) \stackrel{?}{=} 54(4)$$

$$216 = 216$$

Check:

$$\frac{22-8}{-2} \stackrel{?}{=} \frac{11-4(22)}{11}$$

$$\frac{14}{-2} \stackrel{?}{=} \frac{-77}{11}$$

$$14(11) \stackrel{?}{=} -2(-77)$$

$$154 = 154$$

Check:

$$\frac{5.5-8}{7+5.5} \stackrel{?}{=} \frac{-1}{5}$$

$$\frac{-2.5}{12.5} \stackrel{?}{=} \frac{-1}{5}$$

$$-2.5(5) \stackrel{?}{=} 12.5(-1)$$

$$-12.5 = -12.5$$

24. $\frac{2}{-3} = \frac{4v+4}{2v+14}$

$$2(2v+14) = -3(4v+4)$$

$$4v+28 = -12v-12$$

$$16v+28 = -12$$

$$16v = -40$$

$$v = -2.5$$

25. $\frac{m+1}{4} = \frac{3m+6}{7}$

$$7(m+1) = 4(3m+6)$$

$$7m+7 = 12m+24$$

$$7 = 5m+24$$

$$-17 = 5m$$

$$-3.4 = m$$

26. $\frac{6}{4+2w} = \frac{-2}{w-10}$

$$6(w-10) = -2(4+2w)$$

$$6w-60 = -8-4w$$

$$10w-60 = -8$$

$$10w = 52$$

$$w = 5.2$$

27. $\frac{n+0.3}{n-3.2} = \frac{9}{2}$

$$9(n-3.2) = 2(n+0.3)$$

$$9n-28.8 = 2n+0.6$$

$$7n-28.8 = 0.6$$

$$7n = 29.4$$

$$n = 4.2$$

28. $\frac{-3}{11} = \frac{5-h}{h+1.4}$

$$-3(h+1.4) = 11(5-h)$$

$$-3h-4.2 = 55-11h$$

$$8h-4.2 = 55$$

$$8h = 59.2$$

$$h = 7.4$$

29. $\frac{4}{b-3.9} = \frac{2}{b+1}$

$$4(b+1) = 2(b-3.9)$$

$$4b+4 = 2b-7.8$$

$$2b+4 = -7.8$$

$$2b = -11.8$$

$$b = -5.9$$

Check:

$$\frac{2}{-3} \stackrel{?}{=} \frac{4(-2.5)+4}{2(-2.5)+14}$$

$$\frac{2}{-3} \stackrel{?}{=} \frac{-6}{9}$$

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

$$18 = 18$$

Check:

$$\frac{-3.4+1}{4} \stackrel{?}{=} \frac{3(-3.4)+6}{7}$$

$$\frac{-2.4}{4} \stackrel{?}{=} \frac{-4.2}{7}$$

$$-2.4(7) \stackrel{?}{=} 4(-4.2)$$

$$-16.8 = -16.8$$

Check:

$$\frac{6}{4+2(5.2)} \stackrel{?}{=} \frac{-2}{5.2-10}$$

$$\frac{6}{14.4} \stackrel{?}{=} \frac{-2}{-4.8}$$

$$6(-4.8) \stackrel{?}{=} 14.4(-2)$$

$$-28.8 = -28.8$$

Check:

$$\frac{4.2+0.3}{4.2-3.2} \stackrel{?}{=} \frac{9}{2}$$

$$\frac{4.5}{1} \stackrel{?}{=} \frac{9}{2}$$

$$4.5(2) \stackrel{?}{=} 1(9)$$

$$9 = 9$$

Check:

$$\frac{-3}{11} \stackrel{?}{=} \frac{5-7.4}{7.4+1.4}$$

$$\frac{-3}{11} \stackrel{?}{=} \frac{-2.4}{8.8}$$

$$-3(8.8) \stackrel{?}{=} 11(-2.4)$$

$$-26.4 = -26.4$$

Check:

$$\frac{4}{-5.9-3.9} \stackrel{?}{=} \frac{2}{-5.9+1}$$

$$\frac{4}{-9.8} \stackrel{?}{=} \frac{2}{-4.9}$$

$$4(-4.9) \stackrel{?}{=} -9.8(2)$$

$$-19.6 = -19.6$$

Chapter 3, continued

$$30. \quad \frac{16.5 + 3t}{3} = \frac{0.9 - t}{-5}$$

$$-5(16.5 + 3t) = 3(0.9 - t)$$

$$-82.5 - 15t = 2.7 - 3t$$

$$-82.5 = 2.7 + 12t$$

$$-85.2 = 12t$$

$$-7.1 = t$$

Check:

$$\frac{16.5 + 3(-7.1)}{3} \stackrel{?}{=} \frac{0.9 - (-7.1)}{-5}$$

$$\frac{-4.8}{3} \stackrel{?}{=} \frac{8}{-5}$$

$$-4.8(-5) \stackrel{?}{=} 3(8)$$

$$24 = 24$$

$$31. \quad \frac{a}{b} = \frac{c}{d} \quad \text{Given}$$

$$bd \cdot \frac{a}{b} = bd \cdot \frac{c}{d} \quad \text{Multiplication property of equality}$$

$$\frac{bd \cdot a}{b} = \frac{bd \cdot c}{d} \quad \text{Multiply.}$$

$$ab = cb \quad \text{Simplify.}$$

32. The value of h decreases as k increases because when we cross multiply we get $hk = 5(14)$. If k increases, it would have to be multiplied by a smaller number to remain equal to 5 times 14.

$$33. \quad \frac{\text{biscuits}}{\text{cups flour}} \rightarrow \frac{12}{2} = \frac{30}{x}$$

$$12x = 2(30)$$

$$12x = 60$$

$$x = 5$$

There are 5 cups of flour needed to make 30 biscuits.

$$34. \quad \frac{\text{time (min)}}{\text{photos}} \rightarrow \frac{7.2}{8} = \frac{x}{20}$$

$$8x = 20(7.2)$$

$$8x = 144$$

$$x = 18$$

It will take 18 minutes to upload 20 photographs.

$$35. \quad \frac{\text{cm}}{\text{km}} \rightarrow \frac{1}{15} = \frac{6}{x}$$

$$1(x) = 15(6)$$

$$x = 90$$

The actual distance is 90 kilometers.

$$36. \quad \frac{\text{cm}}{\text{km}} \rightarrow \frac{1}{15} = \frac{3.2}{x}$$

$$1(x) = 15(3.2)$$

$$x = 48$$

The actual distance is 48 kilometers.

$$37. \quad \frac{\text{cm}}{\text{km}} \rightarrow \frac{1}{15} = \frac{0.5}{x}$$

$$1(x) = 15(0.5)$$

$$x = 7.5$$

The actual distance is 7.5 kilometers.

$$38. \quad \frac{\text{cm}}{\text{km}} \rightarrow \frac{1}{15} = \frac{4.7}{x}$$

$$1(x) = 15(4.7)$$

$$x = 70.5$$

The actual distance is 70.5 kilometers.

$$39. \quad \frac{\text{model (m)}}{\text{actual (m)}} \rightarrow \frac{1}{25} = \frac{x}{443.2}$$

$$1(443.2) = 25x$$

$$443.2 = 25x$$

$$17.728 = x$$

The height of the model is 17.728 meters.

$$40. \text{ a. } \frac{\text{shell (in.)}}{\text{burst (ft)}} \rightarrow \frac{2}{90} = \frac{4.75}{x}$$

$$2x = 90(4.75)$$

$$2x = 427.5$$

$$x = 213.75$$

The burst diameter is 213.75 feet.

b.

Shell (in.)	Burst (ft)
2	90
3	135
4	180
5	225
6	270

The answer to part (a) makes sense because the shell was between 4 and 5 inches, so the burst should be between 180 and 225 feet.

$$41. \quad \frac{\text{length}}{\text{width}} \rightarrow \frac{3}{2} = \frac{6}{x}$$

$$3x = 2(6)$$

$$3x = 12$$

$$x = 4 \text{ in.}$$

$$\frac{\text{drawing (in.)}}{\text{actual (yd)}} \rightarrow \frac{1}{20} = \frac{4}{w}$$

$$1(w) = 20(4)$$

$$w = 80$$

The actual width of the field is 80 yards. By solving the proportion $\frac{3}{2} = \frac{6}{x}$, you find the width of the field in the drawing. That result can be put into another proportion to solve for the actual width of the field.

$$42. \text{ a. } \frac{\text{moles}}{\text{grams}} \rightarrow \frac{1}{1.008} = \frac{x}{4.58}$$

$$1(4.58) = 1.008x$$

$$4.58 = 1.008x$$

$$4.5 = x$$

There are 4.5 moles of hydrogen.

Chapter 3, continued

$$\text{b. } \frac{\text{moles}}{\text{grams}} \rightarrow \frac{1}{15,999} = \frac{x}{54.5}$$

$$1(54.5) = 15.999x$$

$$54.5 = 15.999x$$

$$3.4 = x$$

There are 3.4 moles of oxygen.

c. The ratio of moles of hydrogen to moles of oxygen

$$\text{is } \frac{4.5}{3.4} \approx \frac{1.32}{1}.$$

It is nearly equal to the ratio of moles of hydrogen to moles of carbon $\frac{4}{3} \approx \frac{1.33}{1}$.

$$43. \frac{\text{females}}{\text{all}} \rightarrow \frac{2}{5} = \frac{x}{75,000}$$

$$2(75,000) = 5x$$

$$150,000 = 5x$$

$$30,000 = x$$

$$75,000 - 30,000 = 45,000$$

There are 30,000 females and 45,000 males in attendance.

Mixed Review

$$44. 16 + \sqrt{x} = 16 + \sqrt{16}$$

$$= 16 + 4$$

$$= 20$$

$$46. -3 \cdot \sqrt{x} = -3 \cdot \sqrt{25}$$

$$= -3 \cdot 5$$

$$= -15$$

$$47. 2 \cdot \sqrt{x} + 11 = 2 \cdot \sqrt{144} + 11$$

$$= 2 \cdot 12 + 11$$

$$= 24 + 11$$

$$= 35$$

$$48. \frac{2}{3} = \frac{x}{21}$$

$$21 \cdot \frac{2}{3} = 21 \cdot \frac{x}{21}$$

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

$$14 = x$$

Check:

$$\frac{2}{3} \stackrel{?}{=} \frac{14}{21}$$

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

$$45. 27 - \sqrt{x} = 27 - \sqrt{81}$$

$$= 27 - 9$$

$$= 18$$

$$49. \frac{m}{6} = \frac{9}{2}$$

$$b \cdot \frac{m}{6} = 6 \cdot \frac{9}{2}$$

$$m = \frac{54}{2}$$

$$m = 27$$

Check:

$$\frac{27}{6} \stackrel{?}{=} \frac{9}{2}$$

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

$$50. \frac{z}{11} = \frac{-10}{22}$$

$$11 \cdot \frac{z}{11} = 11 \cdot \frac{-10}{22}$$

$$z = \frac{-110}{22}$$

$$z = -5$$

Check:

$$\frac{-5}{11} \stackrel{?}{=} \frac{-10}{22}$$

$$\frac{-5}{11} = \frac{-5}{11}$$

$$52. \frac{12}{36} = \frac{2c}{6}$$

$$6 \cdot \frac{12}{36} = 6 \cdot \frac{2c}{6}$$

$$\frac{72}{36} = 2c$$

$$2 = 2c$$

$$1 = c$$

Check:

$$\frac{12}{36} \stackrel{?}{=} \frac{2(1)}{6}$$

$$\frac{12}{36} \stackrel{?}{=} \frac{2}{6}$$

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

$$54. \frac{n-2}{50} = \frac{6}{30}$$

$$50 \cdot \frac{n-2}{50} = 50 \cdot \frac{6}{30}$$

$$n-2 = \frac{300}{30}$$

$$n-2 = 10$$

$$n = 12$$

Check:

$$\frac{12-2}{50} \stackrel{?}{=} \frac{6}{30}$$

$$\frac{10}{50} \stackrel{?}{=} \frac{6}{30}$$

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

$$51. \frac{12}{5} = \frac{b}{25}$$

$$25 \cdot \frac{12}{5} = 25 \cdot \frac{b}{25}$$

$$\frac{300}{5} = b$$

$$60 = b$$

Check:

$$\frac{12}{5} \stackrel{?}{=} \frac{60}{25}$$

$$\frac{12}{5} = \frac{12}{5}$$

$$53. \frac{9}{-8} = \frac{3w}{24}$$

$$24 \cdot \frac{9}{-8} = 24 \cdot \frac{3w}{24}$$

$$\frac{216}{-8} = 3w$$

$$-27 = 3w$$

$$-9 = w$$

Check:

$$\frac{9}{-8} \stackrel{?}{=} \frac{3(-9)}{24}$$

$$\frac{9}{-8} \stackrel{?}{=} \frac{-27}{24}$$

$$\frac{-9}{8} = \frac{-9}{8}$$

$$55. \frac{4}{13} = \frac{a+4}{39}$$

$$39 \cdot \frac{4}{13} = 39 \cdot \frac{a+4}{39}$$

$$\frac{156}{13} = a+4$$

$$12 = a+4$$

$$8 = a$$

Check:

$$\frac{4}{13} \stackrel{?}{=} \frac{8+4}{39}$$

$$\frac{4}{13} \stackrel{?}{=} \frac{12}{39}$$

$$\frac{4}{13} = \frac{4}{13}$$

Quiz 3.4-3.6 (p. 173)

$$1. y - 2 = y + 2$$

$$y - 2 - y = y + 2 - y$$

$$-2 \neq 2$$

no solution

$$2. 2x - 14 = -3x + 6$$

$$5x - 14 = 6$$

$$5x = 20$$

$$x = 4$$

$$3. 10z - 4 = 2(5z - 2)$$

$$10z - 4 = 10z - 4$$

The equation is an identity, so the solution is all real numbers.

Chapter 3, continued

4. $6m + 5 - 3m = 7(m - 1)$

$$3m + 5 = 7m - 7$$

$$5 = 4m - 7$$

$$12 = 4m$$

$$3 = m$$

5. $2(7 - g) = 9g + 14 - 11g$

$$14 - 2g = -2g + 14$$

$$-2g + 14 = -2g + 14$$

The equation is an identity, so the solution is all real numbers.

6. $13k + 3(k + 11) = 8k - 7$

$$13k + 3k + 33 = 8k - 7$$

$$16k + 33 = 8k - 7$$

$$8k + 33 = -7$$

$$8k = -40$$

$$k = -5$$

7. $\frac{1}{4}(8j - 3) = 2j - 3$

$$2j - \frac{3}{4} = 2j - 3$$

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

no solution

8. $8 - 4w = \frac{1}{3}(6w - 12)$

$$8 - 4w = 2w - 4$$

$$8 = 6w - 4$$

$$12 = 6w$$

$$2 = w$$

10. $\frac{24}{20} = \frac{x}{5}$

$$5 \cdot \frac{24}{20} = 5 \cdot \frac{x}{5}$$

$$\frac{120}{20} = x$$

$$6 = x$$

Check:

$$\frac{24}{20} \stackrel{?}{=} \frac{6}{5}$$

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

9. $\frac{2}{5}(10t - 50) = 4(9 - 6t)$

$$4t - 20 = 36 - 24t$$

$$28t - 20 = 36$$

$$28t = 56$$

$$t = 2$$

11. $\frac{6}{-7} = \frac{3z}{42}$

$$42 \cdot \frac{6}{-7} = 42 \cdot \frac{3z}{42}$$

$$\frac{252}{-7} = 3z$$

$$-36 = 3z$$

$$-12 = z$$

Check:

$$\frac{6}{-7} \stackrel{?}{=} \frac{3(-12)}{42}$$

$$\frac{6}{-7} \stackrel{?}{=} \frac{-36}{42}$$

$$\frac{-6}{7} = \frac{-6}{7}$$

12. $\frac{14}{12} = \frac{w + 11}{18}$

$$18 \cdot \frac{14}{12} = 18 \cdot \frac{w + 11}{18}$$

$$\frac{252}{12} = w + 11$$

$$21 = w + 11$$

$$10 = w$$

Check:

$$\frac{14}{12} \stackrel{?}{=} \frac{10 + 11}{18}$$

$$\frac{14}{12} \stackrel{?}{=} \frac{21}{18}$$

$$\frac{7}{6} = \frac{7}{6}$$

14. $\frac{10}{17} = \frac{k}{2k - 3}$

$$10(2k - 3) = 17k$$

$$20k - 30 = 17k$$

$$-30 = -3k$$

$$10 = k$$

Check:

$$\frac{10}{17} \stackrel{?}{=} \frac{10}{2(10) - 3}$$

$$\frac{10}{17} \stackrel{?}{=} \frac{10}{20 - 3}$$

$$\frac{10}{17} = \frac{10}{17}$$

16. $\frac{\text{length}}{\text{width}} \rightarrow \frac{5}{4} = \frac{60}{x}$

$$5x = 4(60)$$

$$5x = 240$$

$$x = 48$$

The width is 48 inches.

3.6 Extension (p. 175)

1. $\frac{JK}{MN} = \frac{JL}{MP}$

$$\frac{18}{24} = \frac{x}{32}$$

$$18(32) = 24x$$

$$576 = 24x$$

$$24 = x$$

JL is 24 inches.

13. $\frac{18}{5a} = \frac{3}{-5}$

$$18(-5) = 3(5a)$$

$$-90 = 15a$$

$$-6 = a$$

Check:

$$\frac{18}{5(-6)} \stackrel{?}{=} \frac{3}{-5}$$

$$\frac{18}{-30} \stackrel{?}{=} \frac{3}{-5}$$

$$18(-5) \stackrel{?}{=} -30(3)$$

$$-90 = -90$$

15. $\frac{h - 1}{3} = \frac{2h + 1}{9}$

$$3(2h + 1) = 9(h - 1)$$

$$6h + 3 = 9h - 9$$

$$3 = 3h - 9$$

$$12 = 3h$$

$$4 = h$$

Check:

$$\frac{4 - 1}{3} \stackrel{?}{=} \frac{2(4) + 1}{9}$$

$$\frac{3}{3} \stackrel{?}{=} \frac{8 + 1}{9}$$

$$\frac{3}{3} \stackrel{?}{=} \frac{9}{9}$$

$$1 = 1$$

2. $\frac{EF}{UV} = \frac{EG}{UW}$

$$\frac{14}{x} = \frac{21}{15}$$

$$14(15) = 21x$$

$$210 = 21x$$

$$10 = x$$

UV is 10 centimeters.

Chapter 3, continued

$$3. \frac{AD}{FJ} = \frac{AB}{FG}$$

$$\frac{x}{14} = \frac{40}{35}$$

$$35x = 14(40)$$

$$35x = 560$$

$$x = 16$$

AD is 16 meters.

$$4. \frac{JK}{QR} = \frac{JM}{QT}$$

$$\frac{36}{30} = \frac{48}{x}$$

$$36x = 30(48)$$

$$36x = 1440$$

$$x = 40$$

QT is 40 feet.

$$5. \frac{\text{height of student}}{\text{height of flagpole}} = \frac{\text{student shadow}}{\text{flagpole shadow}}$$

$$\frac{5 \text{ ft}}{x} = \frac{2 \text{ ft}}{15 \text{ ft}}$$

$$5(15) = 2x$$

$$75 = 2x$$

$$37.5 = x$$

The flagpole is 37.5 feet tall.

Lesson 3.7

3.7 Guided Practice (pp. 176–178)

$$1. \frac{15}{20} = \frac{p}{100}$$

$$1500 = 20p$$

$$75 = p$$

15 is 75% of 20.

$$3. a = p\% \cdot b$$

$$49 = p\% \cdot 56$$

$$0.875 = p\%$$

$$87.5\% = p\%$$

49 is 87.5% of 56.

$$5. a = p\% \cdot b$$

$$a = 45\% \cdot 92$$

$$a = 0.45 \cdot 92$$

$$a = 41.4$$

41.4 is 45% of 92.

$$7. a = p\% \cdot b$$

$$65 = 62.5\% \cdot b$$

$$65 = 0.625 \cdot b$$

$$104 = b$$

65 is 62.5% of 104.

$$9. a = p\% \cdot b$$

$$22 = p\% \cdot 220$$

$$0.1 = p\%$$

$$10\% = p\%$$

10% of students chose fettucine alfredo.

$$2. \frac{a}{90} = \frac{30}{100}$$

$$100a = 2700$$

$$a = 27$$

27 is 30% of 90.

$$4. a = p\% \cdot b$$

$$11 = p\% \cdot 55$$

$$0.2 = p\%$$

$$20\% = p\%$$

11 is 20% of 55.

$$6. a = p\% \cdot b$$

$$a = 140\% \cdot 50$$

$$a = 1.40 \cdot 50$$

$$a = 70$$

70 is 140% of 50.

$$8. a = p\% \cdot b$$

$$50 = 125\% \cdot b$$

$$50 = 1.25 \cdot b$$

$$40 = b$$

50 is 125% of 40.

$$2. \frac{28}{80} = \frac{35}{100}$$

$a = 28$ because it is the part of the base, $b = 80$ because it is the base, and $p = 35$ because it is the percent.

$$3. \frac{27}{75} = \frac{p}{100}$$

$$75p = 2700$$

$$p = 36$$

27 is 36% of 75.

$$5. \frac{a}{80} = \frac{35}{100}$$

$$80(35) = 100a$$

$$2800 = 100a$$

$$28 = a$$

28 is 35% of 80.

$$7. \frac{81}{b} = \frac{54}{100}$$

$$54b = 8100$$

$$b = 150$$

81 is 54% of 150.

$$9. 56 = p\% \cdot 80$$

$$0.7 = p\%$$

$$70\% = p\%$$

56 is 70% of 80.

$$11. 9.18 = p\% \cdot 153$$

$$0.06 = p\%$$

$$6\% = p\%$$

9.18 is 6% of 153.

$$13. a = 115\% \cdot 60$$

$$a = 1.15 \cdot 60$$

$$a = 69$$

69 is 115% of 60.

$$15. 7 = 28\% \cdot b$$

$$7 = 0.28b$$

$$25 = b$$

7 is 28% of 25.

$$17. 41.8 = 44\% \cdot b$$

$$41.8 = 0.44b$$

$$95 = b$$

41.8 is 44% of 95.

$$19. B;$$

$$a = 87.5\% \cdot 512$$

$$a = 0.875 \cdot 512$$

$$a = 448$$

20. The base, b , should be 95 and the part of the base, a , should be 19.

$$19 = p\% \cdot 95$$

$$0.2 = p\%$$

$$20\% = p\%$$

19 is 20% of 95.

$$4. \frac{66}{120} = \frac{p}{100}$$

$$120p = 6600$$

$$p = 55$$

66 is 55% of 120.

$$6. \frac{a}{85} = \frac{60}{100}$$

$$85(60) = 100a$$

$$5100 = 100a$$

$$51 = a$$

51 is 60% of 85.

$$8. \frac{42}{b} = \frac{200}{100}$$

$$200b = 4200$$

$$b = 21$$

42 is 200% of 21.

$$10. 99 = p\% \cdot 225$$

$$0.44 = p\%$$

$$44\% = p\%$$

99 is 44% of 225.

$$12. a = 18\% \cdot 150$$

$$a = 0.18 \cdot 150$$

$$a = 27$$

27 is 18% of 150.

$$14. a = 82\% \cdot 215$$

$$a = 0.82 \cdot 215$$

$$a = 176.3$$

176.3 is 82% of 215.

$$16. 189 = 90\% \cdot b$$

$$189 = 0.9b$$

$$210 = b$$

189 is 90% of 210.

$$18. 71.5 = 52\% \cdot b$$

$$71.5 = 0.52b$$

$$137.5 = b$$

71.5 is 52% of 137.5.

3.7 Exercises (pp. 179–181)

Skill Practice

1. 15 is the percent.

360 is the base.

54 is the part of the base.

Algebra 1

Worked-Out Solution Key

Chapter 3, continued

21. The percent was not properly changed to a decimal.

$$153 = 76.5\% \cdot b$$

$$153 = 0.765 \cdot b$$

$$200 = b$$

$$153 \text{ is } 76.5\% \text{ of } 200.$$

22. $n + 94 = p\% \cdot 140$

$$25 + 94 = p\% \cdot 140$$

$$119 = p\% \cdot 140$$

$$0.85 = p\%$$

$$85\% = p\%$$

24. $a = 52\% \cdot (2n + 15)$

$$a = 52\%(2 \cdot 25 + 15)$$

$$a = 52\%(50 + 15)$$

$$a = 52\% \cdot 65$$

$$a = 0.52 \cdot 65$$

$$a = 33.8$$

26. $3 = p\% \cdot 18.70$

$$0.16 = p\%$$

$$16\% = p\%$$

$$\$3.00 \text{ is } 16\% \text{ of } \$18.70.$$

28. $90 = p\% \cdot 125$

$$0.72 = p\%$$

$$72\% = p\%$$

$$90 \text{ rock CDs is } 72\% \text{ of } 125 \text{ CDs.}$$

30. *Sample answer:* It would be easier to use the percent equation because you would just have to multiply 25% by 600 to find the answer.

31. The area of the smaller square is not 40% of the area of the larger square. To find the area of a square you multiply the lengths of the sides.

$$0.4x(0.4x) = 0.16x^2.$$

So, the area of the smaller square would be 16% of the area of the larger square.

32. y is 10% of a number n .

$$y = 10\% \cdot n$$

$$y = 0.1n$$

$$\frac{y}{0.1} = n$$

$$50\% \text{ of } n = 0.5n.$$

$$0.5\left(\frac{y}{0.1}\right) = \frac{0.5y}{0.1} = 5y$$

$$5y \text{ is } 50\% \text{ of the number.}$$

Problem Solving

33. $18 = p\% \cdot 225$

$$0.08 = p\%$$

$$8\% = p\%$$

8% of the students walk to school.

23. $96 = p\% \cdot 4n$

$$96 = p\% \cdot 4(25)$$

$$96 = p\% \cdot 100$$

$$0.96 = p\%$$

$$96\% = p\%$$

25. $25.5 = (n - 8)\% \cdot b$

$$25.5 = (25 - 8)\% \cdot b$$

$$25.5 = 17\% \cdot b$$

$$25.5 = 0.17b$$

$$150 = b$$

27. $1.44 = p\% \cdot 24$

$$0.06 = p\%$$

$$6\% = p\%$$

$$\$1.44 \text{ is } 6\% \text{ of } \$24.00.$$

29. $241 = p\% \cdot 804$

$$0.30 = p\%$$

$$30\% = p\%$$

$$241 \text{ freshmen is } 30\% \text{ of } 804 \text{ students.}$$

35. a. $a = 36\% \cdot 250$

$$a = 0.36 \cdot 250$$

$$a = 90$$

90 of the listeners are “tired of” the song.

- b. $a = 14\% \cdot 250$

$$a = 0.14 \cdot 250$$

$$a = 35$$

35 of the listeners “love” the song.

- 36.

Year	Hikers who started	Hikers who completed	Percent completion
2001	2380	395	16.6%
2002	1880	376	20%
2003	1750	352	20.1%

$$a = 16.6\% \cdot 2380$$

$$a = 0.166 \cdot 2380$$

$$a = 395.08$$

$$376 = 20\% \cdot b$$

$$376 = 0.2b$$

$$1880 = b$$

$$352 = p\% \cdot 1750$$

$$0.201 = p\%$$

$$20.1\% = p\%$$

37. total hits = $4860 + 1350 + 1080 + 900 = 8190$

$$\text{English} \rightarrow 4860 = p\% \cdot 8190$$

$$0.593 = p\%$$

$$59.3\% = p\%$$

59.3% of the hits are English.

$$\text{French} \rightarrow 1350 = p\% \cdot 8190$$

$$0.165 = p\%$$

$$16.5\% = p\%$$

16.5% of the hits are French.

$$\text{Spanish} \rightarrow 1080 = p\% \cdot 8190$$

$$0.132 = p\%$$

$$13.2\% = p\%$$

13.2% of the hits are Spanish.

$$\text{Japanese} \rightarrow 900 = p\% \cdot 8190$$

$$0.11 = p\%$$

$$11\% = p\%$$

11% of the hits are Japanese.

38. Answer will vary.

$$\frac{x}{75} = \frac{15}{100}$$

$$100x = 75(15)$$

$$100x = 1125$$

$$x = 11.25$$

Chapter 3, continued

39. a. $a = 20\% \cdot 240$

$$a = 0.2 \cdot 240$$

$$a = 48$$

You will save \$48.

b. $a = 25\% \cdot 265$

$$a = 0.25 \cdot 265$$

$$a = 66.25$$

You will save \$66.25.

c. Price of first bicycle:

$$\$240 - \$48 = \$192$$

Price of second bicycle:

$$\$265 - \$66.25 = \$198.75$$

The bicycle from the first store costs less than the one from the second store, so you should buy that one.

40. $\frac{108.24}{60\%} = \frac{108.24}{0.6} = 180.40$

\$180.40 = amount remaining after savings deposit

Let x = paycheck.

$$x - 20\% \cdot x = 180.40$$

$$x - 0.2x = 180.40$$

$$0.8x = 180.40$$

$$x = 225.5$$

$$0.2 \cdot 225.5 = 45.1$$

She deposited \$45.10 in her savings account.

Mixed Review

41. $a = \ell w = 15(8) = 120 \text{ cm}^2$

42. $A = \frac{1}{2}bh = \frac{1}{2}(22)(13) = \frac{1}{2}(286) = 143 \text{ in.}^2$

43. $y = x - 7$

x	-5	-2	1	4
y	-12	-9	-6	-3

Range: -12, -9, -6, -3

44. $y = x + 4$

x	-6	-4	-2	0
y	-2	0	2	4

Range: -2, 0, 2, 4

45. $y = 6x + 3$

x	-1	1	3	5
y	-3	9	21	33

Range: -3, 9, 21, 33

46. $y = 5x - 5$

x	-2	-1	0	1
y	-15	-10	-5	0

Range: -15, -10, -5, 0

47. $-65 + (-27) = -92$ 48. $33 + (-58) = -25$

49. $-43.9 + 89.4 = 45.5$

50. $91.2 - (-20.3) = 91.2 + 20.3 = 111.5$

51. $-13 - 78 = -13 + (-78) = -91$

52. $28 - (-35) = 28 + 35 = 63$

3.7 Extension (p. 183)

1. $p\% = \frac{20 - 16}{16} = \frac{4}{16} = 0.25 = 25\%$

The percent of increase is 25%.

2. $p\% = \frac{49 - 35}{35} = \frac{14}{35} = 0.4 = 40\%$

The percent of increase is 40%.

3. $p\% = \frac{80 - 44}{80} = \frac{36}{80} = 0.45 = 45\%$

The percent of decrease is 45%.

4. $p\% = \frac{120 - 78}{120} = \frac{42}{120} = 0.35 = 35\%$

The percent of decrease is 35%.

5. $p\% = \frac{360 - 241.2}{360} = \frac{118.8}{360} = 0.33 = 33\%$

The percent of decrease is 33%.

6. $p\% = \frac{283.9 - 170}{170} = \frac{113.9}{170} = 0.67 = 67\%$

The percent of increase is 67%.

7. new amount = $14(100\% + 45\%) = 14(1.45) = 20.3$

8. new amount = $78(100\% + 80\%) = 78(1.8) = 140.4$

9. new amount = $44(100\% - 20\%) = 44(0.8) = 35.2$

10. new amount = $108(100\% - 90\%) = 108(0.1) = 10.8$

11. $p\% = \frac{1.50 - 1.25}{1.25} = \frac{0.25}{1.25} = 0.2 = 20\%$

The percent of change is a 20% increase.

12. $p\% = \frac{24 - 21.12}{24} = \frac{2.88}{24} = 0.12 = 12\%$

The percent of change is a 12% decrease.

13. population density = $32.3(100\% + 48.6\%)$
 $= 32.3(1.486)$
 $= 48.0$

The population density in Arizona in 2002 was 48.0 people per square mile.

14. car value = $14,500(100\% - 15\%)$
 $= 14,500(0.85)$
 $= 12,325$

The value of the car after one year is \$12,325.

Chapter 3, continued

Lesson 3.8

3.8 Guided Practice (pp. 184–186)

1. $a - bx = c$

$$-bx = c - a$$

$$x = \frac{c - a}{-b}$$

$$x = \frac{a - c}{b}$$

$$x = \frac{a - c}{b}$$

$$= \frac{12 - (-3)}{5}$$

$$= \frac{15}{5}$$

$$= 3$$

2. $ax = bx + c$

$$ax - bx = c$$

$$x(a - b) = c$$

$$x = \frac{c}{a - b}$$

$$x = \frac{c}{a - b}$$

$$= \frac{20}{11 - 6}$$

$$= \frac{20}{5}$$

$$= 4$$

3. $5x - 4y = 20$

$$4y = 20 - 5x$$

$$y = \frac{20 - 5x}{4}$$

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

4. a. $P = 2l + 2w$

$$P - 2l = 2w$$

$$\frac{P - 2l}{2} = w$$

b. $\frac{19.2 - 2(7.2)}{2} = w$

$$\frac{19.2 - 14.4}{2} = w$$

$$\frac{4.8}{2} = w$$

$$2.4 = w$$

The width is 2.4 feet.

5. $F = \frac{9}{5}C + 32$

$$= \frac{9}{5}(22) + 32$$

$$= 39.6 + 32$$

$$= 71.6^\circ\text{F}$$

The high for Saturday is 71.6°F .

$$F = \frac{9}{5}C + 32 = \frac{9}{5}(16) + 32 = 28.8 + 32 = 60.8^\circ\text{F}$$

The high for Sunday is 60.8°F .

3.8 Exercises (pp. 187–189)

Skill Practice

1. When you write the equation $3x + 2 = 8$ as $ax + b = c$, the equation $ax + b = c$ is called a *literal equation* because the coefficients and constants have been replaced by letters.

2. Divide each side by pr to get $\frac{I}{pr} = t$.

3. $ax = bx - c$

$$ax - bx = -c$$

$$x(a - b) = -c$$

$$x = \frac{-c}{a - b}$$

$$x = \frac{c}{b - a}$$

$$x = \frac{c}{b - a}$$

$$= \frac{10}{3 - 8}$$

$$= -2$$

4. $a(x + b) = c$

$$ax + ab = c$$

$$ax = c - ab$$

$$x = \frac{c - ab}{a}$$

$$x = \frac{c - ab}{a}$$

$$= \frac{9 - 2(1)}{2}$$

$$= \frac{7}{2}$$

$$= 3.5$$

5. $c = \frac{x + a}{b}$

$$cb = x + a$$

$$cb - a = x;$$

$$x = cb - a = 2(7) - 5 = 9$$

6. $\frac{x}{a} = \frac{b}{c}$

$$x = a \cdot \frac{b}{c};$$

$$x = \frac{ab}{c}$$

$$= \frac{8(4.5)}{12}$$

$$= \frac{3b}{12}$$

$$= 3$$

7. $\frac{x}{a} + b = c$

$$\frac{x}{a} = c - b$$

$$x = a(c - b);$$

$$x = a(c - b)$$

$$= 4(13 - 6)$$

$$= 28$$

8. $ax + b = cx - d$

$$b = cx - d - ax$$

$$b + d = cx - ax$$

$$b + d = x(c - a)$$

$$\frac{b + d}{c - a} = x;$$

$$x = \frac{b + d}{c - a} = \frac{9 + 1}{7 - 2} = 2$$

9. The error was that b needed to be subtracted from both sides, not added.

$$ax + b = 0$$

$$ax = -b$$

$$x = \frac{-b}{a}$$

10. The error was that both sides should have been divided by $(a - b)$, not multiplied.

$$c = ax - bx$$

$$c = (a - b)x$$

$$\frac{c}{a - b} = x$$

11. $2x + y = 7$

$$y = 7 - 2x$$

Chapter 3, continued

$$12. \quad 5x + 4y = 10$$

$$4y = 10 - 5x$$

$$y = \frac{10 - 5x}{4}$$

$$y = \frac{5}{2} - \frac{5}{4}x$$

$$14. \quad 18x - 2y = 26$$

$$-2y = 26 - 18x$$

$$y = \frac{26 - 18x}{-2}$$

$$y = -13 + 9x$$

$$16. \quad 8x - 8y = 5$$

$$8y = 5 - 8x$$

$$y = \frac{5 - 8x}{-8}$$

$$y = x - \frac{5}{8}$$

$$18. \quad 3 + 6x = 11 - 4y$$

$$3 + 6x - 11 = -4y$$

$$6x - 8 = -4y$$

$$\frac{6x - 8}{-4} = y$$

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

$$20. \quad V = \ell wh$$

$$\frac{V}{\ell} = wh$$

$$\frac{V}{\ell h} = w$$

$$22. \quad \ell = 24f$$

$$\frac{\ell}{24} = f$$

$$23. \quad C; \quad A = \frac{1}{2}(b_1 + b_2)h$$

$$2A = (b_1 + b_2)h$$

$$\frac{2A}{h} = b_1 + b_2$$

$$\frac{2A}{h} - b_2 = b_1$$

$$24. \quad 4.2x - 2y = 16.8$$

$$-2y = 16.8 - 4.2x$$

$$y = \frac{16.8 - 4.2x}{-2}$$

$$y = 2.1x - 8.4$$

$$26. \quad 8x - 5x + 21 = 36 - 6y$$

$$3x + 21 = 36 - 6y$$

$$3x - 15 = -6y$$

$$\frac{3x - 15}{-6} = y$$

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

$$13. \quad 12 = 9x + 3y$$

$$12 - 9x = 3y$$

$$\frac{12 - 9x}{3} = y$$

$$4 - 3x = y$$

$$15. \quad 14 = 7y - 6x$$

$$14 + 6x = 7y$$

$$\frac{14 + 6x}{7} = y$$

$$2 + \frac{6}{7}x = y$$

$$17. \quad 30 = 9x - 5y$$

$$30 - 9x = -5y$$

$$\frac{30 - 9x}{-5} = y$$

$$\frac{9}{5}x - 6 = y$$

$$19. \quad 2 + 6y = 3x + 4$$

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

$$6y = 3x + 2$$

$$y = \frac{3x + 2}{6}$$

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

$$21. \quad S = 2B + Ph$$

$$S - 2B = Ph$$

$$\frac{S - 2B}{P} = h$$

$$25. \quad 9 - 0.5y = 2.5x$$

$$-0.5y = 2.5x - 9$$

$$y = \frac{2.5x - 9}{-0.5}$$

$$y = -5x + 18$$

$$27. \quad S = \pi r \ell + \pi r^2$$

$$S - \pi r^2 = \pi r \ell$$

$$\frac{S - \pi r^2}{\pi r} = \ell$$

$$\frac{S}{\pi r} - r = \ell;$$

$$\ell = \frac{S}{\pi r} - r = \frac{28.3}{(3.14)(5)} - 5 \approx 18.03 - 5 = 13.03 \text{ cm}$$

$$28. \quad A = 4\pi pw$$

$$\frac{A}{4\pi w} = p;$$

$$p = \frac{A}{4\pi w} = \frac{905}{4(3.14)(9)} \approx 8.01 \text{ ft}$$

29. Answers will vary.

$$30. \quad x = \frac{a + b + c}{ab}$$

$$xab = a + b + c$$

$$xab - a = b + c$$

$$a(xb - 1) = b + c$$

$$a = \frac{b + c}{xb - 1}$$

$$31. \quad y = x\left(\frac{ab}{a - b}\right)$$

$$\frac{y}{x} = \frac{ab}{a - b}$$

$$y(a - b) = xab$$

$$ya - yb = xab$$

$$-yb = xab - ya$$

$$-yb = a(xb - y)$$

$$\frac{-yb}{xb - y} = a$$

$$\frac{yb}{y - xb} = a$$

Problem Solving

$$32. \quad \text{a.} \quad d = 4n - 2$$

$$d + 2 = 4n$$

$$\frac{d + 2}{4} = n$$

$$\text{b.} \quad d = 5: n = \frac{d + 2}{4} = \frac{5 + 2}{4} = \frac{7}{4} = 1.75 \text{ in.}$$

$$d = 12: n = \frac{d + 2}{4} = \frac{12 + 2}{4} = \frac{14}{4} = 3.5 \text{ in.}$$

$$d = 16: n = \frac{d + 2}{4} = \frac{16 + 2}{4} = \frac{18}{4} = 4.5 \text{ in.}$$

$$d = 20: n = \frac{d + 2}{4} = \frac{20 + 2}{4} = \frac{22}{4} = 5.5 \text{ in.}$$

$$33. \quad \text{a.} \quad C = 12x + 25$$

$$C - 25 = 12x$$

$$\frac{C - 25}{12} = x$$

Chapter 3, continued

$$\text{b. } C = 145: x = \frac{C - 25}{12} = \frac{145 - 25}{12} = 10 \text{ nights}$$

$$C = 181: x = \frac{C - 25}{12} = \frac{181 - 25}{12} = 13 \text{ nights}$$

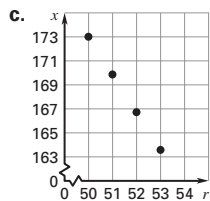
$$C = 205: x = \frac{C - 25}{12} = \frac{205 - 25}{12} = 15 \text{ nights}$$

$$34. \text{ a. } P = 2\pi r + 2x$$

$$P - 2\pi r = 2x$$

$$\frac{P - 2\pi r}{2} = x$$

r (ft)	x (ft)
50	$\frac{660 - 2(3.14)(50)}{2} = 173$
51	$\frac{660 - 2(3.14)(51)}{2} \approx 170$
52	$\frac{660 - 2(3.14)(52)}{2} \approx 167$
53	$\frac{660 - 2(3.14)(53)}{2} \approx 164$



As the radius increases by 1, the value of x decreases by 3. So, when $r = 54$, $x = 164 - 3 = 161$ ft.

35. The percent equation is $a = p\% \cdot b$. Because you want to calculate the percent tip, you should solve the equation for $p\%$. Divide each side of the equation by b to get $\frac{a}{b} = p\%$. So the amount of the tip, a , divided by the amount of the bill, b , gives you the percent tip.

$$36. \text{ a. } C = 2\pi r$$

$$\frac{C}{2\pi} = r$$

$$\text{b. } C = 7: r = \frac{C}{2\pi} = \frac{7}{2(3.14)} \approx 1.1 \text{ ft}$$

$$C = 8: r = \frac{C}{2\pi} = \frac{8}{2(3.14)} \approx 1.3 \text{ ft}$$

$$C = 9: r = \frac{C}{2\pi} = \frac{9}{2(3.14)} \approx 1.4 \text{ ft}$$

- c. The formula for area of a circle is $A = \pi r^2$. Solve the circumference formula for r and substitute $\frac{C}{2\pi}$ for r in the area formula.

$$A = \pi \left(\frac{C}{2\pi} \right)^2$$

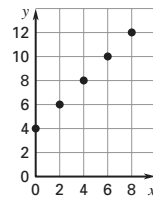
$$37. 20g = 55t$$

$$g = \frac{55t}{20}$$

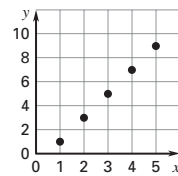
$$g = \frac{11t}{4}$$

Mixed Review

$$38. y = x + 4$$



$$39. y = 2x - 1$$



$$40. 3(2x + 3) = 6x + 9$$

$$42. (3x - 5)(-5) = -15x + 25$$

$$43. (7x + 6)2 = 14x + 12$$

$$44. 64 = p\% \cdot 80$$

$$0.8 = p\%$$

$$80\% = p\%$$

64 is 80% of 80.

$$41. -2(x + 5) = -2x - 10$$

$$45. a = 95\% \cdot 120$$

$$a = 0.95 \cdot 120$$

$$a = 114$$

114 is 95% of 120.

Quiz 3.7-3.8 (p. 189)

$$1. 72 = p\% \cdot 150$$

$$0.48 = p\%$$

$$48\% = p\%$$

72 is 48% of 150.

$$3. 31 = 5\% \cdot b$$

$$31 = 0.05b$$

$$620 = b$$

31 is 5% of 620.

$$5. 5x - 3y = 9$$

$$-3y = 9 - 5x$$

$$y = \frac{9 - 5x}{-3}$$

$$y = \frac{5}{3}x - 3$$

$$2. 93 = p\% \cdot 310$$

$$0.3 = p\%$$

$$30\% = p\%$$

93 is 30% of 310.

$$4. a = 46\% \cdot 55$$

$$a = 0.46 \cdot 55$$

$$a = 25.3$$

25.3 is 46% of 55.

$$6. 3x + 2y + 5x = 12$$

$$8x + 2y = 12$$

$$2y = 12 - 8x$$

$$y = \frac{12 - 8x}{2}$$

$$y = 6 - 4x$$

$$7. 4(2x - y) = 6$$

$$8x - 4y = 6$$

$$-4y = 6 - 8x$$

$$y = \frac{6 - 8x}{-4}$$

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

$$8. V = \pi r^2 h$$

$$\frac{V}{\pi r^2} = h$$

Mixed Review of Problem Solving (p. 190)

$$1. \text{ a. } \frac{7}{31} = \frac{x}{1209}$$

$$\text{b. } 31x = 7(1209)$$

$$31x = 8463$$

$$x = 273$$

273 students would choose baseball as their favorite sport.

Chapter 3, continued

2. a. $\frac{5}{4+5} = \frac{5}{9}$

b. $\frac{5}{9} = \frac{x}{216}$

$$9x = 5(216)$$

$$9x = 1080$$

$$x = 120$$

There are 120 female students in the freshman class.

3. $\frac{7}{154} = \frac{x}{770}$

$$154x = 5390$$

$$x = 35$$

You will use 35 gallons of gasoline to travel 770 miles. At \$2 per gallon for gasoline, $\$2(35) = \70 . So, you should budget \$70 for gasoline.

4. By solving the surface area-to-volume quotient formula for r , you get

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

You can then substitute this equivalent of r into the formula for diameter giving you,

$$d = 2\left(\frac{3}{Q}\right) \text{ or } d = \frac{6}{Q}$$

5. $a = p\% \cdot b$

$$84 = 60\% \cdot b$$

$$84 = 0.6b$$

$$140 = b$$

He had 140 free throw attempts.

6. a. $a = 6\% \cdot 208,000$

$$a = 0.06 \cdot 208,000$$

$$a = 12,480$$

The agent should expect \$12,480 in commission.

b. $a = 6\% \cdot 205,000$

$$a = 0.06 \cdot 205,000$$

$$a = 12,300$$

The agent receives \$12,300.

c. $a = 10\% \cdot 12,300$

$$a = 0.1 \cdot 12,300$$

$$a = 1230$$

The assistant receives \$1230. To find what percent of \$205,000 this amount is, use the percent equation again.

$$1230 = p\% \cdot 205,000$$

$$0.006 = p\%$$

$$0.6\% = p\%$$

The assistant receives 0.6% of the selling price.

7. $A = \frac{1}{2}d_1d_2$

Multiply each side of the equation by 2 (the reciprocal of $\frac{1}{2}$).

$$2A = d_1d_2$$

Divide each side of the equation by d_2 to solve for d_1 .

$$\frac{2A}{d_2} = d_1$$

8. Answers will vary.

Chapter 3 Review (pp. 192–196)

1. A *scale drawing* is a two-dimensional drawing of an object in which the dimensions of the drawing are in proportion to the dimensions of the object.
2. When you perform the same inverse operation on each side of an equation, you produce an *equivalent* equation.
3. When you combine like terms, you get $10x = 10x$. So, the equation is true for all real numbers, making it an identity.

4. In the proportion $\frac{7}{8} = \frac{28}{32}$, $7 \cdot 32$ and $8 \cdot 28$ are *cross products*.

5. $6x - 2y = 16$

Subtract $6x$ from each side of the equation.

$$-2y = 16 - 6x$$

Divide each side by -2 .

$$y = \frac{16 - 6x}{-2}$$

Simplify.

$$y = 3x - 8$$

6. $x - 4 = 3$

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

$$x = 7$$

Check:

$$7 - 4 \stackrel{?}{=} 3$$

$$3 = 3$$

8. $4m = -84$

$$\frac{4m}{4} = \frac{-84}{4}$$

$$m = -21$$

Check:

$$4(-21) \stackrel{?}{=} -84$$

$$-84 = -84$$

7. $-8 + a = 5$

$$-8 + a + 8 = 5 + 8$$

$$a = 13$$

Check:

$$-8 + 13 \stackrel{?}{=} 5$$

$$5 = 5$$

9. $-5z = 75$

$$\frac{-5z}{-5} = \frac{75}{-5}$$

$$z = -15$$

Check:

$$-5(15) \stackrel{?}{=} 75$$

$$75 = 75$$

Chapter 3, continued

10. $11 = \frac{r}{6}$

$$6 \cdot 11 = 6 \cdot \frac{r}{6}$$

$$66 = r$$

Check:

$$11 \stackrel{?}{=} \frac{66}{6}$$

$$11 = 11$$

12. $A = \ell w$

$$211,200 = 660w$$

$$\frac{211,200}{660} = \frac{660w}{660}$$

$$320 = w$$

The width is 320 feet.

13. $9b + 5 = 23$

$$9b = 18$$

$$b = 2$$

Check:

$$9(2) + 5 \stackrel{?}{=} 23$$

$$18 + 5 \stackrel{?}{=} 23$$

$$23 = 23$$

15. $\frac{n}{3} - 4 = 2$

$$\frac{n}{3} = 6$$

$$3 \cdot \frac{n}{3} = 3 \cdot 6$$

$$n = 18$$

Check:

$$\frac{18}{3} - 4 \stackrel{?}{=} 2$$

$$6 - 4 \stackrel{?}{=} 2$$

$$2 = 2$$

17. $3t + 9t = 60$

$$12t = 60$$

$$t = 5$$

Check:

$$3(5) + 9(5) \stackrel{?}{=} 60$$

$$15 + 45 \stackrel{?}{=} 60$$

$$60 = 60$$

19. $3w + 4w - 2 = 12$

$$7w - 2 = 12$$

$$7w = 14$$

$$w = 2$$

Check:

$$3(2) + 4(2) - 2 \stackrel{?}{=} 12$$

$$6 + 8 - 2 \stackrel{?}{=} 12$$

$$12 = 12$$

11. $-27 = \frac{3}{4}w$

$$\frac{4}{3}(-27) = \frac{4}{3}\left(\frac{3}{4}w\right)$$

$$-36 = w$$

Check:

$$-27 \stackrel{?}{=} \frac{3}{4}(-36)$$

$$-27 = -27$$

14. $11 = 5y - 4$

$$15 = 5y$$

$$3 = y$$

Check:

$$11 \stackrel{?}{=} 5(3) - 4$$

$$11 \stackrel{?}{=} 15 - 4$$

$$11 = 11$$

16. $\frac{3}{2}v + 2 = 20$

$$\frac{3}{2}v = 18$$

$$\frac{2}{3} \cdot \frac{3}{2}v = \frac{2}{3} \cdot 18$$

$$v = 12$$

Check:

$$\frac{3}{2}(12) + 2 \stackrel{?}{=} 20$$

$$18 + 2 \stackrel{?}{=} 20$$

$$20 = 20$$

18. $-110 = -4c - 6c$

$$-110 = -10c$$

$$11 = c$$

Check:

$$-110 \stackrel{?}{=} -4(11) - 6(11)$$

$$-110 \stackrel{?}{=} -44 - 66$$

$$-110 \stackrel{?}{=} -110$$

20. $z + 5 - 4z = 8$

$$5 - 3z = 8$$

$$-3z = 3$$

$$z = -1$$

Check:

$$-1 + 5 - 4(-1) \stackrel{?}{=} 8$$

$$4 + 4 \stackrel{?}{=} 8$$

$$8 = 8$$

21. $c + 2c - 5 - 5c = 7$

$$-2c - 5 = 7$$

$$-2c = 12$$

$$c = -6$$

Check:

$$-6 + 2(-6) - 5 - 5(-6) \stackrel{?}{=} 7$$

$$-6 - 12 - 5 + 30 \stackrel{?}{=} 7$$

$$7 = 7$$

22. $4y - (y - 4) = -20$

$$4y - y + 4 = -20$$

$$-3y + 4 = -20$$

$$3y + 4 = -24$$

$$y = -8$$

Check:

$$4(-8) - (-8 - 4) \stackrel{?}{=} -20$$

$$-32 - (-12) \stackrel{?}{=} -20$$

$$-32 + 12 \stackrel{?}{=} -20$$

$$-20 = -20$$

23. $8a - 3(2a + 5) = 13$

$$8a - 6a - 15 = 13$$

$$2a - 15 = 13$$

$$2a = 28$$

$$a = 14$$

Check:

$$8(14) - 3(2 \cdot 14 + 5) \stackrel{?}{=} 13$$

$$112 - 3(28 + 5) \stackrel{?}{=} 13$$

$$112 - 3(33) \stackrel{?}{=} 13$$

$$112 - 99 \stackrel{?}{=} 13$$

$$13 = 13$$

24. $16h - 4(5h - 7) = 4$

$$16h - 20h + 28 = 4$$

$$-4h + 28 = 4$$

$$-4h = -24$$

$$h = 6$$

Check:

$$16(6) - 4(5 \cdot 6 - 7) \stackrel{?}{=} 4$$

$$96 - 4(30 - 7) \stackrel{?}{=} 4$$

$$96 - 4(23) \stackrel{?}{=} 4$$

$$96 - 92 \stackrel{?}{=} 4$$

$$4 = 4$$

25. $\frac{3}{2}(b + 1) = 3$

$$\frac{2}{3} \cdot \frac{3}{2}(b + 1) = \frac{2}{3} \cdot 3$$

$$b + 1 = 2$$

$$b = 1$$

Check:

$$\frac{3}{2}(1 + 1) \stackrel{?}{=} 3$$

$$\frac{3}{2}(2) \stackrel{?}{=} 3$$

$$3 = 3$$

26. $\frac{4}{3}(2x - 1) = -12$

$$\frac{3}{4} \cdot \frac{4}{3}(2x - 1) = \frac{3}{4}(-12)$$

$$2x - 1 = -9$$

$$2x = -8$$

$$x = -4$$

Check:

$$\frac{4}{3}[2(-4) - 1] \stackrel{?}{=} -12$$

$$\frac{4}{3}(-8 - 1) \stackrel{?}{=} -12$$

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

$$-12 = -12$$

27. $\frac{6}{5}(8k + 2) = -36$

$$\frac{5}{6} \cdot \frac{6}{5}(8k + 2) = \frac{5}{6}(-36)$$

$$8k + 2 = -30$$

$$8k = -32$$

$$k = -4$$

Check:

$$\frac{6}{5}[8(-4) + 2] \stackrel{?}{=} -36$$

$$\frac{6}{5}(-32 + 2) \stackrel{?}{=} -36$$

$$\frac{6}{5}(-30) \stackrel{?}{=} -36$$

$$-36 = -36$$

Chapter 3, continued

28. Let x = price per ticket

$$5x + 2.5(5) + 15 = 352.5$$

$$5x + 12.5 + 15 = 352.5$$

$$5x + 27.5 = 352.5$$

$$5x = 325$$

$$x = 65$$

The price per ticket is \$65.

29. $-3z - 1 = 8 - 3z$

$$-1 \neq 8$$

no solution

30. $16 - 2m = 5m + 9$

$$16 = 7m + 9$$

$$7 = 7m$$

$$1 = m$$

31. $2.9w + 5 = 4.7w - 7.6$

$$5 = 1.8w - 7.6$$

$$12.6 = 1.8w$$

$$7 = w$$

32. $2y + 11.4 = 2.6 - 0.2y$

$$2.2y + 11.4 = 2.6$$

$$2.2y = -8.8$$

$$y = -4$$

33. $4(x - 3) = -2(6 - 2x)$

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

$$4x - 12 = 4x - 12$$

The equation is an identity, so the solution is all real numbers.

34. $6(2a + 10) = 5(a + 5)$

$$12a + 60 = 5a + 25$$

$$7a + 60 = 25$$

$$7a = -35$$

$$a = -5$$

35. $\frac{1}{12}(48 + 24b) = 2(17 - 4b)$

$$4 + 2b = 34 - 8b$$

$$4 + 10b = 34$$

$$10b = 30$$

$$b = 3$$

36. $1.5(n + 20) = 0.5(3n + 60)$

$$1.5n + 30 = 1.5n + 30$$

The equation is an identity, so the solution is all real numbers.

37. a. $8x - 3 = 6x + 5$

$$2x - 3 = 5$$

$$2x = 8$$

$$x = 4$$

- b. $P = 4s = 4(6x + 5)$

$$4(6 \cdot 4 + 5) = 4(24 + 5) = 4(29) = 116$$

The perimeter is 116 units.

38. $\frac{56}{16} = \frac{x}{2}$

$$2 \cdot \frac{56}{16} = 2 \cdot \frac{x}{2}$$

$$7 = x$$

Check:

$$\frac{56}{16} \stackrel{?}{=} \frac{7}{2}$$

$$\frac{7}{2} = \frac{7}{2}$$

40. $\frac{2}{7} = \frac{m}{91}$

$$91 \cdot \frac{2}{7} = 91 \cdot \frac{m}{91}$$

$$26 = m$$

41. $\frac{5z}{3} = \frac{105}{6}$

$$3 \cdot \frac{5z}{3} = 3 \cdot \frac{105}{6}$$

$$5z = 52.5$$

$$z = 10.5$$

42. $\frac{9}{4} = \frac{3a}{20}$

$$20 \cdot \frac{9}{4} = 20 \cdot \frac{3a}{20}$$

$$45 = 3a$$

$$15 = a$$

Check:

$$\frac{9}{4} \stackrel{?}{=} \frac{3 \cdot 15}{20}$$

$$\frac{9}{4} \stackrel{?}{=} \frac{45}{20}$$

$$2.25 = 2.25$$

44. $\frac{1}{560} = \frac{x}{1400}$

$$1400 \cdot \frac{1}{560} = 1400 \cdot \frac{x}{1400}$$

$$2.5 = x$$

2.5 gallons of paint are needed to cover 1400 square feet.

45. $\frac{5}{7} = \frac{20}{r}$

$$5r = 7(20)$$

$$5r = 140$$

$$r = 28$$

Check:

$$\frac{5}{7} \stackrel{?}{=} \frac{20}{28}$$

$$5(28) \stackrel{?}{=} 7(20)$$

$$140 = 140$$

39. $\frac{y}{9} = \frac{25}{15}$

$$9 \cdot \frac{y}{9} = 9 \cdot \frac{25}{15}$$

$$y = 15$$

Check:

$$\frac{15}{9} \stackrel{?}{=} \frac{25}{15}$$

$$\frac{5}{3} = \frac{5}{3}$$

Check:

$$\frac{2}{7} \stackrel{?}{=} \frac{26}{91}$$

$$\frac{2}{7} = \frac{2}{7}$$

Check:

$$\frac{5(10.5)}{3} \stackrel{?}{=} \frac{105}{6}$$

$$\frac{52.5}{3} \stackrel{?}{=} \frac{105}{6}$$

$$17.5 = 17.5$$

43. $\frac{c+2}{45} = \frac{8}{5}$

$$45 \cdot \frac{c+2}{45} = 45 \cdot \frac{8}{5}$$

$$c + 2 = 72$$

$$c = 70$$

Check:

$$\frac{70+2}{45} \stackrel{?}{=} \frac{8}{5}$$

$$\frac{72}{45} \stackrel{?}{=} \frac{8}{5}$$

$$1.6 = 1.6$$

46. $\frac{6}{z} = \frac{12}{5}$

$$12z = 6(5)$$

$$12z = 30$$

$$z = 2.5$$

Check:

$$\frac{6}{2.5} \stackrel{?}{=} \frac{12}{5}$$

$$12(2.5) \stackrel{?}{=} 6(5)$$

$$30 = 30$$

Chapter 3, continued

47. $\frac{126}{56} = \frac{9}{4b}$
 $126(4b) = 56(9)$
 $504b = 504$
 $b = 1$

Check:
 $\frac{126}{56} \stackrel{?}{=} \frac{9}{4 \cdot 1}$
 $2.25 = 2.25$

48. $\frac{10}{3m} = \frac{-5}{6}$
 $-5(3m) = 10(6)$
 $-15m = 60$
 $m = -4$

Check:
 $\frac{10}{3(-4)} \stackrel{?}{=} \frac{-5}{6}$
 $\frac{10}{-12} \stackrel{?}{=} \frac{-5}{6}$
 $\frac{-5}{6} = \frac{-5}{6}$

49. $\frac{n+8}{5n-2} = \frac{3}{8}$
 $8(n+8) = 3(5n-2)$
 $8n+64 = 15n-6$
 $64 = 7n-6$
 $70 = 7n$
 $10 = n$

Check:
 $\frac{10+8}{5 \cdot 10-2} \stackrel{?}{=} \frac{3}{8}$
 $\frac{18}{48} \stackrel{?}{=} \frac{3}{8}$
 $\frac{3}{8} = \frac{3}{8}$

50. $\frac{5-c}{3} = \frac{2c+2}{-4}$
 $-4(5-c) = 3(2c+2)$
 $-20+4c = 6c+6$
 $-20 = 2c+6$
 $-26 = 2c$
 $-13 = c$

Check:
 $\frac{5-(-13)}{3} \stackrel{?}{=} \frac{2(-13)+2}{-4}$
 $\frac{18}{3} \stackrel{?}{=} \frac{-26+2}{-4}$
 $6 \stackrel{?}{=} \frac{-24}{-4}$
 $6 = 6$

51. $\frac{2}{65} = \frac{20}{x}$
 $2x = 65(20)$
 $2x = 1300$
 $x = 650$

In 20 minutes, the student can type 650 words.

52. $\frac{1}{12} = \frac{6.8}{x}$
 $1(x) = 12(6.8)$
 $x = 81.6$

The actual distance between the cities is about 81.6 kilometers.

53. $a = 30\% \cdot 55$
 $a = 0.3 \cdot 55$
 $a = 16.5$
 16.5 is 30% of 55.

54. $117 = 78\% \cdot b$
 $117 = 0.78b$
 $150 = b$
 117 is 78% of 150.

55. $21 = p\% \cdot 56$
 $0.375 = p\%$
 $37.5\% = p\%$
 21 is 37.5% of 56.

56. $18 = p\% \cdot 60$
 $0.3 = p\%$
 $30\% = p\%$
 18 is 30% of 60.

57. $a = 20\% \cdot 7500$
 $a = 0.2 \cdot 7500$
 $a = 1500$

There were 1500 general admission tickets sold.

58. $x + 7y = 0$
 $7y = -x$
 $y = \frac{-x}{7}$

59. $3x = 2y - 18$
 $3x + 18 = 2y$
 $\frac{3x+18}{2} = y$
 $\frac{3}{2}x + 9 = y$

60. $4y - x = 20 - y$
 $5y - x = 20$
 $5y = x + 20$
 $y = \frac{x+20}{5}$
 $y = \frac{x}{5} + 4$

61. a. $V = \ell wh$
 $\frac{V}{\ell w} = h$

b. $h = \frac{V}{\ell w} = \frac{5850}{(30)(13)} = \frac{5850}{390} = 15$

The height is 15 inches.

Chapter 3 Test (p. 197)

1. $5 + r = -19$
 $r = -24$

2. $z - 8 = -12$
 $z = -4$

Check:
 $5 + (-24) \stackrel{?}{=} -19$
 $-19 = -19$

Check:
 $-4 - 8 \stackrel{?}{=} -12$
 $-12 = -12$

3. $-11x = -77$
 $x = 7$

Check:
 $-11(7) \stackrel{?}{=} -77$
 $-77 = -77$

4. $\frac{a}{9} = 6$

$9 \cdot \frac{a}{9} = 9 \cdot 6$
 $a = 54$

Check:
 $\frac{54}{9} \stackrel{?}{=} 6$
 $6 = 6$

5. $15q - 17 = 13$

$15q = 30$
 $q = 2$

Check:

$15(2) - 17 \stackrel{?}{=} 13$
 $30 - 17 \stackrel{?}{=} 13$
 $13 = 13$

Chapter 3, continued

6. $3y + 2 = 26$

$$3y = 24$$

$$y = 8$$

Check:

$$3(8) + 2 \stackrel{?}{=} 26$$

$$24 + 2 \stackrel{?}{=} 26$$

$$26 = 26$$

8. $\frac{m}{10} - 6 = 20$

$$\frac{m}{10} = 26$$

$$10 \cdot \frac{m}{10} = 10 \cdot 26$$

$$m = 260$$

9. $6j + 5j = 33$

$$11j = 33$$

$$j = 3$$

Check:

$$6(3) + 5(3) \stackrel{?}{=} 33$$

$$18 + 15 \stackrel{?}{=} 33$$

$$33 = 33$$

11. $14c - 8c + 7 = 37$

$$6c + 7 = 37$$

$$6c = 30$$

$$c = 5$$

Check:

$$14(5) - 8(5) + 7 \stackrel{?}{=} 37$$

$$70 - 40 + 7 \stackrel{?}{=} 37$$

$$37 = 37$$

13. $-19.4 - 15d + 22d = 4.4$

$$-19.4 + 7d = 4.4$$

$$7d = 23.8$$

$$d = 3.4$$

Check:

$$-19.4 - 15(3.4) + 22(3.4) \stackrel{?}{=} 4.4$$

$$-19.4 - 51 + 74.8 \stackrel{?}{=} 4.4$$

$$4.4 = 4.4$$

14. $-12h + 39 = -4h - 17$

$$39 = 8h - 17$$

$$56 = 8h$$

$$7 = h$$

Check:

$$-12(7) + 39 \stackrel{?}{=} -4(7) - 17$$

$$-84 + 39 \stackrel{?}{=} -28 - 17$$

$$-45 = -45$$

7. $\frac{b}{4} + 5 = 14$

$$\frac{b}{4} = 9$$

$$b = 36$$

Check:

$$\frac{36}{4} + 5 \stackrel{?}{=} 14$$

$$9 + 5 \stackrel{?}{=} 14$$

$$14 = 14$$

Check:

$$\frac{260}{10} - 6 \stackrel{?}{=} 20$$

$$26 - 6 \stackrel{?}{=} 20$$

$$20 = 20$$

10. $4k - 9k = 10$

$$-5k = 10$$

$$k = -2$$

Check:

$$4(-2) - 9(-2) \stackrel{?}{=} 10$$

$$-8 + 18 \stackrel{?}{=} 10$$

$$10 = 10$$

12. $4w - 21 + 5w = 51$

$$9w - 21 = 51$$

$$9w = 72$$

$$w = 8$$

Check:

$$4(8) - 21 + 5(8) \stackrel{?}{=} 51$$

$$32 - 21 + 40 \stackrel{?}{=} 51$$

$$51 = 51$$

15. $-5.7v - 44.2 = -8.3v$

$$-44.2 = -2.6v$$

$$17 = v$$

Check:

$$-5.7(17) - 44.2 \stackrel{?}{=} -8.3(17)$$

$$-96.9 - 44.2 \stackrel{?}{=} -141.1$$

$$-141.1 = -141.1$$

16. $-6.5t + 15 = -9.7t + 43.8$

$$3.2t + 15 = 43.8$$

$$3.2t = 28.8$$

$$t = 9$$

Check:

$$-6.5(9) + 15 \stackrel{?}{=} -9.7(9) + 43.8$$

$$-58.5 + 15 \stackrel{?}{=} -87.3 + 43.8$$

$$-43.5 = -43.5$$

17. $3(3n + 4) = 54 + 6n$

$$9n + 12 = 54 + 6n$$

$$3n + 12 = 54$$

$$3n = 42$$

$$n = 14$$

Check:

$$3(3 \cdot 14 + 4) \stackrel{?}{=} 54 + 6 \cdot 14$$

$$3(42 + 4) \stackrel{?}{=} 54 + 84$$

$$3(46) \stackrel{?}{=} 138$$

$$138 = 138$$

18. $\frac{1}{3}(24p - 66) = 3p + 43$

$$8p - 22 = 3p + 43$$

$$5p - 22 = 43$$

$$5p = 65$$

$$p = 13$$

Check:

$$\frac{1}{3}(24 \cdot 13 - 66) \stackrel{?}{=} 3 \cdot 13 + 43$$

$$\frac{1}{3}(312 - 66) \stackrel{?}{=} 39 + 43$$

$$\frac{1}{3}(246) \stackrel{?}{=} 82$$

$$82 = 82$$

19. $\frac{3}{4} = \frac{z}{16}$

$$4z = 3(16)$$

$$4z = 48$$

$$z = 12$$

Check:

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

$$4(12) \stackrel{?}{=} 3(16)$$

$$48 = 48$$

20. $\frac{72}{45} = \frac{8}{w}$

$$72w = 45(8)$$

$$72w = 360$$

$$w = 5$$

Check:

$$\frac{72}{45} \stackrel{?}{=} \frac{8}{5}$$

$$72(5) \stackrel{?}{=} 45(8)$$

$$360 = 360$$

Chapter 3, continued

21. $\frac{k}{9} = \frac{63}{81}$

$$81k = 9(63)$$

$$81k = 567$$

$$k = 7$$

Check:

$$\frac{7}{9} \stackrel{?}{=} \frac{63}{81}$$

$$81(7) \stackrel{?}{=} 9(63)$$

$$567 = 567$$

23. $\frac{34}{6} = \frac{2x+1}{3}$

$$6(2x+1) = 34(3)$$

$$12x + 6 = 102$$

$$12x = 96$$

$$x = 8$$

Check:

$$\frac{34}{6} \stackrel{?}{=} \frac{2 \cdot 8 + 1}{3}$$

$$\frac{34}{6} \stackrel{?}{=} \frac{17}{3}$$

$$\frac{17}{3} = \frac{17}{3}$$

25. $21 = p\% \cdot 84$

$$0.25 = p\%$$

$$25\% = p\%$$

$$21 \text{ is } 25\% \text{ of } 84.$$

27. $a = 15\% \cdot 64$

$$a = 0.15 \cdot 64$$

$$a = 9.6$$

$$9.6 \text{ is } 15\% \text{ of } 64.$$

29. $90 = p\% \cdot 250$

$$0.36 = p\%$$

$$36\% = p\%$$

$$90 \text{ is } 36\% \text{ of } 250.$$

31. $8x + y = 14$

$$y = 14 - 8x$$

32. $-9x + 3y = 18$

$$3y = 9x + 18$$

$$y = \frac{9x + 18}{3}$$

$$y = 3x + 6$$

34. Let x = price of popcorn.

$$2(8.50) + 3(5.50) + 3x = 40.25$$

$$17 + 16.50 + 3x = 40.25$$

$$33.50 + 3x = 40.25$$

$$3x = 6.75$$

$$x = 2.25$$

Each box of popcorn cost \$2.25.

22. $\frac{-5n}{4} = \frac{15}{2}$

$$2(-5n) = 4(15)$$

$$-10n = 60$$

$$n = -6$$

Check:

$$\frac{-5(-6)}{4} \stackrel{?}{=} \frac{15}{2}$$

$$2(-5)(-6) \stackrel{?}{=} 4(15)$$

$$60 = 60$$

24. $\frac{-4a-1}{-10a} = \frac{3}{8}$

$$3(-10a) = 8(-4a-1)$$

$$-30a = -32a - 8$$

$$2a = -8$$

$$a = -4$$

Check:

$$\frac{-4(-4)-1}{-10(-4)} \stackrel{?}{=} \frac{3}{8}$$

$$\frac{16-1}{40} \stackrel{?}{=} \frac{3}{8}$$

$$\frac{15}{40} \stackrel{?}{=} \frac{3}{8}$$

$$\frac{3}{8} = \frac{3}{8}$$

26. $93 = p\% \cdot 124$

$$0.75 = p\%$$

$$75\% = p\%$$

$$93 \text{ is } 75\% \text{ of } 124.$$

28. $a = 44\% \cdot 24.5$

$$a = 0.44 \cdot 24.5$$

$$a = 10.78$$

$$10.78 \text{ is } 44\% \text{ of } 24.5.$$

30. $79.8 = p\% \cdot 95$

$$0.84 = p\%$$

$$84\% = p\%$$

$$79.8 \text{ is } 84\% \text{ of } 95.$$

33. $4x = -2y + 26$

$$4x - 26 = -2y$$

$$\frac{4x - 26}{-2} = y$$

$$-2x + 13 = y$$

35. Let x = number of visits.

$$5x + 30 = 7x$$

$$30 = 2x$$

$$15 = x$$

After 15 visits the total cost is the same for members and nonmembers.

36. $\frac{1 \text{ in.}}{3 \text{ ft}} = \frac{x}{21}$

$$21 = 3x$$

$$7 = x$$

The length should be 7 inches.

$$\frac{1 \text{ in.}}{3 \text{ ft}} = \frac{x}{18}$$

$$18 = 3x$$

$$6 = x$$

The width should be 6 inches.

37. $198 = p\% \cdot 225$

$$0.88 = p\%$$

$$88\% = p\%$$

88% of seniors said "yes."

Standardized Test Preparation (p. 199)

1. *Sample Answer:* When you substitute $x = 0$ into the equation, you get:

$$5(0 + 13) = 8(4 + 0)$$

$$65 \neq 32$$

2. *Sample Answer:* You can eliminate 36 because the base, b , must be greater than the part, $a = 45$.

3. *Sample Answer:* You can eliminate \$5.98 because this is twice the cost of a 3-pound bag, but a 5-pound bag does not have twice the apples as a 3-pound bag.

4. *Sample Answer:* You can eliminate $h = \frac{S - 2\pi r^2}{2\pi r}$ because this formula is equivalent to the original formula.

Standardized Test Practice (pp. 200–201)

1. A; $3(x - 3) = 3x - 6$

$$3x - 9 = 3x - 6$$

$$-9 \neq -6$$

2. D; $\frac{6}{175} = \frac{9}{x}$

$$6x = 9(175)$$

$$6x = 1575$$

$$x = 262.5$$

3. B; Let x = number of months.

$$43x = 104 + 30x$$

$$13x = 104$$

$$x = 8$$

Chapter 3, continued

4. B; Let x = number of visits.

$$4(3x) = 150$$

$$12x = 150$$

$$x = 12.5$$

5. C; $t = 38\frac{53}{60} = 38.88$ h

$$d = rt$$

$$1888 = 38.88r$$

$$48.56 = r$$

6. B; $16.5 = x - 5 + \frac{x}{2} + 8$

$$16.5 = x + \frac{x}{2} + 3$$

$$13.5 = \frac{3}{2}x$$

$$9 = x$$

$$x - 5 = 9 - 5 = 4$$

7. A; Let t = time biking.

$$d = rt$$

$$27 = 16t + 8.5(2 - t)$$

$$27 = 16t + 17 - 8.5t$$

$$27 = 7.5t + 17$$

$$10 = 7.5t$$

$$1.33 = t$$

$$60(1.33) = 80 \text{ minutes}$$

8. C; $\frac{1}{500} = \frac{1.26}{x}$

$$x = 500(1.26)$$

$$x = 630$$

9. B; $a = 37.5\% \cdot 48$

$$a = 0.375 \cdot 48$$

$$a = 18$$

18 beginner trails

$$48 - 18 = 30, 30 \div 2 = 15$$

15 intermediate trails, 15 expert trails

10. D; $140.8 = p\% \cdot 256$

$$0.55 = p\%$$

$$55\% = p\%$$

11. $C = 2\pi r$

$$12 = 2\pi r$$

$$\frac{12}{2\pi} = r$$

$$1.9 = r$$

The radius is 1.9 feet.

12. $75 = 15x - 6(x + 7)$

$$75 = 15x - 6x - 42$$

$$75 = 9x - 42$$

$$117 = 9x$$

$$13 = x$$

13. $41 = 2(5x) + 2(2x + 3)$

$$41 = 10x + 4x + 6$$

$$41 = 14x + 6$$

$$35 = 14x$$

$$2.5 = x$$

14. Let x = number of prints

$$0.29x = 0.14x + 180$$

$$0.15x = 180$$

$$x = 1200$$

After 1200 prints, they will have paid the same amount.

15. a. Let x = number of blue paint cans.

$$132 = 28x + 24(5 - x)$$

$$132 = 28x + 120 - 24x$$

$$12 = 4x$$

$$3 = x$$

She bought 3 cans of blue paint and 2 cans of white paint.

- b. If she bought 2 cans of blue and 3 cans of white, it would have cost,

$$2(28) + 3(24) = 56 + 72 = \$128.$$

$$\$132 - \$128 = \$4.$$

She would have saved \$4.

16. $\frac{84 \text{ rows}}{3 \text{ rows}} (5 \text{ min}) = 28(5) = 140$

It will take Kim 140 minutes to finish her scarf.

$$\frac{88 \text{ rows}}{4 \text{ rows}} (6 \text{ min}) = 22(6) = 132$$

It will take Sandy 132 minutes to finish her scarf. So, Sandy will finish her scarf first.

17. a. Store A: $\$200 - \$30 = \$170$

$$\text{Store B: } \$200 - \$200(12\%) = 200 - 200(0.12)$$

$$= 200 - 24$$

$$= \$176$$

The cost of buying \$200 worth of tools at Store A, \$170, is \$6 less than the cost of buying at Store B.

- b. Store A: $\$300 - \$30 = \$270$

$$\text{Store B: } \$300 - \$300(12\%) = 300 - 300(0.12)$$

$$= 300 - 36$$

$$= \$264$$

The cost of buying \$300 worth of tools at Store A, \$270, is \$4 more than the cost of buying at Store B.

- c. Let x = the amount of tools. If you set the purchase prices (amount of tools minus discounts) from the two stores equal to each other, you can solve the equation for x . So, $x - 30 = x - x(0.12)$.

Chapter 3, continued

$$\begin{aligned} \text{d. } x - 30 &= x - x(0.12) \\ -30 &= -0.12x \\ 250 &= x \end{aligned}$$

It will cost the same to buy from either store if you purchase \$250 worth of tools. If you were to buy more than \$250 worth of tools, the percentage discount from Store B is the better deal. If you were to buy less than \$250 worth of tools, the \$30 discount from Store A is the better deal.

Remember that Store A offers no discount for purchases less than \$100, so any purchases of less than \$100 should be made from Store B.

$$\begin{aligned} \text{18. a. } a &= 60\% \cdot 225 \\ a &= 0.6 \cdot 225 \\ a &= 135 \end{aligned}$$

135 people get directions from the Internet.

$$\begin{aligned} \text{b. } 225 + 15 &= 240 \text{ total} \\ 135 + 15 &= 150 \text{ Internet} \\ 150 &= p\% \cdot 240 \\ 0.625 &= p\% \\ 62.5\% &= p\% \end{aligned}$$

62.5% of 240 people get directions from the Internet.

First we calculate the new total of people surveyed. Then we find the new total of people who chose “from the Internet.” Then we use the percent equation to find what percent of the new total chose “From the Internet.”

$$\begin{aligned} \text{c. } \frac{135 + x}{225 + x} &= \frac{70}{100} \\ 100(135 + x) &= 70(225 + x) \\ 13,500 + 100x &= 15,750 + 70x \\ 13,500 + 30x &= 15,750 \\ 30x &= 2,250 \\ x &= 75 \end{aligned}$$

The proportion states that the part of the base (135 people plus x more people that chose “from the Internet”) over the base (225 total surveyed plus x more) equals the percent (70%) over 100. We set the cross products equal to each other and solve for x to find $x = 75$ people.

Cumulative Review Chs. 1–3 (pp. 202–203)

- $3 \cdot 4^2 - 21 = 3 \cdot 16 - 21 = 48 - 21 = 27$
- $4 + 4^2 \div 8 = 4 + 16 \div 8 = 4 + 2 = 6$
- $77 \div (11 - 4) = 77 \div 7 = 11$
- $\frac{1}{2}(8 \cdot 6) - 4^2 = \frac{1}{2}(8 \cdot 6) - 16$
 $= \frac{1}{2}(48) - 16$
 $= 24 - 16$
 $= 8$

$$\begin{aligned} \text{5. } 3[50 - (13 - 7)^2] &= 3[50 - 6^2] \\ &= 3[50 - 36] \\ &= 3(14) \\ &= 42 \end{aligned}$$

$$\begin{aligned} \text{6. } \frac{3}{4}[(6 + 4)^2 - 40] &= \frac{3}{4}[10^2 - 40] \\ &= \frac{3}{4}[100 - 40] \\ &= \frac{3}{4}[60] \\ &= 45 \end{aligned}$$

$$\begin{aligned} \text{7. } 7t - 11 &= 52 \\ 7(9) - 11 &\stackrel{?}{=} 52 \\ 63 - 11 &\stackrel{?}{=} 52 \\ 52 &= 52 \end{aligned}$$

Solution

$$\begin{aligned} \text{9. } 8z - 11 &> 21 \\ 8(4) - 11 &\stackrel{?}{>} 21 \\ 32 - 11 &\stackrel{?}{>} 21 \\ 21 &\not> 21 \end{aligned}$$

Not a solution

$$\begin{aligned} \text{11. } 5 - y &\geq 5 \\ 5 - 3 &\stackrel{?}{\geq} 5 \\ 2 &\not\geq 5 \end{aligned}$$

Not a solution

$$\begin{aligned} \text{8. } 3b - 2 &= 2b + 3 \\ 3(4) - 2 &\stackrel{?}{=} 2(4) + 3 \\ 12 - 2 &\stackrel{?}{=} 8 + 3 \\ 10 &\neq 11 \end{aligned}$$

Not a solution

$$\begin{aligned} \text{10. } 5a + 3 &\leq 13 \\ 5(2) + 3 &\stackrel{?}{\leq} 13 \\ 10 + 3 &\stackrel{?}{\leq} 13 \\ 13 &\leq 13 \end{aligned}$$

Solution

$$\begin{aligned} \text{12. } 8x - 15 &< 8 \\ 8(7) - 15 &\stackrel{?}{<} 8 \\ 56 - 15 &\stackrel{?}{<} 8 \\ 41 &\not< 8 \end{aligned}$$

Not a solution

$$\text{13. } -2\frac{1}{6} + \left(-4\frac{2}{3}\right) = -2\frac{1}{6} - 4\frac{4}{6} = -6\frac{5}{6}$$

$$\text{14. } 2.5 - (-2.05) = 2.5 + 2.05 = 4.55$$

$$\text{15. } -24.6 - (-5.5) = -24.6 + 5.5 = -19.1$$

$$\text{16. } \frac{5}{2}(-8)(-5) = 5(-4)(-5) = 100$$

$$\text{17. } 9 \div \left(-\frac{3}{7}\right) = 9\left(-\frac{7}{3}\right) = -21$$

$$\text{18. } -\frac{7}{8} \div \frac{1}{2} = -\frac{7}{8} \cdot \frac{2}{1} = -\frac{14}{8} = -\frac{7}{4}$$

$$\text{19. } \frac{32}{w} - 2 = \frac{32}{4} - 2 = 8 - 2 = 6$$

$$\begin{aligned} \text{20. } 7 + 3m^2 - 8m &= 7 + 3(5^2) - 8(5) \\ &= 7 + 3(25) - 8(5) \\ &= 7 + 75 - 40 \\ &= 42 \end{aligned}$$

$$\text{21. } \frac{5y}{32 - y^3} = \frac{5(3)}{32 - 3^3} = \frac{15}{32 - 27} = \frac{15}{5} = 3$$

$$\text{22. } 5.15 + (-h) + 6.6 = 5.15 + (-4.3) + 6.6 = 7.45$$

$$\text{23. } 17.4 - |-p| = 17.4 - |-3.5| = 17.4 - 3.5 = 13.9$$

$$\begin{aligned} \text{24. } k^2 - 12.2k &= (-1.6)^2 - 12.2(-1.6) \\ &= 2.56 - 12.2(-1.6) \\ &= 2.56 + 19.52 \\ &= 22.08 \end{aligned}$$

Chapter 3, continued

$$\begin{aligned} 25. \quad 8.3x - (-y) &= 8.3(6) - (-9) \\ &= 49.8 - (-9) \\ &= 49.8 + 9 \\ &= 58.8 \end{aligned}$$

$$26. \quad \frac{y}{5x - y} = \frac{4}{5(2) - 4} = \frac{4}{10 - 4} = \frac{4}{6} = \frac{2}{3}$$

$$\begin{aligned} 27. \quad m + 16 &= 5 && \text{Check:} \\ m &= -11 && -11 + 16 \stackrel{?}{=} 5 \\ &&& 5 = 5 \end{aligned}$$

$$\begin{aligned} 28. \quad -4 &= \frac{w}{7} && \text{Check:} \\ 7(-4) &= 7\left(\frac{w}{7}\right) && -4 \stackrel{?}{=} \frac{-28}{7} \\ -28 &= w && -4 = -4 \end{aligned}$$

$$\begin{aligned} 29. \quad 5 + 3x &= 23 && \text{Check:} \\ 3x &= 18 && 5 + 3(6) \stackrel{?}{=} 23 \\ x &= 6 && 5 + 18 \stackrel{?}{=} 23 \\ &&& 23 = 23 \end{aligned}$$

$$\begin{aligned} 30. \quad \frac{a}{3} - 4 &= 29 && \text{Check:} \\ \frac{a}{3} &= 33 && \frac{99}{3} - 4 \stackrel{?}{=} 29 \\ 3\left(\frac{a}{3}\right) &= 3(33) && 33 - 4 \stackrel{?}{=} 29 \\ a &= 99 && 29 = 29 \end{aligned}$$

$$\begin{aligned} 31. \quad -4 &= -2b - 18 + 5b \\ -4 &= 3b - 18 \\ 14 &= 3b \\ \frac{14}{3} &= b \\ \text{Check:} \\ -4 &\stackrel{?}{=} -2\left(\frac{14}{3}\right) - 18 + 5\left(\frac{14}{3}\right) \\ -4 &\stackrel{?}{=} -\frac{28}{3} - 18 + \frac{70}{3} \\ -4 &\stackrel{?}{=} \frac{42}{3} - 18 \\ -4 &= -4 \end{aligned}$$

$$\begin{aligned} 32. \quad \frac{3}{8}(16n + 48) &= 72 && \text{Check:} \\ \frac{8}{3} \cdot \frac{3}{8}(16n + 48) &= \frac{8}{3} \cdot 72 && \frac{3}{8}(16 \cdot 9 + 48) \stackrel{?}{=} 72 \\ 16n + 48 &= 192 && \frac{3}{8}(144 + 48) \stackrel{?}{=} 72 \\ 16n &= 144 && \frac{3}{8}(192) \stackrel{?}{=} 72 \\ n &= 9 && 72 = 72 \end{aligned}$$

$$\begin{aligned} 33. \quad -8z + 18 &= 2(2z - 9) && \text{Check:} \\ -8z + 18 &= 4z - 18 && -8(3) + 18 \stackrel{?}{=} 2(2 \cdot 3 - 9) \\ -12z + 18 &= -18 && -24 + 18 \stackrel{?}{=} 2(6 - 9) \\ -12z &= -36 && -6 \stackrel{?}{=} 2(-3) \\ z &= 3 && -6 = -6 \end{aligned}$$

$$\begin{aligned} 34. \quad (15c + 30) &= \frac{1}{3}(102 - 12c) \\ 3(15c + 30) &= 3 \cdot \frac{1}{3}(102 - 12c) \\ 45c + 90 &= 102 - 12c \\ 57c &= 12 \\ c &= \frac{4}{19} \end{aligned}$$

$$\begin{aligned} \text{Check:} \\ \left(15 \cdot \frac{4}{19} + 30\right) &\stackrel{?}{=} \frac{1}{3}(102 - 12 \cdot \frac{4}{19}) \\ \left(\frac{60}{19} + 30\right) &\stackrel{?}{=} \frac{1}{3}(102 - \frac{48}{19}) \\ \frac{630}{19} &\stackrel{?}{=} \frac{1}{3}\left(\frac{1890}{19}\right) \\ \frac{630}{19} &= \frac{630}{19} \end{aligned}$$

$$\begin{aligned} 35. \quad \frac{6}{d} &= \frac{12}{17} && 36. \quad \frac{4}{7} = \frac{20}{m} \\ 6(17) &= 12d && 7(20) = 4m \\ 102 &= 12d && 140 = 4m \\ 8.5 &= d && 35 = m \end{aligned}$$

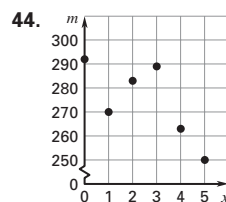
$$\begin{aligned} 37. \quad \frac{1}{9} &= \frac{5}{3x} && 38. \quad \frac{3}{6h} = \frac{12}{72} \\ 1(3x) &= 9(5) && 6h(12) = 3(72) \\ 3x &= 45 && 72h = 216 \\ x &= 15 && h = 3 \end{aligned}$$

$$\begin{aligned} 39. \quad \frac{2}{11} &= 4t - 1 && 40. \quad \frac{12}{a + 1} = \frac{132}{35} \\ 2(t - 1) &= 11(4) && 12(35) = 132(a + 1) \\ 2t - 2 &= 44 && 420 = 132a + 132 \\ 2t &= 46 && 288 = 132a \\ t &= 23 && \frac{24}{11} = a \end{aligned}$$

$$\begin{aligned} 41. \quad \frac{w + 2}{8} &= \frac{w}{3} && 42. \quad \frac{4}{9} = \frac{z}{z + 10} \\ 3(w + 2) &= 8w && 4(z + 10) = 9z \\ 3w + 6 &= 8w && 4z + 40 = 9z \\ 6 &= 5w && 40 = 5z \\ 1.2 &= w && 8 = z \end{aligned}$$

$$\begin{aligned} 43. \quad P &= 2l + 2w \\ P &= 2(15) + 2(12) = 30 + 24 = 54 \text{ ft} \\ \frac{54 \text{ ft}}{3 \text{ ft/piece}} &= 18 \text{ pieces} \end{aligned}$$

You need to buy 18 pieces.



Chapter 3, continued

45. Day 1: $38.82 - 39.16 = -0.34$

Change in price is down \$.34.

Day 2: $38.37 - 38.82 = -0.45$

Change in price is down \$.45.

Day 3: $38.12 - 38.37 = -0.25$

Change in price is down \$.25.

Day 4: $39.14 - 38.12 = 1.02$

Change in price is up \$1.02.

Day 5: $39.22 - 39.14 = 0.08$

Change in price is up \$.08.

46. Area = s^2

$$854 = s^2$$

$$\sqrt{854} = \sqrt{s^2}$$

$$29.22 \approx s$$

The glass needs to have a side length of about 29 inches.

47. Let p = number of people.

$$15.95p + 400 = 2633$$

$$15.95p = 2233$$

$$p = 140$$

140 people attended the prom.

48. $\frac{4}{3} = \frac{x}{16.2}$

$$4(16.2) = 3x$$

$$64.8 = 3x$$

$$21.6 = x$$

The standard screen has a length of 21.6 inches.

$$\frac{16}{9} = \frac{x}{16.2}$$

$$16(16.2) = 9x$$

$$259.2 = 9x$$

$$28.8 = x$$

The wide screen has a length of 28.8 inches.

49. a. $a = 10\% \cdot 20$

$$a = 0.1 \cdot 20$$

$$a = 2$$

2 players play center.

b. $a = 35\% \cdot 20$

$$a = 0.35 \cdot 20$$

$$a = 7$$

7 players play guard.

c. $a = 55\% \cdot 20$

$$a = 0.55 \cdot 20$$

$$a = 11$$

11 players play forward.