DIAGNOSING READINESS page 72

1. $0.45n = 3.60$ **2.** $3s = 124$ **3.** $2 \cdot 4 + 2 \cdot 13 = 8 + 26 = 34$ **4.** $2 \cdot 13 - 4^2 = 26 - 16 = 10$ **5.** $5 \cdot 2 + 2 \cdot 4 - 13 = 10 + 8 - 13 = 5$ **6.** $38 - 4^2 \div 2 = 38 - 16 \div 2 = 38 - 8 = 30$ **7.** 3 **8.** −10 **9.** 8 **10.** −8 **11.** 7.14 **12.** 16.4 **13.** $\frac{3}{10} - \frac{3}{4} = \frac{6}{20} - \frac{15}{20} = -\frac{9}{20}$ **14.** $\frac{1}{5} + \left(-\frac{2}{3}\right) = \frac{3}{15} - \frac{10}{15} = -\frac{7}{15}$ **15.** 17 **16.** $7\left(-\frac{6}{14}\right) = \frac{-42}{14} = -3$ **17.** $4^2(-6) = 16(36) = 576$ **18.** −2.75 **19.** $16k^2$ **20.** $13xy$ **21.** $2t + 2$ **22.** $12x - 4$

2-1 Solving One-Step Equations pages 74–80

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. x **2.** n **3.** c **4.** m **5.** $-2, \frac{1}{2}$ **6.** $2, -\frac{1}{2}$ **7.** $-\frac{3}{5}, \frac{5}{3}$ **8.** $\frac{3}{5}, -\frac{5}{3}$

Check Understanding

1a.
$$m - 10 = 2$$
$$m - 10 + 10 = 2 + 10$$
$$m = 12$$
Check: $m - 10 = 2$
$$12 - 10 \stackrel{?}{=} 2$$
$$2 = 2 \checkmark$$

1b.
$$y - 7.6 = 4$$
$$y - 7.6 + 7.6 = 4 + 7.6$$
$$y = 11.6$$
Check: $y - 7.6 = 4$
$$11.6 - 7.6 \stackrel{?}{=} 4$$
$$4 = 4 \checkmark$$

1c.
$$-9 = b - 5$$
$$-9 + 5 = b - 5 + 5$$
$$-4 = b$$
Check: $-9 = b - 5$
$$-9 \stackrel{?}{=} -4 - 5$$
$$-9 = -9 \checkmark$$

2a.
$$x + 5 = 6$$
$$x + 5 - 5 = 6 - 5$$
$$x = 1$$
Check: $1 + 5 = 6 \checkmark$

2b.
$$\frac{2}{3} + y = \frac{1}{4}$$
$$\frac{2}{3} - \frac{2}{3} + y = \frac{1}{4} - \frac{2}{3}$$
$$y = -\frac{5}{12}$$

2c.
$$-18 = 6 + w$$
$$-18 - 6 = 6 - 6 + w$$
$$-24 = w$$
Check: $-18 \stackrel{?}{=} 6 + (-24)$
$$-18 = -18 \checkmark$$

3. previous balance − withdrawal = new balance
$$x - 25 = 243.19$$
$$x - 25 + 25 = 243.19 + 25$$
$$x = 268.19$$
The previous balance is \$268.19.

4a.
$$\frac{n}{6} = 5$$
$$6\left(\frac{n}{6}\right) = 6(5)$$
$$n = 30$$
Check: $\frac{n}{6} = 5$
$$\frac{30}{6} \stackrel{?}{=} 5$$
$$5 = 5 \checkmark$$

4b.
$$\frac{x}{-3} = 18$$
$$-3\left(\frac{x}{-3}\right) = -3(18)$$
$$x = -54$$
Check: $\frac{-54}{-3} = 18 \checkmark$

4c.
$$-\frac{a}{5} = -20$$
$$5\left(-\frac{a}{5}\right) = 5(-20)$$
$$a = 100$$
Check: $-\frac{100}{5} = -20 \checkmark$

5a.
$$-\frac{1}{4}m = 8$$
$$-4\left(-\frac{1}{4}\right)m = -4(8)$$
$$m = -32$$
Check: $-\frac{1}{4}(-32) = 8 \checkmark$

5b.
$$\frac{3}{8}p = -15$$
$$\frac{8}{3}\left(\frac{3}{8}\right)p = \frac{8}{3}(-15)$$
$$p = -40$$
Check: $\frac{3}{8}(-40) = -15$
$$-15 = -15 \checkmark$$

5c.
$$\frac{8}{15} = \frac{2}{5}a$$
$$\frac{5}{2}\left(\frac{8}{15}\right) = \frac{5}{2}\left(\frac{2}{5}\right)a$$
$$\frac{4}{3} = a$$
$$1\frac{1}{3} = a$$
Check: $\frac{8}{15} = \frac{2}{5}a$
$$\frac{8}{15} \stackrel{?}{=} \frac{2}{5}\left(1\frac{1}{3}\right) = \frac{2}{5}\left(\frac{4}{3}\right)$$
$$\frac{8}{15} = \frac{8}{15} \checkmark$$

6a.
$$3a = 12$$
$$\frac{3a}{3} = \frac{12}{3}$$
$$a = 4$$
Check: $3(4) \stackrel{?}{=} 12$
$$12 = 12 \checkmark$$

6b.
$$20 = -2x$$
$$\frac{20}{2} = \frac{-2x}{2}$$
$$10 = -x$$
$$-10 = x$$
$$\text{Check: } 20 \stackrel{?}{=} -2(-10)$$
$$20 = 20 \checkmark$$

6c.
$$-8 = 5y$$
$$\frac{-8}{5} = \frac{5y}{5}$$
$$-\frac{8}{5} = y$$
$$y = -1\frac{3}{5}$$
$$\text{Check: } -8 \stackrel{?}{=} 5\left(-\frac{8}{5}\right)$$
$$-8 = -8 \checkmark$$

Exercises

1.
$$x - 8 = 0$$
$$x - 8 + 8 = 8$$
$$x = 8$$
$$\text{Check: } 8 - 8 = 0 \checkmark$$

2.
$$n - 2 = -5$$
$$n - 2 + 2 = -5 + 2$$
$$n = -3$$
$$\text{Check: } -3 - 2 = -5 \checkmark$$

3.
$$c - 4 = 9$$
$$c - 4 + 4 = 9 + 4$$
$$c = 13$$
$$\text{Check: } 13 - 4 = 9 \checkmark$$

4.
$$23 = x - 17$$
$$23 + 17 = x - 17 + 17$$
$$40 = x$$
$$\text{Check: } 23 = 40 - 17 \checkmark$$

5.
$$-3.5 = m - 2.5$$
$$-3.5 + 2.5 = m - 2.5 + 2.5$$
$$-1 = m$$
$$\text{Check: } -3.5 = -1 - 2.5 \checkmark$$

6.
$$x - \frac{2}{3} = 5$$
$$x - \frac{2}{3} + \frac{2}{3} = 5 + \frac{2}{3}$$
$$x = 5\frac{2}{3}$$
$$\text{Check: } 5\frac{2}{3} - \frac{2}{3} = 5 \checkmark$$

7.
$$x - \frac{4}{7} = \frac{3}{7}$$
$$x - \frac{4}{7} + \frac{4}{7} = \frac{3}{7} + \frac{4}{7}$$
$$x = 1$$
$$\text{Check: } 1 - \frac{4}{7} \stackrel{?}{=} \frac{3}{7}$$
$$\frac{3}{7} = \frac{3}{7} \checkmark$$

8.
$$28.32 = p - 32.96$$
$$28.32 + 32.96 = p - 32.96 + 32.96$$
$$61.28 = p$$
$$\text{Check: } 28.32 \stackrel{?}{=} 61.28 - 32.96$$
$$28.32 = 28.32 \checkmark$$

9.
$$c - 7.88 = 9.24$$
$$c - 7.88 + 7.88 = 9.24 + 7.88$$
$$c = 17.12$$
$$\text{Check: } 17.12 - 7.88 = 9.24 \checkmark$$

10.
$$b + 5 = -13$$
$$b + 5 - 5 = -13 - 5$$
$$b = -18$$
$$\text{Check: } -18 + 5 = -13 \checkmark$$

11.
$$x + 2 = 6$$
$$x + 2 - 2 = 6 - 2$$
$$x = 4$$
$$\text{Check: } 4 + 2 = 6 \checkmark$$

12.
$$23 + y = 16$$
$$23 - 23 + y = 16 - 23$$
$$y = -7$$
$$\text{Check: } 23 + (-7) = 16 \checkmark$$

13.
$$-31 = 26 + a$$
$$-31 - 26 = 26 - 26 + a$$
$$-57 = a$$
$$\text{Check: } -31 \stackrel{?}{=} 26 + (-57)$$
$$-31 = -31 \checkmark$$

14.
$$k + \frac{3}{11} = \frac{8}{11}$$
$$k + \frac{3}{11} - \frac{3}{11} = \frac{8}{11} - \frac{3}{11}$$
$$k = \frac{5}{11}$$
$$\text{Check: } \frac{5}{11} + \frac{3}{11} = \frac{8}{11} \checkmark$$

15.
$$4 = \frac{2}{3} + c$$
$$4 - \frac{2}{3} = \frac{2}{3} - \frac{2}{3} + c$$
$$3\frac{1}{3} = c$$
$$\text{Check: } 4 = \frac{2}{3} + 3\frac{1}{3} \checkmark$$

16.
$$x + 2.5 = 4.5$$
$$x + 2.5 - 2.5 = 4.5 - 2.5$$
$$x = 2$$
$$\text{Check: } 2 + 2.5 = 4.5 \checkmark$$

17.
$$5.25 + x = 3.75$$
$$5.25 - 5.25 + x = 3.75 - 5.25$$
$$x = -1.5$$
$$\text{Check: } 5.25 - 1.5 = 3.75 \checkmark$$

18.
$$73.35 = 4.37 + y$$
$$73.35 - 4.37 = 4.37 - 4.37 + y$$
$$68.98 = y$$
$$\text{Check: } 73.35 \stackrel{?}{=} 4.37 + 68.98$$
$$73.35 = 73.35 \checkmark$$

19.
$$38\frac{3}{4} + g = 41\frac{1}{2}$$
$$38\frac{3}{4} + g - 38\frac{3}{4} = 41\frac{1}{2} - 38\frac{3}{4}$$
$$g = 2\frac{3}{4}$$

The child grew $2\frac{3}{4}$ in.

20.
$$4.5 = t - 2.5$$
$$4.5 + 2.5 = t - 2.5 + 2.5$$
$$t = 7$$

Rhode Island sales tax = 7%.

21.
$$\frac{y}{5} = 100$$
$$5\left(\frac{y}{5}\right) = 5(100)$$
$$y = 500$$
$$\text{Check: } \frac{500}{5} = 100 \checkmark$$

22.
$$\frac{x}{2} = 98$$
$$2\left(\frac{x}{2}\right) = 2(98)$$
$$x = 196$$
Check: $\frac{196}{2} = 98$ ✓

23.
$$\frac{m}{3} = -6$$
$$3\left(\frac{m}{3}\right) = 3(-6)$$
$$m = -18$$
Check: $\frac{-18}{3} = -6$ ✓

24.
$$\frac{w}{4} = -80$$
$$4\left(\frac{w}{4}\right) = 4(-80)$$
$$w = -320$$
Check: $\frac{-320}{4} = 80$ ✓

25.
$$28 = \frac{p}{7}$$
$$7(28) = 7\left(\frac{p}{7}\right)$$
$$196 = p$$
Check: $28 \stackrel{?}{=} \frac{196}{7}$
$$28 = 28 \checkmark$$

26.
$$10 = \frac{a}{-2}$$
$$(-2)(10) = (-2)\left(\frac{a}{-2}\right)$$
$$-20 = a$$
Check: $10 = \frac{-20}{-2}$ ✓

27.
$$-\frac{c}{7} = 35$$
$$7\left(-\frac{c}{7}\right) = 7(35)$$
$$-c = 245$$
$$c = -245$$
Check: $-\frac{-245}{7} = 35$ ✓

28.
$$-\frac{r}{3} = -101$$
$$\frac{r}{3} = 101$$
$$3\left(\frac{r}{3}\right) = 3(101)$$
$$r = 303$$
Check: $-\frac{303}{3} = -101$ ✓

29.
$$-\frac{2}{3}x = 6$$
$$\left(-\frac{3}{2}\right)\left(-\frac{2}{3}x\right) = \left(-\frac{3}{2}\right)6$$
$$x = -9$$
Check: $\left(-\frac{2}{3}\right)(-9) = 6$ ✓

30.
$$\frac{2}{3}c = -18$$
$$\frac{3}{2}\left(\frac{2}{3}c\right) = \frac{3}{2}(-18)$$
$$c = -27$$
Check: $\frac{2}{3}(-27) = -18$ ✓

31.
$$\frac{2}{5}a = -4$$
$$\frac{5}{2}\left(\frac{2}{5}\right)a = \frac{5}{2}(-4)$$
$$a = -10$$
Check: $\frac{2}{5}(-10) = -4$ ✓

32.
$$\frac{3}{7}y = 1$$
$$\frac{7}{3}\left(\frac{3}{7}y\right) = \frac{7}{3}(1)$$
$$y = \frac{7}{3}$$
$$y = 2\frac{1}{3}$$
Check: $\frac{3}{7}\left(\frac{7}{3}\right) = 1$ ✓

33.
$$\frac{7}{8}w = 14$$
$$\frac{8}{7}\left(\frac{7}{8}w\right) = \frac{8}{7}(14)$$
$$w = 16$$
Check: $\frac{7}{8}(16) = 14$ ✓

34.
$$-\frac{2}{9}x = 10$$
$$\left(-\frac{9}{2}\right)\left(-\frac{2}{9}x\right) = \left(-\frac{9}{2}\right)(10)$$
$$x = -45$$
Check: $-\frac{2}{9}(-45) = 10$ ✓

35.
$$-\frac{1}{6}m = 12$$
$$(-6)\left(-\frac{1}{6}m\right) = (-6)12$$
$$m = -72$$
Check: $-\frac{1}{6}(-72) = 12$ ✓

36.
$$\frac{5}{11}n = 3$$
$$\frac{11}{5}\left(\frac{5}{11}n\right) = \frac{11}{5}(3)$$
$$n = \frac{33}{5} = 6\frac{3}{5}$$
Check: $\frac{5}{11}\left(\frac{33}{5}\right) = 3$ ✓

37.
$$\frac{5}{8}x = 8$$
$$\frac{8}{5}\left(\frac{5}{8}x\right) = \frac{8}{5}(8)$$
$$x = \frac{64}{5} = 12\frac{4}{5}$$
Check: $\frac{5}{8}\left(\frac{64}{5}\right) = 8$ ✓

38.
$$-\frac{12}{17}y = 3$$
$$-\frac{17}{12}\left(-\frac{12}{17}y\right) = -\frac{17}{12}(3)$$
$$y = -\frac{17}{4} = -4\frac{1}{4}$$
Check: $-\frac{12}{17}\left(-\frac{17}{4}\right) = 3$ ✓

39.
$$\frac{4}{7}m = 8$$
$$\frac{7}{4}\left(\frac{4}{7}m\right) = \frac{7}{4}(8)$$
$$m = 14$$
Check: $\frac{4}{7}(14) = 8$ ✓

40.
$$\frac{3}{4}n = -\frac{3}{8}$$
$$\frac{4}{3}\left(\frac{3}{4}n\right) = \frac{4}{3}\left(-\frac{3}{8}\right)$$
$$n = -\frac{1}{2}$$
Check: $\frac{3}{4}\left(-\frac{1}{2}\right) = -\frac{3}{8}$ ✓

41.
$$5x = -75$$
$$\frac{1}{5}(5x) = \frac{1}{5}(-75)$$
$$x = -15$$
Check: $5(-15) = -75$ ✓

42.
$$-7y = 28$$
$$-\tfrac{1}{7}(-7y) = -\tfrac{1}{7}(28)$$
$$y = -4$$
$$\text{Check: } -7(-4) = 28 \checkmark$$

43.
$$-8n = -64$$
$$-\tfrac{1}{8}(-8n) = -\tfrac{1}{8}(-64)$$
$$n = 8$$
$$\text{Check: } -8(8) = -64 \checkmark$$

44.
$$6p = -120$$
$$\tfrac{1}{6}(6p) = \tfrac{1}{6}(-120)$$
$$p = -20$$
$$\text{Check: } 6(-20) = -120 \checkmark$$

45.
$$-6 = -3a$$
$$-\tfrac{1}{3}(-6) = -\tfrac{1}{3}(-3a)$$
$$2 = a$$
$$\text{Check: } -6 = -3(2) \checkmark$$

46.
$$2 = -2m$$
$$-\tfrac{1}{2}(2) = -\tfrac{1}{2}(-2m)$$
$$-1 = m$$
$$\text{Check: } 2 = -2(-1) \checkmark$$

47.
$$-4k = 52$$
$$-\tfrac{1}{4}(-4k) = -\tfrac{1}{4}(52)$$
$$k = -13$$
$$\text{Check: } -4(-13) = 52 \checkmark$$

48.
$$-3x = -48$$
$$-\tfrac{1}{3}(-3x) = -\tfrac{1}{3}(-48)$$
$$x = 16$$
$$\text{Check: } -3(16) = -48 \checkmark$$

49.
$$-4 = 7x$$
$$\frac{-4}{7} = \frac{7x}{7}$$
$$-\tfrac{4}{7} = x$$
$$\text{Check: } -4 \stackrel{?}{=} 7\left(-\tfrac{4}{7}\right)$$
$$-4 = -4 \checkmark$$

50.
$$9 = 11y$$
$$\frac{9}{11} = \frac{11y}{11}$$
$$\frac{9}{11} = y$$
$$\text{Check: } 9 = 11\left(\tfrac{9}{11}\right) \checkmark$$

51.
$$-7m = 9$$
$$-\tfrac{1}{7}(-7m) = -\tfrac{1}{7}(9)$$
$$m = -\tfrac{9}{7} = -1\tfrac{2}{7}$$
$$\text{Check: } -7\left(-\tfrac{9}{7}\right) = 9 \checkmark$$

52.
$$9n = -5$$
$$\tfrac{1}{9}(9n) = \tfrac{1}{9}(-5)$$
$$n = -\tfrac{5}{9}$$
$$\text{Check: } 9\left(-\tfrac{5}{9}\right) = -5 \quad \checkmark$$

53. No; 96.26 is close to 100, and 62.74 is close to 60, so the difference is close to 40, not 159. The 96.26 arises from the error of subtracting 62.74 from 159 instead of adding. **54.** Answers may vary. Sample: CDs cost \$15 each. How many CDs can you buy for \$120?

55.
$$14 + t = 16.1$$
$$14 + t - 14 = 16.1 - 14$$
$$t = 2.1$$

56.
$$\tfrac{2}{3}w = 12$$
$$\tfrac{3}{2}\left(\tfrac{2}{3}\right)w = \tfrac{3}{2}(12)$$
$$w = 18$$

57.
$$b + 6\tfrac{1}{8} = 5\tfrac{3}{4}$$
$$b + 6\tfrac{1}{8} - 6\tfrac{1}{8} = 5\tfrac{3}{4} - 6\tfrac{1}{8}$$
$$b = -\tfrac{3}{8}$$

58.
$$9\tfrac{2}{3} = a + 19$$
$$9\tfrac{2}{3} - 19 = a + 19 - 19$$
$$9\tfrac{2}{3} - 19 = a$$
$$a = -9\tfrac{1}{3}$$

59.
$$\tfrac{x}{6} = -10$$
$$6\left(\tfrac{x}{6}\right) = 6(-10)$$
$$x = -60$$

60.
$$y - 3.7 = 6.93$$
$$y - 3.7 + 3.7 = 6.93 + 3.7$$
$$y = 10.63$$

61.
$$15.9 = r + 27.3$$
$$15.9 - 27.3 = r + 27.3 - 27.3$$
$$-11.4 = r$$

62.
$$-\tfrac{a}{7} = 2.5$$
$$-7\left(-\tfrac{a}{7}\right) = -7(2.5)$$
$$a = -17.5$$

63.
$$-3x = \tfrac{5}{6}$$
$$-\tfrac{1}{3}(-3x) = -\tfrac{1}{3}\left(\tfrac{5}{6}\right)$$
$$x = -\tfrac{5}{18}$$

64.
$$\tfrac{x}{18} = 13.5$$
$$18\left(\tfrac{x}{18}\right) = 18(13.5)$$
$$x = 243$$

65.
$$m - 1.2 = -2.09$$
$$m - 1.2 + 1.2 = -2.09 + 1.2$$
$$m = -0.89$$

66.
$$0.9x = 11.7$$
$$\frac{0.9x}{0.9} = \frac{11.7}{0.9}$$
$$x = 13$$

67.
$$p + \tfrac{1}{4} = -3\tfrac{1}{3}$$
$$p + \tfrac{1}{4} - \tfrac{1}{4} = -3\tfrac{1}{3} - \tfrac{1}{4}$$
$$p = -3\tfrac{3}{4}$$

68.
$$6.1 + m = -11$$
$$6.1 + m - 6.1 = -11 - 6.1$$
$$m = -17.1$$

69.
$$-1\tfrac{3}{4} = p - \tfrac{1}{2}$$
$$-1\tfrac{3}{4} + \tfrac{1}{2} = p - \tfrac{1}{2} + \tfrac{1}{2}$$
$$p = -1\tfrac{1}{4}$$

70. $5.2p = 46$
$\frac{5.2p}{5.2} = \frac{46}{5.2}$
$p = \frac{46}{5.2}$
Rainfall is about 8.8 in.

71. $189 = e - 1048$
$189 + 1048 = e - 1048 + 1048$
$e = 1237$
1237 engineers ran in the marathon.

72a. $106{,}000 + i = 4{,}930{,}000$
$106{,}000 + i - 106{,}000 = 4{,}930{,}000 - 106{,}000$
$i = 4{,}824{,}000$
The number of visits increased by 4,824,000.

72b. $\frac{2}{5}v = 1{,}928{,}000$
$\frac{5}{2}\left(\frac{2}{5}v\right) = \frac{5}{2}(1{,}928{,}000)$
$v = 4{,}820{,}000$
There were 4,820,000 visitors in 2000.

73. $17x = 106.25$
$\frac{17x}{17} = \frac{106.25}{17}$
$x = 6.25$
The wage is \$6.25/h.

74. Answers may vary. Sample: A letter only needs to represent the same value in related equations. If equations are not related, the values of the variable may be different. **75.** Subtraction Property of Equality **76a.** The correct answer is 67.2. The student overlooked the minus sign. Also, the student may have used 112 instead of 11.2. **76b.** The student could have estimated the answer as $a \approx -6 \cdot 11 = -66$.

77. $52 = x + 8$
$52 - 8 = x + 8 - 8$
$44 = x$

78. $70 = 5x$
$\frac{70}{5} = \frac{5x}{5}$
$x = 14$

79. $46 = \frac{x}{2}$
$2(46) = 2\left(\frac{x}{2}\right)$
$x = 92$

80a. Let ℓ = cost of labor.
$\ell = \frac{1}{3}(166.50)$
$\ell = 55.50$
The labor cost is \$55.50.

80b. $c = \frac{55.50}{1.5}$
$c = 37$
The hourly charge is \$37.

81. $109 + b = 180$
$109 + b - 109 = 180 - 109$
$b = 71$
The measure of $\angle b$ is 71°.

82a. $a = 22 - 23 = -1$
$a = -0.1$
$f = 11 - 10 = 1$
$h = -\frac{1288}{80} = -16.1$
$n = 33 - 9 = 24$
$s = \frac{4}{16} = \frac{1}{4}$
$T = \frac{-33}{2} = -16\frac{1}{2}$
$t = -\frac{1}{8} - \frac{5}{8} = -\frac{3}{4}$
$u = 5(4) = 20$
$w = -1\frac{5}{6} + 1\frac{1}{6} = -\frac{2}{3}$

82b. In increasing order, the solutions are $-16\frac{1}{2}$, -16.1, -1, $-\frac{3}{4}$, $-\frac{2}{3}$, -0.1, $\frac{1}{4}$, 1, 20, and 24. The corresponding phrase is, "That was fun."

83. $200 = \frac{2}{3}x$
$x = \frac{3}{2}(200)$
$x = 300$
The answer is 300 mg.

84a. All values of x; this is the Mult. Prop. of Zero.
84b. None; by the Mult. Prop. of Zero, $0 \cdot x = 0 \neq 9$.

85. $g + 7 = 28$
$g + 7 - 7 = 28 - 7$
$g = 21$
The answer is D.

86. $\frac{2}{3}x = 18$
$\frac{3}{2}\left(\frac{2}{3}x\right) = \frac{3}{2}(18)$
$x = 27$
The answer is H.

87. 2(number of field goals) = 38; the answer is D.
88. The cost per CD times the number of CDs must equal \$50.00; the answer is I. **89.** The rise in temperature d must be added to -4 to get 34; the answer is B. **90.** The word *times* represents a multiplication, and *difference* a substraction; the factors are 6 and $(n - 2)$; the answer is G. **91.** *A* **92.** *C* **93.** *B* **94.** *D* **95.** $5(a - 3) = 5(a) - 5(3) = 5(a) - 15$
96. $(6 + y)(-2) = 6(-2) + y(-2) = -12 - 2y$
97. $\frac{1}{2}(18 + m) = \frac{1}{2}(18) + \frac{1}{2}m = 9 + \frac{1}{2}m$
98. $(4a - 5)(2c) = (4a)(2c) - 5(2c) = 8ac - 10c$
99. $12 - 36 \div 6 = 12 - 6 = 6$ **100.** $5 \cdot 9 - 2^2 = 45 - 4 = 41$ **101.** $3 \cdot 2 + 13 - 4 \cdot 8 = 6 + 13 - 32 = -13$

2-2 Solving Two-Step Equations pages 81–87

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. 19; Add. Prop. of Eq. **2.** 5.2; Subtr. Prop. of Eq. **3.** 14; Add. Prop. of Eq. **4.** 33; Add. Prop. of Eq. **5.** 32; Mult. Prop. of Eq. **6.** 3; Div. Prop. of Eq. **7.** $\frac{1}{5}$ **8.** -9 **9.** $3\frac{3}{4}$

Check Understanding

1a.

$$7 = 2y - 3$$
$$7 + 3 = 2y - 3 + 3$$
$$10 = 2y$$
$$\frac{10}{2} = \frac{2y}{2}$$
$$5 = y$$
$$\text{Check: } 7 = 2y - 3$$
$$7 \stackrel{?}{=} 2 \cdot 5 - 3$$
$$7 = 7 \checkmark$$

1b.

$$6a + 2 = -8$$
$$6a + 2 - 2 = -8 - 2$$
$$6a = -10$$
$$\frac{6a}{6} = -\frac{10}{6}$$
$$a = -\frac{5}{3} = -1\frac{2}{3}$$
$$\text{Check: } 6\left(-\frac{5}{3}\right) + 2 \stackrel{?}{=} -8$$
$$-10 + 2 = -8 \checkmark$$

1c.

$$\frac{x}{9} - 15 = 12$$
$$\frac{x}{9} - 15 + 15 = 12 + 15$$
$$\frac{x}{9} = 27$$
$$9\left(\frac{x}{9}\right) = 9(27)$$
$$x = 243$$
$$\text{Check: } \frac{x}{9} - 15 = 12$$
$$\frac{243}{9} - 15 \stackrel{?}{=} 12$$
$$27 - 15 = 12$$
$$12 = 12 \checkmark$$

2. $n = \frac{14 - 3}{0.60} = 18.\overline{3} \approx 18$; you can order 18 bulbs.

3a.

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

3b.

$$-a - 5 = -8$$
$$-a - 5 + 5 = -8 + 5$$
$$-a = -3$$
$$-1(-a) = -1(-3)$$
$$a = 3$$

3c.

$$4 = -c + 11$$
$$4 - 11 = -c + 11 - 11$$
$$-7 = -c$$
$$-1(-7) = -1(-c)$$
$$7 = c$$

4.

$$\frac{3}{5}w + 9 = -1$$
$$\frac{3}{5}w + 9 - 9 = -1 - 9 \text{ (Subtr. Prop. of Eq.)}$$
$$\frac{3}{5}w = -10 \text{ (subtraction)}$$
$$\frac{5}{3}\left(\frac{3}{5}w\right) = \frac{5}{3}(-10) \text{ (Mult. Prop. of Eq.)}$$
$$w = -\frac{50}{3} = -16\frac{2}{3} \text{ (multiplication)}$$

5.

$$-9 - 4m = 3$$
$$-9 + 9 - 4m = 3 + 9 \text{ (Add. Prop. of Eq.)}$$
$$-4m = 12 \text{ (addition)}$$
$$\frac{-4m}{-4} = \frac{12}{-4} \text{ (Div. Prop. of Eq.)}$$
$$m = -3 \text{ (division)}$$

Exercises

1.

$$1 + \frac{a}{5} = -1$$
$$1 - 1 + \frac{a}{5} = -1 - 1$$
$$\frac{a}{5} = -2$$
$$5\left(\frac{a}{5}\right) = -5(2)$$
$$a = -10$$
$$\text{Check: } 1 + \frac{a}{5} = -1$$
$$1 + \frac{-10}{5} \stackrel{?}{=} -1$$
$$-1 = -1 \checkmark$$

2.

$$2n - 5 = 7$$
$$2n - 5 + 5 = 7 + 5$$
$$2n = 12$$
$$\frac{2n}{2} = \frac{12}{2}$$
$$n = 6$$
$$\text{Check: } 2n - 5 = 7$$
$$2(6) - 5 \stackrel{?}{=} 7$$
$$7 = 7 \checkmark$$

3.

$$-1 = 3 + 4x$$
$$-1 - 3 = 3 + 4x - 3$$
$$-4 = 4x$$
$$\frac{4x}{4} = \frac{-4}{4}$$
$$x = -1$$
$$\text{Check: } -1 = 3 + 4(-1) \checkmark$$

4.

$$\frac{y}{2} + 5 = -12$$
$$\frac{y}{2} + 5 - 5 = -12 - 5$$
$$\frac{y}{2} = -17$$
$$2\left(\frac{y}{2}\right) = 2(-17)$$
$$y = -34$$
$$\text{Check: } \frac{y}{2} + 5 = -12$$
$$\frac{-34}{2} + 5 \stackrel{?}{=} -12$$
$$-17 + 5 = -12 \checkmark$$

5.

$$3b + 7 = -2$$
$$3b + 7 - 7 = -2 - 7$$
$$3b = -9$$
$$\frac{3b}{3} = \frac{-9}{3}$$
$$b = -3$$
$$\text{Check: } 3(-3) + 7 = -2 \checkmark$$

6.

$$\frac{x}{3} - 9 = 0$$
$$\frac{x}{3} + 9 - 9 = 0 + 9$$
$$\frac{x}{3} = 9$$
$$3\left(\frac{x}{3}\right) = 3(9)$$
$$x = 27$$
$$\text{Check: } \frac{27}{3} - 9 = 0 \checkmark$$

7.

$$14 + \frac{h}{5} = 2$$
$$14 + \frac{h}{5} - 14 = 2 - 14$$
$$\frac{h}{5} = -12$$
$$5\left(\frac{h}{5}\right) = -5(12)$$
$$h = -60$$

Check: $14 + \frac{-60}{5} \stackrel{?}{=} 2$

$14 - 12 = 2$ ✓

8.
$$-10 = -6 + 2c$$
$$-10 + 6 = -6 + 2c + 6$$
$$-4 = 2c$$

Note: $-4 = 2c$ is equivalent to $2c = -4$.

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

Check: $-10 = -6 + 2(-2)$ ✓

9.
$$\frac{m}{8} + 4 = 16$$
$$\frac{m}{8} + 4 - 4 = 16 - 4$$
$$\frac{m}{8} = 12$$
$$8\left(\frac{m}{8}\right) = 8(12)$$
$$m = 96$$

Check: $\frac{96}{8} + 4 \stackrel{?}{=} 16$

$12 + 4 = 16$ ✓

10.
$$\frac{a}{4} - 21 = 7$$
$$\frac{a}{4} - 21 + 21 = 7 + 21$$
$$\frac{a}{4} = 28$$
$$4\left(\frac{a}{4}\right) = 4(28)$$
$$a = 112$$

Check: $\frac{112}{4} - 21 \stackrel{?}{=} 7$

$28 - 21 = 7$ ✓

11.
$$3x - 1 = 8$$
$$3x - 1 + 1 = 8 + 1$$
$$3x = 9$$
$$3\frac{x}{3} = \frac{9}{3}$$
$$x = 3$$

Check: $3(3) - 1 = 8$ ✓

12.
$$10 = 2n + 1$$
$$10 - 1 = 2n + 1 - 1$$
$$9 = 2n$$
$$\frac{2n}{2} = \frac{9}{2}$$
$$n = 4\tfrac{1}{2}$$

Check: $10 = 2\left(\frac{9}{2}\right) + 1$ ✓

13.
$$35 = 3 + 5x$$
$$35 - 3 = 3 + 5x - 3$$
$$32 = 5x$$
$$\frac{5x}{5} = \frac{32}{5}$$
$$x = 6\tfrac{2}{5}$$

Check: $35 = 3 + 5\left(\frac{32}{5}\right)$ ✓

14.
$$41 = \tfrac{2}{5}x - 7$$
$$41 + 7 = \tfrac{2}{5}x - 7 + 7$$
$$48 = \tfrac{2}{5}x$$
$$\tfrac{5}{2}\left(\tfrac{2}{5}x\right) = \tfrac{5}{2}(48)$$
$$x = 120$$

Check: $41 \stackrel{?}{=} \frac{2}{5}(120) - 7$

$41 = 48 - 7$ ✓

15.
$$-3 + \frac{m}{3} = 12$$
$$-3 + \frac{m}{3} + 3 = 12 + 3$$
$$\frac{m}{3} = 15$$
$$3\left(\frac{m}{3}\right) = 3 \cdot 15$$
$$m = 45$$

Check: $-3 + \frac{45}{3} = 12$ ✓

16.
$$9 + \frac{n}{5} = 19$$
$$9 + \frac{n}{5} - 9 = 19 - 9$$
$$\frac{n}{5} = 10$$
$$5\left(\frac{n}{5}\right) = 5 \cdot 10$$
$$n = 50$$

Check: $9 + \frac{50}{5} = 19$ ✓

17.
$$2n + 4028 = 51{,}514$$
$$2n + 4028 - 4028 = 51{,}514 - 4028$$
$$2n = 47{,}486$$
$$\frac{2n}{2} = \frac{47{,}486}{2}$$
$$n = 23{,}743$$

The library had 23,743 books.

18.
$$2m + 18 = 60$$
$$2m + 18 - 18 = 60 - 18$$
$$2m = 42$$
$$\frac{2m}{2} = \frac{42}{2}$$
$$m = 21$$

Time to finish is 21 min.

19.
$$39.95 + 0.35m = 69.70$$
$$39.95 + 0.35m - 39.95 = 69.70 - 39.95$$
$$0.35m = 29.75$$
$$\frac{0.35m}{0.35} = \frac{29.75}{0.35}$$
$$m = 85$$

The cell phone use was 85 min over 500.

20.
$$-b + 5 = -16$$
$$-b + 5 - 5 = -16 - 5$$
$$-b = -21$$
$$b = 21$$

Check: $-21 + 5 = -16$ ✓

21.
$$-p - 24 = -8$$
$$-p - 24 + 24 = -8 + 24$$
$$-p = 16$$
$$p = -16$$

Check: $-(-16) - 24 = -8$ ✓

22.
$$-7 = -c - 29$$
$$-7 + 29 = -c - 29 + 29$$
$$22 = -c$$
$$c = -22$$

Check: $-7 = -(-22) - 29$ ✓

23.
$$-y - 52 = 33$$
$$-y - 52 + 52 = 33 + 52$$
$$-y = 85$$
$$y = -85$$

Check: $-(-85) - 52 = 33$ ✓

24.
$$-m + 2 = 1$$
$$-m + 2 - 2 = 1 - 2$$
$$-m = -1$$
$$m = 1$$

Check: $-1 + 2 = 1$ ✓

25.
$$-9 = -a + 16$$
$$-9 - 16 = -a + 16 - 16$$
$$-25 = -a$$
$$a = 25$$
Check: $-9 = -25 + 16$ ✓

26.
$$-x + 100 = 100$$
$$-x + 100 - 100 = 100 - 100$$
$$-x = 0$$
$$x = 0$$
Check: $0 + 100 = 100$ ✓

27.
$$-1 = -n - 3$$
$$n = -3 + 1 = -2$$
Check: $-1 = -(-2) - 3$ ✓

28.
$$-y - 3 = 8$$
$$-y - 3 + 3 = 8 + 3$$
$$-y = 11$$
$$y = -11$$
Check: $-(-11) - 3 = 8$ ✓

29.
$$15 = -z + 8$$
$$15 - 8 = -z + 8 - 8$$
$$7 = -z$$
$$z = -7$$
Check: $15 = -(-7) + 8$ ✓

30.
$$-q + 5 = 10$$
$$-q + 5 - 5 = 10 - 5$$
$$-q = 5$$
$$q = -5$$
Check: $-(-5) + 5 = 10$ ✓

31.
$$-a + 9 = 25$$
$$-a + 9 - 9 = 25 - 9$$
$$-a = 16$$
$$a = -16$$
Check: $-(-16) + 9 = 25$ ✓

32.
$$-x - 4 = 20$$
$$-x - 4 + 4 = 20 + 4$$
$$-x = 24$$
$$x = -24$$
Check: $-(-24) - 4 = 20$ ✓

33.
$$-y + 10 = 25$$
$$-y + 10 - 10 = 25 - 10$$
$$-y = 15$$
$$y = -15$$
Check: $-(-15) + 10 = 25$ ✓

34.
$$5 = -z - 3$$
$$5 + 3 = -z - 3 + 3$$
$$8 = -z$$
$$z = -8$$
Check: $5 = -(-8) - 3$ ✓

35.
$$9 = -x + 8$$
$$9 - 8 = 8 - 8$$
$$1 = -x$$
$$x = -1$$
Check: $9 = -(-1) + 8$ ✓

36.
$$\frac{x}{5} + 9 = 11$$
$$\frac{x}{5} + 9 - 9 = 11 - 9 \text{ (Subtr. Prop. of Eq.)}$$
$$\frac{x}{5} = 2 \text{ (subtraction)}$$
$$5\left(\frac{x}{5}\right) = 5(2) \text{ (Mult. Prop. of Eq.)}$$
$$x = 10 \text{ (multiplication)}$$

37.
$$-y - 5 = 11$$
$$-y - 5 + 5 = 11 + 5 \text{ (Add. Prop. of Eq.)}$$
$$-y = 16 \text{ (addition)}$$
$$-1(-y) = -1(16) \text{ (Mult. Prop. of Eq.)}$$
$$y = -16 \text{ (Mult. Prop. of } -1)$$

38.
$$18 - n = 21$$
$$18 - n - 18 = 21 - 18 \text{ (Subtr. Prop. of Eq.)}$$
$$-n = 3 \text{ (subtraction)}$$
$$-1(-n) = -1(3) \text{ (Mult. Prop. of Eq.)}$$
$$n = -3 \text{ (multiplication)}$$

39.
$$12 - 2h = 8$$
$$12 - 2h - 12 = 8 - 12 \text{ (Subtr. Prop. of Eq.)}$$
$$-2h = -4 \text{ (subtraction)}$$
$$\frac{-2h}{-2} = \frac{-4}{-2} \text{ (Div. Prop. of Eq.)}$$
$$h = 2 \text{ (division)}$$

40.
$$\frac{5}{7}x + \frac{1}{7} = 3$$
$$\frac{5}{7}x + \frac{1}{7} - \frac{1}{7} = 3 - \frac{1}{7}$$
$$\frac{5}{7}x = \frac{20}{7}$$
$$\frac{7}{5}\left(\frac{5}{7}x\right) = \frac{7}{5}\left(\frac{20}{7}\right)$$
$$x = 4$$

41.
$$\frac{a}{5} + 15 = 30$$
$$\frac{a}{5} + 15 - 15 = 30 - 15$$
$$\frac{a}{5} = 15$$
$$5\frac{a}{5} = 5 \cdot 15$$
$$a = 75$$

42.
$$-\frac{1}{5}t - 2 = 4$$
$$-\frac{1}{5}t - 2 + 2 = 4 + 2$$
$$-\frac{1}{5}t = 6$$
$$5\left(-\frac{1}{5}t\right) = 5(6)$$
$$t = -30$$

43.
$$-6 + 6z = 0$$
$$-6 + 6z + 6 = 0 + 6$$
$$6z = 6$$
$$\frac{6z}{6} = \frac{6}{6}$$
$$z = 1$$

44.
$$3.5 + 10m = 7.32$$
$$3.5 + 10m - 3.5 = 7.32 - 3.5$$
$$10m = 3.82$$
$$\frac{10m}{10} = \frac{3.82}{10}$$
$$m = 0.382$$

45.
$$7 = -2x + 7$$
$$7 - 7 = -2x + 7 - 7$$
$$0 = -2x$$
$$\frac{-2x}{-2} = \frac{0}{-2}$$
$$x = 0$$

46.
$$\frac{1}{2} = \frac{2}{5}c - 3$$
$$\frac{1}{2} + 3 = \frac{2}{5}c - 3 + 3$$
$$\frac{7}{2} = \frac{2}{5}c$$
$$\frac{5}{2}\left(\frac{2}{5}c\right) = \frac{5}{2}\left(\frac{7}{2}\right)$$
$$c = \frac{35}{4}$$
$$c = 8\frac{3}{4}$$

47.
$$10.7 = -d + 4.3$$
$$10.7 - 4.3 = -d + 4.3 - 4.3$$
$$6.4 = -d$$
$$d = -6.4$$

48.
$$0.4x + 9.2 = 10$$
$$0.4x + 9.2 - 9.2 = 10 - 9.2$$
$$0.4x = 0.8$$
$$\frac{0.4x}{0.4} = \frac{0.8}{0.4}$$
$$x = 2$$

49.
$$4x + 92 = 100$$
$$4x + 92 - 92 = 100 - 92$$
$$4x = 8$$
$$\frac{4x}{4} = \frac{8}{4}$$
$$x = 2$$

50.
$$-t - 0.4 = -3$$
$$-t - 0.4 + 0.4 = -3 + 0.4$$
$$-t = -2.6$$
$$t = 2.6$$

51.
$$-10t - 4 = -30$$
$$-10t - 4 + 4 = -30 + 4$$
$$-10t = -26$$
$$\frac{-10t}{-10} = \frac{-26}{-10}$$
$$t = 2.6$$

52.
$$8 + \frac{c}{-4} = -6$$
$$8 + \frac{c}{-4} - 8 = -6 - 8 \quad \text{(Subtr. Prop. of Eq.)}$$
$$\frac{c}{-4} = -14 \quad \text{(division)}$$
$$-4\left(\frac{c}{-4}\right) = (-4)(-14) \quad \text{(Mult. Prop. of Eq.)}$$
$$c = 56 \quad \text{(multiplication)}$$

53.
$$7 - 3k = -14$$
$$7 - 3k - 7 = -14 - 7 \quad \text{(Subtr. Prop. of Eq.)}$$
$$-3k = -21 \quad \text{(addition)}$$
$$\frac{-3k}{-3} = \frac{-21}{-3} \quad \text{(Div. Prop. of Eq.)}$$
$$k = 7 \quad \text{(division)}$$

54.
$$14 = 6 - 2p$$
$$14 - 6 = 6 - 2p - 6 \quad \text{(Subtr. Prop. of Eq.)}$$
$$8 = -2p \quad \text{(subtraction)}$$
$$\frac{-2p}{-2} = \frac{8}{-2} \quad \text{(Div. Prop. of Eq.)}$$
$$p = -4 \quad \text{(division)}$$

55.
$$\frac{-y}{2} + 14 = -1$$
$$\frac{-y}{2} + 14 - 14 = -1 - 14 \quad \text{(Subtr. Prop. of Eq.)}$$
$$\frac{-y}{2} = -15 \quad \text{(subtraction)}$$
$$-2\left(\frac{-y}{2}\right) = -2(-15) \quad \text{(Mult. Prop. of Eq.)}$$
$$y = 30 \quad \text{(multiplication)}$$

56.
$$10k + 22 = 45$$
$$10k + 22 - 22 = 45 - 22$$
$$10k = 23$$
$$\frac{10k}{10} = \frac{23}{10}$$
$$k = 2.3$$

The depth of the mine is 2.3 km.

57.
$$0.8c - 500 = 4650$$
$$0.8c - 500 + 500 = 4650 + 500$$
$$0.8c = 5150$$
$$\frac{0.8c}{0.8} = \frac{5150}{0.8}$$
$$c = 6437.50$$

The claim is for \$6437.50.

58.
$$10{,}000d + 125{,}000{,}000 = 150{,}000{,}000$$
$$10{,}000d + 125{,}000{,}000 - 125{,}000{,}000 = 150{,}000{,}000 - 125{,}000{,}000$$
$$10{,}000d = 25{,}000{,}000$$
$$\frac{10{,}000d}{10{,}000} = \frac{25{,}000{,}000}{10{,}000}$$
$$d = 2500$$

Time is about 2500 days, or almost 7 years.

59.
$$\frac{x+2}{9} = 5$$
$$9\left(\frac{x+2}{9}\right) = 9(5)$$
$$x + 2 = 45$$
$$x + 2 - 2 = 45 - 2$$
$$x = 43$$

60.
$$\frac{y+1}{3} = 2$$
$$3\left(\frac{y+1}{3}\right) = 3(2)$$
$$y + 1 = 6$$
$$y + 1 - 1 = 6 - 1$$
$$y = 5$$

61.
$$\frac{a-10}{-4} = 2$$
$$-4\left(\frac{a-10}{-4}\right) = -4(2)$$
$$a - 10 = -8$$
$$a - 10 + 10 = -8 + 10$$
$$a = 2$$
$$\text{Check: } \frac{2-10}{-4} = 2 \checkmark$$

62.
$$\frac{b-7}{2} = 6$$
$$2\left(\frac{b-7}{2}\right) = 2(6)$$
$$b - 7 = 12$$
$$b - 7 + 7 = 12 + 7$$
$$b = 19$$
$$\text{Check: } \frac{19-7}{2} = 6 \checkmark$$

63.
$$\frac{x-5}{2} = 10$$
$$2\left(\frac{x-5}{2}\right) = 2(10)$$
$$x - 5 = 20$$
$$x - 5 + 5 = 20 + 5$$
$$x = 25$$
$$\text{Check: } \frac{25-5}{2} = 10 \checkmark$$

64.
$$\frac{x-3}{7} = 12$$
$$7\left(\frac{x-3}{7}\right) = 7(12)$$
$$x - 3 = 84$$
$$x - 3 + 3 = 84 + 3$$
$$x = 87$$
$$\text{Check: } \frac{87-3}{7} \stackrel{?}{=} 12$$
$$12 = 12 \checkmark$$

65.
$$\frac{x+4}{3} = -8$$
$$3\left(\frac{x+4}{3}\right) = 3(-8)$$
$$x + 4 = -24$$
$$x + 4 - 4 = -24 - 4$$
$$x = -28$$
Check: $\frac{-28+4}{3} = -8$ ✓

66.
$$\frac{x+6}{4} = -7$$
$$4\left(\frac{x+6}{4}\right) = 4(-7)$$
$$x + 6 = -28$$
$$x + 6 - 6 = -28 - 6$$
$$x = -34$$
Check: $\frac{-34+6}{4} = -7$ ✓

67.
$$4x + 1 = 63$$
$$4x + 1 - 1 = 63 - 1$$
$$4x = 62$$
$$\frac{4x}{4} = \frac{62}{4}$$
$$x = 15.5$$

68.
$$3x + 1 = 58$$
$$3x + 1 - 1 = 58 - 1$$
$$3x = 57$$
$$\frac{3x}{3} = \frac{57}{3}$$
$$x = 19$$

69.
$$2x + 5 = 68$$
$$2x + 5 - 5 = 68 - 5$$
$$2x = 63$$
$$\frac{2x}{2} = \frac{63}{2}$$
$$x = 31.5$$

70. Miles's equation states that if he starts with the amount on hand so far ($40) and adds the number of weeks of saving (16) times the amount saved per week (x), he will reach his goal of $129. The equation assumes that he saves *exactly* the same amount (x) each week.

71. The minus sign was left out in line 2.
$$12 - 3y = 15$$
$$12 - 3y - 12 = 15 - 12$$
$$-3y = 3$$
$$\frac{-3y}{-3} = \frac{3}{-3}$$
$$y = -1$$

72. The -12 was divided by 3 instead of multiplied by 3.
$$\frac{m}{3} - 9 = -21$$
$$\frac{m}{3} - 9 + 9 = -21 + 9$$
$$\frac{m}{3} = -12$$
$$3\frac{m}{3} = 3(-12)$$
$$m = -36$$

73. Check students' work.

74.
$$2a + 1 = 11$$
$$2a + 1 - 1 = 11 - 1$$
$$2a = 10$$
$$\frac{2a}{10} = \frac{10}{10}$$
$$\underline{a = 5}$$

$$-6 = x - 5$$
$$-6 + 5 = x - 5 + 5$$
$$\underline{-1 = x}$$
$$-7 = 5 - 2y$$
$$-7 - 5 = 5 - 2y - 5$$
$$-12 = -2y$$
$$2y = 12$$
$$\frac{2y}{2} = \frac{12}{12}$$
$$\underline{y = 6}$$
$$-3k = 27$$
$$\frac{-3k}{-3} = \frac{27}{-3}$$
$$\underline{k = -9}$$

75. This eliminates the decimals.

76. Example: $C = 37$ [°C]; $F = 1.8(37) + 32 = 98.6$ [°F]

If F given:
$$F = 1.8C + 32$$
$$F - 32 = 1.8C + 32 - 32$$
$$F - 32 = 1.8C$$
$$\frac{F - 32}{1.8} = \frac{1.8C}{1.8}$$
$$\frac{F - 32}{1.8} = C$$
Example: $F = 212$; $C = \frac{212 - 32}{1.8} = 100$ [°F]

Fahrenheit	Celsius
212°	100°
98.6°	37°
68°	20°
32°	0°
−40°	−40°

77a. $C = 37$ [°C]: $F = 2(37) + 30 = 104$ [°F]; $C = 0$ [°C]: $F = 2(0) + 30 = 30°$ [°F]; $C = -40$ [°C]: $F = 2(-40) + 30 = -50$ [°F] The approximate equation gives 104°F instead of 98.6°F, 30°F instead of 32°F, and −50°F instead of −40°F. **77b.** Answers may vary. Sample: The estimate is good near 32°F. The estimate is exact at 10°C = 50°F.

78.
$$x + y = 8$$
$$x + y - y = 8 - y$$
$$x = 8 - y$$
$$2x + 3y = 21$$
$$2(8 - y) + 3y = 21$$
$$16 - 2y + 3y = 21$$
$$16 + y = 21$$
$$16 + y - 16 = 21 - 16$$
$$y = 5$$

79.
$$x + 2y = 1$$
$$x + 2y - 2y = 1 - 2y$$
$$x = 1 - 2y$$
$$6x - y = -20$$
$$6(1 - 2y) - y = -20$$
$$6 - 12y - y = -20$$
$$6 - 13y = -20$$
$$6 - 13y - 6 = 20 - 6$$
$$-13y = -26$$
$$\frac{-13y}{-13} = \frac{-26}{-13}$$
$$y = 2$$

80.
$$\begin{aligned} x + y &= 12 \\ x + y - y &= 12 - y \\ x &= 12 - y \\ 2x + y &= 17 \\ 2(12 - y) + y &= 17 \\ 24 - 2y + y &= 17 \\ 24 - y &= 17 \\ 24 - y - 24 &= 17 - 24 \\ -y &= -7 \\ y &= 7 \end{aligned}$$

81. $-\frac{3}{5}(-6) - 2 = \frac{18}{5} - 2 = \frac{8}{5} = 1\frac{3}{5} = 1.6$

82. $\frac{\text{new area}}{\text{old area}} = \frac{(3 \cdot 4) \cdot (3 \cdot 5)}{4 \cdot 5} = 9$

83. $\frac{3^2 \times 4 - (-5)^2}{(-2)^3 + 3 \times 4} = \frac{9 \times 4 - 25}{-8 + 12} = \frac{11}{4} = 2\frac{3}{4} = 2.75$

84.
$$\begin{aligned} 48 &= 2n - 6 \\ 48 + 6 &= 2n - 6 + 6 \\ 54 &= 2n \\ \frac{2n}{2} &= \frac{54}{2} \\ n &= 27 \end{aligned}$$

85.
$$\begin{aligned} 24.95 + 6.95n &= 45.80 \\ 24.95 + 6.95n - 24.95 &= 45.80 - 24.95 \\ 6.95n &= 20.85 \\ \frac{6.95n}{6.95} &= \frac{20.85}{6.95} \\ n &= 3 \end{aligned}$$

86.
$$\begin{aligned} 4s &= 18 \\ \frac{4s}{4} &= \frac{18}{4} \\ s &= 4\tfrac{1}{2} \end{aligned}$$

87.
$$\begin{aligned} x - 3 &= 9 \\ x - 3 + 3 &= 9 + 3 \\ x &= 12 \end{aligned}$$

88.
$$\begin{aligned} \frac{m}{5} &= 3 \\ 5\left(\frac{m}{5}\right) &= 5(3) \\ m &= 15 \end{aligned}$$

89.
$$\begin{aligned} -7 &= n + 2 \\ -7 - 2 &= n + 2 - 2 \\ -9 &= n \end{aligned}$$

90.
$$\begin{aligned} 7x &= 42 \\ \frac{7x}{7} &= \frac{42}{7} \\ x &= 6 \end{aligned}$$

91.
$$\begin{aligned} 3y &= 99 \\ \frac{3y}{3} &= \frac{99}{3} \\ x &= 33 \end{aligned}$$

92.
$$\begin{aligned} 5z &= 57 \\ \frac{5z}{5} &= \frac{57}{5} \\ z &= 11\tfrac{2}{5} \end{aligned}$$

93.
$$\begin{aligned} 8a &= 48 \\ \frac{8a}{8} &= \frac{48}{8} \\ a &= 6 \end{aligned}$$

94. 4 **95.** 6 **96.** −11 **97.** 12

READING MATH *page 87*

temperature at summit = temperature at base − (2.5°F times elevation above base)

Let e = elevation in thousands of feet.
$$\begin{aligned} 24 &= 28 - (2.5)e \\ 24 - 28 &= 28 - 2.5e - 28 \\ -4 &= -2.5e \\ 2.5e &= 4 \\ \frac{2.5e}{2.5} &= \frac{4}{2.4} \\ e &= 1.6 \end{aligned}$$

The summit is 1600 ft above the base.

2-3 Solving Multi-Step Equations *pages 88–94*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. $-n$ **2.** $8b - 2$ **3.** $9w - 45$ **4.** $-10b + 120$
5. $-3x + 12$ **6.** $30 - 5w$ **7.** 43 **8.** 26 **9.** −45 **10.** −35

Check Understanding

1a.
$$\begin{aligned} 3x - 4x + 6 &= -2 \\ (3 - 4)x + 6 &= -2 \\ -x + 6 &= -2 \\ -x + 6 - 6 &= -2 - 6 \\ -x &= -8 \\ -1(-x) &= -1(-8) \\ x &= 8 \end{aligned}$$
Check: $3(8) - 4(8) + 6 \stackrel{?}{=} -2$
$24 - 32 + 6 = -2$ ✓

1b.
$$\begin{aligned} 7 &= 4m - 2m + 1 \\ 7 &= (4 - 2)m + 1 \\ 7 &= 2m + 1 \\ 7 - 1 &= 2m + 1 - 1 \\ 6 &= 2m \\ \frac{6}{2} &= \frac{m}{2} \\ 3 &= m \end{aligned}$$
Check: $7 \stackrel{?}{=} 4(3) - 2(3) + 1$
$7 = 12 - 6 + 1$ ✓

1c.
$$\begin{aligned} -2y + 5 + 5y &= 14 \\ 3y + 5 &= 14 \\ 3y + 5 - 5 &= 14 - 5 \\ 3y &= 9 \\ \frac{3y}{3} &= \frac{9}{3} \\ y &= 3 \end{aligned}$$
Check: $-2(3) + 5 + 5(3) \stackrel{?}{=} 14$
$-6 + 5 + 15 = 14$ ✓

1d.
$$\begin{aligned} -3z + 8 + (-2z) &= -12 \\ -5z + 8 &= -12 \\ -5z + 8 - 8 &= -12 - 8 \\ -5z &= -20 \\ \frac{-5z}{-5} &= \frac{-20}{-5} \\ z &= 4 \end{aligned}$$
Check: $-3(4) + 8 + [(-2)(4)] \stackrel{?}{=} -12$
$-12 + 8 - 8 = 12$ ✓

2.
$$x + x + 70 = 340$$
$$2x + 70 = 340$$
$$2x + 70 - 70 = 340 - 70$$
$$2x = 270$$
$$\frac{2x}{2} = \frac{270}{2}$$
$$x = 135;\ 135 \text{ ft}$$

3a.
$$3(k + 8) = 21$$
$$3k + 24 = 21$$
$$3k + 24 - 24 = 21 - 24$$
$$3k = -3$$
$$\frac{3k}{3} = \frac{-3}{3}$$
$$k = -1$$

3b.
$$15 = -3(x - 1) + 9$$
$$15 = -3x + 3 + 9$$
$$15 = -3x + 12$$
$$15 - 12 = -3x + 12 - 12$$
$$3 = -3x$$
$$\frac{-3x}{3} = \frac{3}{3}$$
$$x = -1$$

4a.
$$\frac{m}{4} + \frac{m}{2} = \frac{5}{8}$$
$$\frac{m}{4} + \frac{2m}{4} = \frac{5}{8}$$
$$\frac{3m}{4} = \frac{5}{8}$$
$$\frac{4}{3}\left(\frac{3m}{4}\right) = \frac{4}{3}\left(\frac{5}{8}\right)$$
$$m = \frac{5}{6}$$

4b.
$$\frac{2}{3}x - \frac{5}{8}x = 26$$
$$\left(\frac{2}{3} - \frac{5}{8}\right)x = 26$$
$$\frac{16 - 15}{24}x = 26$$
$$\frac{1}{24}x = 26$$
$$24\left(\frac{1}{24}x\right) = 24(26)$$
$$x = 624$$

5a.
$$0.025x + 22.95 = 23.65$$
$$1000(0.025x + 22.95) = 1000(23.650)$$
$$25x + 22{,}950 = 23{,}650$$
$$25x + 22{,}950 - 22{,}950 = 23{,}650 - 22{,}950$$
$$25x = 700$$
$$\frac{25x}{25} = \frac{700}{25}$$
$$x = 28$$

5b.
$$10(1.2x - 3.6 + 0.3x) = 10(2.4)$$
$$12x - 36 + 3x = 24$$
$$15x - 36 = 24$$
$$15x - 36 + 36 = 24 + 36$$
$$15x = 60$$
$$\frac{15x}{15} = \frac{60}{15}$$
$$x = 4$$

Exercises

1.
$$4n - 2n = 18$$
$$(4 - 2)n = 18$$
$$2n = 18$$
$$\frac{2n}{2} = \frac{18}{2}$$
$$n = 9$$
$$\text{Check: } 4(9) - 2(9) = 18 \checkmark$$

2.
$$y + y + 2 = 18$$
$$2y + 2 = 18$$
$$2y + 2 - 2 = 18 - 2$$
$$2y = 16$$
$$\frac{2y}{2} = \frac{16}{2}$$
$$y = 8$$
$$\text{Check: } 8 + 8 + 2 = 18 \checkmark$$

3.
$$a + 6a - 9 = 30$$
$$7a - 9 = 30$$
$$7a - 9 + 9 = 30 + 9$$
$$7a = 39$$
$$\frac{7a}{7} = \frac{39}{7}$$
$$a = 5\tfrac{4}{7}$$
$$\text{Check: } \frac{39}{7} + 6\left(\frac{39}{7}\right) - 9 \stackrel{?}{=} 30$$
$$7\left(\frac{39}{7}\right) - 9 \stackrel{?}{=} 30$$
$$39 - 9 = 30 \checkmark$$

4.
$$5 - x - x = -1$$
$$5 - 2x = -1$$
$$5 - 2x - 5 = -1 - 5$$
$$-2x = -6$$
$$\frac{-2x}{-2} = \frac{-6}{-2}$$
$$x = 3$$
$$\text{Check: } 5 - 3 - 3 = -1 \checkmark$$

5.
$$72 + 4 - 14c = 36$$
$$76 - 14c = 36$$
$$76 - 14c - 76 = 36 - 76$$
$$-14c = -40$$
$$\frac{-14c}{-14} = \frac{-40}{-14}$$
$$c = \frac{20}{7} = 2\tfrac{6}{7}$$
$$\text{Check: } 72 + 4 - 14\left(\frac{20}{7}\right) \stackrel{?}{=} 36$$
$$76 - 40 = 36 \checkmark$$

6.
$$13 = 5 - 13 + 3a$$
$$13 = -8 + 3a$$
$$13 + 8 = -8 + 3a + 8$$
$$21 = 3a$$
$$\frac{3a}{3} = \frac{21}{3}$$
$$a = 7$$
$$\text{Check: } 13 = 5 - 13 + 3(7) \checkmark$$

7.
$$9 = -3 + n + 2n$$
$$9 = -3 + 3n$$
$$9 + 3 = -3 + 3n + 3$$
$$12 = 3n$$
$$\frac{3n}{3} = \frac{12}{3}$$
$$n = 4$$
$$\text{Check: } 9 = -3 + 4 + 2(4) \checkmark$$

8.
$$7m - 3m - 6 = 6$$
$$4m - 6 = 6$$
$$4m - 6 + 6 = 6 + 6$$
$$4m = 12$$
$$\frac{4m}{4} = \frac{12}{4}$$
$$m = 3$$
$$\text{Check: } 7(3) - 3(3) - 6 \stackrel{?}{=} 6$$
$$4(3) - 6 = 12 - 6 = 6 \checkmark$$

9.
$$\begin{aligned} -13 &= 2b - b - 10 \\ -13 &= b - 10 \\ -13 + 10 &= b - 10 + 10 \\ -3 &= b \end{aligned}$$
Check: $-13 = 2(-3) - (-3) - 10 = -3 - 10$ ✓

10.
$$\begin{aligned} x + \tfrac{1}{2}x &= 1725 \\ \tfrac{3}{2}x &= 1725 \\ \tfrac{2}{3}\left(\tfrac{3}{2}x\right) &= \tfrac{2}{3}(1725) \\ x &= 1150; \$1150 \end{aligned}$$

11.
$$\begin{aligned} x + 9 + x &= 25 \\ 2x + 9 &= 25 \\ 2x + 9 - 9 &= 25 - 9 \\ 2x &= 16 \\ \tfrac{2x}{2} &= \tfrac{16}{2} \\ x &= 8 \end{aligned}$$
The dimensions are 8 ft by 9 ft.

12.
$$\begin{aligned} 2(8 + p) &= 22 \\ 16 + 2p &= 22 \\ 16 + 2p - 16 &= 22 - 16 \\ 2p &= 6 \\ \tfrac{2p}{2} &= \tfrac{6}{2} \\ p &= 3 \end{aligned}$$
Check: $2(8 + 3) = 22$ ✓

13.
$$\begin{aligned} 5(a - 1) &= 35 \\ 5a - 5 &= 35 \\ 5a - 5 + 5 &= 35 + 5 \\ 5a &= 40 \\ \tfrac{5a}{5} &= \tfrac{40}{5} \\ a &= 8 \end{aligned}$$
Check: $5(8 - 1) = 35$ ✓

14.
$$\begin{aligned} 15 &= -3(2q - 1) \\ 15 &= -6q + 3 \\ 15 - 3 &= -6q + 3 - 3 \\ -6q &= 12 \\ \tfrac{-6q}{6} &= \tfrac{12}{6} \\ -q &= 2 \\ q &= -2 \end{aligned}$$
Check: $15 = -3[2(-2) - 1]$ ✓

15.
$$\begin{aligned} 26 &= 6(5 - a) \\ 26 &= 30 - 6a \\ 26 - 30 &= 30 - 6a - 30 \\ -4 &= -6a \\ 6a &= 4 \\ \tfrac{6a}{6} &= \tfrac{4}{6} \\ a &= \tfrac{2}{3} \end{aligned}$$
Check: $26 = 6\left(5 - \tfrac{2}{3}\right) = 6\left(\tfrac{13}{3}\right) = 2 \cdot 13$ ✓

16.
$$\begin{aligned} m + 5(m - 1) &= 7 \\ 6m - 5 &= 7 \\ 6m - 5 + 5 &= 7 + 5 \\ 6m &= 12 \\ \tfrac{6m}{6} &= \tfrac{12}{6} \\ m &= 2 \end{aligned}$$
Check: $2 + 5(2 - 1) = 7$ ✓

17.
$$\begin{aligned} -4(x + 6) &= -40 \\ -4x - 24 &= -40 \\ -4x - 24 + 24 &= -40 + 24 \\ -4x &= -16 \\ \tfrac{-4x}{-4} &= \tfrac{-16}{-4} \\ x &= 4 \end{aligned}$$
Check: $-4(4 + 6) = -40$ ✓

18.
$$\begin{aligned} 48 &= 8(x + 2) \\ \tfrac{48}{8} &= \tfrac{8(x + 2)}{8} \\ 6 &= x + 2 \\ 6 - 2 &= x + 2 - 2 \\ 4 &= x \end{aligned}$$
Check: $48 = 8(4 + 2)$ ✓

19.
$$\begin{aligned} 5(y - 3) &= 19 \\ \tfrac{5(y - 3)}{5} &= \tfrac{19}{5} \\ y - 3 &= \tfrac{19}{5} \\ y - 3 + 3 &= \tfrac{19}{5} + 3 \\ y &= \tfrac{34}{5} = 6\tfrac{4}{5} \end{aligned}$$
Check: $5\left(\tfrac{34}{5} - 3\right) \stackrel{?}{=} 19$
$34 - 15 = 19$ ✓

20.
$$\begin{aligned} 5(2 + y) &= 77 \\ 10 + 5y &= 77 \\ 10 + 5y - 10 &= 77 - 10 \\ 5y &= 67 \\ \tfrac{5y}{5} &= \tfrac{67}{5} \\ y &= 13\tfrac{2}{5} \end{aligned}$$
Check: $5\left(2 + \tfrac{67}{5}\right) \stackrel{?}{=} 77$
$10 + 67 = 77$ ✓

21.
$$\begin{aligned} \tfrac{a}{7} - \tfrac{5}{7} &= \tfrac{6}{7} \\ 7\left(\tfrac{a}{7} - \tfrac{5}{7}\right) &= 7\left(\tfrac{6}{7}\right) \\ a - 5 &= 6 \\ a - 5 + 5 &= 6 + 5 \\ a &= 11 \end{aligned}$$
Check: $\tfrac{11}{7} - \tfrac{5}{7} = \tfrac{6}{7}$ ✓

22.
$$\begin{aligned} x - \tfrac{5}{8} &= \tfrac{7}{8} \\ 8x - 8\left(\tfrac{5}{8}\right) &= 8\left(\tfrac{7}{8}\right) \\ 8x - 5 &= 7 \\ 8x - 5 + 5 &= 7 + 5 \\ 8x &= 12 \\ \tfrac{8x}{8} &= \tfrac{12}{8} \\ x &= \tfrac{3}{2} = 1\tfrac{1}{2} \end{aligned}$$
Check: $\tfrac{3}{2} - \tfrac{5}{8} \stackrel{?}{=} \tfrac{7}{8}$
$\tfrac{12}{8} - \tfrac{5}{8} = \tfrac{7}{8}$ ✓

23.
$$\begin{aligned} \tfrac{m}{6} - 7 &= \tfrac{2}{3} \\ 6\left(\tfrac{m}{6}\right) - 6(7) &= 6\left(\tfrac{2}{3}\right) \\ m - 42 &= 4 \\ m - 42 + 42 &= 4 + 42 \\ m &= 46 \end{aligned}$$
Check: $\tfrac{46}{6} - 7 \stackrel{?}{=} \tfrac{2}{3}$
$\tfrac{23}{3} - \tfrac{21}{3} = \tfrac{2}{3}$ ✓

24.

$$\frac{2}{3} + \frac{3k}{4} = \frac{71}{12}$$
$$12\left(\frac{2}{3}\right) + 12\left(\frac{3k}{4}\right) = 12\left(\frac{71}{12}\right)$$
$$8 + 9k = 71$$
$$8 + 9k - 8 = 71 - 8$$
$$9k = 63$$
$$\frac{9k}{9} = \frac{63}{9}$$
$$k = 7$$
$$\text{Check: } \frac{2}{3} + \frac{3 \cdot 7}{4} \stackrel{?}{=} \frac{71}{12}$$
$$\frac{8}{12} + \frac{63}{12} = \frac{71}{12} \checkmark$$

25.

$$4 + \frac{m}{8} = \frac{3}{4}$$
$$8(4) + 8\left(\frac{m}{8}\right) = 8\left(\frac{3}{4}\right)$$
$$32 + m = 6$$
$$32 + m - 32 = 6 - 32$$
$$m = -26$$
$$\text{Check: } 4 + \frac{-26}{8} \stackrel{?}{=} \frac{3}{4}$$
$$32 - 26 = 6 \checkmark$$

26.

$$\frac{a}{2} + \frac{1}{5} = 17$$
$$10\left(\frac{a}{2}\right) + 10\left(\frac{1}{5}\right) = 10(17)$$
$$5a + 2 = 170$$
$$5a + 2 - 2 = 170 - 2$$
$$5a = 168$$
$$\frac{5a}{5} = \frac{168}{5}$$
$$a = 33\frac{3}{5}$$
$$\text{Check: } \frac{1}{2}\left(\frac{168}{5}\right) + \frac{1}{5} \stackrel{?}{=} 17$$
$$16.8 + 0.2 = 17 \checkmark$$

27.

$$\frac{1}{2} + \frac{7x}{10} = \frac{13}{20}$$
$$20\left(\frac{1}{2}\right) + 20\left(\frac{7x}{10}\right) = 20\left(\frac{13}{20}\right)$$
$$10 + 14x = 13$$
$$10 + 14x - 10 = 13 - 10$$
$$14x = 3$$
$$\frac{14x}{14} = \frac{3}{14}$$
$$x = \frac{3}{14}$$
$$\text{Check: } \frac{1}{2} + \frac{7}{10}\left(\frac{3}{14}\right) \stackrel{?}{=} \frac{13}{20}$$
$$\frac{10}{20} + \frac{3}{20} = \frac{13}{20} \checkmark$$

28.

$$\frac{9y}{14} + \frac{3}{7} = \frac{9}{14}$$
$$14\left(\frac{9y}{14}\right) + 14\left(\frac{3}{7}\right) = 14\left(\frac{9}{14}\right)$$
$$9y + 6 = 9$$
$$9y + 6 - 6 = 9 - 6$$
$$9y = 3$$
$$\frac{9y}{9} = \frac{3}{9}$$
$$y = \frac{1}{3}$$
$$\text{Check: } \frac{9}{14}\left(\frac{1}{3}\right) + \frac{3}{7} \stackrel{?}{=} \frac{9}{14}$$
$$\frac{3}{14} + \frac{6}{14} = \frac{9}{14} \checkmark$$

29.

$$\frac{1}{5} + \frac{3w}{15} = \frac{4}{5}$$
$$15\left(\frac{1}{5}\right) + 15\left(\frac{3w}{15}\right) = 15\left(\frac{4}{5}\right)$$
$$3 + 3w = 12$$
$$3 + 3w - 3 = 12 - 3$$
$$3w = 9$$
$$\frac{3w}{3} = \frac{9}{3}$$
$$w = 3$$
$$\text{Check: } \frac{1}{5} + \frac{3 \cdot 3}{15} \stackrel{?}{=} \frac{4}{5}$$
$$\frac{3}{15} + \frac{9}{15} = \frac{12}{15} \checkmark$$

30.

$$3m + 4.5m = 15$$
$$10(3m + 4.5m) = 10(15)$$
$$30m + 45m = 150$$
$$75m = 150$$
$$\frac{75m}{75} = \frac{150}{75}$$
$$m = 2$$
$$\text{Check: } 3 \cdot 2 + 4.5 \cdot 2 = 6 + 9 = 15 \checkmark$$

31.

$$7.8y + 2 = 165.8$$
$$10(7.8y + 2) = 10(165.8)$$
$$78y + 20 = 1658$$
$$78y + 20 - 20 = 1658 - 20$$
$$78y = 1638$$
$$\frac{78y}{78} = \frac{1638}{78}$$
$$y = 21$$
$$\text{Check: } 7.8(21) + 2 \stackrel{?}{=} 165.8$$
$$163.8 + 2 = 165.8 \checkmark$$

32.

$$3.5 = 12s - 5s$$
$$3.5 = 7s$$
$$10(3.5) = 10(7s)$$
$$35 = 70s$$
$$\frac{70s}{70} = \frac{35}{70}$$
$$s = \frac{1}{2} = 0.5$$
$$\text{Check: } 3.5 = 12(0.5) - 5(0.5) \checkmark$$

33.

$$1.06y - 3 = 0.71$$
$$100(1.06y - 3) = 100(0.71)$$
$$106y - 300 = 71$$
$$106y - 300 + 300 = 71 + 300$$
$$106y = 371$$
$$\frac{106y}{106} = \frac{371}{106}$$
$$y = 3.5$$
$$\text{Check: } 1.06(3.5) - 3 = 0.71 \checkmark$$

34.

$$0.11p + 1.5 = 2.49$$
$$100(0.11p + 1.5) = 100(2.49)$$
$$11p + 150 = 249$$
$$11p + 150 - 150 = 249 - 150$$
$$11p = 99$$
$$\frac{11p}{11} = \frac{99}{11}$$
$$p = 9$$
$$\text{Check: } 0.11(9) + 1.5 = 2.49 \checkmark$$

35.

$$25.24 = 5y + 3.89$$
$$100(25.24) = 100(5y + 3.89)$$
$$2524 = 500y + 389$$
$$2524 - 389 = 500y + 389 - 389$$
$$2135 = 500y$$

$$\frac{500y}{500} = \frac{2135}{500}$$
$$y = 4.27$$
$$\text{Check: } 25.24 \stackrel{?}{=} 5(4.27) + 3.89$$
$$25.24 = 21.35 + 3.89 \checkmark$$

36.
$$1.12 + 1.25y = 8.62$$
$$100(1.12 + 1.25y) = 100(8.62)$$
$$112 + 125y - 112 = 862 - 112$$
$$125y = 750$$
$$\frac{125y}{125} = \frac{750}{125}$$
$$y = 6$$
$$\text{Check: } 1.12 + 1.25(6) \stackrel{?}{=} 8.62$$
$$1.12 + 7.5 = 8.62 \checkmark$$

37.
$$1.025x + 2.458 = 7.583$$
$$1000(1.025x + 2.458) = 1000(7.583)$$
$$1025x + 2458 = 7583$$
$$1025x + 2458 - 2458 = 7583 - 2458$$
$$1025x = 5125$$
$$\frac{1025x}{1025} = \frac{5125}{1025}$$
$$x = 5$$
$$\text{Check: } 1.025(5) + 2.458 \stackrel{?}{=} 7.583$$
$$5.125 + 2.458 = 7.583 \checkmark$$

38.
$$0.25m + 0.1m = 9.8$$
$$0.35m = 9.8$$
$$100(0.35m) = 100(9.8)$$
$$35m = 980$$
$$\frac{35m}{35} = \frac{980}{35}$$
$$m = 28$$
$$\text{Check: } 0.25(28) + 0.1(28) = 7 + 2.8 = 9.8 \checkmark$$

39.
$$0.5t - 3t + 5 = 0$$
$$(0.5 - 3)t + 5 = 0$$
$$-2.5t + 5 = 0$$
$$-2.5t + 5 - 5 = 0 - 5$$
$$-2.5t = -5$$
$$\frac{-2.5t}{-2.5} = \frac{-5}{-2.5}$$
$$t = 2$$

40.
$$-(z + 5) = -14$$
$$z + 5 = 14$$
$$z + 5 - 5 = 14 - 5$$
$$z = 9$$

41.
$$\frac{a}{15} + \frac{4}{15} = \frac{9}{15}$$
$$15\left(\frac{a}{15}\right) + 15\left(\frac{4}{15}\right) = 15\left(\frac{9}{15}\right)$$
$$a + 4 = 9$$
$$a + 4 - 4 = 9 - 4$$
$$a = 5$$

42.
$$0.5(x - 12) = 4$$
$$2[0.5(x - 12)] = 2(4)$$
$$x - 12 = 8$$
$$x - 12 + 12 = 8 + 12$$
$$x = 20$$

43.
$$8y - (2y - 3) = 9$$
$$8y - 2y + 3 = 9$$
$$6y + 3 = 9$$
$$6y + 3 - 3 = 9 - 3$$
$$6y = 6$$
$$\frac{6y}{6} = \frac{6}{6}$$
$$y = 1$$

44.
$$\frac{2}{3} + y = \frac{3}{4}$$
$$12\left(\frac{2}{3}\right) + 12(y) = 12\left(\frac{3}{4}\right)$$
$$8 + 12y = 9$$
$$8 + 12y - 8 = 9 - 8$$
$$12y = 1$$
$$\frac{12y}{12} = \frac{1}{12}$$
$$y = \frac{1}{12}$$

45.
$$2 + \frac{a}{-4} = \frac{3}{5}$$
$$20 \cdot 2 + 20\left(\frac{a}{-4}\right) = 20\left(\frac{3}{5}\right)$$
$$40 - 5a = 12$$
$$40 - 5a + 40 = 12 - 40$$
$$5a = -28$$
$$\frac{-5a}{-5} = \frac{-28}{-5}$$
$$a = \frac{28}{5} = 5\frac{3}{5}$$

46.
$$\frac{1}{4}(m - 16) = 7$$
$$4\left[\frac{1}{4}(m - 16)\right] = 4(7)$$
$$m - 16 = 28$$
$$m - 16 + 16 = 28 + 16$$
$$m = 44$$

47.
$$x + 3x - 7 = 29$$
$$4x - 7 = 29$$
$$4x - 7 + 7 = 29 + 7$$
$$4x = 36$$
$$\frac{4x}{4} = \frac{36}{4}$$
$$x = 9$$

48.
$$4x + 3.6 + x = 1.2$$
$$5x + 3.6 = 1.2$$
$$5x + 3.6 - 3.6 = 1.2 - 3.6$$
$$5x = -2.4$$
$$\frac{5x}{5} = \frac{-2.4}{5}$$
$$x = -0.48$$

49.
$$2(1.5c + 4) = -1$$
$$3c + 8 = -1$$
$$3c + 8 - 8 = -1 - 8$$
$$3c = -9$$
$$\frac{3c}{3} = \frac{-9}{3}$$
$$c = -3$$

50.
$$26.54 - p = 0.5(50 - p)$$
$$26.54 - p = 25 - 0.5p$$
$$26.54 - p + 0.5p = 25 - 0.5p + 0.5p$$
$$26.54 - 0.5p = 25$$
$$26.54 - 0.5p - 26.54 = 25 - 26.54$$
$$0.5p = -1.54$$
$$2(0.5p) = 2(-1.54)$$
$$p = 3.08$$

51. The student forgot to multiply -1 by 8.

52. Answers may vary. Sample: Combine $-3m$ and $5m$ first to simplify the left side of the equation.

53. Answers may vary. Sample: Multiply by -2 to eliminate fractions.

54.
$$\begin{aligned} 22 + 2x + 22 + 2x &= 64 \\ 44 + 4x &= 64 \\ 0.25(44) + 0.25(4x) &= 0.25(64) \\ 11 + x &= 16 \\ x &= 5 \end{aligned}$$

55.
$$\begin{aligned} 4(3x + 2) &= 64 \\ 12x + 8 &= 64 \\ 12x + 8 - 8 &= 64 - 8 \\ 12x &= 56 \\ \tfrac{12x}{12} &= \tfrac{56}{12} \\ x = \tfrac{14}{3} &= 4\tfrac{2}{3} \end{aligned}$$

56.
$$\begin{aligned} 5r + 3(2) &= 41 \\ 5r + 6 &= 41 \\ 5r + 6 - 6 &= 41 - 6 \\ 5r &= 35 \\ \tfrac{5r}{5} &= \tfrac{35}{5} \\ r &= 7 \text{ [7 h]} \end{aligned}$$

57.
$$\begin{aligned} 0.30m + 49.95 + 18.32 &= 95.87 \\ 0.3m + 68.27 &= 95.87 \\ 0.3m + 68.27 - 68.27 &= 95.87 - 68.27 \\ 0.3m &= 27.60 \\ \tfrac{0.3m}{0.3} &= \tfrac{27.60}{0.3} \\ m &= 92 \text{ [92 mi]} \end{aligned}$$

58. Let m = minutes over 200.
$$\begin{aligned} 40 + 0.15m &= 58 \\ 40 + 0.15m - 40 &= 58 - 40 \\ 0.15m &= 18 \\ \tfrac{0.15m}{0.15} &= \tfrac{18}{0.15} \\ m &= 120 \text{ [120 min]} \end{aligned}$$

59. Answers may vary. Sample: $3x + 5 - 4x + 9$

60.
$$\begin{aligned} x + 66 + 50 &= 180 \\ x + 116 &= 180 \\ x + 116 - 116 &= 180 - 116 \\ x &= 64 \end{aligned}$$

61.
$$\begin{aligned} 2x + (x + 15) + 90 &= 180 \\ 3x + 105 &= 180 \\ 3x + 105 - 105 &= 180 - 105 \\ 3x &= 75 \\ \tfrac{3x}{3} &= \tfrac{75}{3} \\ x &= 25 \end{aligned}$$

62.
$$\begin{aligned} 44 + (2x + 16) + 4x &= 180 \\ 44 + 16 + (2 + 4)x &= 180 \\ 60 + 6x &= 180 \\ 60 + 6x - 60 &= 180 - 60 \\ 6x &= 120 \\ \tfrac{6x}{6} &= \tfrac{120}{6} \\ x &= 20 \end{aligned}$$

63.
$$\begin{aligned} \tfrac{1}{2}t + \tfrac{3}{4}t &= 18\tfrac{1}{2} \\ 4\left(\tfrac{1}{2}t\right) + 4\left(\tfrac{3}{4}t\right) &= 4\left(18\tfrac{1}{2}\right) \\ 2t + 3t &= 74 \\ 5t &= 74 \\ \tfrac{5t}{5} &= \tfrac{74}{5} \\ t &= 14\tfrac{4}{5} \end{aligned}$$

The tank holds about 15 gal.

64a. $\frac{1}{5}$; $\frac{1}{7}$ **64b.** $\frac{1}{5}t$ **64c.** $\frac{1}{7}t$

64d.
$$\begin{aligned} \tfrac{1}{5}t + \tfrac{1}{7}t &= 1 \\ 35\left(\tfrac{1}{5}t\right) + 35\left(\tfrac{1}{7}t\right) &= 35 \\ 7t + 5t &= 35 \\ 12t &= 35 \\ \tfrac{12t}{12} &= \tfrac{35}{12} \\ t &= 2\tfrac{11}{12} \end{aligned}$$

The time is $2\frac{11}{12}$ h, or 2 hr 55 min.

65.
$$\begin{aligned} \tfrac{1}{2}m + \tfrac{1}{10}m + \tfrac{1}{20}m + 35{,}000 &= m \\ 20\left(\tfrac{1}{2}m\right) + 20\left(\tfrac{1}{10}m\right) + 20\left(\tfrac{1}{20}m\right) + 20(35{,}000) &= 20m \\ 10m + 2m + m + 700{,}000 &= 20m \\ 13m + 700{,}000 &= 20m \\ 13m + 700{,}000 - 13m &= 20m - 13m \\ 700{,}000 &= 7m \\ \tfrac{7m}{7} &= \tfrac{700{,}000}{7} \\ m &= 100{,}000 \end{aligned}$$

The total is \$100,000.

66.
$$\begin{aligned} 10{,}000\left(1 - \tfrac{n}{20}\right) &= 6500 \\ \tfrac{10{,}000}{10{,}000}\left(1 - \tfrac{n}{20}\right) &= \tfrac{6500}{10{,}000} \\ 1 - \tfrac{n}{20} &= 0.65 \\ 20 - 20\tfrac{n}{20} &= 20(0.65) \\ 20 - n &= 13 \\ 20 - n - 20 &= 13 - 20 \\ -n &= -7 \\ n &= 7 \end{aligned}$$

The time is 7 years.

67.
$$\begin{aligned} x + (x - 10) &= 200 \\ 2x - 10 &= 200 \\ 2x - 10 + 10 &= 200 + 10 \\ 2x &= 210 \\ \tfrac{2x}{2} &= \tfrac{210}{2} \\ x &= 105 \end{aligned}$$

The lengths are 105 cm and 105 cm − 10 cm = 95 cm.

68. $-3(-2) + 6 + (-2) = 6 + 6 - 2 = 10$; the answer is C.

69.
$$\begin{aligned} 8n + 5 - 2n &= 41 \\ 6n + 5 &= 41 \\ 6n + 5 - 5 &= 41 - 5 \\ 6n &= 36 \\ \tfrac{6n}{6} &= \tfrac{36}{6} \\ n &= 6 \end{aligned}$$
; the answer is H.

70.
$$\begin{aligned} (n + 3) \cdot 2 &= -8 \\ 2n + 6 &= -8 \\ 2n + 6 - 6 &= -8 - 6 \\ 2n &= -14 \\ \tfrac{2n}{2} &= \tfrac{-14}{2} \\ n &= -7 \end{aligned}$$
; the answer is A.

71. $12 \text{ gal} - \frac{140 \text{ mi}}{29 \text{ mi/gal}} = 12 \text{ gal} - 4.8 \text{ gal} = 7.2 \text{ gal}$; the answer is G. **72.** The sum of the distances and 4 times m is the total number of miles; the answer is C. **73.** \$.35, plus \$.10 times the number of minutes after the first minute $(m - 1)$, should equal \$5.45; the answer is F.

74.
$$2y + 4 = -6$$
$$2y + 4 - 4 = -6 - 4$$
$$2y = -10$$
$$\frac{2y}{2} = \frac{-10}{2}$$
$$y = -5$$

75.
$$3x - 15 = 33$$
$$3x - 15 + 15 = 33 + 15$$
$$3x = 48$$
$$\frac{3x}{3} = \frac{48}{3}$$
$$x = 16$$

76.
$$-4n + 20 = 36$$
$$-4n + 20 - 20 = 36 - 20$$
$$-4n = 16$$
$$\frac{-4n}{-4} = \frac{16}{-4}$$
$$n = -4$$

77.
$$-8 - c = 11$$
$$-8 - c + 8 = 11 + 8 = 19$$
$$-c = 19$$
$$c = -19$$

78.
$$3x + 5 = 12$$
$$3x + 5 - 5 = 12 - 5$$
$$3x = 7$$
$$\frac{3x}{3} = \frac{7}{3}$$
$$x = 2\tfrac{1}{3}$$

79.
$$-4y - 3 = 15$$
$$-4y - 3 + 3 = 15 + 3$$
$$-4y = 18$$
$$\frac{-4y}{-4} = \frac{18}{-4}$$
$$y = -\tfrac{9}{2} = -4\tfrac{1}{2}$$

80.
$$8m - 4 = 8$$
$$8m - 4 + 4 = 8 + 4$$
$$8m = 12$$
$$\frac{8m}{8} = \frac{12}{8}$$
$$m = \tfrac{3}{2} = 1\tfrac{1}{2}$$

81.
$$-p + 3 = 10$$
$$-p + 3 - 3 = 10 - 3$$
$$-p = 7$$
$$p = -7$$

82. $14 \cdot 4 \cdot 25 = 14 \cdot 100 = 1400$ **83.** $16 + 28 + 34 + 72 = 16 + 34 + 28 + 72 = 50 + 100 = 150$ **84.** $-8 + 15 + (-9) + 2 = -8 - 9 + 15 + 2 = -17 + 17 = 0$ **85.** $3 \cdot 3 \cdot 10 = 9 \cdot 10 = 90$ **86.** $2 \cdot 8 \cdot 5 = 2 \cdot 5 \cdot 8 = 10 \cdot 8 = 80$ **87.** $27 + 46 - 17 - 16 = 27 - 17 + 46 - 16 = 10 + 30 = 40$ **88.** -4 **89.** 27 **90.** -11 **91.** -4 **92.** -10 **93.** -2 **94.** -30 **95.** 5

CHECKPOINT QUIZ 1 *page 94*

1.
$$x - 7 = -6$$
$$x - 7 + 7 = -6 + 7$$
$$x = 1$$
Check: $1 - 7 = -6$ ✓

2.
$$\frac{w}{3} = 11$$
$$3\left(\frac{w}{3}\right) = 3 \cdot 11$$
$$w = 33$$
Check: $\frac{33}{3} = 11$ ✓

3.
$$15 = 0.75v$$
$$\frac{15}{0.75} = \frac{0.75v}{0.75}$$
$$20 = v$$
Check: $15 = 0.75(20)$ ✓

4.
$$2t - 1 = 4$$
$$2t - 1 + 1 = 4 + 1$$
$$2y = 5$$
$$\frac{2t}{2} = \frac{5}{2}$$
$$t = 2\tfrac{1}{2}$$
Check: $2\left(2\tfrac{1}{2}\right) - 1 = 4$ ✓

5.
$$\frac{b}{3} - 20 = 20$$
$$\frac{b}{3} - 20 + 20 = 20 + 20$$
$$\frac{b}{3} = 40$$
$$3\left(\frac{b}{3}\right) = 3(40)$$
$$b = 120$$
Check: $\frac{120}{3} - 20 = 20$ ✓

6.
$$-12 - 4x + 3 = -1$$
$$-4x - 9 = -1$$
$$-4x - 9 + 9 = -1 + 9$$
$$-4x = 8$$
$$\frac{-4x}{-4} = \frac{8}{-4}$$
$$x = -2$$
Check: $-12 - 4(-2) + 3 = -1$ ✓

7.
$$\frac{y}{8} + \frac{y}{12} = -4$$
$$24\left(\frac{y}{8}\right) + 24\left(\frac{y}{12}\right) = 24(-4)$$
$$3y + 2y = -96$$
$$5y = -96$$
$$\frac{5y}{5} = -\frac{96}{5}$$
$$y = -\frac{96}{5} = -19\tfrac{1}{5}$$
Check: $\frac{-19\frac{1}{5}}{8} + \frac{-19\frac{1}{5}}{12} \stackrel{?}{=} -4$
$$-19\tfrac{1}{5}\left(\tfrac{1}{8} + \tfrac{1}{12}\right) = -19\tfrac{1}{5}\left(\tfrac{3}{24} + \tfrac{2}{24}\right) =$$
$$-\frac{96}{5}\left(\frac{5}{24}\right) = -4 \checkmark$$

8.
$$9(n + 7) = -81$$
$$\frac{9(n + 7)}{9} = \frac{-81}{9}$$
$$n + 7 = -9$$
$$n + 7 - 7 = -9 - 7$$
$$n = -16$$
Check: $9(-16 + 7) = 9(-9) = -81$ ✓

9.
$$\tfrac{1}{2} = \tfrac{2}{3}b + \tfrac{1}{6}b$$
$$6\left(\tfrac{1}{2}\right) = 6\left(\tfrac{2}{3}b\right) + 6\left(\tfrac{1}{6}b\right)$$
$$3 = 4b + b$$
$$3 = 5b$$
$$\frac{5b}{5} = \frac{3}{5}$$
$$b = \frac{3}{5}$$
Check: $\frac{1}{2} = \frac{2}{3}\left(\frac{3}{5}\right) + \frac{1}{6}\left(\frac{3}{5}\right) = \frac{2}{5} + \frac{1}{10} = \frac{4}{10} + \frac{1}{10} = \frac{5}{10}$ ✓

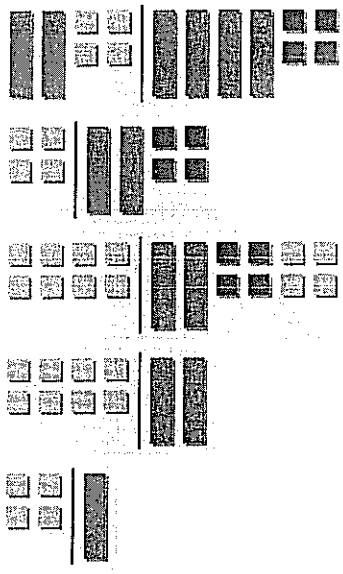
10.

$$\begin{aligned} 240 + 0.05s + 8.95 &= 256.65 \\ 0.05s + 248.95 &= 256.65 \\ 100(0.05s + 248.95) &= 100(256.65) \\ 5s + 24{,}895 &= 25{,}665 \\ 5s + 24{,}895 - 24{,}895 &= 25{,}665 - 24{,}895 \\ 5s &= 770 \\ \frac{5s}{5} &= \frac{770}{5} \\ s &= 154.00 \end{aligned}$$

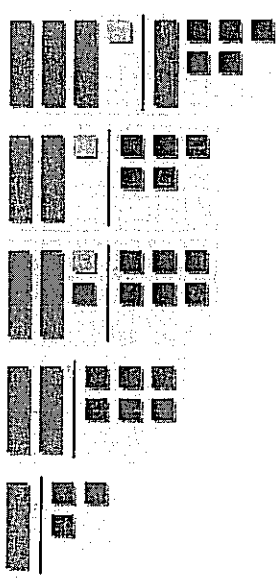
total sales = \$154.00

INVESTIGATION *page 95*

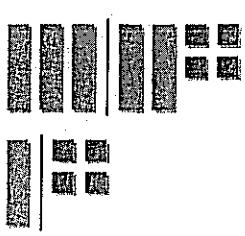
1. $2a + 4 = 4a - 4; 4$



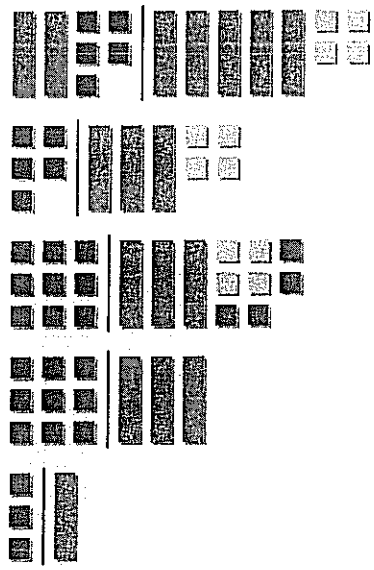
2. $3a + 1 = a - 5; -3$



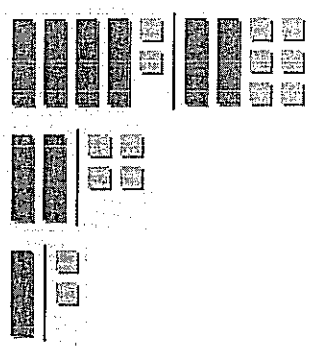
3. $3a = 2a - 4; -4$



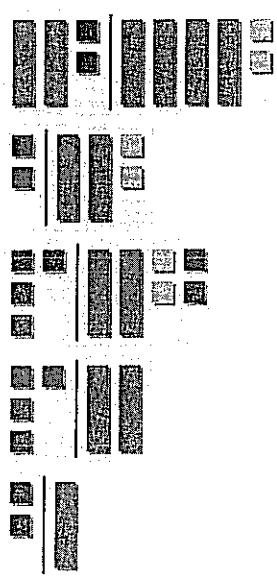
4. $2a - 5 = 5a + 4; -3$



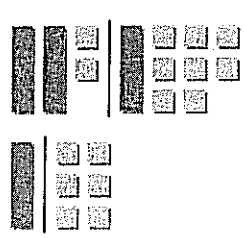
5. $x = 2$

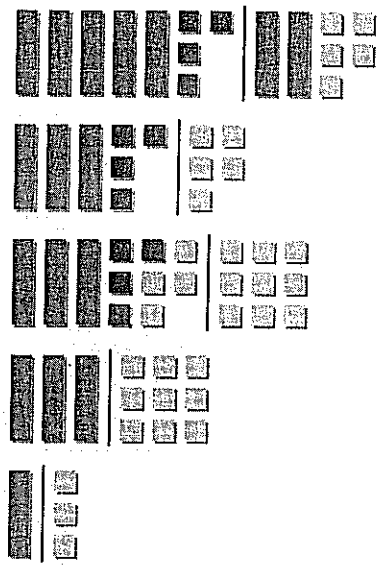


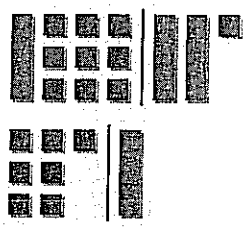
6. $y = 2$

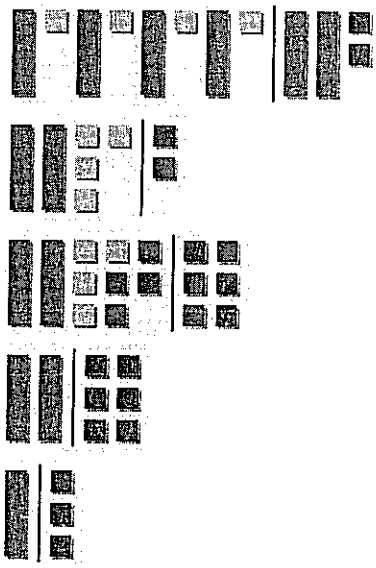


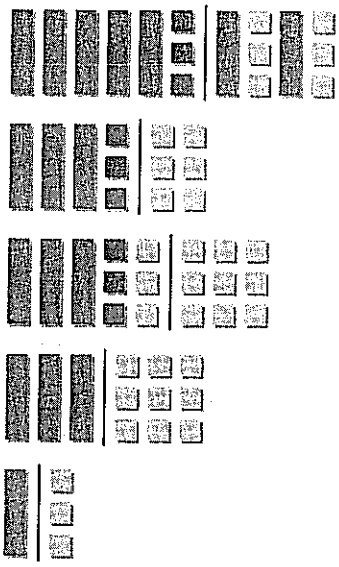
7. $a = 6$

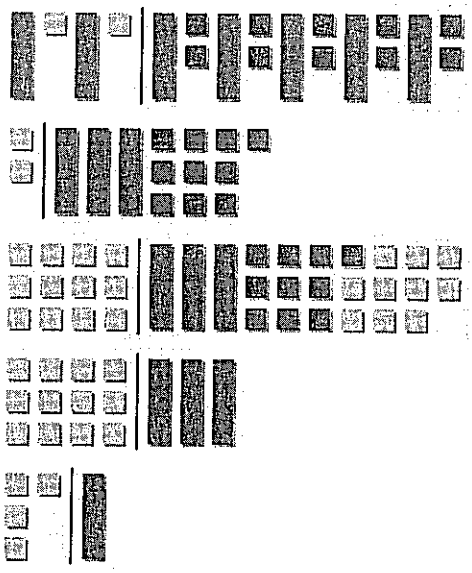


8.  $b = 3$

9.  $n = -7$

10.  $p = -3$

11.  $n = 3$

12.  $k = 4$

2-4 Equations with Variables on Both Sides *pages 96–101*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. $4x$ **2.** $-4x$ **3.** 0 **4.** 0 **5.** -2 **6.** -5 **7.** -7 **8.** $\frac{1}{3}$

Investigation 1.

Key Chains	Cost	Revenue
k	$540 + 3k$	$7k$
100	840	700
110	870	770
120	900	840
130	930	910
140	960	980
150	990	1050

2. cost **3.** The first entry in the table where revenue exceeds cost is $k = 140$. So for some k-value between

130 and 140, the revenue exceeds the cost, and will remain greater than cost for greater k-values.
4. 135 keychains; an estimate halfway between 130 and 140 is a good estimate. **5.** Answers may vary. Sample: An equation may be written in the form profit = revenue − cost. You may set the profit you wish to achieve and solve the equation to yield that profit.

Check Understanding

1a.
$$\begin{aligned} -6d &= d + 4 \\ -6d - d &= d - d + 4 \\ -7d &= 4 \\ \frac{-7d}{-7} &= \frac{4}{-7} \\ d &= -\frac{4}{7} \end{aligned}$$

1b.
$$\begin{aligned} 2(c - 6) &= 9c + 2 \\ 2c - 12 &= 9c + 2 \\ 2c - 12 - 2c &= 9c + 2 - 2c \\ -12 &= 7c + 2 \\ -12 - 2 &= 7c + 2 - 2 \\ -14 &= 7c \\ \frac{7c}{7} &= \frac{-14}{7} \\ c &= -2 \end{aligned}$$

1c.
$$\begin{aligned} m - 5 &= 3m \\ m - 5 - m &= 3m - m \\ -5 &= 2m \\ \frac{2m}{2} &= \frac{-5}{2} \\ m &= -2\tfrac{1}{2} \end{aligned}$$

1d.
$$\begin{aligned} 7k - 4 &= 5k + 16 \\ 7k - 4 - 5k &= 5k + 16 - 5k \\ 2k - 4 &= 16 \\ 2k - 4 + 4 &= 16 + 4 \\ 2k &= 20 \\ \frac{2k}{2} &= \frac{20}{2} \\ k &= 10 \end{aligned}$$

2.
$$\begin{aligned} 4n + 10 &= 3n + 25 \\ 4n + 10 - 3n &= 3n + 25 - 3n \\ n + 10 &= 25 \\ n + 10 - 10 &= 25 - 10 \\ n &= 15 \end{aligned}$$

The cost from Company B is less for orders of more than 15 bottles.

3a.
$$\begin{aligned} 9 + 5n &= 5n - 1 \\ 9 + 5n - 5n &= 5n - 5n - 1 \\ 9 &= -1 \end{aligned}$$

The equation has no solution. There is no value of n for which the equation is true.

3b.
$$\begin{aligned} 9 + 5x &= 7x + 9 - 2x \\ 9 + 5x &= 9 + 5x \end{aligned}$$

This equation is an identity. It is true for all values of x.

Exercises

1.
$$\begin{aligned} 12x + 4 &= 13x - 5 \\ 12x + 4 - 12x &= 13x - 5 - 12x \\ 4 &= x - 5 \\ 4 + 5 &= x - 5 + 5 \\ 9 &= x \end{aligned}$$

2.
$$\begin{aligned} 11x + 33 &= 15x + 5 \\ 11x + 33 - 11x &= 15x + 5 - 11x \\ 33 &= 4x + 5 \\ 33 - 5 &= 4x + 5 - 5 \\ 28 &= 4x \\ \frac{4x}{4} &= \frac{28}{4} \\ x &= 7 \end{aligned}$$

3.
$$\begin{aligned} 6x - 2 &= x + 13 \\ 6x - 2 - x &= x + 13 - x \\ 5x - 2 &= 13 \\ 5x - 2 + 2 &= 13 + 2 \\ 5x &= 15 \\ \frac{5x}{5} &= \frac{15}{5} \\ x &= 3 \end{aligned}$$

Check: $6 \cdot 3 - 2 = 3 + 13$ ✓

4.
$$\begin{aligned} 5y - 3 &= 2y + 12 \\ 5y - 3 - 2y &= 2y + 12 - 2y \\ 3y - 3 &= 12 \\ 3y - 3 + 3 &= 12 + 3 \\ 3y &= 15 \\ \frac{3y}{3} &= \frac{15}{3} \\ y &= 5 \end{aligned}$$

Check: $5(5) - 3 = 2(5) + 12$ ✓

5.
$$\begin{aligned} 4k - 3 &= 3k + 4 \\ 4k - 3 - 3k &= 3k + 4 - 3k \\ k - 3 &= 4 \\ k - 3 + 3 &= 4 + 3 \\ k &= 7 \end{aligned}$$

Check: $4 \cdot 7 - 3 = 3 \cdot 7 + 4$ ✓

6.
$$\begin{aligned} 5m + 3 &= 3m + 9 \\ 5m + 3 - 3m &= 3m + 9 - 3m \\ 2m + 3 &= 9 \\ 2m + 3 - 3 &= 9 - 3 \\ 2m &= 6 \\ \frac{2m}{2} &= \frac{6}{2} \\ m &= 3 \end{aligned}$$

Check: $5 \cdot 3 + 3 = 3 \cdot 3 + 9$ ✓

7.
$$\begin{aligned} 8 - x &= 2x - 1 \\ 8 - x + x &= 2x - 1 + x \\ 8 &= 3x - 1 \\ 8 + 1 &= 3x - 1 + 1 \\ 9 &= 3x \\ \frac{3x}{3} &= \frac{9}{3} \\ x &= 3 \end{aligned}$$

Check: $8 - 3 = 2 \cdot 3 - 1$ ✓

8.
$$\begin{aligned} 2n - 5 &= 8n + 7 \\ 2n - 5 - 2n &= 8n + 7 - 2n \\ -5 &= 6n + 7 \\ -5 - 7 &= 6n + 7 - 7 \\ -12 &= 6n \\ \frac{6n}{6} &= \frac{-12}{6} \\ n &= -2 \end{aligned}$$

Check: $2(-2) - 5 = 8(-2) + 7$ ✓

9.
$$\begin{aligned} 3a + 4 &= a + 18 \\ 3a + 4 - a &= a + 18 - a \\ 2a + 4 &= 18 \\ 2a + 4 - 4 &= 18 - 4 \\ 2a &= 14 \\ \frac{2a}{2} &= \frac{14}{2} \end{aligned}$$

$$a = 7$$
Check: $3 \cdot 7 + 4 = 7 + 18$ ✓

10.
$$6b + 14 = -7 - b$$
$$6b + 14 + b = -7 - b + b$$
$$7b + 14 = -7$$
$$7b + 14 - 14 = -7 - 14$$
$$7b = -21$$
$$\frac{7b}{7} = \frac{-21}{7}$$
$$b = -3$$
Check: $6(-3) + 14 = -7 - (-3)$ ✓

11.
$$5a - 14 = -5 + 8a$$
$$5a - 14 - 5a = -5 + 8a - 5a$$
$$-14 = -5 + 3a$$
$$-14 + 5 = -5 + 3a + 5$$
$$-9 = 3a$$
$$\frac{3a}{3} = \frac{-9}{3}$$
$$a = -3$$
Check: $5(-3) - 14 = -5 + 8(-3)$ ✓

12.
$$3 + 4x = 3x + 6$$
$$3 + 4x - 3x = 3x + 6 - 3x$$
$$3 + x = 6$$
$$3 + x - 3 = 6 - 3$$
$$x = 3$$
Check: $3 + 4 \cdot 3 = 3 \cdot 3 + 6$ ✓

13.
$$30 - 7z = 10z - 4$$
$$30 - 7z + 7z = 10z - 4 + 7z$$
$$30 = 17z - 4$$
$$30 + 4 = 17z - 4 + 4$$
$$34 = 17z$$
$$\frac{34}{17} = \frac{17z}{17}$$
$$2 = z$$
Check: $30 - 7 \cdot 2 = 10 \cdot 2 - 4$ ✓

14.
$$8x - 3 = 7x + 2$$
$$8x - 3 - 7x = 7x + 2 - 7x$$
$$x - 3 = 2$$
$$x - 3 + 3 = 2 + 3$$
$$x = 5$$
Check: $8 \cdot 5 - 3 = 7 \cdot 5 + 2$ ✓

15.
$$-36 + 2w = -8w + w$$
$$-36 + 2w - 2w = -7w - 2w$$
$$-36 = -9w$$
$$\frac{-9w}{-9} = -\frac{36}{9}$$
$$w = 4$$
Check: $-36 + 2 \cdot 4 = -8 \cdot 4 + 4$ ✓

16.
$$4p - 10 = p + 3p - 2p$$
$$4p - 10 = 2p$$
$$4p - 10 - 2p = 2p - 2p$$
$$2p - 10 = 0$$
$$2p - 10 + 10 = 0 + 10$$
$$2p = 10$$
$$\frac{2p}{2} = \frac{10}{2}$$
$$p = 5$$
Check: $4 \cdot 5 - 10 = 5 + 3 \cdot 5 - 2 \cdot 5$ ✓

17.
$$16.95 + 0.05n = 22.95 + 0.02n$$
$$16.95 + 0.05n - 0.02n = 22.95 + 0.02n - 0.02n$$
$$16.95 + 0.03n = 22.95$$
$$16.95 + 0.03n - 16.95 = 22.95 - 16.95$$
$$0.03n = 6$$
$$\frac{0.03n}{0.03} = \frac{6}{0.03}$$
$$n = 200$$
The differential rate (3 cents per call) balances the difference in base charges ($6.00) if the calling time is 200 min.

18.
$$44 + 30n = 99 + 25n$$
$$44 + 30n - 25n = 99 + 25n - 25n$$
$$44 + 5n = 99$$
$$44 + 5n - 44 = 99 - 44$$
$$5n = 55$$
$$\frac{5n}{5} = \frac{55}{5}$$
$$n = 11$$
In 11 months, the difference due to rates ($55) balances the difference in sign-up fees ($55).

19.
$$4\ell - 3 = 3\ell + 5 = \text{length of porch}$$
$$4\ell - 3 - 3\ell = 3\ell + 5 - 3\ell$$
$$\ell - 3 = 5$$
$$\ell - 3 + 3 = 5 + 3$$
$$\ell = 8$$
The fourth board, 8 ft long, makes up for the 3-ft shortage and hangs over an extra 5 ft.

20.
$$100 + 80n = 250 + 70n$$
$$100 + 80n - 70n = 250 + 70n - 70n$$
$$100 + 10n = 250$$
$$100 + 10n - 100 = 250 - 100$$
$$10n = 150$$
$$\frac{10n}{10} = \frac{150}{10}$$
$$n = 15$$
The costs are the same at 15 hours.

21a. Answers may vary. Samples:

$x = 0$: $9 = 9$

$x = 10$: $9 - 6(10) = 3(3 - 2 \cdot 10)$
$-51 = -51$

$x = -5$: $9 - 6 \cdot (-5) = 3[3 - 2(-5)]$
$39 = 39$

$x = 2$: $9 - 6 \cdot 2 = 3(3 - 2 \cdot 2)$
$-3 = -3$

21b.
$$9 - 6x = 3(3 - 2x)$$
$$9 - 6x = 9 - 6x$$
This equation is an identity. It is true for *all* values of x.

22.
$$14 - (2q + 5) = -2q + 9$$
$$-2q + 9 = -2q + 9$$
identity

23.
$$6x + 1 = 6x - 8$$
$$6x + 1 - 6x = 6x - 8 - 6x$$
$$1 = -8$$
no solution

24.
$$-8x + 14 = -2(4x - 7)$$
$$-8x + 14 = -8x + 14$$
identity

25.
$$y - 5 = -(5 - y)$$
$$y - 5 = -5 + y$$
identity

26.
$$a - 4a = 2a + 1 - 5a$$
$$-3a = 1 - 3a$$
$$-3a + 3a = 1 - 3a + 3a$$
$$0 = 1$$
no solution

27.
$$9x + 3x - 10 = 3(3x + x)$$
$$12x - 10 = 12x$$
$$12x - 10 - 12x = 12x - 12x$$
$$-10 = 0$$
no solution

28.
$$18x - 5 = 3(6x - 2)$$
$$18x - 5 = 18x - 6$$
$$18x - 5 - 18x = 18x - 6 - 18x$$
$$-5 = -6$$
no solution

29.
$$9 + 5a = 2a + 9$$
$$9 + 5a - 9 = 2a + 9 - 9$$
$$5a = 2a$$
$$5a - 2a = 2a - 2a$$
$$3a = 0$$
$$\frac{3a}{3} = \frac{0}{3}$$
$$a = 0$$

30.
$$3(x - 4) = 3x - 12$$
$$3x - 12 = 3x - 12$$
identity

31.
$$6x = 4(x + 5)$$
$$6x = 4x + 20$$
$$6x - 4x = 4x + 20 - 4x$$
$$2x = 20$$
$$\frac{2x}{2} = \frac{20}{2}$$
$$x = 10$$

32.
$$\frac{3}{5}k - \frac{1}{10}k = \frac{1}{2}k + 1$$
$$10\left(\frac{3}{5}k\right) - 10\left(\frac{1}{10}k\right) = 10\left(\frac{1}{2}k\right) + 10(1)$$
$$6k - k = 5k + 10$$
$$5k = 5k + 10$$
$$5k - 5k = 5k + 10 - 5k$$
$$0 = 10$$
no solution

33.
$$0.5y + 2 = 0.8y - 0.3y$$
$$0.5y + 2 = 0.5y$$
$$0.5y + 2 - 0.5y = 0.5y - 0.5y$$
$$2 = 0$$
no solution

34.
$$5m - 2(m + 2) = -(2m + 15)$$
$$5m - 2m - 4 = -2m - 15$$
$$5m - 2m - 4 + 2m = -2m - 15 + 2m$$
$$5m - 4 = -15$$
$$5m - 4 + 4 = -15 + 4$$
$$5m = -11$$
$$\frac{5m}{5} = \frac{-11}{5}$$
$$m = -2\frac{1}{5}$$

35.
$$\frac{7}{8}w = \frac{4}{8}w + \frac{6}{8}w$$
$$8\left(\frac{7}{8}w\right) = 8\left(\frac{4}{8}w\right) + 8\left(\frac{6}{8}w\right)$$
$$7w = 4w + 6w$$
$$7w = 10w$$
$$7w - 7w = 10w - 7w$$
$$0 = 3w$$
$$\frac{0}{3} = \frac{3w}{3}$$
$$w = 0$$

36.
$$0 = 0.98b + 0.02b - b$$
$$0 = b - b$$
$$0 = 0$$
identity

37.
$$6(6g - 2) + 8(1 - 5g) = 2g$$
$$36g - 12 + 8 - 40g = 2g$$
$$-4g - 4 = 2g$$
$$-4g - 4 + 4g = 2g + 4g$$
$$-4 = 6g$$
$$\frac{-4}{6} = \frac{6g}{6}$$
$$-\frac{2}{3} = g$$

38.
$$1500 + 8t = 12t$$
$$1500 + 8t - 8t = 12t - 8t$$
$$1500 = 4t$$
$$\frac{4t}{4} = \frac{1500}{4}$$
$$t = 375$$
The company must sell 375 teddy bears.

39.
$$1200 + 9b = 25b$$
$$1200 + 9b - 9b = 25b - 9b$$
$$1200 = 16b$$
$$\frac{16b}{16} = \frac{1200}{16}$$
$$b = \frac{300}{4} = 75$$
The company must sell 75 tote bags.

40. (a)
$$2x + 1 = -5x - 6$$
$$2x + 1 - 2x = -5x - 6 - 2x$$
$$1 = -7x - 6$$
$$1 + 6 = -7x - 6 + 6$$
$$7 = -7x$$
$$\frac{-7x}{-7} = \frac{7}{-7}$$
$$x = -1$$

(b)
$$a - 1 - a = 5a - a$$
$$-1 = 4a$$
$$\frac{4a}{4} = \frac{-1}{4}$$
$$a = -\frac{1}{4}$$

(c)
$$w - 4 = 3w + 4$$
$$w - 4 - w = 3w + 4 - w$$
$$-4 = 2w + 4$$
$$-4 - 4 = 2w + 4 - 4$$
$$-8 = 2w$$
$$\frac{2w}{2} = \frac{-8}{2}$$
$$w = -4$$

(d)
$$9y = -3y$$
$$9y + 3y = -3y + 3y$$
$$12y = 0$$
$$\frac{12y}{12} = \frac{0}{12}$$
$$y = 0$$

41. (a)
$$a + 1 = 7 - a$$
$$a + 1 + a = 7 - a + a$$
$$2a + 1 = 7$$
$$2a + 1 - 1 = 7 - 1$$
$$2a = 6$$
$$\frac{2a}{2} = \frac{6}{2}$$
$$a = 3$$

(b)
$$4b = 3b + 5$$
$$4b - 3b = 3b + 5 - 3b$$
$$b = 5$$

ⓒ
$$2c + 3 = 3c - 4$$
$$2c + 3 - 2c = 3c - 4 - 2c$$
$$3 = c - 4$$
$$3 + 4 = c - 4 + 4$$
$$7 = c$$

ⓓ
$$5d - 3 = 63 - d$$
$$5d - 3 + d = 63 - d + d$$
$$6d - 3 = 63$$
$$6d - 3 + 3 = 63 + 3$$
$$6d = 66$$
$$\frac{6d}{6} = \frac{66}{6}$$
$$d = 11$$

42. ⓧ
$$0.5x + 3 = x + 0.5$$
$$0.5x + 3 - 0.5x = x + 0.5 - 0.5x$$
$$3 = 0.5x + 0.5$$
$$3 - 0.5 = 0.5x + 0.5 - 0.5$$
$$2.5 = 0.5x$$
$$\frac{0.5x}{0.5} = \frac{2.5}{0.5}$$
$$x = 5$$

ⓦ
$$w + 1.5 = 2w - 1.5$$
$$w + 1.5 + 1.5 = 2w - 1.5 + 1.5$$
$$w + 3 = 2w$$
$$w + 3 - w = 2w - w$$
$$3 = w$$

ⓨ
$$2.5y + 2.5 = 5y - 2.5$$
$$2.5y + 2.5 + 2.5 = 5y - 2.5 + 2.5$$
$$2.5y + 5 = 5y$$
$$2.5y + 5 - 2.5y = 5y - 2.5y$$
$$5 = 2.5y$$
$$\frac{5}{2.5} = \frac{2.5y}{2.5}$$
$$2 = y$$

ⓐ
$$a + 1 = 19 - a$$
$$a + 1 - 1 = 19 - a - 1$$
$$a = 18 - a$$
$$a + a = 18 - a + a$$
$$2a = 18$$
$$\frac{2a}{2} = \frac{18}{2}$$
$$a = 9$$

43. ⓐ
$$\tfrac{1}{2} + a = 6\tfrac{1}{2} - a$$
$$\tfrac{1}{2} + a + a = 6\tfrac{1}{2} - a + a$$
$$\tfrac{1}{2} + 2a = 6\tfrac{1}{2}$$
$$2\left(\tfrac{1}{2}\right) + 2(2a) = 2\left(6\tfrac{1}{2}\right)$$
$$1 + 4a = 13$$
$$1 + 4a - 1 = 13 - 1$$
$$4a = 12$$
$$\frac{4a}{4} = \frac{12}{4}$$
$$a = 3$$

ⓑ
$$\tfrac{1}{2}b + 2 = b - 1$$
$$\tfrac{1}{2}b + 2 - \tfrac{1}{2}b = b - 1 - \tfrac{1}{2}b$$
$$2 = \tfrac{1}{2}b - 1$$
$$2 + 1 = \tfrac{1}{2}b - 1 + 1$$
$$3 = \tfrac{1}{2}b$$
$$2(3) = 2\left(\tfrac{1}{2}b\right)$$
$$6 = b$$

ⓒ
$$c - \tfrac{1}{3} = 4\tfrac{2}{3}$$
$$c - \tfrac{1}{3} + \tfrac{1}{3} = 4\tfrac{2}{3} + \tfrac{1}{3}$$
$$c = 5$$

ⓓ
$$\tfrac{1}{3}d + \tfrac{2}{3} = d + \tfrac{4}{9}$$
$$9\left(\tfrac{1}{3}d\right) + 9\tfrac{2}{3} = 9(d) + 9\left(\tfrac{4}{9}\right)$$
$$3d + 6 = 9d + 4$$
$$3d + 6 - 3d = 9d + 4 - 3d$$
$$6 = 6d + 4$$
$$6 - 4 = 6d + 4 - 4$$
$$2 = 6d$$
$$\frac{6d}{6} = \frac{2}{6}$$
$$d = \tfrac{1}{3}$$

44. $9x$ should have been $-9x$.
$$2x = 11x + 45$$
$$2x - 2x = 11x + 45 - 2x$$
$$0 = 9x + 45$$
$$0 - 45 = 9x + 45 - 45$$
$$-45 = 9x$$
$$\frac{9x}{9} = \frac{-45}{9}$$
$$x = -5$$

45. In the third line, one should add y to each side instead of subtracting.
$$4.5 - y = 2(y - 5.7)$$
$$4.5 - y = 2y - 11.4$$
$$4.5 - y + y = 2y - 11.4 + y$$
$$4.5 = 3y - 11.4$$
$$4.5 + 11.4 = 3y - 11.4 + 11.4$$
$$15.9 = 3y$$
$$\frac{3y}{3} = \frac{15.9}{3}$$
$$y = 5.3$$

46.
$$AB = DE$$
$$6x - 2 = 3x + 4$$
$$6x - 2 - 3x = 3x + 4 - 3x$$
$$3x - 2 = 4$$
$$3x - 2 + 2 = 4 + 2$$
$$3x = 6$$
$$\frac{3x}{3} = \frac{6}{3}$$
$$x = 2$$
$$DE = 3x + 4 = 3 \cdot 2 + 4 = 10$$
$$AC = DF$$
$$3y - 2 = 2y + 1$$
$$3y - 2 - 2y = 2y + 1 - 2y$$
$$y - 2 = 1$$
$$y - 2 + 2 = 1 + 2$$
$$y = 3$$
$$DF = 2y + 1 = 2 \cdot 3 + 1 = 7$$
$$BC = EF$$
$$4p - 2 = 2p + 2$$
$$4p - 2 - 2p = 2p + 2 - 2p$$
$$2p - 2 = 2$$
$$2p - 2 + 2 = 2 + 2$$
$$2p = 4$$
$$\frac{2p}{2} = \frac{4}{2}$$
$$p = 2$$
$$EF = 2p + 2 = 2 \cdot 2 + 2 = 6$$

47. No; an equation with a solution of 0 *has* a solution. An equation with no solution is not true for any value of the variable. **48a.** No, but the spreadsheet leads the eye to an approximate solution. **48b.** For $x = 1$, B < C, but for $x = 3$, B > C, so we should have B = C for a value of x between 1 and 3. The differences between B and C are the same at these two entries, so the solution should lie halfway between, at $x = 2$. **48c.** for values of x greater than 2

49–54. Answers may vary. Samples are given.

49. $2x = 3x$ **50.** $x + 2 = 3$ **51.** $x + 2 = 1$

52. $2x + 3 = 2(x + 1.5)$ **53.** $2x + 3 = 2x + 5$

54. $2x + 3 = 3x + 2$

55.
$$\begin{aligned} a + b &= 15 \\ a + b - b &= 15 - b \\ a &= 15 - b \end{aligned}$$

Substitute a into

$$\begin{aligned} b - a &= 3 \\ b - (15 - b) &= 3 \\ 2b - 15 &= 3 \\ 2b - 15 + 15 &= 3 + 15 \\ 2b &= 18 \\ \tfrac{2b}{2} &= \tfrac{18}{2} \\ b &= 9 \\ a &= 15 - b = 15 - 9 = 6 \end{aligned}$$

Substitute a and b into

$$\begin{aligned} a + b - 12 &= c \\ 6 + 9 - 12 &= c \\ 3 &= c \\ a + b + c &= 6 + 9 + 3 = 18 \end{aligned}$$

The pipe is 18 units long.

56.
$$\begin{aligned} 2(4x + 2) + 2(2x) &= 4(4x) \\ 8x + 4 + 4x &= 16x \\ 12x + 4 &= 16x \\ 12x + 4 - 12x &= 16x - 12x \\ 4 &= 4x \\ \tfrac{4x}{4} &= \tfrac{4}{4} \\ x &= 1 \end{aligned}$$

rectangle: 6 units, 2 units; square: 4 units, 4 units

57.
$$\begin{aligned} 2y &= 3y - 20 \\ 2y - 2y &= 3y - 20 - 2y \\ 0 &= y - 20 \\ 20 &= y - 20 + 20 \\ 20 &= y \end{aligned}$$

The answer is D.

58. F.
$$\begin{aligned} -2(y - 3) &= -6y \\ -2y + 6 &= -6y \end{aligned}$$

(This is not equivalent to Equation G.)

$$\begin{aligned} -2y + 6 + 2y &= -6y + 2y \\ 6 &= -4y \end{aligned}$$

H.
$$\begin{aligned} y &= -\tfrac{3}{2} \\ 4y &= 4\left(-\tfrac{3}{2}\right) \\ 4y &= -6 \end{aligned}$$

Equations F, H, and I are clearly equivalent. The answer is G.

59.
$$\begin{aligned} 5400 + 9x &= 3800 + 13x \\ 5400 + 9x - 3800 &= 3800 + 13x - 3800 \\ 1600 + 9x &= 13x \\ 1600 + 9x - 9x &= 13x - 9x \\ 1600 &= 4x \\ \tfrac{1600}{4} &= \tfrac{4x}{4} \\ 400 &= x \end{aligned}$$

The answer is C.

60.
$$\begin{aligned} 3p - 2 &= 6p + 4 \\ 3p - 2 - 3p &= 6p + 4 - 3p \\ -2 &= 3p + 4 \\ -2 - 4 &= 3p + 4 - 4 \\ -6 &= 3p \end{aligned}$$

F.
$$\begin{aligned} 3p &= 6p + 6 \\ 3p - 6p &= 6p + 6 - 6p \\ -3p &= 6 \end{aligned}$$

I.
$$\begin{aligned} -3p - 2 &= 4 \\ -3p - 2 + 2 &= 4 + 2 \\ -3p &= 6 \end{aligned}$$

Equations F, G, and I are equivalent to the original equation, and H is not. The answer is H.

61. Let x = number of CDs. The cost for the store is $12x$. Since 5 CDs are free at the club, the cost at the club is $15(x - 5)$, where $x \geq 5$. The answer is C.

62.
$$\begin{aligned} 2(y - 3) &= 1.2 - y \\ 2y - 6 &= 1.2 - y \\ 2y - 6 + y &= 1.2 - y + y \\ 3y - 6 &= 1.2 \\ 3y - 6 + 6 &= 1.2 + 6 \\ 3y &= 7.2 \\ \tfrac{3y}{3} &= \tfrac{7.2}{3} \\ y &= 2.4 \end{aligned}$$

The answer is I.

63.
$$\begin{aligned} 2[6 + (x + 2)] &= 6 + 2x + (x + 4) \\ 12 + 2x + 4 &= 6 + 2x + x + 4 \\ 2x + 16 &= 3x + 10 \\ 2x + 16 - 2x &= 3x + 10 - 2x \\ 16 &= x + 10 \\ 16 - 10 &= x + 10 - 10 \\ 6 &= x \end{aligned}$$

The answer is A.

64.
$$\begin{aligned} 9 &= -4y + 6y - 5 \\ 9 &= 2y - 5 \\ 9 + 5 &= 2y - 5 + 5 \\ 14 &= 2y \\ \tfrac{2y}{2} &= \tfrac{14}{2} \\ y &= 7 \end{aligned}$$

65.
$$\begin{aligned} -2(a - 3) &= 14 \\ -2a + 6 &= 14 \\ -2a + 6 - 6 &= 14 - 6 \\ -2a &= 8 \\ \tfrac{-2a}{-2} &= \tfrac{8}{-2} \\ a &= -4 \end{aligned}$$

66.
$$\begin{aligned} 0.5m + 2.8 &= 3.64 \\ 0.5m + 2.8 - 2.8 &= 3.64 - 2.8 \\ 0.5m &= 0.84 \\ \tfrac{0.5m}{0.5} &= \tfrac{0.84}{0.5} \\ m &= 1.68 \end{aligned}$$

67.
$$\begin{aligned} \tfrac{1}{2}x + 4 &= \tfrac{2}{3} \\ 6\left(\tfrac{1}{2}x\right) + 6(4) &= 6\left(\tfrac{2}{3}\right) \\ 3x + 24 &= 4 \\ 3x + 24 - 24 &= 4 - 24 \\ 3x &= -20 \\ \tfrac{3x}{3} &= \tfrac{-20}{3} \\ x &= -6\tfrac{2}{3} \end{aligned}$$

68.
$$\begin{aligned} 4.8 &= 1.25(y - 17) \\ 4.8 &= 1.25y - 21.25 \\ 21.25 + 4.8 &= 1.25y - 21.25 + 21.25 \\ 26.05 &= 1.25y \\ \tfrac{1.25y}{1.25} &= \tfrac{26.05}{1.25} \\ y &= 20.84 \end{aligned}$$

69.
$$\begin{aligned} 4\left(\tfrac{1}{4} + x\right) &= 5 \\ 1 + 4x &= 5 \\ 1 + 4x - 1 &= 5 - 1 \\ 4x &= 4 \\ \tfrac{4x}{4} &= \tfrac{4}{4} \\ x &= 1 \end{aligned}$$

70.
$$\begin{aligned} 38\tfrac{1}{2} &= 30 + 2w \\ 38\tfrac{1}{2} - 30 &= 30 + 2w - 30 \\ 8\tfrac{1}{2} &= 2w \\ \tfrac{1}{2}\left(8\tfrac{1}{2}\right) &= \tfrac{2w}{2} \\ 4\tfrac{1}{4} &= w \end{aligned}$$

Each section should be $4\frac{1}{4}$ in. wide.

71. $-\frac{3}{5} = -\frac{24}{40}$, $-\frac{5}{8} = -\frac{25}{40}$, $-\frac{4}{5} = -\frac{32}{40}$

Put in increasing order:

$-\frac{32}{40}, -\frac{25}{40}, -\frac{24}{40}$, or $-\frac{4}{5}, -\frac{5}{8}, -\frac{3}{5}$.

72. 5.009, 5.04, 5.043 **73.** 8.02, 8.1, 8.3

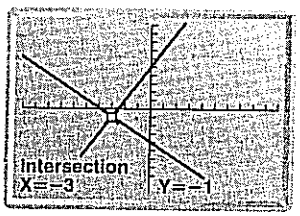
74. −100, −87, 93, 500 **75.** −1.24, 0.45, 1.23, 2.24

76. −9.8, 0.9, 8.6, 9.7

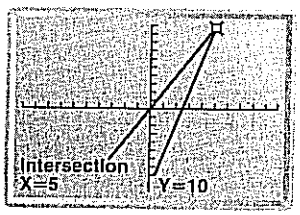
TECHNOLOGY *page 102*

1a. $y = 2x - 1$; $y = x + 1$ **1b.** 2 **1c.** 2

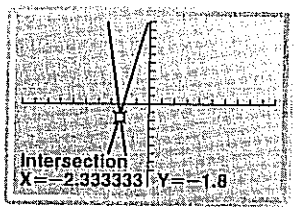
2. No; the solution is -0.5, or $-\frac{1}{2}$.

3. 

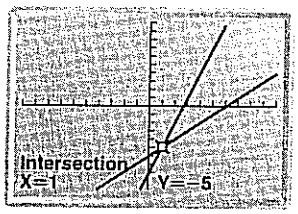
−3

4. 

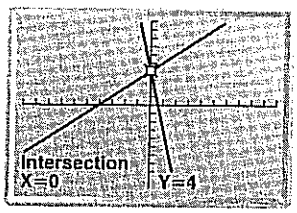
5

5. 

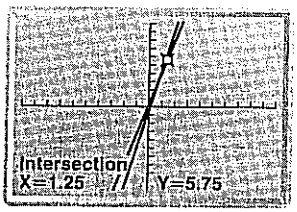
$-2.\overline{3}$

6. 

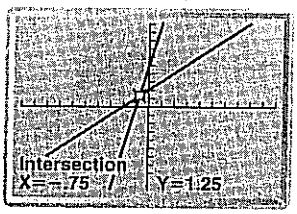
1

7. 

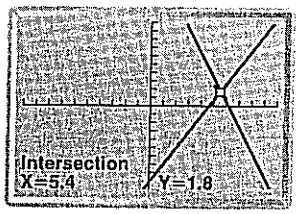
0

8. 

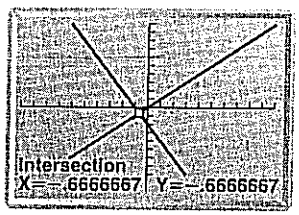
1.25

9. 

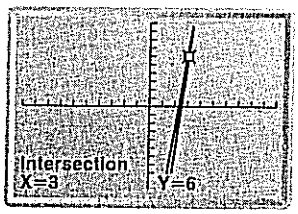
incorrect; −0.75

10. 

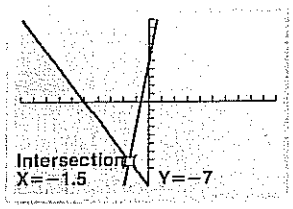
correct

11. 

incorrect; −0.6667

12. 

correct

13. 

incorrect; −1.5

2.5 Equations and Problem Solving *pages 108–110*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. $25q$ **2.** 2ℓ **3.** $34h$ **4.** $5x$ **5.** $3.99n$

Check Understanding

1.
$$\begin{aligned} w &= \ell - 2 \\ P &= 2\ell + 2w \\ 16 &= 2\ell + 2(\ell - 2) \\ 16 &= 4\ell - 4 \\ 16 + 4 &= 4\ell - 4 + 4 \\ 20 &= 4\ell \\ \tfrac{4\ell}{4} &= \tfrac{20}{4} \\ \ell &= 5 \end{aligned}$$

The length is 5 cm.

2a. Let x be the first integer. **2b.** $x + 1$ is the second integer and $x + 2$ is the third.

2c.
$$\begin{aligned} x + (x + 1) + (x + 2) &= 48 \\ 3x + 3 &= 48 \\ 3x + 3 - 3 &= 48 - 3 \\ 3x &= 45 \\ \tfrac{3x}{3} &= \tfrac{45}{3} \\ x &= 15 \end{aligned}$$

The integers are 15, 16, and 17. Their sum is 48. ✓

3a. Let t = time first group travels until the groups meet. Let $t - 2$ = time second group travels until they meet. The distance from the campsite to the meeting point is

$$\begin{aligned} 10t &= 22(t - 2) \\ 10t &= 22t - 44 \\ 10t - 10t &= 22t - 44 - 10t \\ 0 &= 12t - 44 \\ 44 &= 12t - 44 + 44 \\ 44 &= 12t \\ \tfrac{12t}{12} &= \tfrac{44}{12} \\ t &= \tfrac{11}{3} = 3\tfrac{2}{3} \end{aligned}$$

Time for canoe is $3\frac{2}{3}$ h.

3b. Time for motorboat = $3\frac{2}{3}$ h − 2 h = $1\frac{2}{3}$ h.

4. Let t = time to drive to work. $1.5 - t$ = return time.

$$\begin{aligned} 20t &= 40(1.5 - t) \\ 20t &= 60 - 40t \\ 20t + 40t &= 60 - 40t + 40t \\ 60t &= 60 \\ \tfrac{60t}{60} &= \tfrac{60}{60} \\ t &= 1 \text{ [or 1 h]} \end{aligned}$$

5. r = Sarah's rate. $(r - 12)$ = John's rate.

$$\begin{aligned} 2r + 2(r - 12) &= 176 \\ 4r - 24 &= 176 \\ 4r - 24 + 24 &= 176 + 24 \\ 4r &= 200 \\ \tfrac{4r}{4} &= \tfrac{200}{4} \\ r &= 50 \end{aligned}$$

Sarah's speed = 50 mi/h; John's speed = 50 mi/h − 12 mi/h = 38 mi/h.

Exercises

1a. width = w **1b.** length = $\ell = w + 3$

1c.
$$\begin{aligned} 2w + 2(w + 3) &= 30 \\ 4w + 6 &= 30 \\ 4w + 6 - 6 &= 30 - 6 \\ 4w &= 24 \\ \tfrac{4w}{4} &= \tfrac{24}{4} \\ w &= 6 \end{aligned}$$

width = 6 in.

1d. length = $\ell = w + 3 = 6 + 3 = 9$ [9 in.]

2.
$$\begin{aligned} \ell &= w + 8 \\ 2w + 2(w + 8) &= 24 \\ 4w + 16 &= 24 \\ 4w + 16 - 16 &= 24 - 16 \\ 4w &= 8 \\ \tfrac{4w}{4} &= \tfrac{8}{4} \\ w &= 2 \\ \ell &= 2 + 8 = 10 \end{aligned}$$

width = 2 in.; length = 10 in.

3. $w = \frac{\ell}{2}$; $\ell = 2w$

$$\begin{aligned} 2\ell + 2w &= 54 \\ 2(2w) + 2w &= 54 \\ 6w &= 54 \\ \tfrac{6w}{6} &= \tfrac{54}{6} \\ w &= 9 \text{ [width = 9 cm]} \\ \ell &= 2(9) \\ \ell &= 18 \text{ [length = 18 cm]} \end{aligned}$$

4.
$$\begin{aligned} \ell &= 2w + 3 \\ 2\ell + 2w &= 36 \\ 2(2w + 3) + 2w &= 36 \\ 6w + 6 &= 36 \\ \tfrac{6w}{6} + \tfrac{6}{6} &= \tfrac{36}{6} \\ w + 1 &= 6 \\ w + 1 - 1 &= 6 - 1 \\ w &= 5 \text{ [width = 5 yd]} \\ \ell &= 2(5) + 3 = \\ & 13 \text{ [length = 13 yd]} \end{aligned}$$

5. C

6a. Let n = the first integer. **6b.** 2 **6c.** $n + 2$

6d.
$$\begin{aligned} n + n + 2 &= 118 \\ 2n + 2 &= 118 \\ 2n + 2 - 2 &= 118 - 2 \\ 2n &= 116 \\ \tfrac{2n}{2} &= \tfrac{116}{2} \\ n &= 58 \end{aligned}$$

The second integer = 58 + 2 = 60.

7a. Let n = the first integer. **7b.** 2 **7c.** $n + 2$

7d.
$$\begin{aligned} n + n + 2 &= 56 \\ 2n + 2 &= 56 \\ 2n + 2 - 2 &= 56 - 2 \end{aligned} \quad \Bigg| \quad \begin{aligned} 2n &= 54 \\ \tfrac{2n}{2} &= \tfrac{54}{2} \\ n &= 27 \end{aligned}$$

The second integer $= 27 + 2 = 29$.

8.
$$\begin{aligned} n + n + 1 + n + 2 &= 915 \\ 3n + 3 &= 915 \\ 3n + 3 - 3 &= 915 - 3 \\ 3n &= 912 \\ \tfrac{3n}{3} &= \tfrac{912}{3} \end{aligned}$$

$n = 304; n + 1 = 305; n + 2 = 306$

9.
$$\begin{aligned} n + n + 2 &= -298 \\ 2n + 2 &= -298 \\ 2n + 2 - 2 &= -298 - 2 \\ 2n &= -300 \\ \tfrac{2n}{2} &= \tfrac{-300}{2} \\ n &= -150 \\ n + 2 &= -148 \end{aligned}$$

10a. Let t = time for moving van. **10b.** $t - \frac{3}{4}$

10c.

Vehicle	Rate	Time	Distance traveled
Moving van	35	t	$35t$
Car	50	$t - \frac{3}{4}$	$50\left(t - \frac{3}{4}\right)$

10d.
$$\begin{aligned} 35t &= 50\left(t - \tfrac{3}{4}\right) \\ 35t &= 50t - 50\left(\tfrac{3}{4}\right) \\ 35t &= 50t - \tfrac{75}{2} \\ 35t + \tfrac{75}{2} &= 50t - \tfrac{75}{2} + \tfrac{75}{2} \\ 35t + \tfrac{75}{2} &= 50t \\ 35t + \tfrac{75}{2} - 35t &= 50t - 35t \\ \tfrac{75}{2} &= 15t \\ 2\left(\tfrac{75}{2}\right) &= 2(15t) \\ 75 &= 30t \\ 30t &= 75 \\ \tfrac{30t}{30} &= \tfrac{75}{30} \\ t &= 2\tfrac{1}{2} \\ t - \tfrac{3}{4} &= 2\tfrac{1}{2} - \tfrac{3}{4} = 1\tfrac{3}{4} \end{aligned}$$

Time for moving van $= 2\frac{1}{2}$ h; time for car $= 1\frac{3}{4}$ h.

11. Let t = time for first jet to reach meeting point.
$$\begin{aligned} 564t &= 744(t - 0.5) \\ 564t &= 744t - 372 \\ 564t - 564t &= 744t - 564t - 372 \\ 0 &= 180t - 372 \\ 372 &= 180t - 372 + 372 \\ 372 &= 180t \\ \tfrac{180t}{180} &= \tfrac{372}{180} \\ t &= \tfrac{62}{30} \\ t - \tfrac{1}{2} &= \tfrac{62}{30} - \tfrac{1}{2} = \tfrac{62}{30} - \tfrac{15}{30} \\ t - \tfrac{1}{2} &= \tfrac{47}{30} = 1\tfrac{17}{30} \end{aligned}$$

Time for second jet = 1 h 34 min.

12a. Time out $= t$; time back $= 2\frac{1}{4} - t$

12b. Distance out = distance back.
$$\begin{aligned} 22t &= 32\left(2\tfrac{1}{4} - t\right) \\ 22t &= 72 - 32t \\ 22t + 32t &= 72 - 32t + 32t \\ 54t &= 72 \\ \tfrac{54t}{54} &= \tfrac{72}{54} \\ t &= \tfrac{4}{3};\ 1\tfrac{1}{3}\text{ h} \end{aligned}$$

13a. Time out $= t$; time back $= 3 - t$.

13b.
$$\begin{aligned} 320t &= 280(3 - t) \\ 320t &= 840 - 280t \\ 320t + 280t &= 840 - 280t + 280t \\ 600t &= 840 \\ \tfrac{600t}{600} &= \tfrac{840}{600} \\ t &= \tfrac{7}{5};\ 1\tfrac{2}{5}\text{ h} \end{aligned}$$

14a. John's speed $= s$; William's speed $= s - 20$.

14b.
$$\begin{aligned} 4s + 4(s - 20) &= 250 \\ 4s + 4s - 80 &= 250 \\ 8s - 80 &= 250 \\ 8s - 80 + 80 &= 250 + 80 \\ 8s &= 330 \\ \tfrac{8s}{8} &= \tfrac{330}{8} \\ s &= \tfrac{165}{4};\ 41\tfrac{1}{4}\text{ mi/h (John)} \end{aligned}$$

William: $41\frac{1}{4} - 20$; $21\frac{1}{4}$ mi/h

15.
$$\begin{aligned} 2s + 2(s - 5) &= 70 \\ 4s - 10 &= 70 \\ 4s - 10 + 10 &= 70 + 10 \\ 4s &= 80 \\ \tfrac{4s}{4} &= \tfrac{80}{4} \end{aligned}$$

s is 20 mi/h; $s - 5$ is 15 mi/h

16a. 61 **16b.** They are all multiples of three. Let n be any integer, and m be the sum of three consecutive integers starting with n. Then $n + n + 1 + n + 2 = 3n + 3 = 3(n + 1) = m$. So, m must be a multiple of 3.

17.
$$\begin{aligned} \ell &= 2w + 8 \\ P &= 2\ell + 2w \\ P &= 2(2w + 8) + 2w \\ P &= 6w + 16 \\ 6w + 16 &= 34 \\ 6w + 16 - 16 &= 34 - 16 \\ 6w &= 18 \\ \tfrac{6w}{6} &= \tfrac{18}{6} \\ w &= 3 \end{aligned}$$

$\ell = 8 + 2(3) = 14$; the length is 14 cm.

18.
$$\begin{aligned} x + x + 2 + x + 4 + x + 6 &= 308 \\ 4x + 12 &= 308 \\ 4x + 12 - 12 &= 308 - 12 \\ 4x &= 296 \\ \tfrac{4x}{4} &= \tfrac{296}{4} \\ x &= 74 \end{aligned}$$

The integers are 74, 76, 78, and 80.

19.
$$\begin{aligned} n + n + 2 + n + 4 &= -87 \\ 3n + 6 &= -87 \\ 3n + 6 - 6 &= -87 - 6 \\ 3n &= -93 \\ n &= -31 \end{aligned}$$

Other integers are $-31 + 2 = -29$; $-31 + 4 = -27$.

20a. Length of kite = x; length of kite + tail = $x + 2x + 1.5$. **20b.** $\frac{6 \text{ in.}}{1} \cdot \frac{1 \text{ ft}}{12 \text{ in.}} = 0.5$ ft; 15.5 ft

20c.
$$\begin{aligned} x + 2x + 1.5 &= 15.5 \\ 3x + 1.5 &= 15.5 \\ 3x + 1.5 - 1.5 &= 15.5 - 1.5 \\ 3x &= 14 \\ \frac{3x}{3} &= \frac{14}{3} \\ x &= 4\tfrac{2}{3} \end{aligned}$$

Length of tail $= 2\left(\frac{14}{3}\right) + 1\frac{1}{2} = \frac{28}{3} + \frac{3}{2} = \frac{56}{6} + \frac{9}{6} = \frac{65}{6}$; $10\frac{5}{6}$ ft = 10 ft 10 in.

21. t = time for bus to travel before meeting car. Car leaves $\frac{1}{4}$ hour after bus.
$$\begin{aligned} 30t &= 45\left(t - \tfrac{1}{4}\right) \\ 30t &= 45t - \tfrac{45}{4} \\ 30t + \tfrac{45}{4} &= 45t - \tfrac{45}{4} + \tfrac{45}{4} \\ 30t + \tfrac{45}{4} &= 45t \\ 30t + \tfrac{45}{4} - 30t &= 45t - 30t \\ \tfrac{45}{4} &= 15t \\ \tfrac{15t}{15} &= \tfrac{1}{15}\left(\tfrac{45}{4}\right) \\ t &\text{ is } \tfrac{3}{4} \text{ hour} \end{aligned}$$

Meeting time is 11:45 A.M. + 0:45 = 12:30 P.M.

22a. t = time for Ellen to reach library.
$$\begin{aligned} 12t &= 9\left(t + \tfrac{1}{4}\right) \\ 12t &= 9t + \tfrac{9}{4} \\ 12t - 9t &= 9t + \tfrac{9}{4} - 9t \\ 3t &= \tfrac{9}{4} \\ \tfrac{3t}{3} &= \tfrac{1}{3}\left(\tfrac{9}{4}\right) \\ \text{Time is } \tfrac{3}{4} \text{ h} &= 45 \text{ min.} \end{aligned}$$

22b. Ellen reached library at 3:00 P.M. + 0:45 = 3:45 P.M.

23. t = time for Tom to reach meeting (hours).
$$\begin{aligned} 25t &= 30\left(t - \tfrac{1}{6}\right) \\ 25t &= 30t - 5 \\ 25t + 5 &= 30t - 5 + 5 \\ 25t + 5 &= 30t \\ 25t + 5 - 25t &= 30t - 25t \\ 5 &= 5t \\ \tfrac{5t}{5} &= \tfrac{5}{5} \\ \text{Time is 1 h.} \end{aligned}$$

meeting time = 1:30 P.M. + 1:00 = 2:30 P.M.

24. s = speed of first airplane.
$$\begin{aligned} 2s + 2(s + 200) &= 1100 \\ 4s + 400 &= 1100 \\ 4s + 400 - 400 &= 1100 - 400 \\ 4s &= 700 \\ \frac{4s}{4} &= \frac{700}{4} \\ s &= 175 \\ s + 200 &= 175 + 200 = 375 \end{aligned}$$

The speeds are 175 mi/h and 375 mi/h.

25.
$$\begin{aligned} y + y + 1 + y + 2 &= 5961 \\ 3y + 3 &= 5961 \\ 3y + 3 - 3 &= 5961 - 3 \\ 3y &= 5958 \\ \frac{3y}{3} &= \frac{5958}{3} \end{aligned}$$

$y = 1986$; $y + 1 = 1987$; $y + 2 = 1988$

26.
$$\begin{aligned} 3s + 3(s + 10) &= 150 \\ 6s + 30 &= 150 \\ 6s + 30 - 30 &= 150 - 30 \\ 6s &= 120 \\ \frac{6s}{6} &= \frac{120}{6} \\ s &= 20 \\ s + 10 &= 30 \end{aligned}$$

The speeds are 20 mi/h and 30 mi/h.

27.
$$\begin{aligned} 45t &= 60(t - 2) \\ 45t &= 60t - 120 \\ 45t + 120 &= 60t - 120 + 120 \\ 45t + 120 &= 60t \\ 45 + 120 - 45t &= 60t - 45t \\ 120 &= 15t \\ \frac{120}{15} &= \frac{15t}{15} \\ t &= 8 \\ t - 2 &= 6 \end{aligned}$$

The truck travels 8 h; the train travels 6 h.

28. Let n = number of 6-volt batteries.
$$\begin{aligned} 6n + 12(10 - n) &= 84 \\ 6n + 120 - 12n &= 84 \\ -6n + 120 &= 84 \\ -6n + 120 + 6n &= 84 + 6n \\ 120 &= 84 + 6n \\ 120 - 84 &= 84 + 6n - 84 \\ 36 &= 6n \\ \frac{6n}{6} &= \frac{36}{6} \\ n &= 6 \\ 10 - n &= 4 \end{aligned}$$

six 6-volt batteries, four 12-volt batteries

29. Let n = first integer. The next integers are $n + 1$, $n + 2, \ldots$ (or $n + 2, n + 4, \ldots$ for consecutive even or odd integers). Write and solve an equation that describes how the integers are related. **30.** Answers may vary. Sample: Jeff and Anne both left school for the city at the same time. Jeff drove at a speed of 35 mi/h, and Anne drove at a speed of 20 mi/h. Jeff arrived 1 h before Anne, whose driving time is t. How long did each drive?

31a.
$$\begin{aligned} n + n + 1 + n + 2 &= 126 \\ 3n + 3 &= 126 \\ 3n + 3 - 3 &= 126 - 3 \\ 3n &= 123 \\ \frac{3n}{3} &= \frac{123}{3} \\ n &= 41 \end{aligned}$$

The integers are 41, 42 and 43.

31b. Yes. The three integers would be consecutive. One would solve the equation.

$$\begin{aligned} n - 1 + n + n + 1 &= 126 \\ 3n &= 126 \\ \tfrac{3n}{3} &= \tfrac{126}{3} \\ n &= 42 \end{aligned}$$

The integers are 41, 42, and 43.

32. Let x = length of second side.

$$\begin{aligned} (2x - 65) + x + (x - 10) &= 165 \\ 4x - 75 &= 165 \\ 4x - 75 + 75 &= 165 + 75 \\ 4x &= 240 \\ \tfrac{4x}{4} &= \tfrac{240}{4} \\ x &= 60 \end{aligned}$$

$2(60) - 65 = 55$; $60 - 10 = 50$; the lengths are 60 cm, 55 cm, and 50 cm. Check: $55 + 60 + 50 = 165$ ✓

33a. Let t = friends' hiking time.

$$\begin{aligned} 2t &= 3\left(t - \tfrac{5}{12}\right) \\ 2t &= 3t - \tfrac{5}{4} \\ 2t - 3t &= 3t - \tfrac{5}{4} - 3t \\ -t &= -\tfrac{5}{4} \\ t &= \tfrac{5}{4} \end{aligned}$$

$t - \frac{5}{12} = \frac{5}{4} - \frac{5}{12} = \frac{15}{12} - \frac{5}{12} = \frac{10}{12} = \frac{5}{6}$

You will have hiked $\frac{5}{6}$ h, or 50 min.

33b. 9:25 A.M. + 0:50 = 10:15 A.M.

34. The integers are n, $n + 2$, $n + 4$, $n + 6$, and $n + 8$.

$$\begin{aligned} n + (n + 8) &= 3(n + 6) - 1 \\ 2n + 8 &= 3n + 17 \\ 2n + 8 - 2n &= 3n + 17 - 2n \\ 8 &= n + 17 \\ 8 - 17 &= n + 17 - 17 \\ -9 &= n \end{aligned}$$

The integers are $-9, -7, -5, -3$, and -1.

35.

$$\begin{aligned} 3n - 7 + 2n &= 8n + 11 \\ 5n - 7 &= 8n + 11 \\ 5n - 7 - 5n &= 8n + 11 - 5n \\ -7 &= 3n + 11 \\ -7 - 11 &= 3n + 11 - 11 \\ -18 &= 3n \\ \tfrac{-18}{3} &= \tfrac{3n}{3} \\ -6 &= n \end{aligned}$$

The answer is A.

36. Sum $= n + n + 2 + n + 4 = 3n + 6$; the answer is H. This expression applies whether the integers are odd or even.

37. A.

$$\begin{aligned} 2x + 5 &= 5x + 11 \\ 2x + 5 - 2x &= 5x + 11 - 2x \\ 5 &= 3x + 11 \\ 5 - 11 &= 3x + 11 - 11 \\ -6 &= 3x \\ \tfrac{-6}{3} &= \tfrac{3x}{3} \\ -2 &= x \end{aligned}$$

B.

$$\begin{aligned} 7n + 9 &= 3 - 9n \\ 7n + 9 + 9n &= 3 - 9n + 9n \\ 16n + 9 &= 3 \\ 16n + 9 - 9 &= 3 - 9 \\ 16n &= -6 \\ \tfrac{16n}{16} &= \tfrac{-6}{16} \\ n &= -\tfrac{3}{8} \end{aligned}$$

C.

$$\begin{aligned} 3k + 6 - 4k &= k + 10 \\ 6 - k &= k + 10 \\ 6 - k + k &= k + k + 10 \\ 6 &= 2k + 10 \\ 6 - 10 &= 2k + 10 - 10 \\ -4 &= 2k \\ -2 &= k \end{aligned}$$

D.

$$\begin{aligned} 4 + 3q &= 7q + 12 \\ 4 + 3q - 3q &= 7q + 12 - 3q \\ 4 &= 4q + 12 \\ 4 - 12 &= 4q + 12 - 12 \\ -8 &= 4q \\ \tfrac{-8}{4} &= \tfrac{4q}{4} \\ -2 &= q \end{aligned}$$

The answer is B.

38. t = time from truck's departure to meeting, in hours.

$t - \frac{1}{4}$ = time from car's departure to meeting.

$$\begin{aligned} 45t &= 60\left(t - \tfrac{1}{4}\right) \\ 45t &= 60t - 15 \\ 45t - 45t &= 60t - 15 - 45t \\ 0 &= 15t - 15 \\ 0 + 15 &= 15t - 15 + 15 \\ 15 &= 15t \\ \tfrac{15}{15} &= \tfrac{15t}{15} \\ 1 &= t \end{aligned}$$

$t - \frac{1}{4} = 1 - \frac{1}{4} = \frac{3}{4}$; time is 45 min; the answer is G.

39.

$$\begin{aligned} n + (n + 5.2) + (2n + 3.4) &= 22.6 \\ 4n + 8.6 &= 22.6 \\ 4n + 8.6 - 8.6 &= 22.6 - 8.6 \\ 4n &= 14 \\ \tfrac{4n}{4} &= \tfrac{14}{4} \\ n &= 3.5 \end{aligned}$$

The answer is A.

40.

$$\begin{aligned} 2x &= 7x + 10 \\ 2x - 10 &= 7x + 10 - 10 \\ 2x - 10 &= 7x \\ 2x - 10 - 2x &= 7x - 2x \\ -10 &= 5x \\ \tfrac{5x}{5} &= \tfrac{-10}{5} \\ x &= -2 \end{aligned}$$

41.

$$\begin{aligned} 2q + 4 &= 4 - 2q \\ 2q + 4 - 4 &= 4 - 4 - 2q \\ 2q &= -2q \\ 2q + 2q &= -2q + 2q \\ 4q &= 0 \\ \tfrac{4q}{4} &= \tfrac{0}{4} \\ q &= 0 \end{aligned}$$

42.
$$0.5t + 3.6 = 4.2 - 1.5t$$
$$0.5t + 1.5t + 3.6 = 4.2 - 1.5t + 1.5t$$
$$2t + 3.6 = 4.2$$
$$2t + 3.6 - 3.6 = 4.2 - 3.6$$
$$2t = 0.6$$
$$\frac{2t}{2} = \frac{0.6}{2}$$
$$t = 0.3$$

43.
$$2x + 5 + x = 2(3x + 3)$$
$$3x + 5 = 6x + 6$$
$$3x - 3x + 5 = 6x - 3x + 6$$
$$5 = 3x + 6$$
$$5 - 6 = 3x + 6 - 6$$
$$-1 = 3x$$
$$\frac{3x}{3} = \frac{-1}{3}$$
$$x = -\frac{1}{3}$$

44.
$$4 + x + 3x = 2(2x + 5)$$
$$4 + 4x = 4x + 10$$
$$4 + 4x - 4x = 4x - 4x + 10$$
$$4 = 10$$

no solution

45.
$$8z + 2 = 2(z - 5) - z$$
$$8z + 2 = 2z - 10 - z$$
$$8z + 2 = z - 10$$
$$8z - z + 2 = z - z - 10$$
$$7z + 2 = -10$$
$$7z + 2 - 2 = -10 - 2$$
$$7z = -12$$
$$\frac{7z}{7} = \frac{-12}{7}$$
$$z = -1\frac{5}{7}$$

46.
$$40(8.25) + 12.38x = 385.71$$
$$330 + 12.38x = 385.71$$
$$330 + 12.38x - 330 = 385.71 - 330$$
$$12.38x = 55.71$$
$$\frac{12.38x}{12.38} = \frac{55.71}{12.38}$$
$$x = 4.5$$

Brendan worked 4.5 overtime hours.

47. -12 **48.** -10 **49.** 54 **50.** 3

2-6 Formulas pages 111–117

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. 180 mi **2.** 32 cm **3.** 28 m^2

Investigation

1.

d	*r*	*t*
1500 m	301 m/min	4.98 min
800 m	260 m/min	3.08 min
800 m	273 m/min	2.93 min
400 m	339 m/min	1.18 min

2. 301 m/min; 260 m/min; 273 m/min; 339 m/ min **3.** They are the same. **4.** $r = \frac{d}{t}$; it is easier because the equation is solved for the unknown value r.

Check Understanding

1.
$$P = 2(\ell + w)$$
$$P = 2\ell + 2w$$
$$P - 2\ell = 2\ell + 2w - 2\ell$$
$$P - 2\ell = 2w$$
$$\frac{2w}{2} = \frac{P - 2\ell}{2}$$
$$w = \frac{P}{2} - \ell$$

2.
$$y - 4 = 3x - 8$$
$$y + 8 - 4 = 3x - 8 + 8$$
$$y + 4 = 3x$$
$$\frac{y + 4}{3} = \frac{3x}{3}$$
$$\frac{y + 4}{3} = x$$

3.
$$m - hp = d$$
$$m - hp - m = d - m$$
$$-hp = d - m$$
$$\frac{-hp}{-h} = \frac{d - m}{-h}$$
$$p = \frac{m - d}{h}, h \neq 0$$

4.
$$F = \frac{n}{4} + 37$$
$$F - 37 = \frac{n}{4} + 37 - 37$$
$$F - 37 = \frac{n}{4}$$
$$4(F - 37) = 4\frac{n}{4}$$
$$4F - 148 = n$$
$$n = 4(60) - 148 = 92;$$
92 chirps/min

Exercises

1.
$$C = 2r$$
$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$
$$\frac{C}{2\pi} = r$$

2.
$$\pi = \frac{C}{d}$$
$$d\pi = \frac{dC}{d} = C$$
$$\frac{d\pi}{\pi} = \frac{C}{\pi}$$
$$d = \frac{C}{\pi}$$

3.
$$P = 2\ell + 2w$$
$$P - 2w = 2\ell + 2w - 2w$$
$$P - 2w = 2\ell$$
$$\frac{2\ell}{2} = \frac{P - 2w}{2}$$
$$\ell = \frac{P}{2} - w$$

4.
$$S = L + 2B$$
$$S - L = L + 2B - L$$
$$S - L = 2B$$
$$\frac{2B}{2} = \frac{S - L}{2}$$
$$B = \frac{S - L}{2}$$

5.
$$V = \ell wh$$
$$\frac{V}{\ell w} = \frac{\ell wh}{\ell w}$$
$$\frac{V}{\ell w} = h$$

6.
$$P = 4s$$
$$\frac{4s}{4} = \frac{P}{4}$$
$$s = \frac{P}{4}$$

7.
$$A = \tfrac{1}{2}h(b_1 + b_2)$$
$$2(A) = 2\left[\tfrac{1}{2}h(b_1 + b_2)\right]$$
$$2A = h(b_1 + b_2)$$
$$2A = hb_1 + hb_2$$
$$2A - hb_2 = hb_1 + hb_2 - hb_2$$
$$2A - hb_2 = hb_1$$
$$\frac{hb_1}{h} = \frac{2A - hb_2}{h}$$
$$b_1 = \frac{2A}{h} - b_2$$

8.
$$V = r^2h$$
$$\frac{V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2} = h$$

9.
$$y + 2x = 5$$
$$y + 2x - 2x = -2x + 5$$
$$y = -2x + 5$$

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

11.
$$y + 4x = 3$$
$$y + 4x - 4x = -4x + 3$$
$$y = -4x + 3$$

12.
$$2y + 4x = 8$$
$$2y + 4x - 4x = -4x + 8$$
$$2y = -4x + 8$$
$$\frac{2y}{2} = \frac{-4x + 8}{2}$$
$$y = -2x + 4$$

13.
$$3y - 5x = 9$$
$$3y - 5x + 5x = 5x + 9$$
$$3y = 5x + 9$$
$$\frac{3y}{3} = \frac{5x + 9}{3}$$
$$y = \frac{5x + 9}{3}$$

14.
$$4y + 3x = 7$$
$$4y + 3x - 3x = -3x + 7$$
$$4y = -3x + 7$$
$$\frac{4y}{4} = \frac{-3x + 7}{4}$$
$$y = \frac{-3x + 7}{4}$$

15.
$$5x + 4y = 4$$
$$5x + 4y - 5x = -5x + 4$$
$$4y = -5x + 4$$
$$\frac{4y}{4} = \frac{-5x + 4}{4}$$
$$y = \frac{-5x + 4}{4}$$

16.
$$2x + 7y = 4$$
$$2x + 7y - 2x = -2x + 4$$
$$7y = -2x + 4$$
$$\frac{7y}{7} = \frac{-2x + 4}{7}$$
$$y = \frac{-2x + 4}{7}$$

17.
$$dx = c$$
$$\frac{dx}{d} = \frac{c}{d}$$
$$x = \frac{c}{d}$$

18.
$$c = \frac{d}{g}$$
$$cg = g\frac{d}{g}$$
$$cg = d$$
$$\frac{cg}{c} = \frac{d}{c}$$
$$g = \frac{d}{c}$$

19.
$$z - a = y$$
$$z - a + a = y + a$$
$$z = y + a$$

20.
$$ax + by = c$$
$$ax + by - ax = c - ax$$
$$by = c - ax$$
$$\frac{by}{b} = \frac{c - ax}{b}$$
$$y = \frac{c - ax}{b}$$

21.
$$A = P + Prt$$
$$A - P = P - P + Prt$$
$$A - P = Prt$$
$$\frac{Prt}{Pr} = \frac{A - P}{Pr}$$
$$t = \frac{A - P}{Pr}$$

22.
$$S = C + rC$$
$$S - C = C - C + rC$$
$$S - C = rC$$
$$\frac{rC}{C} = \frac{S - C}{C}$$
$$r = \frac{S}{C} - 1$$

23.
$$\frac{m}{n} = \frac{p}{q}$$
$$q\left(\frac{m}{n}\right) = q\left(\frac{p}{q}\right)$$
$$p = \frac{qm}{n}$$

24.
$$\frac{y - b}{m} = x$$
$$m\frac{y - b}{m} = mx$$
$$y - b = mx$$
$$y - b + b = mx + b$$
$$y = mx + b$$

25a.
$$N = 7LH$$
$$\frac{N}{7L} = \frac{7LH}{7L}$$
$$\frac{N}{7L} = H$$

25b. $H = \frac{2310}{7 \cdot 30} = 11$; 11 ft

26a.
$$a = \frac{h}{n}$$
$$na = n\left(\frac{h}{n}\right)$$
$$na = h$$

26b. $h = 200(.265) = 53$; 53 hits

27a.
$$I = prt$$
$$\frac{I}{rt} = \frac{prt}{rt}$$
$$\frac{I}{rt} = p$$

27b. $p = \frac{420}{0.035 \cdot 4} = 3000$; \$3000

27c. If the interest at 3.5% per annum for 4 yr is \$420, the principal is \$3000.00.

28a.
$$C = 0.05s$$
$$\frac{C}{0.05} = \frac{0.05s}{0.05}$$
$$\frac{C}{0.05} = s$$

28b. $s = \frac{24.71}{0.05} = 494.20$; \$494.20

29.
$$A = bh$$
$$\frac{A}{h} = \frac{bh}{h}$$
$$\frac{A}{h} = b$$

30.
$$y = \frac{2}{3}x + 8$$
$$y - 8 = \frac{2}{3}x + 8 - 8$$
$$y - 8 = \frac{2}{3}x$$
$$\frac{3}{2}(y - 8) = \frac{3}{2} \cdot \frac{2}{3}x$$
$$\frac{3}{2}(y - 8) = x$$

31.
$$ap - b = r$$
$$ap - b + b = r + b$$
$$ap = r + b$$
$$\frac{ap}{a} = \frac{r + b}{a}$$
$$p = \frac{r + b}{a}$$

32.
$$2(p + r) = 5$$
$$2p + 2r = 5$$
$$2p + 2r - 2r = 5 - 2r$$
$$2p = 5 - 2r$$
$$\frac{2p}{2} = \frac{5 - 2r}{2}$$
$$p = \frac{5}{2} - r$$

33.
$$SA = 2rh + 2B$$
$$SA - 2B = 2rh + 2B - 2B$$
$$SA - 2B = 2rh$$
$$\frac{SA - 2B}{2\pi r} = \frac{2\pi rh}{2\pi r}$$
$$\frac{SA - 2B}{2\pi r} = h$$

34.
$$2x + 10 = 5y - 4$$
$$2x + 10 + 4 = 5y - 4 + 4$$
$$2x + 14 = 5y$$
$$\frac{2x + 14}{5} = \frac{5y}{5}$$
$$\frac{2x + 14}{5} = y$$

35.
$$\frac{a}{b} = \frac{c}{d}$$
$$b\left(\frac{a}{b}\right) = b\left(\frac{c}{d}\right)$$
$$a = \frac{bc}{d}$$
$$\frac{d}{c}(a) = \frac{d}{c}\left(\frac{bc}{d}\right)$$
$$\frac{da}{c} = b$$

36.
$$\frac{m + k}{h} = w$$
$$h\frac{m + k}{h} = hw$$
$$m + k = hw$$
$$m + k - k = hw - k$$
$$m = hw - k$$

37.
$$V = \frac{1}{3}\pi r^2 h$$
$$3V = 3\left(\frac{1}{3}\pi r^2 h\right)$$
$$3V = \pi r^2 h$$
$$\frac{3V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$$
$$\frac{3V}{\pi r^2} = h$$

38.
$$3y + 2 = 9x - 4$$
$$3y + 2 - 2 = 9x - 4 - 2$$
$$3y = 9x - 6$$
$$\frac{3y}{3} = \frac{9x - 6}{3}$$
$$y = 3x - 2$$

39.
$$y = 3(w - y)$$
$$y = 3w - 3y$$
$$y + 3y = 3w - 3y + 3y$$
$$4y = 3w$$
$$\frac{4y}{4} = \frac{3w}{4}$$
$$y = \frac{3}{4}w$$

40.
$$3m = 2(4 + x)$$
$$3m = 8 + 2x$$
$$3m - 8 = 8 - 8 + 2x$$
$$3m - 8 = 2x$$
$$\frac{3m - 8}{2} = \frac{2x}{2}$$
$$x = \frac{3}{2}m - 4$$

41a.
$$S = (n - 2)180$$
$$\frac{S}{180} = \frac{(n - 2)180}{180}$$
$$\frac{S}{180} = n - 2$$
$$\frac{S}{180} + 2 = n - 2 + 2$$
$$\frac{S}{180} + 2 = n$$

41b.

S	n
540	5
900	7
360	4
1260	9

42. Answers may vary. Sample: Both types of equations are transformed in the same way. In solving a literal equation, you must be concerned about dividing by a variable where the value of the variable might be zero.

43. Check students' work.

44a. $m = \frac{a + b}{2}$

If $a = 8.2$ and $b = 3.5$, then $m = \frac{8.2 + 3.5}{2} = 5.85$.

44b.
$$2m = 2\frac{a + b}{2}$$
$$2m = a + b$$
$$2m - a = a + b - a$$
$$2m - a = b$$

44c. If $m = 2.1$ and $a = -1.7$, then $b = 2(2.1) - (-1.7) = 5.9$.

45a.
$$R = \frac{s^2}{A}$$
$$AR = A\frac{s^2}{A}$$
$$AR = s^2$$
$$\frac{AR}{R} = \frac{s^2}{R}$$
$$A = \frac{s^2}{R}$$

45b. If $s = 9$ and $R = 3$, $A = \frac{9^2}{3} = 27$; $27\ \text{ft}^2$

46.
$$V = 0.104h - 0.018a - 2.69$$
$$V - 0.104h = 0.104h - 0.018a - 2.69 - 0.104h$$
$$V - 0.104h = -0.018a - 2.69$$
$$V - 0.104h + 2.69 = -0.018a - 2.69 + 2.69$$
$$V - 0.104h + 2.69 = -0.018a$$
$$\frac{V - 0.104h + 2.69}{-0.018} = \frac{-0.018a}{-0.018}$$
$$\frac{-V + 0.104h - 2.69}{0.018} = a$$

47.
$$C = 85 + 36h$$
$$C - 85 = 85 + 36h - 85$$
$$C - 85 = 36h$$

$$\frac{C-85}{36} = \frac{36h}{36}$$
$$\frac{C-85}{36} = h$$

The answer is B.

48. $80 + 30m + 50 + (2 \cdot 30)m + 2 \cdot 80 + \frac{2 \cdot 30}{3}m = 290 + 110m$; the answer is I.

49. $36 \times 48 - (24 \times 24) = 1728 - 576 = 1152$; the answer is B.

50.
$$\begin{aligned} 6 &= \tfrac{1}{8}s + 1 \\ 8 \cdot 6 &= s + 8 \\ 48 &= s + 8 \\ 48 - 8 &= s + 8 - 8 \\ 40 &= s \end{aligned}$$

The answer is G.

51.
$$\begin{aligned} n + n + 1 + n + 2 &= 216 \\ 3n + 3 &= 216 \\ 3n + 3 - 3 &= 216 - 3 \\ 3n &= 213 \\ \frac{3n}{3} &= \frac{213}{3} \\ n &= 71 \end{aligned}$$

The integers are 71, 72, and 73.

52.
$$\begin{aligned} \ell &= 2w + 10 \\ \ell - 10 &= 2w + 10 - 10 \\ \ell - 10 &= 2w \\ P &= 2\ell + 2w \\ P &= 2\ell + (\ell - 10) \\ P &= 3\ell - 10 \\ P + 10 &= 3\ell - 10 + 10 \\ P + 10 &= 3\ell \\ \frac{3\ell}{3} &= \frac{P+10}{3} \\ \ell &= \frac{P+10}{3} \\ \ell &= \frac{116+10}{3} = \frac{126}{3} = 42 \end{aligned}$$

The length is 42 cm.

53. $12\begin{bmatrix} -5 & \frac{3}{4} \end{bmatrix} = \begin{bmatrix} -60 & 9 \end{bmatrix}$

54. $2\begin{bmatrix} 7 & -3.1 \\ \frac{1}{4} & -8 \end{bmatrix} = \begin{bmatrix} 14 & -6.2 \\ \frac{1}{2} & -16 \end{bmatrix}$

55. $-3\begin{bmatrix} 5.2 & -9 & -1 \\ 0 & -8 & 9.5 \end{bmatrix} = \begin{bmatrix} -15.6 & 27 & 3 \\ 0 & 24 & -28.5 \end{bmatrix}$

CHECKPOINT QUIZ 2 *page 115*

1.
$$\begin{aligned} 7x + 3 &= 15x + 9 \\ 7x - 7x + 3 &= 15x - 7x + 9 \\ 3 &= 8x + 9 \\ 3 - 9 &= 8x + 9 - 9 \\ -6 &= 8x \\ \frac{8x}{8} &= \frac{-6}{8} \\ x &= -\frac{3}{4} \end{aligned}$$

2.
$$\begin{aligned} \tfrac{3}{4}n + 5 &= \tfrac{2}{5}n \\ 20\left(\tfrac{3}{4}n\right) + 20(5) &= 20\left(\tfrac{2}{5}n\right) \\ 15n + 100 &= 8n \\ 15n - 8n + 100 &= 8n - 8n \\ 7n + 100 &= 0 \\ 7n + 100 - 100 &= 0 - 100 \\ 7n &= -100 \\ \frac{7n}{7} &= \frac{-100}{7} \\ n &= -14\tfrac{2}{7} \end{aligned}$$

3.
$$\begin{aligned} -\tfrac{1}{5}x - 8 &= 4x + 3 \\ 5\left(-\tfrac{1}{5}x\right) - 5(8) &= 5(4x) + 5(3) \\ -x - 40 &= 20x + 15 \\ -x - 40 + x &= 20x + x + 15 \\ -40 &= 21x + 15 \\ -40 - 15 &= 21x + 15 - 15 \\ -55 &= 21x \\ \frac{21x}{21} &= \frac{-55}{21} \\ x &= -2\tfrac{13}{21} \end{aligned}$$

4.
$$\begin{aligned} 5(2w - 4) &= 6w \\ 10w - 20 &= 6w \\ 10w - 20 + 20 &= 6w + 20 \\ 10w &= 6w + 20 \\ 10w - 6w &= 6w - 6w + 20 \\ 4w &= 20 \\ \frac{4w}{4} &= \frac{20}{4} \\ w &= 5 \end{aligned}$$

5.
$$\begin{aligned} 2y - 8 &= -\tfrac{1}{2}(3 - 5y) \\ 2(2y - 8) &= 2\left(-\tfrac{1}{2}\right)(3 - 5y) \\ 4y - 16 &= -3 + 5y \\ 4y - 4y - 16 &= -3 + 5y - 4y \\ -16 &= -3 + y \\ -16 + 3 &= -3 + 3 + y \\ -13 &= y \end{aligned}$$

6.
$$\begin{aligned} 0.3a + 0.7 &= 0.5a - 0.1 \\ 0.3a - 0.3a + 0.7 &= 0.5a - 0.3a - 0.1 \\ 0.7 &= 0.2a - 0.1 \\ 0.7 + 0.1 &= 0.2a - 0.1 + 0.1 \\ 0.8 &= 0.2a \\ \frac{0.8}{0.2} &= \frac{0.2a}{0.2} \\ 4 &= a \end{aligned}$$

7.
$$\begin{aligned} 2x + 7y &= 35 \\ 2x - 2x + 7y &= 35 - 2x \\ 7y &= 35 - 2x \\ \frac{7y}{7} &= \frac{35 - 2x}{7} \\ y &= \frac{35 - 2x}{7} \end{aligned}$$

8.
$$\begin{aligned} 5x - 2y &= 15 \\ 5x - 5x - 2y &= 15 - 5x \\ -2y &= 15 - 5x \\ \frac{-2y}{-2} &= \frac{15 - 5x}{-2} \\ y &= \frac{5x - 15}{2} \end{aligned}$$

9.
$$\begin{aligned} \tfrac{2}{3}x + \tfrac{3}{4}y &= 9 \\ 12\left(\tfrac{2}{3}x\right) + 12\left(\tfrac{3}{4}y\right) &= 12 \cdot 9 \\ 8x + 9y &= 108 \\ 8x - 8x + 9y &= 108 - 8x \\ 9y &= 108 - 8x \\ \frac{9y}{9} &= \frac{108 - 8x}{9} \\ y &= 12 - \tfrac{8}{9}x \end{aligned}$$

10. Let t = time from departure of first car until meeting.

$$\begin{aligned} 44t &= 55(t-1) \\ 44t &= 55t - 55 \\ 44t + 55 &= 55t - 55 + 55 \\ 44t + 55 &= 55t \\ 44t - 44t + 55 &= 55t - 44t \\ 55 &= 11t \\ \frac{11t}{11} &= \frac{55}{11} \\ t &= 5 \\ t - 1 &= 5 - 1 = 4 \end{aligned}$$

first car: 5h; second car: 4h

EXTENSION *pages 116–117*

1. $SA = 2\pi rh + \pi r^2 + \pi r^2 = 2\pi rh + 2\pi r^2$ **2.** $SA = b^2 + 4\left(\frac{1}{2}b\ell\right) = b^2 + 2b\ell = b(b + 2\ell)$ **3.** $SA = 2(8 \cdot 5 + 8 \cdot 10 + 5 \cdot 10) = 2(40 + 80 + 50) = 2 \cdot 170 = 340$; 340 in.^{2} **4.** $SA = 2\pi(3 \cdot 10) + 2\pi 3^2 = 2\pi(30 + 9) = 78\pi \approx 245.04$; 245.04 ft^2 **5.** $SA = 2\pi(8 \cdot 100) + 2\pi 8^2 = 2\pi(800 + 64) = 1728\pi \approx 5428.67$; 5428.67 cm^2 **6.** $SA = 12(12 + 2 \cdot 10) = 12 \cdot 32 = 384$; 384 mm^2 **7.** $SA = 100(100 + 2 \cdot 90) = 100 \cdot 280 = 28{,}000$; 28,000 m^2 **8.** $A = 6s^2$ **9.** $V = \ell wh$ **10.** $V = 8 \cdot 5 \cdot 10 = 400$; 400 in.^{3} **11.** $V = \pi r^2 h = \pi(3^2 \cdot 10) = 90\pi \approx 282.74$; 282.74 ft^3 **12.** $V = 6 \cdot 8 \cdot 16 = 768$; 768 m^3 **13.** $V = 12^3 = 1728$; 1728 mm^3 **14a.** $V = \frac{1}{3}\ell wh = \frac{1}{3}Bh$, where B is the area of the base. **14b.** $V = \frac{1}{3}(7 \cdot 12 \cdot 10) = 7 \cdot 4 \cdot 10 = 280$; 280 cm^3

2-7 Using Measures of Central Tendency *pages 118–123*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. 1.9, 2.4, 3.6, 7.5, 9.8 **2.** 58, 72, 98, 144, 195, 235
3. −12, −8, −3, 0, 7, 14 **4.** $-4\frac{3}{8}, -3\frac{2}{3}, -2\frac{5}{8}, 2\frac{1}{2}, 4\frac{1}{2}, 6\frac{1}{4}$
5. $\frac{3 + 4 + 5 + 6 + 7}{5} = \frac{10 + 10 + 5}{5} = 5$
6. $\frac{5 + 6 + 8 + 9}{4} = \frac{28}{4} = 7$

Check Understanding

1a. mean $= \frac{5(6.25) + 3(6.50) + 7.00 + 7.50}{10} \approx 6.53$; the mean is \$6.53/h. The median is unchanged at \$6.38/h. The mode is unchanged at \$6.25/h.
1b. Median. The mean is still larger than 8 of 10 wages.

2.
$$\begin{aligned} \frac{80 + 93 + 91 + x}{4} &= 92 \\ 4\left(\frac{80 + 93 + 91 + x}{4}\right) &= 4(92) \\ 80 + 93 + 91 + x &= 368 \\ 264 + x &= 368 \\ 264 + x - 264 &= 368 - 264 \\ x &= 104 \end{aligned}$$

No: you would need at least a 104 to have a 92 average.

3. Maine: mean $= \frac{7 + 4 - 3 - 6 + 0}{5} = \frac{2}{5} = 0.4$; 0.4°F
range $= 7 - (-6) = 13$; 13°F
Michigan: mean $= \frac{24 + 15 + 2 - 10 - 5}{5} = 4.4$; 4.4°F
range $= 24 - (-10) = 34$; 34°F
The average temperature was lower in Maine, but the temperature varied much more widely in Michigan.

4.

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

4 | 3 means 4.3

5a. Median—City: Cast aside the highest and lowest values in pairs. The remaining middle value is 28 mi/gal. Highway: The middle value is 32 mi/gal. **5b.** City: Most frequent values (modes) are 23 and 31 mi/gal. Highway: Modes are 32 and 38 mi/gal. **5c.** City: range = 34 − 19 = 15; 15 mi/gal. Highway: range = 41 − 27 = 14; 14 mi/gal.

Exercises

1. mean $= \frac{12 + 10 + 9 + 15 + 16 + 10}{6} = \frac{72}{6} = 12$; median = average of 12 and 10 = 11; mode = 10. The mean best describes the data because there is no outlier.

2. mean $= \frac{14 + 14 + 15 + 15 + 16 + 15 + 15 + 16}{8} = 15$. median = 15; mode = 15. All three are equally useful.

3. mean $= \frac{75 + 38 + 43 + 120 + 65 + 48 + 52}{7} = 63$; median = 52. There is no mode. The median represents the data best, because 120 is an outlier.

4. mean $= \frac{4.4 + 5 + 2.3 + 4.5 + 4.8 + 5.2}{6} = 4.4$; median = 4.8; mode = 4.8. The median or mode best describe the data, because 2.3 is an outlier.

5.
$$\begin{aligned} \text{mean} = \frac{3.8 + 4.2 + 5.3 + x}{4} &= 4.8 \\ \frac{13.3 + x}{4} &= 4.8 \\ 4\left(\frac{13.3 + x}{4}\right) &= 4(4.8) \\ 13.3 + x &= 19.2 \\ 13.3 + x - 13.3 &= 19.2 - 13.3 \\ x &= 5.9 \end{aligned}$$

6.
$$\begin{aligned} \text{mean} = \frac{99 + 86 + 76 + 95 + x}{5} &= 91 \\ \frac{356 + x}{5} &= 91 \\ 5\left(\frac{356 + x}{5}\right) &= 5(91) \\ 356 + x &= 455 \\ 356 + x - 356 &= 455 - 356 \\ x &= 99 \end{aligned}$$

7.
$$\begin{aligned} \text{mean} = \frac{100 + 121 + 105 + 113 + 108 + x}{6} &= 112 \\ \frac{547 + x}{6} &= 112 \\ 6\left(\frac{547 + x}{6}\right) &= 6(112) \\ 547 + x &= 672 \\ 547 + x - 547 &= 672 - 547 \\ x &= 125 \end{aligned}$$

8.
$$\begin{aligned} \text{mean} = \frac{31.7 + 42.8 + 26.4 + x}{4} &= 35 \\ \frac{100.9 + x}{4} &= 35 \\ 4\left(\frac{100.9 + x}{4}\right) &= 4(35) \\ 100.9 + x &= 4(35) \\ 100.9 + x - 100.9 &= 140 - 100.9 \\ x &= 39.1 \end{aligned}$$

9. range $= 30 - 12 = 18$ **10.** $7.3 - 3.1 = 4.2$

11. $5 - (-15) = 20$ **12.** $3\frac{5}{8} - \left(-5\frac{3}{4}\right) = 3\frac{5}{8} + 5\frac{6}{8} = 9\frac{3}{8}$

13. List 1: range $= 71 - 28 = 43$

mean $= \frac{64 + 43 + 55 + 28 + 71}{5} = 52.2$

List 2: range $= 61 - 47 = 14$

mean $= \frac{48 + 53 + 61 + 47 + 52}{5} = 52.2$

14.

1	0 5 5 8
2	2 5 8
3	5 6

1 | 0 means 10

15.

15	3 7
16	
17	5 6
18	4 6

15 | 3 means 15.3

16.

76	1 8 8
77	6
78	5 5 8

76 | 1 means 761

17.

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

0 | 2 means 0.2

18. Class A:

4: $6 + 6 + 4 + 3 = 19$; sum $= 4 \cdot 40 + 19 = 179$

5: $9 + 8 + 6 + 4 + 4 + 4 = 35$; sum $= 6 \cdot 50 + 35 = 335$

6: $5 + 2 + 1 + 0 = 8$; sum $= 4 \cdot 60 + 8 = 248$

7: $8 + 7 + 6 + 6 + 4 + 2 = 33$; sum $= 6 \cdot 70 + 33 = 453$

total of sums $= 179 + 335 + 248 + 453 = 1215$;

mean $= \frac{\text{total of sums}}{\text{number of cases}} = \frac{1215}{20} = 60.75$;

median $= 59.5$; mode $= 54$; range $= 78 - 43 = 35$

Class B:

4: $1 + 1 + 4 + 5 + 7 = 18$; sum $= 5 \cdot 40 + 18 = 218$

5: $0 + 2 + 2 + 2 + 4 = 10$; sum $= 5 \cdot 50 + 10 = 260$

6: $4 + 5 + 8 + 9 = 26$; sum $= 4 \cdot 60 + 26 = 266$

7: $3 + 6 + 7 + 9 + 9 + 9 = 43$; sum $= 6 \cdot 70 + 43 = 463$

total of sums $= 218 + 260 + 266 + 463 = 1207$;

mean $= \frac{\text{total of sums}}{\text{number of cases}} = \frac{1207}{20} = 60.35$;

median $= 59$; modes $= 52, 79$; range $= 79 - 41 = 38$

19. Type A sum:

$2(0.23) + 0.26 + 2(0.31) + 0.32 + 0.33 + 0.41 = 2.4$

mean $= \frac{\text{sum}}{\text{number}} = \frac{2.4}{8} = 0.30$;

median $= 0.31$; modes $= 0.23$ and 0.31; range $= 0.41 - 0.23 = 0.18$

Type B sum:

$0.30 + 2(0.31) + 0.43 + 0.45 + 0.48 + 0.52 + 0.54 = 3.34$

mean $= \frac{\text{sum}}{\text{number}} = \frac{3.34}{8} = 0.4175$

median $= 0.44$; mode $= 0.31$; range $= 0.54 - 0.30 = 0.24$

20. mean $= \frac{\text{sum}}{\text{number}} = \frac{58.5}{8} = 7.3125$;

median $= \frac{6.3 + 7.2}{2} = 6.75$;

mode = none; range $= 9.8 - 5.1 = 4.7$

21. mean $= \frac{\text{sum}}{\text{number}} = \frac{-31}{10} = -3.1$; median $= -2$;

modes $= -1$ and -2; range $= 3 - (-12) = 15$

22. mean $= \frac{\text{sum}}{\text{number}} = \frac{372.2}{8} = 46.525$;

median $= \frac{46.4 + 46.6}{2} = 46.5$; mode = none;

range $= 67.3 - 22.3 = 45.0$

23. 5; since the mode is 6.6, there are a minimum of two data values of 6.6. The median is 6.8, so there are two data values greater than 6.8. So, there are at least 5 data values.

24a. mean $= \frac{\text{sum}}{\text{number}} = \frac{29.1}{12} = 2.425$;

median $= 2.4$

24b. mean $= \frac{\text{sum}}{\text{number}} = \frac{29.1 + 3.3}{13} = 2.492 \approx 2.5$;

median $= 2.4$

25a. Plant A sums: leaf $= 8 + 7 + 4 + 4 + 2 + 4 + 3 + 1 = 33$; stem $= 5 \cdot 50 + 3 \cdot 60 = 430$; total $= 33 + 430 = 463$; 46.3; mean $= \frac{46.3}{8} = 5.79$; median = average of 5.7 and $5.8 = 5.75$; mode $= 5.4$; range $= 6.4 - 5.2 = 1.2$

Plant B sums: leaf $= 3 + 5 + 9 + 2 + 7 + 3 + 4 + 2 = 35$; stem $= 3 \cdot 40 + 2 \cdot 50 + 2 \cdot 60 + 70 = 410$; total $= 35 + 410 = 445$; 44.5; mean $= \frac{44.5}{8} = 5.5625 \approx 5.56$; median = average of 5.2 and $5.7 = 5.45$; mode = none; range $= 7.2 - 4.3 = 2.9$

25b. A—mean. There are no outliers. B—median. The mean is thrown off by high outliers. **25c.** Plant B has poor quality control. The strips of steel produced by their machines have a larger range.

26. Answers may vary. Sample: 50, 62, 64, 64, 64, 65, 65, 85 **27.** Arrange the players in order of increasing height. Player No. 11 must be 5 ft 7 in. tall. The first 10 must be 5 ft 7 in. or less. The number of girls less than 5 ft 7 in. must range from 0 to 10. The answer is 10.

28. An outlier can cause the mean to be significantly larger or smaller than most typical values.

29.

July		April
7 2 0 0 0	0	
0	1	
8	2	
	3	
8 8 0	4	5 5
0	5	5 5
3 1	6	3 3 5 7
	7	
1	8	1 7 8
	9	4
	10	7 8

30. Let x and y be the last two scores.

mean $= \frac{97 + 92 + 88 + 85 + 91 + 90 + x + y}{8} = \frac{543 + x + y}{8} = 92$

$$8\left(\frac{543 + x + y}{8}\right) = 8(92)$$

$$543 + x + y = 736$$

$$543 + x + y - 543 = 736 - 543$$

$$x + y = 193$$

Samples: $100 + 93$; $99 + 94$; $98 + 95$; $97 + 96$

31. average speed $= \frac{\text{total distance}}{\text{total time}}$; $\frac{6 \cdot 44 + 4 \cdot 50}{10} =$ 46.4; 46.4 mi/h

32. In 5 tests, sum of scores = 5(84) = 420. In six tests, mean $= \frac{\text{sum}}{6} = \frac{420 + x}{6} = 85$.

$$6\left(\frac{420 + x}{6}\right) = 6(85)$$
$$420 + x = 510$$
$$420 + x - 420 = 510 - 420$$
$$x = 90$$

33. mean $= \frac{10.2 + 10.6 + 11.9 + 9.9 + 10.6}{5} = 10.64$; median = 10.6; difference = 0.04

34. mean $= \frac{\text{sum of speeds}}{6} = \frac{934.3}{6} = 155.7$

35. mean $= \frac{\text{sum of numbers}}{8} = \frac{166}{8} = 20.75$; median = average of 18 and 22 = 20; mode = 18; 20.75 + 20 + 18 = 58.75.

36. Sum of low temperatures over 4 days = 4(58) = 232. mean $= \frac{\text{sum}}{5} = \frac{232 + x}{5} = 59$ over the last 5 days,

$$232 + x = 5(59) = 295$$
$$232 + x - 232 = 295 - 232$$
$$x = 63$$

37.
$$y = x + 4$$
$$y - 4 = x + 4 - 4$$
$$y - 4 = x$$

38.
$$y = -x + 3$$
$$y + x - y = -x + 3 + x - y$$
$$x = -y + 3$$

39.
$$y = 10x + 4$$
$$y - 4 = 10x + 4 - 4$$
$$y - 4 = 10x$$
$$\frac{10x}{10} = \frac{y - 4}{10}$$
$$x = \frac{y - 4}{10}$$

40.
$$y = 2x + 9$$
$$y - 9 = 2x + 9 - 9$$
$$y - 9 = 2x$$
$$\frac{2x}{2} = \frac{y - 9}{2}$$
$$x = \frac{y - 9}{2}$$

41.
$$\frac{x}{8} = -18$$
$$8\left(\frac{x}{8}\right) = 8(-18)$$
$$x = -144$$

42.
$$-15n = 210$$
$$\frac{-15n}{-15} = \frac{210}{-15}$$
$$n = -14$$

43.
$$-a = \frac{2}{3}$$
$$a = -\frac{2}{3}$$

44.
$$-\frac{y}{5} = -22$$
$$-5\left(-\frac{y}{5}\right) = -5(-22)$$
$$y = 110$$

TEST-TAKING STRATEGIES *page 124*

1. 2 points: The equation, method, and solution are correct.
1 point: no original equation; no details; answer OK
0 point: no equation or method

2. Answers may vary. Sample:
$$1235 = 35 + 25n$$
$$1270 = 25n \text{ (error in subtraction)}$$
$$n = 50.8; \text{ about 51 minutes (error)}$$

3.
$$0.35 + 0.25n = 12.35$$
$$0.35 + 0.25n - 0.35 = 12.35 - 0.35$$
$$0.25n = 12$$
$$4(0.25n) = 4(12)$$
$$n = 48; 48 \text{ min}$$

4. Left side is in cents; right side is in dollars.

CHAPTER REVIEW *pages 125–127*

1. identity 2. solution 3. inverse operations 4. solutions of equivalent equations 5. consecutive integers 6. C 7. D 8. A 9. B

10.
$$y - 7 = 9$$
$$y - 7 + 7 = 9 + 7$$
$$y = 16$$
$$\text{Check: } 16 - 7 = 9 \checkmark$$

11.
$$\frac{x}{12} = -3$$
$$12\left(\frac{x}{12}\right) = 12(-3)$$
$$x = -36$$
$$\text{Check: } \frac{-36}{12} = -3 \checkmark$$

12.
$$w + 23 = 54$$
$$w + 23 - 23 = 54 - 23$$
$$w = 31$$
$$\text{Check: } 31 + 23 = 54 \checkmark$$

13.
$$5d = 120$$
$$\frac{5d}{5} = \frac{120}{5}$$
$$d = 24$$
$$\text{Check: } 5(24) = 120 \checkmark$$

14.
$$9 + t = 35$$
$$9 + t - 9 = 35 - 9$$
$$t = 26$$
$$\text{Check: } 9 + 26 = 35 \checkmark$$

15.
$$c + 0.25 = 4.5$$
$$c + 0.25 - 0.25 = 4.5 - 0.25$$
$$c = 4.25$$
$$\text{Check: } 4.25 + 0.25 = 4.5 \checkmark$$

16.
$$7b = 84$$
$$\frac{7b}{7} = \frac{84}{7}$$
$$b = 12$$
$$\text{Check: } 7(12) = 84 \checkmark$$

17.
$$\frac{z}{4} = \frac{1}{2}$$
$$4\left(\frac{z}{4}\right) = 4\left(\frac{1}{2}\right)$$
$$z = 2$$

18.
$$5x - 8 = 12$$
$$5x - 8 + 8 = 12 + 8$$
$$5x = 20$$

$$\frac{5x}{5} = \frac{20}{5}$$
$$x = 4$$
Check: $5 \cdot 4 - 8 = 12$ ✓

19.
$$7t - 3 = 18$$
$$7t - 3 + 3 = 18 + 3$$
$$7t = 21$$
$$\frac{7t}{7} = \frac{21}{7}$$
$$t = 3$$
Check: $7 \cdot 3 - 3 = 18$ ✓

20.
$$\frac{c}{5} - 4 = -3$$
$$5\left(\frac{c}{5}\right) - 5(4) = 5(-3)$$
$$c - 20 = -15$$
$$c - 20 + 20 = -15 + 20$$
$$c = 5$$
Check: $\frac{5}{5} - 4 = -3$ ✓

21.
$$-2q - 5 = -11$$
$$-2q - 5 + 5 = -11 + 5$$
$$-2q = -6$$
$$\frac{-2q}{-2} = \frac{-6}{-2}$$
$$q = 3$$
Check: $-2(3) - 5 = -11$ ✓

22.
$$-3m + 8 = 2$$
$$-3m + 8 - 8 = 2 - 8$$
$$-3m = -6$$
$$\frac{-3m}{-3} = \frac{-6}{-3}$$
$$m = 2$$
Check: $-3(2) + 8 = 2$ ✓

23.
$$11y + 9 = 130$$
$$11y + 9 - 9 = 130 - 9$$
$$11y = 121$$
$$\frac{11y}{11} = \frac{121}{11}$$
$$y = 11$$
Check: $11(11) + 9 = 130$ ✓

24.
$$8u + 2 = 6$$
$$8u + 2 - 2 = 6 - 2$$
$$8u = 4$$
$$\frac{8u}{8} = \frac{4}{8}$$
$$u = \frac{1}{2}$$
Check: $8\left(\frac{1}{2}\right) + 2 = 6$ ✓

25.
$$10h - 4 = -94$$
$$10h - 4 + 4 = -94 + 4$$
$$10h = -90$$
$$\frac{10h}{10} = \frac{-90}{10}$$
$$h = -9$$
Check: $10(-9) - 4 = -94$ ✓

26.
$$-z + 11 = -7$$
$$-z + 11 - 11 = -7 - 11$$
$$-z = -18$$
$$z = 18$$ ✓
Check: $-18 + 11 = -7$ ✓

27.
$$15 = -t + 3$$
$$t + 15 = -t + 3 + t$$
$$t + 15 = 3$$
$$t + 15 - 15 = 3 - 15$$
$$t = -12$$
Check: $15 = -(-12) + 3$ ✓

28.
$$\frac{w}{3} + 2 = 5$$
$$\frac{w}{3} + 2 - 2 = 5 - 2$$
$$\frac{w}{3} = 3$$
$$3\left(\frac{w}{3}\right) = 3(3)$$
$$w = 9$$
Check: $\frac{9}{3} + 2 = 5$ ✓

29.
$$-\frac{2}{5}x + 4 = 8$$
$$-\frac{2}{5}x + 4 - 4 = 8 - 4$$
$$-\frac{2}{5}x = 4$$
$$-5\left(-\frac{2}{5}\right)x = -5(4)$$
$$2x = -20$$
$$x = -10$$
Check: $-\frac{2}{5}(-10) + 4 = 4 + 4 = 8$ ✓

30. Let x = number of people in car.
$$6x + 3 = 27$$
$$6x + 3 - 3 = 27 - 3$$
$$6x = 24$$
$$\frac{6x}{6} = \frac{24}{6}$$
$x = 4$; 4 people

31.
$$314 = -n + 576$$
$314 + n = -n + 576 + n$ (Add. Prop. of Eq.)
$314 + n = 576$ (addition)
$314 + n - 314 = 576 - 314$ (Subtr. Prop. of Eq.)
$n = 262$ (subtraction)

32.
$$-\frac{1}{4}w - 1 = 6$$
$-4\left(-\frac{1}{4}\right)w - [-4(1)] = -4(6)$ (Mult. Prop. of Eq.)
$w + 4 = -24$ (multiplication)
$w + 4 - 4 = -24 - 4$ (Subtr. Prop. of Eq.)
$w = -28$ (subtraction)

33.
$$3h - 4 = 5$$
$3h - 4 + 4 = 5 + 4$ (Add. Prop. of Eq.)
$3h = 9$ (addition)
$\frac{3h}{3} = \frac{9}{3}$ (Division Property of Equality)
$h = 4$ (division)

34.
$$10 = 35 + \frac{x}{5}$$
$$10 - 35 = 35 + \frac{x}{5} - 35$$
$$-25 = \frac{x}{5}$$
$$5(-25) = 5\left(\frac{x}{5}\right)$$
$$x = -125$$

35.
$$0 = -8t + 48$$
$$8t = -8t + 48 + 8t$$
$$8t = 48$$
$$\frac{8t}{8} = \frac{48}{8}$$
$$t = 6$$

36.
$$31 = 3 - 4k$$
$$31 - 3 = 3 - 4k - 3$$
$$28 = -4k$$
$$\frac{-4k}{-4} = \frac{28}{-4}$$
$$k = -7$$

37.
$$b + 4b = -90$$
$$5b = -90$$
$$\frac{5b}{5} = \frac{-90}{5}$$
$$b = -18$$

38.
$$-x + 7x = 24$$
$$6x = 24$$
$$\frac{6x}{6} = \frac{24}{6}$$
$$x = 4$$

39.
$$2(t + 5) = 9$$
$$2t + 10 = 9$$
$$2t + 10 - 10 = 9 - 10$$
$$2t = -1$$
$$\frac{2t}{2} = \frac{-1}{2}$$
$$t = -\frac{1}{2}$$

40.
$$-(3 - 10y) = 12$$
$$-3 + 10y = 12$$
$$-3 + 10y + 3 = 12 + 3$$
$$10y = 15$$
$$\frac{10y}{10} = \frac{15}{10}$$
$$y = \frac{3}{2} = 1\frac{1}{2}$$

41.
$$x - (4 - x) = 0$$
$$2x - 4 = 0$$
$$2x - 4 + 4 = 4$$
$$2x = 4$$
$$\frac{2x}{2} = \frac{4}{2}$$
$$x = 2$$

42.
$$4n - 6n = 2n$$
$$-2n = 2n$$
$$-2n - 2n = 2n - 2n$$
$$-4n = 0$$
$$\frac{-4n}{-4} = \frac{0}{-4}$$
$$n = 0$$

43.
$$4 + 3n = 5n + 4$$
$$4 + 3n - 4 = 5n + 4 - 4$$
$$3n = 5n$$
$$3n - 5n = 5n - 5n$$
$$-2n = 0$$
$$\frac{-2n}{-2} = \frac{0}{-2}$$
$$n = 0$$

44.
$$-2\left(r - \frac{1}{2}\right) = -2$$
$$-2r + 1 = -2$$
$$-2r + 1 - 1 = -2 - 1$$
$$-2r = -3$$
$$\frac{-2r}{-2} = \frac{-3}{-2}$$
$$r = \frac{3}{2} = 1\frac{1}{2}$$

45.
$$9c + 4 = 3c - 8$$
$$9c - 3c + 4 = 3c - 8 - 3c$$
$$6c + 4 = -8$$
$$6c = -8 - 4 = -12$$
$$\frac{6c}{6} = \frac{-12}{6}$$
$$c = -2$$

46.
$$3(5x - 2) - 6x = 3(3x + 2)$$
$$15x - 6 - 6x = 9x + 6$$
$$9x - 6 = 9x + 6$$
$$-6 = 6$$

no solution

47.
$$3(2t - 6) = 2(3t - 9)$$
$$6t - 18 = 6t - 18$$

identity

48.
$$\frac{3y}{4} - \frac{y}{2} = 5$$
$$4\left(\frac{3y}{4}\right) - 4\left(\frac{y}{2}\right) = 4(5)$$
$$3y - 2y = 20$$
$$y = 20$$

49.
$$0.36p + 0.26 = 3.86$$
$$0.36p + 0.26 - 0.26 = 3.86 - 0.26$$
$$0.36p = 3.6$$
$$\frac{0.36p}{0.36} = \frac{3.6}{0.36}$$
$$p = 10$$

50.
$$2n + 3 + 4n = 5 + 6n - 2$$
$$6n + 3 = 6n + 3$$

identity

51.
$$7s - (3s + 1) = 4(3 + s)$$
$$4s - 1 = 12 + 4s$$
$$4s - 1 - 4s = 12 + 4s - 4s$$
$$-1 = 12$$

no solution

52.
$$w = \ell - 6$$
$$P = 2w + 2\ell$$
$$P = 2(\ell - 6) + 2\ell$$
$$P = 4\ell - 12 = 72$$
$$4\ell - 12 + 12 = 72 + 12$$
$$4\ell = 84$$
$$\frac{4\ell}{4} = \frac{84}{4}$$
$\ell = 21$; length is 21 cm;
$w = 21 - 6 = 15$; width is 15 cm

53.
$$2.50 + 4.25n = 15.25$$
$$2.50 + 4.25n - 2.50 = 15.25 - 2.50$$
$$4.25n = 12.75$$
$$\frac{4.25n}{4.25} = \frac{12.75}{4.25}$$
$n = 3$; he bowled 3 games.

54.
$$A = \frac{1}{2}bh$$
$$\frac{2}{h}A = \frac{2}{h}\left(\frac{1}{2}bh\right)$$
$$\frac{2A}{h} = b$$

55.
$$y = mx + b$$
$$y - b = mx + b - b$$
$$y - b = mx$$
$$\frac{mx}{m} = \frac{y - b}{m}$$
$$x = \frac{y - b}{m}$$

56.
$$C = d$$
$$\frac{\pi d}{\pi} = \frac{C}{\pi}$$
$$d = \frac{C}{\pi}$$

57a.
$$E = IR$$
$$\frac{E}{R} = \frac{IR}{R}$$
$$I = \frac{E}{R}$$

57b. $I = \frac{E}{R} = \frac{6}{0.15} = 40$; 40 amperes

58. (distance) = (speed)(time) or $d = st$

$$\frac{d}{s} = \frac{st}{s}$$
$$t = \frac{d}{s}; \frac{7.6}{4} = 1.9$$

You could walk 1.9 h, or 1 h 54 min.

59. $10.5(3.5) = 36.75$; 36.75 m

60.
$$n + n + 1 + n + 2 = 582$$
$$3n + 3 = 582$$
$$3n + 3 - 3 = 582 - 3$$
$$3n = 579$$
$$\frac{3n}{3} = \frac{579}{3}$$
$$n = 193; n + 1 = 194; n + 2 = 195$$

61.
$$n + n + 2 + n + 4 = -198$$
$$3n + 6 = -198$$
$$3n + 6 - 6 = -198 - 6$$
$$3n = -204$$
$$\frac{3n}{3} = \frac{-204}{3}$$
$$n = -68; n + 2 = -66; n + 4 = -64$$

62. Let t = time after first ship departs.
$$10t + 18(t - 2) = 209$$
$$28t - 36 = 209$$
$$28t - 36 + 36 = 209 + 36$$
$$28t = 245$$
$$\frac{28t}{28} = \frac{245}{28}$$
$$t = 8.75; t - 2 = 6.75;$$

after 6.75 h, or 6 h 45 min

63. $H = 0.8(200 - A) = 0.8(200 - 135) = 52$

64. mean $= \frac{85 + 87 + 81 + 92 + 87 + 80 + 83}{7} = 85$;
median = 85; mode = 87

65. mean $= \frac{\text{sum of values}}{\text{number of values}} = \frac{153}{5} = 30.6$;
median = 27; mode = 24

66. mean $= \frac{\text{sum}}{\text{number}} = \frac{13.8}{6} = 2.3$;
median = 2.3; mode = 2.3

67. mean $= \frac{\text{sum}}{\text{number}} = \frac{379}{9} = 42.1$;
median = 42; mode = 37

68. range $= 19.9 - 16.1 = 3.8$

69. 19 items

70. 6 people

71. sum of leaves = 9; sum of stems = 6(16) + 3(17) + 4(18) + 6(19) = 333; total sum = 9 + 333 = 342;
mean $= \frac{\text{sum}}{\text{number}} = \frac{342}{19} = 18$
median = 18.4; mode = 19.9

CHAPTER TEST *page 128*

1.
$$5n = -20$$
$$\frac{5n}{5} = \frac{-20}{5}$$
$$n = -4$$
Check: $5(-4) = -20$ ✓

2.
$$t + 7 = 4$$
$$t + 7 - 7 = 4 - 7$$
$$t = -3$$
Check: $-3 + 7 = 4$ ✓

3.
$$\frac{r}{3} = 21$$
$$3\left(\frac{r}{3}\right) = 3(21)$$
$$r = 63$$
Check: $\frac{63}{3} = 21$ ✓

4.
$$u - 8 = -15$$
$$u - 8 + 8 = -15 + 8$$
$$u = -7$$
Check: $-7 - 8 = -15$ ✓

5.
$$-x + 4 = -7$$
$$-x + 4 - 4 = -7 - 4$$
$$-x = -11$$
$$x = 11$$
Check: $-11 + 4 = -7$ ✓

6.
$$-2z + 1 = -9$$
$$-2z + 1 - 1 = -9 - 1$$
$$-2z = -10$$
$$2z = 10$$
$$\frac{2z}{2} = \frac{10}{2}$$
$$z = 5$$
Check: $-2(5) + 1 = -9$ ✓

7.
$$3w + 2 - w = -4$$
$$2w + 2 = -4$$
$$2w + 2 - 2 = -4 - 2$$
$$2w = -6$$
$$\frac{2w}{2} = \frac{-6}{2}$$
$$w = -3$$
Check: $3(-3) + 2 - (-3) = -4$ ✓

8.
$$\frac{1}{4}(k - 1) = 10$$
$$4\left[\frac{1}{4}(k - 1)\right] = 4(10)$$
$$k - 1 = 40$$
$$k - 1 + 1 = 40 + 1$$
$$k = 41$$
Check: $\frac{1}{4}(41 - 1) = 10$ ✓

9.
$$6(y + 3) = 24$$
$$\frac{6(y + 3)}{6} = \frac{24}{6}$$
$$y + 3 = 4$$
$$y + 3 - 3 = 4 - 3$$
$$y = 1$$
Check: $6(1 + 3) = 24$ ✓

10.
$$\frac{5n + 1}{8} = \frac{1}{2}$$
$$8\left(\frac{5n + 1}{8}\right) = 8\left(\frac{1}{2}\right)$$
$$5n + 1 = 4$$
$$5n + 1 - 1 = 4 - 1$$
$$5n = 3$$
$$\frac{5n}{5} = \frac{3}{5}$$
$$n = \frac{3}{5}$$
Check: $\frac{5\left(\frac{3}{5}\right) + 1}{8} = \frac{3 + 1}{8} = \frac{1}{2}$ ✓

11.
$$2t + 3 = -9$$
$$2t + 3 - 3 = -9 - 3$$
$$2t = -12$$
$$-\tfrac{3}{2}(2t) = -\tfrac{3}{2}(-12)$$
$$-3t = 18$$
$$-3t - 7 = 18 - 7 = 11$$

12.
$$2x - 4 = -7$$
$$2x - 4 + 4 = -7 + 4 \text{ (Add. Prop. of Eq.)}$$
$$2x = -3 \text{ (addition)}$$
$$\tfrac{1}{2}(2x) = \tfrac{1}{2}(-3) \text{ (Mult. Prop. of Eq.)}$$
$$x = -\tfrac{3}{2} \text{ (multiplication)}$$

13. Let x = money made.
$$x + 25.00 = 453.50$$
$$x + 25.00 - 25.00 = 453.50 - 25.00$$
$$x = 428.50$$
They made \$428.50.

14. Let m = number of miles driven.
$$55 + 0.20m = 80$$
$$55 + 0.2m - 55 = 80 - 55$$
$$0.2m = 25$$
$$\frac{0.2m}{0.2} = \frac{25}{0.2}$$
$$m = 125$$
They drove 125 mi.

15. Let cost of adult ticket = c.
$$c + 3(c - 2) = 20$$
$$4c - 6 = 20$$
$$4c - 6 + 6 = 20 + 6$$
$$4c = 26$$
$$\frac{4c}{4} = \frac{26}{4}$$
$$c = 6.5$$
An adult ticket costs \$6.50.

16.
$$9j + 3 = 3(3j + 1)$$
$$9j + 3 = 9j + 3$$
identity

17.
$$2(1 - 2y) = 4y + 18$$
$$2 - 4y = 4y + 18$$
$$2 - 4y - 2 = 4y + 18 - 2$$
$$-4y = 4y + 16$$
$$-4y - 4y = 4y + 16 - 4y$$
$$-8y = 16$$
$$\frac{-8y}{-8} = \frac{16}{-8}$$
$$y = -2$$

18.
$$4v - 9 = 6v + 7$$
$$4v - 6v - 9 = 6v + 7 - 6v$$
$$-2v - 9 = 7$$
$$-2v - 9 + 9 = 7 + 9$$
$$-2v = 16$$
$$\frac{-2v}{-2} = \frac{16}{-2}$$
$$v = -8$$

19.
$$4p - 5 + p = 7 + 5p + 2$$
$$5p - 5 = 5p + 9$$
$$5p - 5 - 5p = 5p + 9 - 5p$$
$$-5 = 9$$
no solution

20. Answers may vary. Sample: A group consisting of m members contains 4 subgroups, each containing 5 members.

21a. Let x = quarter miles driven and c = total cost. The cost per passenger (per "fare") is $c = 1.85 + 0.40x$.

21b. $x = 4 \cdot 8 = 32$
$c = 1.85 + 0.4(32) = 1.85 + 12.8 = 14.65$; \$14.65

21c. No; for 4 miles, $c = 1.85 + 0.4(16) = 8.25$, or \$8.25 per person, and \$16.50 for two people.

22. 0 | 6 7 9 9
1 | 5 5 7
2 | 0 3
1 | 5 means 15
range = 23 − 6 = 17

23. mean $= \frac{\text{sum of numbers}}{9} = \frac{121}{9} = 13.\overline{4}$;
median = 15; modes = 9, 15

24. Let s = number of students; x = number of others;
$x = 518 - 315 = 203$, or 203 others;
total $= 3s + 4x = 3(315) + 4(203) = 945 + 812 = 1757$, or \$1757

25. $B = J + 1$; $S = J - 1$
$$J + B + S = 57$$
$$J + J + 1 + J - 1 = 57$$
$$3J = 57$$
$$\frac{3J}{3} = \frac{57}{3}$$
$J = 19$ (Jan); $B = 19 + 1 = 20$ (Bill);
$S = 19 - 1 = 18$ (Sue)

26. c = labor cost $= \frac{2}{3}(267) = 178$; \$178

27. Let t = time for family car.
$$40t + 60(t - 2) = 380$$
$$100t - 120 = 380$$
$$100t - 120 + 120 = 380 + 120$$
$$100t = 500$$
$$\frac{100t}{100} = \frac{500}{100} = 5$$
Time is 5 hours. Meeting time is 12:00 + 5:00, or 5:00 P.M.

STANDARDIZED TEST PREP *page 129*

1.
$$3x + 5 - 4x = 7$$
$$5 - x = 7$$
$$5 - x - 5 = 7 - 5$$
$$-x = 2$$
$$x = -2$$
The answer is D.

2. $15 - (6 + 3^2) = 15 - 15 = 0$; the answer is G.

3. $-2(3)(4) = -24$; the answer is B.

4.
$$-8k - 3 = 1$$
$$-8k - 3 + 3 = 1 + 3$$
$$-8k = 4$$
$$\frac{-8k}{-8} = \frac{4}{-8} = -\frac{1}{2}$$
The answer is F.

5. $\begin{bmatrix} 8 & -7 \\ 3 & -5 \end{bmatrix} - \begin{bmatrix} 4 & 0 \\ -2 & -4 \end{bmatrix} =$

$\begin{bmatrix} 8 - 4 & -7 - 0 \\ 3 + 2 & -5 + 4 \end{bmatrix} = \begin{bmatrix} 4 & -7 \\ 5 & -1 \end{bmatrix}$ The answer is C.

6. $(-1, -3)$ and $(1, -1)$ are on the graph; the answer is I.

7. A.
$$\begin{aligned} 4x + 2 &= 5 \\ 4x + 2 - 2 &= 5 - 2 \\ 4x &= 3 \end{aligned}$$

B.
$$\begin{aligned} 4x - 2 &= 5 \\ 4x - 2 + 2 &= 5 + 2 \\ 4x &= 7 \end{aligned}$$

C.
$$\begin{aligned} 4x - 2 &= 5x \\ 4x - 2 - 4x &= 5x - 4x \\ -2 &= x \end{aligned}$$

D.
$$\begin{aligned} 4 - 2x &= 5x \\ 4 - 2x + 2x &= 5x + 2x \\ 4 &= 7x \end{aligned}$$

The answer is C.

8. $5(2 \cdot 3)$ would only be simplified by using the Assoc. or Comm. Properties of Multi., and by multiplying; the answer is H. **9.** $(1.50 + 1.25)8 = 2.75(8) = 22$

10. $(3.49)\frac{10}{16} = 2.18$

11. Sum of data—leaf: sum of 3 5 8 8 1 1 2 2 5 6 8 1 2 3 7 7 5 5 9 9 5 = 102; stem: sum = $10 \cdot 10 + 5 \cdot 20 + 2 \cdot 30 + 3 \cdot 40 + 1 \cdot 70 = 450$; total = $102 + 450 = 552$.

mean $= \frac{552}{25} = 22.08$

12. $P = 2(w + \ell) = 2(1.3 + 4.45) = 2(5.75) = 11.5$

13.
$$\begin{aligned} 3y &= 6 - 2y \\ 3y + 2y &= 6 - 2y + 2y \\ 5y &= 6 \\ \frac{5y}{5} &= \frac{6}{5} \\ y &= \frac{6}{5}, \text{ or } 1.2 \end{aligned}$$

14. $\frac{594}{12} = 49.5$; 50

Jon needs to order 50 cartons containing one dozen each.

15.
$$\begin{aligned} n + n + 1 + n + 2 + n + 3 &= 7798 \\ 4n + 6 &= 7798 \\ 4n + 6 - 6 &= 7798 - 6 \\ 4n &= 7792 \\ \frac{4n}{4} &= \frac{7792}{4} \\ n &= 1948 \\ 1948 + 3 &= 1951 \end{aligned}$$

16.
$$\begin{aligned} 1250 &= x + 859 \\ 1250 - 859 &= x + 859 - 859 \\ 391 &= x \end{aligned}$$