Extra Practice

Chapter 1 (p. 938)

1. When $k = 7$:

$k + 9 = 7 + 9 = 16$

2. When $x = 3$:

$21 - x = 21 - 3 = 18$

3. When $t = 0.9$:

$$3.5 + t = 3.5 + 0.9$$
$$= 4.4$$

4. When $y = \frac{7}{12}$:

$$y - \frac{3}{8} = \frac{7}{12} - \frac{3}{8} = \frac{14}{24} - \frac{9}{24} = \frac{5}{24}$$

5. When $m = 9.6$:

$\frac{m}{4} = \frac{9.6}{4} = 2.4$

6. When $t = 2.3$

$1.5t = 1.5(2.3) = 3.45$

7. When $z = \frac{2}{3}$:

$z^3 = \left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{8}{27}$

8. When $p = 0.2$:

$p^4 = (0.2)^4 = 0.0016$

9. $25 - 7 + 8 = 18 + 8 = 26$

10. $67 - 3 \cdot 4 = 67 - 12 = 55$

11. $8^2 \div 4 + 12 = 64 \div 4 + 12 = 16 + 12 = 28$

12. $9 + 6 \div 3 = 9 + 2 = 11$

13. $\frac{3^3 - 7}{2} = \frac{27 - 7}{2} = \frac{20}{2} = 10$

14. $\frac{1}{3}(7 - 5.5)^2 = \frac{1}{3}(1.5)^2 = \frac{1}{3}(2.25) = 0.75$

15. $3 + 4(3 + 24) = 3 + 4(27) = 3 + 108 = 111$

16. $\frac{3}{5}[27 - (2 + 5)]^2 = \frac{3}{5}(27 - 7)^2 = \frac{3}{5}(20)^2$

$$= \frac{3}{5}(400) = 240$$

17. $\frac{3}{4}m$

18. $\frac{x}{7}$

19. $y - 3$

20. $3n + 6$

21. The expression $45 - m$ represents the number of minutes left in the class.

22. There is 100 centimeters in one meter, so the number of meters in c centimeters is $\frac{c}{100}$.

23. $12 \cdot (r - 4) = 72$

24. $10 < q - 18 < 15$

25. $d - 13 = 25$

What number minus 13 is 25? The solution is 38.

26. $12z = 96$

12 times what number equals 96? The solution is 8.

27. $23 - m = 7$

23 minus what number equals 7? The answer is 16.

28. $\frac{k}{6} = 12$

What number divided by 6 equals 12? The solution is 72.

29. You know the temperatures of Quito and Miami. You need to find out which temperature is higher.

30. You know the rate Katherine walked each day and the total time she walked each day. You need to know the total distance Kathrine walked.

31. The domain is 3, 4, 5, and 6. The range is 9, 11, 13, and 15.

32.

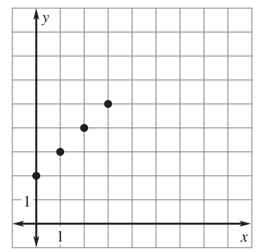
x	2	4
y	$1.25(2) + 5 = 7.5$	$1.25(4) + 5 = 10$

x	6	8
y	$1.25(6) + 5 = 12.5$	$1.25(8) + 5 = 15$

The range is 7.5, 10, 12.5, and 15.

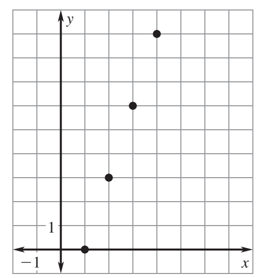
33. $y = x + 2$

x	0	1	2	3
y	2	3	4	5



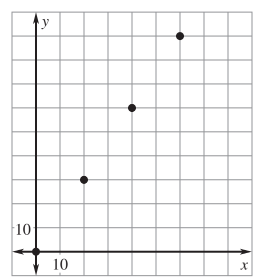
34. $y = 3x - 3$

x	1	2	3	4
y	0	3	6	9



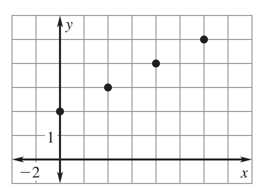
35. $y = 1.5x$

x	0	20	40	60
y	0	30	60	90



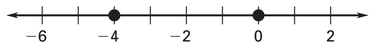
36. $y = \frac{1}{4}x + 2$

x	0	4	8	12
y	2	3	4	5

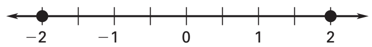


Extra Practice, *continued*

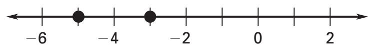
Chapter 2 (p. 939)

1. 

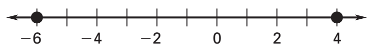
On the number line, 0 is the right of -4. So, $0 > -4$.

2. 

On the number line, 2 is to the right of -2. So, $2 > -2$.

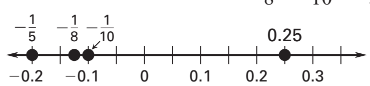
3. 

On the number line, -3 is to the right of -5.
So, $-3 > -5$.

4. 

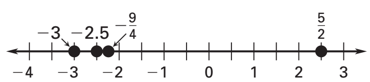
On the number line, 4 is to the right of -6. So, $4 > -6$.

5. Rational numbers: $0.25, -\frac{1}{8}, -\frac{1}{10}, -\frac{1}{5}$



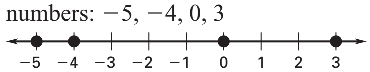
The numbers from least to greatest are $-\frac{1}{5}, -\frac{1}{8}, -\frac{1}{10}$, and 0.25.

6. Integer: -3; Rational number: $-2.5, -3, \frac{5}{2}, -\frac{9}{4}$



The numbers from least to greatest are $-3, -2.5, -\frac{9}{4}$, and $\frac{5}{2}$.

7. Whole numbers: 0, 3; Integers: $-5, -4, 0, 3$; Rational numbers: $-5, -4, 0, 3$



The numbers from least to greatest are $-5, -4, 0$, and 3.

8. $-6 + 10 = |10| - |6| = 10 - 6 = 4$

9. $-25 + (-36) = -(|-25| + |-36|)$
$= -(25 + 36) = -61$

10. $-75 + 58 = -(|75| - |58|) = -(75 - 58) = -17$

11. $8 + (-15) + 7 = -(15 - 8) + 7 = -7 + 7$
$= -(7 - 7) = 0$

12. $-2.8 + 4.3 = |4.3| - |2.8| = 4.3 - 2.8 = 1.5$

13. $-8.2 + (-11.5) = -(|-8.2| + |-11.5|)$
$= -(8.2 + 11.5) = -19.7$

14. $3\frac{2}{3} + \left(-5\frac{3}{8}\right) = -\left(\left|5\frac{3}{8}\right| - \left|3\frac{2}{3}\right|\right) = -\left(\frac{43}{8} - \frac{11}{3}\right)$
$= -\left(\frac{129}{24} - \frac{88}{24}\right) = -\frac{41}{24} = -1\frac{17}{24}$

15. $-12\frac{3}{5} + 8\frac{1}{6} = -\left(\left|12\frac{3}{5}\right| - \left|8\frac{1}{6}\right|\right)$
$= -\left(\frac{63}{5} - \frac{49}{6}\right) = -\left(\frac{378}{30} - \frac{245}{30}\right)$
$= -\frac{133}{30} = -4\frac{13}{30}$

16. $-17 - 20 = -17 + (-20) = -37$

17. $16 - (-50) = 16 + 50 = 66$

18. $-9 - (-12) = -9 + 12 = 3$

19. $\frac{4}{5} - \frac{1}{2} = \frac{8}{10} - \frac{5}{10} = \frac{3}{10}$

20. $-\frac{1}{2} - \frac{2}{3} = -\frac{1}{2} + \left(-\frac{2}{3}\right) = -\frac{3}{6} + \left(-\frac{4}{6}\right) = -\frac{7}{6} = -1\frac{1}{6}$

21. $-\frac{1}{3} - \left(-\frac{3}{4}\right) = -\frac{1}{3} + \frac{3}{4} = -\frac{4}{12} + \frac{9}{12} = \frac{5}{12}$

22. $-6.4 - 15 = -6.4 + (-15) = -21.4$

23. $-12.8 - (-5.6) = -12.8 + 5.6 = -7.2$

24. When $x = 1.5$ and $y = -4$:
$y - x = (-4) - (1.5) = -4 + (-1.5) = -5.5$

25. When $x = 1.5$ and $y = -4$:
$-y - (-x) = -(-4) - (-1.5) = 4 + 1.5 = 5.5$

26. When $x = 1.5$ and $y = -4$:
$x - (10 - y) = 1.5 - [10 - (-4)]$
$= 1.5 - (10 + 4)$
$= 1.5 - 14 = 1.5 + (-14) = -12.5$

27. When $x = 1.5$ and $y = -4$:
$-7 - (x - y) = -7 - [1.5 - (-4)]$
$= -7 - (1.5 + 4) = -7 - 5.5$
$= -7 - (-5.5) = -12.5$

28. $-\frac{2}{3}(-36) = 24$

29. $64\left(\frac{-5}{8}\right) = -40$

30. $-4.1(-3.5) = 14.35$

31. $(1.1)(-0.5)(-4) = (-0.55)(-4) = 2.2$

32. Commutative Property of Multiplication

33. Associative Property of Multiplication

34. Identity Property of Multiplication

35. Multiplicative Property of Zero

36. Commutative Property of Multiplication

37. Multiplicative Property of -1

38. $8(x + 4) = 8(x) + 8(4) = 8x + 32$

39. $5(6 - y) = 5(6) - 5(y) = 30 - 5y$

40. $(m + 7)(-8) = m(-8) + 7(-8) = -8m - 56$

41. $-3(k - 14) = -3(k) - (-3)(14)$
$= -3k - (-42) = -3k + 42$

42. $\frac{3}{5}(-15r - 5) = \frac{3}{5}(-15r) - \frac{3}{5}(5) = -9r - 3$

43. $\frac{7}{12}(24s + 12) = \frac{7}{12}(24s) + \frac{7}{12}(12) = 14s + 7$

44. $(9v - 18)\frac{1}{3} = 9v\left(\frac{1}{3}\right) - 18\left(\frac{1}{3}\right) = 3v - 6$

45. $-\frac{5}{6}(-6w - 30) = -\frac{5}{6}(-6w) - \left(-\frac{5}{6}\right)(30)$
$= 5w - (-25) = 5w + 25$

46. $-35 \div 7 = -35 \cdot \frac{1}{7} = -5$

47. $-92 \div (-4) = -92 \cdot \left(-\frac{1}{4}\right) = 23$

48. $36 \div \left(-\frac{3}{4}\right) = 36 \cdot \left(-\frac{4}{3}\right) = -48$

49. $-56 \div \left(-\frac{7}{8}\right) = -56 \cdot \left(-\frac{8}{7}\right) = 64$

50. $\frac{5}{9} \div (-5) = \frac{5}{9} \cdot \left(-\frac{1}{5}\right) = -\frac{1}{9}$

51. $-\frac{5}{12} \div \frac{1}{2} = -\frac{5}{12} \cdot 2 = -\frac{5}{6}$

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

53. $-\frac{5}{6} \div \left(-\frac{6}{5}\right) = -\frac{5}{6} \cdot \left(-\frac{5}{6}\right) = \frac{25}{36}$

54. $-\sqrt{36} = -6$

55. $\pm\sqrt{400} = \pm 20$

56. $\sqrt{6400} = 80$

57. $\pm\sqrt{144} = \pm 12$

58. $\sqrt{135} \approx 12$

59. $-\sqrt{75} \approx -9$

60. $-\sqrt{160} \approx -13$

61. $\sqrt{250} \approx 16$

Chapter 3 (p. 940)

1. $x + 4 = 20$

$x + 4 - 4 = 20 - 4$

$x = 16$

Check: $x + 4 = 20$

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

$20 = 20$ ✓

2. $8 = m - 13$

$8 + 13 = m - 13 + 13$

$21 = m$

Check:

$8 = m - 13$

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

$8 = 8$ ✓

3. $t + 2 = -10$

$t + 2 - 2 = -10 - 2$

$t = -12$

Check:

$t + 2 = -10$

$-12 + 2 \stackrel{?}{=} -10$

$-10 = -10$ ✓

4. $z - 8 = -7$

$z - 8 + 8 = -7 + 8$

$z = 1$

Check:

$z - 8 = -7$

$1 - 8 \stackrel{?}{=} -7$

$-7 = -7$ ✓

5. $7h = 63$

$\frac{7h}{7} = \frac{63}{7}$

$h = 9$

Check:

$7h = 63$

$7(9) \stackrel{?}{=} 63$

$63 = 63$ ✓

6. $-4t = -44$

$\frac{-4t}{-4} = \frac{-44}{-4}$

$t = 11$

Check

$-4t = -44$

$-4(11) \stackrel{?}{=} -44$

$-44 = -44$ ✓

7. $\frac{b}{4} = 13$

$4 \cdot \left(\frac{b}{4}\right) = 4 \cdot 13$

$b = 52$

Check:

$\frac{b}{4} = 13$

$\frac{52}{4} \stackrel{?}{=} 13$

$13 = 13$ ✓

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

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

$y = -24$

Check:

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

$\frac{-24}{-3} \stackrel{?}{=} 8$

$8 = 8$ ✓

9. $4x + 3 = 27$

$4x + 3 - 3 = 27 - 3$

$4x = 24$

$\frac{4x}{4} = \frac{24}{4}$

$x = 6$

The solution is 6.

Check:

$4x + 3 = 27$

$4(6) + 3 \stackrel{?}{=} 27$

$27 = 27$ ✓

10. $6m - 4 = 14$

$6m - 4 + 4 = 14 + 4$

$6m = 18$

$\frac{6m}{6} = \frac{18}{6}$

$m = 3$

The solution is 3.

Check:

$6m - 4 = 14$

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

$14 = 14$ ✓

11. $50 = 7y - 6$

$50 + 6 = 7y - 6 + 6$

$56 = 7y$

$\frac{56}{7} = \frac{7y}{7}$

$8 = y$

The solution is 8.

Check:

$50 = 7y - 6$

$50 \stackrel{?}{=} 7(8) - 6$

$50 = 50$ ✓

12. $\frac{t}{4} - 3 = 9$

$\frac{t}{4} - 3 + 3 = 9 + 3$

$\frac{t}{4} = 12$

$4 \cdot \frac{t}{4} = 4 \cdot 12$

$t = 48$

The solution is 48.

Check:

$\frac{t}{4} - 3 = 9$

$\frac{48}{4} - 3 \stackrel{?}{=} 9$

$9 = 9$ ✓

13. $\frac{x}{7} + 3 = -2$

$\frac{x}{7} + 3 - 3 = -2 - 3$

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

$7 \cdot \frac{x}{7} = 7 \cdot (-5)$

$x = -35$

The solution is -35.

Check:

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

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

$-5 = -5$ ✓

14. $6p - 2p = 28$

$4p = 28$

$\frac{4p}{4} = \frac{28}{4}$

$p = 7$

The solution is 7.

15. $6x + 3x + 8 = 35$

$9x + 8 = 35$

$9x + 8 - 8 = 35 - 8$

$9x = 27$

$\frac{9x}{9} = \frac{27}{9}$

Check:

$6p - 2p = 28$

$6(7) - 2(7) \stackrel{?}{=} 28$

$28 = 28$ ✓

$x = 3$

The solution is 3.

Check:

$6x + 3x + 8 = 35$

$6(3) + 3(3) + 8 \stackrel{?}{=} 35$

$35 = 35$ ✓

16. $12w - 5 - 3w = 40$

$9w - 5 = 40$

$9w - 5 + 5 = 40 + 5$

$9w = 45$

$\frac{9w}{9} = \frac{45}{9}$

$w = 5$

The solution is 5.

Check:

$12w - 5 - 3w = 40$

$12(5) - 5 - 3(5) \stackrel{?}{=} 40$

$40 = 40$ ✓

17. $4d - 3 - 2d = -15$

$2d - 3 = -15$

$2d - 3 + 3 = -15 + 3$

$2d = -12$

$\frac{2d}{2} = \frac{-12}{2}$

$d = -6$

The solution is -6.

Check:

$4d - 3 - 2d = -15$

$4(-6) - 3 - 2(-6) \stackrel{?}{=} -15$

$-15 = -15$ ✓

18. $7m + 3(m + 2) = -24$

$7m + 3m + 6 = -24$

$10m + 6 = -24$

$10m = -30$

$m = -3$

The solution is -3.

Check:

$7m + 3(m + 2) = -24$

$7(-3) + 3[(-3) + 2] \stackrel{?}{=} -24$

$-21 + 3[-1] \stackrel{?}{=} -24$

$-21 + (-3) \stackrel{?}{=} -24$

$-24 = -24$ ✓

19. $5x - 3(x - 5) = 13$

$5x - 3x + 15 = 13$

$2x + 15 = 13$

$2x = -2$

$x = -1$

The solution is -1.

Check:

$5x - 3(x - 5) = 13$

$5(-1) - 3(-1 - 5) \stackrel{?}{=} 13$

$-5 - 3(-6) \stackrel{?}{=} 13$

$-5 + 18 \stackrel{?}{=} 13$

$13 = 13$ ✓

20. $\frac{3}{4}(2y - 8) = 6$

$\frac{4}{3} \cdot \frac{3}{4}(2y - 8) = \frac{4}{3} \cdot 6$

$2y - 8 = 8$

$2y = 16$

$y = 8$

The solution is 8.

Check:

$\frac{3}{4}(2y - 8) = 6$

$\frac{3}{4}[2(8) - 8] \stackrel{?}{=} 6$

$\frac{3}{4}(8) \stackrel{?}{=} 6$

$6 = 6$ ✓

21. $8x - 4 = 3x + 6$

$5x - 4 = 6$

$5x = 10$

$x = 2$

The solution is 2.

Check:

$8x - 4 = 3x + 6$

$8(2) - 4 \stackrel{?}{=} 3(2) + 6$

$16 - 4 \stackrel{?}{=} 6 + 6$

$12 = 12$ ✓

22. $10 - 2x = 3x - 20$

$10 = 5x - 20$

$30 = 5x$

$6 = x$

The solution is 6.

Check:

$10 - 2x = 3x - 20$

$10 - 2(6) \stackrel{?}{=} 3(6) - 20$

$10 - 12 \stackrel{?}{=} 18 - 20$

$-2 = -2$ ✓

23. $5 - 5x = 14 - 8x$

$5 + 3x = 14$

$3x = 9$

$x = 3$

The solution is 3.

Check:

$5 - 5x = 14 - 8x$

$5 - 5(3) \stackrel{?}{=} 14 - 8(3)$

$5 - 15 \stackrel{?}{=} 14 - 24$

$-10 = -10$ ✓

24. $3(2y - 5) = 4y - 7$

$6y - 15 = 4y - 7$

$2y - 15 = -7$

$2y = 8$

$y = 4$

The solution is 4.

Check:

$3(2y - 5) = 4y - 7$

$3[2(4) - 5] \stackrel{?}{=} 4(4) - 7$

$3[8 - 5] \stackrel{?}{=} 16 - 7$

$9 = 9$ ✓

25. $9 + 4y = 2(3 - y)$

$9 + 4y = 6 - 2y$

$9 + 6y = 6$

$6y = -3$

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

The solution is $-\frac{1}{2}$.

Check:

$9 + 4y = 2(3 - y)$

$9 + 4\left(-\frac{1}{2}\right) \stackrel{?}{=} 2\left[3 - \left(-\frac{1}{2}\right)\right]$

$9 - 2 \stackrel{?}{=} 2\left[\frac{7}{2}\right]$

$7 = 7$ ✓

26. $3x - 3 = \frac{3}{4}(2x + 12)$

$3x - 3 = \frac{3}{2}x + 9$

$\frac{3}{2}x - 3 = 9$

$\frac{3}{2}x = 12$

$\frac{2}{3} \cdot \frac{3}{2}x = \frac{2}{3} \cdot 12$

$x = 8$

The solution is 8.

Check:

$3x - 3 = \frac{3}{4}(2x + 12)$

$3(8) - 3 \stackrel{?}{=} \frac{3}{4}[2(8) + 12]$

$24 - 3 \stackrel{?}{=} \frac{3}{4}(28)$

$21 = 21$ ✓

27. $\frac{7}{2} = \frac{x}{16}$

$16 \cdot \frac{7}{2} = 16 \cdot \frac{x}{16}$

$\frac{112}{2} = x$

$56 = x$

The solution is 56.

Check:

$\frac{7}{2} = \frac{x}{16}$

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

$112 = 112$ ✓

28. $\frac{m}{9} = \frac{6}{27}$

$9 \cdot \frac{m}{9} = 9 \cdot \frac{6}{27}$

$m = \frac{54}{27}$

$m = 2$

The solution is 2.

Check:

$\frac{m}{9} = \frac{6}{27}$

$\frac{2}{9} \stackrel{?}{=} \frac{6}{27}$

$\frac{2}{9} = \frac{2}{9}$ ✓

29. $\frac{z}{4} = \frac{48}{12}$

$4 \cdot \frac{z}{4} = 4 \cdot \frac{48}{12}$

$z = \frac{192}{12}$

$z = 16$

The solution is 16.

Check:

$\frac{z}{4} = \frac{48}{12}$

$\frac{16}{4} \stackrel{?}{=} \frac{48}{12}$

$4 = 4$ ✓

30. $\frac{30}{50} = \frac{t}{10}$

$10 \cdot \frac{30}{50} = 10 \cdot \frac{t}{10}$

$\frac{300}{50} = t$

$6 = t$

The solution is 6.

Check:

$\frac{30}{50} = \frac{t}{10}$

$\frac{30}{50} \stackrel{?}{=} \frac{6}{10}$

$\frac{3}{5} = \frac{3}{5}$ ✓

31. $\frac{5}{7} = \frac{15}{x}$

$x \cdot \frac{5}{7} = x \cdot \frac{15}{x}$

$\frac{5}{7}x = 15$

$\frac{7}{5} \cdot \left(\frac{5}{7}x\right) = \frac{7}{5} \cdot 15$

$x = 21$

The solution is 21.

32. $\frac{9}{3} = \frac{x}{12}$

$12 \cdot \frac{9}{3} = 12 \cdot \frac{x}{12}$

$\frac{108}{3} = x$

$36 = x$

The solution is 36.

33. $\frac{g}{9} = \frac{16}{12}$

$9 \cdot \frac{g}{9} = 9 \cdot \frac{16}{12}$

$g = \frac{144}{12}$

$g = 12$

The solution is 12.

34. $\frac{6}{18} = \frac{y}{3}$

$3 \cdot \frac{6}{18} = 3 \cdot \frac{y}{3}$

$\frac{18}{18} = y$

$1 = y$

The solution is 1.

35. $\frac{12}{x} = \frac{6}{7}$

$12 \cdot 7 = x \cdot 6$

$84 = 6x$

$14 = x$

The solution is 14.

Check:

$\frac{12}{x} = \frac{6}{7}$

$\frac{12}{14} \stackrel{?}{=} \frac{6}{7}$

$\frac{6}{7} = \frac{6}{7}$ ✓

36. $\frac{6x}{4} = \frac{18}{12}$

$6x \cdot 12 = 4 \cdot 18$

$72x = 72$

$x = 1$

The solution is 1.

Check:

$\frac{6x}{4} = \frac{18}{12}$

$\frac{6(1)}{4} \stackrel{?}{=} \frac{18}{12}$

$\frac{6}{4} = \frac{6}{4}$ ✓

37. $\frac{7}{x + 3} = \frac{4}{12}$

$7 \cdot 12 = (x + 3) \cdot 4$

$84 = 4x + 12$

$72 = 4x$

$18 = x$

The solution is 18.

Check:

$\frac{7}{x + 3} = \frac{4}{12}$

$\frac{7}{18 + 3} \stackrel{?}{=} \frac{4}{12}$

$\frac{7}{21} \stackrel{?}{=} \frac{4}{12}$

$\frac{1}{3} = \frac{1}{3}$ ✓

38. $\frac{y+5}{y} = \frac{10}{8}$

$8(y+5) = y \cdot 10$

$8y + 40 = 10y$

$40 = 2y$

$20 = y$

The solution is 20.

Check:

$\frac{y+5}{y} = \frac{10}{8}$

$\frac{20+5}{20} \stackrel{?}{=} \frac{10}{8}$

$\frac{25}{20} \stackrel{?}{=} \frac{10}{8}$

$\frac{5}{4} = \frac{5}{4}$ ✓

39. $\frac{2x+6}{x} = \frac{7}{2}$

$2(2x+6) = x \cdot 7$

$4x + 12 = 7x$

$12 = 3x$

$4 = x$

The solution is 4.

40. $\frac{3b}{5b-7} = \frac{8}{11}$

$3b \cdot 11 = (5b-7) \cdot 8$

$33b = 40b - 56$

$-7b = -56$

$b = 8$

The solution is 8.

Check:

$\frac{3b}{5b-7} = \frac{8}{11}$

$\frac{3(8)}{5(8)-7} \stackrel{?}{=} \frac{8}{11}$

$\frac{24}{33} \stackrel{?}{=} \frac{8}{11}$

$\frac{8}{11} = \frac{8}{11}$ ✓

41. $\frac{8}{2x+12} = \frac{6}{x+8}$

$8(x+8) = (2x+12) \cdot 6$

$8x + 64 = 12x + 72$

$64 = 4x + 72$

$-8 = 4x$

$-2 = x$

The solution is -2.

Check:

$\frac{8}{2x+12} = \frac{6}{x+8}$

$\frac{8}{2(-2)+12} \stackrel{?}{=} \frac{6}{-2+8}$

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

$1 = 1$ ✓

42. $\frac{4.8-2x}{8} = \frac{0.4+x}{10}$

$(4.8-2x) \cdot 10 = 8(0.4+x)$

$48 - 20x = 3.2 + 8x$

$48 = 3.2 + 28x$

$44.8 = 28x$

$1.6 = x$

The solution is 1.6.

Check:

$\frac{4.8-2x}{8} = \frac{0.4+x}{10}$

$\frac{4.8-2(1.6)}{8} \stackrel{?}{=} \frac{0.4+1.6}{10}$

$\frac{1.6}{8} \stackrel{?}{=} \frac{2}{10}$

$0.2 = 0.2$ ✓

43. $\frac{a}{b} = \frac{p}{100}$

$\frac{12}{96} = \frac{p}{100}$

$1200 = 96p$

$12.5 = p$

12 is 12.5% of 96.

44. $\frac{a}{b} = \frac{p}{100}$

$\frac{a}{18} = \frac{35}{100}$

$100a = 630$

$a = 6.3$

6.3 is 35% of 18.

45. $\frac{a}{b} = \frac{p}{100}$

$\frac{14}{b} = \frac{40}{100}$

$1400 = 40b$

$35 = b$

14 is 40% of 35.

46. $\frac{a}{b} = \frac{p}{100}$

$\frac{30}{125} = \frac{p}{100}$

$3000 = 125p$

$24 = p$

30 is 24% of 125.

47. $a = p\% \cdot b$

$= 250\% \cdot 18$

$= 2.5 \cdot 18$

$= 45$

45 is 250% of 18.

48. $a = p\% \cdot b$

$8.7 = p\% \cdot 58$

$8.7 = 58p\%$

$0.15 = p\%$

$15\% = p\%$

8.7 is 15% of 58.

49. $a = p\% \cdot b$

$30.1 = 35\% \cdot b$

$30.1 = 0.35b$

$86 = b$

30.1 is 35% of 86.

50. $a = p\% \cdot b$

$= 70\% \cdot 250$

$= 0.70 \cdot 250$

$= 175$

175 is 70% of 250.

51. $ax - b = c$

$ax = c + b$

$x = \frac{c+b}{a}$

When $a = 6$, $b = 5$, and $c = 25$:

$6x - 5 = 25$

$x = \frac{25+5}{6}$

$= \frac{30}{6}$

$= 5$

The solution of $6x - 5 = 25$ is 5.

52. $a(b - x) = c$

$b - x = \frac{c}{a}$

$-x = \frac{c}{a} - b$

$x = -\left(\frac{c}{a} - b\right) = b - \frac{c}{a}$

When $a = 2$, $b = 8$, and $c = -6$:

$2(8 - x) = -6$

$x = 8 - \frac{-6}{2} = 8 - (-3) = 11$

The solution of $2(8 - x) = -6$ is 11.

Extra Practice, *continued*

53. $5x + y = 10$

$y = 10 - 5x$

$y = -5x + 10$

54. $8x - 2y = 16$

$-2y = 16 - 8x$

$y = -8 + 4x$

$y = 4x - 8$

55. $7x + 3y = 6 - 5x$

$3y = 6 - 12x$

$y = 2 - 4x$

$y = -4x + 2$

56. $21 = 6x + 7y$

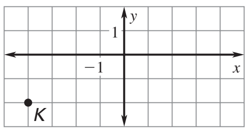
$21 - 6x = 7y$

$3 - \frac{6}{7}x = y$

$y = -\frac{6}{7}x + 3$

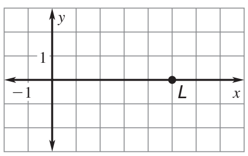
Chapter 4 (p. 941)

1.



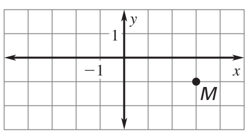
Point K is in Quadrant III.

2.



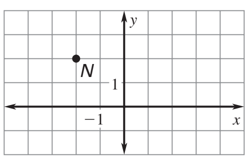
Point L is on the x-axis.

3.



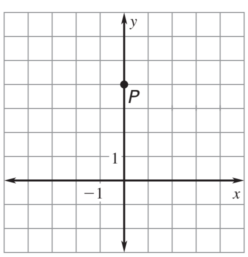
Point M is in Quadrant IV.

4.



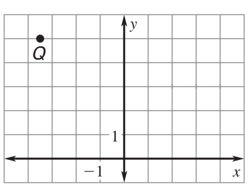
Point N is in Quadrant II.

5.



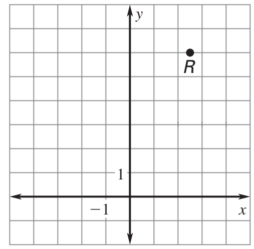
Point P is on the y-axis

6.



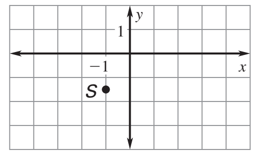
Point Q is in Quadrant II.

7.



Point R is in Quadrant I.

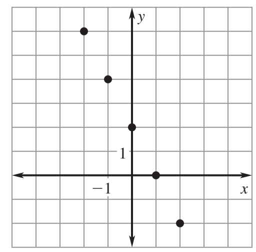
8.



Point S is in Quadrant III.

9.

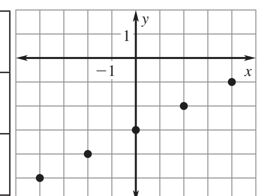
x	$y = -2x + 2$
-2	$y = -2(-2) + 2 = 6$
-1	$y = -2(-1) + 2 = 4$
0	$y = -2(0) + 2 = 2$
1	$y = -2(1) + 2 = 0$
2	$y = -2(2) + 2 = -2$



The range consists of the y-values from the table: -2, 0, 2, 4, and 6.

10.

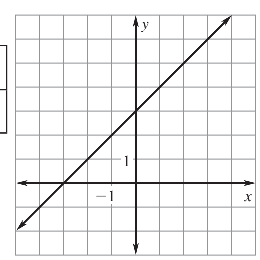
x	$y = \frac{1}{2}x - 3$
-4	$y = \frac{1}{2}(-4) - 3 = -5$
-2	$y = \frac{1}{2}(-2) - 3 = -4$
0	$y = \frac{1}{2}(0) - 3 = -3$
2	$y = \frac{1}{2}(2) - 3 = -2$
4	$y = \frac{1}{2}(4) - 3 = -1$



The range consists of the y-values from the table: -5, -4, -3, -2, and -1.

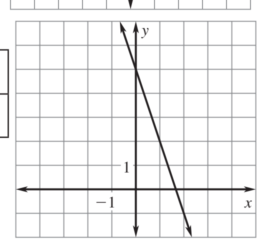
11. $y - x = 3 \rightarrow y = x + 3$

x	-3	-2	-1	0	1
y	0	1	2	3	4



12. $y + 3x = 5 \rightarrow y = -3x + 5$

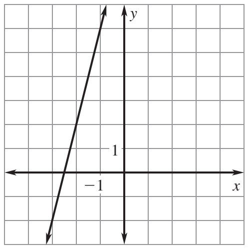
x	-1	0	1	2	3
y	8	5	2	-1	-4



Extra Practice, *continued*

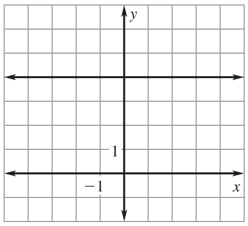
13. $y - 4x = 10 \rightarrow y = 4x + 1$

x	-4	-3	-2	-1	0
y	-6	-2	2	6	10



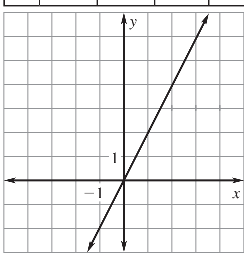
14. $y = 4$

For ever value of x, the value of y is 4.



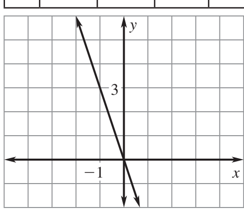
15. $2x - y = 0 \rightarrow y = 2x$

x	-2	-1	0	1	2
y	-4	-2	0	2	4



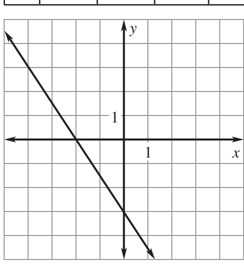
16. $3x + y = 0 \rightarrow y = -3x$

x	-2	-1	0	1	2
y	6	3	0	-3	-6



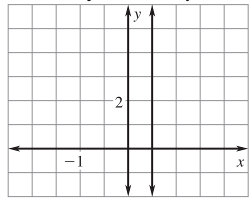
17. $3x + 2y = -6 \rightarrow y = -\frac{3}{2}x - 3$

x	-4	-3	-2	-1	0
y	3	1.5	0	-1.5	-3



18. $x = 0.5$

For every value of y, the value of x is 0.5.



19. $2x - y = 12$

x-intercept: $2x - (0) = 12$

$2x = 12$

$x = 6$

y-intercept: $2(0) - y = 12$

$y = 12$

$y = -12$

The x-intercept is 6. The y-intercept is -12.

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

x-intercept: $-5x - 2(0) = 20$

$-5x = 20$

$x = -4$

y-intercept: $-5(0) - 2y = 20$

$-2y = 20$

$y = -10$

The x-intercept is -4. The y-intercept is -10.

21. $-4x + 1.5y = 4$

x-intercept: $-4x + 1.5(0) = 4$

$-4x = 4$

$x = -1$

y-intercepts: $-4(0) + 1.5y = 4$

$1.5y = 4$

$y \approx 2.67$

The x-intercept is -1. The y-intercept is about 2.67.

22. $y = \frac{3}{4}x - 15$

x-intercept: $0 = \frac{3}{4}x - 15$

$15 = \frac{3}{4}x$

$20 = x$

y-intercept: $y = \frac{3}{4}(0) - 15$

$y = -15$

The x-intercept is 20. The y-intercept is -15.

23. $y = 3x - 6$

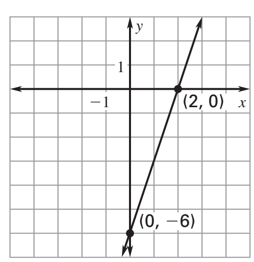
x-intercept: $0 = 3x - 6$

$6 = 3x$

$2 = x$

y-intercept: $y = 3(0) - 6$

$y = -6$



24. $4x + 5y = -20$

x-intercept: $4x + 5(0) = -20$

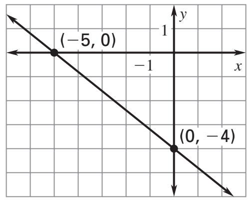
$4x = -20$

$x = -5$

y-intercept: $4(0) + 5y = -20$

$5y = -20$

$y = -4$



25. $\frac{2}{3}x + \frac{1}{2}y = 10$

x-intercept: $\frac{2}{3}x + \frac{1}{2}(0) = 10$

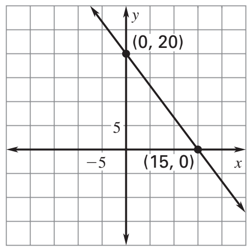
$\frac{2}{3}x = 10$

$x = 15$

y-intercept: $\frac{2}{3}(0) + \frac{1}{2}y = 10$

$\frac{1}{2}y = 10$

$y = 20$



26. $0.3x - y = 6$

x-intercept: $0.3x - 0 = 6$

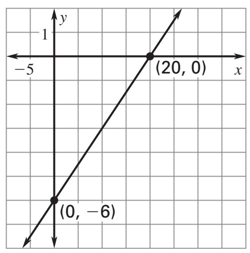
$0.3x = 6$

$x = 20$

y-intercept: $0.3(0) - y = 6$

$-y = 6$

$y = -6$



27. Let $(x_1, y_1) = (4, 2)$ and $(x_2, y_2) = (6, 8)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 2}{6 - 4} = \frac{6}{2} = 3$$

The slope of the line is 3.

28. Let $(x_1, y_2) = (-3, 0)$ and $(x_2, y_2) = (2, -5)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 0}{2 - (-3)} = \frac{-5}{5} = -1$$

The slope of the line is -1.

29. Let $(x_1, y_1) = (-5, 3)$ and $(x_2, y_2) = (-8, 10)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 3}{-8 - (-5)} = \frac{7}{-8 + 5} = -\frac{7}{3}$$

The slope of the line is $-\frac{7}{3}$.

30. Let $(x_1, y_1) = (9, 4)$ and $(x_2, y_2) = (0,1)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{0 - 9} = \frac{-3}{-9} = \frac{1}{3}$$

The slope of the line is $\frac{1}{3}$.

31. Let $(x_1, y_1) = (-2, 5)$ and $(x_2, y_2) = (-2, 10)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 5}{-2 - (-2)} = \frac{-5}{0}$$

Division by zero is undefined, so there is no slope.

32. Let $(x_1, y_1) = (6, -4)$ and $(x_2, y_2) = (4, -4)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - (-4)}{4 - 6} = \frac{0}{-2} = 0$$

33. $y = 7x + 8$

The slope of the line is 7, and the y-intercept is 8.

34. $y = 10x - 6$

The slope of the line is 10, and the y-intercept is -6.

35. $y = 3 - 4x$

The slope of the line is -4 and the y-intercept is 3.

36. $y = x$

The slope of the line is 1, and the y-intercept is 0.

37. $2x + y = 8 \rightarrow y = -2x + 8$

The slope of the line is -2 and the y-intercept is 8.

38. $10x - y = 20 \rightarrow y = 10x - 20$

The slope of the line is 10 and the y-intercept is -20.

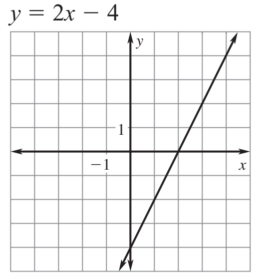
39. $5x + 2y = 10 \rightarrow y = -\frac{5}{2}x + 5$

The slope of the line is $-\frac{5}{2}$ and the y-intercept is 5.

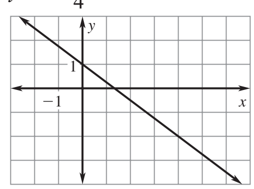
40. $-2x - y = 3 \rightarrow y = -2x - 3$

The slope of the line is -2 and the y-intercept is -3.

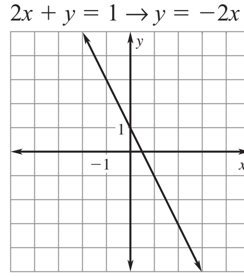
41. $y = 2x - 4$



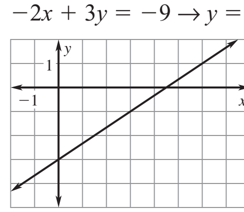
42. $y = -\frac{3}{4}x + 1$



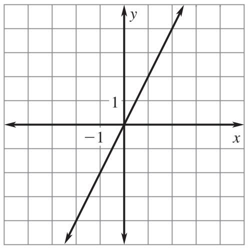
43. $2x + y = 1 \rightarrow y = -2x + 1$



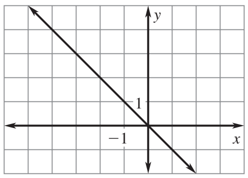
44. $-2x + 3y = -9 \rightarrow y = \frac{2}{3}x - 3$



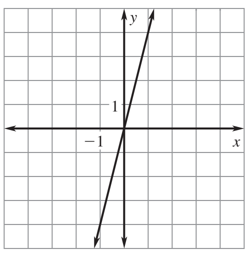
45. $y = 2x$



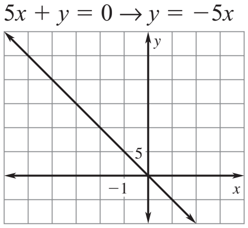
46. $y = -x$



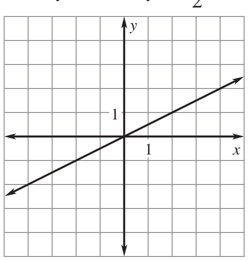
47. $y = 4x$



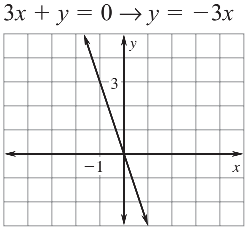
48. $5x + y = 0 \rightarrow y = -5x$



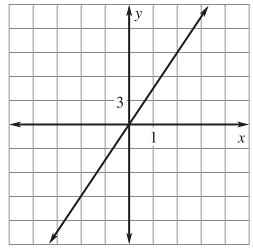
49. $x - 2y = 0 \rightarrow y = \frac{1}{2}x$



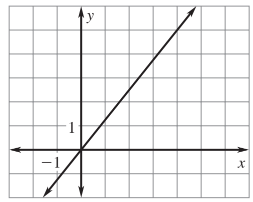
50. $3x + y = 0 \rightarrow y = -3x$



51. $2y = 9x \rightarrow y = \frac{9}{2}x$



52. $y - \frac{5}{4}x = 0 \rightarrow y = \frac{5}{4}x$



53. $f(x) = -7x - 3$

When $f(x) = -17$:

$-17 = -7x - 3$

$-14 = -7x$

$2 = x$

When $x = 2$, $f(x) = -17$.

54. $g(x) = 5x - 4$

When $g(x) = 12$:

$12 = 5x - 4$

$16 = 5x$

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

When $x = \frac{16}{5}$, $g(x) = 12$.

55. $t(x) = 3x + 1$

When $t(x) = -11$:

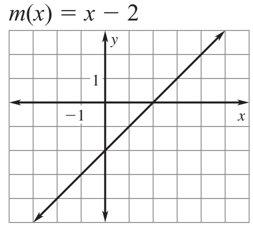
$-11 = 3x + 1$

$-12 = 3x$

$-4 = x$

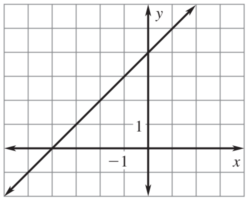
When $x = -4$, $t(x) = -11$.

56. $m(x) = x - 2$



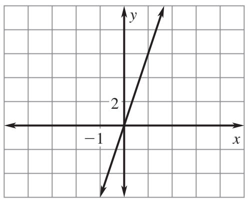
Because the graphs of m and f have the same slope, $m = 1$, the lines are parallel. The y-intercept of m is 2 less than the y-intercept of f.

57. $t(x) = x + 4$



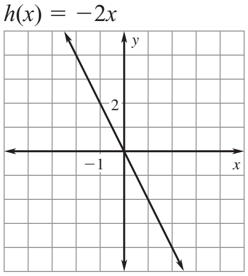
The graph is a vertical translation 2 units down of $f(x) = x$.

58. $z(x) = 6x$



The graph is a vertical translation 4 units up of $f(x) = x$.

59. $h(x) = -2x$



The graph is a vertical stretch by a factor of 6 of $f(x) = x$.

Chapter 5 (p. 942)

1. Slope: 3

y-intercept: 6

$y = 3x + 6$

2. Slope: -2

y-intercept: 4

$y = -2x + 4$

3. Slope: 5

y-intercept: -1

$y = 5x - 1$

4. Slope: -1

y-intercept: -3

$y = -x - 3$

5. Slope: $\frac{1}{2}$

y-intercept: -5

$y = \frac{1}{2}x - 5$

6. Slope: $-\frac{7}{10}$

y-intercept: 8

$y = -\frac{7}{10}x + 8$

7. Use (3, 8) and $m = 2$.

$y = mx + b$

$8 = 2(3) + b$

$2 = b$

An equation of the line is $y = 2x + 2$.

8. Use $(-1, 5)$ and $m = -4$.

$y = mx + b$

$5 = -4(-1) + b$

$1 = b$

An equation of the line is $y = -4x + 1$.

9. Use $(-6, 3)$ and $m = \frac{2}{3}$.

$y = mx + b$

$3 = \frac{2}{3}(-6) + b$

$7 = b$

An equation of the line is $y = \frac{2}{3}x + 7$.

10. (2, 4), (5, 13)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13 - 4}{5 - 2} = \frac{9}{3} = 3$

Use (2, 4) and $m = 3$.

$y = mx + b$

$4 = 3(2) + b$

$-2 = b$

An equation of the line is $y = 3x - 2$.

11. $(1, -2), (-2, 13)$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13 - (-2)}{-2 - 1} = \frac{15}{-3} = -5$

Use $(1, -2)$ and $m = -5$.

$y = mx + b$

$-2 = -5(1) + b$

$3 = b$

An equation of the line is $y = -5x + 3$.

12. $\left(2, \frac{1}{3}\right)$, (6, 3)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - \frac{1}{3}}{6 - 2} = \frac{\frac{8}{3}}{4} = \frac{2}{3}$

Use (6, 3) and $m = \frac{2}{3}$.

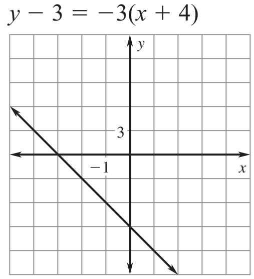
$y = mx + b$

$3 = \frac{2}{3}(6) + b$

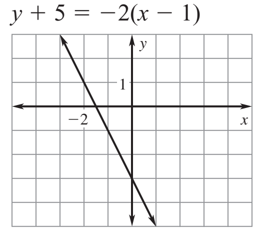
$-1 = b$

An equation of the line is $y = \frac{2}{3}x - 6$.

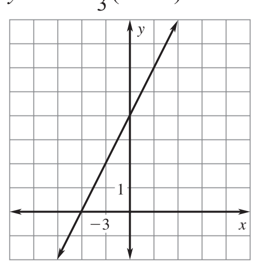
13. $y - 3 = -3(x + 4)$



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



15. $y - 6 = \frac{2}{3}(x - 3)$



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

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{16 - 2}{-2 - (-4)} = \frac{14}{2} = 7$

Use $(-4, 2)$ and $m = 7$. Use $(-2, 16)$ and $m = 7$.

$y - y_1 = m(x - x_1)$ $y - y_1 = m(x - x_1)$

$y - 2 = 7(x + 4)$ $y - 16 = 7(x + 2)$

An equation in point-slope form of the line is

$y - 2 = 7(x + 4)$ or $y - 16 = 7(x + 2)$.

17. $(3, 9), (-7, 4)$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 9}{-7 - 3} = \frac{-5}{-10} = \frac{1}{2}$

Use $(3, 9)$ and $m = \frac{1}{2}$. Use $(-7, 4)$ and $m = \frac{1}{2}$.

$y - y_1 = m(x - x_1)$ $y - y_1 = m(x - x_1)$

$y - 9 = \frac{1}{2}(x - 3)$ $y - 4 = \frac{1}{2}(x + 7)$

An equation in point-slope form of the line is

$y - 9 = \frac{1}{2}(x - 3)$ or $y - 4 = \frac{1}{2}(x + 7)$.

18. $(10, -2), (12, -6)$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - (-2)}{12 - 10} = \frac{-4}{2} = -2$

Use $(10, -2)$ and $m = -2$. Use $(12\ -6)$ and $m = -2$.

$y - y_1 = m(x - x_1)$ $y - y_1 = m(x - x_1)$

$y + 2 = -2(x - 10)$ $y + 6 = -2(x - 12)$

An equation in point slope form of the line is

$y + 2 = -2(x - 10)$ or $y + 6 = -2(x - 12)$.

19. Use $(2, 7)$ and $m = -4$.

$y - y_1 = m(x - x_1)$

$y - 7 = -4(x - 2)$

$y - 7 = -4x + 8$

$4x + y = 15$

An equation of the line in standard form is $4x + y = 15$.

20. Use $(5, 11)$ and $m = 3$

$y - y_1 = m(x - x_1)$

$y - 11 = 3(x - 5)$

$y - 11 = 3x - 15$

$-3x + y = -4$

$3x - y = 4$

An equation of the line in standard form is $3x - y = 4$.

21. $(1, -2), (-2, 4)$

$m = \frac{4 - (-2)}{-2 - 1} = \frac{6}{-3} = -2$

Use $(1, -2)$ and $m = -2$.

$y - y_1 = m(x - x_1)$

$y + 2 = -2(x - 1)$

$y + 2 = -2x + 2$

$2x + y = 0$

An equation of the line in standard form is $2x + y = 0$.

22. $(5, 4), y = 3x + 5$

The slope of the given line is 3, so use $m = 3$.

$y = mx + b$

$4 = 3(5) + b$

$-11 = b$

$y = 3x - 11$

An equation of the parallel line is $y = 3x - 11$.

23. $(-3, -7), y = -5x - 2$

The slope of the given line is -5, so use $m = -5$.

$y = mx + b$

$-7 = -5(-3) + b$

$-22 = b$

$y = -5x - 22$

An equation of the parallel line is $y = -5x - 22$.

24. $(8, -3), y = \frac{3}{4}x + 5$

The slope of the given line is $\frac{3}{4}$, so use $m = \frac{3}{4}$.

$y = mx + b$

$-3 = \frac{3}{4}(8) + b$

$-9 = b$

$y = \frac{3}{4}x - 9$

An equation of the parallel line is $y = \frac{3}{4}x - 9$.

25. $(-12, -2), y = 3x + 2$

The slope of the given line is 3, so use $m = -\frac{1}{3}$.

$y = mx + b$

$-2 = -\frac{1}{3}(-12) + b$

$-6 = b$

$y = -\frac{1}{3}x - 6$

An equation of the perpendicular line is $y = -\frac{1}{3}x - 6$.

26. $(15, -11), y = \frac{3}{5}x - 8$

The slope of the line is $\frac{3}{5}$, so use $m = -\frac{5}{3}$.

$y = mx + b$

$-11 = -\frac{5}{3}(15) + b$

$14 = b$

$y = -\frac{5}{3}x + 14$

An equation of the perpendicular line is $y = -\frac{5}{3}x + 14$.

27. $(7, -6), 4x + 6y = 7$

$4x + 6y = 7 \rightarrow y = -\frac{2}{3}x + \frac{7}{6}$

The slope of the line is $-\frac{2}{3}$, so use $m = \frac{3}{2}$.

$y = mx + b$

$-6 = \frac{3}{2}(7) + b$

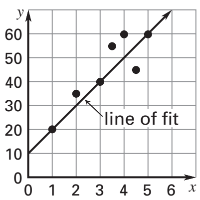
$-6 = \frac{21}{2} + b$

$-\frac{33}{2} = b$

$y = \frac{3}{2}x - \frac{33}{2}$

An equation of the perpendicular line is $y = \frac{3}{2}x - \frac{33}{2}$.

28.



Sample answer: Use (0, 15) and (6, 70).

$m = \frac{70 - 15}{6 - 0} = \frac{55}{6}$

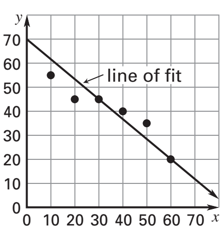
$y - y_1 = m(x - x_1)$

$y - 15 = \frac{55}{6}(x - 0)$

$y = \frac{55}{6}x + 15$

An equation is $y = \frac{55}{6}x + 15$.

29.



Use (10, 55) and (50, 30).

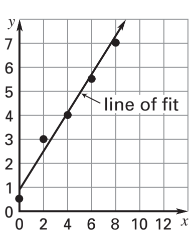
$m = \frac{30 - 55}{50 - 10} = -\frac{25}{40} = -\frac{5}{8}$

$y - y_1 = m(x - x_1)$

$y - 55 = -\frac{5}{8}(x - 10)$

$y = -\frac{5}{8}x + \frac{245}{4}$

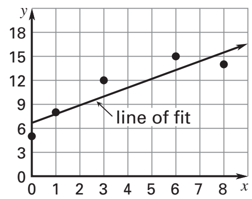
30.



The equation of the best-fitting line is $y = 0.78x + 0.9$.

When $x = 7$, y is about 6.36.

31.



The equation of the best-fitting line is $y = 1.1x + 6.7$.

When $x = 7$, y is about 14.4.

Chapter 6 (p. 943)

1. $y - 2 > 3$

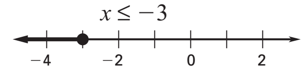
$y - 2 + 2 > 3 + 2$

$y > 5$

2. $5 + x \leq 2$

$5 - 5 + x \leq 2 - 5$

$x \leq -3$



3. $4 \geq x - 3$

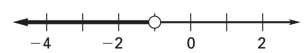
$4 + 3 \geq x - 3 + 3$

$7 \geq x$

4. $m + 3 < 2$

$m + 3 - 3 < 2 - 3$

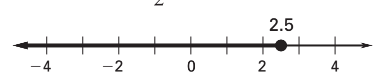
$m < -1$



5. $2 + n \leq 4\frac{1}{2}$

$2 - 2 + n \leq 4\frac{1}{2} - 2$

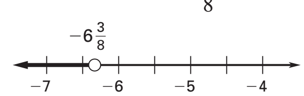
$n \leq 2\frac{1}{2}$



6. $2\frac{3}{4} + n < -3\frac{5}{8}$

$2\frac{3}{4} - 2\frac{3}{4} + n < -3\frac{5}{8} - 2\frac{3}{4}$

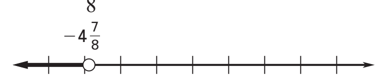
$n < -6\frac{3}{8}$



7. $1\frac{7}{8} > 6\frac{3}{4} + z$

$1\frac{7}{8} - 6\frac{3}{4} > 6\frac{3}{4} - 6\frac{3}{4} + z$

$-4\frac{7}{8} > z$

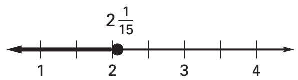


Extra Practice, *continued*

8. $3\frac{2}{5} \ge 1\frac{1}{3} + k$

$3\frac{2}{5} - 1\frac{1}{3} \ge 1\frac{1}{3} - 1\frac{1}{3} + k$

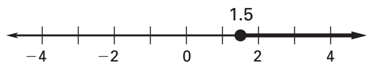
$2\frac{1}{15} \ge k$



9. $-8.5 \le t - 10$

$-8.5 + 10 \le t - 10 + 10$

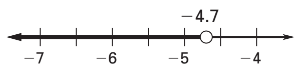
$1.5 \le t$



10. $r + 4 < -0.7$

$r + 4 - 4 < -0.7 - 4$

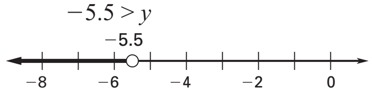
$r < -4.7$



11. $-6.9 > -1.4 + y$

$-6.9 + 1.4 > -1.4 + 1.4 + y$

$-5.5 > y$

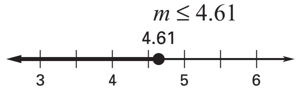


12. $1.48 - m \ge -3.13$

$1.48 - 1.48 - m \ge -3.13 - 1.48$

$-m \ge -4.61$

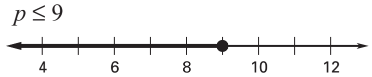
$m \le 4.61$



13. $3p \le 27$

$\frac{3p}{3} \le \frac{27}{3}$

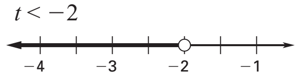
$p \le 9$



14. $-13t > 26$

$\frac{-13t}{-13} < \frac{26}{-13}$

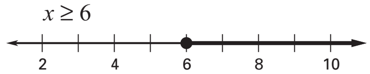
$t < -2$



15. $\frac{x}{3} \ge 2$

$3 \cdot \frac{x}{3} \ge 3 \cdot 2$

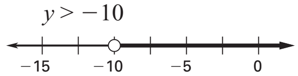
$x \ge 6$



16. $\frac{y}{-2} < 5$

$-2 \cdot \frac{y}{-2} > -2 \cdot 5$

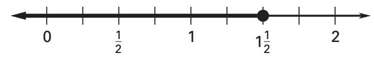
$y > -10$



17. $-6m \ge -9$

$\frac{-6m}{-6} \le \frac{-9}{-6}$

$m \le \frac{3}{2}$



18. $-3 \ge \frac{n}{2}$

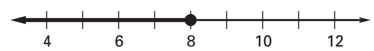
$2 \cdot (-3) \ge 2 \cdot \frac{n}{2}$

$-6 \ge n$

19. $0.3z \le 2.4$

$\frac{0.3z}{0.3} \le \frac{2.4}{0.3}$

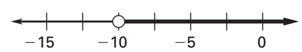
$z \le 8$



20. $25 > -2.5s$

$\frac{25}{-2.5} < \frac{-2.5s}{-2.5}$

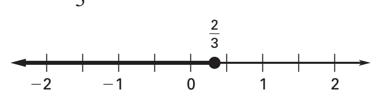
$-10 < s$



21. $4.8z \le 3.2$

$\frac{4.8z}{4.8} \le \frac{3.2}{4.8}$

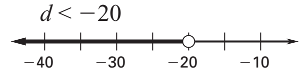
$z \le \frac{2}{3}$



22. $0.09d < -1.8$

$\frac{0.09d}{0.09} < \frac{-1.8}{0.09}$

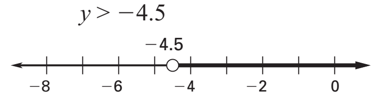
$d < -20$



23. $\frac{y}{0.3} > -15$

$0.3 \cdot \frac{y}{0.3} > 0.3(-15)$

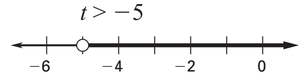
$y > -4.5$



24. $-1.8t < 9$

$\frac{-1.8t}{-1.8} > \frac{9}{-1.8}$

$t > -5$



25. $3x + 5 \geq 20$

$3x \geq 15$

$x \geq 5$

26. $6z - 5 < 13$

$6z < 18$

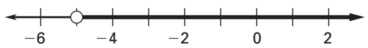
$z < 3$

27. $8(t + 4) > -8$

$8t + 32 > -8$

$8t > -40$

$t > -5$



28. $7 - 8n \leq 4n - 17$

$7 \leq 12n - 17$

$24 \leq 12n$

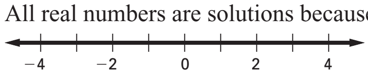
$2 \leq n$

29. $8(m + 2) < 4(5 + 2m)$

$8m + 16 < 20 + 8m$

$16 < 20$

All real numbers are solutions because $16 < 20$ is true.

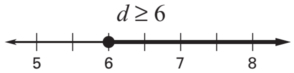


30. $6d - 4 - 3d \geq 14$

$3d - 4 \geq 14$

$3d \geq 18$

$d \geq 6$

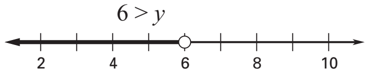


31. $\frac{2}{3}y + 28 > 20 + 2y$

$\frac{2}{3}y + 8 > 2y$

$8 \geq 1\frac{1}{3}y$

$6 > y$

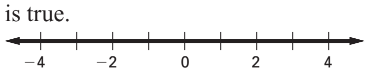


32. $6(-5 + 3p) \geq 3(6p - 10)$

$-30 + 18p \geq 18p - 30$

$-30 \geq -30$

All real numbers are solutions because $-30 \geq -30$ is true.



33. $\frac{5}{6}(12z - 24) > \frac{2}{5}(25z - 25)$

$10z - 20 > 10z - 10$

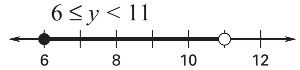
$-20 > -10$

There are no solutions because $-20 > -10$ is false.

34. $2 \leq y - 4 < 7$

$2 + 4 \leq y - 4 + 4 < 7 + 4$

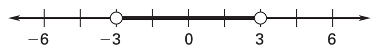
$6 \leq y < 11$



35. $-27 < 9x < 27$

$-\frac{27}{9} < \frac{9x}{9} < \frac{27}{9}$

$-3 < x < 3$



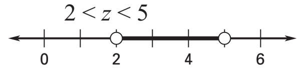
36. $2 < 6z - 10 < 20$

$2 + 10 < 6z - 10 + 10 < 20 + 10$

$12 < 6z < 30$

$\frac{12}{6} < \frac{6z}{6} < \frac{30}{6}$

$2 < z < 5$



37. $15 < \frac{5}{9}(18a - 9) \leq 30$

$\frac{9}{5} \cdot 15 < \frac{9}{5} \cdot \frac{5}{9}(18a - 9) \leq \frac{9}{5} \cdot 30$

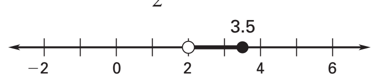
$27 < 18a - 9 \leq 54$

$27 + 9 < 18a - 9 + 9 \leq 54 + 9$

$36 < 18a \leq 63$

$\frac{36}{18} < \frac{18a}{18} \leq \frac{63}{18}$

$2 < a \leq 3\frac{1}{2}$

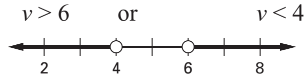


38. $2v > 12$ or $v + 2 < 6$

$2v > 12$ or $v + 2 < 6$

$\frac{2v}{2} > \frac{12}{2}$ or $v + 2 - 2 < 6 - 2$

$v > 6$ or $v < 4$



39. $3r + 7 < -5$ or $32 \leq 7r + 46$

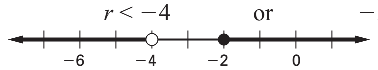
$3r + 7 < -5$ or $32 \leq 7r + 46$

$3r + 7 - 7 < -5 - 7$ or $32 - 46 \leq 7r + 46 - 46$

$3r < -12$ or $-14 \leq 7r$

$\frac{3r}{3} < \frac{-12}{3}$ or $-\frac{14}{7} \leq \frac{7r}{7}$

$r < -4$ or $-2 \leq r$



40. $-4m < 8$ or $2m - 2 < -12$

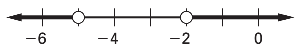
$-4m < 8$ or $2m - 2 < -12$

$\frac{-4m}{-4} > \frac{8}{-4}$ or $2m - 2 + 2 < -12 + 2$

$m > -2$ or $2m < -10$

$\frac{2m}{2} < \frac{-10}{2}$

$m < -5$



41. $9t - 20 \geq 4t$ or $4 < -\frac{1}{2}t$

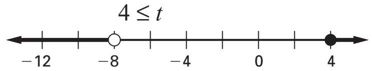
$9t - 20 \geq 4t$ or $4 < -\frac{1}{2}t$

$9t - 9t - 20 \geq 4t - 9t$ or $-2 \cdot 4 > -2 \cdot \left(-\frac{1}{2}\right)t$

$-20 \geq -5t$ or $-8 > t$

$\frac{-20}{-5} \leq \frac{-5t}{-5}$

$4 \leq t$



42. $-n - 1 > 1$ or $2n + 8 > n + 8$

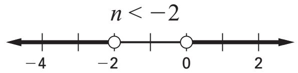
$-n - 1 > 1$ or $2n + 8 > n + 8$

$-n - 1 + 1 > 1 + 1$ or $2n - n + 8 > n - n + 8$

$-n > 2$ $\quad n + 8 > 8$

$\frac{-n}{-1} < \frac{2}{-1}$ $\quad n + 8 - 8 > 8 - 8$

$n < -2$ $\quad n > 0$



43. $|x| = 8$

The distance between x and 0 is 8. So $x = 8$ and $x = -8$. The solutions are 8 and -8.

44. $|y| = -10$

The absolute value of a number is never negative. So, there is no solution.

45. $|m + 6| = 5$

$m + 6 = 5$ or $m + 6 = -5$

$m = -1$ or $m = -11$

The solutions are -11 and -1.

46. $|4z - 2| = 14$

$4z - 2 = 14$ or $4z - 2 = -14$

$4z = 16$ or $4z = -12$

$z = 4$ or $z = -3$

The solutions are -3 and 4.

47. $|t - 7| = 21$

$t - 7 = 21$ or $t - 7 = -21$

$t = 28$ or $t = -14$

The solutions are -14 and 28.

48. $6|z - 4| = 36$

$|z - 4| = 6$

$z - 4 = 6$ or $z - 4 = -6$

$z = 10$ or $z = -2$

The solutions are -2 and 10.

49. $4|6s + 11| = -52$

$|6s + 11| = -13$

The absolute value of a number is never negative. So, there is no solution.

50. $r + 3 - 16 = -4$

$|r + 3| = 12$

$r + 3 = 12$ or $r + 3 = -12$

$r = 9$ or $r = -15$

The solutions are -15 and 9.

51. $|5r| + 10 = 15$

$|5r| = 5$

$5r = 5$ or $5r = -5$

$r = 1$ or $r = -1$

The solutions are -1 and 1.

52. $2|3s + 4| = 14$

$|3s + 4| = 7$

$3s + 4 = 7$ or $3s + 4 = -7$

$3s = 3$ or $3s = -11$

$s = 1$ or $s = -3\frac{2}{3}$

The solutions are $-3\frac{2}{3}$ and 1.

53. $-4|7v + 2| = 32$

$|7v + 2| = -8$

The absolute value of a number is never negative. So, there is no solution.

54. $12\left|\frac{5}{6}w - 4\right| - 4 = 8$

$12\left|\frac{5}{6}w - 4\right| = 12$

$\left|\frac{5}{6}w - 4\right| = 1$

$\frac{5}{6}w - 4 = 1$ or $\frac{5}{6}w - 4 = -1$

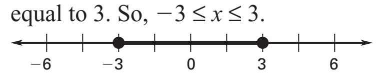
$\frac{5}{6}w = 5$ or $\frac{5}{6}w = 3$

$w = 6$ or $w = 3\frac{3}{5}$

The solutions are $3\frac{3}{5}$ and 6.

55. $1 \times 1 \leq 3$

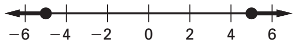
The distance between x and 0 is less than or equal to 3. So, $-3 \leq x \leq 3$.



Extra Practice, *continued*

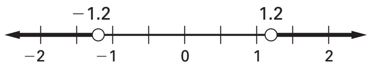
56. $|y| \geq 5$

The distance between y and 0 is greater or equal to 5. So, $y \leq -5$ or $y \geq 5$.



57. $|s| > 1.2$

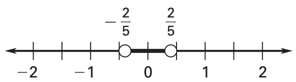
The distance between s and 0 is greater than 1.2. So, $s < -1.2$ or $s > 1.2$.



58. $|q| < \frac{2}{5}$

The distance between q and 0 is less than $\frac{2}{5}$.

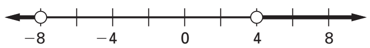
So, $-\frac{2}{5} < q < \frac{2}{5}$.



59. $|x + 2| > 6$

$x + 2 > 6$ or $x + 2 < -6$

$x > 4$ or $x < -8$



60. $|y + 3| \leq 5$

$-5 \leq y + 3 \leq 5$

$-8 \leq y \leq 2$

61. $|8 - m| < 3$

$-3 < 8 - m < 3$

$-11 < -m < -5$

$11 > m > 5$

$5 < m < 11$

62. $|4n - 1| \geq 7$

$4n - 1 \geq 7$ or $4n - 1 \leq -7$

$4n \geq 8$ or $4n \leq -6$

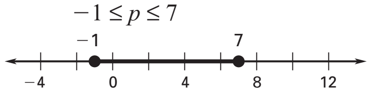
$n \geq 2$ or $n \leq -\frac{3}{2}$

63. $3|p - 3| \leq 12$

$|p - 3| \leq 4$

$-4 \leq p - 3 \leq 4$

$-1 \leq p \leq 7$



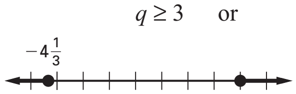
64. $|3q + 2| - 3 \geq 8$

$|3q + 2| \geq 11$

$3q + 2 \geq 11$ or $3q + 2 \leq -11$

$3q \geq 9$ or $3q \leq -13$

$q \geq 3$ or $q \leq -4\frac{1}{3}$



65. $2|5a - 1| + 3 \leq 11$

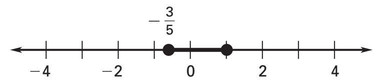
$2|5a - 1| \leq 8$

$|5a - 1| \leq 4$

$-4 \leq 5a - 1 \leq 4$

$-3 \leq 5a \leq 5$

$-\frac{3}{5} \leq a \leq 1$



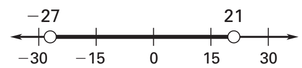
66. $4\left|\frac{2}{3}c + 2\right| < 64$

$\left|\frac{2}{3}c + 2\right| < 16$

$-16 < \frac{2}{3}c + 2 < 16$

$-18 < \frac{2}{3}c < 14$

$-27 < c < 21$



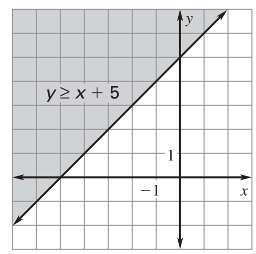
67. $y \geq x + 5$

Test (0, 0) in $y \geq x + 5$.

$0 \overset{?}{\geq} (0) + 5$

$0 \not\geq 5$

The side that does not contain (0, 0) should be shaded.

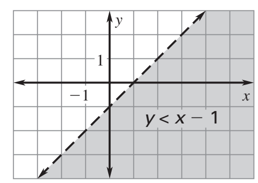


68. $y < x - 1$

Test (0, 0) in $y < x - 1$.

$0 \overset{?}{<} 0 - 1$

$0 \not< -1$



Shade the half-plane that does not contain (0, 0).

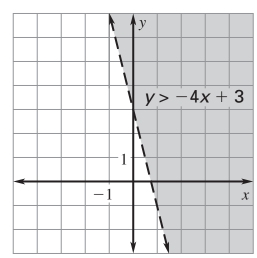
69. $4x + y > 3$

Test (0, 0) in $4x + y > 3$.

$4(0) + (0) \overset{?}{>} 3$

$0 \not> 3$

Shade the half-plane that does not contain (0, 0).



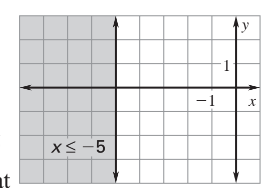
70. $x \leq -5$

Test (2, 2) in $x \leq -5$.

$(2) \overset{?}{\leq} -5$

$2 \not\leq -5$

Shade the half-plane that does not contain (2, 2).



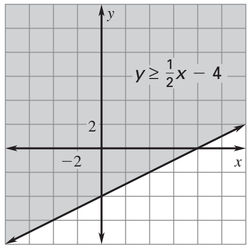
Extra Practice, *continued*

71. $3(x - 8) \le 6y$

Test (2, 2) in $3(x - 8) \le 6y$

$$3(2 - 8) \overset{?}{\le} 6(2)$$
$$-18 \le 12$$

Shade the half-plane that contains the point (2, 2).

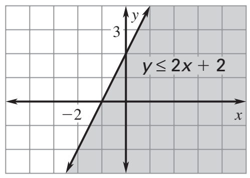


72. $2x - y \ge -2$

Test (2, 0) in $2x - y \ge -2$

$$2(2) - 0 \overset{?}{\ge} -2$$
$$4 \ge -2$$

Shade the half-plane that contains the point (2, 0).

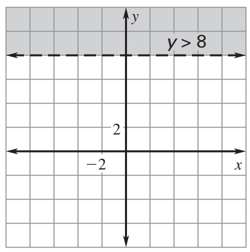


73. $y > 8$

Test (0, 0) in $y > 8$

$$0 \not> 8$$

Shade the half-plane that does not contain the point (0, 0).

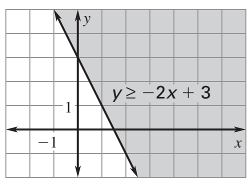


74. $2(x - 1) \ge 1 - y$

Test (0, 0) in $2(x - 1) \ge 1 - y$

$$2(0 - 1) \overset{?}{\ge} 1 - (0)$$
$$-2 \not\ge 1$$

Shade the half-plane that does not contain the point (0, 0).

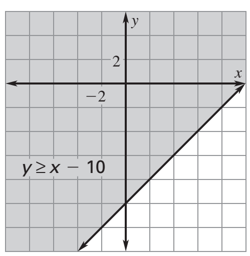


75. $x - 8 \le y + 2$

Test (0, 0) in $x - 8 \le y + 2$

$$0 - 8 \overset{?}{\le} 0 + 2$$
$$-8 \le 2$$

Shade the half-plane that contains the point (0, 0).

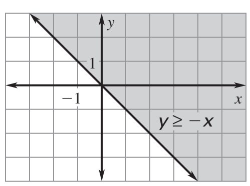


76. $2x \ge -2y$

Test (1, 1) in $2x \ge -2y$

$$2(1) \overset{?}{\ge} -2(1)$$
$$2 \ge -2$$

Shade the half-plane that contains the point (1, 1).

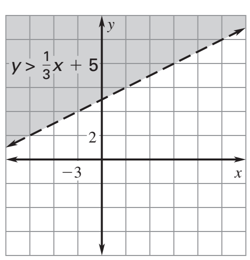


77. $3(y - 8) > x - 9$

Test (0, 0) in $3(y - 8) > x - 9$

$$3(0 - 8) \overset{?}{\ge} 0 - 9$$
$$-24 \not> -9$$

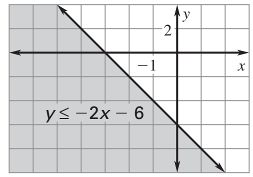
Shade the half-plane that does not contain the point (0, 0).



78. $2(-x - 1) \ge 4 + y$

Test (0, 0) in $2(-x - 1) \ge 4 + y$

$$2(-(0) - 1) \overset{?}{\ge} 4 + (0)$$
$$-2 \not\ge 4$$

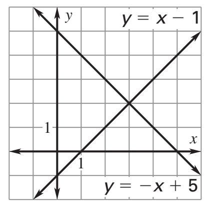


Shade the half-plane that does not contain the point (0, 0).

Chapter 7 (p. 944)

1. $y = x - 1$

$y = -x + 5$



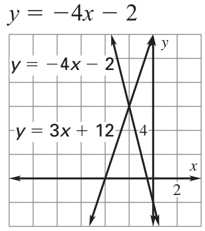
The graphs appear to intersect at (3, 2).

$y = x - 1$	$y = -x + 5$
$2 \overset{?}{=} 3 - 1$	$2 \overset{?}{=} -3 + 5$
$2 = 2$ ✓	$2 = 2$ ✓

Because (3, 2) is a solution of each equation, it is a solution of the linear system.

2. $y = 3x + 12$

$y = -4x - 2$



The graphs appear to intersect at (−2, 6).

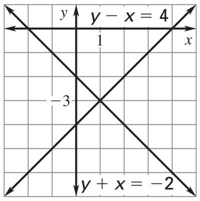
$y = 3x + 12$	$y = -4x - 2$
$6 \overset{?}{=} 3(-2) + 12$	$6 \overset{?}{=} -4(-2) - 2$
$6 = 6$ ✓	$6 = 6$ ✓

Because (−2, 6) is a solution to each equation, it is a solution of the linear system.

Extra Practice, *continued*

3. $x - y = 4 \rightarrow y = x - 4$

$x + y = -2 \rightarrow y = -x - 2$



The graphs appear to intersect at $(1, -3)$.

$x - y = 4 \qquad x + y = -2$

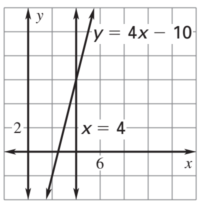
$1 - (-3) \stackrel{?}{=} 4 \qquad 1 + (-3) \stackrel{?}{=} -2$

$4 = 4$ ✓ $\qquad -2 = -2$ ✓

Because $(1, -3)$ is a solution of each equation, it is a solution of the linear system.

4. $4x - y = 10 \rightarrow y = 4x - 10$

$x = 4$



The graphs appear to intersect at $(4, 6)$.

$4x - y = 10 \qquad x = 4$

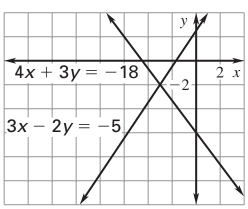
$4(4) - 6 \stackrel{?}{=} 10 \qquad 4 = 4$ ✓

$10 = 10$ ✓

Because $(4, 6)$ is a solution of each equation, it is a solution of the linear system.

5. $3x - 2y = -5 \rightarrow y = \frac{3}{2}x + \frac{5}{2}$

$4x + 3y = -18 \rightarrow y = -\frac{4}{3}x - 6$



The graphs appear to intersect at $(-3, -2)$.

$3x - 2y = -5 \qquad 4x + 3y = -18$

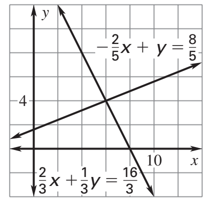
$3(-3) - 2(-2) \stackrel{?}{=} -5 \qquad 4(-3) + 3(-2) \stackrel{?}{=} -18$

$-5 = -5$ ✓ $\qquad -18 = -18$ ✓

Because $(-3, -2)$ is a solution of each equation, it is a solution of the linear system.

6. $\frac{2}{3}x + \frac{1}{3}y = \frac{16}{3} \rightarrow y = -2x + 16$

$-\frac{2}{5}x + y = \frac{8}{5} \rightarrow y = \frac{2}{5}x + \frac{8}{5}$



The graphs appear to intersect at $(6, 4)$.

$\frac{2}{3}x + \frac{1}{3}y = \frac{16}{3} \qquad -\frac{2}{5}x + y = \frac{8}{5}$

$\frac{2}{3}(6) + \frac{1}{3}(4) \stackrel{?}{=} \frac{16}{3} \qquad -\frac{2}{5}(6) + 4 \stackrel{?}{=} \frac{8}{5}$

$\frac{16}{3} = \frac{16}{3}$ ✓ $\qquad \frac{8}{5} = \frac{8}{5}$ ✓

Because $(6, 4)$ is a solution of each equation, it is a solution of the linear system.

7. $y = 2x + 6$

$x = y - 3$

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

$x = -3$

$y = 2(-3) + 6 = 0$

The solution is $(-3, 0)$.

8. $y = 3x + 5$

$x + y = -1$

$x + (3x + 5) = -1$

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

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

The solution is $\left(-\frac{3}{2}, \frac{1}{2}\right)$.

9. $x = 2y - 5$

$2x - y = 11$

$2(2y - 5) - y = 11$

$y = 7$

$x = 2(7) - 5 = 9$

The solution is $(9, 7)$.

10. $2x - y = 0 \rightarrow y = 2x$

$x + 3y = -56$

$x + 3(2x) = -56$

$x = -8$

$y = 2(-8) = -16$

The solution is $(-8, -16)$.

11. $1.5x - 2.5y = 22$

$x - y = 10 \rightarrow x = y + 10$

$1.5(y + 10) - 2.5y = 22$

$y = -7$

$x = -7 + 10 = 3$

The solution is $(3, -7)$.

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

$x - \frac{1}{2}y = 6 \rightarrow x = \frac{1}{2}y + 6$

$\frac{1}{2}\left(\frac{1}{2}y + 6\right) + \frac{3}{4}y = 5$

$y = 2$

$x = \frac{1}{2}(2) + 6 = 7$

The solution is $(7, 2)$.

13. $x + 2y = 2$

$\underline{-x + 3y = 13}$

$5y = 15$

$y = 3$

$x + 2(3) = 2$

$x = -4$

The solution is $(-4, 3)$.

14. $3x - 4y = -16 \rightarrow 3x - 4y = -16$

$x - 4y = -40 \rightarrow \underline{-x + 4y = 40}$

$2x = 24$

$x = 12$

$12 - 4y = -40$

$y = 13$

The solution is $(12, 13)$.

15. $3x + 2y = -31 \rightarrow 3x + 2y = -31$

$5x + 2y = -49 \rightarrow \underline{-5x - 2y = 49}$

$-2x = 18$

$x = -9$

$3(-9) + 2y = -31$

$y = -2$

The solution is $(-9, -2)$.

16. $5x + 4y = 6 \rightarrow 5x + 4y = 6$

$7x + 4y = 14 \rightarrow \underline{-7x - 4y = -14}$

$-2x = -8$

$x = 4$

$5(4) + 4y = 6$

$y = -\frac{7}{2}$

The solution is $\left(4, -\frac{7}{2}\right)$.

17. $10y - 3x = -41 \rightarrow -3x + 10y = -41$

$3x - 5y = 16 \rightarrow \underline{3x + -5y = 16}$

$5y = -25$

$y = -5$

$3x - 5(-5) = 16$

$x = 3$

The solution is $(3, -5)$.

18. $4x - 3y = 39 \rightarrow 4x - 3y = 39$

$7y = 4x - 79 \rightarrow \underline{-4x + 7y = -79}$

$4y = -40$

$y = -10$

$4x - 3(-10) = 39$

$x = \frac{9}{4}$

The solution is $\left(\frac{9}{4}, -10\right)$.

19. $x + y = -3 \rightarrow -5x - 5y = 15$

$5x + 7y = -9 \rightarrow \underline{5x + 7y = -9}$

$2y = 6$

$y = 3$

$x + 3 = -3$

$x = -6$

The solution is $(-6, 3)$.

20. $5x + 2y = -19 \rightarrow -10x - 4y = 38$

$10x - 7y = -16 \rightarrow \underline{10x - 7y = -16}$

$-11y = 22$

$y = -2$

$5x + 2(-2) = -19$

$x = -3$

The solution is $(-3, 2)$.

21. $8x - 3y = 61 \rightarrow 8x - 3y = 61$

$2x - 5y = -23 \rightarrow \underline{-8x + 20y = 92}$

$17y = 153$

$y = 9$

$2x - 5(9) = -23$

$x = 11$

The solution is $(11, 9)$.

22. $4x - 3y = -2 \rightarrow -12x + 9y = 6$

$6x + 4y = 31 \rightarrow \underline{12x + 8y = 62}$

$17y = 68$

$y = 4$

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

$x = \frac{5}{2}$

The solution is $\left(\frac{5}{2}, 4\right)$.

23. $5x - 2y = 53 \rightarrow 15x - 6y = 159$

$2x + 6y = 11 \rightarrow \underline{2x + 6y = 11}$

$17x = 170$

$x = 10$

$5(10) - 2y = 53$

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

The solutin is $\left(10, -\frac{3}{2}\right)$.

24. $15x - 8y = 6 \rightarrow -45x + 24y = -13$

$25x - 12y = 16 \rightarrow \underline{50x - 24y = 32}$

$5x = 14$

$x = \frac{14}{5}$

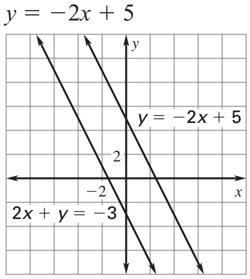
$15\left(\frac{14}{5}\right) - 8y = 6$

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

The solution is $\left(\frac{14}{5}, \frac{9}{2}\right)$.

25. $2x + y = -3 \rightarrow y = -2x - 3$

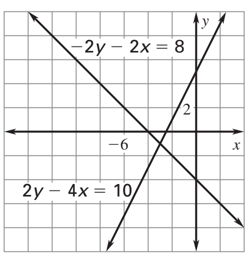
$y = -2x + 5$



The lines are parallel so this linear system has no solutions.

26. $2y - 4x = 10 \rightarrow y = 2x + 5$

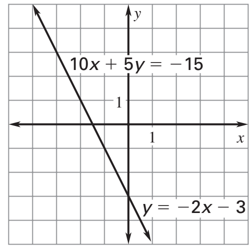
$-2y - 2x = 8 \rightarrow y = -x - 4$



The lines appear to intersect at the point $(-3, -1)$, so the linear system has one solution.

27. $10x + 5y = -15 \rightarrow y = -2x - 3$

$y = -2x - 3$



The equations represent the same line so the linear system has infinitely many solutions.

28. $y - 3x = 5$

$x = y - 5$

$y - 3(y - 5) = 5$

$y = 5$

$x = 5 - 5 = 0$

The solution is $(0, 5)$.

29. $2y - 3x = 36$

$y = 3x - 12$

$2(3x - 12) - 3x = 36$

$x = 20$

$y = 3(20) - 12 = 48$

The solution is $(20, 48)$.

30. $5x + 5y = -32 \rightarrow 15x + 15y = -96$

$3x + 3y = 14 \rightarrow \underline{-15x - 15y = -70}$

$0 = -166$

Only a false statement is left. This tells you the system has no solution.

31. $4x + 6y = 11$

$y = -\frac{2}{3}x + 7$

$4x + 6\left(-\frac{2}{3}x + 7\right) = 11$

$42 = 11$

Only a false statement remains. This tells you the system has no solution.

32. $3y - 3x = 12$

$y = x - 4$

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

$-12 = 12$

Only a false statement remains. This tells you the system has no solution.

33. $x + 2y = -30$

$y = \frac{1}{2}x + 15$

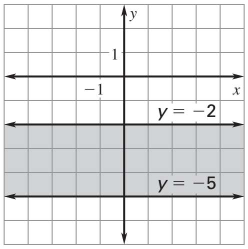
$x + 2\left(\frac{1}{2}x + 15\right) = -30$

$x = -30$

$y = \frac{1}{2}(-30) + 15 = 0$

The solution is $(-30, 0)$.

34.



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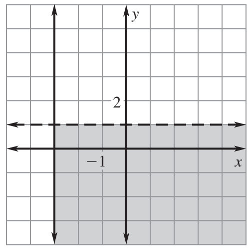

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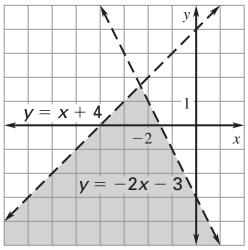

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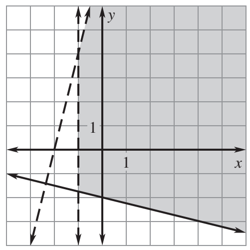

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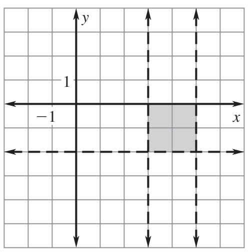

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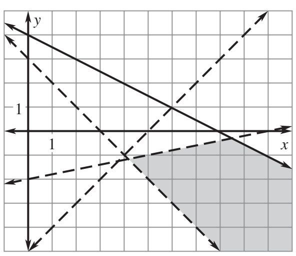


Chapter 8 (p. 945)

1. $5^3 \cdot 5^4 = 5^{3+4} = 5^7$

2. $6 \cdot 6^7 = 6^1 \cdot 6^7 = 6^{1+7} = 6^8$

3. $(-2)^3 \cdot (-2)^6 = (-2)^{3+6} = (-2)^9$

4. $(2^8)^2 = 2^{8 \cdot 2} = 2^{16}$

5. $[(-4)^3]^2 = (-4)^{3 \cdot 2} = (-4)^6$

6. $(8 \cdot 4)^5 = 8^5 \cdot 4^5 = (2^3)^5 \cdot (2^2)^5$

$= 2^{3 \cdot 5} \cdot 2^{2 \cdot 5} = 2^{15+10} = 2^{25}$

7. $m^5 \cdot m^2 = m^{5+2} = m^7$

8. $n^2 \cdot n^4 \cdot n^5 = n^{2+4+5} = n^{11}$

9. $(y^3)^5 = y^{3 \cdot 5} = y^{15}$

10. $(-2x)^3 = (-2)^3 \cdot x^3 = -8x^3$

11. $(3d^2)^3 \cdot 2d^2 = 3^3 \cdot (d^2)^3 \cdot 2d^2 = 27 \cdot d^6 \cdot 2d^2 = 54d^8$

12. $(-4s^2)^3(2s^3)^6 = (-4)^3 \cdot (s^2)^3 \cdot 2^6 \cdot (s^3)^6$

$= -64 \cdot s^6 \cdot 64 \cdot s^{18} = -4096s^{24}$

13. $\frac{8^7}{8^2} = 8^{7-2} = 8^5$

14. $\frac{4^6 \cdot 4^2}{4^3} = \frac{4^8}{4^3} = 4^{8-3} = 4^5$

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

16. $10^{12} \cdot \frac{1}{10^7} = \frac{10^{12}}{10^7} = 10^{12-7} = 10^5$

17. $7^9 \cdot \left(\frac{1}{7}\right)^4 = 7^9 \cdot \frac{1^4}{7^4} = \frac{7^9}{7^4} = 7^{9-4} = 7^5$

18. $\frac{1}{t^9} \cdot t^{13} = \frac{t^{13}}{t^9} = t^{13-9} = t^4$

19. $\left(\frac{p}{8}\right)^7 = \frac{p^7}{8^7}$

20. $\left(\frac{6x^9}{3y^4}\right)^2 = \frac{(6x^9)^2}{(3y^4)^2} = \frac{6^2 \cdot (x^9)^2}{3^2 \cdot (y^4)^2} = \frac{36x^{18}}{9y^8} = \frac{4x^{18}}{y^8}$

21. $\left(\frac{4y^5}{3}\right)^3 \cdot \frac{1}{y^6} = \frac{(4y^5)^3}{3^3} \cdot \frac{1}{y^6} = \frac{4^3(y^5)^3}{27} \cdot \frac{1}{y^6}$

$= \frac{64y^{15}}{27} \cdot \frac{1}{y^6} = \frac{64y^{15}}{27y^6} = \frac{64y^9}{27}$

22. $\left(\frac{2}{u^2}\right)^3 \cdot \left(\frac{3u^4}{z^2}\right)^4 = \frac{2^3}{(u^2)^3} \cdot \frac{(3u^4)^4}{(z^2)^4} = \frac{8}{u^6} \cdot \frac{3^4(u^4)^4}{z^8}$

$= \frac{8}{u^6} \cdot \frac{81u^{16}}{z^8} = \frac{8.81u^{16}}{u^6z^8} = \frac{648u^{10}}{z^8}$

23. $\left(\frac{5x^3y^4}{2x^2y}\right)^2 = \frac{(5x^3y^4)^2}{(2x^2y)^2} = \frac{5^2(x^3)^2(y^4)^2}{2^2(x^2)^2y^2} = \frac{25x^6y^8}{4x^4y^2} = \frac{25x^2y^6}{4}$

24. $\frac{6a^4b^5}{ab} \cdot \left(\frac{2ab}{a^2b^2}\right)^3 = 6a^3b^4 \cdot \left(\frac{2}{ab}\right)^3 = 6a^3b^4 \cdot \frac{2^3}{(ab)^3}$

$= 6a^3b^4 \cdot \frac{8}{a^3b^3} = \frac{48a^3b^4}{a^3b^3} = 48b$

25. $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

26. $(-5)^{-3} = \frac{1}{(-5)^3} = -\frac{1}{125}$

27. $7^0 = 1$

28. $4^{-5} \cdot 4^3 = 4^{-5+3} = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

29. $\left(\frac{1}{2}\right)^3 = \frac{1}{\left(\frac{1}{2}\right)^3} = \frac{1}{\frac{1}{8}} = 8$

30. $(3^{-2})^3 = 3^{-2 \cdot 3} = 3^{-6} = \frac{1}{3^6} = \frac{1}{729}$

31. $\frac{1}{2^{-5}} = 2^5 = 32$

32. $\frac{8^{-4}}{8^{-6}} = 8^{-4-(-6)} = 8^2 = 64$

33. $y^{-10} = \frac{1}{y^{10}}$

34. $(3c)^{-4} = \frac{1}{(3c)^4} = \frac{1}{3^4c^4} = \frac{1}{81c^4}$

35. $10b^{-3}c^5 = \frac{10c^5}{b^3}$

36. $(2d^5e^{-2})^{-3} = \frac{1}{(2d^5e^{-2})^3} = \frac{1}{2^3 \cdot (d^5)^3 \cdot (e^{-2})^3}$

$= \frac{1}{8d^{15}e^{-6}} = \frac{e^6}{8d^{15}}$

Extra Practice, *continued*

37. $\frac{x^{-4}}{y^{-5}} = \frac{y^5}{x^4}$

38. $\frac{1}{6t^{-5}u^3} = \frac{t^5}{6u^3}$

39. $\frac{3}{(-2z)^{-5}} = 3(-2z)^5 = 3 \cdot (-2)^5 z^5$

$= 3 \cdot (-32) \cdot z^5 = -96z^5$

40. $\frac{(2e)^{-4}g^5}{e^5 g^{-3}} = \frac{g^{5-(-3)}}{(2e)^4 e^5} = \frac{g^8}{2^4 \cdot e^4 \cdot e^5} = \frac{g^8}{16e^9}$

41. $0.87 = 8.7 \times 10^{-1}$

42. $378.4 = 3.784 \times 10^2$

43. $0.000359 = 3.59 \times 10^{-4}$

44. $465{,}000{,}000 = 4.65 \times 10^8$

45. $5.3 \times 10^5 = 530{,}000$

46. $1.67 \times 10^{-4} = 0.000167$

47. $8\ 10^{-6} = 0.000008$

48. $9.0001 \times 10^2 = 900.01$

49. $\frac{3 \times 10^2}{8 \times 10^6} = \frac{3}{8} \times \frac{10^2}{10^6}$

$= 0.375 \times 10^{-4}$

$= (3.75 \times 10^{-1}) \times 10^{-4}$

$= 3.75 \times (10^{-1} \cdot 10^{-4})$

$= 3.75 \times 10^{-5}$

50. $(8.5 \times 10^{10})(3.7 \times 10^{-5}) = (8.5 \cdot 3.7) \times (10^{10} \cdot 10^{-5})$

$= 31.45 \times 10^5$

$= (3.145 \times 10^1) \times 10^5$

$= 3.145 \times (10^1 \cdot 10^5)$

$= 3.145 \times 10^6$

51. $\frac{2.4 \times 10^{-5}}{6 \times 10^{-8}} = \frac{2.4}{6} \times \frac{10^{-5}}{10^{-8}}$

$= 0.4 \times 10^3$

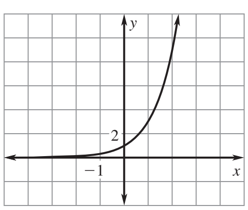
$= (4 \times 10^{-1}) \times 10^3$

$= 4 \times (10^{-1} \cdot 10^3)$

$= 4 \times 10^2$

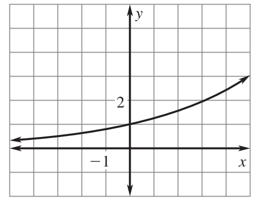
52. $y = 3^x$

x	−2	−1	0	1	2
y	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9



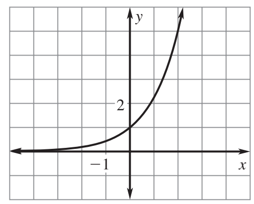
53. $y = 1.25^x$

x	−8	−4	0	4	8
y	0.17	0.41	1	2.44	5.96



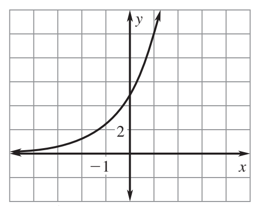
54. $y = \left(\frac{9}{4}\right)^x$

x	−2	−1	0	1	2
y	0.20	0.44	1	2.25	5.06



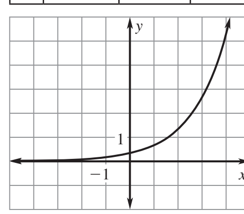
55. $y = 5 \cdot 2^x$

x	−2	−1	0	1	2
y	1.25	2.5	5	10	20



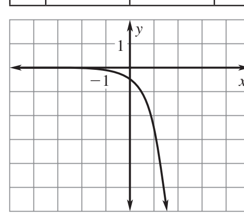
56. $y = \frac{1}{3} \cdot 2^x$

x	−2	−1	0	1	2
y	0.08	0.17	0.33	0.67	1.33



57. $y = -\frac{1}{2} \cdot 5^x$

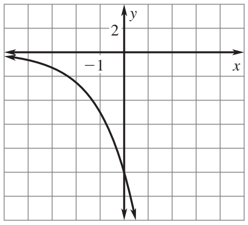
x	−2	−1	0	1	2
y	−0.02	−0.1	−0.5	−2.5	−12.5



Extra Practice, *continued*

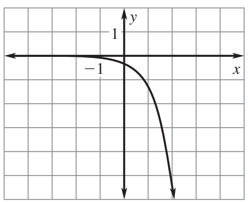
58. $y = -5 \cdot 2^x$

x	3	−2	−1	0	1
y	−0.63	−1.25	−2.5	−5	−10



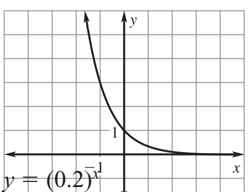
59. $y = -\frac{1}{3} \cdot 4^x$

x	−2	−1	0	1	2
y	−0.02	−0.08	−0.33	−1.33	−5.33



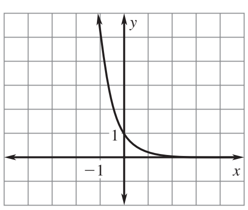
60. $y = \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	9	3	1	0.33	0.11



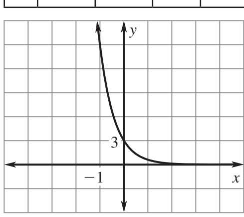
61. $y = (0.2)^x$

x	−2	−1	0	1	2
y	25	5	1	0.2	0.04



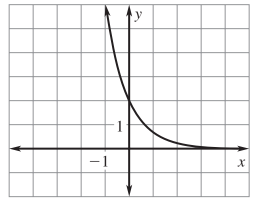
62. $y = 3 \cdot (0.2)^x$

x	−2	−1	0	1	2
y	75	15	3	0.6	0.12



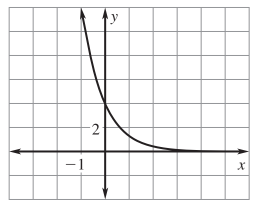
63. $y = 2 \cdot \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	18	6	2	0.67	0.22



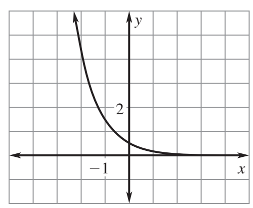
64. $y = 4 \cdot \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	36	12	4	1.33	0.44



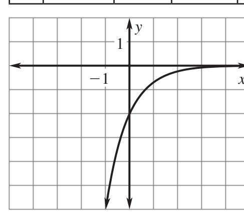
65. $y = \frac{1}{2} \cdot \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	4.5	1.5	0.5	0.17	0.06



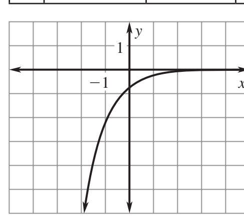
66. $y = -2 \cdot \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	−18	−6	−2	−0.66	−0.22



67. $y = -\frac{3}{4} \cdot \left(\frac{1}{3}\right)^x$

x	−2	−1	0	1	2
y	−6.75	−2.25	−0.75	−0.25	−0.08



68.

x	−1	0	1	2	3
y	$\frac{5}{2}$	5	10	20	40

×2 ×2 ×2 ×2

The y-value are multipled by 2 for each increase of 1 in x, so the table represents an exponential in the form $y = ab^x$ with $b = 2$.

The value when $x = 0$ is 5, so $a = 5$.

The table represents the exponential function $y = 5 \cdot 2^x$.

Chapter 9 (p. 946)

1. $(6x^2 + 7) + (x^2 - 9) = (6x^2 + x^2) + (7 - 9) = 7x^2 - 2$

2. $(8y^2 - 3y - 10) + (-11y^2 + 2y - 7)$
$= (8y^2 - 11y^2) + (-3y + 2y) + (-10 - 7)$
$= -3y^2 - y - 17$

3. $(10m^2 - 7m + 2) - (3m^2 - 2m + 5)$
$= 10m^2 - 7m + 2 - 3m^2 + 2m - 5$
$= (10m^2 - 3m^2) + (-7m + 2m) + (2 - 5)$
$= 7m^2 - 5m - 3$

4. $(2t^3 - 3t^2 + 5t) - (6t^3 + 3t^2 - 5t)$
$= 2t^3 - 3t^2 + 5t - 6t^3 - 3t^2 + 5t$
$= (2t^3 - 6t^3) + (-3t^2 - 3t^2) + (5t + 5t)$
$= -4t^3 - 6t^2 + 10t$

5. $(6b^3 + 12b^2 - b) - (15b^2 + 7b - 8)$
$= 6b^3 + 12b^2 - b - 15b^2 - 7b + 8$
$= 6b^3 + (12b^2 - 15b^2) + (-b - 7b) + 8$
$= 6b^3 - 3b^2 - 8b + 8$

6. $(r^2 - 8 + 4r^3 + 5r) - (7r^3 - 3r^2 + 5)$
$= 4r^3 + r^2 + 5r - 8 - 7r^3 + 3r^2 - 5$
$= (4r^3 - 7r^3) + (r^2 + 3r^2) + 5r + (-8 - 5)$
$= -3r^3 + 4r^2 + 5r - 13$

7. $5x^4(2x^3 - 3x^2 + 5x - 1)$
$= 5x^4(2x^3) - 5x^4(3x^2) + 5x^4(5x) - 5x^4(1)$
$= 10x^7 - 15x^6 + 25x^5 - 5x^4$

8. $(x^2 + 4x + 2)(x + 7)$
$= x^2(x + 7) + 4x(x + 7) + 2(x + 7)$
$= x^3 + 7x^2 + 4x^2 + 28x + 2x + 14$
$= x^3 + 11x^2 + 30x + 14$

9. $(2x + 3)(4x + 2)$
$= 2x(4x) + 2x(2) + 3(4x) + 3(2)$
$= 8x^2 + 4x + 12x + 6 = 8x^2 + 16x + 6$

10. $(2x^2 - 5x + 6)(3x - 2)$
$= 2x^2(3x - 2) - 5x(3x - 2) + 6(3x - 2)$
$= 6x^3 - 4x^2 - 15x^2 + 10x + 18x - 12$
$= 6x^3 - 19x^2 + 28x - 12$

11. $(3x - 7)(x + 5) = 3x(x) + 3x(5) - 7(x) - 7(5)$
$= 3x^2 + 15x - 7x - 35 = 3x^2 + 8x - 35$

12. $(9t - 2)(2t - 3) = 9t(2t) - 9t(3) - 2(2t) - 2(-3)$
$= 18t^2 - 27t - 4t + 6 = 18t^2 - 31t + 6$

13. $(x + 10)^2 = x^2 + 2(x)(10) + 10^2 = x^2 + 20x + 100$

14. $(m + 8)(m - 8) = m^2 - 8^2 = m^2 - 64$

15. $(4x - 2)(4x + 2) = (4x)^2 - 2^2 = 16x^2 - 4$

16. $(3x - 4y)(3x + 4y) = (3x)^2 - (4y)^2 = 9x^2 - 16y^2$

17. $(6 - 3t)(6 + 3t) = 6^2 - (3t)^2 = 36 - 9t^2$

18. $(-11x - 4y)^2 = (-11x)^2 + 2(-11x)(-4y) + (4y)^2$
$= 121x^2 + 88xy + 16y^2$

19. $(m + 8)(m - 2) = 0$
$m + 8 = 0$ or $m - 2 = 0$
$m = -8$ or $m = 2$
The solutions are −8 and 2.

20. $(2y - 6)(y + 3) = 0$
$2y - 6 = 0$ or $y + 3 = 0$
$y = 3$ or $y = -3$
The solutions are −3 and 3.

21. $(5y - 3)(2y - 4) = 0$
$5y - 3 = 0$ or $2y - 4 = 0$
$y = \frac{3}{5}$ or $y = 2$
The solutions are $\frac{3}{5}$ and 2.

22. $3b^2 + 9b = 0$
$3b(b + 3) = 0$
$3b = 0$ or $b + 3 = 0$
$b = 0$ or $b = -3$
The solutions are −3 and 0.

23. $-12m^2 - 3m = 0$
$-3m(4m + 1) = 0$
$-3m = 0$ or $4m + 1 = 0$
$m = 0$ or $m = -\frac{1}{4}$
The solutions are $-\frac{1}{4}$ and 0.

24. $14k^2 = 28k$
$14k^2 - 28k = 0$
$14k(k - 2) = 0$
$14k = 0$ or $k - 2 = 0$
$k = 0$ or $k = 2$
The solutions are 0 and 2.

25. $y^2 + 7y + 12$
Because b and c are both positive, the factors must both be positive.
Using an organized list, the factors 3 and 4 have a sum of 7, so they are the correct values.
$y^2 + 7y + 12 = (y + 3)(y + 4)$

26. $x^2 - 12x + 35$

Because b is negative and c is positive, both factors must be negative.

Using an aranged list, the factors -5 and -7 have a sum of -12, so they are the correct values.

$x^2 - 12x + 35 = (x - 5)(x - 7)$

27. $x^2 + 5x - 36$

Because c is negative, the factors have opposite signs.

Using an organized list, the factors 9 and -4 have a sum of 5, so they are the correct values.

$x^2 + 5x - 36 = (x + 9)(x - 4)$

28. $q^2 + 3q - 40$

Because c is negative, the factors have opposite signs.

Using an organized list, the factors 8 and -5 have a sum of 3, so they are the correct values.

$q^2 + 3q - 40 = (q + 8)(q - 5)$

29. $m^2 - 29m + 100$

Because b is positive and c is negative, the factors are both negative.

Using an organized list, the factors -25 and -4 have a sum of -29, so they are the correct values.

$m^2 - 29m + 100 = (m - 25)(m - 4)$

30. $y^2 + 14y - 72$

Because c is negative, the factors have opposite signs.

Using an organized list the factors 18 and -4 have a sum of 14, so they are the correct values.

$y^2 + 14y - 72 = (y + 18)(y - 4)$

31. $m^2 - 7m + 10 = 0$

$(m - 5)(m - 2) = 0$

$m - 5 = 0$ or $m - 2 = 0$

$m = 5$ or $m = 2$

The solutions are 2 and 5.

32. $p^2 - 7p = 18$

$p^2 - 7b - 18 = 0$

$(p - 9)(p + 2) = 0$

$p - 9 = 0$ or $p + 2 = 0$

$p = 9$ or $p = -2$

The solutions are -2 and 9.

33. $z^2 - 13z + 24 = -12$

$z^2 - 13z + 36 = 0$

$(z - 9)(z - 4) = 0$

$z - 9 = 0$ or $z - 4 = 0$

$z = 9$ or $z = 4$

The solutions are 4 and 9.

34. $n^2 + 8 = 6n$

$n^2 - 6n + 8 = 0$

$(n - 2)(n - 4) = 0$

$n - 2 = 0$ or $n - 4 = 0$

$n = 2$ or $n = 4$

The solutions are 2 and 4.

35. $r^2 - 15r = -8r - 10$

$r^2 - 7r + 10 = 0$

$(r - 5)(r - 2) = 0$

$r - 5 = 0$ or $r - 2 = 0$

$r = 5$ or $r = 2$

The solutions are 2 and 5.

36. $c^2 - 8 = -13c + 6$

$c^2 + 13c - 14 = 0$

$(c + 14)(c - 1) = 0$

$c + 14 = 0$ or $c - 1 = 0$

$c = -14$ or $c = 1$

The solutions are -14 and 1.

37. $-x^2 + 5x - 6 = -(x^2 - 5x + 6)$

Because b is negative and c is positive, both factors of c must be negative.

Using a table to find the correct factorization, $-x^2 + 5x - 6 = -(x - 2)(x - 3)$.

38. $3k^2 - 10k + 8$

Because b is negative and c is positive, both factors of c must be negative.

Using a table to find the correct factorization,

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

39. $4k^2 - 12k + 5$

Because b is negative and c is positive, both factors of c must be negative.

Using a table to find the correct factorization,

$4k^2 - 12k + 5 = (2k - 1)(2k - 5)$.

40. $6t^2 - 5t - 6$

Because c is negative, the factors of c have different signs.

Using a table to find the correct factorization, $6t^2 - 5t - 6 = (2t - 3)(3t + 2)$.

41. $-3s^2 - 7s - 2 = -(3s^2 + 7s + 2)$

Because b is positive and c is positive, both factors of c must be positive.

Using a table to find the correct factorization, $-3s^2 - 7s - 2 = -(s + 2)(3s + 1)$.

42. $2x^2 - 5x + 3$

Because b is negative and c is positive, both factors of c must be negative.

Using a table to find the correct factorization, $2v^2 - 5v + 3 = (v - 1)(2v - 3)$

43. $-3x^2 + 14x - 8 = 0$

$(-3x + 2)(x - 4) = 0$

$-3x + 2 = 0$ or $x - 4 = 0$

$x = \frac{2}{3}$ or $x = 4$

The solutions are $\frac{2}{3}$ and 4.

44. $8t^2 + 6t = 9$

$8t^2 + 6t - 9 = 0$

$(4t - 3)(2t + 3) = 0$

$4t - 3 = 0$ or $2t + 3 = 0$

$t = \frac{3}{4}$ or $t = -\frac{3}{2}$

The solutions are $-\frac{3}{2}$ and $\frac{3}{4}$.

45. $2x^2 + 3x - 2 = 0$

$(2x - 1)(x + 2) = 0$

$2x - 1 = 0$ or $x + 2 = 0$

$x = \frac{1}{2}$ or $x = -2$

The solutions are -2 and $\frac{1}{2}$.

46. $3p^2 - 28 = 17p$

$3p^2 - 17p - 28 = 0$

$(3p + 4)(p - 7) = 0$

$3p + 4 = 0$ or $p - 7 = 0$

$p = -\frac{4}{3}$ or $p = 7$

The solutions are $-\frac{4}{3}$ and 7.

47. $16m^2 - 1 = -15m$

$16m^2 + 15m - 1 = 0$

$(16m - 1)(m + 1) = 0$

$16m - 1 = 0$ or $m + 1 = 0$

$m = \frac{1}{16}$ or $m = -1$

The solutions are -1 and $\frac{1}{16}$.

48. $t(6t - 7) = 3$

$6t^2 - 7t = 3$

$6t^2 - 7t - 3 = 0$

$(3t + 1)(2t - 3) = 0$

$3t + 1 = 0$ or $2t - 3 = 0$

$t = -\frac{1}{3}$ or $t = \frac{3}{2}$

The solutions are $-\frac{1}{3}$ and $\frac{3}{2}$.

49. $y^2 - 36 = y^2 - 6^2 = (y + 6)(y - 6)$

50. $9y^2 - 49 = (3y)^2 - 7^2 = (3y + 7)(3y - 7)$

51. $12y^2 - 27 = 3(4y^2 - 9) = 3[(2y)^2 - 3^2]$

$= 3(2y + 3)(2y - 3)$

52. $x^2 - 8x + 16 = x^2 - 2(x \cdot 4) + 4^2 = (x - 4)^2$

53. $4x^2 - 12x + 9 = (2x)^2 - 2(2x \cdot 3) + 3^2 = (2x - 3)^2$

54. $27x^2 - 36x + 12 = 3(9x^2 - 12x + 4)$

$= 3[(3x)^2 - 2(3x \cdot 2) + 2^2] = 3(3x - 2)^2$

55. $g^2 + 10g + 25 = g^2 + 2(g \cdot 5) + 5^2 = (g + 5)^2$

56. $9b^2 + 24b + 16 = (3b)^2 + 2(3b \cdot 4) + 4^2 = (3b + 4)^2$

57. $4w^2 + 28w + 49 = (2w)^2 + 2(2w \cdot 7) + 7^2$

$= (2w + 7)^2$

58. $2x^2 + 8x + 6 = 2(x^2 + 4x + 3) = 2(x + 1)(x + 3)$

59. $3z^2 - 16z + 5 = (3z - 1)(z - 5)$

60. $5m^2 - 23m + 12 = (5m - 3)(m - 4)$

61. $3y^2 + 15y^2 + 2y + 10 = (3y^3 + 15y^2) + (2y + 10)$

$= 3y^2(y + 5) + 2(y + 5)$

$= (y + 5)(3y^2 + 2)$

62. $30z^3 - 14z^2 - 8z = 2z(15z^2 - 7z - 4)$

$= 2z(3z + 1)(5z - 4)$

63. $98m^3 - 18\text{m} = 2m(49m^2 - 9)$

$= 2m[(7m)^2 - 3^2]$

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

64. $8h^2k - 32k = 8k(h^2 - 4)$

$= 8k(h^2 - 2^2)$

$= 8k(h + 2)(h - 2)$

65. $2h^3 - 3h^2 - 18h + 27 = (2h^3 - 3h^2) + (-18h + 27)$

$= h^2(2h - 3) - 9(2h - 3)$

$= (2h - 3)(h^2 - 9)$

$= (2h - 3)(h + 3)(h - 3)$

66. $-12z^3 + 12z^2 - 3z = -3z(4z^2 - 4z + 1)$

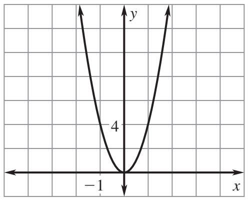
$= -3z[(2z)^2 - 2(2z \cdot 1) + 1^2]$

$= -3z(2z - 1)^2$

Chapter 10 (p. 947)

1. $y = 4x^2$

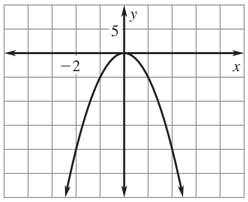
x	−2	−1	0	1	2
y	16	4	0	4	16



Both graphs open up and have the same vertex (0, 0) and the same axis of symmetry, $x = 0$. The graph of $y = 4x^2$ is narrower than the graph $y = x^2$ because the graph of $y = 4x^2$ is a vertical stretch by a factor of 4 of the graph of $y = x^2$.

2. $y = -5x^2$

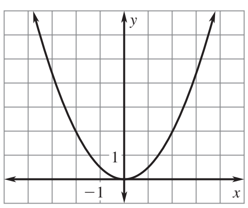
x	-2	-1	0	1	2
y	-20	-5	0	-5	-20



Both graphs have the same vertex (0, 0), and the same axis of symmetry, $x = 0$. However, the graph of $y = -5x^2$ is narrower than the graph of $y = x^2$ and it opens down. This is because the graph of $y = -5x^2$ is a vertical stretch by a factor of 5 with a reflection in the x-axis of the graph of $y = x^2$.

3. $y = \frac{1}{2}x^2$

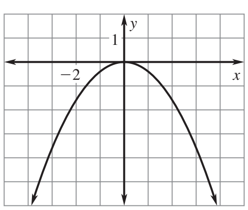
x	-4	-2	0	2	4
y	8	2	0	2	8



Both graphs open up and have the same vertex, (0, 0) and the same axis of symmetry $x = 0$. The graph of $y = \frac{1}{2}x^2$ is wider than the graph of $y = x^2$ because it is a vertical stretch by a factor of $\frac{1}{2}$ of the graph of $y = x^2$.

4. $y = -\frac{2}{5}x^2$

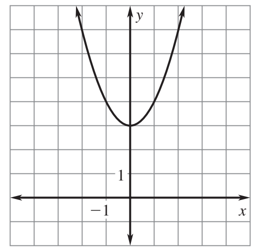
x	-3	-1	0	1	3
y	$-\frac{18}{5}$	$-\frac{2}{5}$	0	$-\frac{2}{5}$	$-\frac{18}{5}$



Both graphs have the same vertex (0, 0), and the same axis of symmetry, $x = 0$. The graph of $y = -\frac{2}{5}x^2$ opens down. Also, the graph of $y = -\frac{2}{3}x^2$ is a reflection in the x-axis of the graph of $y = x^2$ and it is wider because it is a vertical shrink by a factor of $\frac{2}{5}$ of the graph of $y = x^2$.

5. $y = x^2 + 3$

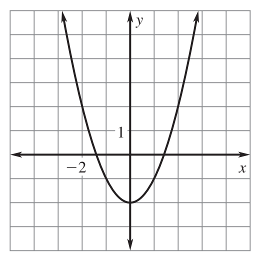
x	-2	-1	0	1	2
y	7	4	3	4	7



Both graphs open up and have the same axis of symmetry, $x = 0$. However, the vertex of the graph of $y = x^2$, (0, 3), is different than the vertex of the graph of $y = x^2$, (0, 0), because the graph of $y = x^2 + 3$ is a vertical translation 3 units up of the graph of $y = x^2$.

6. $y = x^2 - 2$

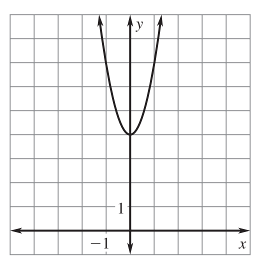
x	-2	-1	0	1	2
y	2	-1	-2	-1	2



Both graphs open up and have the same axis of symmetry, $x = 0$. However, the vertex of the graph of $y = x^2 - 2$, (0, −2) is different than the vertex of the graph of $y = x^2$, (0, 0), because the graph of $y = x^2 - 2$ is a vertical translation 2 units down of the graph of $y = x^2$.

7. $y = 3x^2 + 4$

x	-2	-1	0	1	2
y	16	7	4	7	16

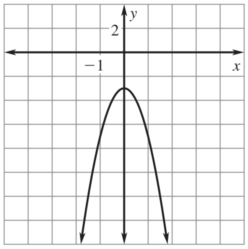


Both graphs open up and have the same axis of symmetry, $x = 0$. However the graph of $y = 3x^2 + 4$ is narrower and has a higher vertex than the graph of $y = x^2$ because the graph fo $y = 3x^2 + 4$ is a vertical stretch by a factor of 3 and a vertical translation 4 units up of the graph of $y = x^2$.

Extra Practice, *continued*

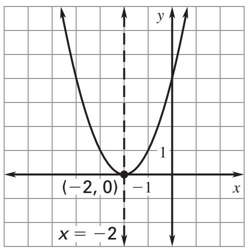
8. $y = -4x^2 - 3$

x	-2	-1	0	1	2
y	-19	-7	-3	-7	-19



The graph of $y = -4x^2 + 3$ is a vertical stretch by a factor of 4 with a vertical translation 3 units down and a reflection in the x-axis of the graph of $y = x^2$.

9.



$y = x^2 + 4x + 4$

Because $a > 0$, the parabola opens up.

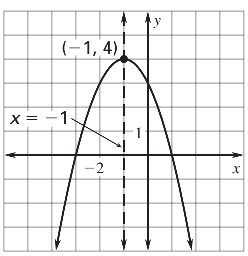
Axis of symmetry: $x = \frac{-b}{2a} = \frac{-4}{2(1)} = -2$

x-coordinate of vertex: -2

y-coordinate of vertex: $y = (-2)^2 + 4(-2) + 4 = 0$

So, the vertex is $(-2, 0)$.

10.



$y = -x^2 - 2x + 3$

Because $a < 0$, the parabola opens down.

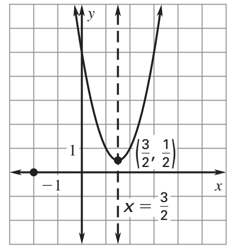
Axis of symmetry: $x = \frac{-b}{2a} = -\frac{-2}{2(-1)} = -1$

x-coordinate of vertex: -1

y-coordinate of vertex: $y = -(-1)^2 - 2(-1) + 3 = 4$

So, the vertex is $(-1, 4)$.

11.



$y = 2x^2 - 6x + 5$

Because $a > 0$, the parabola opens up.

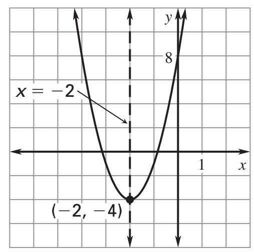
Axis of symmetry: $x = -\frac{b}{2a} = -\frac{-6}{2(2)} = \frac{3}{2}$

x-coordinate of vertex: $\frac{3}{2}$

y-coordinate of vertex: $y = 2\left(\frac{3}{2}\right)^2 - 6\left(\frac{3}{2}\right) + 5 = \frac{1}{2}$

So, the vertex is $\left(\frac{3}{2}, \frac{1}{2}\right)$.

12.



$y = 3x^2 + 12x + 8$

Because $a > 0$, the parabola opens up.

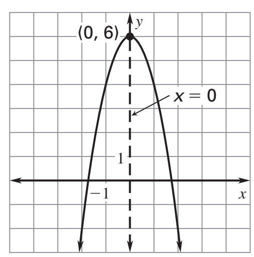
Axis of symmetry: $x = \frac{-b}{2a} = -\frac{12}{2(3)} = -2$

x-coordinate of vertex: -2

y-coordinate of vertex: $y = 3(-2)^2 + 12(-2) + 8 = -4$

So, the vertex is $(-2, -4)$.

13.



$y = -2x^2 + 6$

Because $a < 0$, the parabola opens down.

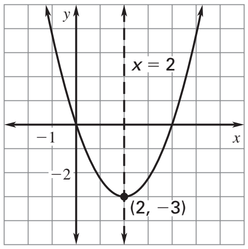
Axis of symmetry: $x = \frac{-b}{2a} = -\frac{0}{2(-2)} = 0$

x-coordinate of vertex: 0

y-coordinate of vertex: $y = -2(0)^2 + 6 = 6$

So, the vertex is $(0, 6)$.

14.



$y = \frac{3}{4}x^2 - 3x$

Because $a > 0$, the parabola opens up.

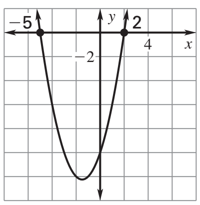
Axis of symmetry: $x = \frac{-b}{2a} = -\frac{-3}{2\left(\frac{3}{4}\right)} = 2$

x-coordinate of vertex: 2

y-coordinate of vertex: $y = \frac{3}{4}(2)^2 - 3(2) = -3$

So, the vertex is $(2, -3)$.

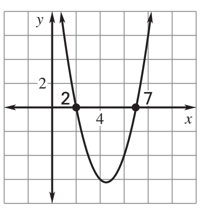
15.



$x^2 + 3x - 10 = 0$

The x-intercepts of the function $y = x^2 - 3x - 10$ are -5 and 2. So, the solutions are -5 and 2.

16.

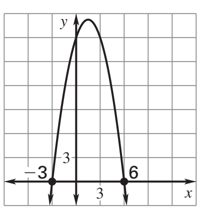


$x^2 + 14 = 9x$

$x^2 - 9x + 14 = 0$

The x-intercepts of the function $y = x^2 - 19x + 14$ are 2 and 7. So, the solutions are 2 and 7.

17.

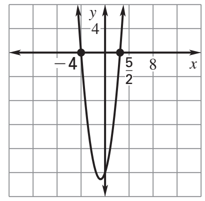


$-x^2 + 3x = -18$

$-x^2 + 3x + 18 = 0$

The x-intercepts of the function $y = -x^2 + 3x + 18$ are -3 and 6. So, the solutions are -3 and 6.

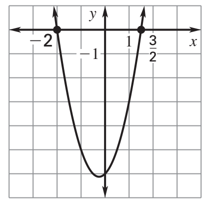
18.



$2x^2 + 3x - 20 = 0$

The x-intercepts of the function $y = 2x^2 + 3x - 20$ are -4 and $\frac{5}{2}$. So, the solutions are -4 and $\frac{5}{2}$.

19.

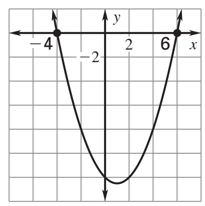


$2x^2 + x = 6$

$2x^2 + x - 6 = 0$

The x-intercepts of the function $y = 2x^2 + x - 6$ are -2 and $\frac{3}{2}$. So, the solutions are -2 and $\frac{3}{2}$.

20.



$\frac{1}{2}x^2 - x = 12$

$\frac{1}{2}x^2 - x - 12 = 0$

The x-intercepts of the function $y = \frac{1}{2}x^2 - x - 12$ are -4 and 6. So, the solutions are -4 and 6.

21. $2x^2 - 20 = 78$

$2x^2 = 98$

$x^2 = 49$

$x = \pm\sqrt{49} = \pm 7$

The solutions are -7 and 7.

22. $3y^2 + 16 = 4$

$3y^2 = -12$

$y^2 = -4$

Negative real numbers do not have real square roots. So, there is no solution.

23. $16y^2 - 6 = 3$

$16y^2 = 9$

$y^2 = \frac{9}{16}$

$y = \pm\sqrt{\frac{9}{16}} = \pm\frac{3}{4}$

The solutions are $-\frac{3}{4}$ and $\frac{3}{4}$.

24. $48 - x^2 = -52$

$-x^2 = -100$

$x^2 = 100$

$x = \pm\sqrt{100} = \pm 10$

The solutions are -10 and 10.

25. $5m^2 - 5 = 10$

$5m^2 = 15$

$m^2 = 3$

$m = \pm\sqrt{3} = \pm 1.73$

The solutions are -1.73 and 1.73.

26. $2 - 5t^2 = 4$

$-5t^2 = 2$

$t^2 = -\frac{2}{5}$

Negative real numbers do not have real square roots. So, there is no solution.

27. $x^2 + 4x - 21 = 0$

$x^2 + 4x = 21$

$x^2 + 4x + 2^2 = 21 + 2^2$

$(x + 2)^2 = 25$

$x + 2 = \pm\sqrt{25}$

$x = -2 \pm 5$

The solutions are $-2 - 5 = -7$ and $-2 + 5 = 3$.

28. $g^2 - 10g = 24$

$g^2 - 10g + 5^2 = 24 + 5^2$

$(g - 5)^2 = 49$

$g - 5 = \pm\sqrt{49}$

$g = 5 \pm 7$

The solutions are $5 - 7 = -2$ and $5 + 7 = 12$.

29. $w^2 - 7w + 6 = 0$

$w^2 - 7w = -6$

$w^2 - 7w + \left(\frac{7}{2}\right)^2 = -6 + \left(\frac{7}{2}\right)^2$

$\left(w - \frac{7}{2}\right)^2 = \frac{25}{4}$

$w - \frac{7}{2} = \pm\sqrt{\frac{25}{4}}$

$w = \frac{7}{2} \pm \frac{5}{2}$

The solutions are $\frac{7}{2} - \frac{5}{2} = 1$ and $\frac{7}{2} + \frac{5}{2} = 6$.

30. $y^2 - \frac{3}{4} = \frac{1}{4}$

$y^2 - \frac{3}{4} + \left(\frac{3}{8}\right)^2 = \frac{1}{4} + \left(\frac{3}{8}\right)^2$

$\left(y - \frac{3}{8}\right)^2 = \frac{25}{64}$

$y - \frac{3}{8} = \pm\sqrt{\frac{25}{64}}$

$y = \frac{3}{8} \pm \frac{5}{8}$

The solutions are $\frac{3}{8} - \frac{5}{8} = -\frac{1}{4}$ and $\frac{3}{8} + \frac{5}{8} = 1$.

31. $x^2 - 6x + 3 = 0$

$x^2 - 6x = -3$

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

$(x - 3)^2 = 6$

$x - 3 = \pm\sqrt{6}$

$x = 3 \pm \sqrt{6}$

The solutions are $3 - \sqrt{6} \approx 0.55$ and $3 + \sqrt{6} \approx 5.45$.

32. $4m^2 + 8m - 7 = 0$

$4m^2 + 8m = 7$

$m^2 + 2m = 1.75$

$m^2 + 2m + 1^2 = 1.75 + 1^2$

$(m + 1)^2 = 2.75$

$m + 1 = \pm\sqrt{2.75}$

$m = -1 \pm \sqrt{2.75}$

The solutions are $-1 - \sqrt{2.75} \approx -2.66$ and $-1 + \sqrt{2.75} \approx 0.66$.

33. $h^2 + 6h - 72 = 0$

$h = \frac{-6 \pm \sqrt{6^2 - 4(1)(-72)}}{2(1)} = \frac{-6 \pm \sqrt{324}}{2} = \frac{-6 \pm 18}{2}$

The solutions are $\frac{-6 - 18}{2} = -12$ and $\frac{-6 + 18}{2} = 6$.

34. $3x^2 - 7x + 2 = 0$

$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(3)(2)}}{2(3)} = \frac{7 \pm \sqrt{25}}{6} = \frac{7 \pm 5}{6}$

The solutions are $\frac{7 - 5}{6} \approx 0.33$ and $\frac{7 + 5}{6} = 2$.

35. $2k^2 - 5k + 2 = 0$

$k = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(2)}}{2(2)} = \frac{5 \pm \sqrt{9}}{4} = \frac{5 \pm 3}{4}$

The solutions are $\frac{5 - 3}{4} = 0.5$ and $\frac{5 + 3}{4} = 2$.

36. $n^2 + 1 = 5n$

$n^2 - 5n + 1 = 0$

$n = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(1)}}{2(1)} = \frac{5 \pm \sqrt{21}}{2}$

The solutions are $\frac{5 - \sqrt{21}}{2} \approx 0.21$ and $\frac{5 + \sqrt{21}}{2} \approx 4.79$.

37. $2z + 4 = 3z^2$

$-3z^2 + 2z + 4 = 0$

$z = \frac{-2 \pm \sqrt{2^2 - 4(-3)(4)}}{2(-3)} = \frac{-2 \pm \sqrt{52}}{-6}$

The solutions are $\frac{-2 - \sqrt{52}}{-6} \approx 1.54$ and $\frac{-2 + \sqrt{52}}{-6} \approx -0.87$.

38. $5x^2 - 4x = 2$

$5x^2 - 4x - 2 = 0$

$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-2)}}{2(5)} = \frac{4 \pm \sqrt{56}}{10}$

The solutions are $\frac{4 - \sqrt{56}}{10} \approx -0.35$ and $\frac{4 + \sqrt{56}}{10} \approx 1.15$.

39. $m^2 - 2m + 1 = 0$

$b^2 - 4ac = (-2)^2 - 4(1)(1) = 0$

The discriminant is zero, so the equation has 1 solution.

40. $3x^2 + 6x + 2 = 0$

$b^2 - 4ac = 6^2 - 4(3)(2) = 12$

The discriminant is positive, so the equation has the two solutions.

41. $2q^2 + 3q + 5 = 0$

$b^2 - 4ac = 3^2 - 4(2)(5) = -31$

The discriminant is negative, so the equation has no solution.

42. $\frac{3}{4}x^2 - x + 2 = 0$

$b^2 - 4ac = (-1)^2 - 4\left(\frac{3}{4}\right)(2) = -5$

The discriminant is negative, so the equation has no solution.

43. $2w^2 - 5w + 6 = 8$

$2w^2 - 5w - 2 = 0$

$b^2 - 4ac = (-5)^2 - 4(2)(-2) = 41$

The discriminant is positive, so the equation has two solutions.

44. $2y^2 + 10y - 5 = 3y^2 - 30$

$-y^2 + 10y + 25 = 0$

$b^2 - 4ac = 10^2 - 4(-1)(25) = 200$

The discriminat is positive, so the equation has two solutions.

45.

x	−1	0	1	2	3
y	3	0	3	12	27

First differences: −3 3 9 15

Second differences: 6 6 6

The table of values represents a quadratic function because the second differences are equal. The equation has the form $y = ax^2$.

Use (1, 3): $y = ax^2$

$3 = a(1)2$

$3 = a$

The equation is $y = 3x^2$.

46.

x	0	1	2	3	4
y	−5	−2	1	4	7

First differences: 3 3 3 3

The table of values represents a linear function because the first differences are equal. The equation has the form $y = mx + b$. The common difference is 3, so the slope of the line is 3. When $x = 0$, $y = -5$ so the y-intercept is -5. The equation is $y = 3x - 5$.

47.

x	1	2	3	4	5
y	1	2	4	8	16

Ratios: 2 2 2 2

The table of values represents an exponential function because the ratios between successive y-values are equal. The equation has the form $y = ab^x$. The value of y increases by a factor of 2, so $b = 2$.

Use (1, 1): $y = ab^x$

$1 = a(2)^1$

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

The equation is $y = \frac{1}{2} \cdot 2^x$.

48.

x	−2	−1	0	1	2
y	18	14	10	6	2

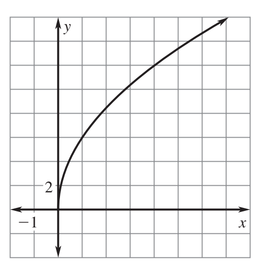
First differences: −4 −4 −4 −4

The table of values represents a linear function because the first differences are equal. The equation has the form $y = mx + b$. The common difference is −4, so the slope of the line is −4. When $x = 0$, $y = 10$ so the y-intercept is 10. The equation is $y = -4x + 10$.

Chapter 11 (p. 948)

1. $y = 6\sqrt{x}$

x	0	1	2	3	4
y	0	6	8.5	10.4	12

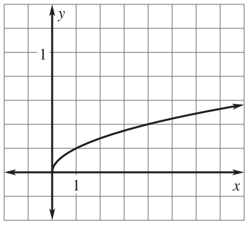


The domain is $x \geq 0$ and the range is $y \geq 0$. The graph of $y = 6\sqrt{x}$ is a vertical stretch by a factor of 6 of the graph of $y = \sqrt{x}$.

Extra Practice, *continued*

2. $y = \frac{1}{5}\sqrt{x}$

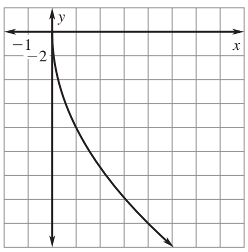
x	0	2	4	6	8
y	0	0.28	0.40	0.49	0.57



The domain is $x \geq 0$ and the range is $y \geq 0$. The graph of $y = \frac{1}{5}\sqrt{x}$ is a vertical shrink by a factor of $\frac{1}{5}$ of the graph of $y = \sqrt{x}$.

3. $y = -8\sqrt{x}$

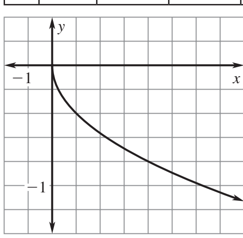
x	0	1	2	3	4
y	0	-8	-11.3	-13.9	-16



The domain is $x \geq 0$ and the range is $y \leq 0$. The graph of $y = -8\sqrt{x}$ is a vertical stretch by a factor of 8 with a reflection in the x-axis of the graph of $y = \sqrt{x}$.

4. $y = -\frac{2}{5}\sqrt{x}$

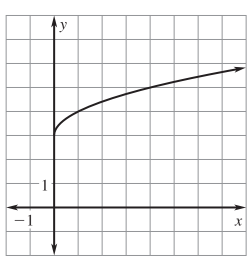
x	0	1	2	3	4
y	0	-0.4	-0.6	-0.7	-0.8



The domain of the function is $x \geq 0$ and the range is $y \leq 0$. The graph of $y = -\frac{2}{5}\sqrt{x}$ is a vertical shrink by a factor of $\frac{2}{5}$ with a reflection in the x-axis of the graph of $y = \sqrt{x}$.

5. $y = \sqrt{x} + 3$

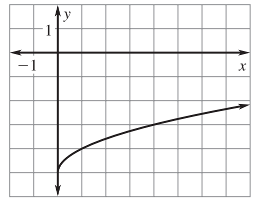
x	0	1	2	3	4
y	3	4	4.4	4.7	5



The domain of the function is $x \geq 0$ and the range is $y \geq 3$. The graph of $y = \sqrt{x} + 3$ is a vertical translation 3 units up of the graph of $y = \sqrt{x}$.

6. $y = \sqrt{x} - 5$

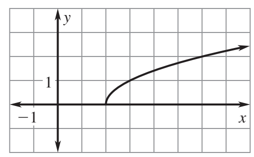
x	0	1	2	3	4
y	-5	-4	-3.6	-3.3	-3



The domain of the function is $x \geq 0$ and the range is $y \geq -5$. The graph of $y = \sqrt{x} - 5$ is a vertical translation 5 units down of the grpah of $y = \sqrt{x}$.

7. $y = \sqrt{x - 2}$

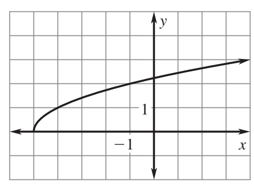
x	2	3	4	5	6
y	0	1	1.4	1.7	2



The domain of the function is $x \geq 2$ and the range is $y \geq 0$. The graph of $y = \sqrt{x - 2}$ is a horizontal translation 2 units right of the graph of $y = \sqrt{x}$.

8. $y = \sqrt{x + 5}$

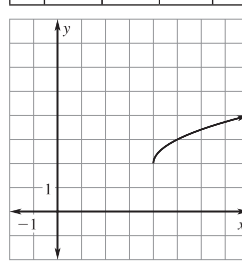
x	-5	-4	-3	-2	-1
y	0	1	1.4	1.7	2



The domain of the function is $x \geq -5$ and the range is $y \geq 0$. The graph of $y = \sqrt{x + 5}$ is a horizontal translation 5 units left of the graph of $y = \sqrt{x}$.

9. $y = \sqrt{x - 4} + 2$

x	4	5	6	7	8
y	2	3	3.4	3.7	4



The domain of the function is $x \geq 4$ and the range is $y \geq 2$. The graph of $y = \sqrt{x-4} + 2$ is a horizontal translation 4 units right and a vertical translation 2 units up of the graph of $y = \sqrt{x}$.

10. $\sqrt{98} = \sqrt{49 \cdot 2} = \sqrt{49} \cdot \sqrt{2} = 7\sqrt{2}$

11. $\sqrt{300} = \sqrt{100 \cdot 3} = \sqrt{100} \cdot \sqrt{3} = 10\sqrt{3}$

12. $\sqrt{128x^3} = \sqrt{64 \cdot 2 \cdot x^2 \cdot x}$

$= \sqrt{64} \cdot \sqrt{2} \cdot \sqrt{x^2} \cdot \sqrt{x} = 8x\sqrt{2x}$

13. $\sqrt{17} \cdot \sqrt{17} = \sqrt{17 \cdot 17} = \sqrt{289} = 17$

14. $\sqrt{112} \cdot \sqrt{63} = \sqrt{112 \cdot 63} = \sqrt{7056} = 84$

15. $\sqrt{11g} \cdot 5\sqrt{g} = 5\sqrt{11g \cdot g} = 5\sqrt{11g^2}$

$= 5\sqrt{11} \cdot \sqrt{g^2} = 5g\sqrt{11}$

16. $4m\sqrt{m} \cdot \sqrt{5m} = 4m\sqrt{m \cdot 5m} = 4m\sqrt{5m^2}$

$= 4m \cdot \sqrt{5} \cdot \sqrt{m^2} = 4m^2\sqrt{5}$

17. $\sqrt{27x^5} \cdot \sqrt{48x} = \sqrt{27x^5 \cdot 48x}$

$= \sqrt{1296x^6} = \sqrt{1296} \cdot \sqrt{x^6} = 36x^3$

18. $\sqrt{\frac{19}{49}} = \frac{\sqrt{19}}{\sqrt{49}} = \frac{\sqrt{19}}{7}$

19. $\frac{\sqrt{1}}{6x^2} = \frac{\sqrt{1}}{\sqrt{6x^2}} = \frac{1}{\sqrt{6x}} = \frac{1}{\sqrt{6x}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{6}}{\sqrt{36x}} = \frac{\sqrt{6}}{6x}$

20. $\frac{3}{\sqrt{5}} = \frac{3}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{\sqrt{25}} = \frac{3\sqrt{5}}{5}$

21. $\frac{\sqrt{7}}{\sqrt{8k}} = \frac{\sqrt{7}}{\sqrt{8k}} \cdot \frac{\sqrt{8k}}{\sqrt{8k}} = \frac{\sqrt{56k}}{\sqrt{64k^2}} = \frac{\sqrt{4} \cdot \sqrt{14k}}{\sqrt{64} \cdot \sqrt{k^2}} = \frac{2\sqrt{14k}}{8k} = \frac{\sqrt{14k}}{4k}$

22. $\sqrt{\frac{5}{27}} = \frac{\sqrt{5}}{\sqrt{27}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{15}}{\sqrt{81}} = \frac{\sqrt{15}}{9}$

23. $2\sqrt{3} + \sqrt{7} + \sqrt{3} = 2\sqrt{3} + \sqrt{3} + \sqrt{7}$

$= (2 + 1)\sqrt{3} + \sqrt{7} = 3\sqrt{3} + \sqrt{7}$

24. $2\sqrt{11} + \sqrt{99} = 2\sqrt{11} + \sqrt{9} \cdot \sqrt{11} = 2\sqrt{11} + 3\sqrt{11}$

$= (2 + 3)\sqrt{11} = 5\sqrt{11}$

25. $\sqrt{45} + 3\sqrt{20} = \sqrt{9 \cdot 5} + 3\sqrt{4 \cdot 5}$

$= \sqrt{9} \cdot \sqrt{5} + 3 \cdot \sqrt{4} \cdot \sqrt{5} = 3\sqrt{5} + 6\sqrt{5}$

$= (3 + 6)\sqrt{5} = 9\sqrt{5}$

26. $\sqrt{3}(12 - \sqrt{15}) = 12\sqrt{3} - \sqrt{3} \cdot \sqrt{15} = 12\sqrt{3} - \sqrt{45}$

$= 12\sqrt{3} - \sqrt{9} \cdot \sqrt{5} = 12\sqrt{3} - 3\sqrt{5}$

27. $3\sqrt{6}(4\sqrt{6} - \sqrt{600}) = 12\sqrt{36} - 3\sqrt{3600}$

$= 12 \cdot 6 - 3 \cdot 60$

$= 72 - 180 = -108$

28. $(6 - \sqrt{7})(6 - \sqrt{7}) = 6^2 - 6\sqrt{7} - 6\sqrt{7} + (\sqrt{7})^2$

$= 36 - 12\sqrt{7} + 7$

$= 43 - 12\sqrt{7}$

29. $(4 - \sqrt{13})(10 + \sqrt{13})$

$= 4(10) + 4\sqrt{13} - 10\sqrt{13} - (\sqrt{13})^2$

$= 40 - 6\sqrt{13} - 13$

$= 27 - 6\sqrt{13}$

30. $6\sqrt{x} - 30 = 0$

$6\sqrt{x} = 30$

$\sqrt{x} = 5$

$(\sqrt{x})^2 = 5^2$

$x = 25$

Check:

$6\sqrt{x} - 30 = 0$

$6\sqrt{25} - 30 \stackrel{?}{=} 0$

$0 = 0$ ✓

The solutioin is 25.

31. $\sqrt{8x} + 5 = 13$

$\sqrt{8x} = 8$

$(\sqrt{8x})^2 = 8^2$

$8x = 64$

$x = 8$

Check:

$\sqrt{8x} + 5 = 13$

$\sqrt{8 \cdot 8} + 5 \stackrel{?}{=} 13$

$13 = 13$ ✓

The solution is 8.

32. $\sqrt{x+3} + 5 = 16$

$\sqrt{x+3} = 11$

$(\sqrt{x+3})^2 = 11^2$

$x + 3 = 121$

$x = 118$

The solution is 118.

Check:

$\sqrt{x+3} + 5 = 16$

$\sqrt{118+3} + 5 \stackrel{?}{=} 16$

$16 = 16$ ✓

33. $3\sqrt{4x+1} - 2 = 25$

$3\sqrt{4x+1} = 27$

$\sqrt{4x+1} = 9$

$(\sqrt{4x+1})^2 = 9^2$

$4x + 1 = 81$

$4x = 80$

$x = 20$

The solution is 20.

Check:

$3\sqrt{4x+1} - 2 = 25$

$3\sqrt{4 \cdot 20 + 1} - 2 \stackrel{?}{=} 25$

$25 = 25$ ✓

34. $\sqrt{3x-12} = \sqrt{5x-26}$

$(\sqrt{3x-12})^2 = (\sqrt{5x-26})^2$

$3x - 12 = 5x - 26$

$-12 = 2x - 26$

$14 = 2x$

$7 = x$

The solution is 7.

Check:

$\sqrt{3x-12} = \sqrt{5x-26}$

$\sqrt{3 \cdot 7 - 12} \stackrel{?}{=} \sqrt{5 \cdot 7 - 26}$

$3 = 3$ ✓

35. $\sqrt{2x+10} - \sqrt{x+7} = 0$

$\sqrt{2x+10} = \sqrt{x+7}$

$(\sqrt{2x+10})^2 = (\sqrt{x+7})^2$

$2x + 10 = x + 7$

$x + 10 = 7$

$x = -3$

The solution is -3.

Check:

$\sqrt{2x+10} - \sqrt{x+7} = 0$

$\sqrt{2 \cdot (-3) + 10} - \sqrt{-3+7} \stackrel{?}{=} 0$

$0 = 0$ ✓

36. $\sqrt{\frac{1}{2}x + 10} - \sqrt{2x - 8} = 0$

$$\sqrt{\frac{1}{2}x + 10} = \sqrt{2x - 8}$$

$$\left(\sqrt{\frac{1}{2}x + 10}\right)^2 = \left(\sqrt{2x - 8}\right)^2$$

$$\frac{1}{2}x + 10 = 2x - 8$$

$$10 = \frac{3}{2}x - 8$$

$$18 = \frac{3}{2}x$$

$$12 = x$$

The solution is 12.

Check:

$$\sqrt{\frac{1}{2}x + 10} - \sqrt{2x - 8} = 0$$

$$\sqrt{\frac{1}{2}(12) + 10} - \sqrt{2(12) - 8} \stackrel{?}{=} 0$$

$$0 = 0 ✓$$

37. $x = \sqrt{11x - 10}$

$$x^2 = \left(\sqrt{11x - 10}\right)^2$$

$$x^2 = 11x - 10$$

$$x^2 - 11x + 10 = 0$$

$$(x - 10)(x - 1) = 0$$

$x - 10 = 0$ or $x - 1 = 0$

$x = 10$ or $x = 1$

Check:

If $x = 10$: $x = \sqrt{11x - 10}$

$10 \stackrel{?}{=} \sqrt{11 \cdot 10 - 10}$

$10 = 10$ ✓

If $x = 1$

$x = \sqrt{11x - 10}$

$1 \stackrel{?}{=} \sqrt{11 \cdot 1 - 10}$

$1 = 1$ ✓

Both 10 and 1 check in the original equation. The solutions are 1 and 10.

38. $x = \sqrt{20 - x}$

$$x^2 = \left(\sqrt{20 - x}\right)^2$$

$$x^2 = 20 - x$$

$$x^2 + x - 20 = 0$$

$$(x + 5)(x - 4) = 0$$

$x + 5 = 0$ or $x - 4 = 0$

$x = -5$ or $x = 4$

Check:

If $x = -5$:

$x = \sqrt{20 - x}$

$-5 \stackrel{?}{=} \sqrt{20 - (-5)}$

$-5 \neq 5$ ✗

If $x = 4$:

$x = \sqrt{20 - x}$

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

$4 = 4$ ✓

Because -5 is an extraneous solution, the only solution is 4.

39. $5x = \sqrt{20x - 3}$

$$(5x)^2 = \left(\sqrt{20x - 3}\right)^2$$

$$5x^2 = 20x - 3$$

$$5x^2 - 20x + 3 = 0$$

$$(5x - 1)(5x - 3) = 0$$

$5x - 1 = 0$ or $5x - 3 = 0$

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

Check:

If $x = \frac{1}{5}$:

$5x = \sqrt{20x - 3}$

$5\left(\frac{1}{5}\right) \stackrel{?}{=} \sqrt{20\left(\frac{1}{5}\right) - 3}$

$1 = 1$ ✓

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

$5x = \sqrt{20x - 3}$

$5\left(\frac{3}{5}\right) \stackrel{?}{=} \sqrt{20\left(\frac{3}{5}\right) - 3}$

$3 = 3$ ✓

Both $\frac{1}{5}$ and $\frac{3}{5}$ check in the original equation. The solutions are $\frac{1}{5}$ and $\frac{3}{5}$.

40. $\sqrt{-4x + 5} = 3x$

$$\left(\sqrt{-4x + 5}\right) = (3x)^2$$

$$-4x + 5 = 9x^2$$

$$0 = 9x^2 + 4x - 5$$

$$0 = (9x - 5)(x + 1)$$

$9x - 5 = 0$ or $x + 1 = 0$

$x = \frac{5}{9}$ or $x = -1$

Check:

If $x = \frac{5}{9}$:

$\sqrt{-4x + 5} = 3x$

$\sqrt{-4\left(\frac{5}{9}\right) + 5} \stackrel{?}{=} 3\left(\frac{5}{9}\right)$

$\frac{5}{3} = \frac{5}{3}$ ✓

If $x = -1$:

$\sqrt{-4x + 5} = 3x$

$\sqrt{-4(-1) + 5} \stackrel{?}{=} 3(-1)$

$1 \neq -3$ ✗

Because -1 is an extraneous solution, the only solution is $\frac{5}{9}$.

41. $x + 1 = \sqrt{6 - 2x}$

$$(x + 1)^2 = \left(\sqrt{6 - 2x}\right)^2$$

$$x^2 + 2x + 1 = 6 - 2x$$

$$x^2 + 4x - 5 = 0$$

$$(x + 5)(x - 1) = 0$$

$x + 5 = 0$ or $x - 1 = 0$

$x = -5$ $x = 1$

Check:

If $x = -5$:

$x + 1 = \sqrt{6 - 2x}$

$-5 + 1 \stackrel{?}{=} \sqrt{6 - 2(-5)}$

$-4 \neq 4$ ✗

If $x = 1$:

$x + 1 = \sqrt{6 - 2x}$

$1 + 1 \stackrel{?}{=} \sqrt{6 - 2(1)}$

$2 = 2$ ✓

Because -5 is an extraneous solution, the only solution is 1.

42. Let $a = 6$ and $b = 8$.

$a^2 + b^2 = c^2$

$6^2 + 8^2 = c^2$

$36 + 64 = c^2$

$100 = c^2$

$10 = c$

The hypotenuse length c is 10.

43. Let $a = 10$ and $c = 26$.

$a^2 + b^2 = c^2$

$10^2 + b^2 = 26^2$

$100 + b^2 = 676$

$b^2 = 576$

$b = 24$

The side length b is 24.

44. Let $b = 40$ and $c = 41$.

$a^2 + b^2 = c^2$

$a^2 + 40^2 = 41^2$

$a^2 + 1600 = 1681$

$a^2 = 81$

$a = 9$

The side length a is 9.

45. Let $a = 2$ and $c = 5$.

$a^2 + b^2 = c^2$

$2^2 + b^2 = 5^2$

$4 + b^2 = 25$

$b^2 = 21$

$b = \sqrt{21}$

The side length b is $\sqrt{21}$.

46. Let $a = 4$ and $b = 7$.

$a^2 + b^2 = c^2$

$4^2 + 7^2 = c^2$

$16 + 49 = c^2$

$65 = c^2$

$\sqrt{65} = c$

The hypotenuse length c is $\sqrt{65}$.

47. Let $b = 8$ and $c = 11$.

$a^2 + b^2 = c^2$

$a^2 + 8^2 = 11^2$

$a^2 + 64 = 121$

$a^2 = 57$

$a = \sqrt{57}$

The side length a is $\sqrt{57}$.

48. Let $a = 10$, $b = 24$, and $c = 26$.

$a^2 + b^2 = c^2$

$10^2 + 24^2 \stackrel{?}{=} 26^2$

$100 + 576 \stackrel{?}{=} 676$

$676 = 676$

The triangle is a right triangle.

49. Let $a = 2$, $b = 4$, and $c = 6$.

$a^2 + b^2 = c^2$

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

$4 + 16 \stackrel{?}{=} 36$

$20 \neq 36$

The triangle is not a right angle.

50. Let $a = 14$, $b = 15$, and $c = 21$.

$a^2 + b^2 = c^2$

$14^2 + 15^2 \stackrel{?}{=} 21^2$

$196 + 225 \stackrel{?}{=} 441$

$421 \neq 441$

The triangle is not a right triangle.

51. Let $a = 16$, $b = 30$, and $c = 34$.

$a^2 + b^2 = c^2$

$16^2 + 30^2 \stackrel{?}{=} 34^2$

$256 + 900 \stackrel{?}{=} 1156$

$1156 = 1156$

The triangle is a right triangle.

52. Let $a = 1.4$, $b = 4.8$, and $c = 5$.

$a^2 + b^2 = c^2$

$1.4^2 + 4.8^2 \stackrel{?}{=} 5^2$

$1.96 + 23.04 \stackrel{?}{=} 25$

$25 = 25$

The triangle is a right triangle.

53. Let $a = 13$, $b = 84$, and $c = 95$

$a^2 + b^2 = c^2$

$13^2 + 84^2 \stackrel{?}{=} 95^2$

$169 + 7056 \stackrel{?}{>} 9025$

$7225 \neq 9025$

The triangle is not a right triangle.

54. Let $(x_1, y_1) = (5, 10)$ and $(x_2, y_2) = (2, 6)$.

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(2 - 5)^2 + (6 - 10)^2}$

$= \sqrt{(-3)^2 + (-4)^2} = \sqrt{25} = 5$

The distance between the points is 5 units.

55. Let $(x_1, y_1) = (2, 8)$ and $(x_2, y_2) = (y, -4)$.

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(7 - 2)^2 + (-4 - 8)^2}$

$= \sqrt{5^2 + (-12)^2}$

$= \sqrt{169} = 13$

The distance between the points is 13 units.

56. Let $(x_1, y_1) = (3, -3)$ and $(x_2, y_2) = (4, 1)$.

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4 - 3)^2 + (1 - (-3))^2}$

$= \sqrt{1^2 + 4^2} = \sqrt{17}$

The distance between the points is $\sqrt{17}$ units.

57. Let $(x_1, y_1) = (6, 1.5)$ and $(x_2, y_2) = (2.5, -4)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(2.5 - 6)^2 + (-4 - 1.5)^2}$$
$$= \sqrt{(-3.5)^2 + (-5.5)^2} = \sqrt{42.5}$$

The distance between the points is $\sqrt{42.5}$ units.

58. Let $(x_1, y_1) = \left(1, \frac{2}{5}\right)$ and $(x_2, y_2) = \left(\frac{1}{2}, -\frac{4}{5}\right)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{\left(\frac{1}{2} - 1\right)^2 + \left(-\frac{4}{5} - \frac{2}{5}\right)^2}$$
$$= \sqrt{\left(\frac{1}{2}\right)^2 + \left(-\frac{6}{5}\right)^2} = \sqrt{1.69} = 1.3$$

The distance between the points is 1.3 units.

59. Let $(x_1, y_1) = \left(-\frac{3}{8}, 1\right)$ and $(x_2, y_2) = \left(\frac{5}{8}, \frac{1}{2}\right)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{\left(\frac{5}{8} - \left(-\frac{3}{8}\right)\right)^2 + \left(\frac{1}{2} - 1\right)^2}$$
$$= \sqrt{1 + \left(\frac{1}{2}\right)^2}$$
$$= \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{2}$$

The distance between the points is $\frac{\sqrt{5}}{2}$ units.

60. Let $(x_1, y_1) = (6, -2)$ and $(x_2, y_2) = (8, -6)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{6 + 8}{2}, \frac{-2 + (-6)}{2}\right) = (7, -4)$$

The midpoint of the line segment is $(7, -4)$.

61. Let $(x_1, y_1) = (0, -5)$ and $(x_2, y_2) = (-4, 8)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{0 + (-4)}{2}, \frac{-5 + 8}{2}\right) = (-2, 1.5)$$

The midpoint of the line segment is $(-2, 1.5)$.

62. Let $(x_1, y_1) = (0, -6)$ and $(x_2, y_2) = (0, 2)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{0 + 0}{2}, \frac{-6 + 2}{2}\right) = (0, -2)$$

The midpoint of the line segment is $(0, -2)$.

63. Let $(x_1, y_1) = (10, 0)$ and $(x_2, y_2) = (-8, 0)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{10 + (-8)}{2}, \frac{0 + 0}{2}\right) = (1, 0)$$

The midpoint of the line segment is $(1, 0)$.

64. Let $(x_1, y_1) = (-5, -3)$ and $(x_2, y_2) = (-8, -7)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-5 + (-8)}{2}, \frac{-3 + (-7)}{2}\right)$$
$$= (-6.5, -5)$$

The midpoint of the line segment is $(-6.5, -5)$.

65. Let $(x_1, y_1) = \left(5, -\frac{1}{2}\right)$ and $(x_2, y_2) = \left(8, -\frac{5}{2}\right)$.

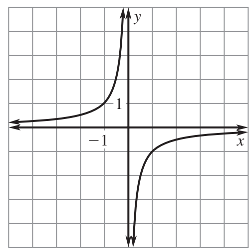
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{5 + 8}{2}, \frac{-\frac{1}{2} + \left(-\frac{5}{2}\right)}{2}\right) = \left(\frac{13}{2}, -\frac{3}{2}\right)$$

Chapter 12 (p. 949)

1. $y = \frac{-1}{x}$

x	y
−4	0.25
−2	0.5
−1	1
0	Undefined
1	−1
2	−0.5
4	−0.25

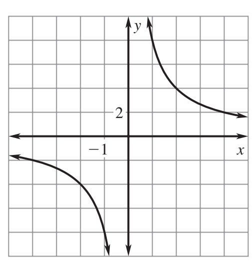
x	y
−10	0.1
−5	0.2
−0.5	2
−0.4	2.5
0.4	−2.5
0.5	−2
5	−0.2
10	−0.1



2. $y = \frac{8}{x}$

x	y
−4	−2
−2	−4
−1	−8
0	Undefined
1	8
2	4
4	2

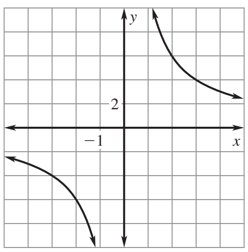
x	y
−10	−0.8
−5	−1.6
−0.5	−16
−0.4	−20
0.4	20
0.5	16
5	1.6
10	0.8



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

x	y
-6	-2
-4	-3
-2	-6
0	Undefined
2	6
4	3
6	2

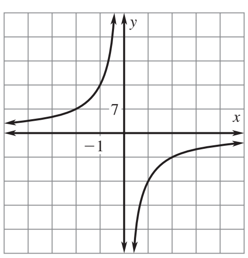
x	y
-10	-1.2
-1	-12
-0.5	-24
-0.4	-30
0.4	30
0.5	24
1	12
10	1.2



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

x	y
-4	3.5
-2	7
-1	14
0	Undefined
1	-14
2	-7
4	-3.5

x	y
-10	1.4
-5	2.8
-0.5	28
-0.4	35
0.4	-35
0.5	-28
5	-2.8
10	-1.4



5. $y = 4$ when $x = 3$.

$y = \frac{a}{x}$

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

$12 = a$

An equation that relates x and y is $y = \frac{12}{x}$.

When $x = 2$, $y = \frac{12}{2} = 6$.

6. $y = 5$ when $x = -2$.

$y = \frac{a}{x}$

$5 = \frac{a}{-2}$

$-10 = a$

An equation that relates x and y is $y = -\frac{10}{x}$.

When $x = 2$, $y = -\frac{10}{2} = -5$.

7. $y = -15$ when $x = -4$.

$y = \frac{a}{x}$

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

$60 = a$

An equation that relates x and y is $y = \frac{60}{x}$.

When $x = 2$, $y = \frac{60}{2} = 30$.

8. $y = -6$ when $x = 8$.

$y = \frac{a}{x}$

$-6 = \frac{a}{8}$

$-48 = a$

An equation that relates x and y is $y = \frac{-48}{x}$.

When $x = 2$, $y = \frac{-48}{2} = -24$.

9. $y = -7$ when $x = -7$.

$y = \frac{a}{x}$

$-7 = \frac{a}{-7}$

$49 = a$

An equation that relates x and y is $y = \frac{49}{x}$.

When $x = 2$, $y = \frac{49}{2} = -24.5$.

10. $y = 11$ when $x = -11$.

$y = \frac{a}{x}$

$11 = \frac{a}{-11}$

$-121 = a$

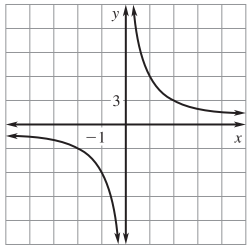
An equation that relates x and y is $y = \frac{-121}{x}$.

When $x = 2$, $y = \frac{-121}{2} = -60.5$.

Extra Practice, *continued*

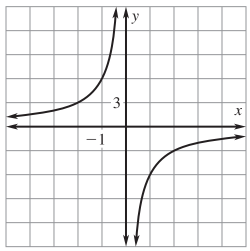
11. $y = \frac{6}{x}$

x	y
−4	−1.5
−2	−3
−1	−6
0	Undefined
1	6
2	3
4	1.5



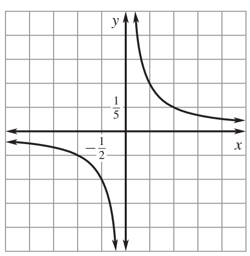
12. $y = \frac{-6}{x}$

x	t
−4	1.5
−2	3
−1	6
0	Undefined
1	−6
2	−3
4	−1.5



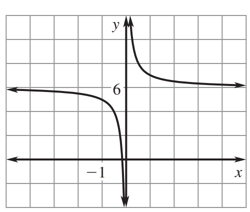
13. $y = \frac{1}{5x}$

x	y
−3	−0.07
−1	−0.2
−0.5	−0.4
0	Undefined
0.5	0.4
1	0.2
3	0.07



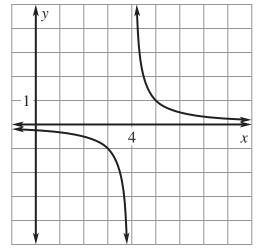
14. $y = \frac{1}{x} + 6$

x	y
−2	5.5
−1	5
−0.5	4
0	Undefined
0.5	8
1	7
2	6.5



15. $y = \frac{1}{x - 4}$

x	y
1	−0.33
2	−0.5
3.5	−2
4	Undefined
4.5	2
6	0.5
7	0.33

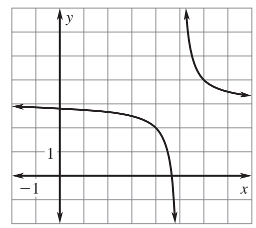


16. $y = \frac{1}{x - 5} + 3$

Vertical asymptote is $x = 5$.

The horizontal asymptote is $y = 3$.

x	y
3	2.5
4	2
4.5	1
5	Undefined
5.5	5
6	4
7	3.5

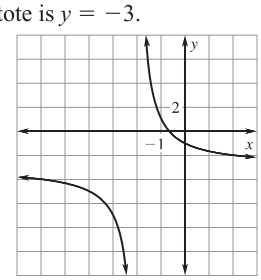


17. $y = \frac{4}{x + 2} - 3$

Vertical asymptote is $x = -2$.

The horizontal asymptote is $y = -3$.

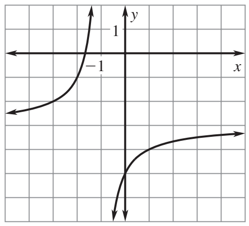
x	y
−5	−4.3
−4	−5
−3	−7
−2	Undefined
−1	1
0	−1
1	−1.7



18. $y = \frac{-2}{x + 1} - 3$

The vertical asymptote is $x = -1$. The horizontal asymptote is $y = -3$.

x	*y*
-4	-2.3
-3	-2
-2	-1
-1	Undefined
0	-5
1	-4
2	-3.7



19. $(30x^4 - 12x^3 + 6x^2) \div (-6x) = \frac{30x^4 - 12x^3 + 6x^2}{-6x}$

$= \frac{30x^4}{-6x} - \frac{12x^3}{-6x} + \frac{6x^2}{-6x}$

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

20.
$$\begin{array}{r}
3y + 3 \\
3y - 2\overline{)9y^2 + 3y - 6} \\
\underline{9y^2 - 6y} \\
9y - 6 \\
\underline{9y - 6} \\
0
\end{array}$$

$(9y^2 + 3y - 6) \div (3y - 2) = 3y + 3$

21.
$$\begin{array}{r}
3v - 4 \\
v + 2\overline{)3v^2 + 2v + 12} \\
\underline{3v^2 + 6v} \\
-4v + 12 \\
\underline{-4v - 8} \\
20
\end{array}$$

$(3v^2 + 2v + 12) \div (v + 2) = 3v - 4 + \frac{20}{v + 2}$

22.
$$\begin{array}{r}
2w - 7 \\
4w + 2\overline{)8w^2 - 24w - 11} \\
\underline{8w^2 + 4w} \\
-28w - 11 \\
\underline{-28w - 14} \\
3
\end{array}$$

$(-24w - 11 + 8w^2) \div (2 + 4w) = 2w - 7 + \frac{3}{4w + 2}$

23.
$$\begin{array}{r}
3m + 4 \\
3m - 4\overline{)9m^2 + 0m - 6} \\
\underline{9m^2 - 12m} \\
12m - 6 \\
\underline{12m - 16} \\
10
\end{array}$$

$(9m^2 - 6) \div (3m - 4) = 3m + 4 + \frac{10}{3m - 4}$

24. $(-2 + 25n^2) \div (2 + 5n)$
$$\begin{array}{r}
5n - 2 \\
5n + 2\overline{)25n^2 + 0n - 2} \\
\underline{25n^2 + 10n} \\
-10n - 2 \\
\underline{-10n - 4} \\
2
\end{array}$$

$(-2 + 25n^2) \div (2 + 5n) = 5n - 2 + \frac{2}{5n + 2}$

25. $\frac{44x^3}{24x} = \frac{4x \cdot 11x^2}{4x \cdot 6} = \frac{11x^2}{6}$

The excluded value is 0.

26. $\frac{3y + 6}{y + 2} = \frac{3 \cdot (y + 2)}{y + 2} = 3$

The excluded value is -2.

27. $\frac{3a - 15}{4a - 20} = \frac{3(a - 5)}{4(a - 5)} = \frac{3}{4}$

The excluded value is 5.

28. $\frac{2b - 8}{4 - b} = \frac{2(b - 4)}{-1(b - 4)} = -2$

The excluded value is 4.

29. $\frac{r^2 - 2r - 15}{r^2 + r - 6} = \frac{(r - 5)(r + 3)}{(r - 2)(r + 3)} = \frac{r - 5}{r - 2}$

The excluded values are -3 and 2.

30. $\frac{s + 3}{2s^2 + 3s - 9} = \frac{s + 3}{(2s - 3)(s + 3)} = \frac{1}{2s - 3}$

The excluded values are -3 and $\frac{3}{2}$.

31. $\frac{2m^2 + 8m - 24}{3m^3 + 24m^2 + 36m} = \frac{2(m - 2)(m + 6)}{3m(m + 2)(m + 6)}$

$= \frac{2(m - 2)(m + 6)}{3m(m + 2)(m + 6)} = \frac{2(m - 2)}{3m(m + 2)}$

The excluded values are -6 and -2, and 0.

32. $\frac{6n^3 - 18n^2}{3n^3 - 27n} = \frac{6n^2(n - 3)}{3n(n - 3)(n + 3)}$

$= \frac{6n \cdot n(n - 3)}{3n(n - 3)(n + 3)} = \frac{2n}{n + 3}$

The excluded values are -3, 0, and 3.

33. $\frac{x^2 + 3x - 10}{2x - 4} \cdot \frac{5x}{x^2 + 2x - 15} = \frac{(x^2 + 3x - 10)(5x)}{(2x - 4)(x^2 + 2x - 15)}$

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

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

34. $\frac{2y^6}{6y^3 + 8y^2} \cdot (3y + 4) = \frac{2y^6(3y + 4)}{6y^3 + 8y^2}$

$= \frac{2y^2 \cdot y^4(3y + 4)}{2y^2(3y + 4)} = y^4$

35. $\frac{3r^2 - 12}{r - 2} \div \frac{2r^2 + 7r + 6}{2r^2 - r - 6} = \frac{3r^2 - 12}{r - 2} \cdot \frac{2r^2 - r - 6}{2r^2 + 7r + 6}$

$= \frac{(3r^2 - 12)(2r^2 - r - 6)}{(r - 2)(2r^2 + 7r + 6)}$

$= \frac{3(r + 2)(r - 2)(2r + 3)(r - 2)}{(r - 2)(2r + 3)(r + 2)}$

$= 3r - 6$

36. $\frac{3s^2 + 11s + 10}{s + 2} \div (-3s^2 + s + 10)$

$= \frac{3s^2 + 11s + 10}{s + 2} \cdot \frac{1}{-(3s^2 - s - 10)}$

$= \frac{3s^2 + 11s + 10}{-(s + 2)(3s^2 - s - 10)}$

$= \frac{(3s + 5)(s + 2)}{-(s + 2)(3s + 5)(s - 2)} = -\frac{1}{s - 2}$

37. $\frac{8}{5t} + \frac{3}{2t^2} = \frac{8 \cdot 2t}{5t \cdot 2t} + \frac{3 \cdot 5}{2t^2 \cdot 5} = \frac{16t}{10t^2} + \frac{15}{10t^2} = \frac{16t + 15}{10t^2}$

38. $\frac{3}{u + 2} + \frac{4}{2u + 1} = \frac{3 \cdot (2u + 1)}{(u + 2)(2u + 1)} + \frac{4 \cdot (u + 2)}{(2u + 1)(u + 2)}$

$= \frac{6u + 3}{(2u + 1)(u + 2)} + \frac{4u + 8}{(2u + 1)(u + 2)}$

$= \frac{(6u + 3) + (4u + 8)}{(2u + 1)(u + 2)} = \frac{10u + 11}{(2u + 1)(u + 2)}$

39. $\frac{3}{c^2 - 9} - \frac{2}{2c^2 - 3c - 9} = \frac{3}{(c - 3)(c + 3)} - \frac{2}{(2c + 3)(c - 3)}$

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

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

40. $\frac{k + 4}{k^2 + 4k + 4} - \frac{k - 4}{k^2 - k - 6}$

$= \frac{k + 4}{(k + 2)(k + 2)} - \frac{k - 4}{(k - 3)(k + 2)}$

$= \frac{(k + 4)(k - 3)}{(k + 2)(k + 2)(k - 3)} - \frac{(k - 4)(k + 2)}{(k - 3)(k + 2)(k + 2)}$

$= \frac{(k + 4)(k - 3) - (k - 4)(k + 2)}{(k + 2)^2(k - 3)}$

$= \frac{k^2 + k - 12 - (k^2 - 2k - 8)}{(k + 2)^2(k - 3)}$

$= \frac{3k - 4}{(k + 2)^2(k - 3)}$

41. $\frac{2}{x + 2} = \frac{x - 5}{9}$

$18 = x^2 - 3x - 10$

$0 = x^2 - 3x - 28$

$0 = (x + 4)(x - 7)$

$x + 4 = 0$ or $x - 7 = 0$

$x = -4$ or $x = 7$

The solutions are -4 and 7.

Check:

If $x = -4$: $\frac{2}{-4 + 2} \stackrel{?}{=} \frac{-4 - 5}{9}$, $1 = 1$ ✓

If $x = 7$: $\frac{2}{7 + 2} \stackrel{?}{=} \frac{7 - 5}{7}$, $\frac{2}{9} = \frac{2}{9}$ ✓

42. $\frac{y}{y - 1} + \frac{1}{4} = \frac{6}{y - 1}$

$\frac{y}{y - 1} \cdot 4(y - 1) + \frac{1}{4} \cdot 4(y - 1) = \frac{6}{y - 1} \cdot 4(y - 1)$

$\frac{4y(y - 1)}{y - 1} + \frac{4(y - 1)}{4} = \frac{24(y - 1)}{y - 1}$

$4y + y - 1 = 24$

$5y - 1 = 24$

$5y = 25$

$y = 5$ ✓

The solution is 5.

Check:

If $y = 5$:

$\frac{5}{5 - 1} + \frac{1}{4} \stackrel{?}{=} \frac{6}{5 - 1}$

$\frac{6}{4} = \frac{6}{4}$ ✓

43. $\frac{z}{z + 3} + 2 = \frac{5}{z - 1}$

$\frac{z}{z + 3} \cdot (z + 3)(z - 1) + 2(z + 3)(z - 1)$

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

$\frac{z(z + 3)(z - 1)}{z + 3} + 2(z + 3)(z - 1) = \frac{5(z + 3)(z - 1)}{z - 1}$

$z^2 - z + 2z^2 + 4z - 6 = 5z + 15$

$3z^2 - 2z - 21 = 0$

$(3z + 7)(z - 3) = 0$

$3z + 7 = 0$ or $z - 3 = 0$

$z = -\frac{7}{3}$ or $z = 3$

Check: If $z = -\frac{7}{3}$: $\frac{-\frac{7}{3}}{-\frac{7}{3} + 3} + 2 \stackrel{?}{=} \frac{5}{\frac{-7}{3} - 1}$, $-\frac{3}{2} = -\frac{3}{2}$ ✓

If $z = 3$: $\frac{3}{3 + 3} + 2 \stackrel{?}{=} \frac{5}{3 - 1}$, $\frac{5}{2} = \frac{5}{2}$ ✓

The solutions are $-\frac{7}{3}$ and 3.

44. $\frac{1}{w+5} - \frac{2}{w+3} = \frac{6}{w^2+5w+6}$

Multiply each side by LCD $(w+2)(w+3)(w+5)$ and divide out common factors.

$$(w+2)(w+3) - 2(w+2)(w+5) = 6(w+5)$$
$$w^2 + 5w + 6 - 2w^2 - 14w - 20 = 6w + 30$$
$$-w^2 - 15w - 44 = 0$$
$$-(w+11)(w+4) = 0$$

$w + 11 = 0$ or $w + 4 = 0$

$w = -11$ or $w = -4$

Check: If $w = -11$:

$$\frac{1}{-11+5} - \frac{2}{-11+3} \stackrel{?}{=} \frac{6}{(-11)^2 + 5(-11) + 6}$$
$$\frac{1}{24} = \frac{1}{24} \checkmark$$

If $w = -4$:

$$\frac{1}{-4+5} - \frac{2}{-4+3} = \frac{6}{(-4)^2 + 5(-4) + 6}$$
$$3 = 3 \checkmark$$

The solutions are -11 and -4.

45. $\frac{3}{h+4} - 4 = \frac{6}{h^2+h-12}$

$$\frac{3}{h+4} - 4 = \frac{6}{(h+4)(h-3)}$$
$$\frac{3}{h+4} \cdot (h+4)(h-3) - 4 \cdot (h+4)(h-3)$$
$$= \frac{6}{(h+4)(h-3)} \cdot (h+4)(h-3)$$
$$\frac{3(h+4)(h-3)}{h+4} - 4(h+4)(h-3) = \frac{6(h+4)(h-3)}{(h+4)(h-3)}$$
$$3h - 9 - 4h^2 - 4h + 48 = 6$$
$$-4h^2 - h + 33 = 0$$
$$-(4h - 11)(h+3) = 0$$

$4h - 11 = 0$ or $h + 3 = 0$

$h = \frac{11}{4}$ or $h = -3$

The solutions are -3 and $\frac{11}{4}$.

Check: if $h = \frac{11}{4}$:

$$\frac{3}{\frac{11}{4}+4} - 4 \stackrel{?}{=} \frac{6}{\left(\frac{11}{4}\right)^2 + \frac{11}{4} - 12}$$
$$-\frac{32}{9} = -\frac{32}{9} \checkmark$$

If $h = -3$:

$$\frac{3}{-3+4} - 4 \stackrel{?}{=} \frac{6}{(-3)^2 + (-3) - 12}$$
$$-1 = -1 \checkmark$$

46. $\frac{2}{a+2} - \frac{5}{a+2} = \frac{4}{a^2+4a+4}$

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

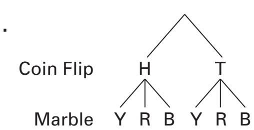
The solution is $-\frac{10}{3}$.

Check: If $x = -\frac{10}{3}$:

$$\frac{2}{-\frac{10}{3}+2} - \frac{5}{-\frac{10}{3}+2} \stackrel{?}{=} \frac{4}{\left(-\frac{10}{3}\right)^2 + 4\left(-\frac{10}{3}\right) + 4}$$
$$\frac{9}{4} = \frac{9}{4} \checkmark$$

Chapter 13 (p. 950)

1.



There are 6 possible outcomes in the sample space. They are below:

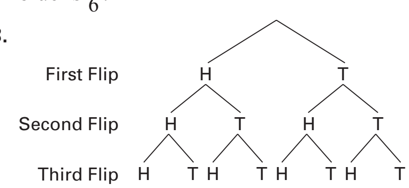
heads, yellow; heads, red; heads, blue; tails, yellow; tails, red; tails blue.

2. $P(\text{tails and blue}) = \frac{\text{ways coin shows tails and the marble is blue}}{\text{total combinations}}$

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

The probability the coin shows tails and the marble is blue is $\frac{1}{6}$.

3.



Odds against 2 heads and 1 tail

$= \frac{\text{Number of unfavorable outcomes}}{\text{Number of favorable outcomes}} = \frac{5}{3}$ or 5:3.

The odds against the coin showing heads twice and tails once is $\frac{5}{3}$.

4. Number of permutations $= 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

There are 720 ways to arrange the letters in the word SPRING.

5. Number of permutations $= 5 \cdot 4 \cdot 3 = 60$

There are 60 ways to arrange 3 of the letters in the word TULIP.

6. $7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5040$

7. ${}_8P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = \frac{8 \cdot 7 \cdot 6 \cdot 5!}{5!} = 336$

8. ${}_{10}P_3 = \frac{10!}{(10-3)!} = \frac{10!}{7!} = \frac{10 \cdot 9 \cdot 8 \cdot 7!}{7!} = 720$

9. ${}_5P_5 = 5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

10. The possible outcomes is the number of combinations of 5 books taken 3 at a time, or ${}_5C_3$.

${}_5C_3 = \frac{5!}{(5-3)!3!} = \frac{5!}{2!3!} = \frac{5 \cdot 4 \cdot 3!}{(2 \cdot 1) \cdot 3!} = 10$

There are 10 possible combinations of books.

11. ${}_6C_2 = \frac{6!}{(6-2)!2!} = \frac{6!}{4!2!} = \frac{6 \cdot 5 \cdot 4!}{4! \cdot (2 \cdot 1)} = 15$

12. ${}_7C_3 = \frac{7!}{(7-3)!3!} = \frac{7!}{4!3!} = \frac{7 \cdot 6 \cdot 5 \cdot 4!}{4! \cdot (3 \cdot 2 \cdot 1)} = 35$

13. ${}_{10}C_4 = \frac{10!}{(10-4)!4!} = \frac{10!}{6!4!} = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6!}{6! \cdot (4 \cdot 3 \cdot 2 \cdot 1)} = 210$

14. ${}_{20}C_{15} = \frac{20!}{(20-15)!15!} = \frac{20!}{5!15!} = \frac{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16 \cdot 15!}{(5 \cdot 4 \cdot 3 \cdot 2 \cdot 1) \cdot 15!}$

$= 15{,}504$

15. Because 5 is a prime number, the events are overlapping.

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= \frac{1}{6} + \frac{3}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

The probability of rolling a 5 or a prime number is $\frac{1}{2}$.

16. Because 4 is not a multiple of 3, the events are mutually exclusive.

$P(A \text{ or } B) = P(A) + P(B) = \frac{1}{6} + \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$

The probability of rolling a 4 or a multiple of 3 is $\frac{1}{2}$.

17. a. $P(\text{blue and blue}) = P(\text{blue}) \cdot P(\text{blue})$

$= \frac{4}{12} \cdot \frac{4}{12} \cdot \frac{16}{144} = \frac{1}{9}$

The probability of drawing two blue marbles with replacement is $\frac{1}{9}$.

b. $P(\text{blue and blue}) = P(\text{blue}) \cdot P(\text{blue given blue})$

$= \frac{4}{12} \cdot \frac{3}{11} = \frac{12}{132} = \frac{1}{11}$

The probability of drawing two blue marbles without replacement is $\frac{1}{11}$.

18. The population is parents or guardians of high school students. The sampling method is systematic sampling.

19. *Sample answer:* The sampling method is not likely to result in a biased sample. The rule used to choose the individuals is not biased, so the sample will most likely be representative of the population.

20. *Sample answer:* The question is potentially biased because it suggests the sound system needs updating.

21. $\bar{x} = \frac{101 + 88 \ldots 78}{10} = \frac{890}{10} = 89$

The median is $\frac{88 + 88}{2} = 88$.

The mode is 88.

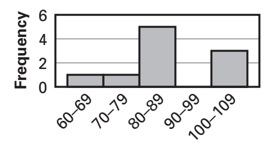
The range is $108 - 69 = 39$.

The mean is 89, so the mean absolute deviation is:

$$\frac{|101 - 89| + |88 - 89| + \ldots + |78 - 89|}{10} = 8.8$$

22.

Interval	Frequency
69-78	II
79-88	𝍸
89-98	
99-108	III



Stem	Leaves
6	9
7	8
8	0 8 8 8 8
9	
10	1 2 8

Key: 6 | 9 = 69

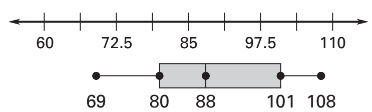
Key: $\frac{7}{8} = 78$

23. *Ordered data:* 69, 78, 80, 88, 88, 88, 88, 101, 102, 108

The median is 88.

The lower quartile is 80.

The upper quartile is 101.



The interquartile range is $101 - 80 = 21$.

A number that is less then $80 - 1.5(21) = 48.5$ or greater than $101 + 1.5(21) = 132.5$ is an outlier. There are no outliers for this data set.