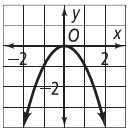
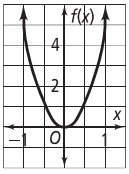
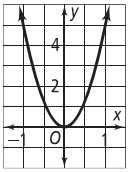
Algebra 2
Lesson 4-1 - Practice and Problem-Solving Exercises Answers

7. 

8. 

9. 

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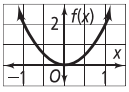
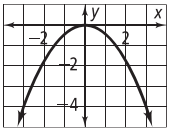
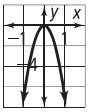
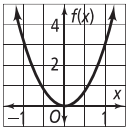
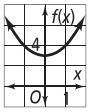
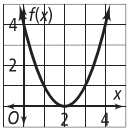
11. 

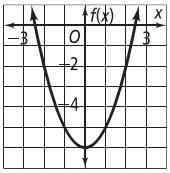
12. 

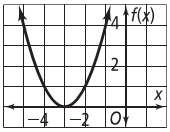
13. 

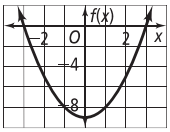
14. 

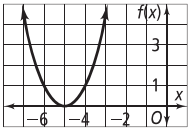
15. translated 3 units up


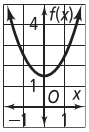
16. translated 2 units to the right


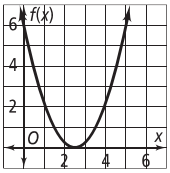
17. translated 6 units down


18. translated 3 units to the left


19. translated 9 units down


20. translated 5 units to the left


21. translated 1.5 units up


22. translated 2.5 units to the right


23. vertex: $(-20, 0)$; axis of symmetry: $x = -20$; maximum: 0; domain: all real numbers. range: $y \leq 0$

24. vertex: $(3.2, 0)$; axis of symmetry: $x = 3.2$; minimum is 0; domain: all real numbers; range: $y \geq 0$

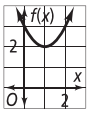
25. vertex: $(-5.5, 0)$; axis of symmetry: $x = -5.5$; minimum: 0; domain: all real numbers; range: $y \geq 0$

26. vertex: $(-1, -1)$; axis of symmetry: $x = -1$; minimum: -1; domain: all real numbers; range: $y \geq -1$

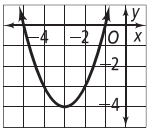
27. vertex: $(4, -25)$; axis of symmetry: $x = 4$; maximum: -25; domain: all real numbers; range: $y \leq -25$

28. vertex: $(125, 125)$; axis of symmetry: $x = 125$; minimum: 125; domain: all real numbers; range: $y \geq 125$

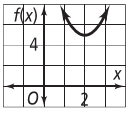
29. $x = 1$



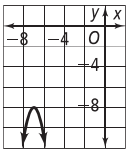
30. $x = -3$



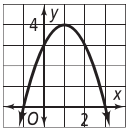
31. $x = 2$



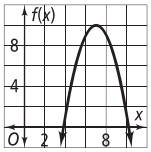
32. $x = -7$



33. $x = 1$



34. $x = 7$



35. $y = (x - 2)^2 + 5$

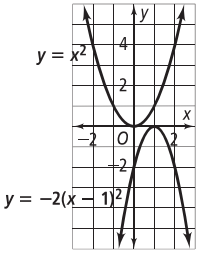
36. $y = 2(x + 1)^2 - 3$

37. $y = -\frac{1}{2}(x + 4)^2 + 2$

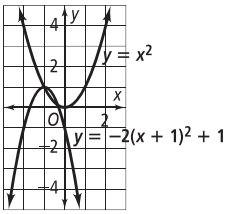
38. 25 m^2

39. 1000 chips; \$20

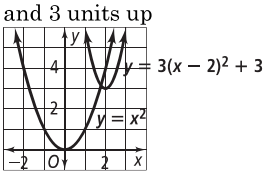
40. stretch vertically by a factor of 2, reflect across the x-axis, translate 1 unit to the right



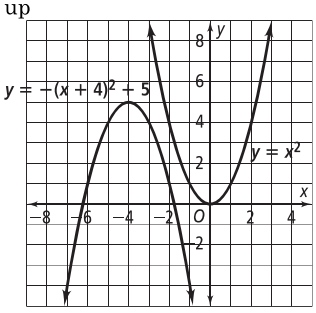
41. stretch vertically by a factor of 2, reflect across the x-axis, translate 1 unit to the left and 1 unit up



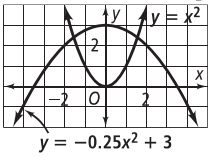
42. stretch vertically by a factor of 3, translate 2 units to the right and 3 units up



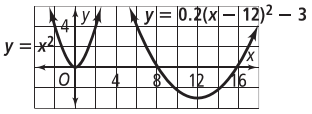
43. reflect across the x-axis, translate 4 units to the left and 5 units up



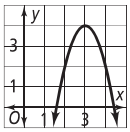
44. compress vertically by a factor of $\frac{1}{4}$, reflect across the x-axis, translate 3 units up



45. compress vertically by a factor of 0.2, translate 12 units to the right and 3 units down

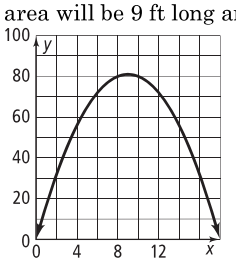


46. The classmate shifted the graph 4 units down and 3 units to the left instead of 4 units up and 3 units to the right.



47. parabola $f(x) = a(x-3)^2 + 4$ with vertex (3, 4) and $a > 0$ or $a < 0$

48. $y = 18x - x^2$ or $y = (x-9)^2 + 81$. The rectangle with the largest area will be 9 ft long and 9 ft wide.



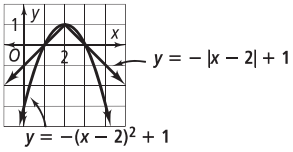
49. $y = -7(x-1)^2 + 2$

50. $y = -\frac{1}{2}(x + 3)^2 + 6$

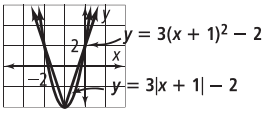
51. $y = -7x^2 + 5$

52. $y = 8\left(x - \frac{1}{4}\right)^2 - \frac{3}{2}$

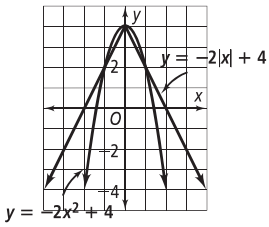
53. similar: same vertex (2, 1) and open downward, same domain (all real numbers), same range $(y \le 1)$, same x-intercepts, $(1, 0)$, $(3, 0)$; different: $y = -|x-2| + 1$ is an absolute value function with y-intercept $(0, -1)$ and $y = -(x-2)^2 + 1$ is a quadratic function with y-intercept $(0, -3)$.



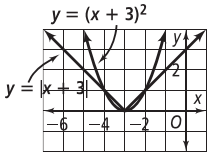
54. similar: same vertex $(-1, -2)$ and open upward, same domain (all real numbers), same range $(y \ge -2)$, same y-intercept, $(0, 1)$; different: $y = 3|x+1| - 2$ is an absolute value function with x-intercepts $\left(-\frac{1}{3}, 0\right)$ and $\left(-\frac{5}{3}, 0\right)$, and $y = 3(x+1)^2 - 2$ is a quadratic function with x-intercepts $\left(-1 \pm \sqrt{\frac{2}{3}}, 0\right)$.



55. similar: same vertex $(0, 4)$ and open downward, same domain (all real numbers), same range $(y \le 4)$, same y-intercept, $(0, 4)$; different: $y = -2|x| + 4$ is an absolute value function with x-intercepts $(\pm 2, 0)$, and $y = -2(x)^2 + 4$ is a quadratic function with x-intercepts $(\pm\sqrt{2}, 0)$.



56. similar: same vertex $(-3, 0)$ and open upward, same domain (all real numbers), same range $(y \ge 0)$, same x-intercept, $(-3, 0)$; different: $y = |x+3|$ is an absolute value function with y-intercept $(0, 3)$ and $y = (x+3)^2$ is a quadratic function with y-intercept $(0, 9)$.



57. Answers may vary. Sample: $y = (x+10)^2 - 4$

58a. (x_1, y_1): $x = 4$, (x_2, y_2): $x = 2.5$

58b. Expand the spreadsheet to have an equal number of values on each side of the axis of symmetry.

58c. (x_1, y_1): $y = -4(x-4)^2 + 1$
(x_2, y_2): $y = 4(x-2.5)^2 + 1$

59. Answers may vary. Sample:
$k = -2,\ a = 3;\ y = 3(x-1)^2 - 2$

60. Answers may vary. Sample:
$a = 3,\ k = -1;\ \ y = 3(x+2)^2 - 1$

61. Answers may vary. Sample:
$a = -6,\ k = 35;\ y = -6(x+1)^2 + 35$

62. Answers may vary. Sample:
$a = \frac{1}{5},\ k = 1;\ y = \frac{1}{5}(x-3)^2 + 1$

63a. $y = a(x-h)^2 + k$ for $x = 0$:
$y = a(0-h)^2 + k$
$= ah^2 + k$

63b. when $h = 0$

64. $y = \frac{1}{4}x^2$

65. $y = \frac{1}{2}(x+3)^2$

66. $y = -\frac{1}{4}(x-3)^2$

67. $y = -\frac{1}{4}(x-4)^2$

68. $y = 2(x-1)^2$

69. $y = -4(x+3)^2$

70. A

71. G

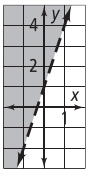
72. C

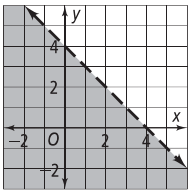
73. $2x + 2y = 225$
$2y = 225 - 2x$
$y = \frac{225}{2} - x$
$A = xy$
$= x\left(\frac{225}{2} - x\right)$
$= -x^2 + 112.5x$
Graph the function. There is a max. at $(56.25, 3164.06)$, so the max area is 3164.06 ft² and the length of each side is 56.25 ft.

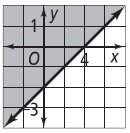
74. The solution is $(3, 2)$.

75. The solution is $(-10, 6)$.

76. The solution is $(1, 0, 3)$.

77. 

78. 

79. 

80. yes

81. no

82. no

83. $(0, 0)$

84. $(-1, 0)$

85. $\left(5, 0\right)$

Algebra 2
Lesson 4-2 - Practice and Problem-Solving Exercises Answers

8. vertex $(-1, 0)$; axis of symmetry: $x = -1$; minimum at $(-1, 0)$; range $y \geq 0$

9. vertex $(1, 2)$; axis of symmetry: $x = 1$; maximum at $(1, 2)$; range $y \leq 2$

10. vertex: $(-2, -3)$; axis of symmetry: $x = -2$; minimum at $(-2, -3)$; range $y \geq -3$

11. vertex: $(1, 6)$; axis of symmetry: $x = 1$; maximum at $(1, 6)$; range $y \leq 6$

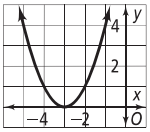
12. vertex $\left(\frac{2}{3}, -3\frac{1}{3}\right)$; axis of symmetry: $x = \frac{2}{3}$; minimum at $\left(\frac{2}{3}, -3\frac{1}{3}\right)$; range $y \geq -3\frac{1}{3}$

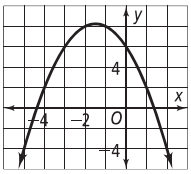
13. vertex $\left(-\frac{3}{4}, 5\frac{1}{8}\right)$; axis of symmetry: $x = -\frac{3}{4}$; maximum at $\left(-\frac{3}{4}, 5\frac{1}{8}\right)$; range $y \leq 5\frac{1}{8}$

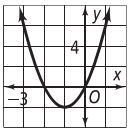
14. vertex: $\left(\frac{3}{2}, -\frac{3}{2}\right)$; axis of symmetry: $x = \frac{3}{2}$; minimum at $\left(\frac{3}{2}, -\frac{3}{2}\right)$; range $y \geq -\frac{3}{2}$

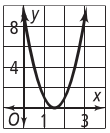
15. vertex: $\left(-\frac{1}{2}, \frac{1}{4}\right)$; axis of symmetry: $x = -\frac{1}{2}$; maximum at $\left(-\frac{1}{2}, \frac{1}{4}\right)$; range: $y \leq \frac{1}{4}$

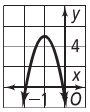
16. vertex: $(0, 5)$; axis of symmetry: $x = 0$; minimum at $(0, 5)$; range: $y \geq 5$

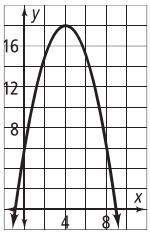
17. 

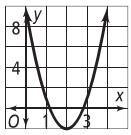
18. 

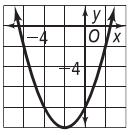
19. 

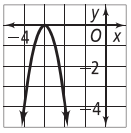
20. 

21. 

22. 

23. 

24. 

25. 

26. $y = (x-2)^2 + 2$

27. $y = (x+1)^2 + 4$

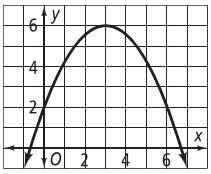
28. $y = 4\left(x + \frac{7}{8}\right)^2 - \frac{49}{16}$

29. $y = 2\left(x - \frac{5}{4}\right)^2 + \frac{71}{8}$

30. $y = -2(x-2)^2 + 11$

31. $y = \frac{9}{4}\left(x + \frac{2}{3}\right)^2 - 2$

32. \$100, \$25,000

33. 

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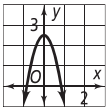
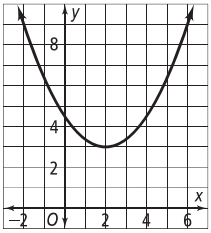
35. 

36. 

37. 4 cm × 9 cm × 9 cm

38. 1250 ft^2

39. $b = -6$; $c = 5$

40. $b = 6$; $c = -3$

41. $a = 1$; $c = -2$

42. $a = 1$; $c = 2$

43. $2s$; 64 ft

44a. Check students' work.

44b. Answers may vary. Sample:
The widths of $y = ax^2 + bx + c$ and $y = -ax^2 + bx + c$ are the same. As $|a|$ increases, the widths of $y = ax^2 + bx + c$ and $y = -ax^2 + bx + c$ decrease.

45. $(0, 3)$

46. $(0, -16)$

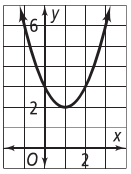
47. $(0, -54)$

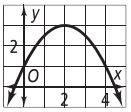
48. $a = -6,\ b = 24$

49. $a = 1,\ b = 2$

50. $a = 3,\ b = -12$

51. $a = -\frac{2}{9},\ b = -\frac{4}{3}$

52. 

53. 

54. 15 min

55. 0

56. $19/hr

57. $\frac{1}{4}$

58. -2.5

59. Elimination because the x's have opposite signs; $(7, -1)$.

60. Substitution because the first equation is already solved for y; $(27, 15)$.

61. Elimination because you can multiply the second equation by -3 to eliminate n; $(3, 2)$

62. vertex: $(-2, -1)$; axis of symmetry: $x = -2$; minimum at $(-2, -1)$; domain: all real numbers; range: $y \geq -1$

63. vertex: $(1, 3)$; axis of symmetry: $x = 1$; maximum at $(1, 3)$; domain: all real numbers; range: $y \leq 3$

64. vertex: $(3, -2)$; axis of symmetry: $x = 3$; minimum at $(3, -2)$; domain: all real numbers; range: $y \geq -2$

65. vertex: $(-3, 5)$; axis of symmetry: $x = -3$; maximum at $(-3, 5)$; domain: all real numbers; range: $y \leq 5$

66. vertex: $(-4, 0)$; axis of symmetry: $x = -4$; minimum at $(-4, 0)$; domain: all real numbers; range: $y \geq 0$

67. vertex: $(4, 6)$; axis of symmetry: $x = 4$; maximum at $(4, 6)$; domain: all real numbers; range: $y \leq 6$

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

69. $y = x^2 - 4$

70. $y = (x+1)^2 - 2$

Algebra 2
Lesson 4-3 - Practice and Problem-Solving Exercises Answers

7. $y = -x^2 + 3x - 4$

8. $y = x^2 - 5x + 2$

9. $y = 2x^2 - x + 3$

10. $y = x^2 + 2x - 2$

11. $y = x^2 - 6x + 3$

12. $y = -x^2 - 4x + 5$

13. $y = x^2 + 2x$

14. $y = -3x^2 + 20$

15. $y = -x^2 + x - 2$

16a. $y = -0.083x^2 + 2.757x + 46.457$

16b. about 68.3%

17a. $y = -16x^2 + 33x + 46$, where x is the number of seconds after release and y is the height in ft.

17b. 28.5 ft

17c. About 63 feet at 1.031 seconds.

18. yes; $y = 4x^2$

19. yes; $y = -2x^2 + 3x + 5$

20. no

21. yes; $y = \frac{5}{8}x^2 - \frac{7}{4}x + 1$

22a. x: 4, 5
y: 6, 10

22b. $y = \frac{1}{2}x^2 - \frac{1}{2}x$

22c. 45 segments

23. Substitute 30 for x.
$y = 0.005(30)^2 - 1.95(30) + 120$
$= 66$
The water level is 66 mm.

24. Answers may vary. Sample answer: $(2, 2)$.

25a. $y = -0.00357x^2 + 0.93x + 18.586$

25b. Answers may vary. Sample:
domain: integers from 0 to 27
range: whole numbers from 18 to 42

25c. the year 2004

25d. the year 2021

26a. $y = 3.157x - 52.335$

26b. $y = 0.042x^2 - 0.041x + 0.889$

26c. Answers may vary. Sample:
Quadratic; the quadratic model comes closer to most data points than the linear model because the data follows a curve.

27. Answers may vary. Sample:
$y = -\frac{1}{25}x^2$, $y = \frac{1}{25}x^2 - \frac{2}{5}x$, $y = \frac{1}{5}x^2 - \frac{6}{5}x$

28. Answers may vary. Sample:
You need at least 3 points. You substitute x- and y-values into $y = ax^2 + bx + c$ to set up and solve a linear system to find values of a, b, and c.

29. The vertex is (3, 5).

30a. You can find how high the arrow was when it was released.

30b. The negative intercept tells you how much earlier you would have to shoot the arrow from height zero for its height to be described by the same function. The positive intercept tells you how many seconds after the release the arrow will take to hit the ground.

31. A

32. I

33. D

34. Let d = number of dimes, let q = number of quarters

$d + q = 42$

$q = 42 - d$

$0.10d + 0.25q = 6$

$0.1d + 0.25(42 - d) = 6$ (substitution)

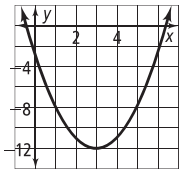
$0.1d + 10.5 - 0.25 = 6$

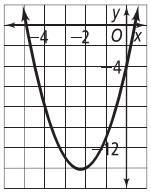
$d = 30$

$(30) + q = 42$

$q = 12$

Mark has 12 quarters and 30 dimes.

35. 

36. 

37. 

38. (2, 5)

39. (5, 8)

40. (−1, −1)

41. $\frac{4}{5}$

42. $-\frac{7}{2}$

43. $x^2 + 5x - 1$

44. $6x^2 - 10x - 3$

45. $4x^2 - x - 10$

Algebra 2
Lesson 4-4 - Practice and Problem-Solving Exercises Answers

14. $(x+1)(x+2)$

15. $(x+2)(x+3)$

16. $(x+2)(x+5)$

17. $(x+2)(x+8)$

18. $(y+3)(y+12)$

19. $(x+2)(x+20)$

20. $(x-1)(x-2)$

21. $-(x-12)(x-1) = (-x+12)(x-1)$

22. $(-r+9)(r-2)$

23. $(x-4)(x-6)$

24. $(d-3)(d-9)$

25. $(x-4)(x-9)$

26. $(x-7)(x+2)$

27. $-(x-4)(x+5)$

28. $-(x-8)(x+5)$

29. $(c-7)(c+9)$

30. $(x-5)(x+15)$

31. $(-t+11)(t+4)$

32. $3;\ 3(a^2+3)$

33. $5b;\ 5b(5b-4)$

34. $x;\ x(x-2)$

35. $5;\ 5(t+1)(t-2)$

36. $7;\ 7(2y+3)(y-1)$

37. $9;\ 9(3p^2-p+2)$

38. $(3x+4)(x+9)$

39. $(x-8)(2x-3)$

40. $(r+2)(5r+13)$

41. $(m-3)(2m-5)$

42. $(t+4)(5t+8)$

43. $(x-12)(2x-3)$

44. $(x+4)(3x-5)$

45. $(y+4)(5y-8)$

46. $(x-2)(7x+6)$

47. $(z+4)(2z-7)$

48. $(x+4)(3x-4)$

49. $(4k+3)(7k-2)$

50. $(x+1)^2$

51. $(t-7)^2$

52. $(k-9)^2$

53. $(2z-5)^2$

54. $(3x+8)^2$

55. $(9z+2)^2$

56. $(x-2)(x+2)$

57. $(c-8)(c+8)$

58. $(3x-1)(3x+1)$

59. The rectangle would have one side equal to x and one side equal to $x+2y$.

60. $(5x-1)$ cm by $(5x-1)$ cm

61. $9(x+2)(x-2)$

62. $2(3z+2)(3z-2)$

63. $3(2y+5)(2y-5)$

64. $16(2t+1)(2t-1)$

65. $3(2x+3)^2$

66. $4(2x-5)^2$

67. $2(a-4)^2$

68. $3(x+1)(x-9)$

69. $2(3b+5)(3b-1)$

70. $4(n-2)(n-3)$

71. $3(y+3)(y+5)$

72. $-(x-1)(x-4)$

73. $2(x-5)(2x-1)$

74. $\frac{1}{2}(x+1)(x-1)$

75. $-6(z^2+100)$

76. $(2x-1)(x-5)$

77. $(x-y)(x+y)$

78. $-\left(\frac{1}{4}s-1\right)\left(\frac{1}{4}s+1\right)$

79. The third line should be $x(2x-5)-(2x-5)$, and the final line should be $(x-1)(2x-5)$.

80. $(x-70)$ ft

81. y; $y(y-1)$

82. b; $b(ab-1)$

83. 10; $10(x-3)(x+3)$

84. $3t$; $3t(t-8)$

85. 2; $2(x^2-37x+6)$

86. xy; $xy(xy+1)$

87. D

88. $\pi h(R+r)(R-r)$

89. Check students' work.

90. Factor 3 from the terms to get $3(x^2 + 2x - 24)$. Look for numbers whose product is -24 and whose sum is 2. The numbers -4 and 6 work. The complete factorization is $3(x-4)(x+6)$.

91. $(0.5t + 0.4)(0.5t - 0.4)$

92. $100(9x - 10)(9x + 10)$

93. $(x + 12)(x - 3)$

94. $(x - 10)(x - 9)$

95. $(2x + 9)(3x + 14)$

96. $2(a + 1)(6a - 7)$

97. Factor the GCF, $4x^2$, from the terms to get $4x^2(x^2 + 6x + 8)$. To factor $x^2 + 6x + 8$, look for numbers whose product is 8 and whose sum is 6. The numbers 4 and 2 work. The complete factorization is $4x^2(x + 4)(x + 2)$.

98. $(x - y)(x + y)(x^2 + y^2)$

99. $(4x^2 + 25y^2)(2x + 5y)(2x - 5y)$

100. $3a(9a^2 + 1)(3a + 1)(3a - 1)$

101. $(x - 8)(x + 3)$

102. Factor the expression completely to get $(n-1)n(n+1)$. The number 3 must go into exactly one of any three consecutive numbers.

103. B

104. H

105a. By entering the given lists into a graphing calculator and then calculating the quadratic regression, you get $h^2 = -16t^2 + 22t + 3$ as the quadratic model for the ball's height as a function of time.

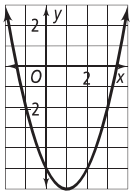
105b. $h = -16t^2 + 22t + 3$

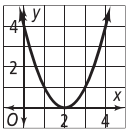
$$h = \left(\frac{-16t}{8} + \frac{24}{8}\right)\left(\frac{-16t}{-2} - \frac{2}{-2}\right)$$

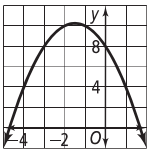
$$h = (-2t + 3)(8t + 1)$$

106. $y = -0.149x^2 + 5.171x - 16.971$

107. penny: 2.5 g; nickel: 5 g; dime: 2.3 g

108. 

109. 

110. 

Algebra 2
Lesson 4-5 - Practice and Problem-Solving Exercises Answers

9. $-4,\ -2$

10. $3,\ 6$

11. $\frac{3}{2},\ -1$

12. 5

13. $-2\ ,\ -1$

14. $-\frac{2}{3},\ 6$

15. $0,\ 4$

16. $0,\ -\frac{2}{3}$

17. $0,\ 4$

18. $-4.30, -0.70$

19. $3,\ 8$

20. $-1.32,\ 8.32$

21. $-0.78,\ 1.28$

22. $18, -2$

23. $4, -10$

24. $1, -0.75$

25. $-1\ ,\ 0.8$

26. $0.5\ ,\ 0.6$

27. The solutions are -1.67 and -1.5.

28. $-0.59,\ 2.26$

29. $-0.94,\ 2.34$

30. $-5.53,\ 0.36$

31. $-1,\ 0.25$

32. $-3.12,\ 5.12$

33. $-1.46,\ 5.46$

34. $-5.16,\ 1.16$

35. $-1.16,\ 2.16$

36a. about 6.61 seconds

36b. about 6.89 seconds

36c. Answers may vary. Sample:
domain: $0 \le t \le 10.4$; range: $0 \le h \le 1700$

37. 3 in.

38. about 10.5 seconds

39. about 3.6 feet

40. The student needs to start by subtracting 2 from each side of the equation. The error is that the problem was done as if the equation were equal to 0.

$x^2 + 5x + 6 - 2 = 0$

$x^2 + 5x + 4 = 0$

$(x+1)(x+4) = 0$

$x = -1$ or $x = -4$

41a. Answers may vary. Sample:
$x^2 - 8x + 15 = 0$

41b. Answers may vary. Sample:
$x^2 + x - 6 = 0$

41c. Answers may vary. Sample:
$x^2 + 7x + 6 = 0$

42. $-8.69,\ 0.69$

43. $-\frac{2}{3},\ -\frac{3}{2}$

44. $3.5,\ -4$

45. $\frac{5}{2},\ -4$

46. $-3.25,\ 0.92$

47. $4,\ -1$

48. $0,\ -6$

49. $0,\ -4$

50. $7,\ 1$

51. $-1.37,\ 4.37$

52. $-1.8,\ 0.55$

53. $-1,\ \frac{10}{3}$

54. $(-1,\ 1),\ (2,\ 4)$

55. $(0,\ -2),\ (2,\ 2)$

56. $\left(-\frac{5}{3},\ -\frac{4}{9}\right),\ (2,\ 2)$

57. Solve $(x-4)(x-6)=0$ to find that the zeros of $y=x^2-10x+24$ are 4 and 6. Average 4 and 6 to get 5. This is the x-coordinate of the vertex. Substitute 5 for x in $x^2-10x+24$ to find that -1 is the y-coordinate of the vertex. The vertex is $(5,\ -1)$.

58a. Answers may vary. Sample:
If $x \neq h$, then $x-h$ will be nonzero, $(x-h)^2$ will be positive, and $a(x-h)^2$ will be positive. Adding a positive to k will always result in a number greater than k. So the point $(h,\ k)$ is the lowest point when $x=h$ is on the graph of $y=(x-h)^2+k$.

58b. No; the expression $(x-h)^3$ can be negative.

59a. 2.45 m

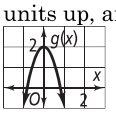
59b. 1.3 seconds

60. B

61. H

62. A

63. reflection across the x-axis, followed by a vertical translation 2 units up, and stretched by a factor of 3.



64. $(4x-1)(4x+1)$

65. $(5x-1)(x-5)$

66. $(2x-1)(x+7)$

67. $(2,\ 0,\ -2)$

68. $(-2,\ 1,\ 5)$

69. $(7,\ 1,\ -1)$

70. vertex: $(-9,\ 4)$; axis of symmetry: $x=-9$;
translation 9 units to the left and 4 units up

71. vertex: $\left(\frac{7}{2},\ 0\right)$; axis of symmetry: $x=\frac{7}{2}$;
stretch by a factor of 2, translation $3\frac{1}{2}$ units to the right

72. vertex: $(0,\ -1)$; axis of symmetry: $x=0$;
vertical compression by a factor of $\frac{3}{4}$, translation 1 unit down

73. $x^2+8x+13$

74. $4x^2-4x+1$

75. $x^2 - 6x + 9$

Algebra 2
Lesson 4-6 - Practice and Problem-Solving Exercises Answers

12. $4, -4$

13. $2, -2$

14. $4, -4$

15. $\frac{5}{3}, -\frac{5}{3}$

16. $\sqrt{5}, -\sqrt{5}$

17. $\pm 2\sqrt{2}$

18. 12 ft × 30 ft × 6 ft

19. $-2, -4$

20. $-8, 12$

21. $-1, 3$

22. $-\frac{8}{3}, -\frac{16}{3}$

23. $-4, 3$

24. $1, 11$

25. $\frac{2}{5}, -\frac{4}{5}$

26. $35, -5$

27. $\frac{2}{3}, -\frac{10}{3}$

28. 81

29. $\frac{1}{4}$

30. 144

31. 100

32. $\frac{9}{4}$

33. 4

34. $-3 \pm 2\sqrt{3}$

35. $6 \pm \sqrt{29}$

36. $-2 \pm \sqrt{2}$

37. $1 \pm \sqrt{6}$

38. $-4 \pm 3\sqrt{3}$

39. $5 \pm \sqrt{13}$

40. $2 \pm \sqrt{3}$

41. $3 \pm \sqrt{11}$

42. $-1 \pm \sqrt{6}$

43. $-\frac{5}{4} \pm \frac{\sqrt{37}}{4}$

44. $\frac{2}{3} \pm \frac{\sqrt{6}}{3}$

45. $-\frac{3}{5} \pm \frac{\sqrt{21}}{5}$

46. $y = (x+2)^2 - 3$

47. $y = 2(x-2)^2 - 7$

48. $y = -(x+1)^2 + 4$

49. $y = (x+2)^2 - 11$

50. $y = 2\left(x - \frac{3}{2}\right)^2 - \frac{11}{2}$

51. $y = -(x-2)^2 + 3$

52. 8 in.

53. 10, –10

54. 20, –20

55. 22, –22

56. 16, –16

57. 18, –18

58. 10, –10

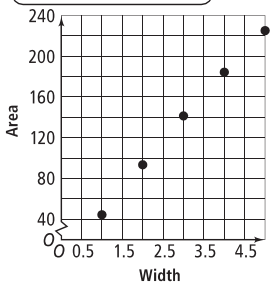
59. 1, –1

60. 12, –12

61. 84, –84

62a.

Width	Length	Area
1	49	49
2	48	96
3	47	141
4	46	184
5	45	225



$A = -w^2 + 50w$

62b. Check students' work.

62c. $0 < w < 50$
Since the perimeter is 100, the width would have to be less than 50. Also, width can't be negative, so it would have to be greater than 0.

62d. 625 units^2; 25 units × 25 units

62e. $A = w(50 - w)$; yes; both equations are equivalent.

63. $-\frac{5}{2} \pm \frac{\sqrt{37}}{2}$

64. $-\frac{3}{2} \pm \frac{\sqrt{17}}{2}$

65. $\frac{1}{2} \pm \frac{\sqrt{21}}{2}$

66. $-\frac{1}{2} \pm \frac{\sqrt{5}}{2}$

67. $-\frac{2}{3} \pm \frac{\sqrt{10}}{3}$

68. $1, -\frac{4}{5}$

69. $-\frac{3}{8} \pm \frac{\sqrt{41}}{8}$

70. $\frac{1}{8} \pm \frac{\sqrt{5}}{8}$

71. $\frac{1}{3}, -\frac{2}{3}$

72. $1 \pm \sqrt{5}$

73. $-3 \pm \sqrt{7}$

74. $-\frac{6}{5} \pm \frac{\sqrt{66}}{5}$

75a. $-0.01(x-59)^2 + 36.81$ ft

75b. 7.65 feet

75c. 118 ft

76. $2a, -\frac{3}{2}a$

77. $\frac{-a \pm a\sqrt{13}}{6}$

78. $\frac{3}{a}, \frac{1}{a}, a \neq 0$

79. $-\frac{1}{2a}, -\frac{3}{2a}, a \neq 0$

80. $3, -\frac{3a}{a+3}, a \neq -3$

81. $-\frac{2}{3a}, \frac{5}{2a}, a \neq 0$

82. $5+3\sqrt{2}, -5+3\sqrt{2}$

83. $y = -4\left(x+\frac{5}{8}\right)^2 + \frac{73}{16}, \left(-\frac{5}{8}, \frac{73}{16}\right)$

84. $\frac{1}{2}(x-5)^2 - \frac{1}{2}, \left(5, -\frac{1}{2}\right)$

85. $-\frac{1}{5}(x-2)^2 + 3, (2, 3)$

86. D

87. G

88. B

89. Move the variables to the left side and the constant to the right by using the Addition Property of Equality.

$x^2 - 9 = -8x$

$x^2 + 8x = 9$

$\left(\frac{8}{2}\right)^2 = 4^2 = 16$ Find $\left(\frac{b}{2}\right)^2 = 16$.

$x^2 + 8x + 16 = 9 + 16$ Add 16 to each side.

$(x+4)^2 = 25$ Factor left side. Simplify right side.

$x + 4 = \pm 5$ Take the square root of each side.

$x = -4 \pm 5$ Add –4 to each side.

$x = -9, 1$ Simplify.

90. $\frac{1}{2}, 1$

91. $-4, 1$

92. $-\frac{2}{3}, 8$

93. Yes; $y = \frac{1}{2}x^2 + \frac{7}{2}x + 9$.

94. Yes; $y = -\frac{1}{2}x^2 + x + 2$.

95. Yes; $y = 3x^2 - 5x + 2$.

96. $(2, 0)$

97. $(3, 1)$

98. $(3, 1)$

99. 24

100. 84

Algebra 2
Lesson 4-7 - Practice and Problem-Solving Exercises Answers

11. 1.3

12. $-6, -2$

13. $1, -\frac{7}{2}$

14. $\frac{1}{3}, -1$

15. -5

16. $1, -\frac{5}{2}$

17. $\frac{3 \pm \sqrt{5}}{2}$

18. $-3 \pm \sqrt{14}$

19. $\frac{2 \pm \sqrt{10}}{3}$

20. $\frac{1 \pm \sqrt{7}}{2}$

21. 4, 1

22. $\frac{1}{3}, -\frac{5}{3}$

23. \$16.34

24. \$0.87

25. -4; no real solution

26. 36; two real solutions

27. 0; one real solution

28. -223; no real solution

29. 169; two real solutions

30. -116; no real solutions

31. 1; two real solutions

32. 0; one real solution

33. 0; one real solution

34. -35; no real solutions

35. -23; no real solutions

36. 0; one real solution

37. no

38. yes

39. 2.29 in. × 15.71 in.

40. Answers may vary. Sample:
Assume the coefficients are real numbers. If the discriminant is negative, then there is no real solution. If the discriminant is zero, then there is one real solution. If the discriminant is positive, then there are two real solutions.

41. $-\frac{1}{6}, 1$

42. $1.38, -1.24$

43. $0.89, -2.49$

44. $1.90, -2.90$

45. $2.69, -0.19$

46. $0.31, -0.81$

47. 10, 1

48. $0, 42$

49. $-\frac{3}{2}, \frac{1}{2}$

50. –3.45, 1.45

51. 4.70, –1.70

52. –7,7

53. 0.47, –8.47

54. $-\frac{1}{2}, \frac{3}{2}$

55. 1.47, –7.47

56a. Answers may vary. Sample:
Graph $y = 0.4409x^2 - 5.1724x + 99.0321$ and $y = 100$. Where they intersect is the year when 100 million tons were released in the air. The graph of $y = 0.4409x^2 - 5.1724x + 99.0321$ is above $y = 100$ when more than 100 million tons were released.

56b. Write $y = 0.4409x^2 - 5.1724x + 99.0321 > 100$. Subtract 100 from each side to get $y = 0.4409x^2 - 5.1724x - 0.9679 < 0$. Use the Quadratic Formula to solve.

56c. Check students' work.

57. 1.89 seconds

58. two

59. one

60. none

61. two

62. two

63. two

64. two

65. two

66. none

67a. $|k| < 12$

67b. $k = \pm 12$

67c. $|k| > 12$

68a. II

68b. III

68c. I

69a. $x^2 = 100\pi$

69b. 17.72 cm

70. Answers may vary. Sample:
$x^2 - 3x + 1 = 0$

71. Answers may vary. Sample:
$x^2 + 5x + 3 = 0$

72. Answers may vary. Sample:
$2x^2 + 5x + 1 = 0$

73. $0, \pm\sqrt{5}$

74. $1, 3, 2 \pm \sqrt{7}$

75. 1,-5

76a. $$\frac{-b+\sqrt{b^2-4ac}}{2a} + \frac{-b-\sqrt{b^2-4ac}}{2a} = \frac{-b+\sqrt{b^2-4ac}+\left(-b\right)-\sqrt{b^2-4ac}}{2a}$$
$$= \frac{-2b}{2a}$$
$$= -\frac{b}{a}$$

76b. $\left(\frac{-b}{2a}+\frac{\sqrt{b^2-4ac}}{2a}\right)\times\left(\frac{-b}{2a}-\frac{\sqrt{b^2-4ac}}{2a}\right)=\left(\frac{-b}{2a}\right)^2-\left(\frac{\sqrt{b^2-4ac}}{2a}\right)^2$

$$=\frac{b^2}{4a^2}-\frac{b^2-4ac}{4a^2}$$
$$=\frac{b^2-b^2-4ac}{4a^2}$$
$$=\frac{4ac}{4a^2}$$
$$=\frac{c}{a}$$

77. The absolute value of $\frac{\sqrt{b^2-4ac}}{2a}$ is the distance from the axis of symmetry to the x-intercepts, if the discriminant is nonnegative.

78. no real solutions

79. 3

80. -3

81. 15

82. $10,\ -2$

83. $\frac{2+\sqrt{2}}{2}$

84. $\frac{3\pm\sqrt{41}}{2}$

85. $z^2+8z^2-2z+5z=9z^2+3z$

86. $4x+k$

87. $2y-8x$

88. $2\sqrt{17}$

89. 5

90. 13

Algebra 2
Lesson 4-8 - Practice and Problem-Solving Exercises Answers

8. $2i$

9. $i\sqrt{7}$

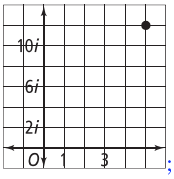
10. $i\sqrt{15}$

11. $9i$

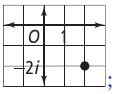
12. $5i\sqrt{2}$

13. 

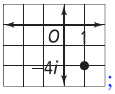
; 2

14. 

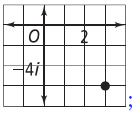
; 13

15. 

; $2\sqrt{2}$

16. 

; $\sqrt{17}$

17. 

; $3\sqrt{5}$

18. $6+3i$

19. $1-7i$

20. $7+4i$

21. $10+6i$

22. $-7-10i$

23. $9+58i$

24. $9-23i$

25. -36

26. $65+72i$

27. $-\frac{2}{5}-\frac{3}{5}i$

28. $-1-i$

29. $\frac{8}{17}+\frac{19}{17}i$

30. $-\frac{3}{5}-\frac{4}{5}i$

31. $\frac{8}{13}+\frac{12}{13}i$

32. $1-\frac{3}{2}i$

33. $\pm 5i$

34. $\pm\frac{i\sqrt{2}}{2}$

35. $\pm\frac{8i\sqrt{3}}{3}$

36. $\pm i\sqrt{7}$

37. $\pm 6i$

38. $\pm\frac{i\sqrt{15}}{5}$

39. $-1\pm i\sqrt{2}$

40. $\frac{1\pm i\sqrt{35}}{6}$

41. $1\pm\frac{i\sqrt{10}}{2}$

42. $1\pm i$

43. $2 \pm i$

44. $\frac{1}{2}(3 \pm i)$

45a. A: -5; B: $3+2i$; C: $2-i$; D: $3i$; E: $-6-4i$; F: $-1+5i$

45b. A: 5; B: $-3-2i$; C: $-2+i$; D: $-3i$; E: $6+4i$; F: $1-5i$

45c. A: -5; B: $3-2i$; C: $2+i$; D: $-3i$; E: $-6+4i$; F: $-1-5i$

45d. A: 5; B: $\sqrt{13}$; C: $\sqrt{5}$; D: 3; E: $2\sqrt{13}$; F: $\sqrt{26}$

46. a circle

47. $5, -5$

48. $288i$

49. $-1+5i$

50. $10-4i$

51. $8-2i$

52. $11-5i$

53. $6+10i$

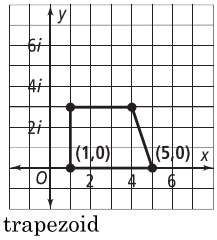
54. $7-i$

55. $10+11i$

56a. $c < 9$

56b. $c > 9$

56c. $c = -9$

57. 

trapezoid

58. $\frac{2}{29} - \frac{5}{29}i$

59. $\frac{1}{26} + \frac{3}{52}i$

60. $\frac{a-bi}{a^2+b^2}$

61. sum: 2; product: 3

62. sum: $-\frac{2}{5}$; product: $\frac{1}{5}$

63. sum: $\frac{3}{2}$; product: $\frac{3}{2}$

64. Answers may vary. Sample:
$x^2 + 36 = 0$

65. Answers may vary. Sample:
$x^2 - 4x + 29 = 0$

66. Answers may vary. Sample:
$x^2 - 8x + 25 = 0$

67. $x = -7$, $y = 3$

68. $x = \frac{16}{3}$, $y = -\frac{19}{8}$

69. $x = -7$, $y = -3$

70. $(a+bi)(a-bi) = a^2 + b^2$; since a and b are real, so is $a^2 + b^2$.

71. $(x+yi)^2 = (x+yi)(x+yi)$
$= x^2 + 2xyi + y^2 i^2$
$= x^2 + 2xyi + y^2(-1)$
$= x^2 + 2xyi - y^2$
imaginary for all nonzero numbers x and y

72. True; the additive inverse of $a + bi$ is $-a - bi$. The conjugate of $-a - bi$ is $-a + bi$. The conjugate of $a + bi$ is $a - bi$. The additive inverse of $a - bi$ is $-a + bi$.

73. B

74. G

75. A

76. $\pm 2,\ \pm 2i$;

$x^4 - 16 = \left(x^2 - 4\right)\left(x^2 + 4\right)$

$= \left(x - 2\right)\left(x + 2\right)\left(x^2 + 4\right)$

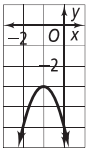
$x - 2 = 0,\ x + 2 = 0,\ x^2 + 4 = 0$

$x = 2 \qquad x = -2 \qquad x = \pm 2i$

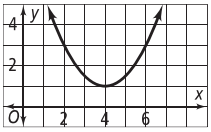
77. $\dfrac{-3 \pm \sqrt{41}}{4}$

78. $\dfrac{-1 \pm \sqrt{17}}{8}$

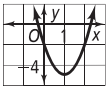
79. $\dfrac{-7 \pm \sqrt{17}}{2}$

80. 

; axis of symmetry; $x = -1$

81. 

; axis of symmetry; $x = 4$

82. 

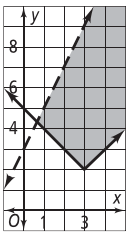
; axis of symmetry; $x = 1$

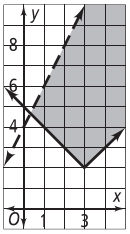
83. $y = 3x - 4$

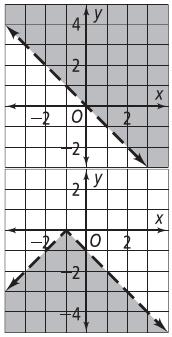
84. $y = -0.5x - 2$

85. $y = -7x + 10$

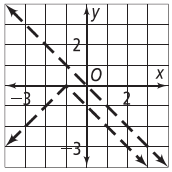
86. $y = 2x + 8$

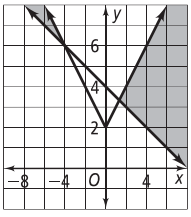
87. 



88. 

The graphs do not overlap. There are no solutions.



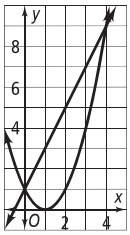
89. 

Algebra 2
Lesson 4-9 - Practice and Problem-Solving Exercises Answers

8.

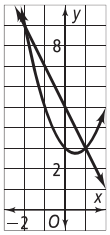
The solution is $(0, 1)$.

9.



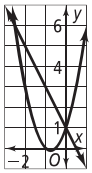
The solutions are $(0, 1)$ and $(4, 9)$.

10.



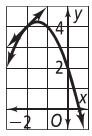
The solutions are $(-2, 9)$ and $(1, 3)$.

11.



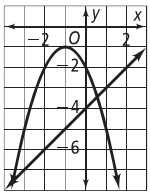
The solutions are $(0, 1)$ and $\left(-\frac{5}{2}, 6\right)$.

12.



The solution is $(-2, 4)$.

13.



The solutions are $\left(\frac{-3+\sqrt{17}}{2}, \frac{-11+\sqrt{17}}{2}\right)$ and $\left(\frac{-3-\sqrt{17}}{2}, \frac{-11-\sqrt{17}}{2}\right)$ or $(0.56, -3.44)$ and $(-3.56, -7.56)$.

14. The solutions are $(0, 1)$ and $(-3, -2)$.

15. The solutions are $(3, 7)$ and $(-2, 2)$.

16. The solutions are $(0, -1)$ and $(2, -3)$.

17. The solution is $(1, -2)$.

18. The solutions are $(5, -10)$ and $(-3, -2)$.

19. The solutions are $\left(-3+\sqrt{6}, -1+\sqrt{6}\right)$ and $\left(-3-\sqrt{6}, -1-\sqrt{6}\right)$.

20. The solution is $(0, 1)$.

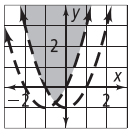
21. The solution is $(0, -1)$.

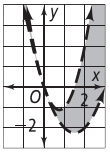
22. The solutions are $(-1, 0)$ and $(-2, 0)$.

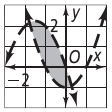
23. The solutions are $(0, -3)$ and $\left(\frac{1}{3}, -\frac{31}{9}\right)$.

24. The solutions are $(-1, 0)$ and $\left(\frac{1}{4}, \frac{25}{16}\right)$.

25. There is no solution.

26. 

27. 

28. 

29. When the width is 20.45 inches, the length is 21.45 inches. Or, when the width is 6.55 inches, the length is 7.55 inches.

30. Answers may vary. Sample:
You can solve by graphing or substitution. The solutions are $(5.30, 1.30)$ and $(1.70, -2.30)$. To solve graphically, solve the first equation for y: $y = -1 \pm \sqrt{x}$ and graph $y_1 = -1 + \sqrt{x}$ and $y_2 = -1 - \sqrt{x}$ along with the linear equation.

31. The solutions are $(8.42, -5.42)$ and $(-1.42, 4.42)$.

32. The solutions are $(-3, -4)$ and $(1, 8)$.

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

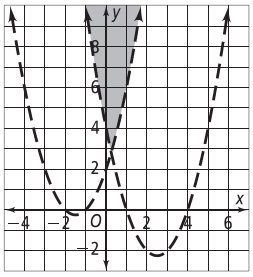
34. The solutions are $(3, -1)$ and $(-2, 4)$.

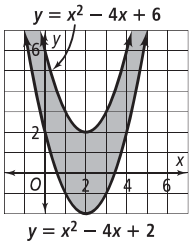
35. The solutions are $(0, -4)$ and $(2, -2)$.

36. The solutions are $(3, -8)$ and $(-0.5, 0.75)$.

37. 

38. 

39. 

40. The solutions of the system are in the common area (shaded) on the graph. So, yes, there are solutions, even though the graphs of the parabolas do not intersect.


41. The solutions are $(0, -1)$ and $(1, 0)$.

42. The solution is $(0, -5)$.

43. The solutions are $(10, 68)$ and $(-3, 16)$.

44. The solutions are $(-17, 80.5)$ and $(1, 8.5)$.

45. The solutions are $(-8, -16)$ and $\left(-\frac{4}{3}, 4\right)$.

46. The solutions are $(4.47, 0.47)$ and $(-4.47, -8.47)$.

47a. $0 < p < 25$

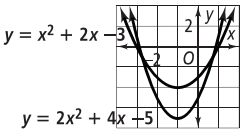
47b. 13

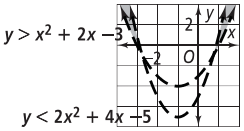
48. The solutions are $\left(\frac{-7 + 2\sqrt{11}}{5}, 10 - 2\sqrt{11}\right)$ and $\left(\frac{-7 - 2\sqrt{11}}{5}, 10 + 2\sqrt{11}\right)$ or $(-0.0734, 3.3668)$ and $(-2.7266, 16.6332)$.

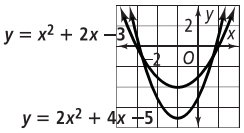
49. There are no solutions.

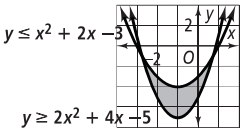
50. The solution is $(-2, 4)$.

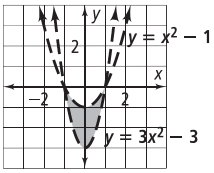
51. The solution is $\left(\frac{1}{2}, \frac{7}{2}\right)$.

52a. 

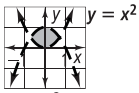
$y > x^2 + 2x - 3$ and $y < 2x^2 + 4x + 5$


52b. 

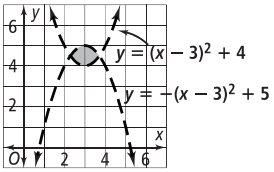
$y \le x^2 + 2x - 3$ and $y \ge 2x^2 + 4x + 5$


53. 

Answers may vary. Sample:
$(0, -2)$

54. 

Answers may vary. Sample:
$\left(0, \frac{1}{2}\right)$

55. 

Answers may vary. Sample:
$\left(3, \frac{9}{2}\right)$

56. Answers may vary. Sample:
y-intercept of -2.

57. Never.
The graphs are vertical translations of $y = x^2$, so they will never intersect.

58. Always.
The graphs have the same vertex; they just have different widths.

59. Always.
The graphs are horizontal translations. They will always intersect because the domain for both is all real numbers.

60. Sometimes.
They will intersect if both open in the same direction because they have different vertices. But they will not intersect if the first one has a vertex above the y-axis and opens upward and the second has a vertex below the y-axis and opens downward.

61. $\sqrt{5} - 1$ units

62. C

63. F

64. C

65. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = \frac{-(5) \pm \sqrt{5^2 - 4(-3)(4)}}{2(-3)}$
$x = \frac{5 \pm \sqrt{73}}{6}$

66. $-4 + 3i$

67. $7 + 7i$

68. $3 + 3i$

69. $-1, -\frac{3}{2}$

70. 1, 3

71. $\frac{3}{5}$

72. $y = -(k-2)^2 + 10$

73. $y = (x+3)^2 - 8$

74. $y = 2(n-2)^2 - 11$

75. $11q$

76. $2a^2b + ab^2$

77. $-y^2 + 2y$