Answers for 9.6

For use with pages 596–599

9.6 Skill Practice

1. roots
2. Enter the polynomial as Y_1 and enter the polynomial in factored form as Y_2. Graph Y_1 and Y_2 in the same viewing window. If the graphs coincide then the factorization is correct.
3. To factor the polynomial that has a leading coefficient of 1, $x^2 - x - 2$, you only need to find factors of the constant term, -2, that add to the coefficient of the middle term, -1. To factor the polynomial that has a leading coefficient that is not 1, $6x^2 - x - 2$, you must also take into account how the factors of the leading coefficient, 6, affect the coefficient of the middle term.
4. $-(x - 5)(x + 4)$
5. $-(y - 4)(y + 2)$
6. $-(a - 3)(a - 9)$
7. $(5w - 1)(w - 1)$
8. $-(3p + 1)(p + 3)$
9. $(6s + 5)(s - 1)$
10. $(2t - 9)(t + 7)$
11. $(2c - 1)(c - 3)$
12. $(3n - 2)(n - 5)$
13. $-(2h + 1)(h - 3)$
14. $-(2k + 3)(3k + 2)$
15. $(2x + 3)(5x - 9)$
16. $(4m + 5)(m + 1)$
17. $(3z + 7)(z - 2)$
18. $(4a - 3)(a + 3)$
19. $(2n + 3)(2n + 51)$
20. $-(5b - 2)(b - 1)$
21. $(3y - 4)(2y + 1)$
22. B
23. $-\frac{7}{2}, 5$
24. $-\frac{1}{3}, -7$
25. $\frac{1}{4}, -3$
26. $\frac{5}{7}, -1$
27. $\frac{3}{4}, -\frac{1}{2}$
28. $-\frac{7}{6}, 2$
29. $-\frac{1}{4}, \frac{2}{5}$
30. $\frac{5}{6}, \frac{3}{2}$
31. $\frac{1}{3}, -5$
32. $-\frac{9}{2}, 5$
33. $\frac{2}{5}, 1$
34. $\frac{3}{2}, -1$
35. $\frac{11}{2}, -3$
36. $\frac{1}{7}, \frac{1}{4}$
37. $-\frac{4}{3}, \frac{1}{2}$

38. In order to solve an equation by factoring and using the zero-product property, the equation must first be put in the form $ax^2 + bx + c = 0$. The left side of the equation should not be factored until 4 is subtracted from each side, making the right side of the equation zero; $5x^2 + x - 4 = 0$, $(5x - 4)(x + 1) = 0$, $5x - 4 = 0$ or $x + 1 = 0$, $x = \frac{4}{5}$ or $x = -1$; $\frac{4}{5}, -1$.

39. The factorization of the polynomial should be $(3x + 2)(4x - 1)$ instead of $(3x - 1)(4x + 2)$; $-\frac{2}{3}, \frac{1}{4}$.

40. $\frac{3}{5}$ in.

41. $9\frac{1}{2}$ in.; to find the width, solve the equation $w(4w + 1) = 3$ to get $w = \frac{3}{4}$ or $w = -1$. The width cannot be negative, so the width is $\frac{3}{4}$ inch. Then the length is $4\left(\frac{3}{4}\right) + 1 = 4$ inches, and the perimeter is $2\left(\frac{3}{4}\right) + 2(4) = 9\frac{1}{2}$ inches.

42. $\frac{1}{2}, -1$

43. 5, 7

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

45. $-\frac{7}{3}, 2$

46. $\frac{7}{4}, -1$

47. $\frac{7}{2}, -\frac{3}{2}$

48. $-\frac{8}{3}, 5$

49. $-\frac{1}{4}, \frac{5}{2}$

50. $-\frac{9}{2}, \frac{11}{2}$

51. C

52. $x^2 + x - 6 = 0$; any root $x = r$ of $x^2 + bx + c = 0$ comes from setting the factor $x - r$ equal to zero after $x^2 + bx + c$ is written in factored form; so, the roots -3 and 2 come from the factors $x - (-3)$, or $x + 3$, and $x - 2$. The product of these factors is $(x + 3)(x - 2)$
$= x^2 - 2x + 3x - 6$
$= x^2 + x - 6$.

53. $2x^2 - 9x - 5 = 0$; any root $x = \frac{r}{s}$ of $ax^2 + bx + c = 0$ comes from setting the factor $sx - r$ equal to zero after $ax^2 + bx + c$ is written in factored form; so, the roots $-\frac{1}{2}$ and 5 come from the factors $2x - (-1)$, or $2x + 1$, and $x - 5$. The product of these factors is $(2x + 1)(x - 5)$
$= 2x^2 - 10x + x - 5$
$= 2x^2 - 9x - 5$.

54. $12x^2 + 13x + 3 = 0$; any root $x = \frac{r}{s}$ of $ax^2 + bx + c = 0$ comes from setting the factor $sx - r$ equal to zero after $ax^2 + bx + c$ is written in factored form; so, the roots $-\frac{3}{4}$ and $-\frac{1}{3}$ come from the factors $4x - (-3)$, or $4x + 3$, and $3x - (-1)$, or $3x + 1$. The product of these factors is $(4x + 3)(3x + 1)$
$= 12x^2 + 4x + 9x + 3$
$= 12x^2 + 13x + 3$.

55. $(2x - y)(x - 5y)$

56. $(3x - 4y)(x + 2y)$

57. $2x(3x + 7y)(x - 4y)$

9.6 Probem Solving

58. about 2.54 sec

59. a. $24x^2 + 48x + 24$

b. 4 in., 2 in.

60. 2 sec; the ball's height (in feet) is modeled by the equation $h = -16t^2 + 31t + 6$, where t is the time (in seconds) since you threw it. To find when the height is 4 feet, substitute 4 for h. Solve the equation $4 = -16t^2 + 31t + 6$, or $16t^2 - 31t - 2 = 0$. The roots of the equation are $-\frac{1}{16}$ and 2. The time t cannot be negative, so distegard the root $-\frac{1}{16}$; the ball reaches a height of 4 feet after 2 seconds.

61. 31 m, 70 m

62. a. $h = -16t^2 + 24t$

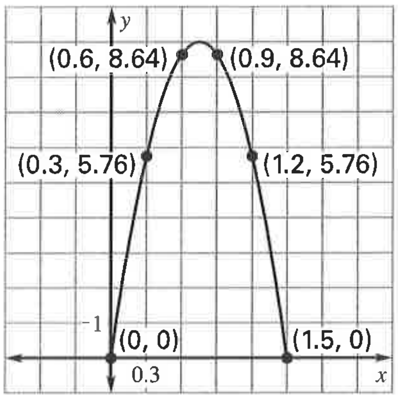
b.

x (feet)	y (feet)
0	0
0.3	5.76
0.6	8.64
0.9	8.64
1.2	5.76
1.5	0

Answers for 9.6 *continued*

For use with pages 596–599

62. c.



0.75 sec; substitute $h = 9$ feet into the equation $h = -16t^2 + 24t$ and solve for t, $t = 0.75$ second.

63. a. $h = -16t^2 + 4t$

b. 0.125 sec

c. No; $t = 0.125$ is the only solution of the equation $\frac{1}{4} = -16t^2 + 4t$, so the cricket is 3 inches off the ground only once. This happens only at the highest point of the cricket's jump; all other heights are reached twice, once on the way up and once on the way down.

9.6 Mixed Review

64. not a solution

65. solution

66. not a solution

67. solution

68. not a solution

69. solution

70. not a solution

71. not a solution

72. solution

73. $a^2 - 18a + 81$

74. $k^2 + 24k + 144$

75. $9x^2 - 12x + 4$

76. $m^2 - 16$

77. $4c^2 - 1$

78. $25n^2 - 9$

79. $64 - 48y + 9y^2$

80. $4s^2 - 20st + 25t^2$

81. $x^2 - 4y^2$

Answer Key

Lesson 9.6

Practice Level B

1. $(-x + 4)(x + 7)$ **2.** $(-p + 2)(p - 6)$
3. $(-m - 8)(m + 5)$ **4.** $(2y + 1)(y + 7)$
5. $(3a - 1)(a - 4)$ **6.** $(5d + 2)(d - 4)$
7. $(3c + 2)(2c + 1)$ **8.** $2(5n - 3)(n - 2)$
9. $(2w + 3)(6w - 5)$ **10.** $(b + 4)(-2b + 3)$
11. $(r + 5)(-3r - 2)$ **12.** $(s - 2)(-4s - 2)$
13. $-4, 5$ **14.** $-8, -2$ **15.** $6, 7$ **16.** $\frac{1}{2}, 5$
17. $-\frac{5}{2}, 2$ **18.** $-\frac{5}{8}, -\frac{1}{2}$ **19.** $-6, -\frac{1}{3}$
20. $\frac{1}{4}, \frac{2}{3}$ **21.** $-\frac{2}{3}, \frac{4}{5}$ **22.** $-4, -\frac{1}{2}$ **23.** $-2, \frac{5}{3}$
24. $-\frac{1}{2}, \frac{5}{4}$ **25.** $-3, 9$ **26.** $-8, \frac{1}{2}$ **27.** $-6, \frac{4}{3}$
28. $-1, 2$ **29.** $\frac{5}{3}, 4$ **30.** $-7, \frac{3}{8}$ **31.** $-6, -\frac{5}{4}$
32. $-10, \frac{3}{2}$ **33.** $-1, \frac{1}{2}$ **34.** $90 **35.** 3 sec
36. a. $4x^2 + 24x + 32$ **b.** 8 in. by 16 in.

Answers for 9.7

For use with pages 603–605

9.7 Skill Practice

1. perfect square

2. Write the binomial in the form $a^2 - b^2$ and then factor it as $(a + b)(a - b)$, the sum and difference of a and b.

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

4. $(n + 8)(n - 8)$

5. $(9c + 2)(9c - 2)$

6. $(7 + 11p)(7 - 11p)$

7. $-3(m + 4n)(m - 4n)$

8. $9(5x + 4y)(5x - 4y)$

9. $(x - 2)^2$ **10.** $(y - 5)^2$

11. $(7a + 1)^2$ **12.** $(3t - 2)^2$

13. $\left(m + \frac{1}{2}\right)^2$ **14.** $2(x + 3y)^2$

15. $4(c + 10)(c - 10)$

16. $(2f - 9)^2$

17. $(2s + 3r)(2s - 3r)$

18. $(z + 6)^2$

19. $8(3 + 2y)(3 - 2y)$

20. $5(3r - 4s)^2$

21. $(2x)^2 - 3^2$ is in the form $a^2 - b^2$, so it must be factored using the difference of two squares pattern, not the perfect square trinomial pattern; $9(2x + 3)(2x - 3)$.

22. $y^2 - 2(y \cdot 3) + 3^2$ is in the form $a^2 - 2ab + b^2$, so it must be factored using the perfect square trinomial pattern, not the difference of two squares pattern; $(y - 3)^2$.

23. C **24.** A

25. -4 **26.** $\frac{1}{4}$ **27.** ± 3

28. $\pm\frac{4}{3}$ **29.** -2 **30.** -7

31. ± 12 **32.** ± 6 **33.** $\pm\frac{7}{2}$

34. $\frac{2}{9}$ **35.** $\frac{5}{6}$ **36.** $\pm\frac{1}{6}$

37. $\pm\frac{4}{3}$ **38.** $-\frac{2}{5}$ **39.** 0, 1

40. ± 12 **41.** ± 12 **42.** ± 16

43. 1 **44.** 36 **45.** 144

9.7 Problem Solving

46. 1.25 sec **47.** 2.5 sec

48. a. $h = -16t^2 + 8t$

b. 0.25 sec

49. Once; the ball's height (in feet) is modeled by the equation $h = -16t^2 + 56t + 5$, where t is the time (in seconds) since it was thrown. To find when the height is 54 feet, substitute 54 for h and solve the equation $54 = -16t^2 + 56t + 5$, or $16t^2 - 56t + 49 = 0$. Because the left side of the equation factors as a perfect square trinomial, $(4t - 7)^2$, the equation has only one solution $\frac{7}{4}$ or 1.75; so, the ball reaches a height of 54 feet only once, 1.75 seconds after being thrown.

50. a.

x (feet)	*y* (feet)
0	0
2	5
5	8.75
8	8
11	2.75

b. $0 \le x \le 12$; the table in part (a) shows the heights of the arch for various values of x from 0 to 11; to find the greatest x-value for which the equation gives a height that makes sense, find the other value of x for which the height is 0. Solve the equation $0 = -\frac{1}{4}x^2 + 3x$; the roots are 0 and 12, so the equation makes sense for $0 \le x \le 12$.

c. 6 ft

51. a. $4d^2 - 9$

b. 10 in.

52. a. $1 + 3 + 5 + 7 = 16$;
$1 + 3 + 5 + 7 + 9 = 25$;
3^2; 4^2; 5^2

b. The sum of the first n odd integers is n^2; 100.

c. The nth odd integer is in the form $2n - 1$, so 11 is the sixth odd integer and 21 is the eleventh odd integer. To find the sum of the odd integers from 11 to 21, find the sum of the first 11 odd integers ($11^2 = 121$) and subtract the sum of the first 5 odd integers ($5^2 = 25$) to get $121 - 25 = 96$.

52. d. 6 rows; let x = the number of chairs in the last row, so that the sum of the odd integers from 15 to x is 120. x can be written in the form $2n - 1$. 15 is the eighth odd integer and x is the nth odd integer, so the sum of the odd integers from 15 to x can be found as described in part (c): the sum of the first n odd integers minus the sum of the first 7 odd integers, $n^2 - 7^2$, or $n^2 - 49$. The total number of chairs is to be 120, so this leads to the equation $n^2 - 49 = 120$, or $n^2 - 169 = 0$. This equation has two solutions, 13 and -13. Disregard the solution -13 because n cannot be negative in this situation. So, x is the thirteenth odd integer. The numbers of chairs in the rows go from the eighth odd integer (15) to the thirteenth odd integer (25). There are $13 - 8 + 1 = 6$ rows of chairs.

9.7 Mixed Review

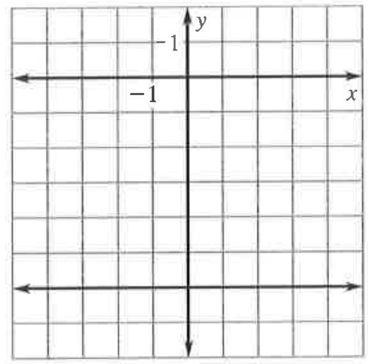
53. -3 **54.** -6 **55.** 2

56. -1 **57.** $-1, 9$

58. $-11, -6$ **59.** $-15, 3$

60. $-3, \frac{5}{2}$ **61.** $\frac{7}{3}, 5$

62.



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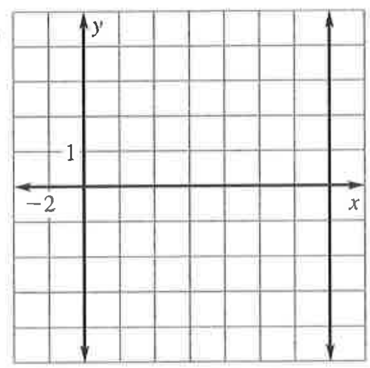

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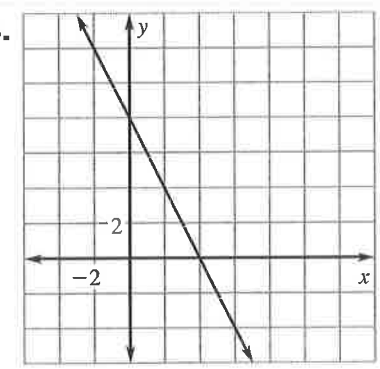

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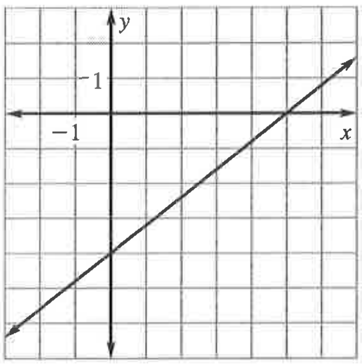

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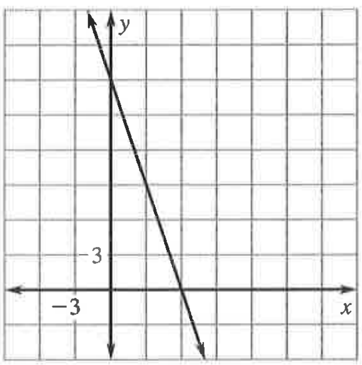

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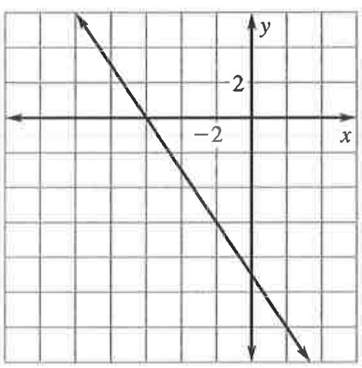

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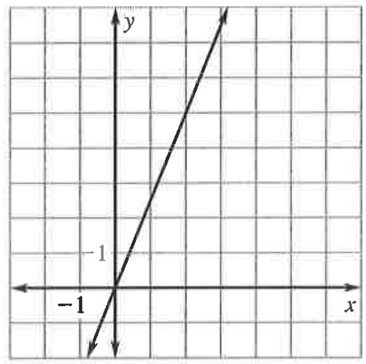

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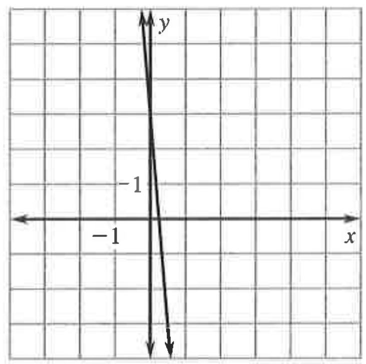

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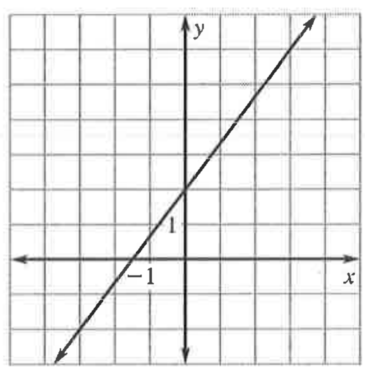


71. $10a^2 - 19a + 6$

72. $2x^3 - x^2 + 2x - 3$

73. $c^2 + 8c + 15$

74. $6x^2 - 29x + 28$

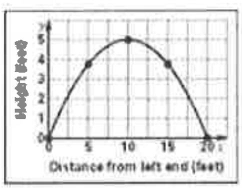
75. $4k^2 - 121$ **76.** $y^2 - 14y + 49$

Answer Key

Lesson 9.7

Practice Level B

1. $(x - 6)(x + 6)$ **2.** $(5p - 12)(5p + 12)$
3. $(2b - 10)(2b + 10)$ **4.** $(6m - 9)(6m + 9)$
5. $-2(x - 4)(x + 4)$ **6.** $-4(r - 5s)(r + 5s)$
7. $(y + 12)^2$ **8.** $(3c + 4)^2$ **9.** $(5w - 2)^2$
10. $(4n - 7)^2$ **11.** $-2(3a + 1)^2$ **12.** $5(2z - 7)^2$
13. -7 **14.** $-\frac{5}{2}, \frac{5}{2}$ **15.** $\frac{1}{8}$ **16.** $-3, 3$ **17.** -5
18. 4 **19.** $-5, 5$ **20.** 10 **21.** $\frac{1}{2}$ **22.** $-\frac{5}{3}$
23. $-\frac{3}{5}$ **24.** $-\frac{3}{8}, \frac{3}{8}$ **25.** 8 **26.** 3 **27.** 1 sec
28. a. 0; 3.75; 5; 3.75; 0 **b.** Any other values between 0 and 20 because the ladder is on the ground at $x = 0$ and meets the ground again at
$x = 20$.
c.



d. 10 ft