

Answers for 9.4

For use with pages 578–581

9.4 Skill Practice

- The vertical motion model is the equation $h = -16t^2 + vt + s$, where h is the height (in feet) of a projectile after t seconds in the air, given an initial velocity of v feet per second and an initial height of s feet.
- Set each of the two polynomial factors, $3x$ and $x - 7$, equal to zero and then solve each equation for x .
 - 5, -3
 - 13, 14
 - 7, $-\frac{4}{3}$
 - ± 3
 - $-\frac{11}{3}, -1$
 - $-\frac{5}{2}, \frac{5}{7}$
 - C
- The step of setting each factor equal to zero was left out;
 $z - 15 = 0$ or $z + 21 = 0$,
 $z = 15$ or $z = -21$.
- $2(x + y)$
- $3(2x^2 - 5y)$
- $s(3s^3 + 16)$
- $d^5(5d + 2)$
- $7w^2(w^3 - 5)$
- $3m^2(3m^5 - 1)$
- $5n(3n^2 + 5)$
- $4a(3a^4 + 2)$
- $\frac{1}{2}x^4(5x^2 - 1)$
- A common monomial factor, $3x$, was factored out, but not the greatest common factor, which is $3x^3$; $3x^3(6x^5 - 3x - 2)$.
- 0, -6
- 0, 1
- 0, $\frac{7}{2}$
- 0, $-\frac{15}{2}$
- 0, $-\frac{1}{3}$
- 0, $-\frac{3}{4}$
- 0, 2
- 0, $\frac{1}{2}$
- 0, $\frac{5}{2}$
- 0, $-\frac{1}{3}$
- 0, $-\frac{2}{7}$
- 0, $\frac{5}{2}$
- C
- $4xy(5xy - 1)$
- $2ab(4a - 3b)$
- $2s^2t(9t^4 - s)$
- $v(v^2 - 5v + 9)$
- $-2g(g^3 - 7g - 3)$
- $3q^2(2q^3 - 7q^2)$

Answers for 9.4 *continued*

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46. 0, 15 47. $0, \frac{1}{2}$ 48. 0, 9

49. 0; 0; at least one of them must be 0.

50. for $x = 0$ and y any real number, or for all real numbers x and y where $x = y$

9.4 Problem Solving

51. about 0.69 sec

52. a. $h = -16t^2 + 10t$

b. about 1.563 ft

53. 0, about 0.28; the zero $t = 0$ seconds means that the penguin begins at a height of 0 feet in the air as it leaves the water; the zero $t \approx 0.28$ second means that the penguin lands back in the water (at a height of 0 feet in the air) after about 0.28 second.

54. about 0.73 sec

55. a. $h = -4.9t^2 + 4.9t$

b. $0 \leq t \leq 1$; a reasonable domain for the function will cover the time from when the rabbit leaves the ground until the rabbit lands back on the ground; these times t are the zeros of the function, 0 seconds and 1 second.

56. B

57. a. $w(w + 2) = w(10 - w)$

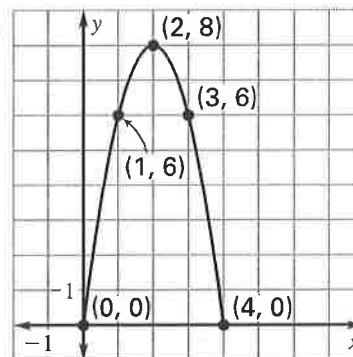
b. 4

c. 48 ft^2

58. a.

x (feet)	y (feet)
0	0
1	6
2	8
3	6
4	0

b.



c. 4 ft

Answers for 9.4 *continued*
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59. a. 8 ft; the zeros of the function, 0 and 8, are the x -intercepts of the graph, which represent the edges of the base of the doorway. The distance between 0 and 8 on the x -axis is 8 units, so the width of the doorway at its base is 8 feet.

b. 8 ft; the center of the base is the midpoint of the segment joining the x -intercepts 0 and 8, so at the center of the base $x = 4$. The doorway's highest point will be the point $(4, y)$ on the graph of $y = -0.5x(x - 8)$. Substitute $x = 4$ into the equation for y to find the height: $y = -0.5(4)(4 - 8) = 8$ feet.

9.4 Mixed Review

60. $45x^2$

61. $-54a^3$

62. $224n$

63. $y^2 + 6y - 7$

64. $m^2 - 18m + 65$

65. $2b^2 + 11b + 15$

66. $12p^2 + 29p - 8$

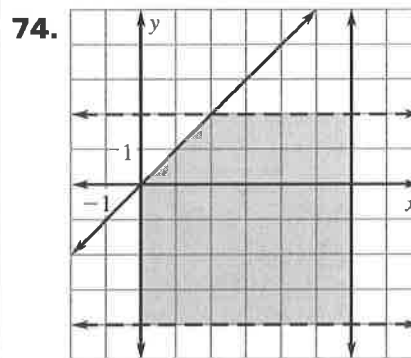
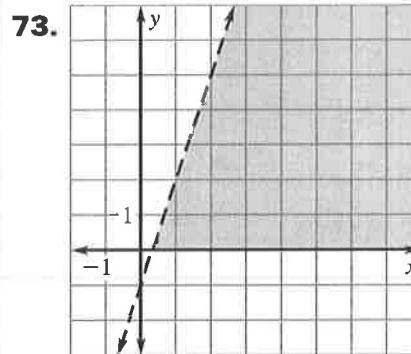
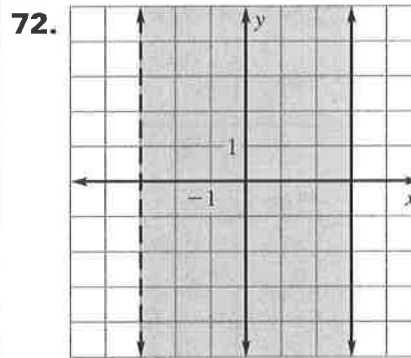
67. $25z^2 - 30z + 8$

68. $36t^2 + 73t + 35$

69. $4c^2 + 28c + 49$

70. $81 - 90w + 25w^2$

71. $9g^2 - 24gh + 16h^2$



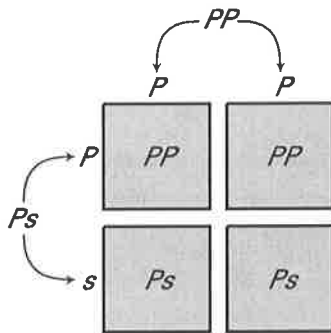
Answers for 9.4 *continued*
For use with pages 578–581

9.1–9.4 Mixed Review of Problem Solving

1. a. $4x^2 + 240x + 3456$

b. 4480 in.^2

2. a. *Sample:*



b. *Sample answer:* 100%

c. The gene from the father is modeled by $0.5P + 0.5s$ and the gene from the mother is modeled by $0.5P + 0.5P = P$, so the possible gene combinations of the offspring are modeled by $P(0.5P + 0.5s) = 0.5P^2 + 0.5Ps$. Because any gene combination with a P results in pinto coloring, both terms represent pinto offspring. The sum of the coefficients, $0.5 + 0.5 = 1$, shows that 100% of the offspring will be pinto.

3. a. The football with the initial vertical velocity of 44 ft/sec

b. The height of the football with the initial vertical velocity of 44 feet per second is modeled by the equation

$$h = -16t^2 + 44t, \text{ which}$$

has zeros $h = 0$ seconds and $h = 2.75$ seconds. The height of the football with the initial vertical velocity of 40 feet per second is modeled by the equation $h = -16t^2 + 40t$, which has zeros $h = 0$ seconds and $h = 2.5$ seconds. The first football stays in the air $2.75 - 2.5 = 0.25$ second longer than the second football.

2.75 – 2.5 = 0.25 second longer than the second football.

$$h = -16t^2 + 40t,$$

which has zeros $h = 0$ seconds and $h = 2.5$ seconds. The first football stays in the air

$2.75 - 2.5 = 0.25$ second

longer than the second football.

longer than the second football.

4. 3;

			3
	/	/	
.	.	.	.
	0	0	0
①	①	①	①
②	②	②	②
③	③	③	●
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

Answers for 9.4 *continued*
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5. a. $T = 0.067t^3 - 0.107t^2$
 $+ 0.686t + 4.74$

b. about 4.74 million people,
about 37.7 million people

c. About 4.12 million people per
year; to find the average rate of
change, divide the total change
in participation from 1992 to
2000 by the number of years
from 1992 to 2000:

$$\frac{(37.7 - 4.74) \text{ million people}}{(2000 - 1992) \text{ years}}$$
$$= \frac{32.96 \text{ million people}}{8 \text{ years}}$$
$$\approx 4.12$$

million people per year.

6. a. $\pi r^2 + 4\pi r + 4\pi$

b. $12.25\pi \text{ ft}^2$; evaluate the
polynomial from part (a)

when $r = 1.5$:

$$\pi(1.5^2) + 4\pi(1.5) + 4\pi$$
$$= 2.25\pi + 6\pi + 4\pi$$
$$= 12.25\pi \text{ square feet.}$$

Answer Key

Lesson 9.4

Practice Level B

1. $-14, 3$ 2. $-5, 12$ 3. $-24, -15$ 4. $8, 9$
5. $-8, \frac{1}{2}$ 6. $-\frac{3}{4}, 6$ 7. $-5, 4$ 8. $-2, 3$
9. $\frac{2}{3}, 8$ 10. $-\frac{1}{2}, \frac{1}{2}$ 11. $-3, \frac{1}{2}$ 12. $-\frac{5}{4}, \frac{5}{4}$
13. $10(x - y)$ 14. $4(2x^2 + 5y)$ 15. $6(3a^2 - b)$
16. $4x(x - 1)$ 17. $r(r + 2s)$ 18. $2m(m + 3n)$
19. $5q(p^2 + 2)$ 20. $a^3(9a^2 + 1)$ 21. $2w^2(3w - 7)$
22. $0, 10$ 23. $-14, 0$ 24. $0, 1$ 25. $-1, 0$
26. $0, 3$ 27. $-2, 0$ 28. $0, \frac{5}{2}$ 29. $-\frac{5}{4}, 0$
30. $0, \frac{5}{2}$ 31. $0, \frac{1}{2}$ 32. $-\frac{1}{2}, 0$ 33. $-\frac{3}{8}, 0$
34. 1.5 sec; Yes. From the equation, you can see that the factor $t - 1.5$ will be zero when $t = 1.5$.
35. a. $h = -16t^2 + 14t$ b. $\frac{7}{8}$ sec
36. a. $w(w + 3) = w(7 - w)$ b. 2 ft c. 20 ft²

Answers for 9.5

For use with pages 586–589

9.5 Skill Practice

1. factors
2. p and q are both negative; $pq = 12$, so the product pq is positive, which means p and q are either both positive or both negative. Also $p + q = -8$. In order for p and q to have the same sign and have a negative sum, both p and q must be negative.
3. $(x + 3)(x + 1)$
4. $(a + 4)(a + 2)$
5. $(b - 9)(b - 8)$
6. $(s - 8)(s - 2)$
7. $(z + 12)(z - 4)$
8. $(w + 14)(w + 4)$
9. $(y - 9)(y + 2)$
10. $(n - 7)(n - 2)$
11. $(x + 10)(x - 7)$
12. $(f + 8)(f - 4)$
13. $(m - 15)(m + 8)$
14. $(d - 11)(d - 9)$
15. $(p + 16)(p + 4)$
16. $(x + 12)(x - 6)$
17. $(c + 11)(c + 4)$

18. In order to have a product of -60 , p and q cannot both be negative; $(s - 20)(s + 3)$.
19. In order to have a product of $+24$, p and q must have the same sign; $(m - 6)(m - 4)$.
20. 7, 3
21. 10, -3
22. 11, 4
23. -10 , 5
24. -6 , 4
25. -5 , -4
26. 5, -3
27. -22 , -1
28. 5, 3
29. C
30. -9 , -2
31. -3 , -2
32. 16, 2
33. 9, 5
34. 8, -3
35. 17, -3
36. -13 , 3
37. 14, 2
38. 30, -6
39. -9 , 8
40. 7, 3
41. -17 , -2
42. $x^2 - 2x - 24$; 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 -4 and 6 come from the factors $x - (-4)$, or $x + 4$, and $x - 6$. The product of these factors is $(x + 4)(x - 6)$
 $= x^2 - 6x + 4x - 24$
 $= x^2 - 2x - 24$.

Answers for 9.5 *continued*
For use with pages 586–589

43. 20 in., 5 in. **44.** 17 m, 2 m

45. 26 yd, 6 yd **46.** 17 ft, 14 ft

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

48. $(y - 5z)(y - z)$

49. $(c + 9d)(c + 4d)$

50. $(r + 10s)(r + 5s)$

51. $(a + 5b)(a - 3b)$

52. $(x + 13y)(x - 5y)$

53. $(m - 7n)(m + 6n)$

54. $(u - 12v)(u + 9v)$

55. $(g + 10h)(g - 6h)$

56. $\pm 8, \pm 16$

57. $\pm 10, \pm 22$

58. $\pm 1, \pm 11, \pm 19, \pm 41$

9.5 Problem Solving

59. 10 cm^2

60. a. $x^2 + 82x + 1600$

b. 8 ft

61. 40 in.; the side lengths of the trimmed photo can be represented by $x - 5$ and $x - 6$; the area of the trimmed photo is 20 square inches, so to find the side length x of the original square photo, solve the equation $(x - 5)(x - 6) = 20$.

The equation has two solutions, 10 and 1, but when $x = 1$ inch, both $x - 5$ and $x - 6$ are negative, which does not make sense in this situation. So $x = 10$ inches, and the perimeter of the original square photo was $4(10) = 40$ inches.

62. a. $630w - w^2$

b. $630w - w^2 = 3125$;
625, 5; 5 ft

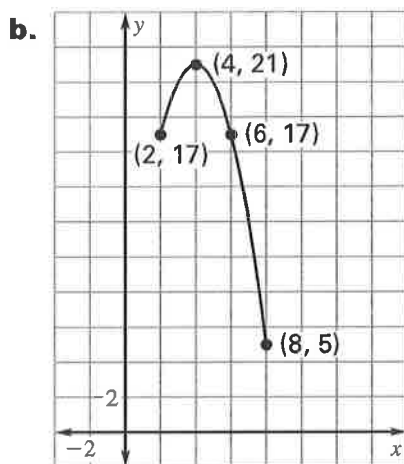
c. 625 feet does not make sense as a path width in this problem situation because it is wider than the length of either path. In the diagram w is also the side length of the overlapping square. If $w = 625$ feet, the square is larger than either part of the path. Only the solution $w = 5$ feet makes sense as a path width.

63. B

Answers for 9.5 *continued*
For use with pages 586–589

64. a.

x (feet)	y (feet)
2	17
4	21
6	17
8	0



c. Yes. *Sample answer:* From the graph it appears that the keys reach a height of 21 feet when they are still 1 foot from the edge of the building (when $x = 4$ feet); when the keys are at the edge of the building ($x = 5$ feet), they have started to fall back down and appear to be at a height of about 20 feet, the height of the window.

d. 3, 5; there are two points at which the keys reach a height of 20 feet; because you are standing 5 feet from the building, the x -value of 5 feet means that when the keys reach the edge of the building they are at a height of 20 feet.

65. a. 10 ft, 12 ft

b. 20 ft, 18 ft

9.5 Mixed Review

66. -8 **67.** 3 **68.** -3

69. 9 **70.** -5 **71.** -4

72. $8, -3$ **73.** $-\frac{5}{3}, -2$

74. $3x^2 - 8x - 35$

75. $6a^2 - 35a + 36$

76. $c^3 + 3c^2 - 2c - 8$

77. $49 - 14y - 15y^2$

78. $4k^2 - 64$

79. $196 - 56n + 4n^2$

80. $25x^2 + 160xy + 256y^2$

81. $9x^2 - 36y^2$

Answer Key

Lesson 9.5

Practice Level B

1. $(x + 7)(x + 1)$ 2. $(b - 5)(b - 2)$
3. $(w - 13)(w + 1)$ 4. $(p + 5)^2$
5. $(m - 6)(m - 4)$ 6. $(y - 8)(y + 3)$
7. $(a + 9)(a + 4)$ 8. $(n - 6)(n + 8)$
9. $(z - 10)(z - 4)$ 10. $-9, -8$ 11. $-3, 12$
12. $6, 7$ 13. $-2, 7$ 14. $-8, -3$ 15. $3, 9$
16. $-10, 5$ 17. $-12, -4$ 18. $-5, 6$ 19. $-4, 9$
20. $-10, 2$ 21. $3, 8$ 22. $-7, -4$ 23. $-12, 1$
24. $-6, 3$ 25. $-12, -5$ 26. $-4, 8$
27. $-5, -3$ 28. $-7, 1$ 29. $-2, 5$ 30. -9
31. a. $x^2 + 150x + 5000$ b. 20 ft
32. a. $x^2 - 7x + 12$ b. 144 in.