Selected Answers

UNIT 1

1.1 Exercise Set A (p. 4)

1. Know: Number of boxes and number of blueberry muffins in one box; Need to find out: How many dozen blueberry muffins need to be made **3.** Know: How long you have been driving and your average speed; Need to find out: The distance that you travel

5. $d = rt$ **7.** \$80 **9.** 12; \$59.40

1.1 Exercise Set B (p. 5)

3. $x + 3x = 500$ **5.** $d = rt$; $d = 250$; $t = 5$

7. 30 ft by 15 ft **9.** 0°C; 35.6°C

1.2 Exercise Set A (p. 9)

1. independent **3.** function **5.** not a function

7.

Domain	10	20	30	40
Range	4	5	6	7

9. $y = 5x$ **11.** $y = x - 2$

13. $y = 10 + 3x$; independent: number of hours left in shift; dependent: number of loaves baked; 22 loaves

1.2 Exercise Set B (p. 10)

1. function **3.** not a function

5.

Domain	12	15	18	21
Range	0	1	2	3

7.

Domain	10	20	30	40
Range	1	$\frac{4}{3}$	$\frac{5}{3}$	2

9. $y = \frac{1}{2}x - 1$

11. $y = 8 + 4x$; 32 sandwich rings

1.3 Exercise Set A (pp. 13–14)

1. (0, 3), (1, 5), (2, 7), (3, 9), (4, 11)

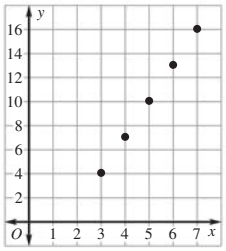
3. (3, 2), (6, 2), (9, 4), (12, 4), (15, 6)

5. (0, 6), (1, 8), (2, 10), (3, 12); domain: 0, 1, 2, 3; range: 6, 8, 10, 12

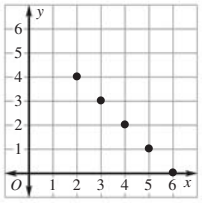
7.

x	0	1	2	3
y	2	5	8	11

9.



11.



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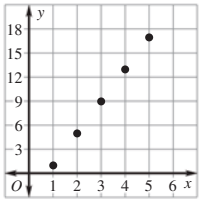
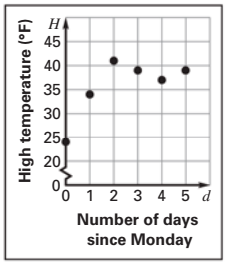


15. $y = x + 6$; domain: 0, 1, 2, 3; range: 6, 7, 8, 9

17. $y = 2x + 5$; domain: 0, 1, 2, 3; range: 5, 7, 9, 11

19. $y = 6x - 4$; domain: 1, 2, 3, 4; range: 2, 8, 14, 20

21.



Sample answer: The high temperatures increase from Monday to Wednesday, decrease from Wednesday to Friday, and then increase from Friday to Saturday.

1.3 Exercise Set B (pp. 15–16)

1. (4, 8), (6, 12), (8, 16), (10, 20), (12, 24)

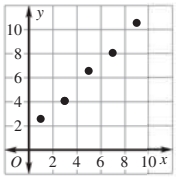
3. (−3, −15), (3, −9), (9, −3), (15, 3), (21, 9)

5. (−1, −4), (0, −2), (1, 0), (2, 2); domain: −1, 0, 1, 2; range −4, −2, 0, 2

7.

x	6	9	12	15
y	0	2	4	6

9.



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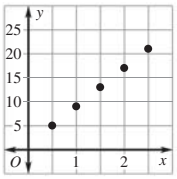

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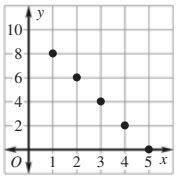
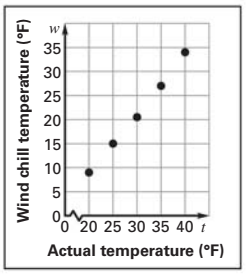


SELECTED ANSWERS

15. $y = 3x - 4$; domain: 2, 3, 4, 5, 6; range: 2, 5, 8, 11, 14 **17.** $y = \frac{1}{2}x - \frac{1}{2}$; domain: 1, 3, 5, 7, 9; range: 0, 1, 2, 3, 4

19. $y = \frac{1}{10}x$; domain: 10, 20, 30, 40; range: 1, 2, 3, 4

21. a.



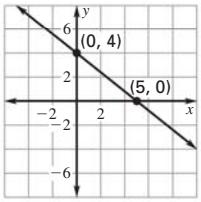
b. As the temperature decreases, the wind chill temperature decreases.

1.4 Exercise Set A (pp. 19–20)

1. x: 4; y: 3 **3.** x: 3; y: 2 **5.** x: -5; y: 5

7. x: 6; y: 3 **9.** x: 2; y: -8 **11.** x: $\frac{1}{2}$; y: -3

13.



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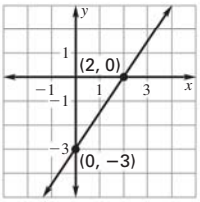

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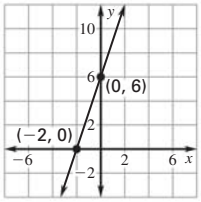

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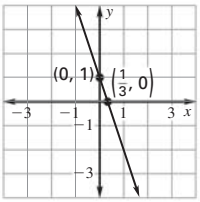

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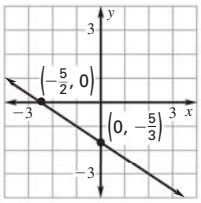

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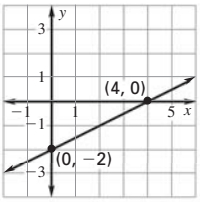
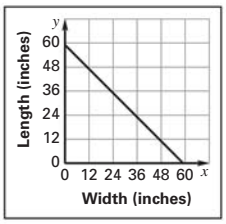
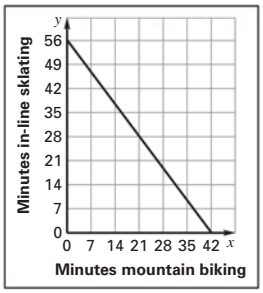


29. a. $2x + 2y = 118$

b. x: 59; y: 59



31. a. x: 42; y: 56



b. The x-intercept is the number of calories burned when the man only mountain bikes and the y-intercept is the number of calories burned when the man only in-line skates. **c.** *Sample answer:* 42 minutes mountain biking and 0 minutes in-line skating; 0 minutes mountain biking and 56 minutes in-line skating; 21 minutes mountain biking and 28 minutes in-line skating

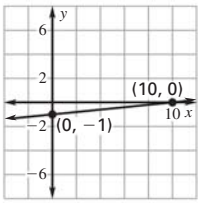
1.4 Exercise Set B (pp. 21–22)

1. x: -2; y: -1 **3.** x: -3; y: -4 **5.** x: -5; y: 7

7. x: -2; y: $-\frac{1}{4}$ **9.** x: $\frac{15}{7}$; y: -15

11. x: -3.75; y: -9

13.



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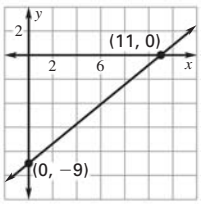

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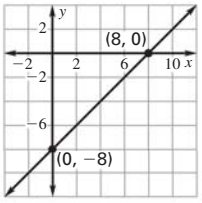
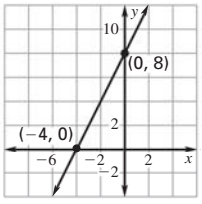


19.



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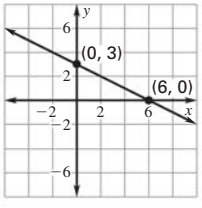

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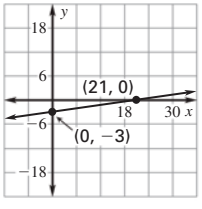
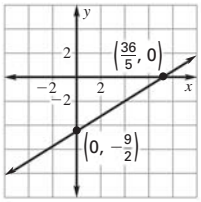
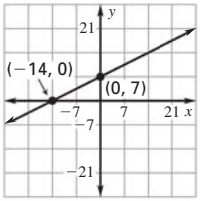
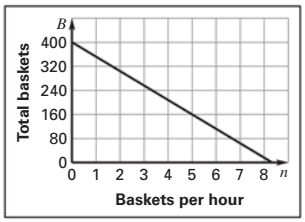


25. 

27. 

33. a. 

domain: $0 \le n \le 8\frac{1}{3}$

range: $0 \le B \le 400$

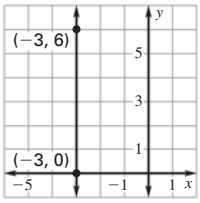
$8\frac{1}{3}$ baskets per hour

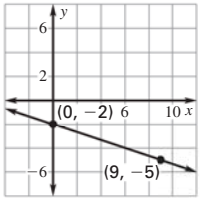
b. The intercepts change and the slant of the graph changes; 7.5 baskets per hour

1.5 Exercise Set A (pp. 25–26)

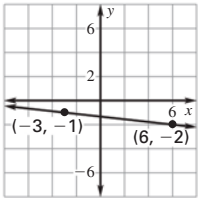
1. positive **3.** undefined

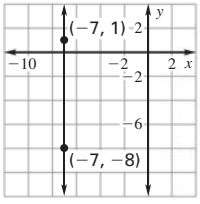
5. undefined **7.** negative





9. negative **11.** undefined





13. $\frac{2}{3}$ **15.** 0 **17.** $\frac{3}{5}$ **19.** $\frac{5}{6}$ **21.** undefined

23. $\frac{1}{2}$ **25.** 0 **27.** $\frac{1}{3}$ **29.** 4 **31.** 8 **33.** 6

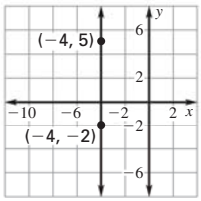
35. a. From 1980 to 1985: −29.4 buses per year; From 1985 to 1990: 31.2 buses per year; From 1990 to 1995: 10.6 buses per year; From 1995 to 2000: 13.2 buses per year; From 1980 to 1985, the number of buses decreased, but then the number of buses increased after that. **b.** Greatest: From 1985 to 1990; Least: From 1990 to 1995

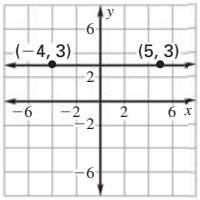
37. The person's heartrate increased for 0 to 12 minutes, then it slowly decreased until the end of the workout.

1.5 Exercise Set B (pp. 27–28)

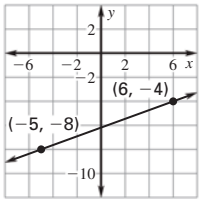
1. positive **3.** zero

5. undefined **7.** zero





9. positive



11. $-\frac{11}{6}$ **13.** $-\frac{4}{3}$ **15.** 0 **17.** $-\frac{2}{3}$ **19.** $\frac{3}{5}$

21. undefined **23.** $\frac{4}{7}$ **25.** 0 **27.** $\frac{1}{6}$ **29.** 4 **31.** 9

33. −3 **35. a.** From 10 to 15 min **b.** From 0 to 5 min **c.** Your speed increased from 0 to 15 minutes, then you slowed down for the rest of the ride.

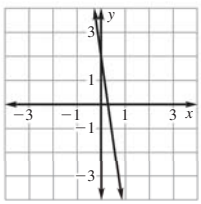
1.6 Exercise Set A (pp. 32–33)

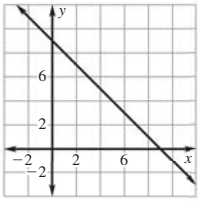
1. Slope: −2; y-intercept: 1 **3.** Slope: $\frac{1}{2}$; y-intercept: 0 **5.** Slope: −4; y-intercept: 10

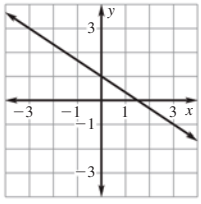
7. Slope: −4; y-intercept: 3 **9.** Slope: $-\frac{2}{5}$; y-intercept: 2 **11.** Slope: $-\frac{3}{2}$; y-intercept: $\frac{1}{2}$

13. Slope: −1; y-intercept: $\frac{3}{5}$

15. Slope: undefined; y-intercept: none

19. 

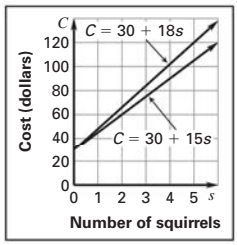
21. 

23. 

25. line through $(-1, -4)$ and $(0, 2)$ and line through $(1, 3)$ and $(2, 9)$ **27.** neither

29. perpendicular **31.** perpendicular

33. a. and **b.**



c. \$12

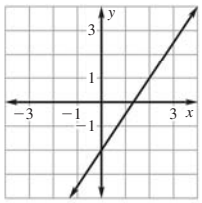
1.6 Exercise Set B (pp. 34–35)

1. Slope: -3; y-intercept: 1 **3.** Slope: $\frac{3}{2}$; y-intercept: 2 **5.** Slope: -6; y-intercept: 19

7. Slope: $-\frac{3}{2}$; y-intercept: 4 **9.** Slope: $\frac{4}{3}$; y-intercept: 3 **11.** Slope: $\frac{4}{9}$; y-intercept: -2

13. Slope: $\frac{2}{5}$; y-intercept: -2 **15.** Slope: $-\frac{1}{10}$; y-intercept: 2

17.



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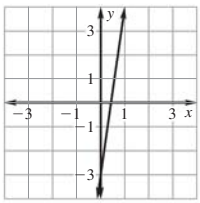

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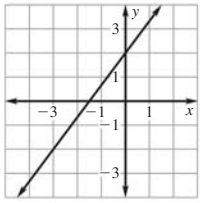

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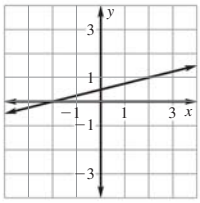
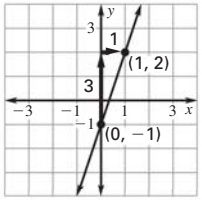


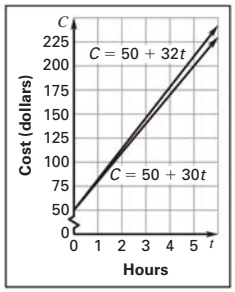
25. The y-intercept is -1, not 1.



27. line through $(-1, 3)$ and $(0, -3)$ and line through $(0, 2)$ and $(1, -4)$ **29.** parallel

31. neither **33.** -38 **35.** -2

37. a. and **b.**



c. \$6; Because the cost increased by \$2 per hour and the job took 3 hours, the difference in cost is $2(3) = 6$.

1.7 Exercise Set A (pp. 41–42)

1. -41; 4; 34 **3.** 16; -5; -19 **5.** 13.2; 0; -8.8

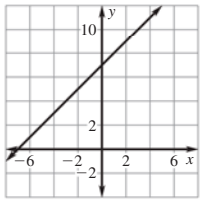
7. $-\frac{22}{5}$; -2; $-\frac{2}{5}$ **9.** $-\frac{57}{8}$; -6; $-\frac{21}{4}$

11. -15.6; -3; 5.4 **13.** 5 **15.** -3 **17.** 4

19. -3 **21.** -5

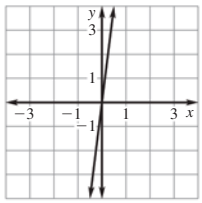
23. The graph of g is a vertical shift of 2 units up of the graph of f. **25.** The graph of g is a vertical stretch of the graph of f using a scale factor of 1.5.

27.



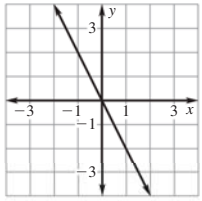
The graph of g is a vertical shift of 7 units up of the graph of f.

29.



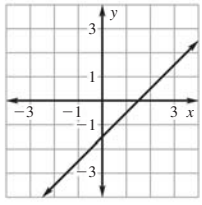
The graph of d is a vertical stretch of the graph of f using a scale factor of 8.

31.



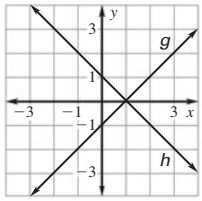
The graph of n is a vertical stretch of the graph of f using a scale factor of 2 and a reflection in the x-axis.

33.

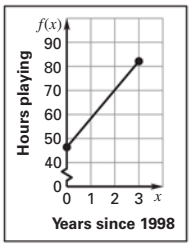


The graph of d is a vertical shift of 1.5 units down of the graph of f.

35. The graph of g is a vertical shift of 5 units up of the graph of f.

39. 

The graph of h is a reflection of the graph of g in the x-axis.

41. a. 

domain: $0 \le x \le 3$
range: $46.4 \le f(x) \le 82.1$

b. $f(2) = 70.2$; In 2000, people spent 70.2 hours each year playing video games. **c.** $f(1.1) \approx 60$; Near the beginning of 1999, people spent 60 hours each year playing video games.

1.7 Exercise Set B (pp. 43–44)

1. -19.6; 6.4; 19.4 **3.** 2.5; -13.5; -21.5

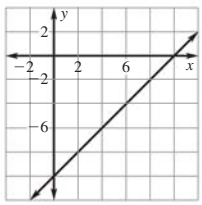
5. -2.3; 22.7; 35.2 **7.** -9; $2\frac{2}{3}$; 8.5

9. 2.75; 0.25; -1 **11.** -9.75; 1.5; 7.125

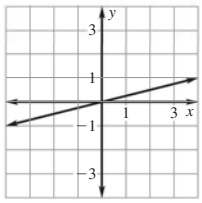
13. -2 **15.** -3 **17.** 1.5 **19.** 5.4 **21.** -5

23. -3.09

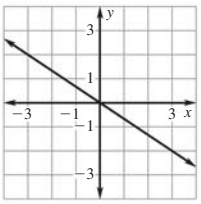
25. The graph of g is a vertical shift of 4 units up of the graph of f. **27.** The graph of g is a vertical shrink of the graph of f using a scale factor of $\frac{1}{2}$.

29. 

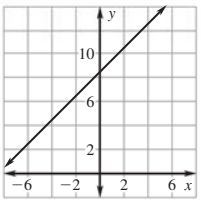
The graph of h is a vertical shift of 10 units down of the graph of f.

31. 

The graph of g is a vertical shrink of the graph of f using a scale factor of $\frac{1}{4}$.

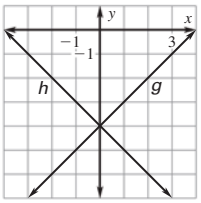
33. 

The graph of h is a vertical shrink of the graph of f using a scale factor of $\frac{2}{3}$ and a reflection of the graph of f in the x-axis.

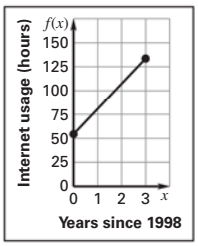
35. 

The graph of g is a vertical shift of 8.5 units up of the graph of f.

37. The graph of g is the graph of f shifted 6 units down.

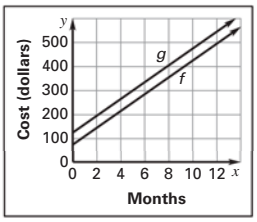
41. 

The graph of h is a reflection of the graph of g in the y-axis.

43. a. 

domain: $0 \le x \le 3$
range: $54.4 \le f(x) \le 133.6$

b. $f(2) = 107.2$; In 2000, a person spent 107.2 hours on the Internet. Because 1998 corresponds to 0, 2000 corresponds to 2. So to find the answer find $f(x)$ when $x = 2$. **c.** $f(2.5) \approx 120$; Near the middle of 2000, a person spent 120 hours on the Internet. To find the answer, find x when $f(x) = 120$. Then use the fact that 1998 corresponds to 0 to find the year.

45. 

The graphs of f and g are parallel and the graph of g is a vertical shift of 50 units up of the graph of f.

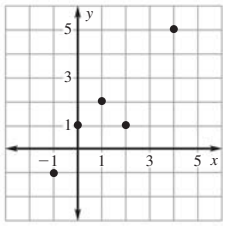
1.8 Exercise Set A (pp. 47–48)

1. *Sample answer:* $y = 1.19x + 0.35$; 1.54

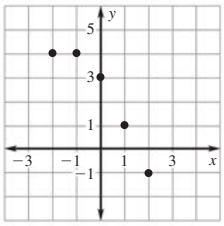
3. *Sample answer*: $y = 0.58x + 0.4$; 0.98

SELECTED ANSWERS

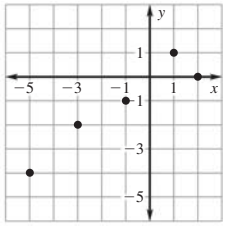
5. *Sample answer:* $y = x + 0.4$; 3.4



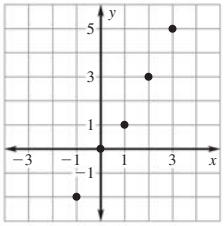
7. *Sample answer:* $y = -1.3x + 2.2$; -1.7



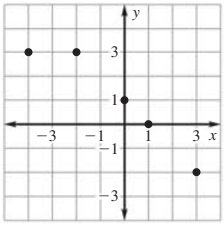
9. *Sample answer:* $y = 0.6x - 0.4$; 2.6



11. *Sample answer:* $y = 1.7x - 0.3$; 8.2



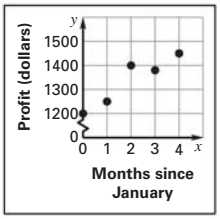
13. *Sample answer*: $y = -0.75x + 0.7$; -3.05



15. 0.5 **17.** -30 **19.** 10 **21.** $\frac{90}{7}$ **23.** 12

25. 18.75 **27.** 30

29. a.



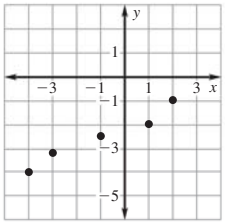
b. *Sample answer:* $y = 63x + 1210$
c. *Sample answer:* \$1651

1.8 Exercise Set B (pp. 49–50)

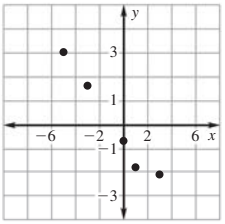
1. *Sample answer:* $y = 0.83x - 0.14$; 0.69

3. *Sample answer:* $y = 2.13x + 9.35$; 11.48

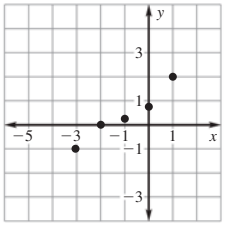
5. *Sample answer:* $y = 0.44x - 2.1$; -2.98



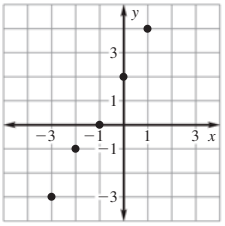
7. *Sample answer:* $y = -0.68x - 0.55$; 0.81



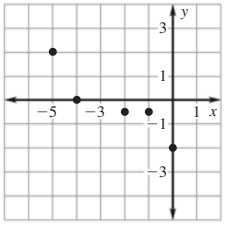
9. *Sample answer:* $y = 0.68x + 1.08$; 1.93



11. *Sample answer:* $y = 1.7x + 2.1$; 4.225



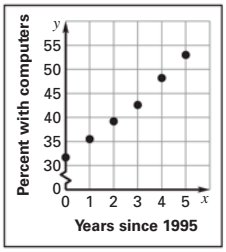
13. *Sample answer:* $y = -0.63x - 1.72$; -2.5



15. 0.2 **17.** -0.9 **19.** 8 **21.** $\frac{1}{2}$ **23.** $\frac{5}{6}$

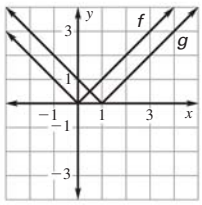
25. 1 **27.** 10

29. a.

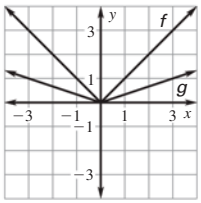


b. *Sample answer:* $y = 4.23x + 31.1$
c. *Sample answer:* 90.32%
d. about -7; this means that there were 0% of U.S. households with computers about 7 years before 1995, or in 1988.

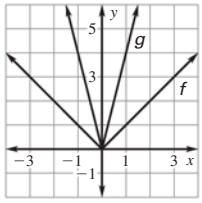
1.9 Exercise Set A (p. 53)

7. 

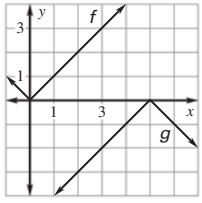
The graph of g is a horizontal shift 1 unit right of the graph of f.

9. 

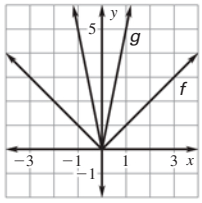
The graph of g is a vertical shrink of the graph of f using a scale factor of $\frac{1}{3}$.

11. 

The graph of g is a vertical stretch of the graph of f using a scale factor of 4.

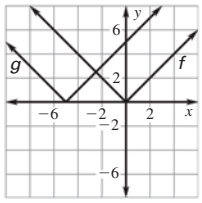
13. 

The graph of g is a vertical shift 5 units right and a reflection in the x-axis of the graph of f.

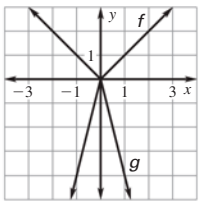
15. 

The graph of g is a vertical stretch of the graph of f using a scale factor of 5.

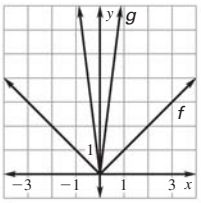
1.9 Exercise Set B (p. 54)

7. 

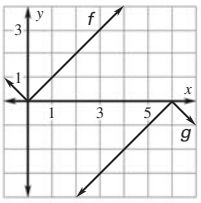
The graph of g is a horizontal shift 5 units left of the graph of f.

9. 

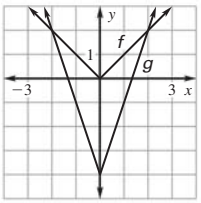
The graph of g is a vertical stretch of the graph of f using a scale factor of 4 and a reflection in the x-axis.

11. 

The graph of g is a vertical stretch of the graph of f using a scale factor of 8.

13. 

The graph of g is a horizontal shift 6 units right and a reflection of the graph of f in the x-axis.

15. 

The graph of g is a vertical stretch of the graph of f using a scale factor of 3 and a vertical shift 4 units down.

UNIT 2

2.1 Exercise Set A (p. 61)

1. $4n^5$; degree: 5; leading coefficient: 4

3. $4y^4 + 6y^3 - 2y^2 - 5$; degree: 4; leading coefficient: 4 **5.** polynomial; degree: 3; trinomial

7. $5z^2 + 3z - 7$ **9.** $3x^2 + 6$

11. $-4m^2 + 2m - 3$ **13.** $10x + 2$

15. Area: $\frac{17}{4}x^2 + 8x - 32$

2.1 Exercise Set B (p. 62)

1. polynomial; degree: 0; monomial

3. polynomial; degree: 2; trinomial

5. $-5y^2 - 2y + 9$

7. $-4z^2 + 4z + 14$ **9.** $-x^4 - 2x^3 + 6x^2 - 5x$

11. $-4a^3b^2 + 15a^2b^2 - 10a^2b + 5$

13. a. $T = 4.93t^4 - 56.78t^3 + 177.65t^2 - 126.42t + 1367.51$ **b.** In 1997, 1367.51 thousand metric tons were produced and in 2003, 1129.19 thousand metric tons were produced. So more peat and perlite were produced in 1997.

2.2 Exercise Set A (p. 66)

1. $6x^4 - 3x^3 - x^2$

3. $-8d^5 + 20d^4 - 24d^3 + 8d^2$

SELECTED ANSWERS

5. $2y^2 - 7y - 15$ **7.** $5b^2 - 42b + 16$

9. $-3p^3 + 6p^2 - p + 2$ **11.** $-6d^2 + 23d - 10$

13. $w^3 + 5w^2 - 23w - 3$

15. $5x^3y - 20x^2y^2 + 5xy^3$ **17.** $-3x^2 + 8x + 10$

19. $3x^2 + 15x$

21. a. $A = 4x^2 + 22x + 30$ **b.** 72 ft^2

2.2 Exercise Set B (p. 67)

1. $-16y^7 + 40y^5 - 24y^3$ **3.** $-18w^2 + 33w - 12$

5. $2x^3 + 11x^2 + 13x - 6$

7. $6p^6 + 12p^4 - 10p^2 - 20$ **9.** $10z^4 - 39z^2 - 27$

11. $-6x^2y - 15xy$ **13.** $5x^2 + xy - 6y^2$

15. $5x^3y - 20x^2y^2 + 5xy^3$

17. $w^6 + 13w^5 + 3w^4 - 10w^3 + 5w^2$

19. $24x^2 + 22x + 3$

21. a. E: \$14,439.09; P: 12.6%; $E \cdot P$ indicates the amount of money spent on exercise equipment.
b. $E \cdot P = 0.0001112t^8 - 0.0002186t^7 - 0.06424t^6 + 0.983634t^5 - 6.7188068t^4 + 22.667885t^3 - 120.819698t^2 + 568.42959t + 1819.32534$ **c.** \$1819.32534 million dollars

2.3 Exercise Set A (p. 70)

1. $x^2 - 18x + 81$ **3.** $25s^2 + 20s + 4$

5. $16p^2 - 40p + 25$ **7.** $100z^2 - 60z + 9$

9. $9y^2 - 6xy + x^2$ **11.** $z^2 - 400$

13. $36m^2 - 100$ **15.** $81c^2 - 1$ **17.** $-w^2 + 16$

19. Find the product $(20 - 5)(20 + 5)$.

21. Find the product $(20 - 2)^2$.

23. $16x^2 + 4x + 0.25$

25. Using the square of a binomial pattern, $b = 5$, not -5; $s^2 - 10s + 25$

2.3 Exercise Set B (p. 71)

1. $64x^2 - 80x + 25$ **3.** $100m^2 - 220m + 121$

5. $400b^2 - 600b + 225$ **7.** $r^2 - 16rs + 64s^2$

9. $4x^2 - 16xy + 16y^2$ **11.** $121t^2 - 16$

13. $81z^2 - 144$ **15.** $-25p^2 + 36$

17. $100a^2 - 25b^2$

19. Find the product $(40 - 4)(40 + 4)$.

21. Find the product $(50 - 1)^2$. **23.** $324x^2$

27. a. $T = 1.96t^2 - 4.41$

b. 91.63 thousand dollars **c.** 1995 and 1996

2.4 Exercise Set A (p. 75)

1. 1, 8, 28, 56, 70, 56, 28, 8, and 1

3. $x^2 + 2x + 1$

5. $p^4 + 20p^3 + 150p^2 + 500p + 625$

7. $b^6 + 6b^5 + 15b^4 + 20b^3 + 15b^2 + 6b + 1$

9. $x^2 + 8x + 16$

11. $z^5 - 5z^4 + 10z^3 - 10z^2 + 5z - 1$

13. $r^4 - 20r^3 + 150r^2 - 500r + 625$

15. $8x^3 + 12x^2 + 6x + 1$

17. $125y^3 + 150y^2 + 60y + 8$

19. $a^5 + 20a^4b + 160a^3b^2 + 640a^2b^3 + 1280ab^4 + 1024b^5$ **21.** 294 **23.** 19,440 **25.** $n + 1$ terms

2.4 Exercise Set B (p. 76)

1. $x^3 + 12x^2 + 48x + 64$

3. $w^6 + 6w^5 + 15w^4 + 20w^3 + 15w^2 + 6w + 1$

5. $b^6 + 30b^5 + 375b^4 + 2500b^3 + 9375b^2 + 18{,}750b + 15{,}625$

7. $x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$

9. $b^6 - 24b^5 + 240b^4 - 1280b^3 + 3480b^2 - 6144b + 4096$ **11.** $-27y^3 + 108y^2 - 144y + 64$

13. $64x^3 + 96x^2 + 48x + 8$

15. $27y^3 + 135y^2 + 225y + 125$

17. $729c^6 + 1458c^5d + 1215c^4d^2 + 540c^3d^3 + 135c^2d^4 + 18cd^5 + d^6$

19. $x^8 + 8x^6 + 24x^4 + 32x^2 + 16$

21. $32s^{20} + 400s^{16} + 2000s^{12} + 5000s^8 + 6250s^4 + 3125$ **23.** $-11{,}250$

25. The coefficients for the x and x^2 terms are incorrect; $x^3 + 9x^2 + 27x + 27$.

27. The pattern formed is that the sum of the previous 2 diagonals is added to get the sum of the next diagonal.

2.5 Exercise Set A (p. 79)

1. $-14, 3$ **3.** $-24, -15$ **5.** $-8, \frac{1}{2}$ **7.** $-5, 4$

9. $\frac{2}{3}, 8$ **11.** $-3, \frac{1}{2}$ **13.** $10(x - y)$ **15.** $6(3a^2 - b)$

17. $r(r + 2s)$ **19.** $5q(p^2 + 2)$ **21.** $2w^2(3w - 7)$

23. $-14, 0$ **25.** $-1, 0$ **27.** $-2, 0$ **29.** $-\frac{5}{4}, 0$

31. $0, \frac{1}{2}$ **33.** $-\frac{3}{8}, 0$

35. a. $h = -16t^2 + 14t$ **b.** $\frac{7}{8}$ sec

2.5 Exercise Set B (p. 80)

1. $-3, \frac{2}{5}$ **3.** $-4, 6$ **5.** $-\frac{3}{2}, 9$ **7.** $\frac{2}{9}, \frac{3}{7}$ **9.** $\frac{9}{8}, \frac{5}{2}$

11. $4m(m^2 + 6)$ **13.** $3y(2x^3 + 3y)$

15. $4mn(3m - 2n)$ **17.** $3p(-p^3 + 5p + 2)$

19. $0, \frac{3}{4}$ **21.** $0, \frac{4}{3}$ **23.** $-\frac{1}{2}, 0$ **25.** $-\frac{3}{50}, 0$

27. $-\frac{13}{17}, 0$ **29.** $0, \frac{1}{4}$ **31.** $0, \frac{3}{5}$

2.6 Exercise Set A (p. 83)

1. $(x + 7)(x + 1)$ **3.** $(w - 13)(w + 1)$

5. $(m - 6)(m - 4)$ **7.** $(a + 9)(a + 4)$

9. $(z - 10)(z - 4)$ **11.** $-3, 12$ **13.** $-2, 7$

15. $3, 9$ **17.** $-12, -4$ **19.** $-4, 9$ **21.** $3, 8$

23. $-12, 1$ **25.** $-12, -5$ **27.** $-5, -3$

29. a. $x^2 - 7x + 12$ **b.** 144 in.

2.6 Exercise Set B (p. 84)

1. $(x - 8)(x + 7)$ **3.** $(y - 9)(y - 6)$

5. $(w - 9)(w - 5)$ **7.** $-4, 15$ **9.** 12 **11.** $-12, 11$

13. $-6, 10$ **15.** 8 **17.** $-10, 15$ **19.** $-20, 30$

21. $-8, -5$ **23.** $-2, 12$

25. a. $x^2 + 600x + 80{,}000$ **b.** 25 ft

2.7 Exercise Set A (p. 87)

1. $(-x + 4)(x + 7)$ **3.** $(-m - 8)(m + 5)$

5. $(3a - 1)(a - 4)$ **7.** $(3c + 2)(2c + 1)$

9. $(2w + 3)(6w - 5)$ **11.** $(r + 5)(-3r - 2)$

13. $-4, 5$ **15.** $6, 7$ **17.** $-\frac{5}{2}, 2$ **19.** $-6, -\frac{1}{3}$

21. $-\frac{2}{3}, \frac{4}{5}$ **23.** $-2, \frac{5}{3}$ **27.** $-8, \frac{1}{2}$ **29.** $-1, 2$

31. $-7, \frac{3}{8}$ **33.** $-10, \frac{3}{2}$

35. a. $4x^2 + 24x + 32$ **b.** 8 in. by 16 in.

2.7 Exercise Set B (p. 88)

1. $(-x + 9)(x + 20)$ **3.** $(p - 10)(-3p - 4)$

5. $(b + 3)(14b - 4)$ **7.** $-\frac{5}{4}, \frac{3}{8}$ **9.** $-\frac{2}{5}, \frac{2}{3}$

11. $-\frac{2}{9}, \frac{5}{7}$ **13.** $-\frac{3}{8}, \frac{1}{2}$ **15.** $\frac{1}{3}, 5$ **17.** $\frac{7}{10}, \frac{3}{2}$

19. $-\frac{1}{2}, -\frac{1}{3}$ **21.** $-1, \frac{1}{3}$ **23.** $-1, \frac{2}{5}$ **25.** $\frac{2}{5}, 2$

27. $\frac{5}{6}$ **29.** 2 sec

2.8 Exercise Set A (p. 91)

1. $(x - 6)(x + 6)$ **3.** $(2b - 10)(2b + 10)$

5. $-2(x - 4)(x + 4)$ **7.** $(y + 12)^2$ **9.** $(5w - 2)^2$

11. $-2(3a + 1)^2$ **13.** $(x - 9y)^2$ **15.** $4(2x + 5y)^2$

17. $-\frac{5}{2}, \frac{5}{2}$ **19.** $-3, 3$ **21.** 4 **23.** 10 **25.** $-\frac{5}{3}$

27. $-\frac{3}{8}, \frac{3}{8}$ **29.** 3

2.8 Exercise Set B (p. 92)

1. $(5x - 9)(5x + 9)$ **3.** $(11w - 25)(11w + 25)$

5. $\frac{1}{16}(3r - 1)(3r + 1)$ **7.** $-3(y + 8)^2$

9. $3(2z + 1)^2$ **11.** $-2(3s + 4t)^2$

13. The difference of two squares pattern was used to factor the polynomial instead of perfect square trinomial pattern.

$$y^2 - 10y + 25 = y^2 - 2(y \cdot 5) + 5^2$$
$$= (y - 5)^2$$

15. -9 **17.** 10 **19.** $\frac{4}{15}$ **21.** $\frac{4}{7}$ **23.** $\frac{8}{3}$ **25.** $\frac{3}{4}$

27. 140 **29.** 16 **31.** 28

2.9 Exercise Set A (p. 95)

1. $(4x - 3)(x + 5)$ **3.** $(w^2 - 5)(w + 8)$

5. $(y - 1)(x + 15)$ **7.** $(x^2 + 5)(x + 1)$

9. $(m^2 + 2)(m - 6)$ **11.** $(t^2 - 2)(t + 12)$

13. $7x^2(x + 4)$ **15.** $-2p(8p^2 + 1)$

17. $15y(1 - 4y)$ **19.** $5(m^2 + 4m + 8)$

21. $4z(z - 2)(z + 1)$ **23.** $(x^2 + 5)(x + 1)$

25. $-4, -2$ **27.** $\frac{7}{2}$ **29.** $\frac{4}{3}$ **31.** $2(2x + 3)(x + 1)$

33. a. $-16t^2 + 8t + 2$ **b.** 2.64 ft **c.** about 0.7 sec

SELECTED ANSWERS

2.9 Exercise Set B (p. 96)

1. $13a(1 - 2a)$ **3.** $-2(m + 1)(m + 7)$

5. $r(r + 5)^2$ **7.** $4n^3(n + 6)(n - 5)$

9. $-5(2t - 5)(t + 3)$ **11.** $(x^2 - 8)(x + 5)$

13. $3x^3y(x - 9)(x + 9)$ **15.** $25x^2y(x - 4)$

17. $-2, 2$ **19.** $-\frac{15}{4}, \frac{15}{4}$ **21.** $-6, 0$ **23.** $\frac{5}{6}, \frac{9}{2}$

25. $-\frac{9}{4}, 0, \frac{9}{4}$ **27.** 14 **29.** $-3, 9$

33. a. $2\pi r^2 - \frac{1}{2}\pi = 0$ **b.** $\frac{1}{2}$ ft

2.10 Exercise Set A (pp. 100–101)

1.

x	-2	-1	0	1	2
y	36	9	0	9	36

3.

x	-4	-2	0	2	4
y	41	11	1	11	41

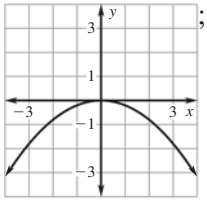
5.

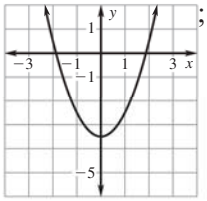
x	-2	-1	0	1	2
y	-13	-1	3	-1	-13

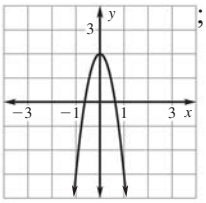
11. shift the graph 4 units up and reflect over x-axis

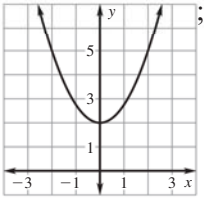
13. stretch vertically by a factor of 5, reflect in x-axis, and shift 1 unit up

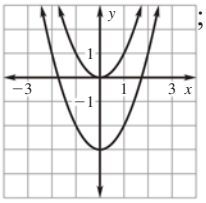
15. shrink vertically by a factor of $\frac{3}{4}$, reflect over x-axis, and shift 5 units up

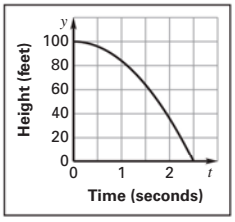
17.  ; domain: all reals; range: $y \le 0$; vertical shrink by a factor of $\frac{1}{5}$ and reflection in x-axis

19.  ; domain: all reals; range: $y \ge -3.5$; vertical shift 3.5 units down

21.  ; domain: all reals; range: $y \le 2$; vertical stretch by a factor of 5, reflection in x-axis, and vertical shift 2 units up

23.  ; domain: all reals; range: $y \ge 2$; vertical shrink by a factor of $\frac{3}{4}$ and vertical shift 2 units up.

25.  ; The graph of $y = x^2 - 3$ should be shifted 3 units down, not 3 units up. The vertex should be $(0, -3)$.

27. a. 

b. $0 \le t \le 2.5$; $0 \le y \le 100$

c. 84 ft

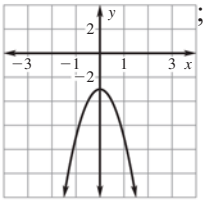
d. Answers will vary.

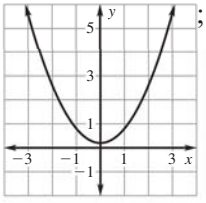
e. about 1.8 sec

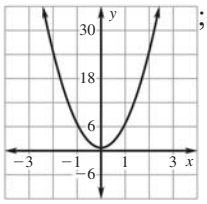
2.10 Exercise Set B (pp. 102–103)

1.

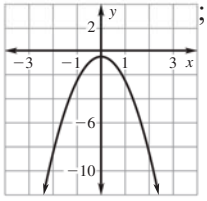
x	-2	-1	0	1	2
y	36	6	-4	6	36

7.  ; domain: all reals; range: $y \le -3$; vertical stretch by a factor of 4, reflection in x-axis, and shift 3 units down

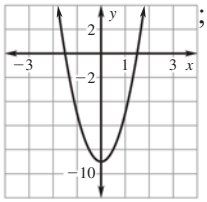
9.  ; domain: all reals; range: $y \ge \frac{1}{5}$; vertical shrink by a factor of $\frac{3}{5}$ and vertical shift $\frac{1}{5}$ unit up

11. 

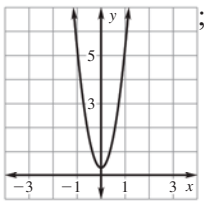
; domain: all reals; range: $y \geq \frac{3}{4}$; vertical stretch by a factor of 6 and vertical shift $\frac{3}{4}$ unit up

13. 

; domain: all reals; range: $y \leq -\frac{1}{2}$; vertical stretch by a factor of 2, reflection in x-axis, and vertical shift $\frac{1}{2}$ unit down

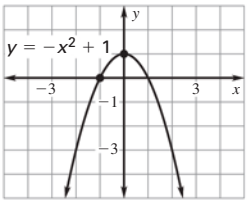
15. 

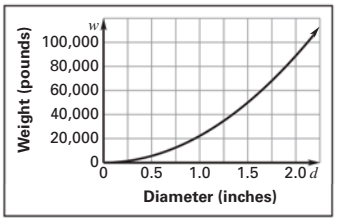
; domain: all reals; range: $y \geq -9$; vertical stretch by a factor of 4, and vertical shift 9 units down.

17. 

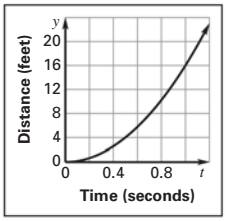
; domain: all reals; range: $y \geq \frac{1}{3}$; vertical stretch by a factor of 5 and vertical shift $\frac{1}{3}$ unit up.

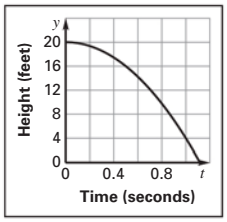
19. shift the graph of f 5 units down **21.** shift the graph of f 16 units up **23.** shrink the graph of f vertically by a factor of $\frac{1}{2}$

25. 

27. a. 

b. about 1.5 in.

29. a. 

b. 

c. The second graph is a transformation of the first graph. The first graph has been reflected in the x-axis and shifted 20 units up to obtain the second graph. For the first graph, find the value of t when $y = 8$. For the second graph, find the value of t when $y = 12$.

2.11 Exercise Set A (pp. 107–108)

1. $a = 6, b = 3, c = 5$

3. $a = 7, b = -3, c = -1$

5. $a = \frac{3}{4}, b = 0, c = -10$

7. upward; $x = 0$; $(0, -5)$ **9.** downward; $x = \frac{3}{2}$; $\left(\frac{3}{2}, \frac{23}{2}\right)$ **11.** upward; $x = -1$; $(-1, -5)$

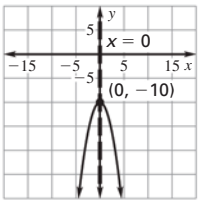
13. upward; $x = -5$; $\left(-5, -\frac{33}{2}\right)$ **15.** downward; $x = \frac{3}{2}$; $\left(\frac{3}{2}, -\frac{5}{4}\right)$ **17.** downward; $x = \frac{7}{4}$; $\left(\frac{7}{4}, \frac{57}{8}\right)$

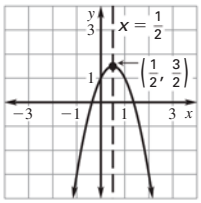
19.

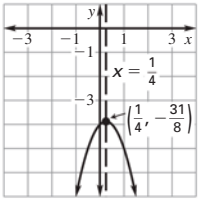
x	3	4	5	6	7
y	−18	−21	−22	−21	−18

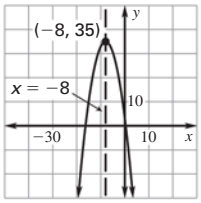
21.

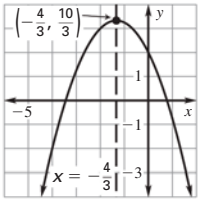
x	−1	0	1	2	3
y	$\frac{17}{2}$	7	$\frac{13}{2}$	7	$\frac{17}{2}$

23. 

25. 

27. 

29. 

31. 

33. minimum; $(0, -40)$

SELECTED ANSWERS

35. minimum; $\left(\frac{1}{4}, \frac{7}{2}\right)$ **37.** The graph of $g(x)$ is a reflection in the y-axis of the graph of $f(x)$.

39. 12 ft

2.11 Exercise Set B (pp. 109–110)

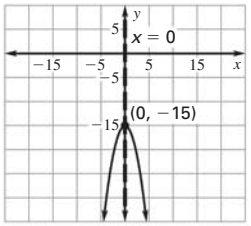
1. downward; $x = \frac{1}{2}$; $\left(\frac{1}{2}, \frac{23}{4}\right)$ **3.** upward; $x = \frac{1}{8}$; $\left(\frac{1}{8}, \frac{23}{8}\right)$ **5.** upward; $x = 0$; $(0, -9)$ **7.** upward; $x = 8$; $(8, -8)$ **9.** downward; $x = 1$; $(1, 11)$

11. upward; $x = -1$; $(-1, -8)$

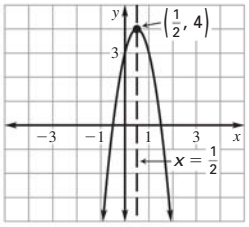
13.

x	2	3	4	5	6
y	2	$\frac{5}{4}$	1	$\frac{5}{4}$	2

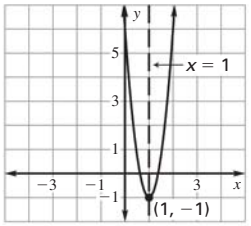
15.



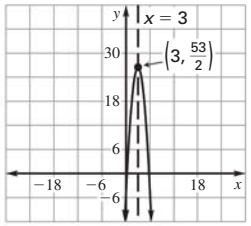
17.



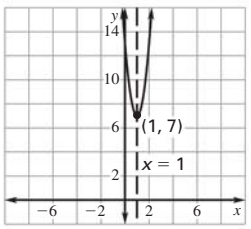
19.



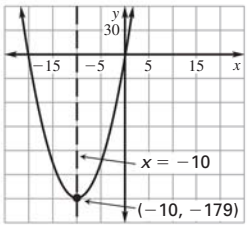
21.



23.



25.

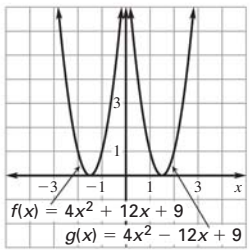


27. minimum; $(0, -36)$ **29.** minimum; $(4, -17)$

31. minimum; $\left(-\frac{5}{2}, -\frac{37}{4}\right)$ **33.** minimum; $\left(\frac{9}{2}, \frac{5}{4}\right)$

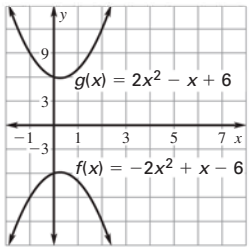
35. minimum; $(-6, -11)$

37.



The graph of $g(x)$ is a reflection in the y-axis of the graph of $f(x)$.

39.



The graph of $g(x)$ is a reflection in the x-axis of the graph of $f(x)$.

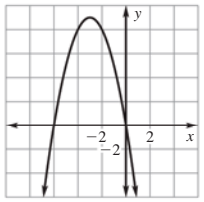
41. a. lamp A: 25 cm; lamp B: 20 cm **b.** 5 cm

2.12 Exercise Set A (pp. 114–115)

1. not a solution **3.** not a solution

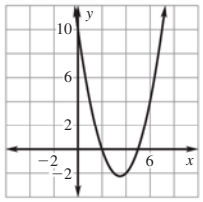
5. not a solution **7.** -4 **9.** $-8, 3$ **11.** $-5, 5$

13.



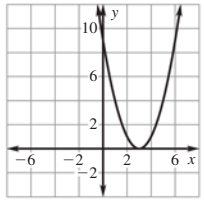
$-6, 0$

15.



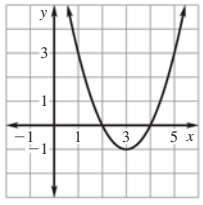
$2, 5$

17.



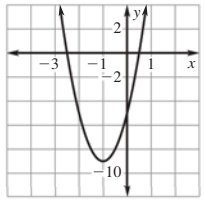
3

19.



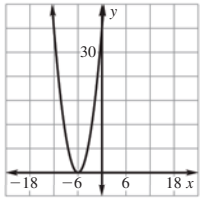
$2, 4$

21.



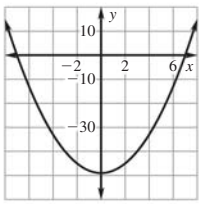
$-2.5, 0.5$

23.



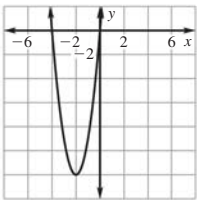
-6

25.



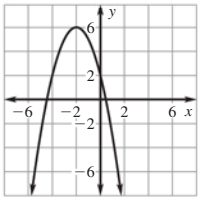
$-7, 7$

27.



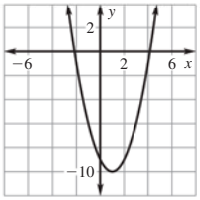
$-4, 0$

29. a.



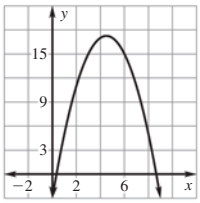
b. $-4, 0$

31. a.



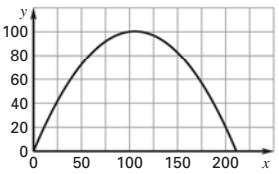
b. $-2, 4$

33. a.



b. 0, 9

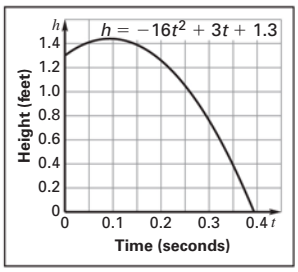
35.



211.1 ft

37. a. $h = -16t^2 + 3t + 1.3$

b.

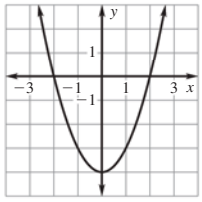


c. about 0.4 sec

d. about 0.34 sec

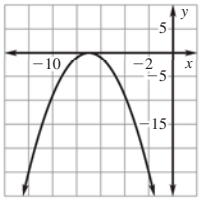
2.12 Exercise Set B (pp. 116–117)

1.



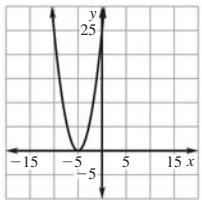
$-2, 2$

3.



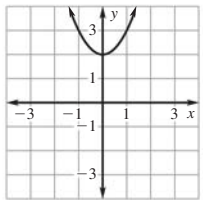
-7

5.



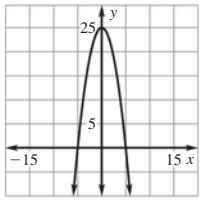
-5

7.



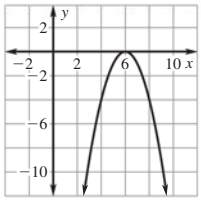
no solution

9.



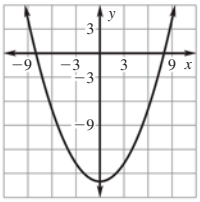
$-5, 5$

11.



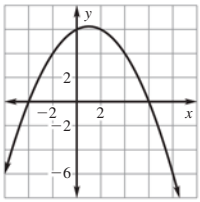
6

13.



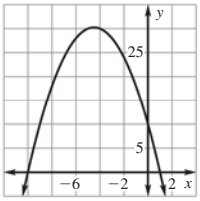
$-8, 8$

15.



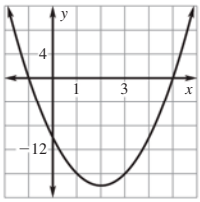
$-4, 6$

17.



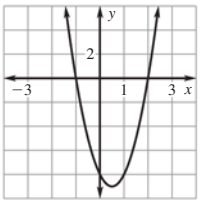
$-10, 1$

19.



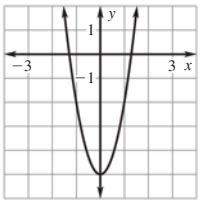
$-1, 5$

21.



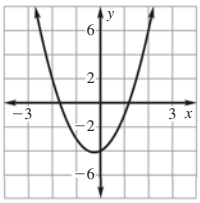
$-1, 2$

23. a.



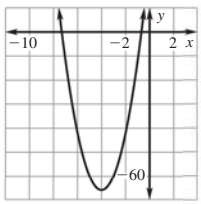
b. $-1, 1$

25. a.



b. $-2, 1$

27. a.

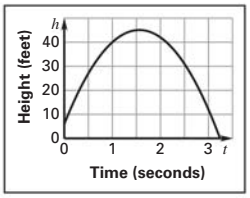


b. $-7, -1$

29. 4.5 in. **31.** 9.9 cm

SELECTED ANSWERS

33. a.



b. about 3.2 sec

c. about 3.1 sec; Determine t when $y = 5$.

2.13 Exercise Set A (p. 121)

1. $-2, 2$ **3.** $-6, 6$ **5.** $-5, 5$ **7.** $-5, 5$
9. $-1, 1$ **11.** $-1.73, 1.73$ **13.** $-2.24, 2.24$
15. $-2.45, 2.45$ **17.** $-2.5, 2.5$ **19.** 0.76, 5.24
21. 1.55, 6.45 **23.** about 6.16 in. **25.** about 3 in.

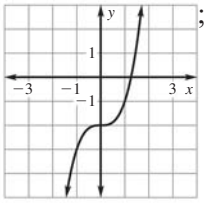
2.13 Exercise Set B (p. 122)

1. $-3, 3$ **3.** $-4, 4$ **5.** $-6, 6$ **7.** $-5.70, 5.70$
9. no solution **11.** $-2.45, 2.45$
13. $-11.45, -6.55$ **15.** $-10.46, -3.54$
17. $-3.16, 3.16$ **19.** $-3, 3$ **21.** $-1.03, 1.03$
23. $-8, 12$ **25.** $1, 13$ **27.** $-8, 0$

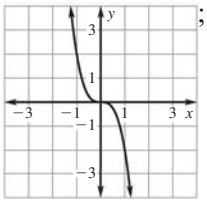
UNIT 3

3.1 Exercise Set A (p. 128)

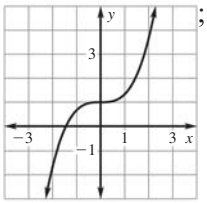
1. $f(x) \to -\infty$ as $x \to -\infty$ and $f(x) \to +\infty$ as $x \to +\infty$ **3.** $f(x) \to -\infty$ as $x \to -\infty$ and $f(x) \to +\infty$ as $x \to +\infty$

5. 

; same end behavior; vertical translation 2 units down

7. 

; different end behavior; vertical stretch by a factor of 2 and a reflection in the x-axis

9. 

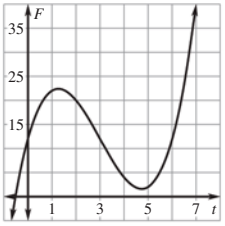
; same end behavior; vertical shrink by a factor of $\frac{1}{3}$ and a vertical translation 1 unit up

11. odd **13.** neither **15.** neither

17. a.

t (years since 2000)	0	1	2	3
F (number of fish)	12	22	20	12

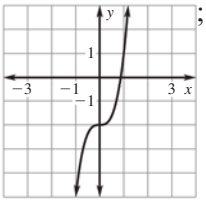
t (years since 2000)	4	5	6	7
F (number of fish)	4	2	12	40

b. 

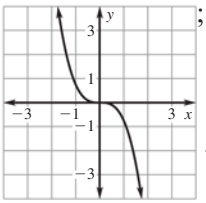
c. decrease

3.1 Exercise Set B (p. 129)

1. $f(x) \to +\infty$ as $x \to -\infty$ and $f(x) \to -\infty$ as $x \to +\infty$ **3.** $f(x) \to -\infty$ as $x \to -\infty$ and $f(x) \to +\infty$ as $x \to +\infty$

5. 

; same end behavior; vertical stretch by a factor of 3 and a vertical translation 2 units down

7. 

; different end behavior; vertical shrink by a factor of $\frac{3}{4}$ and a reflection in the x-axis

9. odd **11.** neither **13. a.** \$15,000 **b.** 2000 and 2004 **c.** 2004 and 2007

3.2 Exercise Set A (p. 132)

1. $(x - 2)^3$ **3.** $(2x - 1)^3$ **5.** $(x + 10)^3$
11. $(xy + 1)^3$ **13.** $(3x - 2y)^3$
15. The student used the wrong sign in the factorization; the correct solution is $(ab - cd)^3$.

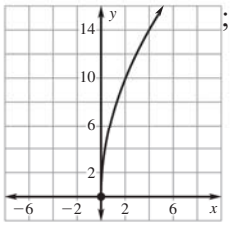
3.2 Exercise Set B (p. 133)

1. $(a + 3)^3$ **3.** $2(1 - 2y)^3$ **5.** They are both correct; Their expressions are equivalent.

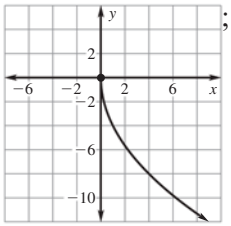
7. $(1 - gh)^3$ **9.** $(8x + 5y)^3$ **11.** 144 **13.** 96

15. *Sample answer:* =, +, + **17.** 2 times longer

3.3 Exercise Set A (pp. 138–139)

1. 

; domain: $x \geq 0$; range: $y \geq 0$; vertical stretch by a factor of 7

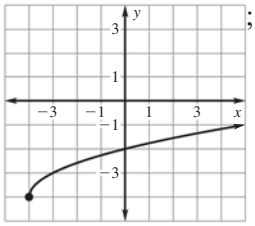
3. 

; domain: $x \geq 0$; range: $y \leq 0$; vertical stretch by a factor of 4 and reflection in x-axis

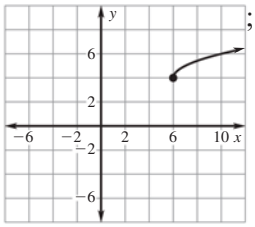
5. translate graph of $y = \sqrt{x}$ vertically 3 units up

7. translate graph of $y = \sqrt{x}$ vertically 5 units down

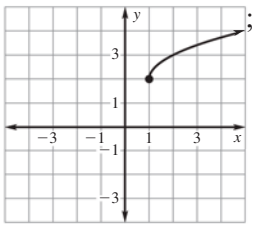
9. translate graph of $y = \sqrt{x}$ horizontally $\frac{1}{2}$ unit right

17. 

; domain: $x \geq -4$; range: $y \geq -4$; vertical translation 4 units down and horizontal translation 4 units left

19. 

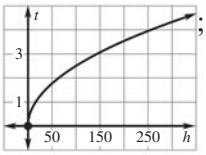
; domain: $x \geq 6$; range: $y \geq 4$; vertical translation 4 units up and horizontal translation 6 units right

21. 

; domain: $x \geq 1$; range: $y \geq 2$; vertical translation 2 units up and horizontal translation 1 unit right

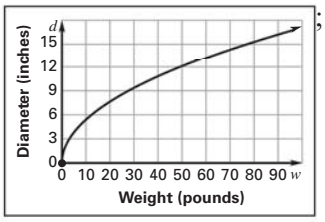
23. a.

***h* (feet)**	0	25	100	225
***t* (seconds)**	0	$\frac{5}{4}$	$\frac{5}{2}$	$\frac{15}{4}$

b. 

; about 250 feet

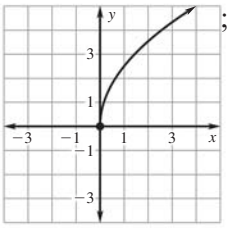
c. Yes; the building could be about 250 feet tall.

25. a. 

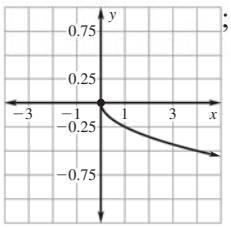
; domain: $w \geq 0$; range: $d \geq 0$

b. 99 lb **c.** 4 lb

3.3 Exercise Set B (pp. 140–141)

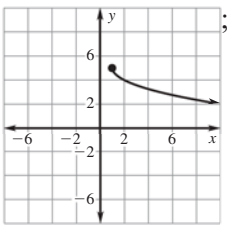
1. 

; domain: $x \geq 0$; range: $y \geq 0$; vertical stretch by a factor of 2.5

3. 

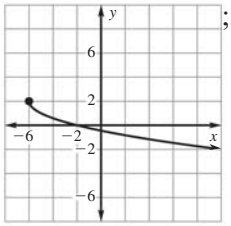
; domain: $x \geq 0$; range: $y \leq 0$; vertical shrink by a factor of 0.25 and reflection in x-axis

5. translate graph of $y = \sqrt{x}$ vertically $\frac{3}{2}$ units down **7.** translate graph of $y = \sqrt{x}$ horizontally $\frac{1}{4}$ unit right **9.** translate graph of $y = \sqrt{x}$ vertically $\frac{3}{4}$ unit up

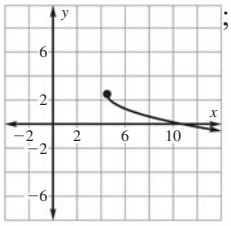
17. 

; domain: $x \geq 1$; range: $y \leq 5$; reflection in x-axis, vertical translation 5 units up, and horizontal translation 1 unit right

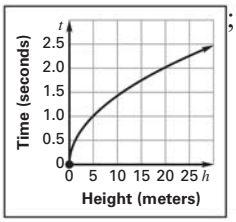
SELECTED ANSWERS

19. 

; domain: $x \geq -6$; range: $y \leq 2$; reflection in x-axis, vertical translation 2 units up, and horizontal translation 6 units left

21. 

; domain: $x \geq 4.5$; range: $y \leq 2.5$; reflection in x-axis, vertical translation 2.5 units up, and horizontal translation 4.5 units right

25. a. 

; domain: $h \geq 0$; range: $t \geq 0$

b. 11.025 m

3.4 Exercise Set A (p. 144)

1. $10\sqrt{2}$ **3.** $4\sqrt{7}$ **5.** $3y$ **7.** $3\sqrt{7}$ **9.** $2x\sqrt{5}$

11. $\frac{\sqrt{5}}{7}$ **13.** $\frac{4\sqrt{5}}{5}$ **15.** $\frac{9\sqrt{2x}}{2x}$ **17.** $\frac{24 - 6\sqrt{5}}{11}$

19. $13\sqrt{7}$ **21.** $-7 + 4\sqrt{7}$ **23.** $37 + 20\sqrt{3}$

25. a. 3.87 mi/h **b.** 4.61 mi/h

3.4 Exercise Set B (p. 145)

1. $3s\sqrt{5s}$ **3.** $15c^2\sqrt{2c}$ **5.** $11x^3y^4\sqrt{x}$ **7.** $3y^2\sqrt{15x}$

9. $\frac{d}{5}$ **11.** $\frac{m^2\sqrt{77m}}{11}$ **13.** $\frac{5 + \sqrt{3}}{11}$ **15.** $\frac{6\sqrt{5} - 5}{31}$

17. $-14 + 3\sqrt{7}$ **19.** $133 + 60\sqrt{3}$ **21.** $\frac{5m\sqrt{5mn}}{n}$

23. $\frac{2\sqrt{3}}{3}$ **25. a.** 50 watts **b.** 100 watts

3.5 Exercise Set A (p. 148)

1. not a solution **3.** solution **5.** solution

7. Add 5 to each side, then square each side, subtract 3 from each side, and divide each side by 7. **9.** Square each side and solve the resulting linear equation for x. **11.** Add the second radical expression to each side, square each side, and solve the resulting linear equation for x. **13.** 16 **15.** 46

17. 81 **19.** $\frac{32}{5}$ **21.** $\frac{3}{2}$ **23.** 1 **25.** 6 **27.** no solution

29. 6 **31. a.** 560,000 subscriptions

b. 312,500 subscriptions

3.5 Exercise Set B (p. 149)

1. Subtract 1 from each side, square each side, and then solve the resulting linear equation for x.

3. Subtract 4 from each side, divide each side by -2, square each side, and then solve the resulting equation for x. **5.** Square each side and solve the resulting linear equation for x. **7.** Divide each side by 3, square each side, and then solve the resulting linear equation for x. **9.** Subtract x from each side, square each side, and solve the resulting quadratic equation for x.

11. $\frac{20}{3}$ **13.** 144 **15.** no solution **17.** no solution

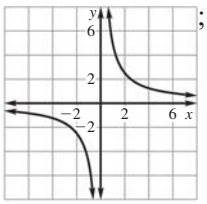
19. 3 **21.** 2 **23.** 4

25. *Sample answer:* $x = \sqrt{7x - 12}$

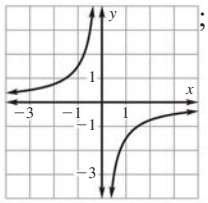
27. a. 4.8°C **b.** 0 m/sec

3.6 Exercise Set A (pp. 153–154)

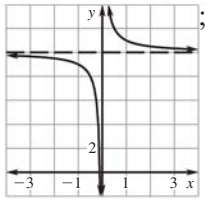
1. domain: all reals except 3; range: all reals except 1 **3.** domain: all reals except -6; range: all reals except -4 **5.** domain: all reals except -3; range: all reals except 3

9. 

; domain: all reals except 0; range: all reals except 0; vertical stretch

11. 

; domain: all reals except 0; range: all reals except 0; vertical stretch and reflection in x-axis

13. 

; domain: all reals except 0; range: all reals except 10; vertical translation 10 units up

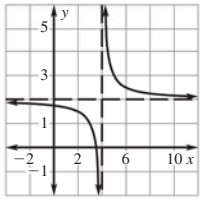
15. *Sample answer:* $y = \frac{2}{x}$

17. $x = -5, y = -6$ **19.** $x = -7, y = 7$

21. $x = -5, y = 10$ **23.** $x = -12, y = -3$

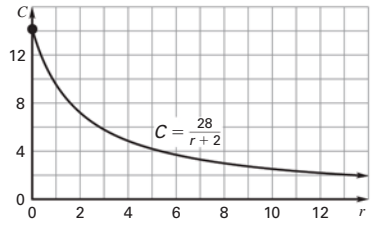
25. The sign on the vertical asymptote is wrong. It should be $x = -1$.

27.



29. a. $C = \frac{28}{r + 2}$

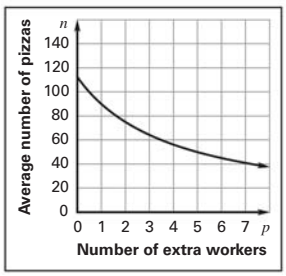
b.



12 additional rentals

31. a. $n = \frac{450}{4 + p}$

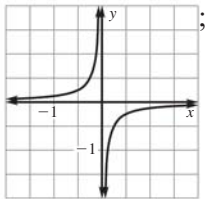
b.



c. 75 pizzas

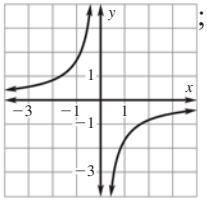
3.6 Exercise Set B (pp. 155–156)

1.



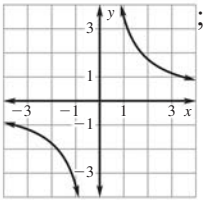
; domain: all reals except 0; range: all reals except 0; vertical shrink and reflection in x-axis

3.



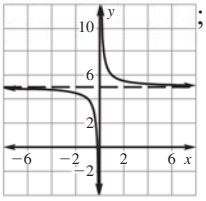
; domain: all reals except 0; range: all reals except 0; vertical stretch and reflection in x-axis

5.



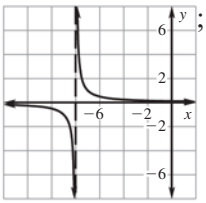
; domain: all reals except 0; range: all reals except 0; vertical stretch

7.



; domain: all reals except 0; range: all reals except 5; vertical translation 5 units up

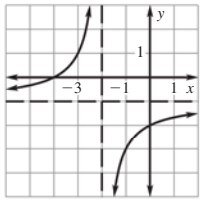
9.



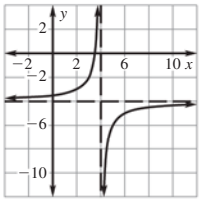
; domain: all reals except −8; range: all reals except 0; horizontal translation 8 units to the left

11. $x = -13, y = -10$ **13.** $x = -1, y = -3$

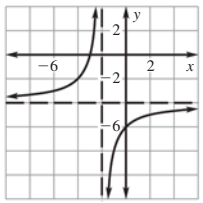
15.



17.



19.

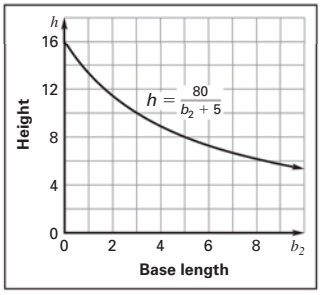


21. $y = \frac{-14}{x + 2} + 5$ **23.** $y = \frac{-7}{x + 4} - 4$

25. a. $h = \frac{80}{5 + b_2}$

Domain: $b_2 > 0$

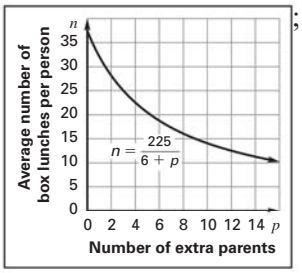
Range: $0 < h < 16$



b. about 8.3

SELECTED ANSWERS

27. $n = \dfrac{225}{6 + p}$



; 9 people

3.7 Exercise Set A (p. 159)

1. $3x^2 - 4x + 2$ **3.** $-11x^3 + 9x - 3$ **5.** $5x - 3$

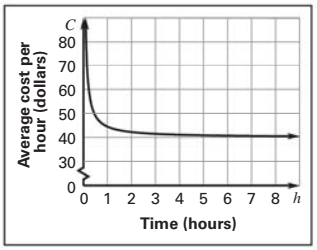
7. $6x - 2$ **9.** $9x - 4 - \dfrac{2}{x + 1}$

11. The remainder was written incorrectly.

The answer is $5 + \dfrac{-6}{x + 2}$.

15. a. $C = \dfrac{40t + 4.5}{t}$

b. $y = \dfrac{4.5}{t} + 40$



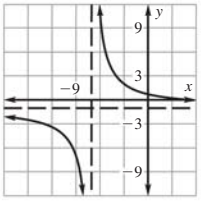
3.7 Exercise Set B (p. 160)

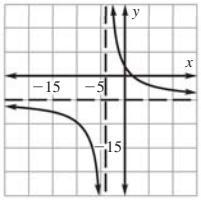
1. $3x^2 - 4x + 2$ **3.** $7x + 16 + \dfrac{27}{x - 2}$

5. $3x + 8 + \dfrac{54}{x - 4}$ **7.** $-x - 10 + \dfrac{17}{-x + 2}$

9. $-x + 4 - \dfrac{9}{x + 4}$

11. $y = \dfrac{12}{x + 7} - 1$ **13.** $y = \dfrac{28}{x + 4} - 5$

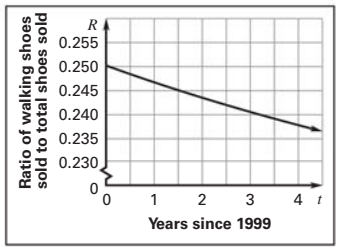




15. 10 **17.** -7

19. a. $R = \dfrac{1}{6} + \dfrac{1049}{546t + 12,552}$

b.



3.8 Exercise Set A (p. 163)

1. 0 **3.** -10 **5.** -3 **7.** 1 **9.** $-5, 5$ **11.** 6; 4

13. $\dfrac{1}{x - 11}$; -11, 11

15. in simplest form; $-3, -8$ **17.** $\dfrac{3x + 5}{x(x + 5)}$

19. a. $\dfrac{2(4x + 3) + 2(4x - 2)}{(4x + 3)(4x - 2)}$ **b.** $\dfrac{8x + 1}{(4x + 3)(2x - 1)}$

3.8 Exercise Set B (p. 164)

1. $-4, \dfrac{1}{3}$ **3.** 7 **5.** $\dfrac{-2x^2}{3x - 5}$; $0, \dfrac{5}{3}$ **7.** $\dfrac{3x^3}{3x + 4}$; $-\dfrac{4}{3}$, 0

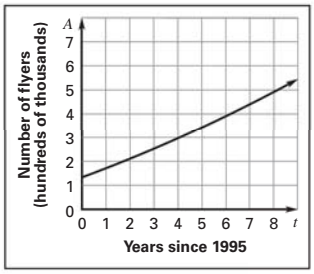
9. $\dfrac{4x}{2x + 1}$; $-\dfrac{1}{2}$, 3 **11.** $\dfrac{1}{x(x - 4)}$; 0, 4

13. No; they do not have the same excluded values; the excluded values for $\dfrac{x^2 + 2x}{x^2 - 4}$ are ± 2, and the excluded values for $\dfrac{x^2}{x^2 - 2x}$ are 0 and 2. They are not equivalent for $x = 0$ and for $x = -2$.

15. $3x^2 + 8x - 3$, $5x^2 + 16x + 3$; Answers will vary.

17. a. $\dfrac{6(t + 4)}{0.01t^2 - 0.5t + 18}$ **b.** about 400,000

c.



The number of flyers increased as time went by.

3.9 Exercise Set A (p. 167)

1. $\frac{1}{6x^3}$ **3.** $\frac{14}{5}$ **5.** $\frac{1}{2(x+5)}$ **7.** $\frac{x(x+3)}{3(2x-1)}$

9. $3(x+5)$ **11.** $\frac{x^6}{4}$ **13.** $\frac{1}{9}$ **15.** $\frac{1}{4}$ **17.** $\frac{2}{(x+3)^2}$

19. $\frac{125}{150-t}$; about \$8.74 per unit

3.9 Exercise Set B (p. 168)

1. x **3.** $-\frac{1}{2}$ **5.** $\frac{x^5}{9}$ **7.** $\frac{2(x+3)(x+6)}{x^2+6}$ **9.** -1

11. $\frac{x^2(x^2-5)(x-7)}{4(x^2-7)}$ **13.** $\frac{3}{x}$ **15.** $(x+6)(x-6)$

17. $A = \frac{500(t+20)}{1-0.05t}$; about \$13,529

3.10 Exercise Set A (p. 173)

1. $\frac{x+8}{x+5}$ **3.** $\frac{3(2x+1)}{x-9}$ **5.** $\frac{10x-7}{x^2-9}$ **7.** $15x^3$

9. $(x-4)(x+6)$ **11.** $x(x-5)(x+2)$

13. $\frac{85}{14x}$ **15.** $\frac{x(5x+31)}{(x-5)(x+2)}$ **17.** $\frac{25-3x}{x(x-7)}$

19. $\frac{2x^2+5x+1}{(x-1)(x+1)}$ **21.** $\frac{-5}{(x+1)(x+4)(x-4)}$

23. a. $t = \frac{50}{r} + \frac{50}{r+3}$ **b.** 6.1 h **c.** about 1.4 h

3.10 Exercise Set B (p. 174)

1. $\frac{3(x-2)}{x+3}$ **3.** $\frac{-3x+2}{2x-5}$ **5.** $\frac{-2x^2-22x-9}{(x+10)(x-1)}$

7. $\frac{9x^3-16x^2+3x-2}{3x^2(x-2)}$ **9.** $\frac{-15x^2+x-30}{8x(x+6)}$

11. $\frac{5x-7}{(x-3)^2(x+5)}$ **13.** $\frac{-x^2+19x+50}{(x+2)(x+1)}$

15. $\frac{21x^2+79x-2}{(x+1)(x+4)(x+6)}$ **17.** $\frac{11c^2-34c-105}{(3c+4)^2}$

19. a. $y = \frac{1}{t}$ **b.** no; It will take you and your friend over an hour to deliver all of the advertisements.

3.11 Exercise Set A (p. 178)

1. $-9, 9$ **3.** -7 **5.** -5 **7.** -1 **9.** 1

11. $2(x-1)$ **13.** 0 **15.** $\frac{7}{4}$

17. a.

Person	Fraction of room papered each hour	Time (hours)	Fraction of room papered
Assistant	$\frac{1}{x}$	3	$\frac{3}{x}$
Expert	$\frac{3}{2x}$	3	$\frac{9}{2x}$

b. *Sample answer:* The fractions of the job must add up to 1 whole job. **c.** $\frac{3}{x} + \frac{9}{2x} = 1$; 7.5 h

3.11 Exercise Set B (p. 179)

1. $\frac{1}{4}$ **3.** 6 **5.** $\frac{1}{2}$ **7.** $-2, 2$ **9.** $-\frac{19}{3}$

11. $-2, -1$ **13.** no solution **15.** 5 **17.** 4 pt

3.12 Exercise Set A (p. 183)

1. -3 **3.** $-\frac{1}{3}$

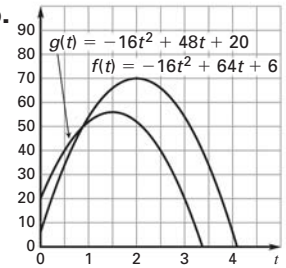
5. The average rate of change of f from x_1 to x_2 is greater.

7. The student wrote the denominator incorrectly; the correct answer is $\frac{f(0)-f(-1)}{0-(-1)} = \frac{0-1}{1} = -1$.

9. 0 **11.** 4 **13.** $-2.04, 1.88$

15. a. $f(t) = -16t^2 + 64t + 6$; $g(t) = -16t^2 + 48t + 20$

b.



c. $\frac{7}{8}$; After $\frac{7}{8}$ second, the objects are at the same height, 49.75 feet.

3.12 Exercise Set B (p. 184)

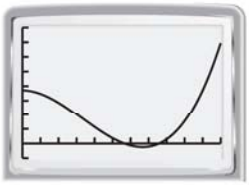
1. $-\frac{2}{3}$ **3.** -0.2

SELECTED ANSWERS

5. The average rate of change of g from x_1 to x_2 is greater. **7. a–b.** Answers will vary.

9. $-2, 0, \frac{1}{2}$ **11.** no solution **13.** negative

15. a.



b. 19.6; This shows that the profit increased rapidly from 2004–2007. **c.** 2005–2007; 1999–2001

3.13 Exercise Set A (p. 187)

1. 2, 4, 6, 8, 10, 12 **3.** 2, 1, 0, −1, −2, −3

5. 4, 9, 16, 25, 36, 49 **7.** −2, 4, −8, 16, −32, 64

9. $\frac{1}{4}, \frac{2}{7}, \frac{3}{10}, \frac{4}{13}, \frac{5}{16}, \frac{6}{19}$

11. You can write the terms as $5 - 2(1), 5 - 2(2), 5 - 2(3), 5 - 2(4)$; $a_5 = -5$; $a_n = 5 - 2n$

13. You can write the terms as $2(1^2) - 1, 2(2^2) - 1, 2(3^2) - 1, 2(4^2) - 1$; $a_5 = 49$; $a_n = 2n^2 - 1$

15. You can write the terms as $-\frac{1^2}{2}, -\frac{2^2}{2}, -\frac{3^2}{2}, -\frac{4^2}{2}$; $a_5 = -\frac{25}{2}$; $a_n = -\frac{n^2}{2}$

3.13 Exercise Set B (p. 188)

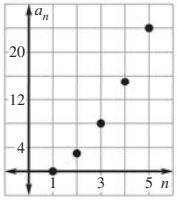
1. −5, −10, −15, −20, −25, −30

3. 7, 4, −1, −8, −17, −28

5. 0, 4, 18, 48, 100, 180 **7.** 1010 **9.** $-\frac{1}{133}$

11. You can write the terms as $(-1)^1[2(1)], (-1)^2[2(2)], (-1)^3[2(3)], (-1)^4[2(4)]$; $a_5 = -10$; $a_n = (-1)^n(2n)$ **13.** The student wrote the terms correctly, but did not write the rule correctly; $a_n = (-1)^{n+1}(n^2)$.

15.



17. True **19.** False; A sequence is a function so an input is paired with exactly one output.

UNIT 4

4.1 Exercise Set A (p. 195)

1. $\sqrt{5}$ **3.** $5\sqrt{2}$ **5.** $\sqrt{37}$ **7.** $4\sqrt{2}$ **9.** $2\sqrt{13}$ **11.** 2

13. −3, 5 **15.** −7, 3 **17.** $\left(-\frac{17}{2}, 8\right)$ **19.** $\left(\frac{11}{2}, -\frac{3}{2}\right)$

21. $\left(-\frac{3}{2}, 2\right)$ **23.** 15 mi **25.** 8.5 books

4.1 Exercise Set B (p. 196)

1. 13 **3.** $\sqrt{458}$ **5.** $\sqrt{661}$ **7.** $\sqrt{122}$ **9.** $\frac{\sqrt{37}}{3}$

11. 2, 6 **13.** −4, 22 **15.** −4, 24 **17.** $\left(\frac{5}{2}, 8\right)$

19. (3.75, 9.25) **21.** (−5.5, 4) **23.** (−2, 8)

25. a. about 12 mi **b.** (4, 7)

c. about 3 mi; $\left(\frac{5}{2}, \frac{9}{2}\right)$; Find the midpoint between (1, 2) and (4, 7) and then find the distance between these points.

4.2 Exercise Set A (pp. 199–200)

1.

3.

5.

7. add 111 to the previous number; 557

9. add 2 to the numerator and 1 to the denominator of the previous number; $\frac{9}{7}$

11. subtract 3 from the previous number; −9

13. double the previous number and then add 1; 47

15. add $\frac{1}{3}$ to the previous number; $-\frac{2}{3}, -\frac{1}{3}, 0$

17. 20 **19.** *Sample answer:* $|5| - |7| = -2$

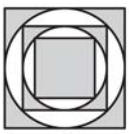
21. *Sample answer:* $\sqrt{\frac{1}{4}} = \frac{1}{2}, \frac{1}{2} > \frac{1}{4}$

23. $y = 2x - 7$ **25.** $y = \frac{1}{x}$

27. 512 billion bacteria

4.2 Exercise Set B (pp. 201–202)

1.



3.

5. add 2 to the absolute value of the previous number and use the opposite sign; 15

7. add 1.1 to the absolute value of the previous number and use the opposite sign; 9.5

9. subtract 1 from both the numerator and the denominator of the previous number; $\frac{6}{7}$

11. add 2^n to the previous (nth) number; 61

13. The rate of decrease is increasing by $5n$; -10

15. Multiply the first number by 10 to get the second number, take half the second number to get the third number, and repeat this pattern; 75

17. *Sample answer:* double the previous number; 8, 16, 32; add n to the previous (nth) number; 7, 11, 16 **19.** *Sample answer:* the nth number is 2^n; 16, 32, 64; add $n + 1$ to the previous number; 13, 19, 26

21. equal to **23.** $1^2 + 3^2 = 10$; 10 is not odd.

25. *Sample answer:* $y = (x + 1)^2$

4.3 Exercise Set A (pp. 207–208)

1. If it is 6 P.M., then it is time for dinner.

3. If an angle is obtuse, then it measures more than 90° and less than 180°.

5. converse: If you go to the hockey game, then you like hockey; **inverse:** If you do not like hockey, then you do not go to the hockey game; **contrapositive:** If you do not go to the hockey game, then you do not like hockey.

7. true **9.** true

11. converse: If an angle is acute, then it measures 30°. **13. converse:** If two circles have the same circumference, then they have the same diameter; **biconditional:** Two circles have the same circumference if and only if they have the same diameter.

15. conditional statement: If two lines are perpendicular, then they intersect to form right angles; **converse:** If two lines intersect to form right angles, then the two lines are perpendicular.

17. yes **19.** yes **21.** A saxophone that has a frequency of 69 cycles per second to 415 cycles per second is called an E-flat baritone saxophone.

23. A saxophone that has a frequency of 138 cycles per second to 830 cycles per second is called an E-flat alto saxophone. **25.** nothing; It could be any of the three saxophones.

4.3 Exercise Set B (pp. 209–210)

1. If a car has leaking antifreeze, then it has a problem. **3.** If a dog is old, then you cannot teach it new tricks. **5.** Learn from your mistakes.

7. Let sleeping dogs lie.

9. if-then: If a circle has a radius of r, then it has a circumference of $2\pi r$. true; **converse:** If a circle has a circumference of $2\pi r$, then it has a radius of r. true; **inverse:** If a circle does not have a radius of r, then it does not have a circumference of $2\pi r$. true; **contrapositive:** If a circle does not have a circumference of $2\pi r$, then it does not have a radius of r. true **11.** false; def. of opp. rays is not satisfied because F does not lie between C and E.

13. true; $\angle CFD$ is a straight angle, so its measure is 180°. **15.** false; $\angle CFE$ and $\angle DFE$ are supplementary, so the sum of their measures is 180° and because they are $\cong$, the measure of each is 90°.

17. A statement is a conditional statement if and only if it is a logical statement that has two parts, a hypothesis and a conclusion.

19. A situation is a counterexample if and only if it represents a specific case for which a given conjecture is false.

21. valid **23.** valid

25. If $-x > -8$, then $x < 8$; True. **27.** no

29. not valid; does not specify that it must form over Atlantic Ocean. **31.** not valid; does not specify that the cyclone must form in the tropics.

4.4 Exercise Set A (pp. 213–214)

1. Law of Detachment **3.** Law of Detachment

5. invalid **7.** deductive reasoning; Deductive reasoning is based on logic and order. If Walt is taller than Peter and Peter is taller than Natalie, then Walt is taller than Natalie. **9.** inductive reasoning; Inductive reasoning depends on previous examples and patterns to form a conjecture. Dana came to her conclusion based on previous examples.

11. not valid; It does not say that Jeff is not allowed to play video games on Saturday afternoon. It says that he does not play video games on Saturday afternoon.

13. not valid; the hypothesis is not necessarily true.

15. false; The mall is open. Therefore Jodi and Dan went shopping, and therefore Dan bought a pretzel. You cannot conclude that Dan also bought a pizza.

17. true; The mall is open. Therefore Jodi and Dan went shopping, and therefore Jodi bought a pizza.

19. D, B, A, E, C; The robot extinguishes the fire.

4.4 Exercise Set B (pp. 215–216)

1. Dr. Klein will operate with precision today; detachment **3.** If a player receives two technical fouls in one game, then the player has to sit out the following game; syllogism **5.** There is significant danger to the firefighters; detachment **7.** If the company contributes $20,000 to the charity, then it will go into a lower tax bracket; syllogism

9. The result is the perfect square; detachment

11. The ball will float in water; detachment

13. inductive; the conclusion is a conjecture based on your specific results from the first three weeks.

15. inductive; you are making a conjecture based on your normal spending habits.

17. *Sample answer:* The area of one circle is one-fourth the area of another circle with a radius that is twice as long.

19. Either a catch platform must be installed or each worker must wear a safety belt attached to an approved lifeline, because the eave is over 16 feet high and the pitch is greater than 4 to 12.

4.5 Exercise Set A (pp. 219–220)

1. 1. Given **2.** Substitution Property of Equality **3.** $\overline{HI} \cong \overline{IJ}$ **4.** Given **5.** Transitive Property of Congruence

3. 1. Given **2.** Reflexive Property of Equality **3.** Addition Property of Equality **4.** Segment Addition Postulate **5.** Segment Addition Postulate **6.** Substitution Property of Equality

5. $x = 6$; Because the angles are congruent, the measures of the angles are congruent by the definition of congruent angles. Set the measures of the angles equal to each other to find x. **7.** $x = 5$; By the transitive property, $\angle ABD \cong \angle EBC$. Because the angles are congruent, the measures of the angles are congruent by the definition of congruent angles. Set the measures of the angles equal to each other to find x.

9. $\overline{UV} \cong \overline{ZY}$, $\overline{UW} \cong \overline{ZX}$ (Given)
$UV = ZY$, $UW = ZX$ (Def. of $\cong$)
$VW = UW - UV$ (Segment Addition Postulate)
$YX = ZX - ZY$ (Segment Addition Postulate)
$YX = UW - UV$ (Substitution Property of Equality)
$VW = YX$ (Transitive Property of Equality)
$\overline{VW} \cong \overline{YX}$ (Def. of $\cong$)

4.5 Exercise Set B (pp. 221–222)

1. Given; $m\angle CBD + m\angle DBE$; Substitution Property of Equality; Subtraction Property of Equality; $m\angle DBE$; $\angle CBD \cong \angle DBE$; Transitive Property of Equality **3.** $\angle 5 \cong \angle 7$

5. Reflexive Property of Congruence

7. Transitive Property of Congruence

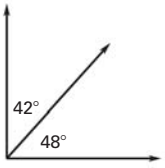
9. $\overline{RS} \cong \overline{ST}$ and $\overline{ST} \cong \overline{TU}$ by the definition of midpoint. Then $\overline{RS} \cong \overline{TU}$ by the Transitive Property of Congruence, so $RS = TU$. Then $5x + 7 = 7x - 3$ by the Substitution Property of Equality, $10 = 2x$ by the Subtraction Property of Equality, and $5 = x$ by the Division Property of Equality.

11.
1. $\overline{AE} \cong \overline{CE}$, $\overline{AB}$ and $\overline{CD}$ bisect each other. (Given)
2. E is the midpoint of $\overline{AB}$ and of $\overline{CD}$. (Definition of segment bisector)
3. $\overline{EB} \cong \overline{AE}$, $\overline{CE} \cong \overline{ED}$ (Definition of midpoint)
4. $\overline{AE} \cong \overline{ED}$ (Transitive Property of Congruence)
5. $\overline{EB} \cong \overline{ED}$ (Transitive Property of Congruence)

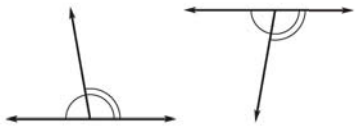
4.6 Exercise Set A (pp. 225–226)

1. false **3.** false

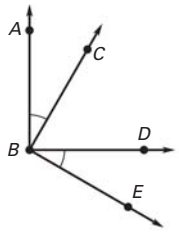
5.



7.



9.



11. $x = 5, y = 26$; 74°, 106°, 74°, 106°

13. $x = 7, y = 9$; 36°, 144°, 36°, 144°

15. It was assumed that $\angle 2$ and $\angle 3$, and $\angle 1$ and $\angle 4$ are linear pairs, but they are not; $\angle 2$ and $\angle 4$, and $\angle 1$ and $\angle 3$ are not vertical angles and are not congruent. **17. 1.** Given **2.** Definition of complementary angles **3.** Given **4.** Definition of congruent angles **5.** Substitution Property of Equality **6.** Substitution Property of Equality **7.** Definition of complementary angles

19. < **21.** =

4.6 Exercise Set B (pp. 227–228)

1. The Linear Pair Post. and Vertical Angles Congruence Thm. can be used to deduce that $\angle 5$, $\angle 6$, and $\angle 7$ are right angles. So, $\angle 5$, $\angle 6$, $\angle 7$, and $\angle 8$ are all congruent by the Right Angles Congruence Thm. $\angle 1 \cong \angle 3$ and $\angle 4 \cong \angle 2$ by the Congruent Complements Thm.

3. 37°, 90°, 53°, 37° **5.** 51°, 39°, 90°, 51°

7. $x = 25, y = 14$ **9.** $x = 50, y = 53, z = 127$

11. 118° **13.** 84° **15.** 28° **17.** yes **19.** no

21. yes **23. 1.** Given; **2.** $m\angle STU$; **2.** Angle Addition Post.; **3.** 40° + 50°; **4.** 90°; **5.** Def. of rt. Angle; **6.** $\angle S \cong \angle STU$

4.7 Exercise Set A (pp. 231–232)

1. $r \perp s$; Theorem 4.7 **3.** $\angle 1$ and $\angle 2$ are complementary; Theorem 4.9 **5.** 25 **7.** 105 **9.** 50

11. 30° **13.** 30° **15.** 60° **17.** yes **19.** 2.8

21. 4.5 **23.** 3.6 **25. a.** 90° **b.** 30° **c.** 500 ft **d.** 224 ft

4.7 Exercise Set B (pp. 233–234)

1. 58° **3.** 90° **5.** 52° **7.** 25° **9.** 65° **11.** no

13. 15 **15.** 21 **17.** 12 **19.** 4.9 **21.** 6

23. a. 1.5 miles **b.** 1.4 miles **c.** hiking trail; even though it appears it would be shorter for the hikers to walk to the highway, they can only cross the river at a bridge. So, walking to the trail is the shortest distance.

4.8 Exercise Set A (pp. 238–239)

1. true; SSS **3.** true; SSS **5.** not congruent

7. congruent **9.** not congruent

11. Not stable; there are many possible shapes for a four-sided figure with the given side lengths.

13. Yes; the corresponding sides are congruent.

15. 1. Given; **2.** Given; **3.** Reflexive Property of Congruence; **4.** SSS Congruence Postulate

17. The second picture frame is stable because the brace and the sides form triangles of fixed side lengths which cannot change shape by the SSS Congruence Postulate.

4.8 Exercise Set B (pp. 240–241)

1. true; SSS **3.** true; SSS **5.** congruent

7. not congruent **9.** Not stable; there are many possible shapes for a four-sided figure with the given side lengths.

11. 1. $\overline{HI} \cong \overline{JK}$; **2.** $\overline{IJ} \cong \overline{KH}$; **3.** $\overline{HJ} \cong \overline{HJ}$; **4.** $\triangle HIJ \cong \triangle JKH$

13. $x = 3$; Setting $2x + 3 = 7x - 12$ and $-x + 14 = 6x - 7$ yields $x = 3$ in both equations.

4.9 Exercise Set A (pp. 244–245)

1. $\angle ABC$ **3.** $\angle ABD$ **5.** $\angle DAB$ **7.** not enough

9. not enough **11.** Yes, HL Congruence Theorem

13. The SAS Congruence Postulate does not apply because the congruent angles are not the included angles of the congruent sides. **15.** $\angle J \cong \angle D$

17. 1. Given; **2.** $\overline{AB} \cong \overline{BE}$; **3.** Given; **4.** $\overline{CB} \cong \overline{BD}$; **5.** Vertical Angles Theorem; **6.** SAS Congruence Postulate

4.9 Exercise Set B (pp. 246–247)

1. not enough **3.** not enough

5. $\angle C$; $\angle D$ **7.** $\overline{AC}$; $\overline{FD}$ **9. 3.** Definition of perpendicular lines; **4.** $\triangle PRS$ and $\triangle QSR$ are right triangles; **5.** Reflexive Property of Congruence; **6.** HL Congruence Theorem

SELECTED ANSWERS

11. $\triangle AEC \cong \triangle ABD$; From the figure you know that $\overline{AC} \cong \overline{AD}$ and $\overline{CE} \cong \overline{DB}$. $\angle CDE$ is a straight angle so its measure is 180°. To find $m\angle ADB$, add the measures of $\angle ADC$ and $\angle BDE$ then subtract from 180° to get 70°. So, $\angle ADB \cong \angle ACE$. By the SAS Congruence Postulate, $\triangle AEC \cong \triangle ABD$.

4.10 Exercise Set A (pp. 251–252)

1. $\overline{DF} \cong \overline{MO}$ **3.** $\angle D \cong \angle M$ **5.** $\angle B \cong \angle Y$

7. no **9.** Yes, AAS Congruence Theorem

11. Yes, AAS Congruence Theorem

13. No; three pairs of congruent angles is insufficient to prove triangle congruence.

15. Two pairs of corresponding sides ($\overline{BF} \cong \overline{BD}$, $\overline{EF} \cong \overline{ED}$) and the corresponding included angles ($\angle BFE \cong \angle BDE$) are congruent.

17. Two pairs of corresponding angles ($\angle ABF \cong \angle CBD$, $\angle BAF \cong \angle BCD$) and the corresponding non-included sides ($\overline{AF} \cong \overline{CD}$) are congruent.

4.10 Exercise Set B (pp. 253–254)

1. $\overline{FE} \cong \overline{TR}$ or $\overline{DE} \cong \overline{QR}$ **3.** $\overline{DF} \cong \overline{QT}$

5. Yes; $\angle KNL \cong \angle MLN$ by Alternate Interior Angles Theorem, $\overline{LN} \cong \overline{LN}$ by Reflexive Property of Congruence, $\triangle KLN \cong \triangle MNL$ by ASA Congruence Postulate

7. No, $\angle M$ and $\angle Y$ are not corresponding angles.

9. Yes, AAS Congruence Theorem

11. Two pairs of corresponding sides ($\overline{AF} \cong \overline{BF}$, $\overline{FD} \cong \overline{FC}$) and the corresponding included angle ($\angle AFD \cong \angle BFC$, by Vertical Angles Theorem) are congruent.

13. $\angle ACD \cong \angle ABD$ is given. $\angle BDC \cong \angle ABD$ by Alternate Interior Angles Theorem. $\overline{DC} \cong \overline{DC}$ by Reflexive Property of Congruence. $\overline{AC} \cong \overline{BD}$ by the Segment Addition Postulate and substitution. $\triangle ACD \cong \triangle BDC$ by the SAS Congruence Theorem.

15. 1. Given; **2.** Given; **3.** Reflexive Property of Congruence; **4.** AAS Congruence Theorem

17.

Statements	Reasons
1. $\overline{ML} \cong \overline{LK}$, $\angle MLJ \cong \angle KLJ$	**1.** Given
2. $\angle MLJ$ and $\angle MLN$ form a linear pair. $\angle KLJ$ and $\angle KLN$ form a linear pair.	**2.** Def. of Linear Pair
3. $\angle MLN \cong \angle KLN$	**3.** Congruent Complements Thm.
4. $\overline{LN} \cong \overline{LN}$	**4.** Reflexive Prop. of $\cong$
5. $\triangle MLN \cong \triangle KLN$	**5.** SAS Congruence Postulate

UNIT 5

5.1 Exercise Set A (pp. 260–261)

1. 14 **3.** 17 **5.** $\overline{JK}$ **7.** $\overline{KS}$, $\overline{RT}$ **9.** $\overline{LT}$, $\overline{RS}$

11. *Sample answer:* (0, 0), (7, 0), (7, 4), (0, 4)

13. (0, 0), (12, 0), (0, 12) **15.** 14 **17.** 54 units

19. You do not know that $\overline{PQ}$ and $\overline{NO}$ are parallel.

21. $S\left(\frac{h}{2}, \frac{k}{2}\right)$, $T\left(\frac{3h}{2}, \frac{k}{2}\right)$; Proof

23. 72 in.; The crossbar is the midsegment of the legs.

5.1 Exercise Set B (pp. 262–263)

1. $\overline{WY}$ **3.** 4 **5.** 32

7. $A(-h, 4k)$, $C(-2h, 4k)$, $D(-h, 0)$

9. $\overline{BD}$ does not connect the midpoints of two sides of $\triangle ABC$.

11. By the definition of an angle bisector, $\angle ABD \cong \angle CBD$. Use the Distance Formula to show $AB = \sqrt{\frac{c^2}{4} + b^2}$ and $BC = \sqrt{\frac{c^2}{4} + b^2}$.

Because $\overline{BD} \cong \overline{BD}$, you can apply the SAS Congruence Postulate to conclude that $\triangle ABD \cong \triangle CBD$.

13. 24; DE is one half the length of $\overline{FG}$. So, $FG = 12$. FG is one half the length of AC. So, $AC = 24$.

5.2 Exercise Set A (pp. 266–267)

1. 4 **3.** 35 **5.** no **7.** 44 **9.** 36 **11.** 31 **13.** 25

15. 24 **17.** 15

19. You do not know that $ML = NL$. So, you cannot conclude that $\overleftrightarrow{JK}$ passes through point L.

21. $AC = BC = 1.125$ in.

23. Because a point on the $\perp$ bisector is equidistant to the endpoints, $\overline{AC} \cong \overline{BC}$. By the Reflexive Property of $\cong$, $\overline{CD} \cong \overline{CD}$. By the definition of bisector, $\overline{AD} \cong \overline{BD}$. By the SSS Congruence Postulate, $\triangle ACD \cong \triangle BCD$.

25. The post is the $\perp$ bisector of the segment between the ends of the wires.

5.2 Exercise Set B (pp. 268–269)

1. 17 **3.** 51 **5.** 40 **7.** 54 **9.** 76 **11.** $2\frac{1}{8}$ in.

13. 10 **15.** always **17.** Because N is on the perpendicular bisector of $\overline{MO}$, you know $\overline{MN} \cong \overline{NO}$ by the Perpendicular Bisector Theorem. $\overline{NR} \cong \overline{NR}$ by the Reflexive Property of Congruence. Because R is on the perpendicular bisector of $\overline{MO}$, you know that $\overline{MR} \cong \overline{RO}$. So, by SSS Congruence Postulate, $\triangle NMR \cong \triangle NOR$.

19. Perpendicular Bisector Theorem; $\overline{AC} \perp \overline{DB}$ and $\overline{AB} \cong \overline{CB}$, so $\overline{DB}$ is the perpendicular bisector of $\overline{AC}$. Because D is on the perpendicular bisector of $\overline{AC}$, it is equidistant from A and C. Therefore, $AD = CD$ and $\overline{AD} \cong \overline{CD}$.

5.3 Exercise Set A (pp. 274–275)

1. 19 **3.** 86° **5.** yes; $\overrightarrow{BD}$ bisects $\angle ABC$ by the converse of the Angle Bisector Theorem.

7. 7 **9.** 8 **11.** No; you need to know that the congruent segments are $\perp$ to the rays.

13. HN is not the perpendicular distance from N to $\overline{JG}$. The same is true about KN; the distance from N to each side of the triangle is the same.

15. 7 **17.** 8 **19.** 35 ft

5.3 Exercise Set B (pp. 276–277)

1. 6 **3.** 7.5 **5.** Yes; Converse of the Angle Bisector Theorem **7.** yes **9.** no **11.** 9 **13.** 4

15. Use the Concurrency of Angle Bisectors of a Triangle Theorem to find the incenter of $\triangle ABC$. Then measure the distance from the incenter to B.

5.4 Exercise Set A (pp. 280–281)

1. 8 **3.** 5 **5.** 12 **7. a.** $M(2, 4)$; $P(2, 1)$

b. $N(0, 1)$; $KP = 4$ and $KN = 6$ therefore $KP = \frac{2}{3}KN$.

9. $(5, -2)$ **11.** no; no; no **13.** 12; 78°

15. $\frac{1}{3}$ **17.** $\frac{2}{3}$ **19.** 5 **21.** sometimes **23.** always

25. 36 in.; By Theorem 5.8, the distance from the vertex to the centroid is $\frac{2}{3}$ times the length of the median $(\overline{AB})$.

5.4 Exercise Set B (pp. 282–283)

1. 10 **3.** 12 **5.** 13 **7.** $\frac{1}{3}$ **9.** 2 **11.** 8 **13.** $(5, 2)$

15. always **17.** 3 in.^{2}; altitude

5.5 Exercise Set A (pp. 287–288)

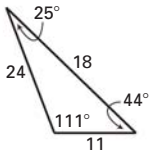
1–3. Check student's drawings. Longest side and largest angle are opposite each other, shortest side and smallest angle are opposite each other.

5. $\overline{ST}$, $\overline{RT}$, $\overline{RS}$; $\angle R$, $\angle S$, $\angle T$

7. $\overline{JK}$, $\overline{JL}$, $\overline{KL}$; $\angle L$, $\angle K$, $\angle J$

9. $\overline{QR}$, $\overline{PR}$, $\overline{PQ}$; $\angle P$, $\angle Q$, $\angle R$

11.



13. yes

15. yes **17.** yes **19.** 3 in. $< x <$ 15 in.

21. 9 m $< x <$ 27 m **23.** 2 in. $< x <$ 46 in.

25. $m\angle 1 > m\angle 2$; $m\angle 1 > m\angle 3$ **27.** $2 < x < 6$

29. $m\angle ABC < m\angle BAC$ and $m\angle BAD < m\angle ABD$

31. Think of the 60- and 24-ft distances as two sides of a triangle. Then the unknown distance d is 36 ft $< d <$ 84 ft. This doesn't account for the cases when the ball lands straight forward ($d = 36$ ft) or straight backward ($d = 84$ ft).

5.5 Exercise Set B (pp. 289–290)

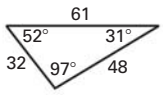
1. smallest, $\angle A$ and $\angle B$; largest, $\angle C$

3. smallest, $\angle H$; largest, $\angle G$

5. shortest, $\overline{KH}$ and $\overline{KJ}$; longest, $\overline{JH}$ **7.** $x > 4$

9. $12 < x < 21$

SELECTED ANSWERS

11. 

13. yes

15. no; $21 + 13 = 34$ **17.** yes

19. $\overline{DE}$, $\overline{AE}$, $\overline{AD}$, $\overline{AB}$, $\overline{BD}$, $\overline{BC}$, $\overline{CD}$

21. 4 in. $< x <$ 14 in. **23.** 60 in. $< x <$ 108 in.

25. 599 feet **27.** $\overline{RT} \perp \overline{TS}$, so $\triangle RTS$ is a right triangle. The largest angle in a right triangle is the right angle, so $m\angle RTS > m\angle RST$, so $RS > RT$. (If one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.)

5.6 Exercise Set A (pp. 294–295)

1. >; Hinge Thm. with $m\angle R > m\angle U$

3. <; Hinge Thm. with $m\angle JMK < m\angle LKM$

5. >; Converse of Hinge Thm. with the side opposite $\angle 1$ longer than the side opposite $\angle 2$.

7. >; Converse of Hinge Thm. with the side opposite $\angle 1$ longer than the side opposite $\angle 2$.

9. $x < 34$ **11.** Assume temporarily that the two parallel lines contain two sides of a triangle.

13. Assume temporarily that xy is odd.

15. the second angler; The included $\angle$ for the second angler is 96° and for the first angler is 90°.

17. Temporarily assume that $AB > AC$. Because $\overline{AD}$ is a median of $\triangle ABC$, D is the midpoint of $\overline{BC}$. Then $\overline{BD} \cong \overline{CD}$ by the definition of midpoint. Also, $\overline{AD} \cong \overline{AD}$ by the reflexive property. Then $m\angle ADB > m\angle ADC$ by the converse of the Hinge Theorem. But this contradicts the given statement that $m\angle ADB \cong m\angle ADC$. This contradiction shows that the temporary assumption that $AB > AC$ is false.

5.6 Exercise Set B (pp. 296–297)

1. =; Hinge Thm. with $m\angle O = m\angle M$

3. <; Converse of Hinge Thm. with side opposite $\angle 1$ is shorter than the side opposite $\angle 2$.

5. >; Converse of Hinge Thm. with side opposite $\angle ACT$ is longer than the side opposite $\angle BCT$.

7. never **9.** always **11.** never

13. In order to use the Hinge Theorem, the student must know the measure of the included angles $\angle JMK$ and $\angle MKL$. **15.** $x > 1$

17. Assume temporarily that $BC \not> AC$. Then, it follows that either $BC < AC$ or $BC = AC$. Case 1: If $BC < AC$, then $m\angle A < m\angle B$ by Theorem 5.10. This contradicts the given statement that $m\angle A > m\angle B$. Case 2: If $BC = AC$, then $\triangle ABC$ would be an isosceles triangle with $m\angle A = m\angle B$. This contradicts the given statement that $m\angle A > m\angle B$. Both cases lead to contradictions, so the temporary assumption that $BC \not> AC$ cannot be true. This proves that $BC > AC$.

19. Assume temporarily that $RS > RT$ so that $\triangle RST$ is not isosceles. Then, $m\angle T > m\angle S$, but $\triangle RUS \cong \triangle RUT$ by the ASA Congruence Postulate. So, $\angle S \cong \angle T$, or $m\angle T = m\angle S$. This is a contradiction, so $RS \leq RT$. We get a similar contradiction if we assume $RT > RS$; therefore $RS = RT$, and $\triangle RST$ is isosceles by definition.

5.7 Exercise Set A (pp. 300–301)

1. 720° **3.** 1620° **5.** 3240° **7.** triangle

9. heptagon **11.** 16-gon **13.** 30-gon

15. 50-gon **17.** 56 **19.** 64 **21.** 9 **23.** 40°

25. 114° **27.** 135°; 45° **29.** 172°; 8°

31. 176.4°; 3.6° **33.** 75 **35.** 120

37. $x = 70$; $m\angle M = m\angle S = 70°$, $m\angle N = m\angle R = 160°$, $m\angle O = m\angle Q = 150°$, and $m\angle P = 140°$

5.7 Exercise Set B (pp. 302–303)

1. 3420° **3.** 8640° **5.** 19 **7.** 38 **9.** 51

11. 17 **13.** 16 **15.** 3 **17.** 105°

19. about 128.6°; about 51.4°

21. about 158.8°; about 21.2°

23. about 174.9°; about 5.1° **25.** 24 **27.** 72

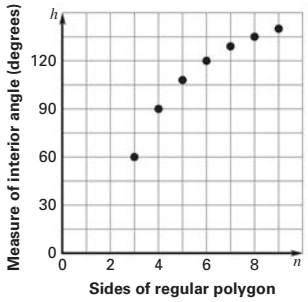
29. No; The polygon would have 14.4 sides which is not possible.

31. Yes; The polygon would have 72 sides.

33. $x = 13.5$; $m\angle A = 117°$, $m\angle B = 86°$, $m\angle C = 134°$, $m\angle D = 86°$, $m\angle E = 117°$

35. a. $h(n) = \dfrac{(n-2) \cdot 180°}{n}$ **b.** 144°; 15

c.



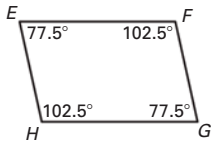
$h(n)$ increases as n increases, but the rate of increase slows down.

5.8 Exercise Set A (pp. 306–307)

1. 116° **3.** 96° **5.** $x = 2$; $y = 17$

7. $f = 78$, $g = 3.5$ **9.** $j = 4.5$, $k = 2$

11.



$m\angle E = m\angle G = 77.5°$, $m\angle F = m\angle H = 102.5°$

13. 40° **15.** 80° **17.** 40° **19.** 120° **21.** 5

23. 18° **25.** 30° **27.** 55° **29.** 20

31.

Statements	Reasons
1. $ABCD$ is a $\square$.	**1.** Given
2. Draw $\overline{BD}$.	**2.** Through any 2 points there exists exactly 1 line.
3. $\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{AD}$	**3.** Definition of parallelogram
4. $\angle ABD \cong \angle CDB$, $\angle ADB \cong \angle CBD$	**4.** Alternate Interior Angles Theorem
5. $\overline{BD} \cong \overline{BD}$	**5.** Reflexive Property of Congruence
6. $\triangle ABD \cong \triangle CDB$	**6.** ASA Congruence Postulate
7. $\overline{AB} \cong \overline{CD}$, $\overline{BC} \cong \overline{AD}$	**7.** Corresp. parts of $\cong$ $\triangle$ are $\cong$.

5.8 Exercise Set B (pp. 308–309)

1. $a = 11$, $b = 12$ **3.** $e = 8$, $t = 3$

5. $j = 14$, $k = 2$ **7.** $p = 4$, $q = 8$ **9.** $t = 9$, $v = 4$

11. 3; Diagonals of $\square$ bisect each other.

13. 4; Pythagorean Theorem

15. 5; Pythagorean Theorem or SAS $\cong$ Theorem

17. 37°; Alternate Interior Angles Theorem

19. 53°; Triangle Sum Theorem

21. 20; All 4 $\triangle$ are $\cong$ with hypotenuse = 5.

23. 61.1° and 118.9°

25. $MN = 4$ and $PO = 4$ so $\overline{MN} \cong \overline{PO}$.

27. Because $\parallel$ lines have equal slopes

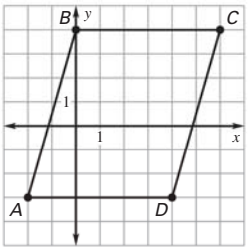
29. 1. Given **2.** Theorem 5.20
3. $m\angle MHN + m\angle ATN = 180°$ **4.** Given
5. $56° + m\angle ATN = 180°$ **6.** Subtraction property of equality **7.** $\angle MNT \cong \angle ATN$
8. Definition of congruent angles
9. $m\angle MNT = 124°$ **10.** Linear Pair Postulate
11. $124° + m\angle MNH = 180°$
12. Subtraction property of equality

5.9 Exercise Set A (pp. 313–314)

1. Theorem 5.23 **3.** Theorem 5.25

5. 6 **7.** 1 **9.** 20 **11.** 108

13.



The slope of $\overline{BC}$ and $\overline{AD}$ is 0, so $\overline{BC} \parallel \overline{AD}$. Also, $BC = AD = 6$. By Theorem 5.24, $ABCD$ is a parallelogram.

15. *Sample answer:* Show $\triangle ABD \cong \triangle CDB$ using the AAS Congruence Theorem. This makes $\overline{AB} \cong \overline{CD}$ using corresponding parts of congruent triangles are congruent. Then apply Theorem 5.22.

17. $D(6, -3)$

19. Alternate Interior Angles Congruence Theorem, Reflexive Property of Segment Congruence, Given, SAS, Corresponding Parts of Congruent Triangles are Congruent, Theorem 5.22; **1.** $\overline{QR} \parallel \overline{PS}$ (Given) **2.** $\angle PSQ \cong \angle RQS$ (Alt. Interior $\measuredangle$ Congruence Thm.) **3.** $\overline{QS} \cong \overline{QS}$ (Reflexive Prop. of Segment Congruence) **4.** $\overline{QR} \cong \overline{PS}$ (Given)
5. $\triangle RSQ \cong \triangle PQS$ (SAS Congruence Postulate)
6. $\overline{RS} \cong \overline{PQ}$ (Corr. Parts of $\cong$ $\triangle$s are $\cong$.)
7. $PQRS$ is a parallelogram. (Theorem 5.22)

5.9 Exercise Set B (pp. 315–316)

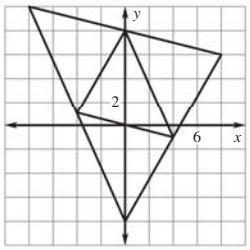
1. 5 **3.** 14 **5.** 12 **7.** yes **9.** no

11. no **13.** yes

SELECTED ANSWERS

15. slope of $\overline{AB}$ = slope of $\overline{CD}$ = -1 and slope of $\overline{BC}$ = slope of $\overline{DA}$ = 5, so $ABCD$ is a $\square$ by definition.

17. (8, 6), (0, -8), and (-8, 10)



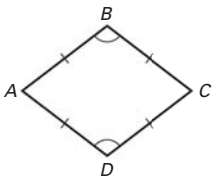
19. The congruent sides must be opposite one another to apply Theorem 5.22.

21.

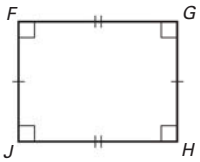
Statements	Reasons
1. $VWKJ$ and $SJRU$ are $\square$.	**1.** Given
2. $\angle W \cong \angle J$, $\angle J \cong \angle U$	**2.** Opposite $\measuredangle$s of a $\square$ are $\cong$.
3. $\angle W \cong \angle U$	**3.** Transitive Prop. of $\cong$

5.10 Exercise Set A (pp. 319–320)

1. always; Opposite angles in a rhombus are congruent.



3. always; Every angle in a rectangle is a right angle.



5. rhombus; All sides are congruent.

7. rhombus, square **9.** parallelogram, rhombus

11. rectangle, square

13. parallelogram, rectangle, rhombus, square

15. square; All sides are congruent and all angles are right angles; $x = 2$, $y = 1$

17. 30° **19.** 12 **21.** 40° **23.** 6 **25.** 90° **27.** 5

29. No; The diagonals of all rectangles are congruent, so the window may not be square.

31.

Statements	Reasons
1. $ABCD$ is a rhombus.	**1.** Given
2. $\angle ABF \cong \angle CDF$, $\angle BAF \cong \angle DCF$	**2.** Theorem 5.27
3. $\overline{BA} \cong \overline{DC}$	**3.** Definition of a rhombus.
4. $\triangle BFA \cong \triangle DFC$	**4.** ASA Cong. Postulate

5.10 Exercise Set B (pp. 321–322)

1. true; false **3.** true; false **5.** true; true; A rhombus is a square if and only if it is a rectangle.

7. 54° **9.** 54° **11.** 90° **13.** 63° **15.** 60°

17. rhombus; All sides are $\cong$.; $x = 5$, $y = 11$

19. 71° **21.** about 28.6 **23.** 34° **25.** 16.5

27. Given; Diagonals of $\square$ bisect each other.; $\overline{HD} \cong \overline{DT}$; $DART$ is a rhombus.; Definition of rhombus; Substitution; $WA = WD + DA$, $HT = HD + DT$; $WA = HT$; Theorem 5.28

29. *Sample answer:* Let rectangle $PQRS$ have vertices (0, 0), (p, 0), (p, q), and (0, q), respectively. The diagonal $\overline{PR}$ has a length of $\sqrt{p^2 + q^2}$ and diagonal $\overline{QS}$ has a length of $\sqrt{p^2 + q^2}$. So, $PR = QS = \sqrt{p^2 + q^2}$.

5.11 Exercise Set A (pp. 325–326)

1. trapezoid **3.** 70°, 70°, 110° **5.** 19 **7.** 88°

9. $ST = VS = 5\sqrt{2}$, $TU = UV = 13$

11. 14 **13.** 3.1

15. a. No; None of the side lengths are congruent.

b. trapezoid **c.** $\frac{3\sqrt{13}}{2}$ units

17. $\overline{MN}$ is the midsegment of isosceles trapezoid $FGHJ$, so $FM = MG = JN = NH$. Also, $\overline{MN} \parallel \overline{FJ}$ by Theorem 5.32. So, $FMNJ$ is an isosceles trapezoid because it has one pair of parallel sides ($\overline{MN} \parallel \overline{FJ}$) and the legs are congruent ($\overline{FM} \cong \overline{JN}$).

5.11 Exercise Set B (pp. 327–328)

1. yes; no **3.** yes; yes **5.** 129° **7.** 20.5 **9.** 7

11. $m\angle T = 113°$, $m\angle W = 97°$

13. $EW = ES = \sqrt{58}$, $ST = WT = \sqrt{109}$

15. $EH = EF = 3\sqrt{34}$, $HG = FG = 9\sqrt{5}$

17. 4.5 **19.** 60°, 60°, 120°, 120°

21. Given; Definition of rectangle; $\angle ILB \cong \angle ROD$; Opposite sides of $\square$ are $\cong$.; $\overline{LB} \cong \overline{DO}$; SAS Congruence Postulate; $\overline{BI} \cong \overline{DR}$; $\overline{BD} \parallel \overline{IR}$; Definition of isosceles trapezoid

5.12 Exercise Set A (pp. 331–332)

	$\square$	Rect.	Rhom.	Sq.	Kite	Trap.
1.	X	X	X	X		
3.						
5.					X	

7. isosceles trapezoid; A trapezoid with a pair of congruent base angles is isosceles.

9. kite; There are two pairs of consecutive congruent sides, but opposite sides are not congruent.

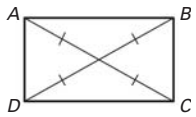
11. yes; Theorem 5.28 **13.** no

15. rectangle; Opposite sides are congruent and contains 4 right angles.

17. $\overline{FG}$ and $\overline{HJ}$ **19.** trapezoid

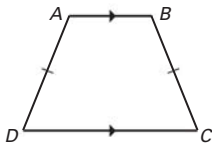
5.12 Exercise Set B (pp. 333–334)

1.



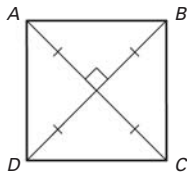
rectangle

3.



isosceles trapezoid

5.



square

7. always **9.** never **11.** never

13. yes; By Theorem 4.11, there is one pair of parallel sides. **15.** no; You must know the other two sides are also parallel.

17. rectangle; slope $\overline{PQ}$ = slope $\overline{RS} = -\frac{1}{4}$; slope $\overline{QR}$ = slope $\overline{PS} = 4$; adjacent sides $\perp$ and $\not\cong$ $(\sqrt{17} \neq \sqrt{68})$ **19.** $(-5, 5.5)$, $(-8, 2)$, $(-7, -2.5)$, $(-4, 1)$; parallelogram

21. *Sample answer:* $\overline{AB} \cong \overline{AD}$; Quadrilateral with two pairs of consecutive $\cong$ sides, but opposite sides $\not\cong$ is a kite.

23. Yes; **1.** Given **2.** Given **3.** Definition of a midsegment **4.** Midsegment Theorem **5.** $\overline{PR} \cong \overline{QS}$ **6.** $PR = QS$ **7.** Substitution property of equality **8.** Substitution property of equality **9.** Rhombus Corollary

UNIT 6

6.1 Exercise Set A (p. 340)

1. 6 **3.** 9 **5.** The number of choices is the product, not the sum, of 3 and 4: $3 \cdot 4 = 12$. **7.** 80

9. 4; Use the multiplication counting principle and solve the equation $7(3)x = 84$ for x to find the number of desserts. **11.** 35,152,000

13. a. $\frac{21}{26}$ **b.** $\frac{125}{17{,}576}$ **c.** $\frac{1}{17{,}576}$ **d.** $\frac{1}{676}$

6.1 Exercise Set B (p. 341)

1. 80 **3.** 208 **5.** 7500 **7.** 504 **9.** 720; It doubles the number of possible displays to 1440. **11.** 1; 31

13. a. $\frac{5}{26}$ **b.** $\left(\frac{21}{26}\right)^5$ **c.** $\frac{1}{26^5}$ **d.** $\frac{1}{26^4}$

6.2 Exercise Set A (p. 344)

1. a. 24 **b.** 12 **3. a.** 120 **b.** 20 **5.** the number of permutations of 24 objects taken 10 at a time **7.** 720

9. 39,916,800 **11.** 1320 **13.** 120 **15.** 2730

17. 151,200 **19.** > **21.** < **23.** = **25.** 720

6.2 Exercise Set B (p. 345)

1. a. 120 **b.** 60 **3. a.** 720 **b.** 120 **5.** 840

7. 56 **9.** 5 **11.** 2,162,160 **13.** 6,375,600

15. 1260 **17.** 14 **19.** 120 **21.** = **23.** 40,320

25. a. $\frac{1}{132}$ **b.** $\frac{11}{12}$

6.3 Exercise Set A (p. 349)

1. 70 **3.** 1 **5.** 1365 **7.** 6 **9.** 12,870

11. > **13.** = **15.** =

SELECTED ANSWERS

17. combinations; Order is not important; 43,949,268 **19.** 30

21. a. 6435 **b.** $\frac{1}{5}$; $\frac{1}{210}$; It is more likely that you and your friend are just part of the group.

6.3 Exercise Set B (p. 350)

1. 84 **3.** 1 **5.** 1287 **7.** 26,334 **9.** 19,448

11. < **13.** > **15.** <

17. permutations; Order is important; 55,440

19. 90

6.4 Exercise Set A (p. 353)

1. overlapping; $\frac{4}{9}$ **3.** overlapping; $\frac{5}{9}$

5. independent; $\frac{25}{121}$

7. a. $\frac{13}{25}$ **b.** $\frac{12}{25}$ **c.** The sum of the probabilities is 1.

6.4 Exercise Set B (p. 354)

1. mutually exclusive; $\frac{6}{11}$ **3.** overlapping; $\frac{9}{11}$

5. independent; $\frac{18}{169}$

6.5 Exercise Set A (p. 357)

1. 0.72 **3.** Player A: 0 points; Player B: 0 points

5. 21.5 lawns per day

7. a.

Amount	\$95,000	\$0	−\$65,000
Probability	0.6	0.2	0.2

b. \$44,000 **c.** The company can expect to gain an average of \$44,000 with venture. **9.** −\$.80

6.5 Exercise Set B (p. 358)

1. 400 **3.** player A: 2.48 points; player B: 0.52 point **5.** about 2.5 points per turn; 32 turns

7. about \$.006

6.6 Exercise Set A (p. 361)

1. music store customers; self-selected sample

3. Biased sample; Riders dissatisfied with biking conditions may be more likely to complete the survey than other riders.

5. The sample is biased because students in the drama club are more likely than other students to prefer performances such as school plays and concerts. The Student Council should use a random or stratified sampling method. **7.** not biased because a particular response is not encouraged

9. Biased; It suggests that taxes are already high; Would you use your taxes to fund a new highway?

11. *Sample answer:* You could survey 25 random students in each grade. The random sample is likely to be representative of all students.

6.6 Exercise Set B (p. 362)

1. all students in a school; stratified random sample

3. Biased sample; Customers at one store location may have stronger opinions than all customers in general. **5.** not biased because a particular response is not encouraged

7. biased because it suggests that two hot lunches are better than one hot lunch and one cold lunch; Do you think that the school should offer two hot lunches or a hot lunch and a cold lunch?

9. *Sample answer:* You could survey 40 random students in each grade. The random sample is likely to be representative of all students. What sport would you like added to the athletic program? The question is unbiased because it does not encourage a particular response.

6.7 Exercise Set A (p. 365)

1. mean: 5; median: 5; modes: 1, 5 **3.** mean: 16; median: 13.5; modes: 8, 28 **5.** median **7.** mean

9. range: 6; mean absolute deviation: 1.68

11. range: 13; mean absolute deviation: 4.67

13. range: 9; mean absolute deviation: 2.44

15. a. 24 **b.** mean: 41.25; median: 41.5; mode: none **c.** either the mean or the median because they are both close to all of the data

17. a. highs: mean: 85.3; median: 87; mode: 89; lows: mean: 64.1; median: 66; mode: none **b.** both the medians because they are closer to all of the data **c.** The range of the lows is greater than the range of the highs, so the lows cover a wider interval than the highs.

d. The mean absolute deviation of the highs is greater, so the average variation from the mean is greater for the highs than the lows.

6.7 Exercise Set B (p. 366)

1. mean: 50; median: 48; mode: 48

3. mean: 329; median: 332.5; mode: 410

5. mean: 7.7; median: 7.65; mode: 7.5

7. median **9.** median or mode

11. range: 26; mean absolute deviation: 8.48

13. range: 0.75; mean absolute deviation: 0.18

15. range: 29; mean absolute deviation: 7.54

17. Answers will vary.

19. a. $\frac{90 + 108 + 88 + 75 + 95 + 101 + x}{7} \leq 90$; $x \leq 73$ **b.** Yes; the median of the existing scores is 92.5; if the median is 100, then the last score must be greater than 92.5, so you did not meet your goal.

6.8 Exercise Set A (p. 371)

1. mean = 8; median = 8; range = 9; lower quartile = 5.5; upper quartile = 11; interquartile range = 5.5

3. mean = 4.7; median = 4.9; range = 5.2; lower quartile = 3.1; upper quartile = 6.3; interquartile range = 3.2

5. The data was not ordered before the quartiles were found; median = 19; lower quartile = 15; upper quartile = 23 **7.** Sample A's mean and median are greater than Sample B's mean and median. Sample A's range is less than Sample B's range, so Sample A's data is less spread out than Sample B's data. Sample A's interquartile range is less than Sample B's interquartile range, so Sample A's middle 50% of the data showed less variation than the middle 50% of Sample B's data.

9. The average mean increases to 87.3 and is still greater than the population mean. The average median increases to 88.75 and is now greater than the population median. The average range decreases to 30.75 and is still less than the population range. The average interquartile range decreases to 11.25 and is still less than the population interquartile range.

6.8 Exercise Set B (p. 372)

1. mean = 14.5; median = 15; range = 10; lower quartile = 11; upper quartile = 17; interquartile range = 6 **3.** mean = 44.5; median = 44; range = 39; lower quartile = 35; upper quartile = 54.5; interquartile range = 19.5

5. Sample B's mean and median are greater than Sample A's mean and median. Sample B's range is less than Sample A's range, so Sample B's data is less spread out than Sample A's data. Sample B's interquartile range is less than Sample A's interquartile range, so Sample B's middle 50% of the data showed less variation than the middle 50% of Sample A's data.

7. average mean = 151.4; average median = 152.1; average range = 174.4; average interquartile range = 76.7