Algebra 2
Lesson 13-1 - Practice and Problem-Solving Exercises Answers

6. Answers may vary. Sample:
from $x = -2$ to $x = 3$, or from $x = 2$ to $x = 7$
period = 5

7. Answers may vary. Sample:
from $x = 0$ to $x = 4$, or from $x = 5$ to $x = 9$
period = 4

8. Answers may vary. Sample:
from $x = 0$ to $x = 4$, or from $x = 2$ to $x = 6$
period = 4

9. not periodic

10. periodic
from $x = -3$ to $x = 9$, so period = 12

11. not periodic

12. not periodic

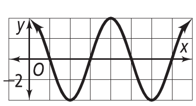
13. periodic
from $x = 0$ to $x = 8$, so period = 8

14. periodic
from $x = 0$ to $x = 7$, so period = 7

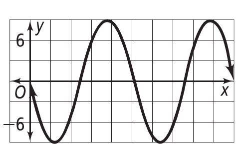
15. 4

16. 3

17. 1

18. 

1 unit on the x-axis is 0.005 s.

19. 

1 unit on the x-axis is 0.001 s.

20a. y

20b. x

21a. Answers may vary. Sample:
Yes, this could be; average monthly temperatures for three years should be cyclical due to the variation of the seasons.

21b. Answers may vary. Sample:
Probably not; population usually increases or decreases but is not cyclical.

21c. Answers may vary. Sample:
Yes, this could be; traffic that passes through an intersection should be at similar levels at the same times of day on each of the two consecutive work days.

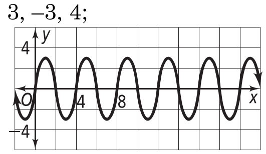
22. repeating of a pattern at regular intervals

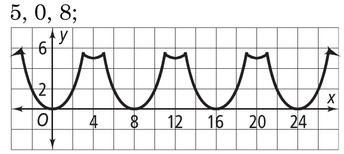
23. 60 beats per minute

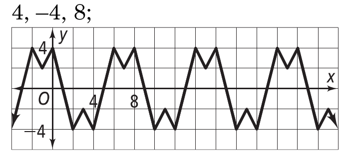
24a. 1 s

24b. 1.5 mV

25. Check students' work.

26. 3, −3, 4;


27. 5, 0, 8;


28. 4, −4, 8;


29. 1 year

30. 2 weeks

31. 3 months

32. 1 hour

33. 1 day

34a. 67

34b. 70

34c. 70

34d. 67

35a. 24.22 days

35b. 0.78 day

35c. 0.22 day

35d. Answers may vary. Sample:
The calendar year is meant to predict events in the solar year. Minimizing the difference between the two is necessary for the calendar year to be useful.

36. C

37. G

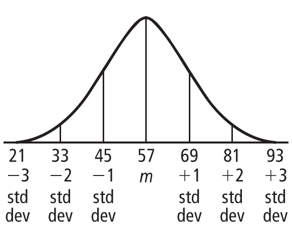
38. B

39. I

40. 64 seconds

41. 1.9° E of N

42.



43. $x^2 + y^2 = 1$

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

45. $x^2 + y^2 = 25$

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

47. $x^2 + y^2 = 1$

48. $x^2 + y^2 = 1$

Algebra 2
Lesson 13-2 - Practice and Problem-Solving Exercises Answers

7. –315°

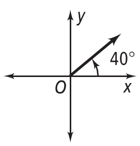
8. –315°

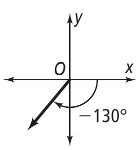
9. 240°

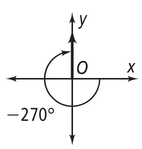
10. 150°

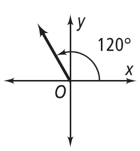
11. 30°

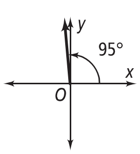
12. 300°

13. 

14. 

15. 

16. 

17. 

18. 25°

19. 215°

20. 315°

21. 4°

22. 140°

23. 150°

24. 55°

25. 180°

26. $\frac{1}{2}, -\frac{\sqrt{3}}{2}$; 0.50, –0.87

27. $-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$; –0.71, 0.71

28. $\frac{\sqrt{3}}{2}, -\frac{1}{2}$; 0.87, –0.50

29. $-\frac{1}{2}, \frac{\sqrt{3}}{2}$; –0.50, 0.87

30. $\frac{\sqrt{3}}{2}, \frac{1}{2}$; 0.87, 0.50

31. $\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}$; 0.71, –0.71

32. $\frac{\sqrt{3}}{2}, -\frac{1}{2}$; 0.87, –0.50

33. $-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$; –0.71, 0.71

34. –0.09, –1.00

35. 0.98, –0.17

36. –0.90, 0.44

37. 0.00, 1.00

38. –0.87, –0.50

39. 5

40. Answers may vary. Sample:
$45° + 360° = 405°$
$45° - 360° = -315°$

41. Answers may vary. Sample:
$10° + 360° = 370°$
$10° - 360° = -350°$

42. Answers may vary. Sample:
$-675° + 360° + 360° = 45°$
$45° - 360° = -315°$

43. Answers may vary. Sample:
$400° - 360° = 40°$
$40° - 360° = -320°$

44. Answers may vary. Sample:
$213° + 360° = 573°$
$213° - 360° = -147°$

45. II

46. III

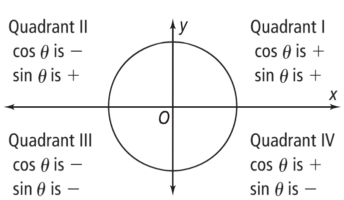
47. negative

48. IV

49. positive

50. $-276°$

51a.



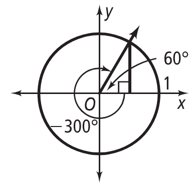
51b. II

51c. If the terminal side of an angle is in Quadrants I or II, then the sine of the angle is positive; otherwise, it is not.
If the terminal side of an angle is in Quadrants I or IV, then the cosine of the angle is positive; otherwise, it is not.

52a. 0.77, 0.77, 0.77

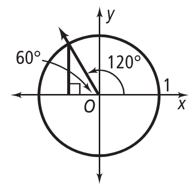
52b. The cosines of the three angles are equal because the angles are coterminal.

53.



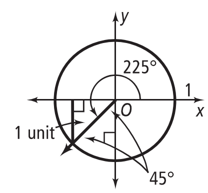
$$\cos(-300°) = \frac{1}{2}$$
$$\sin(-300°) = \frac{\sqrt{3}}{2}$$

54.



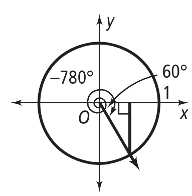
$$\cos 120° = -\frac{1}{2}$$
$$\sin 120° = \frac{\sqrt{3}}{2}$$

55.



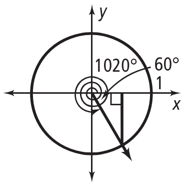
$$\cos 225° = -\frac{\sqrt{2}}{2}$$
$$\sin 225° = -\frac{\sqrt{2}}{2}$$

56.



$$\cos(-780°) = \frac{1}{2}$$
$$\sin(-780°) = -\frac{\sqrt{3}}{2}$$

57.

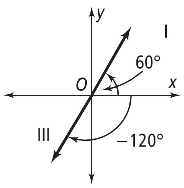


$\cos 1020° = \dfrac{1}{2}$

$\sin 1020° = -\dfrac{\sqrt{3}}{2}$

58. Answers may vary. Sample:
$30°,\ 150°,\ -210°,\ 390°$

59. No; yes; if the sine and cosine are both negative, the angle is in Quadrant III. $60°$ is in Quadrant I, and $-120°$ is in Quadrant III.

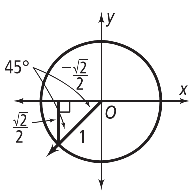


60. A

61. H

62. D

63.



$\left[\sin\left(-135°\right)\right]^2 + \left[\cos\left(-135°\right)\right]^2 = \left[-\dfrac{\sqrt{2}}{2}\right]^2 + \left[-\dfrac{\sqrt{2}}{2}\right]^2$

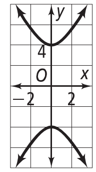
$= \dfrac{2}{4} + \dfrac{2}{4} = 1$

64. periodic; 3

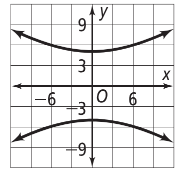
65. not periodic

66. periodic; 6

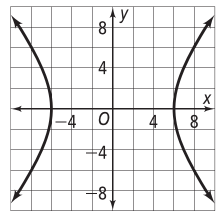
67. $\left(0,\ 2\sqrt{5}\right)$ and $\left(0,\ -2\sqrt{5}\ \right)$



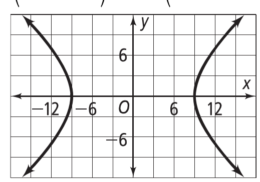
68. $\left(0,\ 5\sqrt{5}\right)$ and $\left(0,\ -5\sqrt{5}\ \right)$



69. $\left(\sqrt{85},\ 0\right)$ and $\left(-\sqrt{85},\ 0\ \right)$



70. $\left(\sqrt{145},\ 0\right)$ and $\left(-\sqrt{145},\ 0\ \right)$



71. 50.24 in.^2

72. 3846.5 m^2

73. 200.96 mi^2

74. 9.0746 ft^2

Algebra 2
Lesson 13-3 - Practice and Problem-Solving Exercises Answers

6. $-\frac{5\pi}{3}$, -5.24

7. $\frac{5\pi}{6}$, 2.62

8. $-\frac{\pi}{2}$, -1.57

9. $-\frac{\pi}{3}$, -1.05

10. $\frac{8\pi}{9}$, 2.79

11. $\frac{\pi}{9}$, 0.35

12. 540°

13. 198°

14. –120°

15. –172°

16. 90°

17. 270°

18. $\frac{\sqrt{3}}{2}$, $\frac{1}{2}$

19. $\frac{1}{2}$, $\frac{\sqrt{3}}{2}$

20. 0, 1

21. $\frac{\sqrt{2}}{2}$, $-\frac{\sqrt{2}}{2}$

22. $-\frac{1}{2}$, $\frac{\sqrt{3}}{2}$

23. 0, –1

24. $-\frac{\sqrt{2}}{2}$, $-\frac{\sqrt{2}}{2}$

25. $-\frac{\sqrt{3}}{2}$, $-\frac{1}{2}$

26. 3.1 cm

27. 10.5 m

28. 51.8 ft

29. 25.1 in.

30. 4.7 m

31. 43.2 cm

32. ≈ 746 ft

33. ≈ 32 ft

34a. ≈ 11,048 km, ≈ 33,144 km, ≈ 27,620 km, ≈ 276,198 km

34b. ≈ 18.1 h

35. ≈ 42.2 in.

36a. 15°, $\frac{\pi}{12}$ radians

36b. ≈ 1036.7 mi

36c. ≈ 413.6 mi

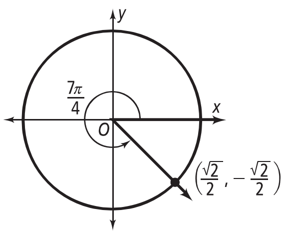
37. III

38. II

39. negative x-axis

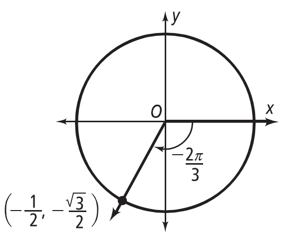
40. III

41.



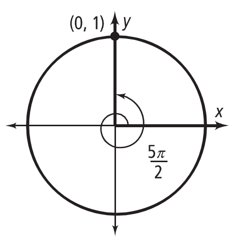
0.71, – 0.71

42.



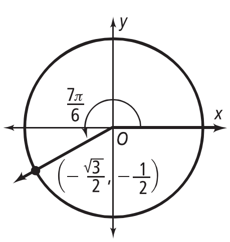
–0.50, – 0.87

43.



0, 1

44.



–0.87, – 0.50

45. If two angles measured in radians are coterminal, the difference of their measures will be evenly divisible by 2π.

46. Check students' work.

47. ≈ 11 radians

48. The student forgot to include parentheses around $2*\pi$.

49. ≈ 6.3 cm

50. ≈ 4008.7 mi

51. $-\frac{3\pi}{2}$ radians

52. $\frac{4\pi}{3}$ radians

53.
$$\frac{\theta}{2\pi} = \frac{s}{2\pi r}$$
$$\frac{\theta}{2\pi} \cdot 2\pi r = \frac{s}{2\pi r} \cdot 2\pi r$$
$$\theta r = s$$
$$s = r\theta$$

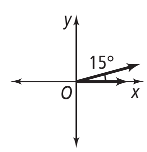
54. C

55. G

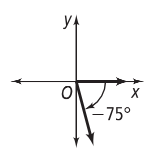
56. B

57. For a central angle of 1 radian, the length of the intercepted arc is the length of the radius.

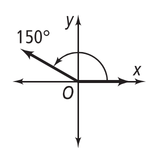
58.



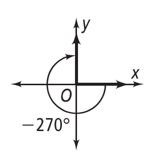
59.



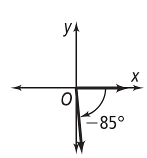
60.



61.



62.



63. mean ≈ 12.9
s.d. ≈ 3.53

64. mean $= 30$
s.d. ≈ 8.09

65. 2

66. all real numbers

67. 1

Algebra 2
Lesson 13-4 - Practice and Problem-Solving Exercises Answers

6. 1

7. ≈ 0.1

8. ≈ -0.8

9. ≈ -1

10. -1

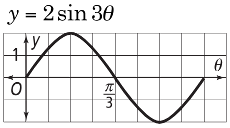
11. ≈ -0.7

12. $3;\ 2,\ \frac{2\pi}{3}$

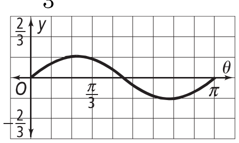
13. $\frac{1}{2};\ 1,\ 4\pi$

14. $2;\ 3,\ \pi$

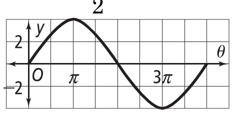
15. $y = 2\sin 3\theta$



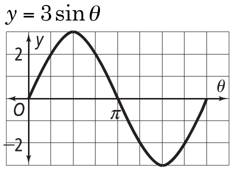
16. $y = \frac{1}{3}\sin 2\theta$



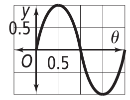
17. $y = 4\sin\frac{1}{2}\theta$



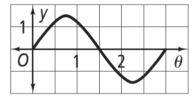
18. $y = 3\sin\theta$



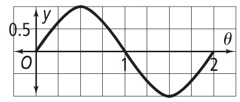
19. $y = \sin\pi\theta$



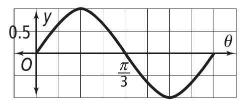
20. $y = \frac{3}{2}\sin\frac{2\pi}{3}\theta$



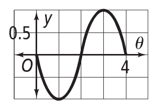
21.



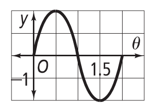
22.



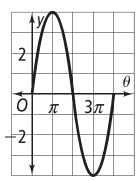
23.



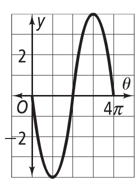
24.



25.



26.



27. $2\pi;\ y = 2\sin\theta$

28. $2\pi,\ y = -3\sin\theta$

29. $\pi;\ y = \frac{5}{2}\sin 2\theta$

30. $\frac{\pi}{3}$; $y = \frac{1}{2}\sin 6\theta$

31. 1; 1, 2π

32. 5; 1, $\frac{2\pi}{5}$

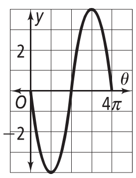
33. π; 1, 2

34. 1; 3, 2π

35. 1; 5, 2π

36. 2π; 5, 1

37.

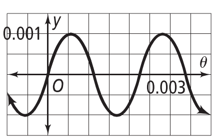


They are reflections of each other across the x-axis. When a is replaced by its opposite, the graph is a reflection of the original graph across the x-axis.

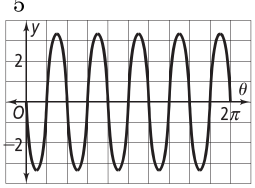
38a. π

38b. 4

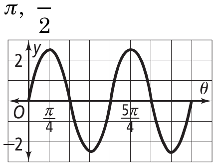
39.



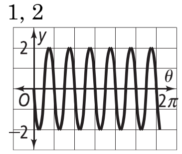
40. $\frac{2\pi}{5}$, 3.5



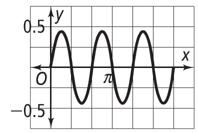
41. π, $\frac{5}{2}$



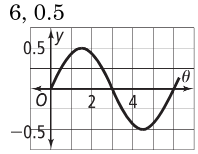
42. 1, 2



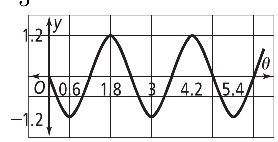
43. $\frac{2\pi}{3}$, 0.4



44. 6, 0.5

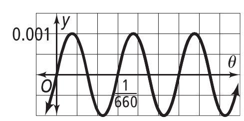


45. $\frac{12}{5}$, 1.2



46. Check students' work.

47.



48a. independent variable: days from spring equinox
dependent variable: hours of sunlight

48b. $\frac{23}{12}$ h, about 365 days

48c. $y = \frac{23}{12}\sin\frac{2\pi x}{365}$

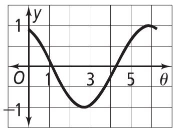
48d. 1.1 h

49. $y = \sin 60\pi\theta$

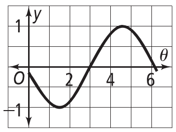
50. $y = \sin 30\pi\theta$

51. $y = \sin 240{,}000\pi\theta$

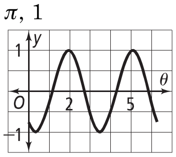
52. 2π, 1



53. 2π, 1



54. π, 1



55. C

56. G

57. C

58. G

59. 120°; consider the point at which a 60° angle intersects the unit circle. Reflect this point across the *y*-axis. The resulting point is where a 120° angle intersects the unit circle. These two points have the same *y*-coordinate. Therefore, $\sin 120° = \sin 60°$.

60. $-\dfrac{4\pi}{9}$ radians ≈ -1.40 radians

61. $\dfrac{5\pi}{6}$ radians ≈ 2.62 radians

62. $-\dfrac{4\pi}{3}$ radians ≈ -4.19 radians

63. $\dfrac{16\pi}{9}$ radians ≈ 5.59 radians

64. $-\dfrac{5\pi}{2}$ radians ≈ -7.85 radians

65. $\approx$ 49%

66. 1

67. 0

68. −1

69. 0

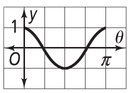
Algebra 2
Lesson 13-5 - Practice and Problem-Solving Exercises Answers

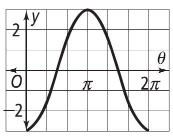
7. 2π, 3; max: 0, 2π; min: π; zeros: $\frac{\pi}{2}$, $\frac{3\pi}{2}$

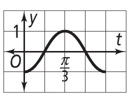
8. $\frac{2\pi}{3}$, 1; max: 0, $\frac{2\pi}{3}$, $\frac{4\pi}{3}$, 2π; min: $\frac{\pi}{3}$, π, $\frac{5\pi}{3}$
zeros: $\frac{\pi}{6}$, $\frac{\pi}{2}$, $\frac{5\pi}{6}$, $\frac{7\pi}{6}$, $\frac{3\pi}{2}$, $\frac{11\pi}{6}$

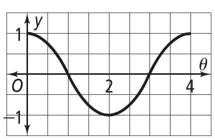
9. π, 1; max: 0, π, 2π; min: $\frac{\pi}{2}$, $\frac{3\pi}{2}$
zeros: $\frac{\pi}{4}$, $\frac{3\pi}{4}$, $\frac{5\pi}{4}$, $\frac{7\pi}{4}$

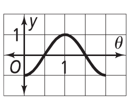
10. 2π, 2; max: π; min: 0, 2π
zeros: $\frac{\pi}{2}$, $\frac{3\pi}{2}$

11.


12.


13.


14.


15.


16. $y = 2\cos 2\theta$

17. $y = \frac{\pi}{2}\cos\frac{2\pi}{3}\theta$

18. $y = \pi\cos\pi\theta$

19. $y = -3\cos 2\theta$

20. $y = 2\cos\frac{\pi}{4}x$

21. 0.52, 2.62, 3.67, 5.76

22. 1.98, 4.30

23. 0.55, 1.45, 2.55, 3.45, 4.55, 5.45

24. 2.52

25. 0.00

26. 0.86, 5.14

27. 2π, $-3 \le y \le 3$, 3

28. π, $-1 \le y \le 1$, 1

29. 4π, $-2 \le y \le 2$, 2

30. 4π, $-\frac{1}{3} \le y \le \frac{1}{3}$, $\frac{1}{3}$

31. 6π, $-3 \le y \le 3$, 3

32. $\frac{2\pi}{3}$, $-\frac{1}{2} \le y \le \frac{1}{2}$, $\frac{1}{2}$

33. $\frac{4}{3}$, $-16 \le y \le 16$, 16

34. 2, $-0.7 \le y \le 0.7$, 0.7

35. $y = 70 + 13\cos\frac{\pi}{6}(x-1)$, where x represents the months of the year with January as 1, February as 2, March as 3, etc.

36. Graph the equations $y = -1$ and $y = 6 \sin 2t$ on the same screen. Use the Intersect feature to find the points at which the two graphs intersect. The graph shows 4 solutions in the interval from 0 to 2π. They are: 1.65, 3.06, 4.80, and 6.20.

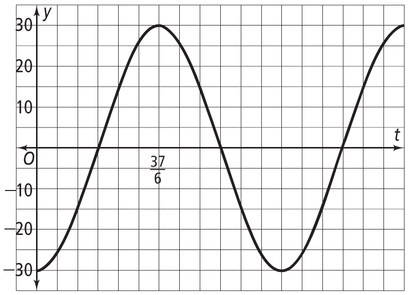
37. 0.64, 2.50

38. 1.83, 2.88, 4.97, 6.02

39. 0.50, 2.50, 4.50

40a. 3.79, 5.64

40b. 10.07, 11.92
These values are the sums of the values from part (a) and 2π.

41a.


41b. 4:40 P.M., 5:00 A.M. (next day), 5:20 P.M., 5:40 A.M. (two days later)

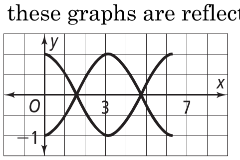
41c. 6 hours, 10 minutes; 6 hours, 10 minutes

42a. 5.5 ft; 1.5 ft

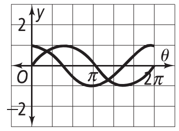
42b. about 12 h 22 min

42c. $y = 1.5\cos\dfrac{60\pi t}{371}$

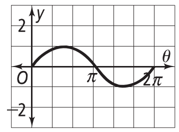
42d. You could come and go any time except between 7:49 A.M. and 12:39 P.M.

43. On the unit circle, the x-values of $-\theta$ are equal to the x-values of θ, so $\cos(-\theta) = \cos\theta$. $-\cos\theta$ is the opposite of $\cos\theta$, so these graphs are reflections of each other across the x-axis.


44. $y = \cos\dfrac{\pi}{12}x$ or $y = -\cos\dfrac{\pi}{12}x$

45a.


shift of $\dfrac{\pi}{2}$ units to the right

45b.


They are the same.

45c. To write a sine function as a cosine function, replace sin with cos and replace θ with $\theta - \dfrac{\pi}{2}$

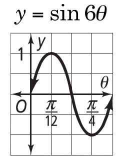
46. D

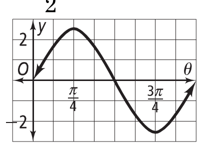
47. F

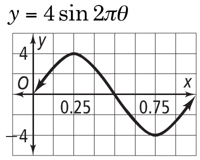
48. C

49. G

50. 0.2, 6; for this function, $a = -0.2$ and $b = \dfrac{\pi}{3}$. So, the amplitude is 0.2 and the period is $\dfrac{2\pi}{b} = \dfrac{2\pi}{\frac{\pi}{3}} = 6$.

51. $y = \sin 6\theta$


52. $y = \dfrac{5}{2}\sin 2\theta$


53. $y = 4\sin 2\pi\theta$


54. about 1111

55. about 204

56. about 83

57. $a_n = a_1 \cdot r^{n-1}$
10, 30, 90, 270, 810

58. $a_n = 12 \cdot \left(-0.3\right)^{n-1}$
12, -3.6, 1.08, -0.324, 0.0972

59. $a_n = 900 \cdot \left(-\frac{1}{3}\right)^{n-1}$
900, -300, 100, $-\frac{100}{3}$, $\frac{100}{9}$

60. 0.866, 0.5, 1.732

61. 0.5, -0.866, 0.577

62. 1, 0, undefined

63. 0.5, -0.866, -0.577

64. 1, 0, undefined

65. 0, 1, 0

Algebra 2
Lesson 13-6 - Practice and Problem-Solving Exercises Answers

8. 0

9. 0

10. -1

11. undefined

12. 1

13. 0

14. 1

15. undefined

16. $\frac{2\pi}{3}$

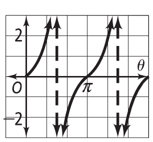
17. $\frac{\pi}{2}$

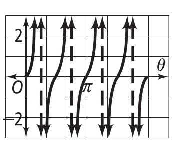
18. $\frac{\pi}{5}$; $\theta = -\frac{\pi}{10}$ and $\theta = \frac{\pi}{10}$

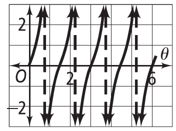
19. $\frac{2\pi}{3}$; $\theta = -\frac{\pi}{3}$ and $\theta = \frac{\pi}{3}$

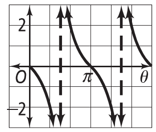
20. $\frac{\pi}{4}$; $\theta = -\frac{\pi}{8}$ and $\theta = \frac{\pi}{8}$

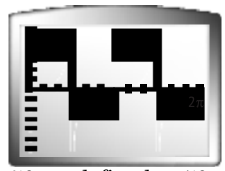
21. $\frac{3\pi^2}{2}$; $\theta = -\frac{3\pi^2}{4}$ and $\theta = \frac{3\pi^2}{4}$

22. 

23. 

24. 

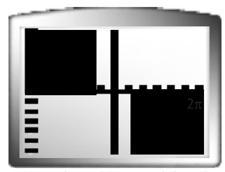
25. 

26. 

50, undefined, -50

27. 

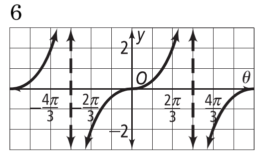
-100, undefined, 100

28. 
≈ 51.8, 125, ≈ 301.8

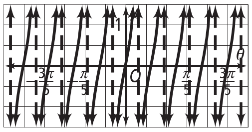
29a. 

29b. ≈ 14.3 ft

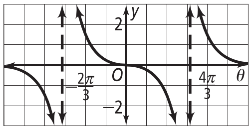
29c. ≈ 20.2 ft

30. 6


31. $\frac{2\pi}{5}$



32. $\frac{2\pi^2}{3}$



33. 1.11, 4.25

34. 2.03, 5.18

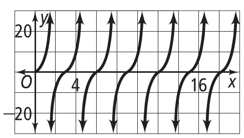
35. 0.08, 1.65, 3.22, 4.79

36a. Check students' work.

36b. Check students' work.

36c. Check students' work.

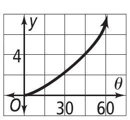
37.



$150\sqrt{3} \approx 260$ in.^{2}

38a. ≈ 140.4 ft^2

38b.



≈ 1.7 in., ≈ 5.2 in.

38c. 5.2 in.^{2}, 15.6 in.^{2}

38d. $\approx$ 3888 tiles, $\approx$ 1296 tiles

39. 200

40. 0

41. 135

42. −162

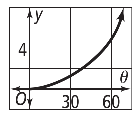
43. 70

44. $y = \tan\left(\frac{1}{2}x\right)$

45. $y = -\tan\left(\frac{1}{2}x\right)$

46. $y = -\tan x$ or $y = \tan(-x)$

47a.

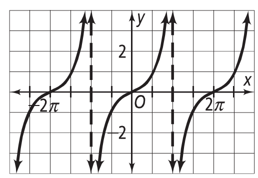


≈ 6.9 ft

47b. ≈ 27.7 ft^2

47c. ≈ 166.3 ft^2

48a.



48b. 2π, 1

48c. $\left(\frac{\pi}{2}, 1\right)$

48d. $y = \tan\left(\frac{1}{2}x\right)$

49. Answers may vary. Sample:
Triangles OAP and OBQ both share the angle θ and each triangle has a right angle, so they are similar by AA.
$\frac{\sin\theta}{\cos\theta} = \frac{AP}{OA} = \frac{BQ}{OB} = \frac{\tan\theta}{1}$. Thus $\frac{\sin\theta}{\cos\theta} = \tan\theta$.

50a. Check students' work.

50b. The new pattern is asymptote-$(-a)$-zero-(a)-asymptote.

51. 2; for $0 \le x \le 2\pi$, x is nonnegative and there are only 2 sections of the graph of the tangent function on or above the x-axis.

52. C

53. H

54. B

55. I

56. No, because the tangent function has no upper or lower limit.

57. 1.32, 4.97

58. 1.77, 4.51

59. 6.15

60. 0.44, 1.56, 2.44, 3.56, 4.44, 5.56

61. mean ≈ 5.9, median = 6, modes = 4 and 6

62. 83

63. –227

64. 145

65. –332

66. 2 units to the right and up 5 units

67. 5 units to the left and down 4 units

68. 2 units to the left and up 1 unit

Algebra 2
Lesson 13-7 - Practice and Problem-Solving Exercises Answers

6. −1; 1 unit to the left

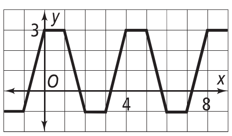
7. −2; 2 units to the left

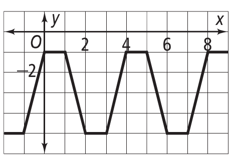
8. 1.6; 1.6 units to the right

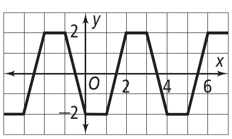
9. 3; 3 units to the right

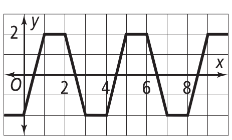
10. $-\pi$; π units to the left

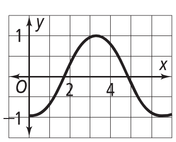
11. $\frac{5\pi}{7}$; $\frac{5\pi}{7}$ units to the right

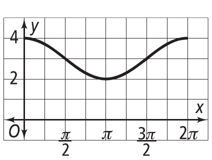
12. 

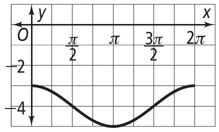
13. 

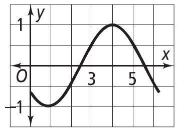
14. 

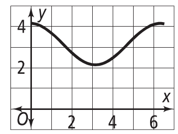
15. 

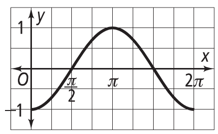
16. 

17. 

18. 

19. 

20. 

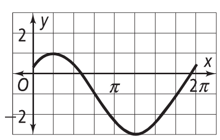
21. 

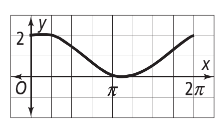
22. 1 unit up

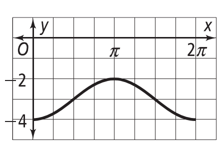
23. 1 unit to the left and 2 units down

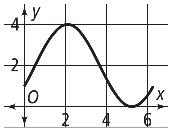
24. $\frac{\pi}{2}$ units to the left and 2 units up

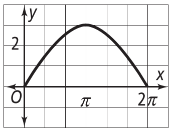
25. 3 units to the right and 2 units up

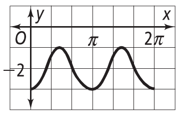
26. 

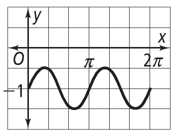
27. 

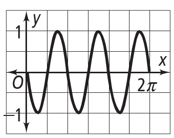
28. 

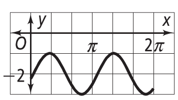
29. 

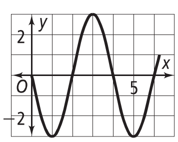
30. 

31. 

32. 

33. 

34. 

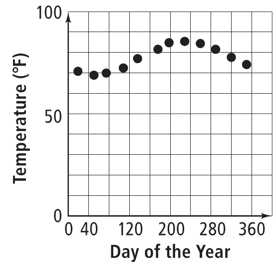
35. 

36. $y = \sin(x + \pi)$

37. $y = \cos x - \dfrac{\pi}{2}$

38. $y = \sin x + 3$

39. $y = \cos(x - 1.5)$

40a. 

40b. $y = 8.5\cos\dfrac{2\pi}{365}(x - 228) + 77.5$

41. $y = \cos(x + 3) + \pi$

42. $y = \sin\left(x - \dfrac{\pi}{2}\right) + 3.5$

43. $y = 1.5\cos\left[\dfrac{\pi}{6}(x - 6) - \dfrac{\pi}{2}\right] + 2$

44. $y = 2\cos\left(x - \dfrac{\pi}{3}\right) - 1$

$y = 2\sin\left(x + \dfrac{\pi}{6}\right) - 1$

45. $y = -10\cos\dfrac{\pi}{10}x$

$y = 10\sin\left(\dfrac{\pi}{10}x - \dfrac{\pi}{2}\right)$

46a. $\dfrac{\pi}{2}$; $\sin x = \cos\left(x - \dfrac{\pi}{2}\right)$

46b. $-\dfrac{\pi}{2}$; $\cos x = \sin\left(x + \dfrac{\pi}{2}\right)$

47a. Check students' work.

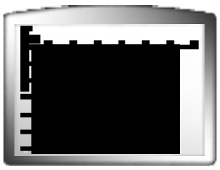
47b. $g(x) = f(x + 4) - 3$

48a. $y = 3\sin 2(x - 2) + 1$

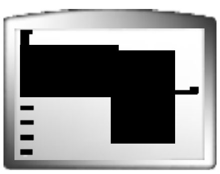
48b. 3, π;
translation of $y = 3\sin 2x$, 2 units to the right and 1 unit up

49.


50.


51.


52.


53.


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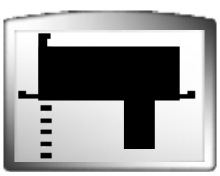


55. C

56. G

57. B

58. If the function $y = \cos\theta$ is shifted $\frac{\pi}{2}$ radians to the right, the result is $y = \cos\left(\theta - \frac{\pi}{2}\right)$, which is the same as $y = \sin\theta$.

So $a = 1$, and $b = -\frac{\pi}{2}$.

59. $\frac{\pi}{6}$; $\theta = -\frac{\pi}{12}, \frac{\pi}{12}$

60. 4π; $\theta = -2\pi, 2\pi$

61. $\frac{2\pi}{3}$; $\theta = -\frac{\pi}{3}, \frac{\pi}{3}$

62. 6π; $\theta = -3\pi, 3\pi$

63. 0.0064

64. 0.3456

65. 0.136

66. 0.198

67. $\frac{13}{9}$

68. $-\frac{8}{5}$

69. 2π

70. $\frac{15}{4m}$

71. $-\frac{t}{14}$

Algebra 2
Lesson 13-8 - Practice and Problem-Solving Exercises Answers

9. -1

10. $-\sqrt{2}$

11. $-\dfrac{\sqrt{3}}{3}$

12. undefined

13. 0

14. -2

15. $-\sqrt{2}$

16. undefined

17. ≈ -1.248

18. ≈ -5.033

19. ≈ 0.675

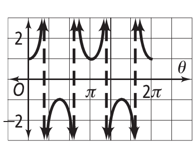
20. undefined

21. ≈ -1.6

22. ≈ -1.035

23. undefined

24. ≈ -1.462

25.


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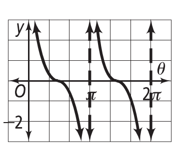

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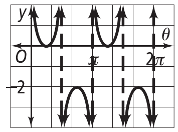
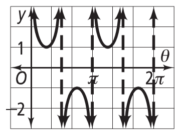


28.


29. 1.1547

30. 5.7588

31. -2.9238

32. 2

33. ≈ 1.0642

34. ≈ 1.3054

35. 1.7321

36. 0.5774

37. ≈ 104 ft
≈ 164 ft

38. about 28.28 ft

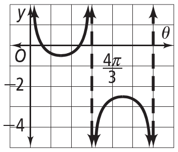
39. Answers may vary. Sample:
$y = \csc\left(\theta + \dfrac{\pi}{2}\right)$

40. B

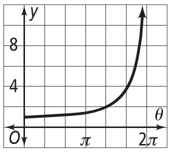
41. C

42. A

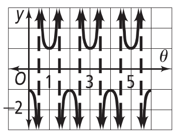
43.



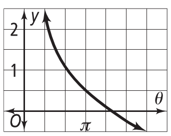
44.



45.



46.



47a. domain: all real numbers except multiples of π
range: $y \geq 1$ or $y \leq -1$
period: 2π

47b. 1

47c. −1

48a. Reciprocals have the same sign.

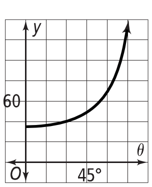
48b. The reciprocal of -1 is -1.

49. $\csc 180°$ is undefined because $\sin 180° = 0$ and $\csc\theta = \dfrac{1}{\sin\theta}$.

50. $\sec 90°$ is undefined because $\cos 90° = 0$ and $\sec\theta = \dfrac{1}{\cos\theta}$.

51. $\cot 0°$ is undefined because $\sin 0° = 0$ and $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$.

52a.

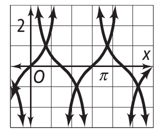


52b. ≈ 35.9 ft

52c. ≈ 40.4 ft

52d. about 64°; 80 ft above ground

53a.

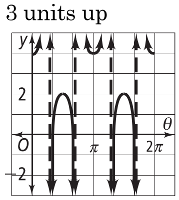


53b. The domain of $y = \tan x$ is all real numbers except odd multiples of $\dfrac{\pi}{2}$, where its asymptotes occur. The domain of $y = \cot x$ is all real numbers except multiples of π, where its asymptotes occur. The range of both functions is all real numbers.

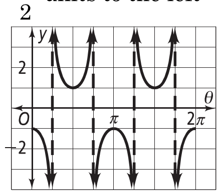
53c. The graphs have the same period and range. Their asymptotes are shifted $\dfrac{\pi}{2}$ units.

53d. Answers may vary. Sample:
$x = \dfrac{\pi}{4}$, $x = \dfrac{3\pi}{4}$

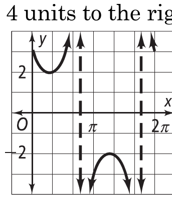
54. 3 units up



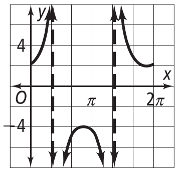
55. $\dfrac{\pi}{2}$ units to the left



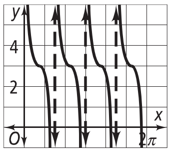
56. 4 units to the right



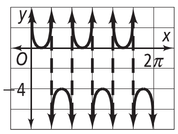
57. 2 units to the left and 1 unit down



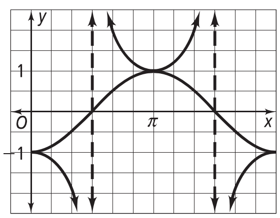
58. π units to the left and 3 units up



59. $\frac{\pi}{6}$ units to the right and 2 units down



60a.



60b. $y = -\cos x$: domain: all real numbers; range: $-1 \le y \le 1$; period: 2π

$y = -\sec x$: domain: all real numbers except odd multiples of $\frac{\pi}{2}$; range: $y \ge 1$ or $y \le -1$; period: 2π

60c. Multiples of π; by definition $\sec x = \frac{1}{\cos x}$, so $-\cos x = -\sec x$ is equivalent to $-\cos x = -\frac{1}{\cos x}$, or $(\cos x)^2 = 1$. The solutions of $(\cos x)^2 = 1$ are the values of x for which $\cos x = 1$ or $\cos x = -1$. These values are multiples of π.

60d. Answers may vary. Sample:
The graphs have the same period and their signs are always the same. However, they have no range values in common except 1 and -1.

60e. The signs of $-\sec x$ and $-\cos x$ are the same because reciprocals have the same sign.

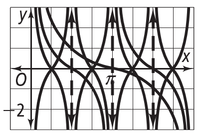
61a. II

61b. I

62. The curves of $y = \sec x$ and $y = \csc x$ are not parabolas because parabolas are not restricted by asymptotes, whereas the sections of $y = \sec x$ and $y = \csc x$ are between asymptotes.

63. $y = \cos 3x$ cycles 3 times for each cycle of $y = \cos x$. Thus, for each cycle of $y = \sec x$, $y = \sec 3x$ cycles 3 times, and each cycle of $y = \sec 3x$ is $\frac{1}{3}$ as wide as one cycle of $y = \sec x$.

64a.



64b. Answers may vary. Sample:
Given $y = \cot bx$, as $|b|$ decreases, the period increases; as $|b|$ increases, the period decreases. If $b < 0$, $y = \cot bx$ begins each branch with negative y-values and ends with positive y-values; the opposite is true for $b > 0$.

65. $\frac{4}{3}$

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

67. $\frac{3}{4}$

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

69. 1.4

70. 0.6

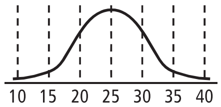
71. 2; 2π; 5 units down

72. 1; 2π; 4 units left, 7 units down

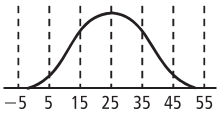
73. 3; 2π; $\frac{\pi}{6}$ units left, 4 units up

74. 5; 2; 1.5 units right, 8 units down

75.



76.



77. $2x + 3x = 5x$

$5x = 5x$

true; Additive Property

78. $-(4x - 10) = 10 - 4x$

$-4x + 10 = 10 - 4x$

$10 - 4x = 10 - 4x$

true; Distributive Property and Commutative Property of Addition

79. $3x + 15 = 5(x - 3) - 2x$

$3x + 15 = 5x - 15 - 2x$

$13 + 15 = 3x - 15$

not true