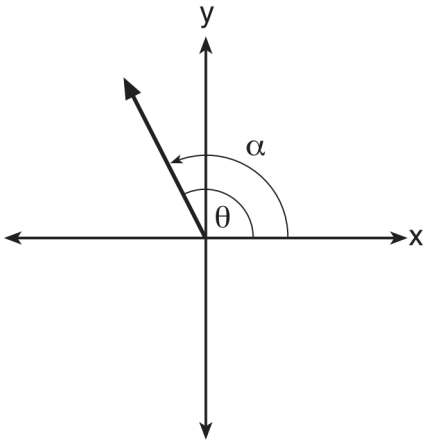
Pre-Calc Trig Review

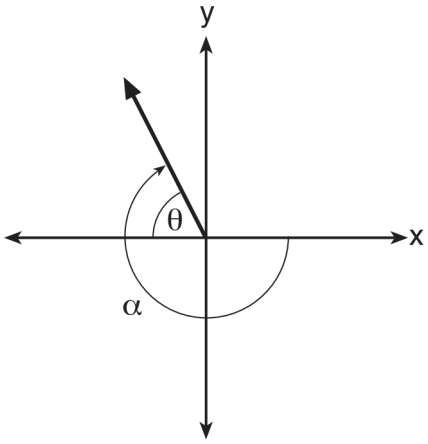
Name: _____ **Date:** _____

1. Which diagram represents an angle, α, measuring $\frac{13\pi}{20}$ radians drawn in standard position, and its reference angle, θ?

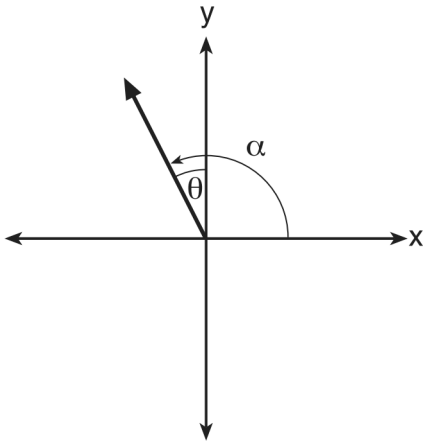
A.



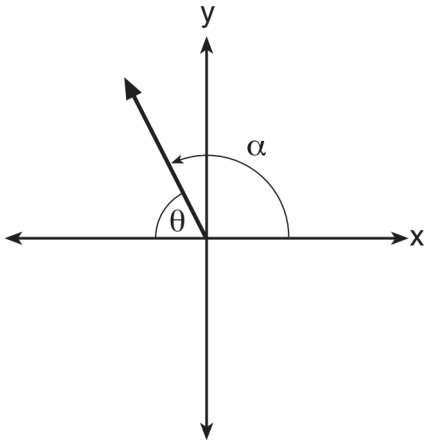
B.



C.



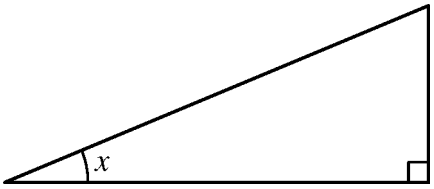
D.



2. If $\sin\theta = \frac{2}{\sqrt{5}}$ and θ is a positive acute angle, find the value of $\tan\theta$.

3. If $\cos\theta = -\frac{1}{2}$ and θ is *not* a third-quadrant angle, what is $\sin\theta$?

4. In the figure below, if $\sin x = \frac{5}{13}$, what are $\cos x$ and $\tan x$?



A. $\cos x = \frac{12}{13}$ and $\tan x = \frac{5}{12}$

B. $\cos x = \frac{12}{13}$ and $\tan x = \frac{12}{5}$

C. $\cos x = \frac{13}{12}$ and $\tan x = \frac{5}{12}$

D. $\cos x = \frac{13}{12}$ and $\tan x = \frac{13}{5}$

5. Express $-\frac{11\pi}{6}$ radians in degrees.

A. -660°

B. -330°

C. -300°

D. None of the above

6. If $\sin\beta = \frac{1}{2}$ and $90^\circ < \beta < 180^\circ$, what is the value of $\cos\beta$?

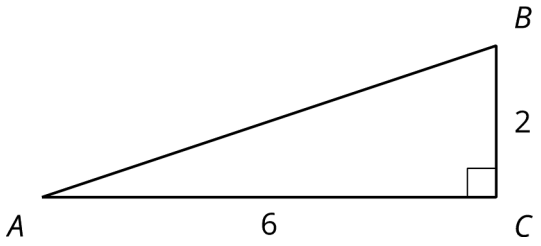
A. $-\frac{\sqrt{3}}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{\sqrt{3}}{2}$

7. Match each radian measure with its corresponding unit circle coordinate.

1. $\cos\frac{4\pi}{3}$	a. $\frac{1}{2}$
2. $\sin\frac{5\pi}{6}$	b. $\frac{-1}{2}$
3. $\cos\frac{7\pi}{4}$	c. $\frac{\sqrt{2}}{2}$
4. $\sin\frac{8\pi}{3}$	d. $\frac{-\sqrt{2}}{2}$
5. $\cos\frac{-17\pi}{6}$	e. $\frac{\sqrt{3}}{2}$
6. $\sin\frac{-3\pi}{4}$	f. $\frac{-\sqrt{3}}{2}$

8. Here is a triangle.

Find $\cos(A)$, $\sin(A)$, and $\tan(A)$. Explain your reasoning.



9. The exact value of $\sin\left(\tan^{-1}\left(-\frac{1}{2}\right)\right)$ is:

A. $\frac{-\sqrt{3}}{3}$ B. $\frac{-\sqrt{5}}{5}$ C. $\frac{\sqrt{5}}{5}$

D. Undefined

10. If $\sin(\theta) = -\frac{1}{3}$ and $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$, what is $\tan(\theta)$?

A. $\frac{2\sqrt{2}}{9}$

B. $-\frac{2\sqrt{2}}{9}$

C. $\frac{\sqrt{2}}{4}$

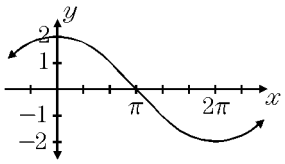
D. None of the above

11. If θ terminates in Quadrant II and $\sin\theta = \frac{12}{13}$, find $\cos\theta$.

12. What is the period of the function $-\frac{3}{4}\cos\left(6x - \frac{3\pi}{4}\right) + 5$?

A. $\frac{3}{4}$ B. $\frac{\pi}{3}$ C. $\frac{3\pi}{4}$ D. $\frac{-\pi}{8}$

13. Which equation is represented in the accompanying graph?



A. $y = 2\cos 2x$

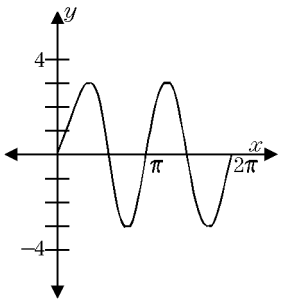
B. $y = \frac{1}{2}\cos 2x$

C. $y = 2\cos\frac{1}{2}x$

D. $y = \frac{1}{2}\cos\frac{1}{2}x$

14. What is the period of the graph of the equation $y = 2\sin 3x$?

15. Which equation is represented by the graph in the accompanying diagram?



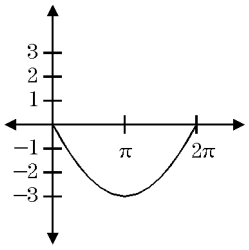
A. $y = 3\sin 2x$

B. $y = 2\sin 3x$

C. $y = 3\sin x$

D. $y = 2\sin 4x$

16. Which equation is represented by the graph in the accompanying diagram?



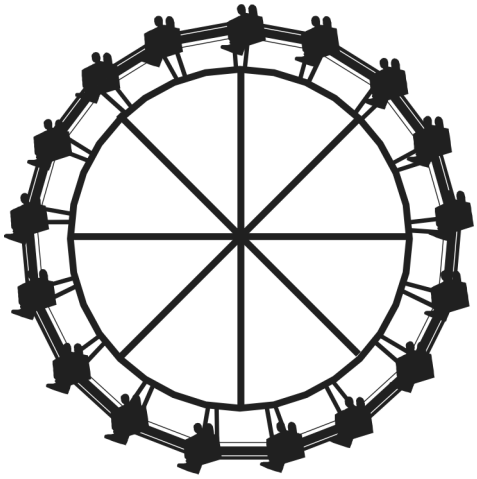
A. $y = 3\sin x$

B. $y = 3\sin\frac{1}{2}x$

C. $y = -3\sin x$

D. $y = -3\sin\frac{1}{2}x$

17. A Ferris wheel has a diameter of 80 feet. Riders enter the Ferris wheel at its lowest point, 5 feet above the ground, at time $t = 0$ seconds. One complete rotation takes 65 seconds.



Which function models a rider's vertical height, $h(t)$, at t seconds?

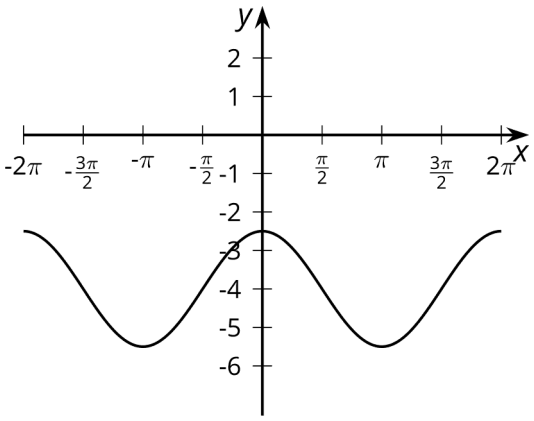
A. $h(t) = -80\cos\left(\frac{2\pi}{65}t\right) + 5$

B. $h(t) = -40\cos\left(\frac{2\pi}{65}t\right) + 45$

C. $h(t) = -45\cos\left(\frac{65}{2\pi}t\right) + 40$

D. $h(t) = -5\cos\left(\frac{65}{2\pi}t\right) + 80$

18. Here is a graph of a trigonometric function. Which equation could define this function?



A. $y = 1.5\sin(x) - 4$ B. $y = 1.5\cos(x) - 4$

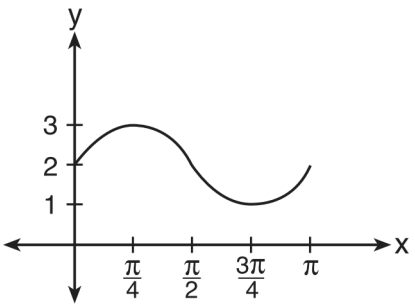
C. $y = -4\sin(1.5x)$ D. $y = -4\cos(1.5x)$

19. Which trigonometric function has period 5?

A. $f(x) = \sin\left(\frac{1}{5}x\right)$ B. $f(x) = \sin(5x)$

C. $f(x) = \sin\left(\frac{5}{2\pi}x\right)$ D. $f(x) = \sin\left(\frac{2\pi}{5}x\right)$

20. The accompanying graph represents a portion of a sound wave.



Which equation best represents this graph?

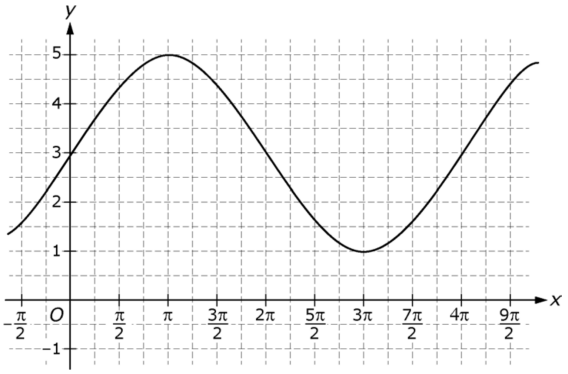
A. $y = 2\sin\frac{1}{2}x$ B. $y = \sin\frac{1}{2}x + 2$

C. $y = \sin 2x$ D. $y = \sin 2x + 2$

21. Select *all* trigonometric functions with an amplitude of 3.

- ❍ $y = 3\sin(\theta) - 1$
- ❍ $y = \sin(\theta) + 3$
- ❍ $y = 3\cos(\theta) + 2$
- ❍ $y = \cos(\theta) - 3$
- ❍ $y = 3\sin(\theta)$
- ❍ $y = \cos(\theta - 3)$

22.



The graph of the function $f(x)$ is shown in the coordinate plane above, and $g(x) = 2\cos(x) + 2$. Answer each of the following questions about $f(x)$ and $g(x)$.

Part A

How do the maximum values of the two functions compare?

Part B

How do the minimum values of the two functions compare?

Part C

How do the amplitudes of the two functions compare?

Part D

How do the periods of the two functions compare?

23. Astronomers have observed that sunspots vary sinusoidally. The variation is from a minimum of about 10 sunspots per year to a maximum of about 120 per year. A cycle lasts about 11 years. If a minimum occurred in 1964, which function could model the number of sunspots, S, as a function of the year, t?

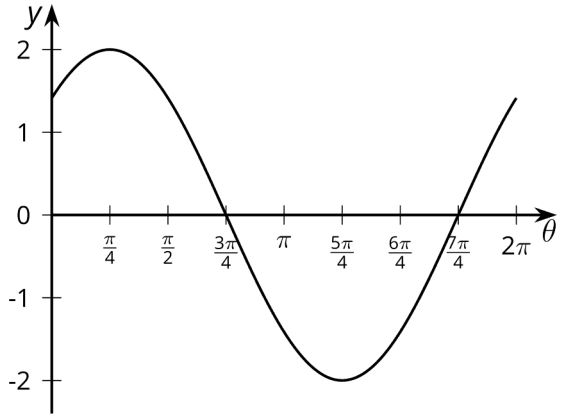
A. $S(t) = -55\cos\left(\frac{2\pi}{11}(t - 1964)\right) + 65$

B. $S(t) = -55\cos\left(\frac{2\pi}{11}t - 1964\right) + 65$

C. $S(t) = -65\cos\left(\frac{2\pi}{11}(t - 1964)\right) + 55$

D. $S(t) = -65\cos\left(\frac{2\pi}{11}t - 1964\right) + 55$

24. Here is a graph of a trigonometric function.



Which equation does the graph represent?

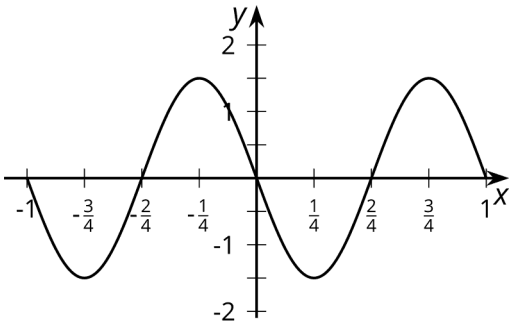
A. $y = 2\sin(\theta)$

B. $y = 2\cos\left(\theta + \frac{\pi}{4}\right)$

C. $y = 2\sin\left(\theta - \frac{\pi}{4}\right)$

D. $y = 2\cos\left(\theta - \frac{\pi}{4}\right)$

25. Here is the graph of a trigonometric function.



Which equation has this graph? Select *all* that apply.

- ❍ $y = \frac{3}{2}\cos\left(2\pi x - \frac{\pi}{2}\right)$
- ❍ $y = -\frac{3}{2}\sin(2\pi x)$
- ❍ $y = \frac{3}{2}\cos(2\pi x)$
- ❍ $y = \frac{3}{2}\cos\left(2\pi x + \frac{\pi}{2}\right)$
- ❍ $y = \frac{3}{2}\sin(2\pi x + \pi)$

26. Amplitude: 2

Period: $\frac{2\pi}{3}$

Which of the following trigonometric functions has the properties given above?

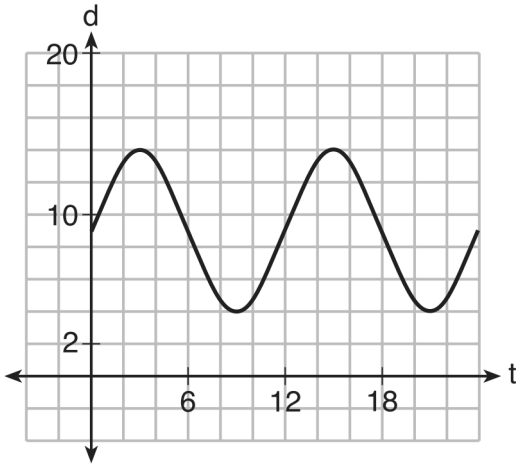
A. $y = \frac{2}{3}\cos(2x)$

B. $y = \frac{2}{3}\cos(3x)$

C. $y = 2\cos(\frac{2}{3}x)$

D. $y = 2\cos(3x)$

27. The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.



If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is an equation for the depth of the water at the marker?

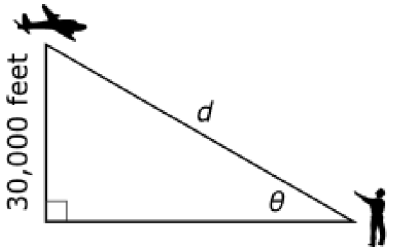
A. $d = 5\cos(\frac{\pi}{6}t) + 9$ B. $d = 9\cos(\frac{\pi}{6}t) + 5$

C. $d = 9\sin(\frac{\pi}{6}t) + 5$ D. $d = 5\sin(\frac{\pi}{6}t) + 9$

28. A 100-foot wire is extended from the ground to the top of a 60-foot pole, which is perpendicular to the level ground. To the *nearest degree*, what is the measure of the angle that the wire makes with the ground?

A. 31 B. 37 C. 53 D. 59

29. An airplane is flying at an altitude of 30,000 feet. The distance, d, in feet from an observer on the ground to the plane is a function of the angle of elevation, θ, defined as the acute angle between the ground and the line between the observer and the plane, as shown in the figure.



Part A

Which equation gives d as a function of θ?

A. $d(\theta) = \dfrac{30{,}000}{\sin\theta}$

B. $d(\theta) = \dfrac{\sin\theta}{30{,}000}$

C. $d(\theta) = \dfrac{30{,}000}{\cos\theta}$

D. $d(\theta) = \dfrac{\cos\theta}{30{,}000}$

Part B

Within the context of the situation described, what is the domain of the function d. Enter the appropriate values, in degrees, in the inequality.

Write your answer in the boxes.

$\square^\circ < \theta < \square^\circ$

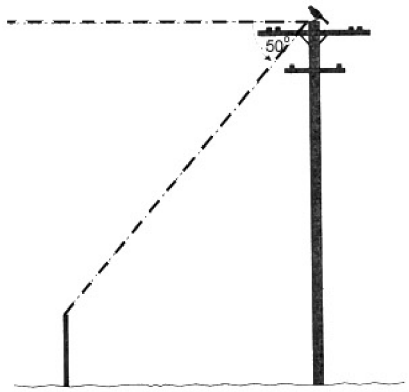
Part C

When the angle of elevation is 75 degrees, what is the distance between the observer and the plane, to the nearest foot?

Part D

For what value of θ will the distance between the observer and the plane be 60,000 feet?

30. Use the diagram below to answer the question

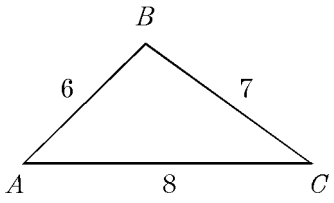


A bird flies from the top of a 40-ft. utility pole on a straight course to the top of a post eight feet above the ground. If the angle of depression is 50°, how far did the bird fly to reach the post? Round your answer to the nearest tenth.

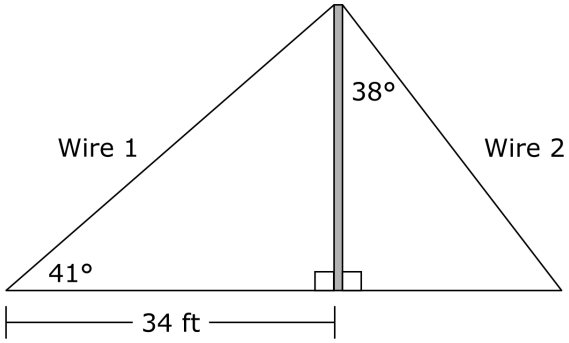
A. 41.8 feet
B. 49.8 feet
C. 52.2 feet
D. 62.2 feet

31. Triangle *ABC* has sides 6, 7, and 8 as shown. To the nearest degree, what is the measure of angle *A*?

A. 58°
B. 62°
C. 68°
D. 78°



32. In the figure below, a pole has two wires attached to it, one on each side, forming two right triangles.



Based on the given information, answer the questions below.

a) How tall is the pole?

b) How far from the base of the pole does Wire 2 attach to the ground?

c) How long is Wire 1?

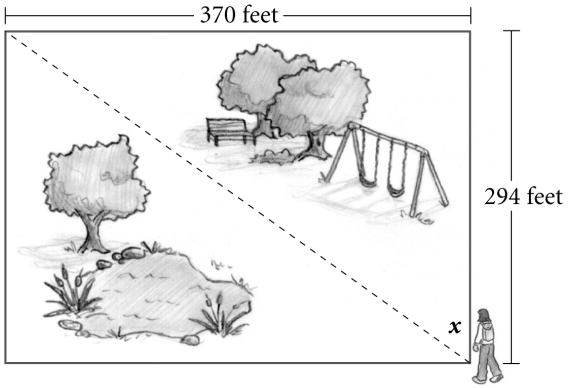
33. Triangle *WXY* has the following properties:

- The angle at vertex *W* is 14°, and the angle at vertex *X* is obtuse.
- The side opposite vertex *W* has a length of 7.00 units.
- The side opposite vertex *X* has a length of 9.00 units.

What is the *approximate* length of the side opposite vertex *Y*?

A. 1.73 units
B. 2.08 units
C. 3.26 units
D. 5.40 units

34. Barbara went for a walk in the city park. To cut across the rectangular park, she chose the path shown by the dotted line in the drawing below.

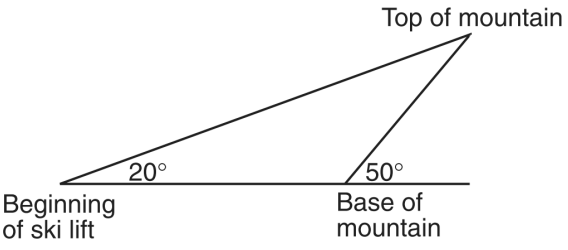


Drawing **not** to scale

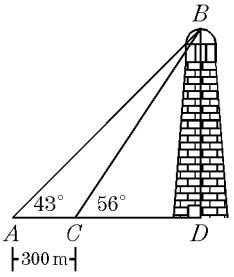
At what angle, x, did Barbara cut across the park? Round the answer to the nearest tenth of a degree.

A. 37.4 B. 38.5 C. 51.5 D. 52.6

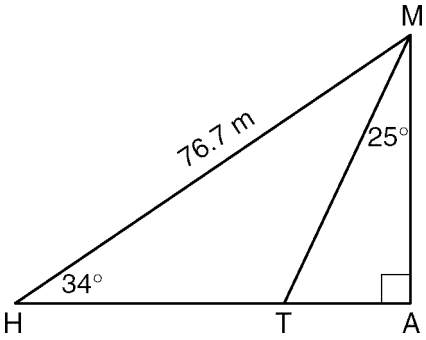
35. A ski lift begins at ground level 0.75 mile from the base of a mountain whose face has a 50° angle of elevation, as shown in the accompanying diagram. The ski lift ascends in a straight line at an angle of 20°. Find the length of the ski lift from the beginning of the ski lift to the top of the mountain, to the *nearest hundredth of a mile*.



36. The angle of elevation from a ship at point A to the top of a lighthouse, point B, is 43°. When the ship reaches point C, 300 meters closer to the lighthouse, the angle of elevation is 56°. Find to the *nearest meter*, the height to the lighthouse, BD. [*Show or explain the procedure used to obtain your answer.*]



37. In the accompanying diagram of $\triangle HMA$, $\overline{MT}$ is drawn, $m\angle A = 90$, $m\angle MHA = 34$, $m\angle AMT = 25$, and $HM = 76.7$ meters.



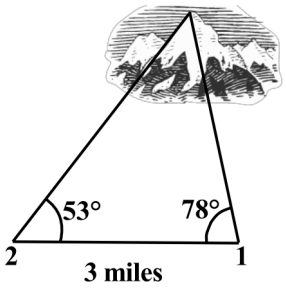
a) Find, to the *nearest tenth* of a meter, the length of

(1) $\overline{MA}$

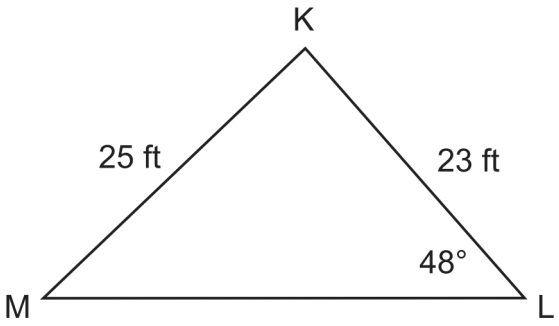
(2) $\overline{HA}$

b) Using the results from part a, find the area of $\triangle HMT$ to the *nearest square meter*.

38. Tara wants to fix the location of a mountain by taking measurements from two positions 3 miles apart. From the first position, the angle between the mountain and the second position is 78°. From the second position, the angle between the mountain and the first position is 53°. How can Tara determine the distance of the mountain from each position, and what is the distance from each position?



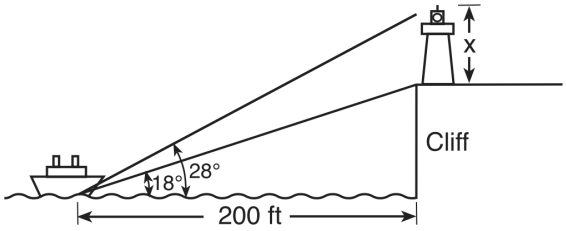
39. Acute triangle *KLM* is shown below.



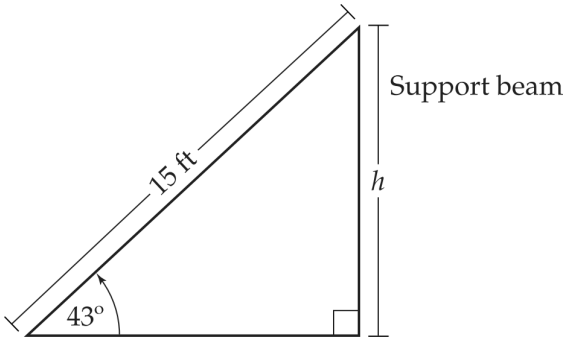
Which could be the measure of $\angle M$?

A. 38° B. 42° C. 44° D. 52°

40. A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18° and the angle of elevation to the top of the lighthouse is 28°. What is the height of the lighthouse, *x*, to the *nearest tenth of a foot*?



41. Johnny wants to build a 15-foot sloped roof at an angle of 43°, as shown in the diagram below.



What is the height (h) of the beam that is needed to support the roof? Round the answer to the nearest foot.

A. 10 feet B. 11 feet

C. 14 feet D. 22 feet

42. Which value of x does not satisfy the equation $\sin^2 x + \sin x = 0$?

A. $\frac{\pi}{2}$ B. 2π C. $\frac{3}{2}\pi$ D. π

43. If $\sin A = \frac{2}{3}$, find $\cos 2A$.

44. The expression $(\sec^2\theta)(\cot^2\theta)(\sin\theta)$ is equivalent to

A. $\sin\theta$ B. $\cos\theta$ C. $\csc\theta$ D. $\sec\theta$

45. If $\tan\theta = \frac{1}{3}$, then $\sin 2\theta$ equals:

A. $\frac{3}{5}$ B. $\frac{6}{\sqrt{10}}$ C. $\frac{2}{9}$ D. $\frac{3}{\sqrt{10}}$

46. What is the positive value of $\sin x$ that satisfies the equation $\sin^2 x + 4\sin x - 5 = 0$?

47. The expression $\dfrac{\sec\theta}{\tan\theta}$ is equivalent to

A. $\sin\theta$ B. $\cos\theta$ C. $\sec\theta$ D. $\csc\theta$

48. For all values of x for which the expressions are defined, $\sec x - \tan x$ is equivalent to

A. 1 B. $\cos x - \cot x$

C. $\dfrac{1-\sin x}{\cos x}$ D. $\dfrac{\cos x - \sin^2 x}{\sin x \cos x}$

49. The value of $\cos(2\cos^{-1}\frac{4}{5})$ is:

A. $\frac{5}{7}$ B. $\frac{8}{5}$ C. $\frac{7}{25}$

D. none of these

50. The solution set for the equation $\sin 2\theta + \sin\theta = 0$ on the interval $[0, 2\pi)$ is:

A. $\left\{0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}\right\}$

B. $\left\{0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}\right\}$

C. $\left\{0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}\right\}$

D. $\left\{0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, 2\pi\right\}$

51. The expression $\dfrac{\sin^2 x + \cos^2 x}{\sin x}$ is equivalent to

A. $\csc x$ B. $\sec x$

C. $\sin x \cot x$ D. $\sin x \cos x \cot x$

52. Suppose x is in the first and y is in the second quadrant, $\sin x = \frac{4}{5}$ and $\cos y = -\frac{1}{4}$. Determine the exact value of $\sin(x + y)$.

A. $\frac{11}{20}$ B. $\frac{-4-3\sqrt{15}}{20}$

C. $\frac{4}{5} - \frac{\sqrt{15}}{4}$ D. $\frac{-4+3\sqrt{15}}{20}$

53. Solve algebraically for all exact values of x in the interval $0 \le x < 2\pi$:

$$2\sin^2 x + 5\sin x = 3$$

54. If $0 < \theta < \pi$ and $2\cos^2\theta + \sin\theta - 2 = 0$, then the set of all possible values for θ is

A. $\{0\}$ B. $\left\{\frac{\pi}{6}\right\}$

C. $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$ D. $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$

55. Find the measure of the *smallest* positive angle that satisfies the equation $\tan^2 A - 3 = 0$.

56. Which expression is equivalent to $(\sec\theta)\left(\dfrac{\sin\theta}{\tan\theta}\right)$?

A. $\cos^2\theta - \sin^2\theta$ B. $\sin^2\theta - \cos^2\theta$

C. $\cot^2\theta - \csc^2\theta$ D. $\csc^2\theta - \cot^2\theta$

57. If $\tan^{-1}\left(-\dfrac{2}{3}\right) = A$, then $\sin 2A$ equals:

A. $-\dfrac{12}{13}$ B. $-\dfrac{6}{13}$ C. $\dfrac{4}{13}$ D. $\dfrac{6}{\sqrt{13}}$

58. Express each of the following in terms of sine and cosine:

a) $\tan x \cdot \sec^2 x$

b) $\dfrac{\cot x}{\csc x}$

59. For $0 \le \theta < 2\pi$, the solution set for $2\sin^2\theta - \cos\theta - 1 = 0$ is:

A. $\emptyset$ B. $\left\{\frac{\pi}{3}, \pi\right\}$

C. $\left\{\frac{\pi}{3}, \frac{5\pi}{3}, \pi\right\}$ D. $\left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}\right\}$

60. a) $\sin A = \frac{\sqrt{5}}{3}$ and $\angle A$ is in Quadrant I. Find, in simplest form, the value of

1) $\sin 2A$

2) $\cos 2A$

b) Using logarithms, find $\frac{\sqrt[3]{1450}}{4}$ to the *nearest hundredth*.

61. If θ is a second quadrant angle with $\sin\theta = \frac{4}{5}$, then $\tan 2\theta$ is equal to:

A. $\frac{8}{3}$ B. $\frac{24}{7}$ C. $-\frac{24}{7}$

D. none of the above

62. The measure of angle θ is between 0 and 2π radians. Which statements *must* be true of $\sin(\theta)$ and $\cos(\theta)$? Select *all* that apply.

- ❍ $\cos^2(\theta) + \sin^2(\theta) = 1$
- ❍ If $\sin(\theta) = 0$, then $\cos(\theta) = 1$.
- ❍ If $\sin(\theta) = 1$, then $\cos(\theta) = 0$.
- ❍ $\cos(\theta) + \sin(\theta) = 1$.
- ❍ The point $(\cos(\theta), \sin(\theta))$ lies on the unit circle.

63. $\frac{\cos x}{\sec x + \tan x}$ is equal to:

A. $1 - \sin(x)$ B. $1 + \sin(x)$

C. $\frac{\cos x}{1 + \sin x}$ D. $\frac{1 + \sin^2 x}{1 + \sin x}$

64. Determine the value of $\cos 2x$ given that $\cos x = \frac{-3}{5}$ and $\pi < x < \frac{3\pi}{2}$.

A. $\frac{7}{25}$ B. $\frac{1}{5}$ C. $-\frac{7}{25}$ D. 1

65. Which expression is equivalent to $\frac{\cos(\theta)}{1 - \sin(\theta)} - \tan(\theta)$?

A. $\sec(\theta)$ B. $\sin(\theta)$

C. $\cos(\theta)$ D. $\csc(\theta)$

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1.
Answer: D
Objective: F-TF.A
Points: 1

2.
Answer: 2
Points: 1

3.
Answer: $\frac{\sqrt{3}}{2}$
Points: 1

4.
Answer: A
Objective: GE.18.0
Points: 1

5.
Answer: B
Points: 1

6.
Answer: A
Objective: CC F.TF.8
Points: 1

7.
Answer: b; a; c; e; f; d
Objective: CC F.TF.2
Points: 1

8.
Answer:
Points: 1

9.
Answer: B
Points: 1

10.
Answer: C
Points: 1

11.
Answer: $-\frac{5}{13}$
Points: 1

12.
Answer: B
Points: 1

13.
Answer: C
Points: 1

14.
Answer: $\frac{2\pi}{3}$
Points: 1

15.
Answer: A
Points: 1

16.
Answer: D
Points: 1

17.
Answer: B
Points: 1

18.
Answer:
Points: 1

19.
Answer:
Points: 1

20.
Answer: D
Points: 1

21.
Points: 1

22.
Answer: The maximum of f is 5 and the maximum of g is 4, so f has the greater maximum; The minimum of f is 1 and the minimum of g is 0, so f has the greater minimum; The maximum and minimum of f are 5 and 1 respectively, so its amplitude is $\frac{5-1}{2} = 2$. The amplitude of g is the coefficient of cosine, which is 2. So both functions have the same amplitude; Since x changes by 2π when going from the maximum of f to its minimum, f has a period of 4πṠince the coefficient of the x inside the cosine is 1, the period is 2πṪhus, the period of f is twice the period of g.
Points: 1

23.
Answer: A
Points: 1

24.
Answer:
Points: 1

25.
Points: 1

26.
Answer: D
Points: 1

27.
Answer: D
Objective: F-TF.B
Points: 1

28.
Answer: B
Points: 1

29.
Answer: A; $0^\circ < \theta < 90^\circ$; 31058 feet; 30 degrees
Points: 1

30.
Answer: A
Points: 1

31.
Answer: A
Points: 1

32.
Answer: 29.55574909 ft; 23.09148194 ft; 45.05044177 ft;
Points: 1

33.
Answer: B
Objective: 2.02.c
Points: 1

34.
Answer: C
Points: 1

35.
Answer: 1.15
Points: 1

36.
Answer: 754
Points: 1

37.
Answer: 42.9, 63.6; 935
Points: 1

38.
Answer:
Objective: CC G.SRT.11
Points: 1

39.
Answer: C
Objective: PA G.1.2.1.1
Points: 1

40.
Answer: 41.4
Points: 1

41.
Answer:
Objective: 2.2.2
Points: 1

42.
Answer: A
Points: 1

43.
Answer: $\frac{1}{9}$
Points: 1

44.
Answer: C
Points: 1

45.
Answer: A
Points: 1

46.
Answer: 1
Points: 1

47.
Answer: D
Points: 1

48.
Answer: C
Points: 1

49.
Answer: C
Points: 1

50.
Answer: C
Points: 1

51.
Answer: A
Points: 1

52.
Answer: D
Points: 1

53.
Answer: $\frac{\pi}{6}$ and $\frac{5\pi}{6}$ and correct algebraic work is shown.
Points: 1

54.
Answer: D
Points: 1

55.
Answer: 60°
Points: 1

56.
Answer: D
Points: 1

57.
Answer: A
Points: 1

58.
Answer: a. $\frac{\sin x}{\cos^3 x}$; b. $\cos x$
Points: 1

59.
Answer: C
Points: 1

60.
Answer: $\frac{4\sqrt{5}}{9}$, $-\frac{1}{9}$; 2.83
Points: 1

61.
Answer: B
Points: 1

62.
Points: 1

63.
Answer: A
Points: 1

64.
Answer: C
Points: 1

65.
Answer: A
Points: 1