Right Triangle Trig

17. For an angle with measure α in a right triangle, $\sin\alpha = \frac{112}{113}$ and $\tan\alpha = \frac{112}{15}$. What is the value of $\cos\alpha$?

A. $\frac{15}{113}$

B. $\frac{15}{112}$

C. $\frac{15}{\sqrt{25{,}313}}$

D. $\frac{15}{\sqrt{12{,}319}}$

E. $\frac{113}{15}$

---

24. Given that $\sin A = \frac{20}{25}$, which of the following values could $\tan A$ equal?

F. $\frac{5}{20}$

G. $\frac{15}{20}$

H. $\frac{20}{15}$

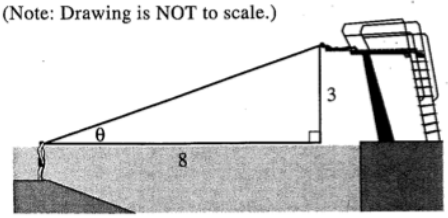
J. 4

K. 5

---

26. Josh is standing in a pool and looking up at his friend Olivia. Olivia is lying on her stomach on the diving board looking at Josh. The horizontal and vertical distances, in meters, between Josh and Olivia are given in the diagram below. What is the measure of the angle of elevation, θ, of Josh's line of sight?

(Note: Drawing is NOT to scale.)



F. $\text{Arcsin}\left(\frac{3}{8}\right)$

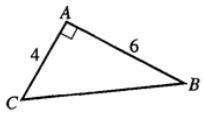
G. $\text{Arccos}\left(\frac{3}{8}\right)$

H. $\text{Arctan}\left(\frac{3}{8}\right)$

J. $\text{Arccot}\left(\frac{3}{8}\right)$

K. $\text{Arccsc}\left(\frac{3}{8}\right)$

Shown below is right triangle $\triangle ABC$ with the given dimensions in meters.



28. Which of the following expressions represents $\cos B$?

F. $\frac{AB}{AC}$

G. $\frac{AB}{BC}$

H. $\frac{AC}{BC}$

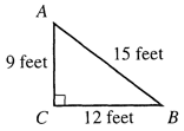
J. $\frac{AC}{AB}$

K. $\frac{BC}{AB}$

---

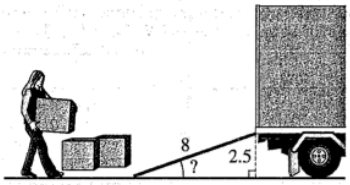
29. For right triangle $\triangle ABC$ shown below, which of the following expressions has a value that is equal to $\cos A$?

A. $\sin A$
B. $\sin B$
C. $\cos B$
D. $\tan A$
E. $\tan B$



---

29. Janelle is loading a truck by using a ramp, as shown below. The ramp is 8 feet long, and the end of the ramp that is resting on the truck is 2.5 feet above the level ground. Which of the following expressions gives the angle of inclination of the ramp?



A. $\text{Arccos}\left(\frac{2.5}{8}\right)$

B. $\text{Arcsin}\left(\frac{2.5}{8}\right)$

C. $\text{Arctan}\left(\frac{2.5}{8}\right)$

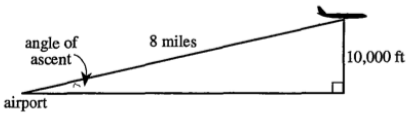
D. $\text{Arccos}\left(\frac{8}{2.5}\right)$

E. $\text{Arcsin}\left(\frac{8}{2.5}\right)$

---

31. An airplane taking off from an airport climbs at a constant angle of ascent so that it will reach an altitude of 10,000 feet when the airplane has flown 8 miles, as illustrated in the figure below. Which of the following expressions gives the angle of ascent?

(Note: 1 mile = 5,280 feet)



A. $\text{Arcsin}\left(\frac{8}{10{,}000}\right)$

B. $\text{Arctan}\left(\frac{10{,}000}{8(5{,}280)}\right)$

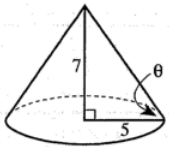
C. $\text{Arcsin}\left(\frac{10{,}000}{8(5{,}280)}\right)$

D. $\text{Arccos}\left(\frac{10{,}000}{8(5{,}280)}\right)$

E. $\text{Arctan}\left(\frac{8(5{,}280)}{10{,}000}\right)$

---

32. The radius of the base of the right circular cone shown below is 5 inches, and the height of the cone is 7 inches. Solving which of the following equations gives the measure, θ, of the angle formed by a slant height of the cone and a radius?



F. $\tan\theta = \frac{5}{7}$

G. $\tan\theta = \frac{7}{5}$

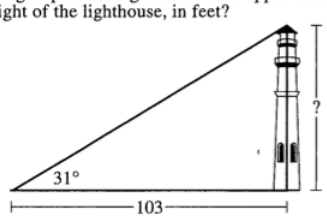
H. $\sin\theta = \frac{5}{7}$

J. $\sin\theta = \frac{7}{5}$

K. $\cos\theta = \frac{7}{5}$

---

33. Anoki wants to determine the height of a vertical lighthouse, shown below. He measures the angle of elevation to the top of the lighthouse at a point 103 feet along level ground from the center of the base of the lighthouse. The angle of elevation is 31°. Which of the following expressions gives the best approximation of the height of the lighthouse, in feet?



A. $\frac{\cos 31°}{103}$

B. $\frac{\tan 31°}{103}$

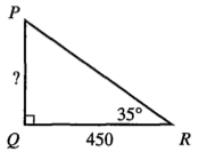
C. $103 \sin 31°$

D. $103 \cos 31°$

E. $103 \tan 31°$

---

37. In right triangle $\triangle PQR$ shown below, $\overline{QR}$ is 450 feet long and the measure of $\angle R$ is 35°. What is the length, in feet, of $\overline{PQ}$?



A. $450 \sin 35°$

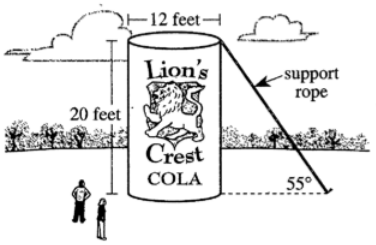
B. $450 \tan 35°$

C. $\frac{450}{\sin 35°}$

D. $\frac{450}{\cos 35°}$

E. $\frac{450}{\tan 35°}$

Shown below is an inflatable display (on level ground) of a Lion's Crest Cola can. A blower pumps air into the display at an average rate of 600 cubic feet per minute as it inflates the display. When fully inflated, the display is a right circular cylinder with a diameter of 12 feet and a height of 20 feet. Also shown below is 1 of the support ropes that anchors the display. The rope is attached to the top of the display and has an angle of elevation of 55°. The volume of air in the fully inflated display is equal to the display's height times the area of 1 of the circular bases.



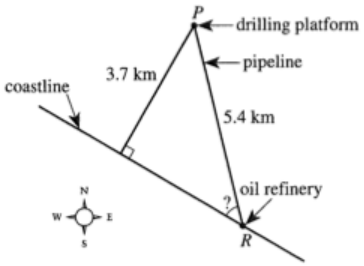
38. Which of the following is closest to the length, in feet, of the support rope?

(Note: $\sin 55° \approx 0.82$; $\cos 55° \approx 0.57$; $\tan 55° \approx 1.43$)

F. 24
G. 29
H. 32
J. 35
K. 40

---

38. Engineers are building a straight underwater pipeline from a drilling platform at P to an oil refinery located at R on a straight stretch of coastline, as shown on the map below. The distance from the platform to the refinery is 5.4 km, and the distance from the platform to the coastline is 3.7 km. Which of the following expressions gives the measure of the acute angle formed by the pipeline and the coastline?



F. $\cos^{-1}\left(\frac{3.7}{5.4}\right)$

G. $\cos^{-1}\left(\frac{5.4}{3.7}\right)$

H. $\tan^{-1}\left(\frac{3.7}{5.4}\right)$

J. $\tan^{-1}\left(\frac{5.4}{3.7}\right)$

K. $\sin^{-1}\left(\frac{3.7}{5.4}\right)$

---

38. The figure below shows a 10-foot ladder leaning against a vertical wall. The base of the ladder makes a 65° angle with the level ground. Which of the following expressions gives the distance, in feet, between the base of the ladder and the wall?

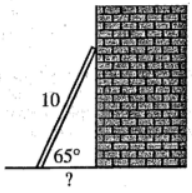
F. 10 sin 65°

G. 10 cos 65°

H. 10 tan 65°

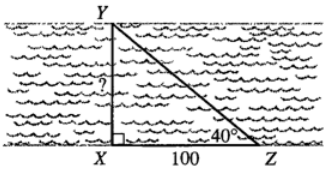
J. $\frac{10}{\sin 65°}$

K. $\frac{10}{\cos 65°}$



---

41. During a competition, a swimmer will be swimming the width of a river, from X to Y in the figure below. The swimmer wants to know how wide the river is. The right triangle shows the measurements the swimmer obtained by walking 100 feet from X to Z, sighting to Y from both points. From this sighting, it is determined that the measure of $\angle Z$ is 40°. How wide, in feet, is the river?



A. $\frac{100}{\sin 40°}$

B. $\frac{100}{\tan 40°}$

C. 100 sin 40°

D. 100 cos 40°

E. 100 tan 40°

---

42. The figure below shows a support wire for a television transmission tower. The wire, which is fastened to the tower at a point 125 feet above the level ground, has an angle of elevation of 65°. Which of the following expressions gives the length, in feet, of the wire?

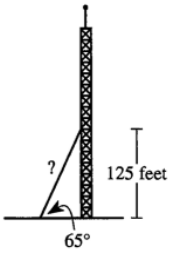
F. $\frac{125}{\sin 65°}$

G. $\frac{125}{\cos 65°}$

H. $\frac{125}{\tan 65°}$

J. 125 sin 65°

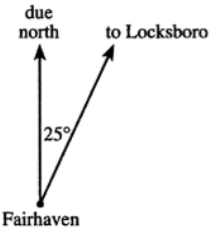
K. 125 tan 65°



---

48. An airplane flies the 200 miles from Fairhaven to Locksboro along a straight line in a direction (shown below) that is 25° clockwise (↷) from due north. To the nearest mile, Locksboro is how many miles due east and how many miles due north from Fairhaven?

(Note: sin 25° ≈ 0.423, cos 25° ≈ 0.906)



	due east	due north
F.	85	181
G.	100	173
H.	141	141
J.	173	100
K.	181	85

---

48. The figure below shows a lighthouse keeper looking down at a rowboat on the sea through a navigational instrument. The instrument is 60 feet above sea level and indicates an angle of depression of 53° to the rowboat. Which of the following is closest to the horizontal distance, in feet, between the navigational instrument and the rowboat?

(Note: sin 53° ≈ 0.80, cos 53° ≈ 0.60, tan 53° ≈ 1.33)

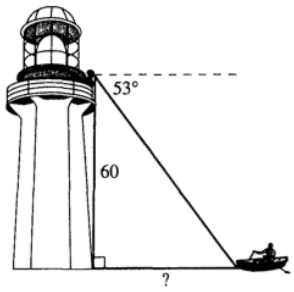
F. 36

G. 45

H. 48

J. 53

K. 80



49. A well in the form of a right circular cylinder is 25 feet deep and 3 feet in diameter. In Figure 1 below, the Sun is shining directly down on the bottom of the well. Later in the day, Earth rotates so that the bottom of the well is just in shadow, creating the right triangle shown in Figure 2 below. Which of the following expressions gives θ ?

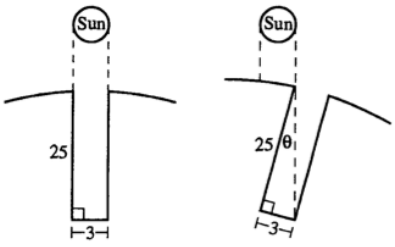


Figure 1 Figure 2

A. $\sin^{-1}\left(\frac{3}{25}\right)$

B. $\sin^{-1}\left(\frac{25}{3}\right)$

C. $\cos^{-1}\left(\frac{3}{25}\right)$

D. $\tan^{-1}\left(\frac{3}{25}\right)$

E. $\tan^{-1}\left(\frac{25}{3}\right)$

---

50. For right triangle $\triangle ABC$, $\sin \angle A = \frac{2}{3}$. What is $\cos \angle A$?

F. $-\frac{2}{3}$

G. $\frac{1}{3}$

H. $\frac{3}{2}$

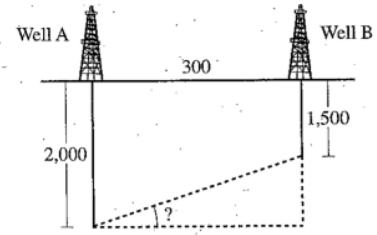
J. $\frac{\sqrt{5}}{3}$

K. $\frac{\sqrt{13}}{3}$

---

51. As shown in the figure below, the drill holes for Well A and Well B are 300 feet apart on level ground. Well A is dug straight down and reaches oil at 2,000 feet. Well B is dug straight down and reaches oil at 1,500 feet. What is the angle of elevation from the point where Well A reaches oil to the point where Well B reaches oil?

(Note: The figure is NOT drawn to scale.)



A. $\sin^{-1}\left(\frac{3}{5}\right)$

B. $\cos^{-1}\left(\frac{3}{5}\right)$

C. $\tan^{-1}\left(\frac{3}{5}\right)$

D. $\cos^{-1}\left(\frac{5}{3}\right)$

E. $\tan^{-1}\left(\frac{5}{3}\right)$

---

54. For a certain angle with measure θ, $\sin \theta = 0.4$. What is $\csc \theta$?

F. $\frac{5}{2}$

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

H. $\frac{1}{4}$

J. $\sqrt{0.84}$

K. $\frac{1}{\sqrt{0.84}}$

---

54. The angle measures of $\triangle CDE$ are shown below. Point B of $\triangle ABC$ lies on $\overline{CD}$, and point C lies on $\overline{AE}$. What is the value of $\cos(\alpha + \beta)$?

(Note: $\cos 30° = \frac{\sqrt{3}}{2}$)

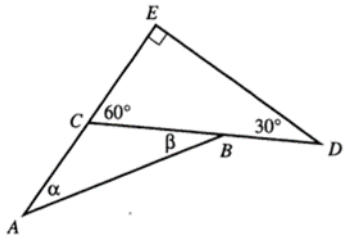
F. 0

G. $\frac{1}{2}$

H. $\frac{\sqrt{2}}{2}$

J. $\frac{\sqrt{3}}{2}$

K. 1



56. For all x such that $\tan x \neq 0$, the expression $\frac{\sec^2 x \cdot \sin x}{\tan x}$ is equivalent to which of the following?

(Note: $\sec x = \frac{1}{\cos x}$; $\tan x = \frac{\sin x}{\cos x}$)

F. 1
G. $\cos x$
H. $\cos^3 x$
J. $\sec x$
K. $\sec x \cdot \tan^2 x$

---

58. Which of the following is equal to $\tan \theta \cos \theta$ when $\sin \theta = \frac{2}{3}$ and $0 < \theta < \frac{\pi}{2}$?

F. $\frac{2}{3}$
G. $\frac{2\sqrt{5}}{9}$
H. $\frac{\sqrt{5}}{3}$
J. $\frac{2\sqrt{5}}{5}$
K. 1

---

58. For all values of x such that $\sin x > 0$ and $\cos x > 0$, which of the following expressions is equivalent to $\sin x > \frac{1}{2} \cos x$?

F. $\sin x + \cos x > \frac{1}{2}$
G. $\sin x - \cos x > \frac{1}{2}$
H. $\cos x - \sin x < 2$
J. $\tan x > \frac{1}{2}$
K. $\tan x < 2$

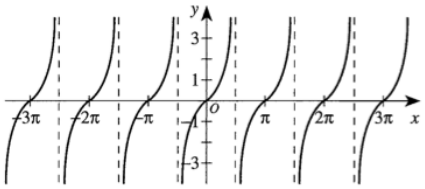
---

60. In $\triangle XYZ$, the measure of $\angle X$ is 90°, the measure of $\angle Z$ is θ, $XY = 12$ units, and $\tan \theta = \frac{4}{9}$. What is the area of $\triangle XYZ$, in square units?

F. 162
G. 324
H. $2\sqrt{65}$
J. $6\sqrt{585}$
K. $12\sqrt{585}$

Trig Functions

36. The graph of $y = \tan x$ is shown in the standard (x,y) coordinate plane below. What is the period of $\tan x$?



F. $\frac{\pi}{4}$

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

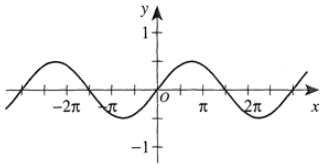
H. π

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

K. 2π

---

49. The graph of $y = a \sin bx$ is shown below for certain positive values of a and b. One of the following values is equal to a. Which one?



A. $\frac{1}{2}$

B. $\frac{2}{3}$

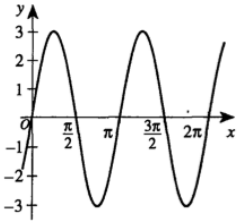
C. $\frac{3}{2}$

D. 2

E. 3

---

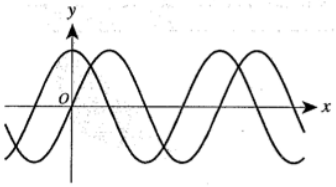
53. The graph of the function $y = 3 \sin(2x)$ is shown below in the standard (x,y) coordinate plane. What are the amplitude and the period of the function?



	amplitude	period
A.	3	π
B.	3	2π
C.	6	π
D.	6	2π
E.	6	$\frac{\pi}{2}$

---

56. The functions $y = \sin x$ and $y = \sin(x + a) + b$, for constants a and b, are graphed in the standard (x,y) coordinate plane below. The functions have the same maximum value. One of the following statements about the values of a and b is true. Which statement is it?



F. $a < 0$ and $b = 0$
G. $a < 0$ and $b > 0$
H. $a = 0$ and $b > 0$
J. $a > 0$ and $b < 0$
K. $a > 0$ and $b > 0$

---

57. Given that $2 \sin a = 2$ and $2 \cos\left(\frac{\pi}{2} - b\right) = 2$, which of the following could be a value, in radians, of $a + b$?

A. 0

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

C. 2

D. π

E. 2π

Unit Circle and Radians

28. If $90° < \theta < 180°$ and $\sin\theta = \frac{10}{26}$, then $\cos\theta = ?$

F. $\frac{26}{10}$

G. $\frac{10}{24}$

H. $-\frac{24}{26}$

J. $-\frac{26}{24}$

K. $-\frac{26}{10}$

---

52. An angle with measure θ such that $\sin\theta = \frac{5}{13}$ is in standard position with its terminal side extending into Quadrant II as shown in the standard (x,y) coordinate plane below. What is the value of $\cos\theta$?

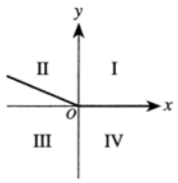
F. $-\frac{12}{13}$

G. $-\frac{5}{13}$

H. $\frac{5}{13}$

J. $\frac{13}{12}$

K. $\frac{13}{5}$



---

53. Angle A measures $\frac{9}{2}\pi$ radians from its initial side to its terminal side. Angle B has the same initial side and terminal side as Angle A. Which of the following measures could be that of Angle B ?

A. 5°
B. 14°
C. 25°
D. 90°
E. 180°

---

53. Angle A has a measure of $\frac{25}{3}\pi$ radians. Angle A and Angle B are coterminal. Angle B could have which of the following measures?

A. 3°
B. 14°
C. 26°
D. 60°
E. 120°

---

53. In the distance that Molly pushed the wheelbarrow shown below, the wheel rotated $\frac{3\pi}{2}$ radians. The distance that Molly pushed the wheelbarrow is what fraction of the circumference of the wheel?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{2}{3}$

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

E. $\frac{3}{2}$

---

57. Given that $\sin A = \frac{5}{13}$ and $0° \le A < 360°$, what are all possible values of $\cos A$?

A. $-\frac{5}{13}$ only

B. $-\frac{5}{13}$ and $\frac{5}{13}$

C. $\frac{12}{13}$ only

D. $-\frac{12}{13}$ only

E. $-\frac{12}{13}$ and $\frac{12}{13}$

---

58. Let θ be the radian angle measure that satisfies $\sin^2\theta - \sin\theta = -\frac{1}{4}$ for $0 < \theta < \frac{\pi}{2}$. What is $\cos\theta$?

F. $\frac{1}{16}$

G. $\frac{1}{4}$

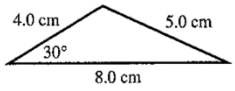
H. $\frac{1}{2}$

J. $\frac{\sqrt{3}}{2}$

K. $\frac{\sqrt{15}}{4}$

---

59. The lengths of the triangle shown below are rounded to the nearest 0.1 cm. What is the area, to the nearest 1 cm^2, of this triangle?



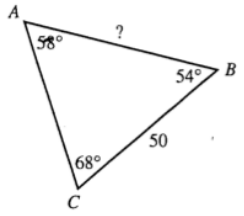
(Note: The area of any triangle with sides of length a, b, and c opposite angles of measure A, B, and C, respectively, is given by $\frac{1}{2}ab\sin C$.)

A. 4
B. 5
C. 8
D. 10
E. 14

Law of Sines & Cosines

40. For $\triangle ABC$ shown below, the length of $\overline{BC}$ is 50 mm. Which of the following equations, when solved, will give the length, in millimeters, of $\overline{AB}$?

(Note: The law of sines states that given $\triangle XYZ$, $\frac{\sin \angle X}{YZ} = \frac{\sin \angle Y}{XZ} = \frac{\sin \angle Z}{XY}$.)



F. $\frac{\sin 68°}{50} = \frac{\sin 58°}{AB}$

G. $\frac{\sin 58°}{50} = \frac{\sin 68°}{AB}$

H. $\frac{\sin 58°}{50} = \frac{\sin 54°}{AB}$

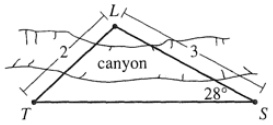
J. $\frac{\sin 54°}{50} = \frac{\sin 68°}{AB}$

K. $\frac{\sin 54°}{50} = \frac{\sin 58°}{AB}$

---

44. Li is standing at point L on the north side of the small canyon shown in the figure below. As measured by line of sight, Li is 2 miles from an observation tower at T, and she is 3 miles from a scenic overlook at S. Li, the observation tower, and the scenic overlook are all at the same elevation. The measure of $\angle S$ is 28°. Which of the following equations, when solved, gives the measure of $\angle T$?

(Note: For a triangle with sides of length a, b, and c that are opposite $\angle A$, $\angle B$, and $\angle C$, respectively, $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$.)



F. $\frac{\sin T}{3} = \frac{\sin 28°}{2}$

G. $\frac{\sin T}{3} = 2$

H. $\frac{\sin T}{2} = \frac{\sin 28°}{3}$

J. $\frac{\sin 28°}{T} = \frac{2}{3}$

K. $\sin T - \sin 28° = 3 - 2$

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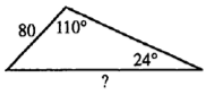
48. A surveyor is finding the dimensions of the triangular lot shown below. The length of 1 side is 80 feet. Which of the following is an expression for the length, in feet, of the side of the lot opposite the 110° angle?



(Note: The law of sines states that in every triangle, the ratio of a side's length to the sine of the angle opposite that side is equal for all 3 sides.)

F. $\frac{80 \sin 24°}{\sin 110°}$

G. $\frac{\sin 24°}{80 \sin 110°}$

H. $\frac{80}{(\sin 24°)(\sin 110°)}$

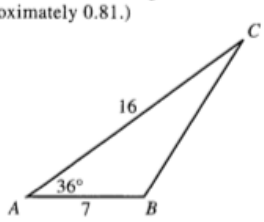
J. $\frac{80 \sin 110°}{\sin 24°}$

K. $\frac{\sin 110°}{80 \sin 24°}$

---

54. In $\triangle ABC$ shown below, lengths given are in inches, and the measure of $\angle A$ is 36°. Which of the following values is closest to the length, in inches, of $\overline{BC}$?

(Note: For any triangle with side lengths a, b, and c, $a^2 = b^2 + c^2 - 2bc \cos \theta$, where θ is the measure of the angle opposite the side of length a. The value of $\cos 36°$ is approximately 0.81.)

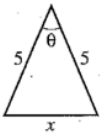


F. 11.1
G. 14.4
H. 17.5
J. 19.7
K. 22.1

---

58. As shown in the figure below, a triangle has 2 sides each of length 5 feet and a 3rd side of length x feet. The degree measure of the angle between the 2 sides that are 5 feet long is θ. In terms of x, $\cos \theta = ?$

(Note: For any triangle, if a, b, and c are the lengths of the sides opposite $\angle A$, $\angle B$, and $\angle C$, respectively, then $a^2 = b^2 + c^2 - 2bc \cos \angle A$.)



F. $\frac{x^2 + 50}{50}$

G. $\frac{x^2 - 50}{50}$

H. $\frac{x^2 - 10}{50}$

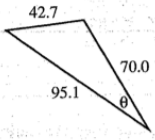
J. $\frac{50 - x^2}{50}$

K. $\frac{10 - x^2}{50}$

---

58. The lengths of the sides of the triangle shown below are given in meters. Which of the following equations gives the degree measure θ ?

(Note: For any triangle, $c^2 = a^2 + b^2 - 2ab \cos C$, where a, b, and c are the lengths of the sides opposite angles with measures A, B, and C, respectively.)



F. $42.7^2 = 95.1^2 + 70.0^2 - 2(95.1)(70.0) \cos \theta$

G. $70.0^2 = 95.1^2 + 42.7^2 - 2(95.1)(42.7) \cos \theta$

H. $95.1^2 = 70.0^2 + 42.7^2 - 2(70.0)(42.7) \cos \theta$

J. $\sin \theta = \frac{42.7}{95.1}$

K. $\cos \theta = \frac{70.0}{95.1}$

58. The sides of an acute triangle measure 14 cm, 18 cm, and 20 cm, respectively. Which of the following equations, when solved for θ, gives the measure of the smallest angle of the triangle?

(Note: For any triangle with sides of length a, b, and c that are opposite angles A, B, and C, respectively, $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ and $c^2 = a^2 + b^2 - 2ab \cos C$.)

F. $\frac{\sin \theta}{14} = \frac{1}{18}$

G. $\frac{\sin \theta}{14} = \frac{1}{20}$

H. $\frac{\sin \theta}{20} = \frac{1}{14}$

J. $14^2 = 18^2 + 20^2 - 2(18)(20)\cos \theta$

K. $20^2 = 14^2 + 18^2 - 2(14)(18)\cos \theta$

Right Triangle	
Problem Number	Answer
17	A
24	H
26	H
28	G
29	B
29	B
31	C
32	G
33	E
37	B
38	F
38	K
38	G
41	E
42	F
48	F
48	G
49	D
50	J
51	E
54	F
54	G
56	J
58	F
58	J
60	F

Unit Circle	
Problem Number	Answer
28	H
52	F
53	D
53	D
53	D
57	E
58	J
59	C

Law of Sines & Cosines	
Problem Number	Answer
40	G
44	F
48	J
54	F
58	J
58	F
58	J

Trig Function	
Problem Number	Answer
36	H
49	A
53	A
56	F
57	D