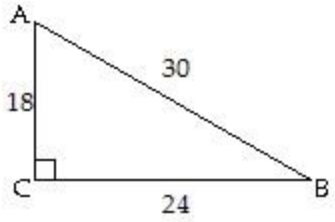
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. Evaluate the function requested. Write your answer as a fraction in lowest terms.

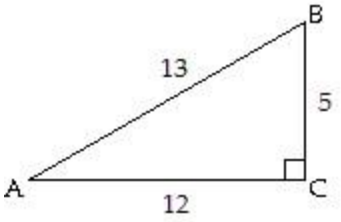
1) 1) _____



Find sin A.

A) sin A = $\frac{5}{4}$ B) sin A = $\frac{4}{5}$ C) sin A = $\frac{3}{5}$ D) sin A = $\frac{4}{3}$

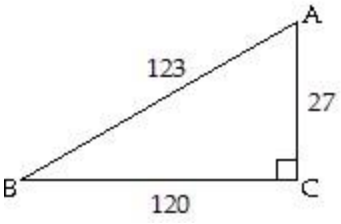
2) 2) _____



Find tan A.

A) tan A = $\frac{5}{12}$ B) tan A = $\frac{13}{5}$ C) tan A = $\frac{12}{5}$ D) tan A = $\frac{5}{13}$

3) 3) _____



Find cos B.

A) cos B = $\frac{40}{41}$ B) cos B = $\frac{9}{41}$ C) cos B = $\frac{9}{40}$ D) cos B = $\frac{41}{40}$

Suppose ABC is a right triangle with sides of lengths a, b, and c and right angle at C. Find the unknown side length using the Pythagorean theorem and then find the value of the indicated trigonometric function of the given angle. Rationalize the denominator if applicable.

4) Find sin A when b = 27 and c = 45 4) _____

A) $\frac{3}{4}$ B) $\frac{5}{4}$ C) $\frac{4}{5}$ D) $\frac{3}{5}$

5) Find csc A when b = 40 and c = 85 5) _____

A) $\frac{8}{15}$ B) $\frac{17}{15}$ C) $\frac{15}{17}$ D) $\frac{17}{8}$

6) Find tan B when a = 24 and c = 25. 6) _____

A) $\frac{24}{25}$ B) $\frac{24}{7}$ C) $\frac{7}{24}$ D) $\frac{7}{25}$

7) Find sin A when a = 7 and b = 6. 7) _____

A) $\frac{\sqrt{85}}{7}$ B) $\frac{6\sqrt{85}}{85}$ C) $\frac{7\sqrt{85}}{85}$ D) $\frac{\sqrt{85}}{6}$

8) Find cos A when a = 7 and b = 3. 8) _____

A) $\frac{7\sqrt{58}}{58}$ B) $\frac{\sqrt{58}}{3}$ C) $\frac{\sqrt{58}}{7}$ D) $\frac{3\sqrt{58}}{58}$

9) Find cos A when a = $\sqrt{2}$ and c = 12. 9) _____

A) $\frac{1}{6}$ B) $\frac{\sqrt{142}}{12}$ C) $\frac{\sqrt{2}}{12}$ D) 71

10) Find csc B when a = 3 and b = 7. 10) _____

A) $\frac{7\sqrt{58}}{58}$ B) $\frac{3\sqrt{58}}{58}$ C) $\frac{\sqrt{58}}{7}$ D) $\frac{\sqrt{58}}{3}$

11) Find sec B when a = 5 and b = 7. 11) _____

A) $\frac{7\sqrt{74}}{74}$ B) $\frac{5\sqrt{74}}{74}$ C) $\frac{5\sqrt{74}}{7}$ D) $\frac{\sqrt{74}}{5}$

12) Find cot A when a = 4 and c = 7. 12) _____

A) $\frac{\sqrt{33}}{7}$ B) $\frac{4\sqrt{33}}{33}$ C) $\frac{\sqrt{33}}{4}$ D) $\frac{7\sqrt{33}}{33}$

13) Find tan B when b = 7 and c = 8. 13) _____

A) $\frac{\sqrt{15}}{7}$ B) $\frac{7\sqrt{15}}{15}$ C) $\frac{\sqrt{15}}{8}$ D) $\frac{8\sqrt{15}}{15}$

Without using a calculator, give the exact trigonometric function value with rational denominator.

14) sin 30° 14) _____

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

15) cos 30° 15) _____

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

16) cos 60° 16) _____

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

17) sin 60° 17) _____

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

18) tan 60° 18) _____

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

19) tan 45° 19) _____

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

20) cot 45° 20) _____

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

21) sec 45° 21) _____

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

22) csc 45° 22) _____

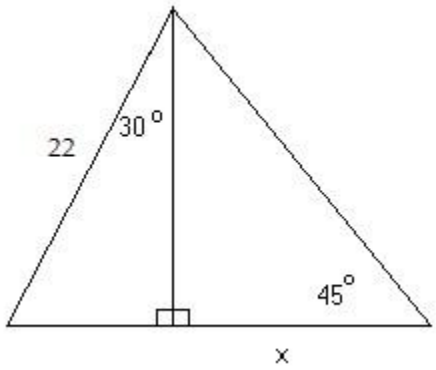
A) $\frac{1}{2}$ B) $\sqrt{2}$ C) $\frac{2\sqrt{3}}{3}$ D) 1

23) sec 30° 23) _____

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

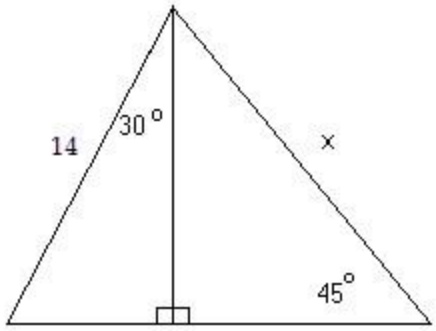
Solve the problem.

24) Find the exact value of x in the figure. 24) _____



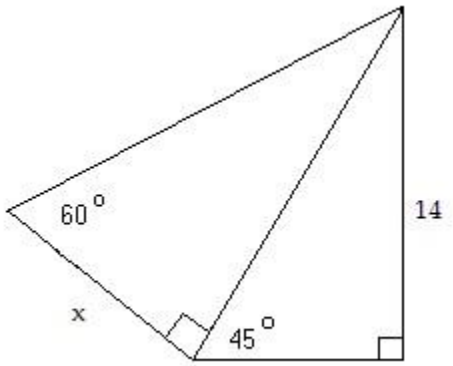
A) $12\sqrt{3}$ B) $9\sqrt{3}$ C) $11\sqrt{6}$ D) $11\sqrt{3}$

25) Find the exact value of x in the figure. 25) _____



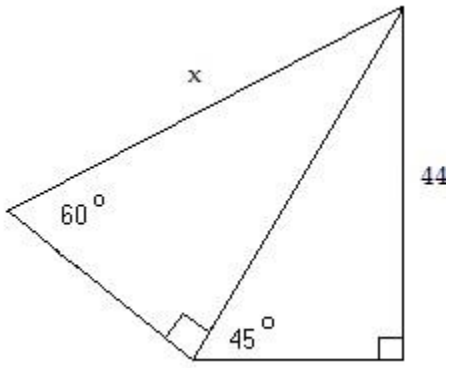
A) $7\sqrt{2}$ B) $7\sqrt{5}$ C) $7\sqrt{3}$ D) $7\sqrt{6}$

26) Find the exact value of x in the figure. 26) _____



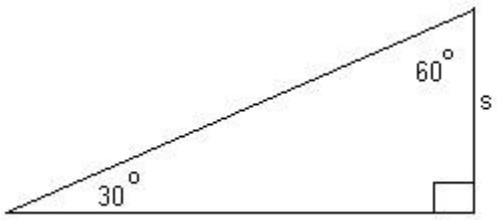
A) $\frac{14\sqrt{6}}{3}$ B) $7\sqrt{3}$ C) $\frac{14\sqrt{3}}{3}$ D) $7\sqrt{6}$

27) Find the exact value of x in the figure. 27) _____



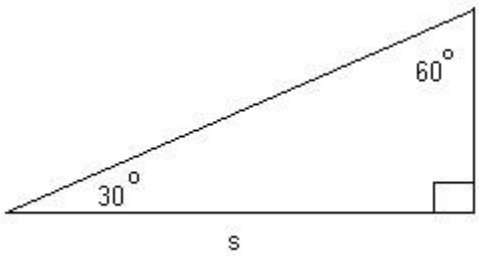
A) $\frac{22\sqrt{6}}{3}$ B) $\frac{88\sqrt{6}}{3}$ C) $87\sqrt{6}$ D) $\frac{82\sqrt{3}}{3}$

28) Find a formula for the area of the figure in terms of s. 28) _____



A) $\frac{\sqrt{3}}{6}s^2$ B) $\frac{\sqrt{s}}{3}$ C) $\frac{\sqrt{3}}{2}s^2$ D) $\frac{\sqrt{2}}{2}s^2$

29) Find a formula for the area of the figure in terms of s. 29) _____



A) $\frac{\sqrt{3}}{2}s^2$ B) $\frac{\sqrt{6}}{4}s^2$ C) $\frac{\sqrt{3}}{6}s^2$ D) $\sqrt{6}\,s^2$

Write the function in terms of its cofunction. Assume that any angle in which an unknown appears is an acute angle.

30) sin 44° 30) _____

A) csc 46° B) sin 134° C) cos 44° D) cos 46°

31) cos 48° 31) _____

A) sin 42° B) sec 42° C) cos 138° D) sin 48°

32) tan 24° 32) _____

A) cot 66° B) tan 114° C) cot 156° D) cot 24°

33) csc 60° 33) _____

A) sec 30° B) sin 30° C) csc 120° D) sec 60°

34) sin(θ + 85°) 34) _____

A) cos(5° - θ) B) sin (175° - θ) C) csc(5° - θ) D) cos (175° - θ)

35) tan(θ + 15°) 35) _____

A) tan(75° - θ) B) cot(75° - θ) C) cot(165° - θ) D) cot(105° - θ)

36) sec(θ - 44°) 36) _____

A) cos(134° - θ) B) csc(46° - θ) C) csc(134° - θ) D) sec(136° - θ)

37) cot 50.5° 37) _____

A) tan 129.5° B) cot 39.5° C) tan 39.5° D) tan 50.5°

38) cos 31.9° 38) _____

A) sec 148.1° B) sin 31.9° C) sin 58.1° D) cos 148.1°

39) sec 41.5° 39) _____

A) cos 48.5° B) csc 41.5° C) csc 48.5° D) cos 138.5°

Find a solution for the equation. Assume that all angles are acute angles.

40) sin A = cos 5A 40) _____

A) 75° B) 5° C) 15° D) 85°

41) sec θ = csc(θ + 32°) 41) _____

A) 16° B) 29° C) 74° D) 61°

42) tan(3α + 32°) = cot(α + 36°) 42) _____

A) 9.5° B) 2° C) 5.5° D) 6°

43) sin(2β + 10°) = cos(3β - 10°) 43) _____

A) 20° B) 17.5° C) 19° D) 18°

44) sec(θ + 15°) = csc(2θ + 9°) 44) _____

A) 20° B) 24.5° C) 22° D) 16°

45) tan(3θ + 17°) = cot(θ + 7°) 45) _____

A) 16° B) 18° C) 15.5° D) 16.5°

Decide whether the statement is true or false.

46) $\sin 41° > \sin 29°$ 46) _____

A) True B) False

47) $\cos 72° \leq \cos 59°$ 47) _____

A) True B) False

48) $\tan 35° < \tan 8°$ 48) _____

A) True B) False

49) $\sin 86° < \cos 86°$ 49) _____

A) True B) False

50) $\tan 26° > \cot 26°$ 50) _____

A) True B) False

51) $\sec 13° < \sec 3°$ 51) _____

A) True B) False

Solve the problem for the given information.

52) Find the equation of a line passing through the origin and making a $45°$ angle with the positive x-axis. 52) _____

A) $y = x$ B) $y = \frac{\sqrt{2}}{2}x$ C) $y = \frac{\sqrt{3}}{3}x$ D) $y = -x$

53) What angle does the line $y = x$ make with the positive x-axis? 53) _____

A) 30° B) 60° C) 45° D) 90°

54) Find the equation of a line passing through the origin so that the sine of the angle between the line in quadrant and the positive x-axis is $\frac{\sqrt{3}}{2}$. 54) _____

A) $y = x$ B) $y = \frac{\sqrt{3}}{2}x$ C) $y = \frac{\sqrt{3}}{3}x$ D) $y = \sqrt{3}x$

55) Find the equation of a line passing through the origin so that the sine of the angle between the line in quadrant and the positive x-axis is $\frac{\sqrt{2}}{2}$. 55) _____

A) $y = \frac{\sqrt{3}}{3}x$ B) $y = \sqrt{3}x$ C) $y = \frac{\sqrt{2}}{2}x$ D) $y = x$

56) Find the equation of a line passing through the origin so that the cosine of the angle between the line in quadrant and the positive x-axis is $\frac{\sqrt{3}}{2}$. 56) _____

A) $y = \frac{\sqrt{3}}{3}x$ B) $y = \frac{\sqrt{3}}{2}x$ C) $y = x$ D) $y = \sqrt{3}x$

57) Find the equation of a line passing through the origin so that the cosine of the angle between the line in quadrant and the positive x-axis is $\frac{1}{2}$. 57) _____

A) $y = \sqrt{3}x$

B) $y = \frac{\sqrt{3}}{3}x$ C) $y = \frac{\sqrt{3}}{2}x$ D) $y = \frac{1}{2}x$

Find the reference angle for the given angle.

58) 55° 58) _____

A) 145° B) 35° C) 125° D) 55°

59) 108° 59) _____

A) 82° B) 18° C) 72° D) 28°

60) 247.3° 60) _____

A) 112.7° B) 22.7° C) 67.3° D) 157.3°

61) -26.1° 61) _____

A) 26.6° B) 26.1° C) 64.4° D) 63.9°

62) 420° 62) _____

A) 30° B) 120° C) 60° D) 150°

63) -424° 63) _____

A) 64° B) 154° C) 116° D) 26°

Find the exact value of the expression.

64) cos 30° 64) _____

A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{2\sqrt{3}}{3}$ D) $\sqrt{3}$

65) tan 60° 65) _____

A) $\frac{\sqrt{3}}{3}$ B) 2 C) $\sqrt{3}$ D) $\frac{\sqrt{3}}{2}$

66) sec 45° 66) _____

A) $\frac{2\sqrt{3}}{3}$ B) $\frac{\sqrt{2}}{2}$ C) $\sqrt{3}$ D) $\sqrt{2}$

67) cos 210° 67) _____

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

68) tan 300° 68) _____

A) $\frac{\sqrt{3}}{3}$ B) $-\sqrt{3}$ C) $-\frac{\sqrt{3}}{3}$ D) $\sqrt{3}$

69) cot 120° 69) _____

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

70) sec 240° 70) _____

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

71) sec 150° 71) _____

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

72) csc 240° 72) _____

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

73) csc 330° 73) _____

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

74) csc 1920° 74) _____

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

75) csc (-240°) 75) _____

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

76) sec 2655° 76) _____

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

77) sec (-1575°) 77) _____

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

78) tan 690° 78) _____

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

79) cot (-1215°) 79) _____

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

80) sin (-2820°) 80) _____

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

81) sin 2115° 81) _____

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

82) cos 1200° 82) _____

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

83) cos (-2850°) 83) _____

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

Evaluate.

84) $\sin^2 30° + \cos^2 30°$ 84) _____

A) $\frac{1}{4}$ B) 0 C) 2 D) 1

85) $3 \tan^2 60° + 3 \sin^2 30° - \cos^2 360°$ 85) _____

A) $-\frac{43}{4}$ B) $\frac{43}{4}$ C) $\frac{35}{4}$ D) $\frac{29}{4}$

86) $\cos^2 135° - \sin^2 90° + 5 \tan^2 210°$ 86) _____

A) $\frac{13}{6}$ B) $\frac{7}{6}$ C) $\frac{1}{6}$ D) $\frac{19}{6}$

87) $5 \sin^2 240° + \csc^2 150° - \sec^2 30°$ 87) _____

A) $\frac{13}{12}$ B) $\frac{77}{12}$ C) $\frac{8}{3}$ D) $\frac{29}{6}$

88) $\cot^2 315° + \sin 150° + 3 \tan^2 315°$ 88) _____

A) $\frac{5}{2}$ B) $\frac{9}{2}$ C) $\frac{7}{2}$ D) $\frac{3}{2}$

89) $2 \cot^2 90° + 2 \sec^2 180° - \csc^2 315°$ 89) _____

A) $\frac{3}{2}$ B) 4 C) $\frac{5}{2}$ D) 0

90) $3 \cot^2 135° + \tan^4 60° - 4 \sin^4 0°$ 90) _____

A) 84 B) 13 C) 8 D) 12

Determine whether the statement is true or false.

91) $\cos 45° + \cos 60° = \cos 105°$ 91) _____

A) True B) False

92) $\cos(180° + 30°) = \cos 180° \cdot \cos 30° - \sin 180° \cdot \sin 30°$ 92) _____

A) True B) False

93) $\cos 540° = 1 - 2 \sin^2 270°$ 93) _____

A) True B) False

94) $\cos 240° = 1 - \sin^2 120°$ 94) _____

A) True B) False

95) $\cos 60° = \cos 180° - \cos 120°$ 95) _____

A) True B) False

96) cos 60° = cos 150° cos 90° + sin 150° sin 90° 96) _____
A) True B) False

97) cos 180° = 2 cos 210° cos 30° + 2 sin 210° sin 30° 97) _____
A) True B) False

98) sin 240° = 2 sin 120° 98) _____
A) True B) False

99) sin 0° = 2 sin 0° cos 0° 99) _____
A) True B) False

100) sin 225° = sin 135° cos 90° + cos 135° sin 90° 100) _____
A) True B) False

Find the sign of the following.

101) $\csc \frac{\theta}{2}$, given that θ is in the interval (90°, 180°). 101) _____
A) negative B) positive

102) $\sin \frac{\theta}{2}$, given that θ is in the interval (180°, 270°). 102) _____
A) positive B) negative

103) cot (θ + 180°), given that θ is in the interval (90°, 180°). 103) _____
A) positive B) negative

104) cot (θ + 180°), given that θ is in the interval (270°, 360°). 104) _____
A) positive B) negative

105) tan (-θ), given that θ is in the interval (90°, 180°). 105) _____
A) negative B) positive

106) sin (-θ), given that θ is in the interval (180°, 270°). 106) _____
A) negative B) positive

Find all values of θ, if θ is in the interval [0, 360°) and has the given function value.

107) $\cos \theta = \frac{1}{2}$ 107) _____
A) 150° and 210° B) 60° and 300° C) 210° and 330° D) 60° and 120°

108) $\sin \theta = \frac{\sqrt{3}}{2}$ 108) _____
A) 60° and 300° B) 150° and 210° C) 210° and 330° D) 60° and 120°

109) $\sin \theta = -\frac{1}{2}$ 109) _____
A) 210° and 330° B) 60° and 120° C) 150° and 210° D) 60° and 300°

110) cos θ = - 110) _____

$\frac{\sqrt{3}}{2}$ 110) ____

A) 210° and 330° B) 60° and 300° C) 150° and 210° D) 60° and 120°

111) sec θ is undefined 111) _____

A) 90° and 270° B) 0° and 180° C) 0° D) 90°

112) $\cos\theta = \frac{\sqrt{3}}{2}$ 112) _____

A) 30° and 330° B) 45° and 225° C) 225° and 315° D) 135° and 225°

113) $\sec\theta = -\sqrt{2}$ 113) _____

A) 45° and 225° B) 135° and 225° C) 225° and 315° D) 45° and 315°

114) $\sin\theta = -\frac{\sqrt{2}}{2}$ 114) _____

A) 45° and 225° B) 225° and 315° C) 45° and 315° D) 135° and 225°

115) $\tan\theta = 1$ 115) _____

A) 135° and 225° B) 45° and 315° C) 225° and 315° D) 45° and 225°

116) $\cot\theta = 1$ 116) _____

A) 135° and 225° B) 45° and 315° C) 45° and 225° D) 225° and 315°

Use a calculator to find the function value. Give your answer rounded to seven decimal places, if necessary.

117) $\sin 81°15'$ 117) _____

A) 0.9983615 B) 0.9783615 C) 0.9873615 D) 0.9883615

118) $\cos 366°19'$ 118) _____

A) 1.193929 B) 0.993929 C) 0.4969645 D) 0.3969645

119) $\tan 63°18'$ 119) _____

A) 1.9891787 B) 1.9885787 C) 1.9888787 D) 1.9882787

120) $\csc 7°15'$ 120) _____

A) 7.923995 B) 7.925995 C) 7.922995 D) 7.924995

121) $\sec 57°31'$ 121) _____

A) 1.8610093 B) 3.7250186 C) 3.7240186 D) 1.8620093

122) $\cot 40°41'$ 122) _____

A) 1.1634916 B) 1.1632916 C) 1.1626916 D) 1.1630916

123) $\sin(-54°47')$ 123) _____

A) -0.8009056 B) -0.8169772 C) -0.8138114 D) -0.8041682

124) $\frac{1}{\tan 55°33'}$ 124) _____

A) 1.4577326 B) 1.4458003 C) 0.6859969 D) 0.6916585

125) $\frac{\sin 61°}{\cos 61°}$ 125) _____

A) 1.8040478 B) 1 C) 0.0174551 D) 0.5543091

126) sin 49° cos 41° + cos 49° sin 41° 126) _____

A) 2 B) 0 C) -1 D) 1

127) cos 81° 59' cos 8° 1' - sin 81° 59' sin 8° 1' 127) _____

A) 1 B) 2 C) 0 D) -1

128) $\sin^2 28° + \cos^2 28°$ 128) _____

A) 0 B) 2 C) -1 D) 1

129) 2 sin 25° 13' cos 25° 13' - sin 50° 26' 129) _____

A) -1 B) 0 C) 2 D) 1

Use a calculator to decide whether the statement is true or false.

130) sin (45° + 120°) = sin 45° + sin 120° 130) _____

A) True B) False

131) sin (30°+ 210°) = sin 30° · cos 210° + cos 30° · sin 210° 131) _____

A) True B) False

132) sin (2 · 135°) = 2 · sin 135° 132) _____

A) True B) False

133) sin (2 · 210°) = 2 · sin 210° · cos 210° 133) _____

A) True B) False

134) cos (2 · 180°) = 2 · cos 180° 134) _____

A) True B) False

135) $\cos (2 \cdot 225°) = \cos^2 225° - \sin^2 225°$ 135) _____

A) True B) False

Find a value of θ in [0°, 90°] that satisfies the statement. Leave answer in decimal degrees rounded to seven decimal places, if necessary.

136) sin θ = 0.2239939 136) _____

A) 12.9437229° B) 77.0562771° C) 192.943723° D) 167.056277°

137) cos θ = 0.22146103 137) _____

A) 102.794861° B) 282.794861° C) 12.7948608° D) 77.2051392°

138) tan θ = 0.78557547 138) _____

A) 51.8476914° B) 218.152309° C) 38.1523086° D) 321.847691°

139) tan θ = 1.9527292 139) _____

A) 117.117157° B) 242.882843° C) 62.8828427° D) 27.1171573°

140) cot θ = 1.4100183 140) _____

A) 35.3446720° B) 54.6553280° C) 44.8292718° D) 45.1707282°

141) sec θ = 2.1411882 141) _____

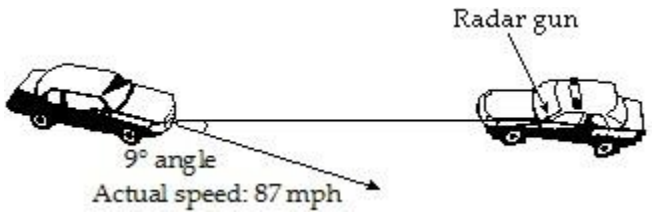
A) 28.8032142° B) 27.8417059° C) 62.1582940° D) 25.0340049°

142) csc θ = 1.7596469 142) _____

A) 60.3906112° B) 55.3685257° C) 34.6314743° D) 29.6093888°

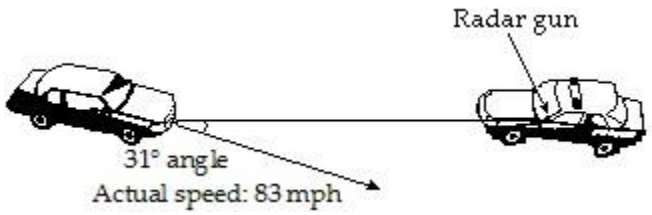
Solve the problem.

143) Any offset between a stationary radar gun and a moving target creates a "cosine effect" that reduces the radar mileage reading by the cosine of the angle between the gun and the vehicle. That is, the radar speed reading is the product of the actual reading and the cosine of the angle. Find the radar reading to the nearest hundredth for the auto shown in the figure. 143) _____



A) 87.99 mph B) 86.01 mph C) 13.61 mph D) 85.93 mph

144) Any offset between a stationary radar gun and a moving target creates a "cosine effect" that reduces the radar mileage reading by the cosine of the angle between the gun and the vehicle. That is, the radar speed reading is the product of the actual reading and the cosine of the angle. Find the radar reading to the nearest hundredth for the auto shown in the figure. 144) _____



A) 71.14 mph B) 82.14 mph C) 83.86 mph D) 42.75 mph

145) The grade resistance F of a car traveling up or down a hill is modeled by the equation F = W sin θ, where W is the weight of the car and θ is the angle of the hill's grade (θ > 0 for uphill travel, θ < 0 for downhill travel). What is the grade resistance (to the nearest pound) of a 2000-lb car traveling uphill on a 2° grade ($\theta = 2°$)? 145) _____

A) -70 lb B) 70 lb C) 2002 lb D) -2002 lb

146) The grade resistance F of a car traveling up or down a hill is modeled by the equation F = W sin θ, where W is the weight of the car and θ is the angle of the hill's grade (θ > 0 for uphill travel, θ < 0 for downhill travel). Find the weight of the car (to the nearest pound) that is traveling on a $-2.2°$ downhill grade and which has a grade resistance of -153.55 lb. 146) _____

A) 3800 lb B) 4300 lb C) 4100 lb D) 4000 lb

147) The grade resistance F of a car traveling up or down a hill is modeled by the equation F = W sin θ, where W is the weight of the car and θ is the angle of the hill's grade (θ > 0 for uphill travel, θ < 0 for downhill travel). What is the grade resistance (to the nearest pound) of a 2500-lb car traveling downhill on a 6° grade (θ = - 6°)? 147) _____

A) 261 lb B) -261 lb C) -2506 lb D) 2506 lb

148) The grade resistance F of a car traveling up or down a hill is modeled by the equation F = W sin θ, where W is the weight of the car and θ is the angle of the hill's grade (θ > 0 for uphill travel, θ < 0 for downhill travel). What is the grade resistance (to the nearest pound) of a 2050-lb car on a level road (θ = 0°)? 148) _____

A) undefined B) 2050 lb C) 0 lb D) -2050 lb

149) The grade resistance F of a car traveling up or down a hill is modeled by the equation F = W sin θ, where W is the weight of the car and θ is the angle of the hill's grade (θ > 0 for uphill travel, θ < 0 for downhill travel). A 2550-lb car has just rolled off a sheer vertical cliff (θ = - 90°). What is the car's grade resistance? 149) _____

A) 0 lb B) 2550 lb C) undefined D) -2550 lb

150) If an automobile is traveling at velocity V (in feet per second) , the safe radius R for a curve with superelevation α is given by the formula $R = \frac{V^2}{g(f + \tan \alpha)}$, where f and g are constants. A road is being constructed for automobiles traveling at 53 miles per hour. If $\alpha = 4°$, $g = 30.5$, and $f = 0.16$, calculate R. Round to the nearest foot. (Hint: 1 mile = 5280 feet) 150) _____

A) R = 862 ft B) R = 1312 ft C) R = 845 ft D) R = 882 ft

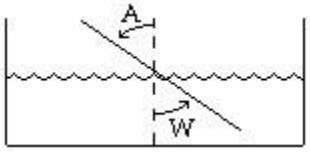
151) A formula used by an engineer to determine the safe radius of a curve, R, when designing a road is:
$R = \frac{V^2}{g(f + \tan \alpha)}$, where α is the superelevation of the road and V is the velocity (in feet per second) for which the curve is designed. If $V = 80$ ft per sec, f = 0.1, $g = 30$, and $\alpha = 2.7°$, find R. Round to the nearest foot. 151) _____

A) R = 1450 ft B) R = 1453 ft C) R = 1460 ft D) R = 1447 ft

152) A formula used by an engineer to determine the safe radius of a curve, R, when designing a particular road is: $R = \frac{V^2}{g(f + \tan \alpha)}$, where α is the superelevation of the road and V is the velocity (in feet per second) for which the curve is designed. If $\alpha = 1.1°$, f = 0.1, $g = 30$, and $R = 1331.36$ ft, find V. Round to the nearest foot per second. 152) _____

A) V = 72 ft per sec B) V = 69 ft per sec
C) V = 65 ft per sec D) V = 67 ft per sec

153) The index of refraction for air, I_a, is 1.0003. The index of refraction for water, I_W, is 1.3. If $\frac{I_W}{I_a} = \frac{\sin A}{\sin W}$, and $A = 31.5°$, find W to the nearest tenth. 153) _____



A) 23.7° B) 22.7° C) 20.7° D) 21.7°

154) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin \theta_1}{\sin \theta_2}$. Use this law to find the requested value. If $c_1 = 3 \times 10^9$, $\theta_1 = 44°$, and $\theta_2 = 38°$, find c_2. 154) _____

A) $c_2 = 2.66 \times 10^8$ B) $c_2 = 2.66 \times 10^9$ C) $c_2 = 3.19 \times 10^9$ D) $c_2 = 2.42 \times$

155) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin\theta_1}{\sin\theta_2}$. Use this law to find the requested value. If $c_1 = 8 \times 10^9$, $c_2 = 5.38 \times 10^9$, $\theta_1 = 50°$, find θ_2. Round your answer to the nearest degree. 155) _____

A) $\theta_2 = 31°$ B) $\theta_2 = 30°$ C) $\theta_2 = 33°$ D) $\theta_2 = 34°$

156) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin\theta_1}{\sin\theta_2}$. Use this law to find the requested value. If $c_1 = 6 \times 10^8$, $c_2 = 4.47 \times 10^8$, $\theta_2 = 33°$, find θ_1. Round your answer to the nearest degree. 156) _____

A) $\theta_1 = 50°$ B) $\theta_1 = 47°$ C) $\theta_1 = 48°$ D) $\theta_1 = 45°$

The number represents an approximate measurement. State the range represented by the measurement.

157) 17 ft 157) _____

A) 16.9 ft to 17.1 ft
B) 16.75 ft to 17.25 ft
C) 16.5 ft to 17.5 ft
D) 16 ft to 18 ft

158) 4.5 m 158) _____

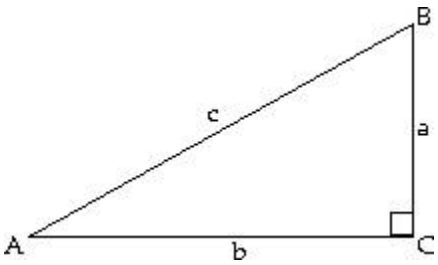
A) 3.5 m to 5.5 m
B) 4.49 m to 4.51 m
C) 4.475 m to 4.525 m
D) 4.45 m to 4.55 m

159) 35.53 k 159) _____

A) 35.529 kg to 35.531 kg
B) 34.53 kg to 36.53 kg
C) 35.5275 kg to 35.5325 kg
D) 35.525 kg to 35.535 kg

Solve the right triangle. If two sides are given, give angles in degrees and minutes.

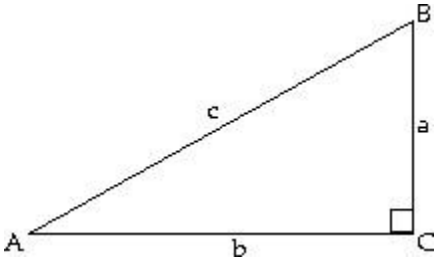
160) 160) _____



A = 17° 39′, c = 224 ft
Round side lengths to two decimal places.

A) B = 73° 20′; a = 67.92 ft; b = 209.46 ft
B) B = 72° 21′; a = 67.92 ft; b = 213.46 ft
C) B = 72° 21′; a = 67.35 ft ; b = 212.57 ft
D) B = 72° 20′; a = 71.12 ft; b = 214.66 ft

161)

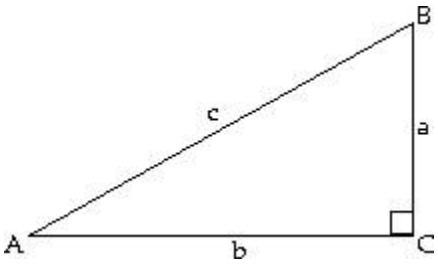


B = 68°14′, b = 17 km

hs to one decim al place. Roun d side lengt

161) _____

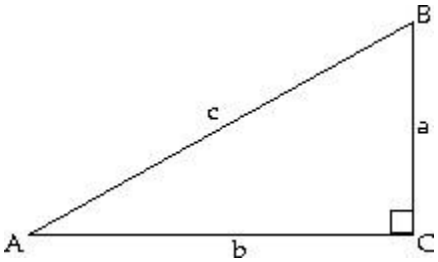
A) A = 21°46'; c = 18.3 km; a = 6.8 km
B) A = 21°46'; c = 45.8 km; a = 18.3 km
C) A = 21°46'; c = 45.8 km; a = 6.8 km
D) A = 21°46'; c = 18.3 km; a = 45.7 km

162) 

162) _____

A = 33.3°, b = 3.8 m
Round side lengths to one decimal place.

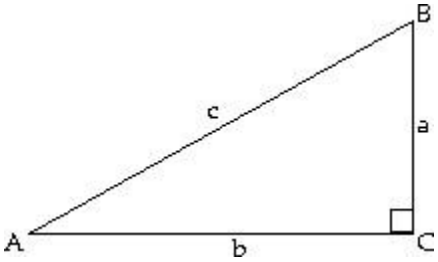
A) B = 56.7°; a = 2.5 m; c = 4.5 m
B) B = 56.7°; a = 1.4 m; c = 5.0 m
C) B = 56.7°; a = 1.4 m; c = 4.0 m
D) B = 56.7°; a = 5.0 m; c = 6.3 m

163) 

163) _____

B = 65.4834°, c = 3829.0 m
Give side lengths to two decimal places.

A) A = 24.5166°; a = 1499.05 m; b = 3468.48 m
B) A = 24.5166°; a = 1651.45 m; b = 3483.78 m
C) A = 24.5166°; a = 1588.87 m; b = 3438.39 m
D) A = 24.5166°; a = 1588.87 m; b = 3483.78 m

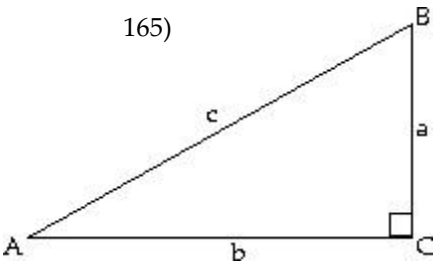
164) 

164) _____

B = 58.45°, a = 565.4 m
Give side lengths to two decimal places.

A) A = 31.55°; b = 864.30 m; c = 1080.57 m
B) A = 31.55°; b = 977.38 m; c = 1067.00 m
C) A = 31.55°; b = 920.84 m; c = 1080.57 m
D) A = 31.55°; b = 920.84 m; c = 1093.22 m

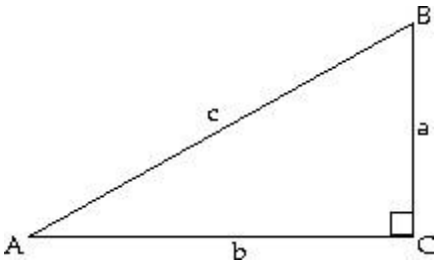
165)

165) 

____
_

a = 20.3 cm, b = 20.8 cm
Round the missing side length to one decimal place.

A) A = 77°25'; B = 12°35'; c = 27.1 cm
B) A = 77°25'; B = 12°35'; c = 29.1 cm
C) A = 44°18'; B = 45°42'; c = 30.8 cm
D) A = 44°18'; B = 45°42'; c = 29.1 cm

166) 

166) _____

a = 82.32 ft, c = 291 ft
Round the missing side length to two decimal places.

A) A = 14° 26′, B = 75° 34′, b = 293.07 ft
B) A = 16° 26′, B = 73° 34′, b =259.57 ft
C) A = 17° 26′, B = 72° 34′, b = 279.11 ft
D) A = 16° 26′; B = 73° 34′; b = 279.11 ft

Solve the right triangle.

167) a = 3.4 cm, b = 3.2 cm, C = 90° 167) _____
Round values to one decimal place.

A) A = 46.7°, B = 43.3°, c = 4.7 cm
B) A = 42.2°, B = 47.8°, c = 4.7 cm
C) A = 43.3°, B = 46.7°, c = 4.7 cm
D) A = 70.3°, B = 19.7°, c = 6.6 cm

168) a = 3.5 m, B = 41.5°, C = 90° 168) _____
Round values to one decimal place.

A) A = 48.5°, b = 5.6 m, c = 6.6 m
B) A = 48.5°, b = 5.6 m, c = 4.7 m
C) A = 48.5°, b = 3.1 m, c = 4.7 m
D) A = 48.5°, b = 2 m, c = 4.0 m

169) a = 2.4 in., A = 51.6°, C = 90° 169) _____
Round values to one decimal place.

A) b = 0.8 in., B = 38.4°, c = 2.5 in.
B) b = 1.9 in., B = 38.4°, c = 3.1 in.
C) b = 3.6 in., B = 38.4°, c = 3.1 in.
D) b = 3.6 in., B = 38.4°, c = 4.3 in.

170) B = 34.4°, c = 4.6 mm, C = 90° 170) _____

Round values to one decimal place.

A) a = 2.6 mm, A = 55.6°, b = 3.8 mm B) a = 3.8 mm, A = 55.6°, b = 2.6 mm

C) a = 3.8 mm, A = 55.6°, b = 3 mm D) a = 3 mm, A = 55.6°, b = 3.5 mm

171) A = 14° $14'$, c = 269 ft, C = 90° 171) _____

Round side lengths to two decimal places, if necessary.

A) B = 76° $45'$, a = 66.14 ft, b = 256.74 ft B) B = 75° $46'$, a = 66.14 ft, b = 260.74 ft

C) B = 75° $46'$, a = 65.57 ft , b = 259.85 ft D) B = 75° $45'$, a = 69.34 ft, b = 261.94 ft

172) A = 64° $13'$, c = 219 m , C = 90° 172) _____

Round side lengths to two decimal places, if necessary.

A) B = 25° $13'$, a = 198.4 m, b = 88.26 m B) B = 26° $37'$, a = 197.4 m, b = 95.26 m

C) B = 25° $47'$, a = 197.4 m, b = 102.26 m D) B = 25° $47'$, a = 197.2 m, b = 95.26 m

Solve the problem.

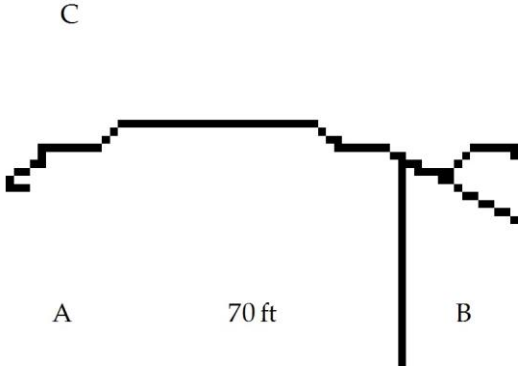
173) On a sunny day, a flag pole and its shadow form the sides of a right triangle. If the hypotenuse is 35 meters long and the shadow is 28 meters, how tall is the flag pole? 173) _____

A) 49 m B) 21 m C) 63 m D) 45 m

174) On a sunny day, a tree and its shadow form the sides of a right triangle. If the hypotenuse is 40 meters long and the tree is 32 meters tall, how long is the shadow? 174) _____

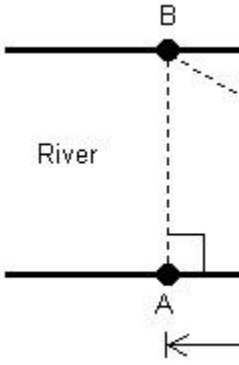
A) 24 m B) 51 m C) 72 m D) 64 m

175) To measure the width of a river, a surveyor starts at point A on one bank and walks 70 feet down the river to point B. He then measures the angle ABC to be $24°38'12''$. Estimate the width of the river to the nearest foot. See the figure below. 175) _____



A) 29 ft B) 64 ft C) 32 ft D) 153 ft

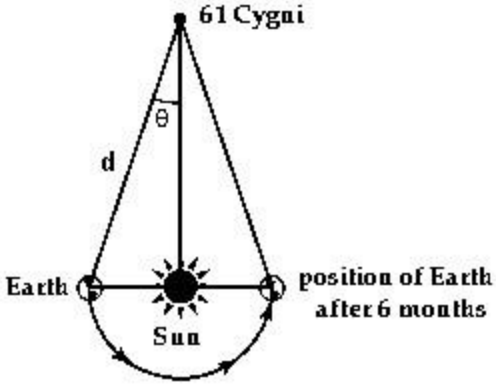
176) A conservation officer needs to know the width of a river in order to set instruments correctly for a study of pollutants in the river. From point A, the conservation officer walks 90 feet downstream and sights point B on the opposite bank to determine that $\theta = 30°$ (see figure). How wide is the river (round to the nearest foot)?



176) _____

A) 52 ft B) 104 ft C) 45 ft D) 156 ft

177) In 1838, the German mathematician and astronomer Friedrich Wilhelm Bessel was the first person to calculate the distance to a star other than the Sun. He accomplished this by first determining the parallax of the star, 61 Cygni, at 0.314 arc seconds (Parallax is the change in position of the star measured against background stars as Earth orbits the Sun. See illustration.) If the distance from Earth to the Sun is about 150,000,000 km and $\theta = 0.314$ seconds $= \frac{0.314}{60}$ minutes $= \frac{0.314}{60 \cdot 60}$ degrees, determine the distance d from Earth to 61 Cygni using Bessel's figures. Express the answer in scientific notation. 177) _____



A) 2.28×10^{13} km B) 1.97×10^{14} km C) 1.05×10^{14} km D) 9.85×10^{13} km

178) A tunnel is to be dug from point A to point B. Both A and B are visible from point C. If AC is 220 miles and BC is 547 miles, and if angle C is 90°, find the measure of angle B. Round your answer to the tenths place. 178) _____

A) 31.4° B) 21.9° C) 34.1° D) 18.7°

179) The length of the base of an isosceles triangle is 55.07 meters. Each base angle is 31.89°. Find the length of each of the two equal sides of the triangle. Round your answer to the hundredths place. 179) _____

A) 52.12 m B) 44.25 m C) 32.43 m D) 64.86 m

180) From a boat on the lake, the angle of elevation to the top of a cliff is $30°59'$. If the base of the cliff is 1194 feet from the boat, how high is the cliff (to the nearest foot)? 180) _____

A) 727 ft B) 730 ft C) 717 ft D) 720 ft

181) From a boat on the river below a dam, the angle of elevation to the top of the dam is $22°56'$. If the dam is 1688 feet above the level of the river, how far is the boat from the base of the dam (to the nearest foot)? 181) _____

A) 3990 ft B) 3970 ft C) 3980 ft D) 3960 ft

182) From a balloon 834 feet high, the angle of depression to the ranger headquarters is $72°28'$. How far is the headquarters from a point on the ground directly below the balloon (to the nearest foot)? 182) _____

A) 263 ft B) 268 ft C) 253 ft D) 258 ft

183) When sitting atop a tree and looking down at his pal Joey, the angle of depression of Mack's line of sight is $34°15'$. If Joey is known to be standing 10 feet from the base of the tree, how tall is the tree (to the nearest foot)? 183) _____

A) 7 ft B) 11 ft C) 13 ft D) 9 ft

184) From the top of a vertical tower, 374 feet above the the surface of the earth, the angle of depression to a doghouse is $24° 34'$. How far is it from the doghouse to the foot of the tower? Round your answer to the hundredths place when necessary. 184) _____

A) 920.74 ft B) 802.55 ft C) 818.14 ft D) 830.54 ft

185) A 33-foot ladder is leaning against the side of a building. If the ladder makes an angle of $22° 38'$ with the side of the building, how far is the bottom of the ladder from the base of the building? Round your answer to the hundredths place when necessary. 185) _____

A) 14 ft B) 12.7 ft C) 18.4 ft D) 3.33 ft

186) A 39-foot ladder is leaning against the side of a building. If the ladder makes an angle of $23° 41'$ with the side of the building, how far up from the ground does the ladder make contact with the building? Round your answer to the hundredths place when necessary. 186) _____

A) 33.15 ft B) 35.72 ft C) 38.88 ft D) 36.92 ft

187) A contractor needs to know the height of a building to estimate the cost of a job. From a point 91 feet away from the base of the building, the angle of elevation to the top of the building is found to be $47° 53'$. Find the height of the building. Round your answer to the hundredths place when necessary. 187) _____

A) 100.65 ft B) 99.12 ft C) 103.55 ft D) 104.88 ft

An observer for a radar station is located at the origin of a coordinate system. For the point given, find the bearing of an airplane located at that point. Express the bearing using both methods.

188) (7, 0) 188) _____

A) 90°; N 90° E or S 90° E B) 270°; N 90° E or S 90° E
C) 270°; N 90° W or S 90° W D) 90°; N 90° W or S 90° W

189) (-3, -3) 189) _____

A) 315°; N 45° E B) 315°; N 45° W C) 225°; S 45° W D) 225°; S 45° E

190) (3, -3) 190) _____

A) 45°; S 45° E B) 135°; S 45° E C) 135°; N 45° W D) 45°; N 45° W

191) (0, -9) 191) _____

A) 180°; N 0° W or N 0° E B) 180°; S 0° W or S 0° E
C) 0°; N 0° W or N 0° E D) 0°; S 0° W or S 0° E

Solve the problem.

192) A fire is sighted due west of lookout A. The bearing of the fire from lookout B, 12.6 miles due south of A, is N 40°50'W. How far is the fire from B (to the nearest tenth of a mile)? 192) _____

A) 16.7 mi B) 19.7 mi C) 17.7 mi D) 18.7 mi

193) A boat sails for 5 hours at 25 mph in a direction 164°23'. How far south has it sailed (to the nearest mile)? 193) _____

A) 118 mi B) 120 mi C) 116 mi D) 122 mi

194) A boat sails for 5 hours at 30 mph in a direction 164°56'. How far south has it sailed (to the nearest mile)? 194) _____

A) 141 mi B) 147 mi C) 143 mi D) 145 mi

195) An airplane travels at 200 km/h for 1 hr in a direction of 323° from Greenville. At the end of this time, how far west of Greenville is the plane (to the nearest kilometer)? 195) _____

A) 160 km B) 265 km C) 332 km D) 120 km

196) An airplane travels at 145 km/h for 5 hr in a direction of 97° from a local airport. At the end of this time, how far east of the airport is the plane (to the nearest kilometer)? 196) _____

A) 720 km B) 730 km C) 89 km D) 88 km

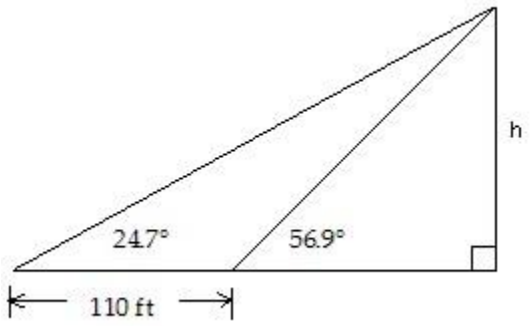
197) A ship travels 58 km on a bearing of 21°, and then travels on a bearing of 111° for 123 km. Find the distance from the starting point to the end of the trip, to the nearest kilometer. 197) _____

A) 21 km B) 136 km C) 54 km D) 181 km

198) Radio direction finders are set up at points A and B, 8.68 mi apart on an east-west line. From A it is found that the bearing of a signal from a transmitter is $N\ 54.3°E$, while from B it is $N\ 35.7°W$. Find the distance of the transmitter from B, to the nearest hundredth of a mile. 198) _____

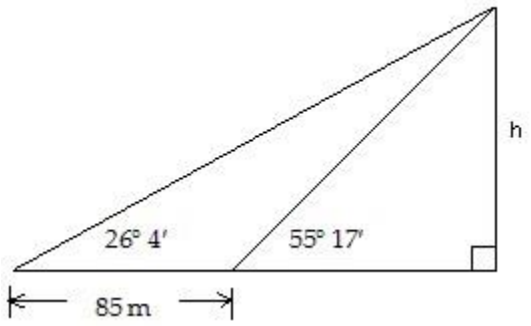
A) 5.07 mi B) 4.57 mi C) 7.05 mi D) 7.55 mi

199) Find h as indicated in the figure. Round to the nearest foot. 199) _____



A) 72 ft B) 77 ft C) 69 ft D) 75 ft

200) Find h as indicated in the figure. Round to the nearest meter. 200) _____



A) 83 m B) 63 m C) 163 m D) 48 m

201) The angle of elevation from a point on the ground to the top of a tower is $35°\ 16'$. The angle of elevation from a point 130 feet farther back from the tower is $24°\ 18'$. Find the height of the tower. Round to the nearest foot. 201) _____

A) 162 ft B) 1624 ft C) 158 ft D) 173 ft

202) Bob is driving along a straight and level road straight toward a mountain. At some point on his trip he

measures the angle of elevation to the top of the mountain and finds it to be $22° 39'$. He then drives 1 mile (1 mile = 5280 ft) more and measures the angle of elevation to be $33° 58'$. Find the height of the mountain to the nearest foot. 202) ____

A) 5889 ft B) 57,893 ft C) 578,931 ft D) 5789 ft

203) A person is watching a boat from the top of a lighthouse. The boat is approaching the lighthouse directly. When first noticed, the angle of depression to the boat is $19° 25'$. When the boat stops, the angle of depression is $48° 5'$. The lighthouse is 200 feet tall. How far did the boat travel from when it was first noticed until it stopped? Round to the nearest foot. 203) _____

A) 433 ft B) 388 ft C) 373 ft D) 410 ft

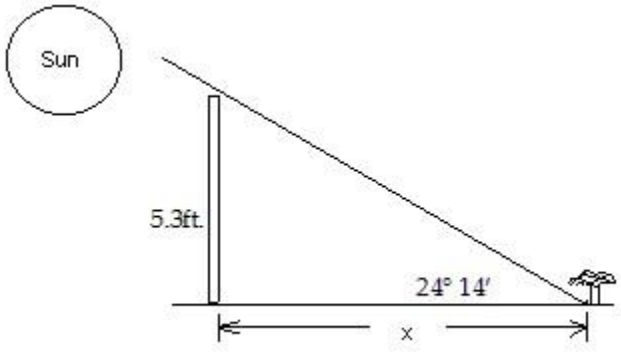
204) A person is watching a car from the top of a building. The car is traveling on a straight road directly toward the building. When first noticed, the angle of depression to the car is $27° 4'$. When the car stops, the angle of depression is $49° 11'$. The building is 210 feet tall. How far did the car travel from when it was first noticed until it stopped? Round to the nearest foot. 204) _____

A) 430 ft B) 256 ft C) 209 ft D) 230 ft

205) A person is watching a car from the top of a building. The car is traveling on a straight road away from the building. When first noticed, the angle of depression to the car is $49° 48'$. When the car stops, the angle of depression is $23° 16'$. The building is 210 feet tall. How far did the car travel from when it was first noticed until it stopped? Round to the nearest foot. 205) _____

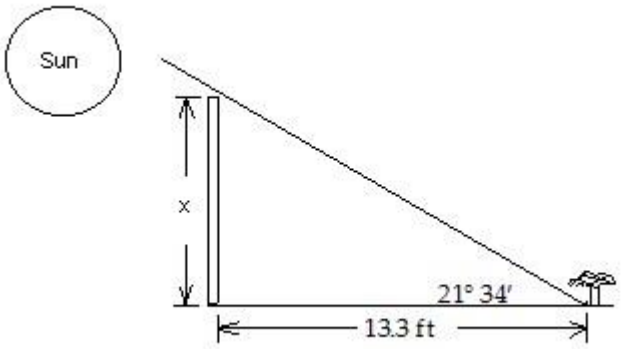
A) 290 ft B) 511 ft C) 311 ft D) 337 ft

206) In one area, the lowest angle of elevation of the sun in winter is $24° 14'$. Find the minimum distance x that a plant needing full sun can be placed from a fence that is 5.3 feet high. Round your answer to the tenths place when necessary. 206) _____



A) 15.2 ft B) 11.4 ft C) 11.8 ft D) 12 ft

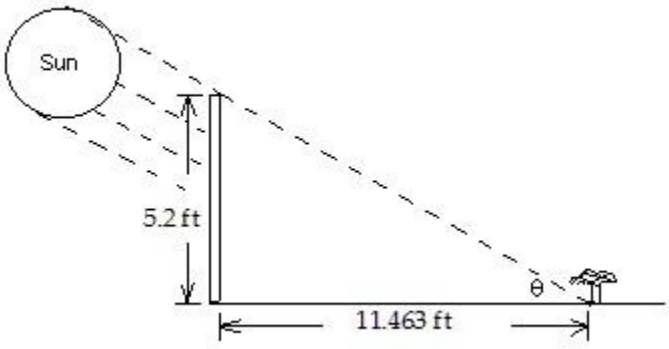
207) In one area, the lowest angle of elevation of the sun in winter is $21° 34'$. A fence is to be built 13.3 ft away from a plant in the direction of the sun. (See drawing) Find the maximum height, x , for the fence so that the plant will get full sun. Round your answer to the tenths place when 207) _____



necessary.

A) 5.6 ft B) 4.6 ft C) 5.3 ft D) 6.8 ft

208) A 5.2-ft fence is 11.463 ft away from a plant in the direction of the sun. It is observed that the shadow of the fence extends exactly to the bottom of the plant. (See drawing) Find θ, the angle of elevation of the sun at that time. Round the measure of the angle to the nearest tenth of a degree when necessary. 208) _____



A) θ = 24.6° B) θ = 24.4° C) θ = 25.8° D) θ = 24.2°

1) B
2) A
3) A
4) C
5) B
6) C
7) C
8) D
9) B
10) C
11) D
12) C
13) B
14) D
15) C
16) B
17) D
18) D
19) A
20) C
21) B
22) B
23) A
24) D
25) D
26) A
27) B
28) C
29) C
30) D
31) A
32) A
33) A
34) A
35) B
36) C
37) C
38) C
39) C
40) C
41) B
42) C
43) D
44) C
45) D
46) A
47) A
48) B
49) B
50) B
51) B

52) A
53) C
54) D
55) D
56) A
57) A
58) D
59) C
60) C
61) B
62) C
63) A
64) A
65) C
66) D
67) C
68) B
69) A
70) D
71) B
72) B
73) C
74) C
75) A
76) C
77) D
78) A
79) B
80) A
81) D
82) B
83) A
84) D
85) C
86) B
87) B
88) B
89) D
90) D
91) B
92) A
93) A
94) B
95) B
96) A
97) B
98) B
99) A
100) A
101) B
102) A
103) B

104) B
105) B
106) B
107) B
108) D
109) A
110) C
111) A
112) A
113) B
114) B
115) D
116) C
117) D
118) B
119) D
120) A
121) D
122) B
123) B
124) C
125) A
126) D
127) C
128) D
129) B
130) B
131) A
132) B
133) A
134) B
135) A
136) A
137) D
138) C
139) C
140) A
141) C
142) C
143) D
144) A
145) B
146) D
147) B
148) C
149) D
150) A
151) A
152) B
153) A
154) B
155) A

156) B
157) C
158) D
159) D
160) B
161) A
162) A
163) D
164) C
165) D
166) D
167) A
168) C
169) B
170) B
171) B
172) D
173) B
174) A
175) C
176) A
177) D
178) B
179) C
180) C
181) A
182) A
183) A
184) C
185) B
186) B
187) A
188) A
189) C
190) B
191) B
192) A
193) B
194) D
195) D
196) A
197) B
198) A
199) A
200) B
201) A
202) D
203) B
204) D
205) C
206) C
207) C

208) B