Trigonometry (Ch. 4) Test Review - CALCULATOR ALLOWED

1. A guy wire runs from the ground to a cell tower. The wire is attached to the cell tower $a = 190$ feet above the ground. The angle formed between the wire and the ground is $\theta = 75^\circ$ (see figure).

How long is the guy wire? Round your answer to one decimal place.

a. The guy wire is about 393.4 feet long.
b. The guy wire is about 65.6 feet long.
c. The guy wire is about 590.1 feet long.
d. The guy wire is about 98.4 feet long.
e. The guy wire is about 196.7 feet long.

2. A passenger in an airplane at an altitude of $a = 40$ kilometers sees two towns directly to the east of the plane. The angles of depression to the towns are $28^\circ$ and $55^\circ$ (see figure). How far apart are the towns? How far apart are the ships? Round your answer to one decimal place.

a. 49.2 km 
b. 47.2 km 
c. 48.2 km 
d. 50.2 km 
e. 51.2 km
3. A television camera at ground level is filming the lift-off of a space shuttle at a point $a = 700$ meters from the launch pad (see figure). Let $\theta$ be the angle of elevation to the shuttle and let $s$ be the height of the shuttle. Write $\theta$ as a function of $s$.

a. $\theta = \arccot \frac{s}{700}$

b. $\theta = \arcsin \frac{s}{700}$

c. $\theta = \arccsc \frac{s}{700}$

d. $\theta = \arctan \frac{s}{700}$

e. $\theta = \arctan \frac{s}{700}$
4. A boat is pulled in by means of a winch located on a dock $a = 5$ feet above the deck of the boat (see figure). Let $\theta$ be the angle of elevation from the boat to the winch and let $s$ be the length of the rope from the winch to the boat. Write $\theta$ as a function of $s$.

\[ a = 5 \quad s \]

a. $\theta = \text{arcsec} \left( \frac{5}{s} \right)$

b. $\theta = \text{arccos} \left( \frac{5}{s} \right)$

c. $\theta = \text{arcsin} \left( \frac{5}{s} \right)$

d. $\theta = \text{arctan} \left( \frac{5}{s} \right)$

e. $\theta = \text{arccsc} \left( \frac{5}{s} \right)$
5. A television camera is on a reviewing platform $a$ meters from the street on which a parade will be passing from left to right (see figure). Write the distance $d$ from the camera to a particular unit in the parade as a function of the angle $x$.

$a = 28$

\[ d = 28 \cos x \]

6. Solve the right triangle shown in the figure for all unknown sides and angles. Round your answers to two decimal places.

$A = 30^\circ, b = 15$

\[ a \approx 17.32, c \approx 8.66, B = 60^\circ \]

\[ a \approx 17.32, c \approx 8.66, B = 60^\circ \]
7. State the quadrant in which \( \theta \) lies if \( \tan \theta < 0 \) and \( \csc \theta > 0 \).
   a. Quadrant I
   b. Quadrant III
   c. Quadrant II
   d. Quadrant IV

8. Evaluate the expression. Round your result to two decimal places.

   \[ \sin^{-1} 0.75 \]
   a. 1.85
   b. \(-1.15\)
   c. \(-0.15\)
   d. 2.85
   e. 0.85

9. Find the exact values of the three trigonometric functions of the angle \( \theta \) \( (\cot \theta, \sec \theta, \csc \theta) \) shown in the figure. (Use the Pythagorean Theorem to find the third side of the triangle.)

   \[
   \begin{align*}
   a &= 9, \quad b = 41 \\
   a. \quad \cot \theta &= \frac{9}{40}, \quad \sec \theta &= \frac{1}{9}, \quad \csc \theta &= \frac{1}{41} \\
   b. \quad \cot \theta &= \frac{40}{9}, \quad \sec \theta &= \frac{41}{9}, \quad \csc \theta &= \frac{41}{40} \\
   c. \quad \cot \theta &= \frac{9}{40}, \quad \sec \theta &= \frac{41}{9}, \quad \csc \theta &= \frac{41}{40} \\
   d. \quad \cot \theta &= \frac{9}{40}, \quad \sec \theta &= \frac{1}{9}, \quad \csc \theta &= \frac{1}{40} \\
   e. \quad \cot \theta &= \frac{9}{40}, \quad \sec \theta &= \frac{41}{40}, \quad \csc \theta &= \frac{1}{9}
   \end{align*}
   \]
10. The point \((-5, -12)\) is on the terminal side of an angle in standard position. Determine the exact value of \(\tan \theta\).

a. \(\tan \theta = \frac{-13}{12}\)

b. \(\tan \theta = \frac{-12}{13}\)

c. \(\tan \theta = \frac{17}{12}\)

d. \(\tan \theta = \frac{-1}{12}\)

e. \(\tan \theta = \frac{12}{5}\)

11. Use the Pythagorean Theorem to determine the third side and then find the three trigonometric functions of \(\theta\): \(\sin \theta\), \(\cos \theta\), and \(\cot \theta\).

\[
\tan \theta = \frac{5}{12}
\]

a. \(\sin \theta = \frac{13}{5}, \cos \theta = \frac{13}{12}, \cot \theta = \frac{12}{5}\)

b. \(\sin \theta = \frac{13}{5}, \cos \theta = \frac{13}{12}, \cot \theta = \frac{12}{5}\)

c. \(\sin \theta = \frac{13}{5}, \cos \theta = \frac{13}{12}, \cot \theta = \frac{12}{5}\)

d. \(\sin \theta = \frac{13}{5}, \cos \theta = \frac{13}{12}, \cot \theta = \frac{12}{5}\)

e. \(\sin \theta = \frac{13}{5}, \cos \theta = \frac{13}{12}, \cot \theta = \frac{12}{5}\)
12. Find the radian measure of the central angle of a circle of radius $r$ that intercepts an arc of length $s$.

Radius $r$  ArcLengths

8 inches  24 inches

a. $\theta = 3$ radians
b. $\theta = \frac{1}{4}$ radians
c. $\theta = 192$ radians
d. $\theta = 32$ radians
e. $\theta = \frac{1}{3}$ radians

13. Evaluate the expression. Round your result to two decimal places.

arccos 0.32

a. 1.25
b. 0.25
c. –0.75
d. 2.25
e. 3.25

14. An airplane, flying at an altitude of $a = 6$ miles, is on a flight path that passes directly over an observer (see figure). If $\theta$ is the angle of elevation from the observer to the plane, find the distance $d$ from the observer to the plane when $\theta = 30^\circ$.

a. $d = 12$ miles
b. $d \approx 6.9$ miles
c. $d = 13$ miles
d. $d = 6$ miles
e. $d = 7$ miles
15. Determine the period and amplitude of the following function.

\[ y = 2 \cos \left( \frac{2x}{5} + \frac{\pi}{2} \right) \]

a. period: 3\pi; amplitude: 3
b. period: \( \frac{2\pi}{3} \); amplitude: 3
c. period: 3\pi; amplitude: 4
d. period: 10\pi; amplitude: 2
e. period: 5\pi; amplitude: 2

16. A plane is 57 miles west and 42 miles north of an airport. The pilot wants to fly directly to the airport. What bearing should the pilot take? Answer should be given in degrees and minutes.

a. 127° 25'
b. 129° 22'
c. 124° 20'
d. 53° 37'
e. 126° 23'

17. A ladder 20 feet long leans against the side of a house. Find the height from the top of the ladder to the ground if the angle of elevation of the ladder is 80°. Approximate the answer to one decimal place.

a. 22.7 ft
b. 23.7 ft
c. 19.7 ft
d. 20.7 ft
e. 21.7 ft
18. Find the area of the sector of the circle with radius $r$ and central angle $\theta$. Round to two decimal places.

$$\text{Radius } r \quad \text{Central Angle } \theta$$

8 inches $\quad \frac{\pi}{5}$

a. $A \approx 20.11$ square inches  
b. $A \approx 22.11$ square inches  
c. $A \approx 18.11$ square inches  
d. $A \approx 160.85$ square inches  
e. $A \approx 40.21$ square inches

19. Find the exact values of the three trigonometric functions of the angle $\theta$ ($\sin \theta, \cos \theta, \tan \theta$) shown in the figure. (Use the Pythagorean Theorem to find the third side of the triangle.)

\[a = 5\]

a. $\sin \theta = \frac{\sqrt{2}}{2}, \tan \theta = \sqrt{2}, \sec \theta = 1$

b. $\sin \theta = 1, \tan \theta = \sqrt{2}, \sec \theta = \frac{\sqrt{2}}{2}$

c. $\sin \theta = 1, \tan \theta = \frac{\sqrt{2}}{2}, \sec \theta = \sqrt{2}$

d. $\sin \theta = \sqrt{2}, \tan \theta = 1, \sec \theta = \frac{\sqrt{2}}{2}$

e. $\sin \theta = \frac{\sqrt{2}}{2}, \tan \theta = 1, \sec \theta = \sqrt{2}$
20. Find the value of given trigonometric function. Round your answer to four decimal places.

\[ \csc \left( \frac{2\pi}{9} \right) \]

a. \( \csc \left( \frac{2\pi}{9} \right) \approx 1.7557 \)

b. \( \csc \left( \frac{2\pi}{9} \right) \approx 1.5557 \)

c. \( \csc \left( \frac{2\pi}{9} \right) \approx -1.5557 \)

d. \( \csc \left( \frac{2\pi}{9} \right) \approx 1.6557 \)

e. \( \csc \left( \frac{2\pi}{9} \right) \approx 1.4557 \)

21. A granular substance such as sand naturally settles into a cone-shaped pile when poured from a small aperture. Its height depends on the humidity and adhesion between granules. The angle of elevation of a pile, \( \theta \), is called the angle of repose. If the height of a pile of sand is 13 feet and its diameter is approximately 45 feet, determine the angle of repose. Round answer to nearest degree.

a. 27°

b. 28°

c. 29°

d. 30°

e. 26°
22. The point \((7, 24)\) is on the terminal side of an angle in standard position. Determine the exact value of \(\tan \theta\).
   a. \(\tan \theta = \frac{25}{24}\)
   b. \(\tan \theta = \frac{7}{24}\)
   c. \(\tan \theta = \frac{24}{25}\)
   d. \(\tan \theta = \frac{25}{24}\)
   e. \(\tan \theta = \frac{24}{7}\)

23. Find the length of the arc on a circle of radius \(r\) intercepted by a central angle \(\theta\). Round to two decimal places.

<table>
<thead>
<tr>
<th>Radius (r)</th>
<th>Central Angle (\theta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 centimeters</td>
<td>(52^\circ)</td>
</tr>
</tbody>
</table>

   a. \(s \approx 24.32\) centimeters
   b. \(s \approx 28.32\) centimeters
   c. \(s \approx 29.29\) centimeters
   d. \(s \approx 26.32\) centimeters
   e. \(s \approx 8.38\) centimeters
A land developer wants to find the distance across a small lake in the middle of his proposed development. The bearing from \( A \) to \( B \) is N 20°W. The developer leaves point \( A \) and travels 59 yards perpendicular to \( AB \) to point \( C \). The bearing from \( C \) to point \( B \) is N 70°W. Determine the distance, \( AB \), across the small lake. Round distance to nearest yard.

a. 80 yards  
b. 50 yards  
c. 65 yards  
d. 32 yards  
e. 25 yards
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Answer Section

1. ANS: E  PTS: 1  REF: 4.3.71a
2. ANS: B  PTS: 1  REF: 4.8.25
3. ANS: E  PTS: 1  REF: 4.7.106a
4. ANS: C  PTS: 1  REF: 4.7.105a
5. ANS: A  PTS: 1  REF: 4.6.92
6. ANS: C  PTS: 1  REF: 4.8.5
7. ANS: C  PTS: 1  REF: 4.4.19
   OBJ: Determine quadrant given constraints
8. ANS: E  PTS: 1  REF: 4.7.29
9. ANS: C  PTS: 1  REF: 4.3.6
10. ANS: E  PTS: 1  REF: 4.4.15
    OBJ: Determine value of trig function given point on terminal side
11. ANS: C  PTS: 1  REF: 4.3.13
12. ANS: A  PTS: 1  REF: 4.1.93
13. ANS: A  PTS: 1  REF: 4.7.23
14. ANS: A  PTS: 1  REF: 4.4.97a
15. ANS: E  PTS: 1  REF: 4.5.6
    OBJ: Determine period and amplitude of trig graph
16. ANS: E  PTS: 1  REF: 4.8.36b  OBJ: Find bearings
17. ANS: C  PTS: 1  REF: 4.8.21
18. ANS: A  PTS: 1  REF: 4.1.101
19. ANS: E  PTS: 1  REF: 4.3.8
20. ANS: B  PTS: 1  REF: 4.2.52
21. ANS: D  PTS: 1  REF: 4.7.108a
    OBJ: Use inverse functions to solve for theta
22. ANS: E  PTS: 1  REF: 4.4.13
    OBJ: Determine value of trig function given point on terminal side
23. ANS: D  PTS: 1  REF: 4.1.92
24. ANS: B  PTS: 1  REF: 4.8.41
    OBJ: Find distance using surveying bearings