

Do all work neatly on a separate sheet of paper.

1. The Stratosphere in Las Vegas, Nevada, features two thrill rides located near the top. At a particular time of day the shadow cast by the tower is 535.8 ft long. The angle of elevation of the sun is  $65^\circ$ . What is the height of the Stratosphere Tower?
2. The chair lift at a ski resort rises at an angle of  $20.75^\circ$  and attains a vertical height of 1200 feet.
  - a. How far does the chair lift travel up the side of the mountain?
  - b. How far from the center of the base of the mountain is the bottom of ski lift?
3. A regular octagon has a perimeter of 56 inches. Find the apothem of the octagon.
4. When Mount Saint Helens erupted in 1980, the top of the mountain was blown off. A surveyor determined the height of the new summit by measuring the angle of elevation to the top to be  $37^\circ 46'$ . She then moved 1000 feet closer to the volcano and measured the angle of elevation to be  $40^\circ 30'$ . Find the new height of Mount Saint Helens.

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1. If right triangle  $\triangle ABC$  had legs  $a = 36$  and  $b = 77$  with hypotenuse  $c = 85$ , what is the measure of angle  $\angle A$ ?
  - a.  $25^\circ$
  - b.  $35^\circ$
  - c.  $65^\circ$
  - d.  $42^\circ$
2. A ladder leans against a building forming an angle of  $54^\circ$  with the ground. The base of the ladder is 7 feet from the building. Determine the length of the ladder.
  - a. 1.5 ft.
  - b. 9.4 ft.
  - c. 8.7 ft.
  - d. 11.9 ft.
3. A tree casts a shadow of 27 meters when the angle of elevation of the sun is  $26^\circ$ . Find the height of the tree to the nearest meter.
  - a. 24 m
  - b. 15 m
  - c. 320 m
  - d. 13 m
4. Which angle is not coterminal with  $421^\circ$ ?
  - a.  $781^\circ$
  - b.  $-299^\circ$
  - c.  $61^\circ$
  - d.  $-119^\circ$
5. Convert  $288^\circ$  to radians.
  - a.  $\frac{4}{5}\pi$
  - b.  $\frac{16}{5}\pi$
  - c.  $\frac{16}{15}\pi$
  - d.  $\frac{8}{5}\pi$

6. On a Ferris wheel, you travel through a central angle of  $\frac{21}{2}\pi$  before stopping. If the radius of the Ferris wheel is 80 feet, how many feet have you traveled?
  - a. 2638.9 ft
  - b. 2838.9 ft
  - c. 2538.9 ft
  - d. 2938.9 ft
7. Find  $\cot \theta$  if  $(8, 15)$  is a point on the terminal side of  $\theta$ .
  - a.  $\frac{15}{17}$
  - b.  $\frac{8}{17}$
  - c.  $\frac{8}{15}$
  - d.  $\frac{15}{8}$
8.  $\theta$  is an angle in standard position with point  $P(-4, 2)$  on the terminal side. Which statement is *not* correct?
  - a.  $\cos \theta = \frac{\sqrt{5}}{5}$
  - b.  $\cot \theta = -2$
  - c.  $\sin \theta = \frac{\sqrt{5}}{5}$
  - d.  $\sec \theta = -\frac{\sqrt{5}}{2}$
9. What are the values of  $\sin \theta$  and  $\cos \theta$  for the acute angle  $\theta$  in standard position if  $\tan \theta = \frac{2}{\sqrt{5}}$ ?
  - a.  $\sin \theta = \frac{2}{3}, \cos \theta = \frac{3}{\sqrt{5}}$
  - b.  $\sin \theta = \frac{3}{2}, \cos \theta = \frac{3}{\sqrt{5}}$
  - c.  $\sin \theta = \frac{2}{3}, \cos \theta = \frac{\sqrt{5}}{3}$
  - d.  $\sin \theta = \frac{\sqrt{5}}{3}, \cos \theta = \frac{2}{3}$
10. Which single expression is equivalent to  $\sin(\theta + \pi)$ .
  - a.  $\cos \theta$
  - b.  $\sin \theta$
  - c.  $-\sin \theta$
  - d.  $-\cos \theta$
11. Find one positive angle and one negative angle that are coterminal with an angle of  $-328^\circ$  in standard position.
12. Find the degree of the angle in standard position formed by rotating the terminal side by  $\frac{22}{45}$  of a circle.
13. Convert  $\frac{7}{4}\pi$  to degrees.
14. A wheel is 5 feet in diameter and rotates at 1100 rpm.
  - a. What is the angular speed of the wheel?
  - b. How fast is a point on the circumference of the wheel traveling in feet per minute? In miles per hour?
15. Express  $(\cos \theta)(\csc \theta)$  in terms of  $\tan \theta$

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1. Evaluate the expression  $\cos\left(\frac{7}{4}\pi\right)$ .

- a.  $\frac{\sqrt{2}}{2}$       b.  $-\frac{\sqrt{2}}{2}$       c. 0      d. -1

2. Evaluate the expression  $\tan\left(-\frac{257}{4}\pi\right)$ .

- a. -1      b.  $-\frac{\sqrt{2}}{2}$       c. 1      d.  $\frac{\sqrt{2}}{2}$

3. Evaluate  $\cos\frac{\pi}{6} + \sin\frac{\pi}{3}$  without using a calculator.

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1. One angle of a rhombus is  $38^\circ 42'$  and its sides are 4.836 in long. Find the length of the shorter diagonal.
2. Two observers A and B are in lighthouses 7 miles apart. Observer A spots a boat C and notes that  $m\angle BAC$  is  $64^\circ$ . At the same time observer B notes that  $m\angle ABC$  is  $43^\circ$ . What is the distance from B to C?
3. A ladder 27 ft long makes an angle of  $58^\circ$  with the horizontal when it reaches a certain window. What angle will a 33 ft long ladder make with the horizontal when it reaches the same window?
4. The radius of a circle is 12 in. What is the central angle that intercepts a chord 18 in long?
5. Two planes leave an airport at the same time. One flies SE at 186 mph, the other at a bearing of  $60^\circ$  at 213 mph. How far apart are the two planes after 2 hours?

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- Construct a triangle for which the terminal side lies in Quadrant IV and  $\tan \theta = -\frac{24}{7}$ . Then find  $\csc \theta$ .
- Find the exact values of the six trig functions if  $\theta = \frac{11\pi}{6}$ .
- Verify  $\cos 90^\circ = 2\cos^2 45^\circ - 1$
- Evaluate the following without a calculator:
  - $3\cos\left(\frac{\pi}{2}\right)\cos\left(\frac{\pi}{6}\right) + \sin\left(\frac{\pi}{3}\right)\sin^2\left(\frac{\pi}{6}\right)$
  - $\sec(0) - 2\sin(\pi)$
  - $3\csc\left(\frac{\pi}{2}\right) + 4\sec\left(\frac{\pi}{2}\right)$
- If the dimensions of a rectangle are 674 ft by 106 ft, find the measure of the angle between the shorter side and the diagonal.
- If the angle of elevation of the top of a building from a point 63 m from the base of the building is  $56^\circ 20'$ , what is the height of the building?
- Sketch each angle in standard position and give the measure of its reference angle:
  - $-17^\circ$
  - $185^\circ$
  - $\frac{5}{6}\pi$
- Given that the terminal side of an angle  $\theta$  in standard position goes through  $(-2, \sqrt{5})$ , find:
  - $\cot \theta$
  - $\csc \theta$
- If the central angle is  $50^\circ$  lies on a circle of radius 5, find the length of the arc.

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- Given  $a = 5$ ,  $b = 8$ , and  $C = 70^\circ$ , find  $c$ .
- Given  $c = 4$ ,  $a = 6$ , and  $A = 50^\circ$ , find  $C$ .
- Given  $A = 31^\circ 21'$ ,  $C = 65^\circ 50'$ , and  $c = 6$ , find  $b$ .
- Given  $c = 6$ ,  $B = 61^\circ 40'$ , and  $A = 92^\circ 30'$ , find the area of the triangle.
- Given  $b = 6$ ,  $a = 3$ , and  $A = 64^\circ$ , find the area of the triangle.
- Given  $a = 20$ ,  $b = 50$ , and  $c = 60$ , find the area of the triangle.
- Determine the number of triangles that exist with the given information and state why.
  - $B = 40^\circ$ ,  $b = 30$ ,  $c = 20$
  - $B = 140^\circ$ ,  $c = 30$ ,  $b = 20$
  - $C = 55^\circ 10'$ ,  $b = 480$ ,  $c = 628$
  - $A = 28^\circ$ ,  $a = 4.8$ ,  $b = 6$
- In a parallelogram with side lengths of 92 in and 48 in, the angle between the longer diagonal and the shorter side is  $43^\circ$ . What is the measure of the obtuse angle in the parallelogram?
- Two chords measuring 18.64cm and 14.32cm intersect at a point on a circle at an angle of  $114^\circ 26'$ . A third chord connects the noncommon endpoints of the chords to form a triangle. Find all the measurements of the triangle.
- A triangular plot of land has two sides that measure 185ft and 147ft which intersect at an angle measuring  $51^\circ 10'$ . Determine the area of the plot.
- Three circles are tangent to each other with radii of 115, 150, and 225. Draw the triangle formed by connecting their centers. Determine the measure of each angle of the triangle.
- A plane flying due east at 100 m/s is blown by a strong wind blowing due south at 40 m/s. Find the speed and bearing of the plane.
- Two forces, one of 30N and another of 50N act on an object. If the angle between the forces is  $40^\circ$ , find the magnitude and direction for the resulting force.

Complete the chart with the exact values of the six trigonometric functions for the given angle measurements.

| Radian | Degree      | $\sin \theta$ | $\cos \theta$ | $\tan \theta$ | $\csc \theta$ | $\sec \theta$ | $\cot \theta$ |
|--------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
|        | $0^\circ$   |               |               |               |               |               |               |
|        | $30^\circ$  |               |               |               |               |               |               |
|        | $45^\circ$  |               |               |               |               |               |               |
|        | $60^\circ$  |               |               |               |               |               |               |
|        | $90^\circ$  |               |               |               |               |               |               |
|        | $120^\circ$ |               |               |               |               |               |               |
|        | $135^\circ$ |               |               |               |               |               |               |
|        | $150^\circ$ |               |               |               |               |               |               |
|        | $180^\circ$ |               |               |               |               |               |               |
|        | $210^\circ$ |               |               |               |               |               |               |
|        | $225^\circ$ |               |               |               |               |               |               |
|        | $240^\circ$ |               |               |               |               |               |               |
|        | $270^\circ$ |               |               |               |               |               |               |
|        | $300^\circ$ |               |               |               |               |               |               |
|        | $315^\circ$ |               |               |               |               |               |               |
|        | $330^\circ$ |               |               |               |               |               |               |
|        | $360^\circ$ |               |               |               |               |               |               |