

All answers must be exact. Fractions must be expressed in lowest terms and radicals must be expressed in simplest radical form.

\_\_\_\_\_ 1. Find the radian measure of the central angle of a circle of radius 3 feet that intercepts an arc of 24 inches.

\_\_\_\_\_ 2. If  $\sin \theta = \frac{2\sqrt{3}}{9}$  and  $\frac{\pi}{2} < \theta < \pi$ , find  $\sec \theta$ .

\_\_\_\_\_ 3. Find the period of the graph of  $y = -8\cos\left(\frac{\pi}{5} - \frac{\pi}{15}x\right) + 6$

\_\_\_\_\_ 4. Write an algebraic expression equivalent to  $\csc\left(\arctan \frac{x}{5}\right)$ .

\_\_\_\_\_ 5. Simplify the expression to a single trigonometric function:  $\tan\left(x - \frac{\pi}{2}\right)\sin(-x)$

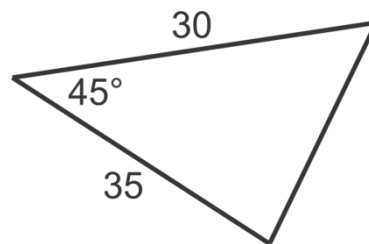
\_\_\_\_\_ 6. Find all solutions of the equation in the interval  $[0, \pi)$ :  $4 + 4\tan(3x) = 0$

\_\_\_\_\_ 7. Simplify to a single trigonometric function:  $\cos\left(\frac{\pi}{11}\right)\cos\left(\frac{\pi}{9}\right) - \sin\left(\frac{\pi}{9}\right)\sin\left(\frac{\pi}{11}\right)$ .

\_\_\_\_\_ 8. Write the trigonometric expression as an algebraic expression:  
 $\sin(\arccos(3x) - \arccos(x))$

\_\_\_\_\_ 9. Find the exact value of  $\csc(2\theta)$  if  $\sec(\theta) = -\frac{7}{3}$  and  $\pi < \theta < \frac{3\pi}{2}$ .

\_\_\_\_\_ 10. Find the area of a triangle pictured.



\_\_\_\_\_ 11. A hiker walks 80 feet from A to B with a bearing of N  $75^\circ$  E. Then she walks 60 feet from B to C with a bearing of N  $30^\circ$  E. Find the straight-line distance from C to A.