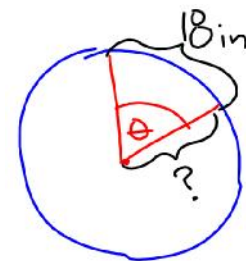


TEST: 5.1 – 5.2—Calculator Permitted  
Angles, angle measure, and applications of angles

Part I: Multiple Choice

- \_\_\_\_\_ 1. The angle  $\theta = -47845168^\circ$  terminates in which quadrant?  
 (A) I      (B) II      (C) III      (D) IV      (E) on an axis
- \_\_\_\_\_ 2. The minute hand of a clock is 9 inches long. What distance does its tip move in 19 minutes?  
 (A)  $\frac{19\pi}{270}$  in      (B)  $\frac{57\pi}{20}$  in      (C)  $\frac{19\pi}{540}$  in      (D)  $\frac{57\pi}{10}$  in      (E) 19 in
- \_\_\_\_\_ 3. For  $\theta = 276.798^\circ$ , Find the reference angle,  $\theta_{ref}$   
 (A)  $273.656^\circ$       (B)  $\frac{\pi}{6}$       (C)  $6.798^\circ$       (D)  $276.798^\circ$       (E)  $83.202^\circ$
- \_\_\_\_\_ 4. Which of the following angles is coterminal with  $-\frac{45049\pi}{4}$ ?  
 (A)  $\frac{5\pi}{4}$       (B)  $\frac{7\pi}{4}$       (C)  $\frac{3\pi}{4}$       (D)  $\frac{3\pi}{2}$       (E)  $\frac{\pi}{4}$
- \_\_\_\_\_ 5. Find the arc length of a circle of radius 14 feet subtended by a central angle of  $39^\circ$ .  
 (A) 1092 ft      (B) 546 ft      (C)  $\frac{39}{14}$  ft      (D)  $\frac{91\pi}{30}$  ft      (E)  $\frac{91\pi}{60}$  ft
- \_\_\_\_\_ 6. The angle  $\frac{6\pi}{19}$  expressed in degrees, minutes, seconds is  
 (A)  $18^\circ 5' 36.255''$       (B)  $570^\circ 0' 0''$       (C)  $178^\circ 34' 29.065''$       (D)  $181^\circ 26' 11.886''$       (E)  $56^\circ 50' 31.579''$
- \_\_\_\_\_ 7. A pizza slice from a 20-inch diameter pizza has a central angle of  $35^\circ$ . What is the area, in square inches, of this slice?  
 (A)  $\frac{350\pi}{9}$       (B) 700      (C)  $\frac{35\pi}{18}$       (D)  $\frac{175\pi}{18}$       (E)  $\frac{7\pi}{36}$
- \_\_\_\_\_ 8. As shown in the diagram at right, find the radius of a circle if an arc length of 18 inches is subtended by a central angle of  $\theta = \frac{3\pi}{10}$ .  
 (A)  $\frac{30}{\pi}$  in      (B) 3 in      (C)  $\frac{1}{3}$  in      (D)  $\frac{120}{\pi}$  in      (E)  $\frac{60}{\pi}$  in



Part II: Free Response

- \_\_\_\_\_ 9. The radius of a car wheel is 15 inches. How many revolutions per minute (rpm) is the wheel making when the car is travelling at 30 mph? Round your answer to the nearest revolution.  
 (A) 3318 rpm      (B) 4215 rpm      (C) 336 rpm      (D) 9 rpm      (E) 2101 rpm

Show all work and equations/formulas used. Avoid intermediate rounding error. Box your final answers, with units when appropriate.

10. A figure skater at the Sochi Olympics is in the middle of her long program, contending for the Gold Medal. She is currently spinning with her arms outstretched at a rate of  $\frac{180}{\pi}$  revolutions per minute. Oh, what a beautiful sight it is to behold!



- (a) What is her angular velocity, in radians per second?
- (b) Her fingertip travels in a circle of radius 80 cm. How far does her fingertip travel in the 2 seconds?
- (c) What is the linear velocity of her fingertip in centimeters per second at this time?
- (d) The end of her shoulder is 18 cm from her axis of rotation. Explain why it is correct to say that her shoulder has both the same velocity as AND a smaller velocity than her fingertip, depending on which kind of velocity you use.
- (e) As the skater draws in her arms, she is increasing her angular velocity to 17 radians per second. The tip of her elbow is now 23 cm from her axis of rotation. What is her elbow's linear velocity?
- (f) If you were a judge at the Sochi Olympics, what score would you give this skater?

