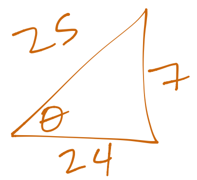
Name KEY Date Period

TEST: 5.1 – 5.3—Calculator Permitted A
Angles, angle measure, applications of angles, & Circular Functions.

Part I: Short Answer—Show all work. No work, no credit.

A 1. In a $7-24-25$ right triangle, if θ is the smallest angle, what is $\tan\theta$?

(A) $\frac{7}{24}$ (B) $\frac{24}{25}$ (C) $\frac{7}{25}$ (D) $\frac{5}{7}$ (E) $\frac{25}{24}$



$\tan\theta = \frac{7}{24}$

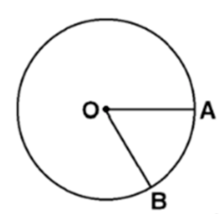
C 2. $\sec\left(\frac{-117139\pi}{6}\right) =$

(A) -.866 (B) .5 (C) -1.154 (D) -1.732 (E) -2

$1/\cos\left(\frac{-117139\pi}{6}\right)$

A 3. . In circle O below, the length of arc $\overset{\frown}{AB}$ is 7 feet, and the measure of central angle $\angle AOB$ is $48°$.

$\frac{48°}{1}\left(\frac{\pi}{180°}\right) = \frac{4\pi}{15}$



Which of the following is the approximate length of the radius $\overline{OB}$?

(A) 8.355 ft (B) 82.466 ft (C) 5.864 ft. (D) 26.25 ft (E) .594 ft

$s = r\theta$

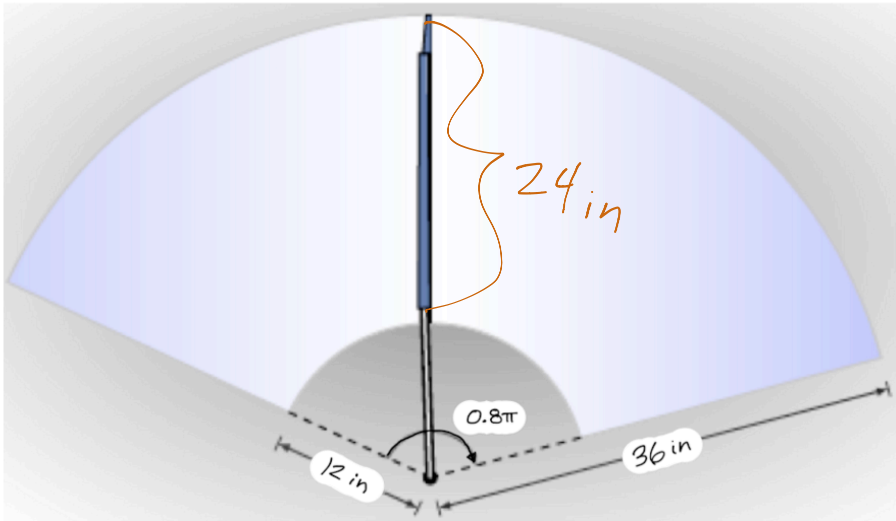
$7 = r\left(\frac{4\pi}{15}\right)$

$r = 7\left(\frac{15}{4\pi}\right) = 8.355\text{ft}$

C 4. The radius of a car tire is 15 inches. If the car is traveling down the road at 60 mph, to the nearest RPM, how fast are the tires spinning?

(A) 374 (B) 6635 (C) 672 (D) 841 (E) 7143

$\frac{60\text{mi}}{1\text{hr}} \times \frac{1\text{hr}}{60\text{min}} \times \frac{5280\text{ft}}{1\text{mile}} \times \frac{12\text{in}}{1\text{ft}} \times \frac{1\text{rot}}{\underbrace{2\pi(15)\text{in}}_{\text{Circumference}}} = 672.270\text{ rpm}$



D ___ 5. A windshield wiper that is 24 inches long sweeps through an angle of 0.8π radians, as shown in the diagram above. To the nearest square inch, what is the area of the region, in square inches, covered by the wiper?

(A) 230 (B) 461 (C) 724 (D) 1448 (E) 2895

$A = \frac{1}{2}R^2\theta - \frac{1}{2}r^2\theta$

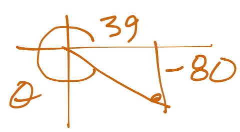
$= \frac{1}{2}\theta(R^2 - r^2)$

$= \frac{1}{2}(0.8\pi)(36^2 - 12^2)$

$= 1447.645 \text{ in}^2$

E ___ 6. The terminal ray of an angle θ passes through the point $(39,-80)$. If $0° \le \theta < 360°$, what is θ?

(A) 64.010° (B) 115.989° (C) 151.010° (D) 244.010° (E) 295.989°



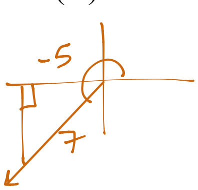
$\theta = \tan^{-1}\left(-\frac{80}{39}\right)$

$= -64.010°\ldots + 360°$

$= 295.989°$

D ___ 7. If $\cos\theta = -\frac{5}{7}$ and $\cot\theta > 0$, find θ.

(A) 44.415° (B) 135.585° (C) 151.010° (D) 224.415° (E) 225.585°



$\theta = \cos^{-1}\left(-\frac{5}{7}\right)$

$= 135.584\ldots°$

$\theta_{ref} = 180° - 135.584\ldots°$

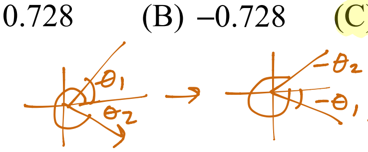
$= 44.415\ldots°$

$\theta = 180° + 44.415\ldots° = 224.415°$

C ___ 8. If $\cos\theta = 0.7$, then $\cos(-\theta) + \sec\theta =$

$0.7 + \frac{1}{0.7} = 2.128$

(A) 0.728 (B) −0.728 (C) 2.128 (D) −2.128 (E) 0



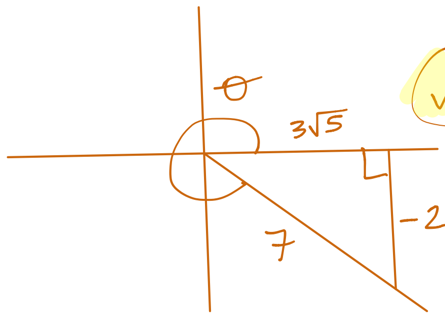
same ratio for $\cos\theta$ & $\cos(-\theta)$

Part II: Free Response

Show all work below. Avoid intermediate rounding error. Box your final answers, with units when appropriate.

10. If $\csc\theta = -\frac{7}{2}$ and $\tan\theta < 0$

(a) Draw the reference triangle for θ in the correct quadrant. Show your arc and angle θ.



✓1

$x^2 + (-2)^2 = 7^2$

$x = \sqrt{49-4}$

$x = \sqrt{45} = 3\sqrt{5}$ ✓2

(b) Explain in 3 or more complete sentences why you chose the quadrant above for θ to terminate.

The cosecant ratio is negative.
cosecant is negative when y is negative.
✓3 This puts you in either QIII or QIV.
tangent is neg in QII & QIV.
The overlapping quadrant is QIV.

(c) Find the **simplified, exact, rationalized** value of $\cot\theta$.

$\cot\theta = \frac{3\sqrt{5}}{-2}$ or $\frac{\sqrt{45}}{-2}$ ✓4

(d) Find the **simplified, exact, rationalized** value of $\sin\theta$.

$\sin\theta = -\frac{2}{7}$ ✓5

(e) Find the reference angle, θ_{ref}, for θ in degrees. **Show the equation you are solving** and report 3 decimals.

$$\theta = \sin\left(-\frac{2}{7}\right) \quad \sqrt{6}$$

$$\theta = -16.6015^\circ$$

So, $\theta_{ref} = 16.601^\circ$ or 16.602° $\sqrt{7}$

(f) To three decimals, find the value of θ such that $\theta \in \left[0^\circ, 360^\circ\right)$. Show the computations that lead to your answer.

$$\theta = 360^\circ - \theta_{ref}$$

$$= 343.398^\circ \quad \sqrt{8}$$

(g) If ϕ is a coterminal angle to θ such that $\phi = \theta + (360)\left(360^\circ\right)$, what is the **simplified, exact value** of $\csc\phi$?

$$\csc\phi = \csc\theta = -\frac{7}{2} \quad \sqrt{9}$$

since ϕ is coterminal with θ & coterminal angles have the same trig ratios.