

Use the blank paper provided for all your work and answers.

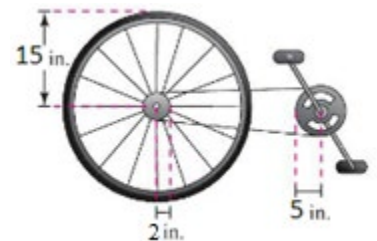
Leave 1-inch margin top, bottom, left and right.

Write big. Write dark.

Show all work.

Circle final answers.

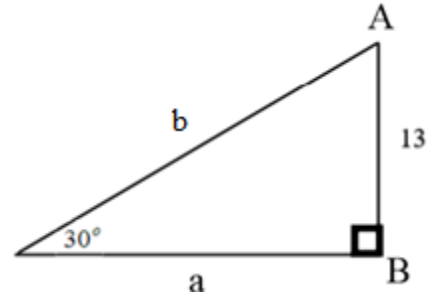
1. Arc Length and Area of Sector. Suppose we have a circle of radius $r = 7$.
 - a. (5 pts) Find the arc length on the circle, that is intercepted by an angle of 1220° . Round to 3 decimal places.
 - b. (5 pts) Find the *exact* area of the sector that is intercepted (swept through) by an angle of $\theta = \frac{7\pi}{6}$
2. Answer the questions about the equation $\sin(\theta) = \frac{2}{3}$.
 - a. (5 points) Sketch two triangles that satisfy $\sin(\theta) = \frac{2}{3}$.
 - b. (5 pts) Assume the terminal side of the angle θ lies in the 2nd quadrant. Find the other five trigonometric functions of θ .
 - c. (5 pts) Again, assuming θ 's terminal side lies in Q II, and $0 \leq \theta < 2\pi$, find θ , in radians *and* degrees, rounded to 3 decimal places.
 - d. (5 pts) Give *all* solutions to the equation $\sin(\theta) = \frac{2}{3}$, in degrees *and* radians, rounded to three (3) decimal places.
3. (5 pts) Sketch one period of the graphs of $y = \sin(x)$ and $y = \csc(x)$ on the same set of coordinate axes.
4. The radii of the pedal sprocket, the wheel sprocket, and the wheel of the bicycle in the figure are 5 inches, 2 inches and 15 inches, respectively. A cyclist is pedaling at a rate of 1.4 revolutions per second.
 - a. (5 pts) Find the speed of the bicycle in feet per second.
 - b. (5 pts) Convert your answer, above, to miles per hour. Round final answers to 1 decimal place.



5. (5 pts) Sketch the graph of $f(x) = 2 \cos\left(\frac{\pi}{4}x + \frac{7\pi}{4}\right) + 5$.

6. (5 pts) Write the cosine function that achieves its maximum height of $y = 23$ centimeters at time $t = 6$ seconds and its minimum height of $y = -5$ centimeters at $t = 30$ seconds.

7. (5 pts) Solve the triangle in the figure on the right. That means, find all lengths and angles. Exact answers required.



8. (5 pts) Find the exact value of $\arctan\left(\sin\left(\frac{3\pi}{2}\right)\right)$

9. (5 pts) Find $\sin\left(\frac{u}{2}\right)$, $\cos\left(\frac{u}{2}\right)$, and $\tan\left(\frac{u}{2}\right)$, given that $\sin(u) = -\frac{2}{3}$ and $\pi \leq u < \frac{3\pi}{2}$.

10. Consider the equation $4\sin^2(x) - 3 = 0$.

a. (5 pts) Find all solutions x , in radians *and* degrees, to the equation in the interval $[0, 2\pi)$.

b. (5 pts) Find all real solutions x , in radians *and* degrees.

11. (5 pts) Draw the picture and use it to re-write $\sin\left(\cos^{-1}\left(\frac{2}{x}\right)\right)$ as an algebraic expression.

12. Find the *exact* value of $\cos\left(\frac{5\pi}{12}\right)$ in two ways: (Hint: If degrees are easier for you, *use degrees*.)

a. (5 pts) Use a Sum identity.

b. (5 pts) Use a Half-Angle identity

13. (5 pts) Find $\sin(2u)$, $\cos(2u)$ and $\tan(2u)$, given that $\cos(u) = \frac{4}{11}$ and $\sin(u) < 0$.

14. BONUS (5 pts) Re-write $\cos(\arcsin(x) + \arccos(x))$ as an algebraic expression. (Hint: Use Sum identity.)