Do all your work and submit answers with your work, on the separate paper provided. Organize your work for efficient grading and feedback. Leave a margin, especially in the top left corner!

Leave space between problems. No prizes for saving paper, here. Figure this stuff out, and use your smarts to plant trees! Only use one column of work. Don't start a 2nd column to save paper. ALL I WANT ON THIS TEST COVER SHEET IS YOUR NAME. No points for answers on this page.

1. (10 pts) Find two angles, between -2π and 2π (i.e., -360⁰ and 360⁰) that are coterminal with $\dfrac{33\pi}{8}$. Give

   exact answers in degrees and radians.

2. (5 pts) Arc Length. Suppose we have a kid's wagon wheel of radius $r = 8$ inches. If the wagon rolls 50 feet, how many revolutions of the wheel were there? Round your answer to one (1) decimal place.

3. (5 pts) Find the *exact* area of the sector that is intercepted (swept through) by an angle of $\theta = \dfrac{3\pi}{8}$ on a

   circle of radius $r = 40$ cm.

4. Answer the questions about the equation $\tan(\theta) = -\dfrac{2}{7}$.

   a. (5 points) Sketch two triangles that satisfy $\tan(\theta) = -\dfrac{2}{7}$.

   b. (5 pts) Suppose that $\cos(\theta) > 0$. Find the other five trigonometric functions of θ.

   c. (5 pts) Assuming $0 \le \theta < 2\pi$, find θ, in radians *and* degrees, rounded to 3 decimal places.

   d. (5 pts) Give *all* solutions to the equation $\sin(\theta) = -\dfrac{2}{7}$, in degrees *and* radians, rounded to three (3)

      decimal places.

5. (10 pts) Sketch one period of the graphs of $y = \sin(x)$ and $y = \csc(x)$ on the same set of coordinate axes.

6. (10 pts) The radii of the pedal sprocket, the wheel sprocket, and the wheel of the bicycle in the figure are 5 inches, 3 inches and 16 inches, respectively. A cyclist is pedaling at a rate of 1.5 revolutions per second. Find the speed of the bicycle in feet per second. Then convert that to miles per hour. Round final answers to 1 decimal place.
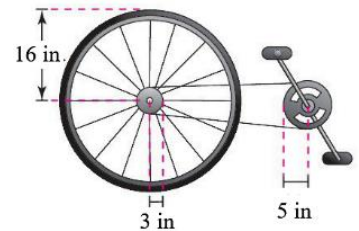
7. (10 pts) Sketch the graph of $f(x) = 30\sin\left(\dfrac{\pi}{11}x - \dfrac{12\pi}{11}\right) + 50$.

8. (10 pts) Write the cosine function that achieves its maximum height of $y = 250$ meters at time $t = 7$ seconds and its minimum height of $y = 30$ meters at $t = 55$ seconds.

9. (5 pts) Solve the triangle. That means, find all lengths and angles.
   Round your *final* answers to 4 decimal places.
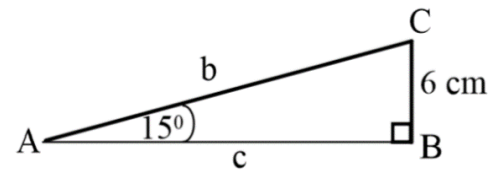
10. Find the exact value of…

   a. … (5 pts) $\cot\left(\arcsin\left(\dfrac{2}{7}\right)\right)$.

   b. … (5 pts) $\arcsin\left(\sin\left(\dfrac{7\pi}{6}\right)\right)$

11. (5 pts) Draw the sketch and use it to find an algebraic expression that is equivalent to $\tan\left(\arcsin\left(\dfrac{3}{5x}\right)\right)$

Bonus: Answer *two* of the following, for *up to* 10 points:

B1. (5 pts) Sketch the picture(s) corresponding to the following information, *if possible*. If
    it is *not* possible, briefly explain why.
    a. $\tan(x)=0$
    b. $\cos(x)=0$
    c. $\sin(x)=\dfrac{2}{\sqrt{5}}$
    d. $\sec(x)=\dfrac{\sqrt{5}}{2}$
    e. $\sin(x)=1$

B2. (5 pts) Sketch the graph of one period of $y=\tan(x)$ (restricted to make it 1-to-1) *and* $y=\arctan(x)$ on the
    same set of coordinate axes. I want to see the function and its inverse in the same picture. Label $\left(\dfrac{\pi}{4},1\right)$ in
    the graph of tangent, and $\left(-1,-\dfrac{\pi}{4}\right)$ in the graph of arcangent. State the domain and range of the restricted
    tangent function and its inverse.

B3. (5 pts) Explain, in your own words, how to reason to the arc-length and area-of-a-sector formulas, from the
    formulas for the circumference and area of a circle.