Math 32, Spring 2010, Section 101
Worksheet 9

Work through the following problems in groups of about four. Take turns writing; everyone should get a chance to write for some of the problems. It's more important to understand the problems than to do all of them.

1. What is the definition of an angle in radians?

   Arclength divided by radius.

2. Is $\sin(3^\circ)$ equal to $\sin(3 \text{ radians})$? If there is no symbol indicating either degrees or radians, how should one interpret it (i.e. what does sin(3) mean?)

   No, 3 radians is different than 3 degrees. Unless otherwise specified, assume radians (although if it's unclear on a quiz or test, it never hurts to ask).

3. Why do we use radians?

   One reason is that it often makes formulas more simple.

4. How do you convert between radians and degrees?

   Radians = Degrees $*\pi/180$ and Degrees = Radians $*180/\pi$. If you find yourself confusing the formulas, you can check that your formula converts 360 degrees to 2π radians, and vice versa.

5. What is the length of the shaded arc on the circle? What is the area of the sector it descibes?

   The picture drawn on the board had a sector with angle $\theta = 5\pi/8$ and radius $r = 8$ (unless I'm remembering incorrectly; let's go with these numbers). In that case, the arc has length $s = r\theta$ and the area of the sector is $\frac{1}{2}r^2\theta$.

6. A wheel of radius 10cm rotates 100 times per minute. What is the angular speed of the wheel? What is the linear speed of the outside edge? If the wheel had radius 10mm instead, would these speeds increase, decrease or stay the same (justify your answers intuitively)?

   If the wheel is rotating 100 times per minute, it is passing through an angle of 200π radians per minute, which is the angular speed. In one minute, a point on the wheel has circumference 20π cm, so a point on the outside moves 2000π centimeters per minute, or 20π meters per minute. If the wheel were smaller, the circumference would be smaller so the linear speed would be smaller. However, the angular speed would stay the same.