Thus, 360° equals 2π rad, or one complete revolution. In other words, one revolution corresponds to an angle of approximately $2(3.14) = 6.28$ rad. **Figure 2** on the previous page depicts a circle marked with both radians and degrees.

It follows that any angle in degrees can be converted to an angle in radians by multiplying the angle measured in degrees by $2\pi/360°$. In this way, the degrees cancel out and the measurement is left in radians. The conversion relationship can be simplified as follows:

$$\theta(\text{rad}) = \frac{\pi}{180°}\theta(\text{deg})$$

Angular displacement

Just as an angle in radians is the ratio of the arc length to the radius, the **angular displacement** traveled by the bulb on the Ferris wheel is the change in the arc length, Δs, divided by the distance of the bulb from the axis of rotation. This relationship is depicted in **Figure 3.**

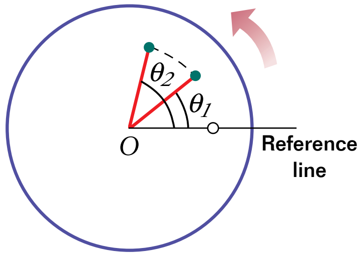

Figure 3
A light bulb on a rotating Ferris wheel rotates through an angular displacement of $\Delta\theta = \theta_2 - \theta_1$.

ANGULAR DISPLACEMENT

$$\Delta\theta = \frac{\Delta s}{r}$$

$$\textbf{angular displacement (in radians)} = \frac{\textbf{change in arc length}}{\textbf{distance from axis}}$$

This equation is similar to the equation for linear displacement in that this equation denotes a change in position. The difference is that this equation gives a change in *angular* position rather than a change in *linear* position.

For the purposes of this textbook, when a rotating object is viewed from above, the arc length, *s*, is considered positive when the point rotates counterclockwise and negative when it rotates clockwise. In other words, $\Delta\theta$ is positive when the object rotates counterclockwise and negative when the object rotates clockwise.

Quick Lab

Radians and Arc Length

MATERIALS LIST

- **drawing compass**
- **paper**
- **thin wire**
- **wire cutters or scissors**

SAFETY

Cut ends of wire are sharp. Cut and handle wire carefully.

Use the compass to draw a circle on a sheet of paper, and mark the center point of the circle. Measure the radius of the circle, and cut several pieces of wire equal to the length of this radius. Bend the pieces of wire, and lay them along the circle you drew with your compass. Approximately how many pieces of wire do you use to go all the way around the circle? Draw lines from the center of the circle to each end of one of the wires. Note that the angle between these two lines equals 1 rad. How many of these angles are there in this circle? Repeat the experiment with a larger circle, and compare the results of each trial.