1. Open **Radian Measure Present.gsp.** Press the *Go* button.

As the radius segment rolls around the circle, explain that students can think of a radian as the angle that corresponds to one length of the radius being laid out along the circumference of the circle.

Q1 How long is the blue segment? [It's equal to the radius of the circle.]

Q2 What do the red ticks mark off? [Each tick marks a distance of one radius and an angle of one radian.]

2. Press *Reset;* then *1 Radian.* The animation stops after marking off one radian.

Q3 About how many degrees are there in one radian? To coax a good guess, point out the triangle formed by points *A, B,* and *C.* You can think of arc *BC* as a side of the triangle. That would make it an equilateral triangle, but one of the sides is not straight. Would that make $\angle BAC$ greater than 60° or less than 60°?

3. Press *Show Central Angle.* It will show that $\theta \approx 57.30°$.

4. Press *Semicircle.*

Q4 Count the tick marks. How many radians are there in a semicircle? [a little more than 3]

To change the angle units, choose **Edit | Preferences.**

5. Change the Angle Units to **radians.** Angle θ appears as 1π radians.

6. So a semicircle has π radians. That means that a circle must have 2π radians. Press *1 Circle* to confirm that.

Q5 But you already knew that, didn't you? What is the circumference in terms of r? [$2\pi r$] So how many times will the radius go into the circumference? [2π] So how many radians are there in a circle? [2π]

7. Press *Reset;* then press *Go.* Press *Go* again to stop the animation with θ somewhere between 0 and 2π. Press *Show Arc.*

When entering numbers that are on the screen, click the measurement itself.

8. Here is something you can do with radians, but not with degrees. Choose **Number | Calculate.** Enter $\theta \cdot r$. Compare the calculation with the measured length of the arc. Try it with several different values of θ and r.

Q6 The formula for area of a sector is $\frac{\theta}{360°}\pi r^2$. Convert the 360° to radians and simplify. What is the new formula? $\left[\frac{\theta r^2}{2}\right]$

9. Press *Show Sector.* Use the Sketchpad Calculator and enter $\theta \cdot r^2/2$. Compare the answer to the measured arc length.