

### Section 3.2: Applications of Radian Measure

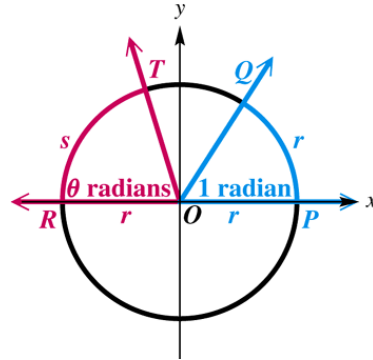
#### I. Arc Length on a Circle

- **Formula:** The length  $s$  of the arc intercepted on a circle of radius  $r$  by a central angle of measure  $\theta$  radians is given by the product of the radius and the radian measure of the angle.

$$s = r\theta, \quad \text{where } \theta \text{ is in radians}$$

#### CAUTION

*When the formula  $s = r\theta$  is applied, the value of  $\theta$  MUST be*



- Why? Proportionality...

**Example 1 (Finding Arc Length Using  $s = r\theta$ ):** A circle has radius 25.60 cm. Find the length of the arc intercepted by a central angle having each of the following measures.

a)  $\theta = \frac{7\pi}{8}$

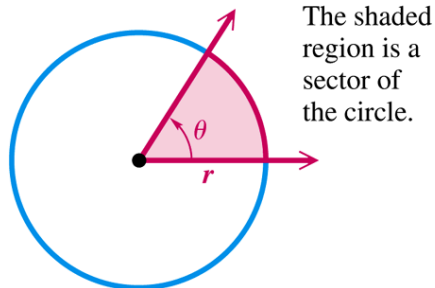
b)  $\theta = 54^\circ$

**Example 2 (Application):** A rope is being wound around a drum with radius 0.327 m. How much rope will be wound around the drum if the drum is rotated through an angle of  $132.6^\circ$ ?

**Practice (Finding an Angle Measure Using  $s = r\theta$ ):** Two gears are adjusted so that the smaller gear drives the larger one. If the radii of the gears are 3.6 in. and 5.4 in., and the smaller gear rotates through  $150^\circ$ , through how many degrees will the larger gear rotate?

**II. Area of a Sector of a Circle**

- A **sector of a circle** is the portion of the interior of a circle intercepted by a central angle.
- Think of it as a “piece of pie.”



- **Formula:** The area  $A$  of a sector of a circle of radius  $r$  and central angle  $\theta$  is given by the following formula.

$$A = \frac{1}{2}r^2\theta, \quad \theta \text{ in radians}$$

**Example 3(Finding the Area of a Sector):** Find the area of a sector of a circle having radius 15.20 ft and central angle  $108.0^\circ$ .