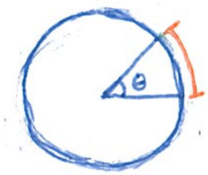
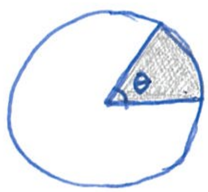
Arc length → length measured along the edge of the circle, a fraction of the circumference



$$\text{arc length} = \left(\frac{\theta^\circ}{360^\circ}\right) \cdot 2\pi r$$

Sector area → area of pizza slice, a fraction of the circle's area



$$\text{sector area} = \left(\frac{\theta^\circ}{360^\circ}\right) \cdot \pi r^2$$

Example Problem

The minute hand of a clock is 1.2 cm long. How far does the tip of the minute hand move in 20 minutes? What area is swept out by the hand?

20 minutes = $\frac{1}{3}$ of 60 min, so $\frac{1}{3}$ of circle

$$\text{arc length} = \frac{1}{3} \cdot 2\pi \cdot 1.2 \text{ cm}$$
$$= 0.8\pi \text{ cm}$$
$$\approx 2.51 \text{ cm}$$

$$\text{sector area} = \frac{1}{3} \cdot \pi \cdot (1.2 \text{ cm})^2$$
$$= 0.48\pi \text{ cm}^2$$
$$\approx 1.51 \text{ cm}^2$$

Radians

definition – another way to measure angles, without degrees

$$\text{angle measure in radians} = \frac{\text{arc length}}{\text{radius}}$$

one radian is the angle where the arc is the length of the radius

converting between degrees and radians

$180^\circ = \pi$ radians

$$\text{angle in radians} = \text{angle in degrees} \cdot \frac{\pi \text{ radians}}{180^\circ}$$

$$\text{angle in degrees} = \text{angle in radians} \cdot \frac{180^\circ}{\pi \text{ radians}}$$