

10-3 The Unit Circle

If you know the measure of a central angle of a circle, you can determine the length s of the arc intercepted by the angle.

$$\frac{\text{radian measure of } \theta}{\text{radian measure of circle}} \rightarrow \frac{\theta}{2\pi} = \frac{s}{2\pi r} \leftarrow \frac{\text{arc length intercepted by } \theta}{\text{arc length intercepted by circle}}$$

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

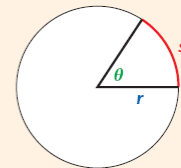
$$s = r\theta$$

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Arc Length Formula

For a circle of radius r , the arc length s intercepted by a central angle θ (measured in radians) is given by the following formula.

$$s = r\theta$$



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Example 3: Automobile Application

A tire of a car makes 653 complete rotations in 1 min. The diameter of the tire is 0.65 m. To the nearest meter, how far does the car travel in 1 s?

$$S = r\theta$$

$$S = (0.325) \left(\frac{653 \text{ rotations}}{60 \text{ seconds}} \right) (2\pi \text{ rad})$$

$$S = 22.22 \text{ m/second}$$

$$22 \text{ m/second}$$

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Check It Out! Example 3a

A minute hand on Big Ben's Clock Tower in London is 14 ft long. To the nearest tenth of a foot, how far does the tip of the minute hand travel in 1 minute?

$$S = r\theta$$

$$S = 14 \left(\frac{2\pi}{60} \right)$$

$$S \approx 1.5 \text{ ft}$$

