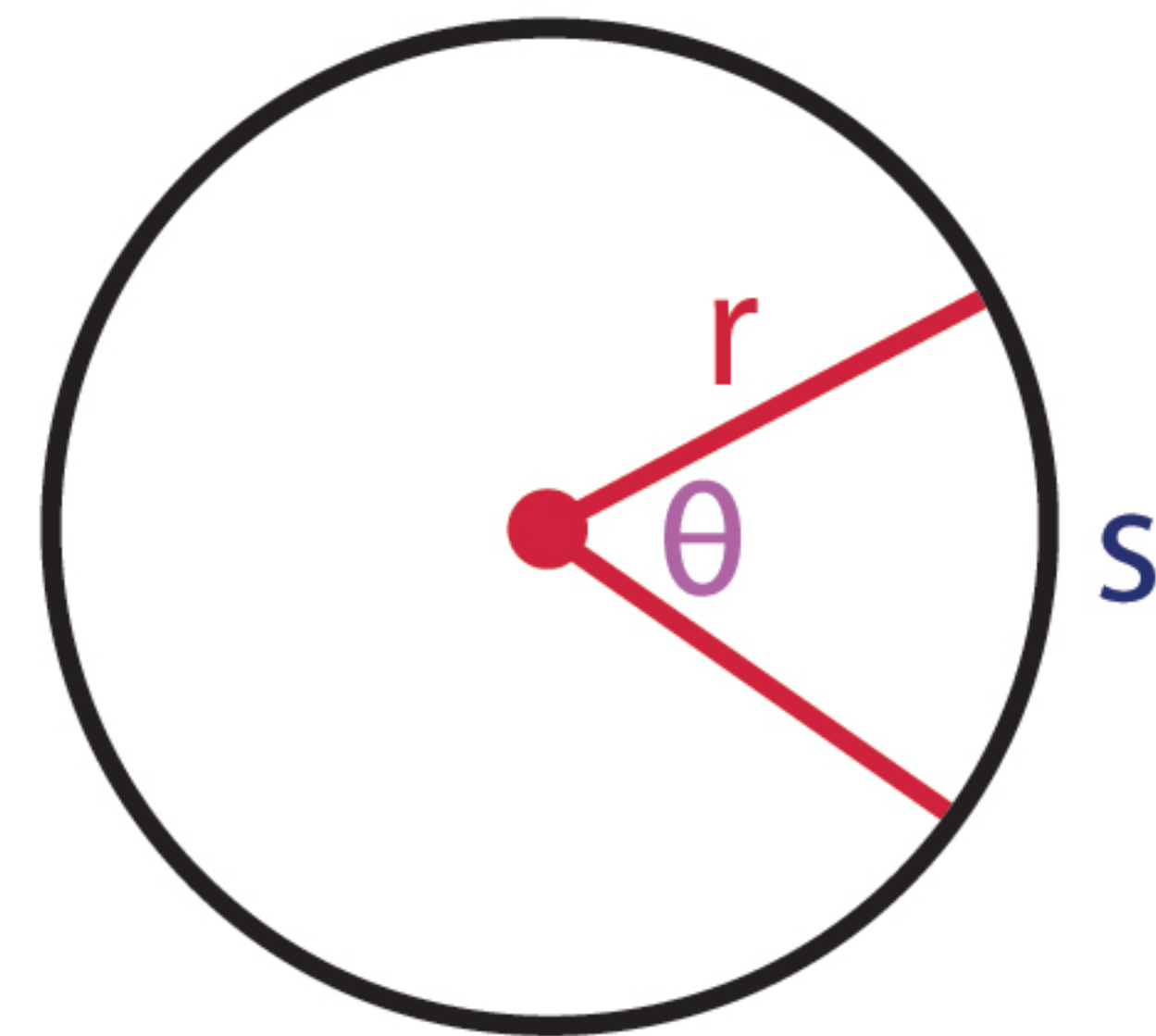


ARC LENGTH FORMULA

The Arc Length, s , of a circle of radius, r , with central angle, θ radians, is given by

Arc Length : $s = r\theta$



θ must be in radian measure

Examples: Find the length of each arc intercepted by the given radius and central angle

1. $r = 50\text{cm}$, $\theta = \frac{\pi}{4}$

$$s = r\theta$$
$$s = (50) \left(\frac{\pi}{4} \right)$$

$$s = \frac{25\pi}{2} \text{ cm or } 39.27\text{cm}$$

2. $r = 12\text{in}$, $\theta = \frac{9\pi}{8}$

$$s = r\theta$$
$$s = (12) \left(\frac{9\pi}{8} \right)$$

$$s = \frac{27\pi}{2} \text{ in or } 42.41\text{in}$$

3. $r = 48\text{m}$, $\theta = 10^\circ$

$$s = r\theta$$
$$s = (48) \left(10^\circ \cdot \frac{\pi}{180^\circ} \right)$$

$$s = (48) \left(\frac{\pi}{18} \right)$$

$$s = \frac{8\pi}{3} \text{ m or } 8.38\text{m}$$

4. $r = 13\text{cm}$, $\theta = 300^\circ$

$$s = r\theta$$
$$s = (13) \left(300^\circ \cdot \frac{\pi}{180^\circ} \right)$$

$$s = (13) \left(\frac{5\pi}{3} \right)$$

$$s = \frac{65\pi}{3} \text{ cm or } 68.07\text{cm}$$

5. Find the radius of the circle given the arc length of 3π and central angle of $\frac{\pi}{2}$

$$s = r\theta$$

$$3\pi = r\left(\frac{\pi}{2}\right)$$

$$3\cancel{\pi}\left(\frac{2}{\cancel{\pi}}\right) = r$$

$r = 6$

6. Find the measure of the central angle given the radius of 12.3 and arc length of 25.8

$$s = r\theta$$

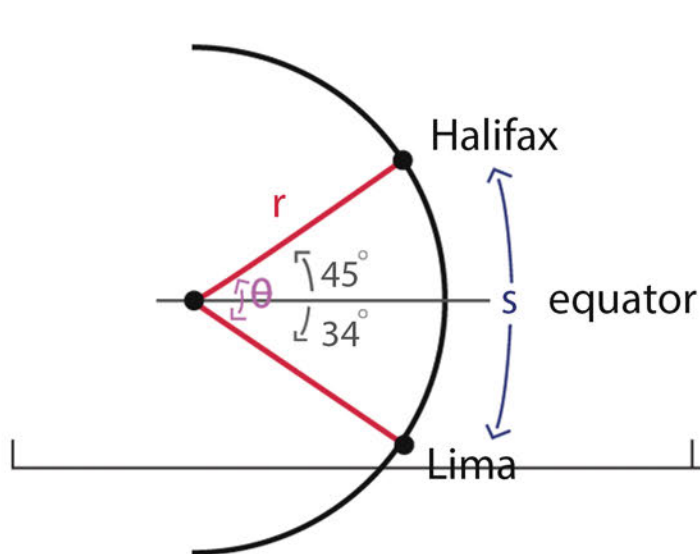
$$25.8 = (12.3)\theta$$

$\theta = 2.098 \text{ radians}$

or

$\theta = 2.098 \left(\frac{180^\circ}{\pi}\right) = 120^\circ$

7. Find the distance in kilometers between Halifax, Nova Scotia, 45° N, and Lima, Peru, 34° S, assuming they lie on the same north - south line and the Earth's radius is 6400 km



$$\theta = 45^\circ + 34^\circ = 79^\circ$$

$$s = r\theta$$

$$s = (6400)\left(79^\circ \cdot \frac{\pi}{180^\circ}\right)$$

$$s = (6400)\left(\frac{79\pi}{180}\right)$$

$$s = \frac{25280\pi}{9} \text{ km apart}$$

or

$s = 8,824.38 \text{ km apart}$