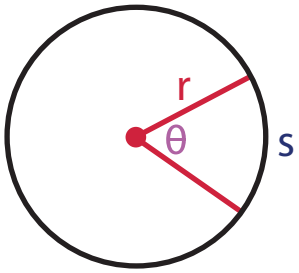
ARC LENGTH FORMULA

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

$s = r\theta$

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

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

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

$s = r\theta$

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

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

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

$s = r\theta$

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

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

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

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

$s = r\theta$

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

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

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

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

$$s = r\theta$$

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

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

$$\boxed{r = 6}$$

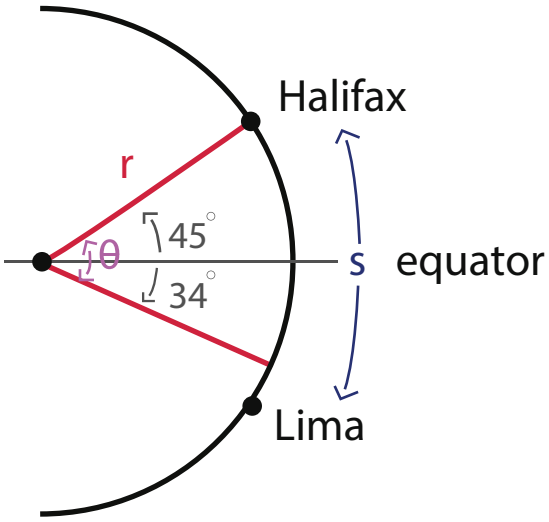
6. Find the measure of the central angle given the radius of 12.3 and arc length of 25.8

$$s = r\theta$$

$$25.8 = (12.3)\,\theta$$

$$\boxed{\theta = 2.098 \text{ radians}} \quad \text{or} \quad \boxed{\theta = 2.098\left(\frac{180^\circ}{\pi}\right) = 120^\circ}$$

7. Find the distance in kilometers between Halifax, Nova Scotia, 45° N, and Lima, Peru, 12° 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

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