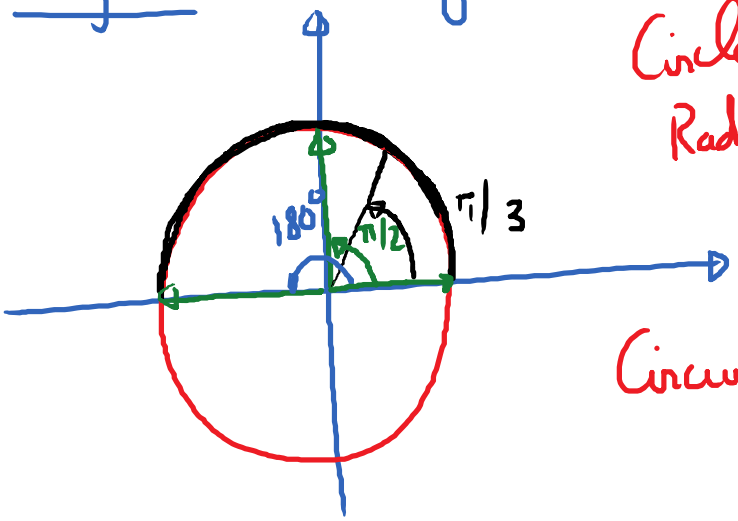
3.2. Applications of Radian Measures

Tuesday, October 3, 2017 1:56 PM

Obj 1: Arc length on a circle



Circle

Radius $R = 2$

Circumference $= 2\pi \cdot 2$

$= 4\pi$

$\theta = 90^\circ = \frac{\pi}{2}$

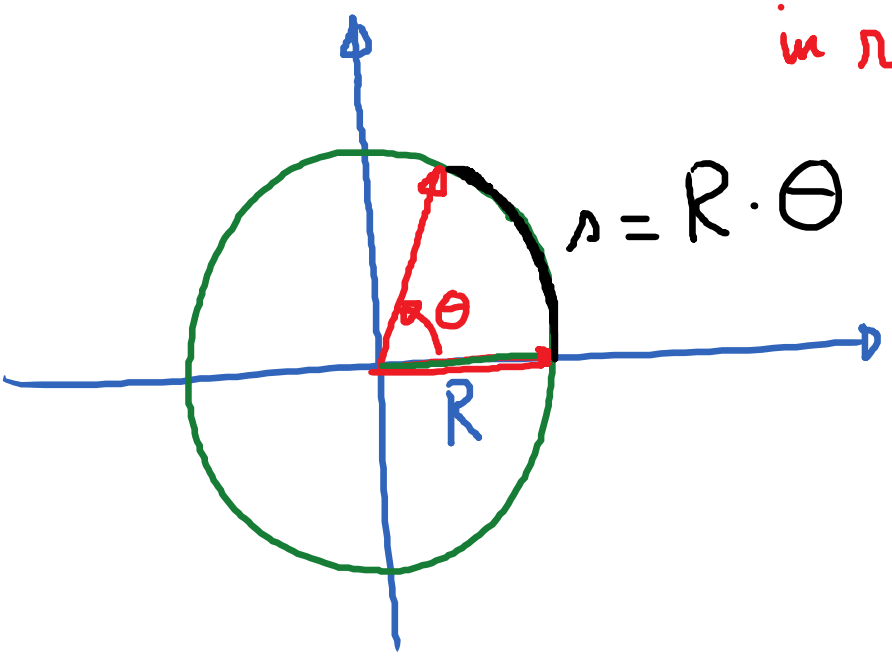
θ	Length of the arc subtended by that angle
2π	4π
$\frac{\pi}{2}$	π
π	2π
$\frac{\pi}{3}$	$\frac{2\pi}{3}$

Arc length.

The length s of the arc sustended by an angle θ measured in radians in a circle of radius R is given by

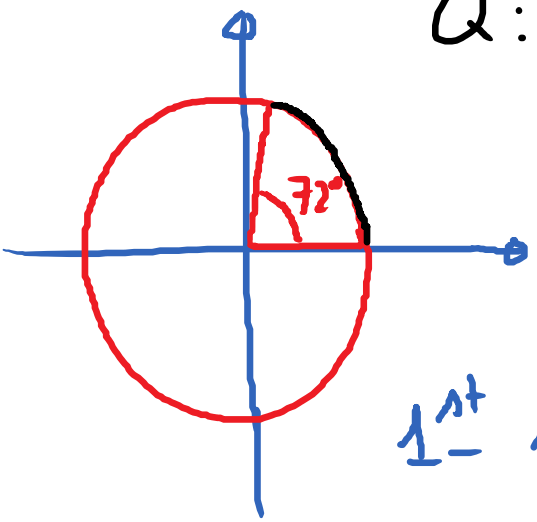
$$s = R \cdot \theta$$

need to be measured in radians



Eg. Given a circle with Radius = 6.5

$\theta = 72^\circ$



Q: Find length of the arc subtended by 72° angle.

1st step: convert angle to radian:

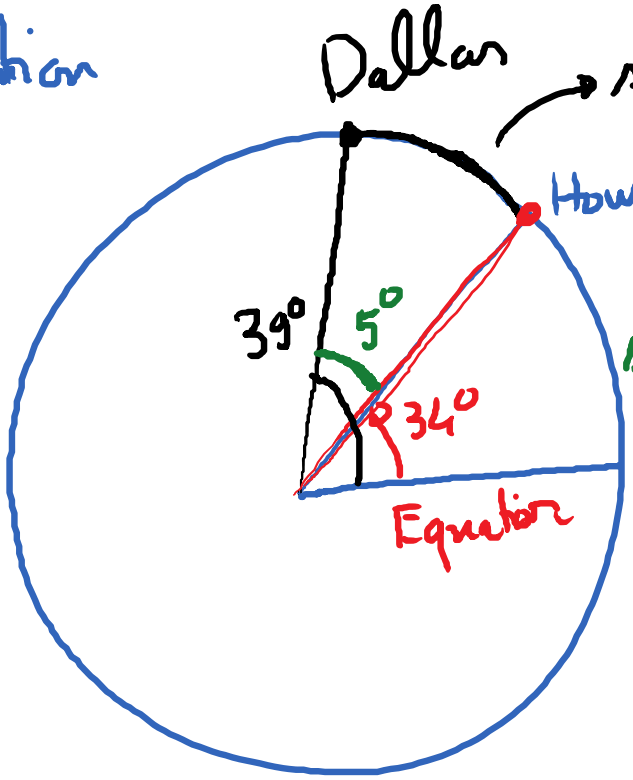
$$72 \cdot \frac{\pi}{180} = \frac{72\pi}{180} = \frac{2\pi}{5} \text{ radian.}$$

2nd step: $s = R \cdot \theta$

$$= (6.5) \cdot \left(\frac{2\pi}{5}\right) \approx$$

Radius = 6400 km

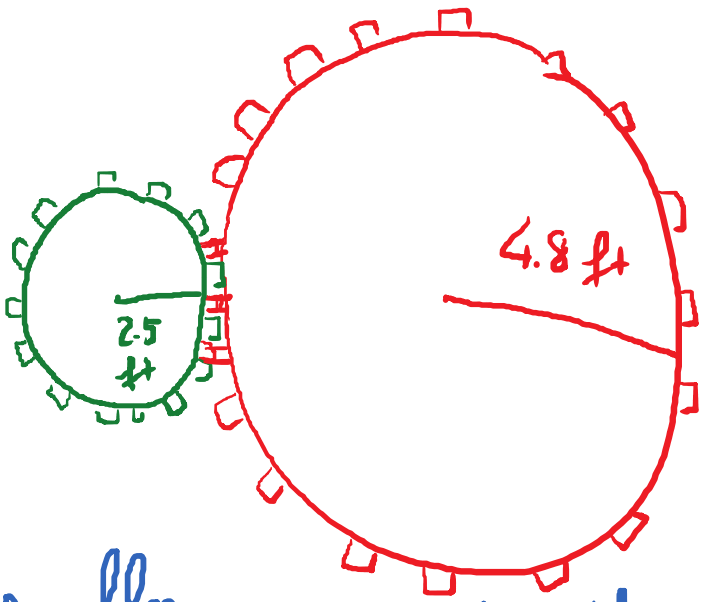
Application



$$s = \overbrace{6400 \cdot \left(5 \cdot \frac{\pi}{180}\right)}^{\theta}$$

$$= 558.51$$

Eg.



Q: If the smaller gear rotates through an angle of 225°, then through how many degrees will the larger gear rotate?

$225^\circ \longrightarrow$ radian

$$225 \cdot \frac{\pi}{180} = \frac{225\pi}{180} = \frac{5\pi}{4} \text{ (radian)}$$

Arc length that the smaller gear rotates is:

$$(2.5) \cdot \left(\frac{5\pi}{4}\right) = \frac{(2.5)\cdot 5}{4}\pi = \frac{12.5\pi}{4}$$

This is the same as the arc length that the larger gear rotates.

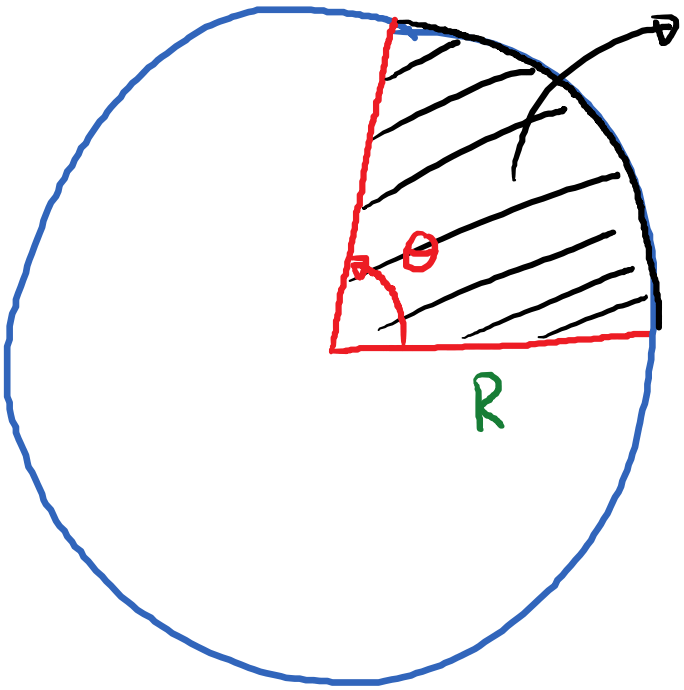
$$s = \boxed{(4.8)\cdot\theta = \frac{12.5\pi}{4}}$$

$$\theta = \frac{\frac{12.5\pi}{4}}{4.8} = \left(\frac{\frac{12.5}{4}}{4.8}\right)\cdot\pi$$

$$\theta = 0.651\pi \text{ radian}$$

$$\theta = 0.651\pi \cdot \frac{180}{\pi} \approx 117.19^\circ$$

Obj 2: Area of a sector

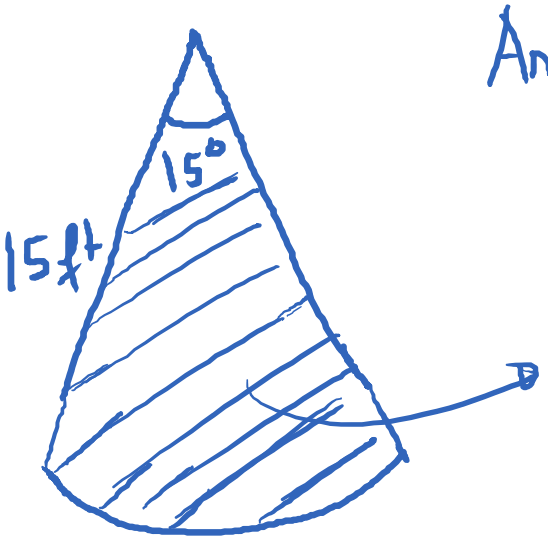


Area = ?

$$\text{Area} = \frac{1}{2} R^2 \cdot \theta$$

must be measured in radian.

E.g. Irrigation System



Area = ?

$$\text{Area} = \frac{1}{2} \cdot (15)^2 \cdot \left(15 \cdot \frac{\pi}{180}\right)$$

$$= \frac{1}{2} \cdot (225) \cdot 15 \cdot \frac{\pi}{180}$$

$$= \frac{75\pi}{8} \approx 29.45 \text{ ft}^2$$