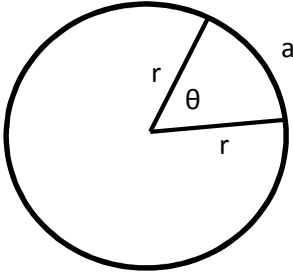


The radian measure of an angle θ is defined as the length, a , of the arc that subtends the angle divided by the radius, r , of the circle.

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



For one complete revolution, the length of the arc equals the circumference of the circle, $2\pi r$.

$$\theta = \frac{2\pi r}{r} = 2\pi$$

One complete revolution measures 2π radians.

Converting Radians to Degrees

$$2\pi \text{ radians} = 360^\circ$$

$$1 \text{ radian} = \frac{360^\circ}{2\pi}$$

$$1 \text{ radian} = \frac{180^\circ}{\pi}$$

Multiply the radians by $\frac{180^\circ}{\pi}$ to determine the equivalent degree measurement.

\therefore 1 radian is approx. 57.3° .

Converting Degrees to Radians

$$360^\circ = 2\pi \text{ radians}$$

$$1^\circ = \frac{2\pi}{360^\circ}$$

$$1^\circ = \frac{\pi}{180^\circ}$$

Multiply the degrees by $\frac{\pi}{180^\circ}$ to determine the equivalent radian measurement.

\therefore 1° is approx. 0.0175 radians.

Examples:

- a) Convert 60° to radians. Determine an exact measurement and an approximate measurement.

- b) Using the exact value for 60° , determine the radian measure of 120° & 20° .

- c) Convert $\frac{2\pi}{3}$ radians to degrees.

- d) Convert 4.32 radians to degrees.

Arc Length

To determine the arc length, we use the formula $\theta = \frac{a}{r}$ and isolate for **a**, $a = r\theta$.

To use the arc length formula θ must be measured in radians.

Example: A circle has a radius of 4.7cm. Determine the length of the arc subtended by each angle.

a) 1.7 radians

b) 64°

Angular Velocity of a Rotating Object

The angular velocity of a rotating object is the rate at which the central angle changes with respect to time.

To determine the Angular Velocity of a Rotating Object:

- 1) Multiply the number of revolutions by 360° or 2π depending on whether the answer is required in degrees or radians.
- 2) Divide your answer by the corresponding unit of measurement.

Example: The hard disk in a computer rotates at 7200 revolutions per minute. Determine the angular velocity in:

a) Degrees per second.

b) Radians per second.