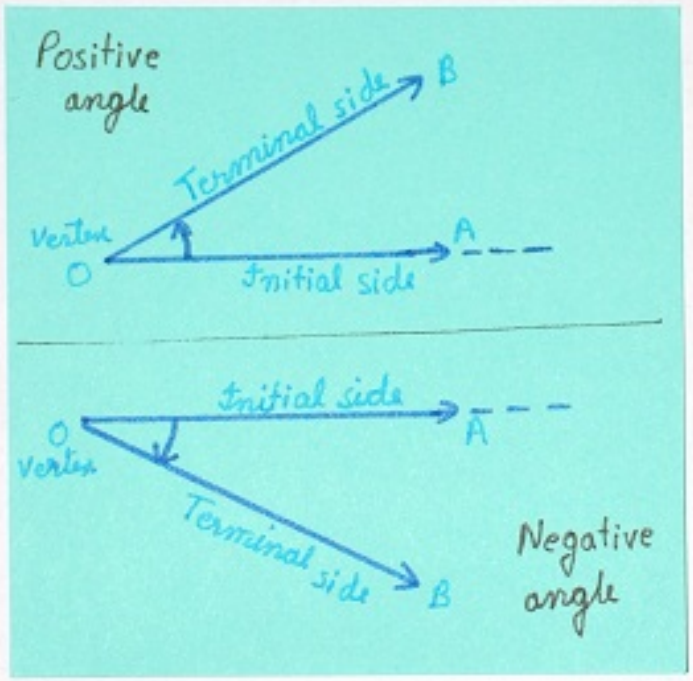
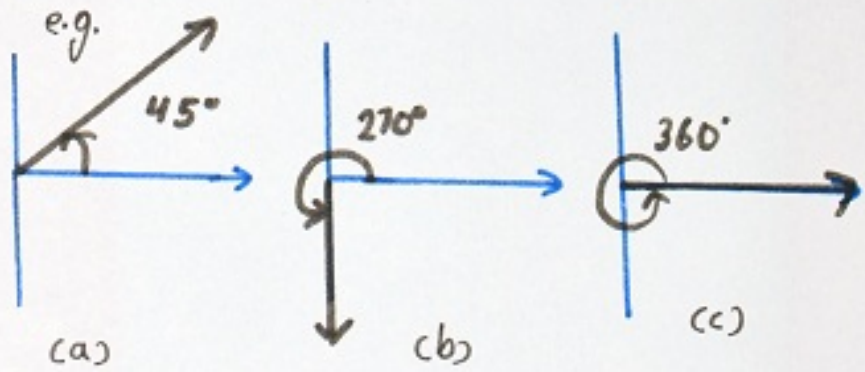
CHAPTER - 3

TRIGONOMETRIC FUNCTIONS

Angle is a measure of rotation of a given ray about its initial point (the vertex)

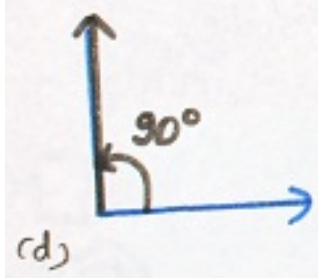


The measure of an angle is the amount of rotation performed to get the terminal side from the initial side.



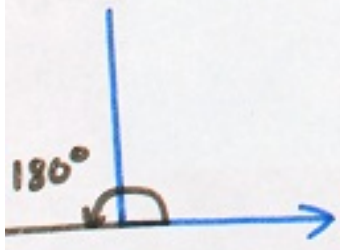
degree measure

We say that if initial side = terminal side, i.e. the ray performs a complete revolution and returns to its original position, it has moved by 360 degrees. (fig (c) above)



(d)

$\therefore$ 1 degree $\equiv 1^\circ = \left(\frac{1}{360}\right)^{th}$ of a revolution



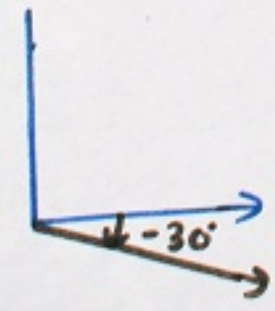
(e)

We subdivide a degree into minutes & seconds :

$1^\circ = 60'$ (60 minutes)

$1' = 60''$ (60 seconds)

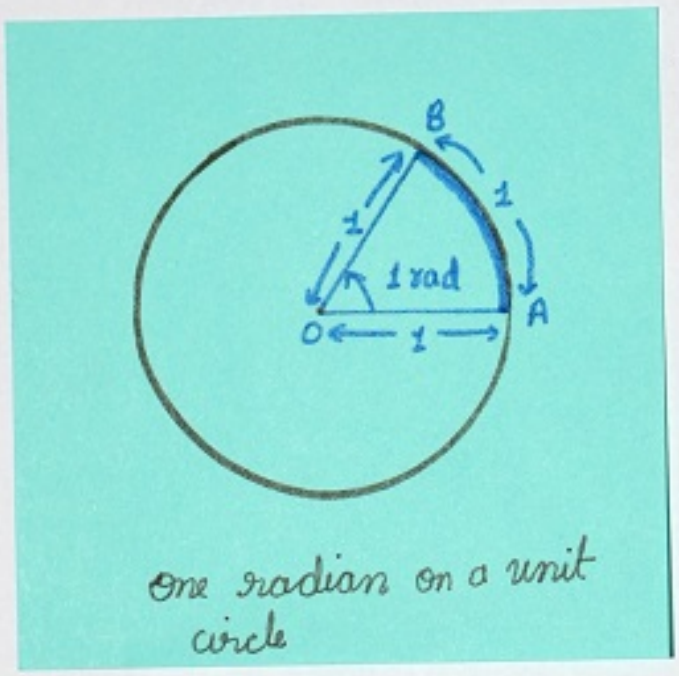
$\therefore\ 1^\circ = 60' = 3600''$ (3600 seconds)



Radian measure

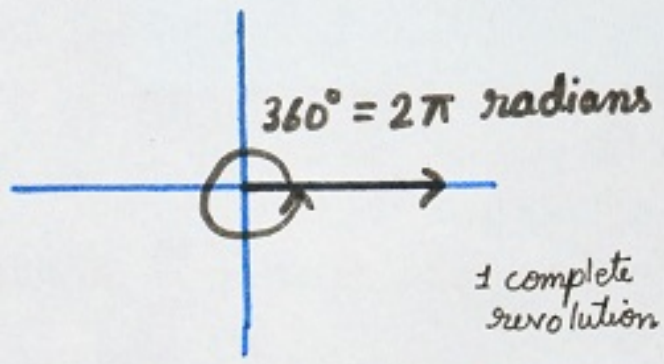
Radian is another measuring unit for angles. It is used as a standard instead of degrees in scientific measurements.

1 radian ≡ the angle subtended by an arc of length 1 unit in a unit circle (of radius 1) at the centre



one radian on a unit circle

Another way to understand it is that one complete revolution of the initial side is equivalent to angle of 2π radians:



1 complete revolution

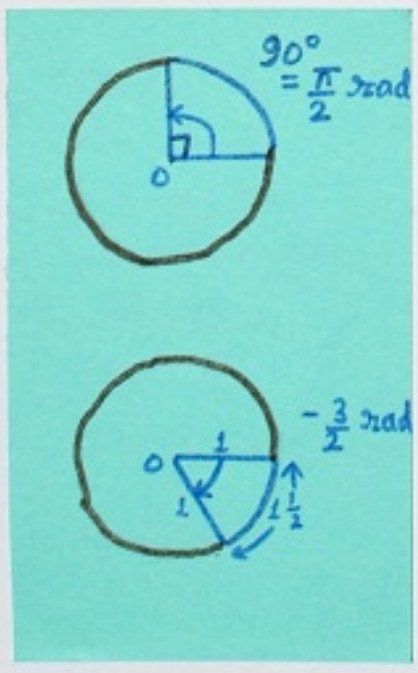
Equal arcs of a circle subtend equal angle at the centre.

In general,

360 degrees ≡ 2π radians
≡ 1 revolution

1 rad = $\frac{180°}{\pi}$
= 57°16' (approx)

1° = $\frac{\pi}{180}$ radian
= 0.01746 rad (approx)



In a circle of radius r, an arc of length l will subtend an angle of θ radians at the centre, and we have

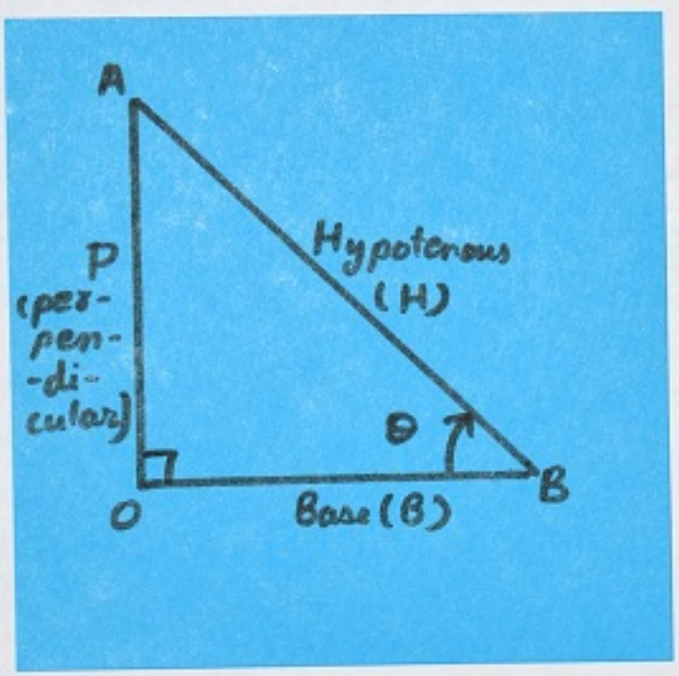
$$\theta = \frac{l}{r} \Rightarrow \boxed{l = r\theta}$$

DEGREE	30°	45°	60°	90°	180°	270°	360°
RADIAN	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π

$$\text{Radian measure} = \frac{\pi}{180} \times \text{Degree measure}$$

$$\text{Degree measure} = \frac{180}{\pi} \times \text{Radian measure}$$

TRIGONOMETRIC FUNCTIONS



Let's consider an example of an acute right angled triangle OAB

We define trigonometric ratios as

$$\sin\theta = \frac{P}{H}, \quad \operatorname{cosec}\theta = \frac{H}{P}$$

$$\cos\theta = \frac{B}{H}, \quad \sec\theta = \frac{H}{B}$$

$$\tan\theta = \frac{P}{B}, \quad \cot\theta = \frac{B}{P}$$

Recall that

$$P^2 + B^2 = H^2$$ (Pythagoras theorem)