

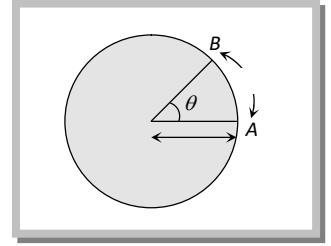
Trigonometry.

$$\text{Angle } (\theta) = \frac{\text{Arc}}{\text{Radius}} = \frac{AB}{OA} = \frac{S}{r} \text{ (formula true for radian only)}$$

unit of angle is radian or degree

Relation between radian and degree:

$$2\pi \text{radian} = 360^\circ; 1 \text{radian} = 57.3^\circ$$



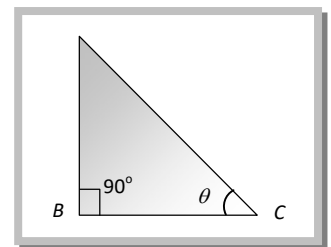
(1) **Trigonometric ratio** : In right angled triangle ABC , the largest side AC , which is opposite to the right angle is called hypotenuse, and if angle considered is θ , then side opposite to θ , AB , will be termed as perpendicular and BC is called the base of the triangle.

$$\sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{AB}{AC}$$

$$\operatorname{cosec} \theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{AC}{AB}$$

$$\cos \theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{BC}{AC}$$

$$\sec \theta = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{AC}{BC}$$



$$\tan \theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{AB}{BC}$$

$$\cot \theta = \frac{\text{Base}}{\text{Perpendicular}} = \frac{BC}{AB}$$

(2) Value of trigonometric ratio of standard angles

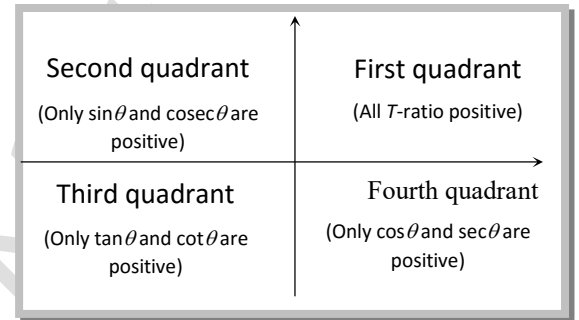
Angle	0°	30°	45°	60°	90°	105°	120°	135°	150°	180°	225°	270°
$\sin \theta$	0	1/2	1/√2	√3/2	1	√3/2	1/√2	1/2	0	-1	-√3/2	-1
$\cos \theta$	1	√3/2	1/√2	1/2	0	-1/2	-1/√2	-√3/2	-1	0	1/√2	1
$\tan \theta$	0	1/√3	1	√3	∞	-√3	-1	-1/√3	0	1/√3	1	∞

	/	3		$\sqrt{3}$	1	1		∞
	$\sqrt{3}$					/		
	3					$\sqrt{3}$		
						3		

(3) Important points:

- (i) Value of $\sin \theta$ or $\cos \theta$ lies between -1 and $+1$, however $\tan \theta$ and $\cot \theta$ can have any real value.
- (ii) Value of $\sec \theta$ and $\operatorname{cosec} \theta$ cannot be numerically less than one.

- (iii) $(90^\circ - \theta)$ will lie in first quadrant
 $(90^\circ + \theta)$ will lie in second quadrant
 $(180^\circ - \theta)$ will lie in second quadrant
 $(180^\circ + \theta)$ will lie in third quadrant
 $(270^\circ + \theta)$ and $(0^\circ - \theta)$ will lie in fourth quadrant.



(4) Fundamental trigonometrical relation

- (i) $\tan \theta = \frac{\sin \theta}{\cos \theta}$
- (ii) $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$
- (iii) $\sec \theta = \frac{1}{\cos \theta}$
- (iv) $\cot \theta = \frac{1}{\tan \theta}$
- (v) $\sin^2 \theta + \cos^2 \theta = 1$
- (vi) $\sec^2 \theta - \tan^2 \theta = 1$
- (vii) $\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$

(5) T-Ratios of allied angles: The angles whose sum or difference with angle θ is zero or a multiple of 90° are called angle allied to θ .

(i)	$\sin(-\theta) = -\sin \theta$	$\cos(-\theta) = \cos \theta$	$\tan(-\theta) = -\tan \theta$
(ii)	$\sin(90^\circ - \theta) = \cos \theta$	$\cos(90^\circ - \theta) = \sin \theta$	$\tan(90^\circ - \theta) = \cot \theta$
(iii)	$\sin(90^\circ + \theta) = \cos \theta$	$\cos(90^\circ + \theta) = -\sin \theta$	$\tan(90^\circ + \theta) = -\cot \theta$

(iv)	$\sin(180^\circ - \theta) = \sin \theta$	$\cos(180^\circ - \theta) = -\cos \theta$	$\tan(180^\circ - \theta) = -\tan \theta$
(v)	$\sin(180^\circ + \theta) = -\sin \theta$	$\cos(180^\circ + \theta) = -\cos \theta$	$\tan(180^\circ + \theta) = \tan \theta$
(vi)	$\sin(270^\circ - \theta) = -\cos \theta$	$\cos(270^\circ - \theta) = -\sin \theta$	$\tan(270^\circ - \theta) = \cot \theta$
(vii)	$\sin(270^\circ + \theta) = -\cos \theta$	$\cos(270^\circ + \theta) = \sin \theta$	$\tan(270^\circ + \theta) = -\cot \theta$
(viii)	$\sin(360^\circ - \theta) = -\sin \theta$	$\cos(360^\circ - \theta) = \cos \theta$	$\tan(360^\circ - \theta) = -\tan \theta$
(ix)	$\sin(360^\circ + \theta) = \sin \theta$	$\cos(360^\circ + \theta) = \cos \theta$	$\tan(360^\circ + \theta) = \tan \theta$

Note: Angle $(2n\pi + \theta)$ lies in first quadrant, if θ in an acute angle. Similarly $(2n\pi - \theta)$ will lie in fourth quadrant. Where $n = 0, 1, 2, 3, 4$

- Angle $(-\theta)$ is presumed always lie in fourth quadrant, whatever the value of θ .
- If parent angle is 90° or 270° then $\sin \theta$ change to $\cos \theta$, $\tan \theta$ change to $\cot \theta$ and $\sec \theta$ change to $\csc \theta$.
- If parent angle is 180° or 360° then no change in trigonometric function