

IIT-JEE · CBSE **eBOOKS**

CLASS 11 & 12th



Learning Inquiry
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CLASS 11th

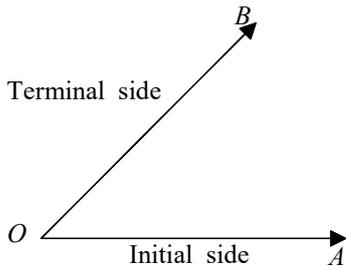
Basics of Trigonometry

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01. Angle

Consider a ray \overrightarrow{OA} . If this ray rotates about its end point O and takes the position OB , then we say that the angle $\angle AOB$ has been generated.

An angle is considered as the figure obtained by rotating a given ray about its end-point.



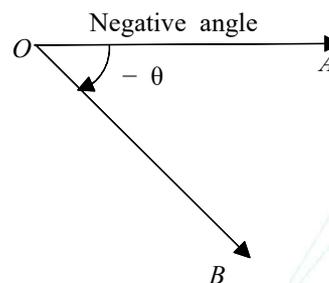
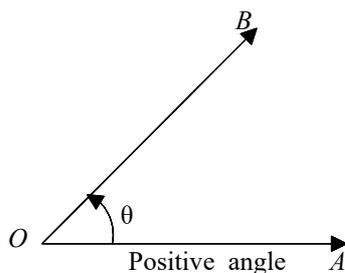
The revolving ray is called the generating line of the angle. The initial position OA is called the initial side and the final position OB is called terminal side of the angle. The end point O about which the ray rotates is called the vertex of the angle.

MEASURE OF AN ANGLE

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

SENSE OF AN ANGLE

The sense of an angle is said to be positive or negative according as the initial side rotates in anticlockwise or clockwise direction to get to the terminal side.



RIGHT ANGLE

If the revolving ray starting from its initial position to final position describes one quarter of a circle, then we say that the measure of the angle formed is a right angle.

02. Systems of Measurement of Angles

SEXAGESIMAL SYSTEM

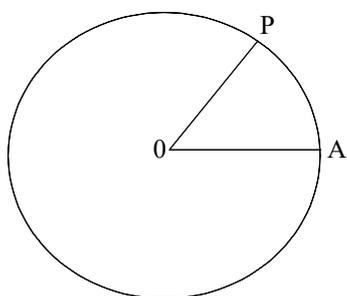
There, 1 right angle = 90 degrees (= 90°)
 $1^\circ = 60$ minutes (= $60'$)
 $1' = 60$ seconds (= $60''$)

CENTESIMAL SYSTEM

There, 1 right angle = 100 grades (= 100^g)
 1 grade = 100 minutes (= $100'$)
 1 minute = 100 seconds (= $100''$)

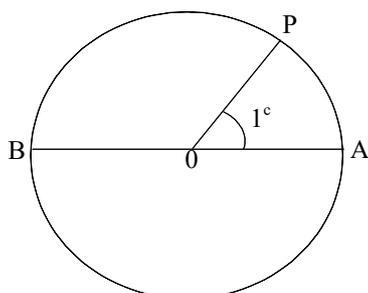
CIRCULAR SYSTEM

In this system the unit of measurement of radian where one radian, written as 1^c , is the measure of an angle subtended at the centre of a circle by an arc of length equal to the radius of the circle.



RESULT 1

Radian is a constant angle.



RESULT 2

The number of radians in an angle subtended by an arc of a circle at the center is equal to $\frac{\text{arc}}{\text{radius}}$.

03. Relation Between Degrees and Radians

- REMARK** (1) When an angle is expressed in radians, the word radian is generally omitted.
 (2) *Since $180^\circ = \pi$ radians. Therefore, $1^\circ = \pi/180$ radian.

Hence, $30^\circ = \frac{\pi}{180} \times 30 = \frac{\pi}{6}$ radians, $45^\circ = \frac{\pi}{180} \times 45 = \frac{\pi}{4}$ radians,

$60^\circ = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radians, $90^\circ = \frac{\pi}{180} \times 90 = \frac{\pi}{2}$ radians etc,

- (3) We have,

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

$$\therefore 1 \text{ radian} = \frac{180^\circ}{\pi} = \left(\frac{180}{22} \times 7\right)^\circ = 57^\circ 16' 22'' \text{ (approx).}$$

- (4) We have,

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

$$\Rightarrow 1^\circ = \frac{\pi}{180} \text{ radian} = \left(\frac{22}{7 \times 180}\right) \text{ radian} = 0.01746 \text{ radian.}$$

04. Relation Between Three Systems of Measurement of an Angle

$$\frac{D}{90} = \frac{G}{100} = \frac{2R}{\pi}$$

SOME USEFUL POINTS

- (i) The angle between two consecutive digits in a clock is $30^\circ (= \pi/6 \text{ radian})$.
- (ii) The hour hand rotates through an angle of 30° in one hour i.e., $(1/2)^\circ$ in one minute.
- (iii) The minute hand rotates through an angle of 6° in one minute.

05. Trigonometric Ratios or Functions

