

MEASUREMENT OF ANGLES

Angles

Angles are the shape formed by two lines or rays which are diverging from a common point or the vertex.

Here, AB is the initial line and AC is a revolving line. Here, AC starts from AB, which revolves in the anticlockwise (opposite) direction, then the angle ABC is called positive angle.

If AC starts from AB and revolve round A, it is clockwise (positive) direction, then the angle ABC is called negative angle.

Measurement of Angles

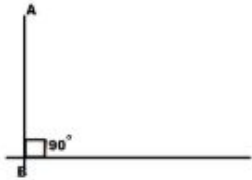
There are three systems which are commonly used for the measurement of angles and they are listed below:-

Sexagesimal system or English system (Degree system)

Centesimal system or French system (Grade system)

Radian system or Circular measure

(NOTE: The Right angle is taken as the standard angle in each of these systems.)



Act

Sexagesimal system or English system

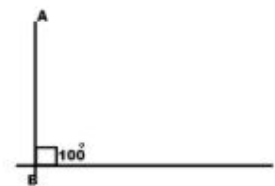
It is a system where the unit of measurement of an angle is degree. In this system, the right angle is divided into 90 equal parts and each part is called a degree. It is a base with 60 which uses the concept of degrees, minutes and seconds for measuring angles where,

1 right angle = 90° (90 degrees)

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

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

Centesimal system or French system



It is a system where the unit of measurement of an angle is grade. In this system where the unit of measurement of an angle is grade. In this system, a right angle is divided into two equal parts and each part is known as a grade. It uses the concept of grade, minute and seconds where,

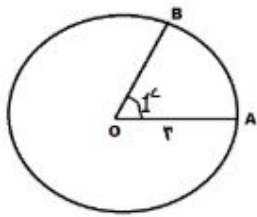
1 right angle = 100^g (100 grades)

$1 = 100'$ (100 centesimal minutes)

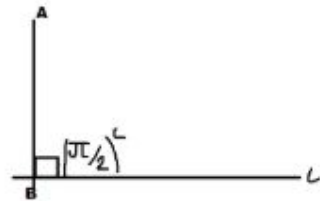
$1' = 100''$ (100 centesimal seconds)

A

Radian system or Circular measure



Radian is the plane angle subtended by a circular arc as the length of the arc divided by the radius of the arc. In this figure O is the centre of a circle and OA is the radius. Let's take point B on the circumference making $OA = \text{arc } AB$ and join OB. The angle AOB hence formed and called 1 radian. In this measure, 1 right angle = $(\frac{\pi}{2})^\circ$



Relation between different systems of measurement

Relation between Sexagesimal and Centesimal system: -

As we know that,

$$1 \text{ right angle} = 90^\circ$$

$$1 \text{ right angle} = 100^g$$

$$\text{So, } 90^\circ = 100^g$$

$$\text{or, } 1^\circ = \left(\frac{100}{90}\right)^g$$

$$= \left(\frac{10}{9}\right)^g$$

$$\text{so, } x^\circ = \left(\frac{10}{9} \times x\right)^\circ$$

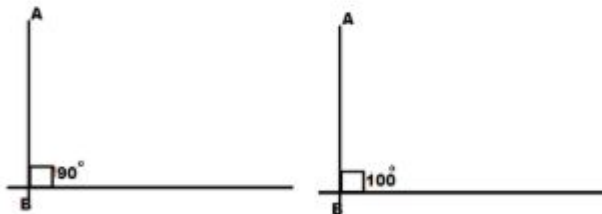
Again

$$100^g = 90^\circ$$

$$\text{or, } 1^g = \left(\frac{90}{100}\right)^\circ$$

$$\text{or, } 1^g = \left(\frac{9}{10}\right)^\circ$$

$$\text{So, } x^g = \left(\frac{9}{10} \times x\right)^\circ$$



Relation between Sexagesimal and Radian system

As we know that,

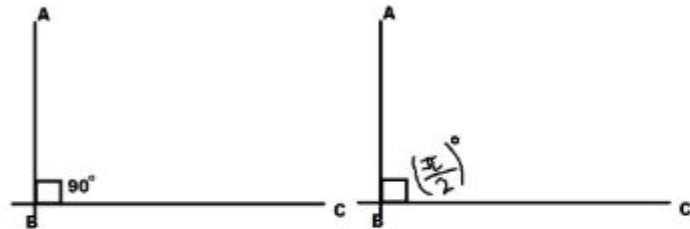
$$180^{\circ} = \pi^{\circ}$$

$$\text{or, } x^{\circ} = \left(\frac{\pi}{180}\right)^{\circ}$$

Similarly,

$$1^{\circ} = \left(\frac{180}{\pi}\right)^{\circ}$$

$$\text{So, } x^{\circ} = \left(\frac{180}{\pi} \times x\right)^{\circ}$$



Relation between Centesimal and Radian system

We have,

$$200^g = \pi^{\circ}$$

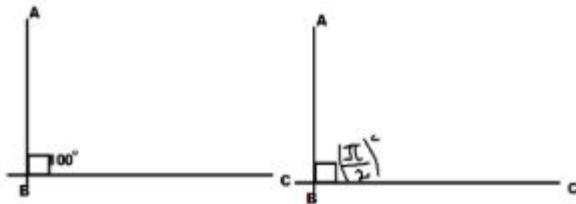
$$\text{or, } x^g = \left(\frac{\pi \times x}{200}\right)^{\circ}$$

Again

$$\pi^{\circ} = 200^g$$

$$\text{or, } 1^{\circ} = \left(\frac{200}{\pi}\right)^g$$

$$\text{So, } \left(\frac{200 \times x}{\pi}\right)^g$$



Polygon

Polygon is a closed plane figure having three or more than three line segments. Triangles, quadrilateral, nonagon, octagon etc. are the examples of a polygon. A polygon having all sides equal in length is called a regular polygon. A regular polygon has the same measures of interior angles.

In regular polygons of sides n , each interior angle is $\theta = \frac{(n-2) \times 180^{\circ}}{n}$

Similarly,

The exterior angle is a side of a regular polygon where an angle between any side of a shape and a line extended from the next side.

$$\text{Exterior angle of polygon } (\Phi) = \frac{360^{\circ}}{n}$$

Some types of polygon are discussed below: -

Polygons	No. of sides
Triangle	3
Quadrilateral	4
Pentagon	5
Hexagon	6
Heptagon	7
Octagon	8
Nonagon	9
Decagon	10