

Circles : Basics and Properties

By [BrushMyQuant](#)



YouTube Video Link to this Post is [Here](#)

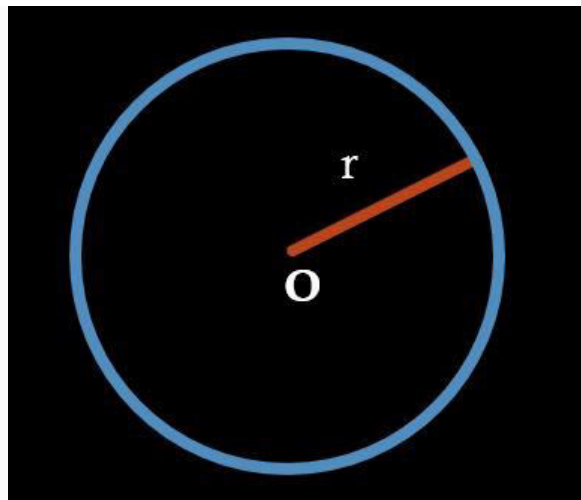
Following is Covered in this post

Theory

- ❑ What is a Circle?
- ❑ Circle Geometry Definitions
- ❑ Circle : Area and Circumference
- ❑ Semicircle : Area and Circumference
- ❑ Arc of a Circle
- ❑ Sector of Circle
- ❑ Properties of Circles

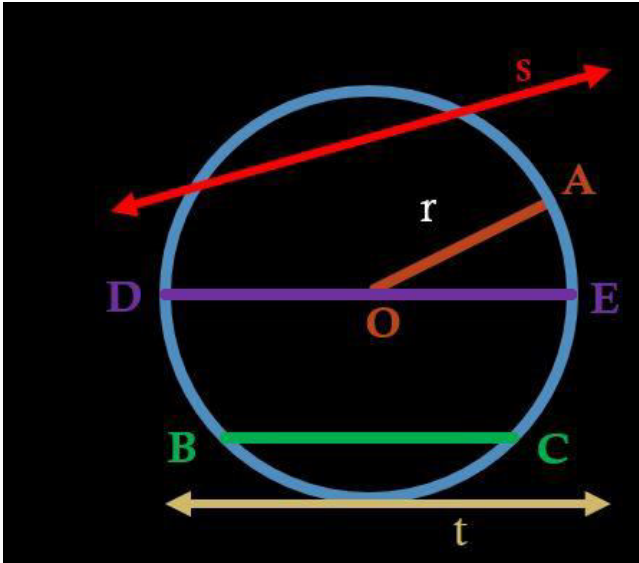
What is a Circle?

- A Circle is a 2D figure which is formed by joining all the points in a 2D plane which are at a fixed distance (i.e radius) from a single point. (i.e center of the circle)



Circle Geometry Definitions

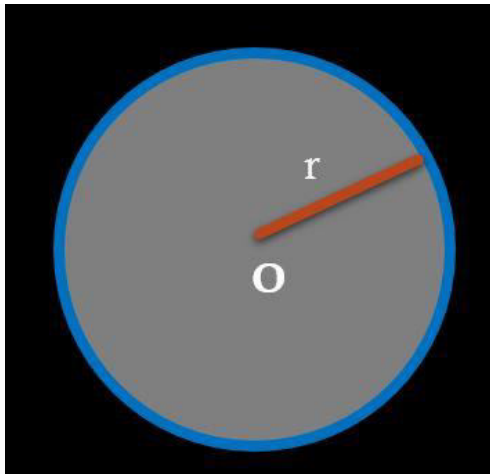
- ☐ **Radius** – A line segment joining the center of the circle to any point on the circle. (Ex: **OA**)
- ☐ **Chord**– A line segment whose two end points lie on the circle (Ex: **BC**)
- ☐ **Diameter**– A chord which passed through the center. (Ex: **DE**)
(Diameter = 2* Radius)



- ☐ **Secant**– A line which cuts the circle at two points. (Ex: **line s**)
- ☐ **Tangent**– A line which touches circle at only one point. (Ex: **line t**)

Circle : Area and Circumference

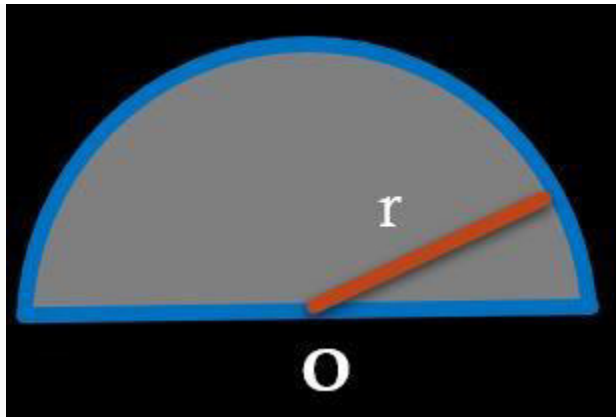
- **Area of a Circle with radius r, $A = \pi r^2$**



- **Circumference of a Circle with radius r, $C = 2 \pi r$**
- **Central Angle = 360°**

Semicircle : Area and Circumference

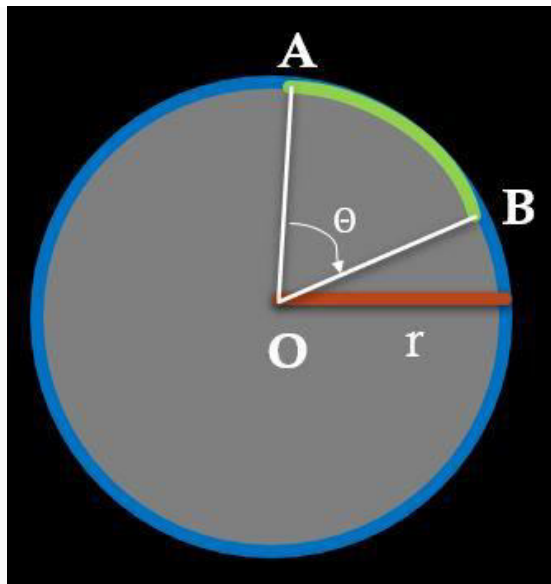
- Area of a Semicircle with radius r , $A = \frac{\pi r^2}{2}$



- Circumference of a Semicircle with radius r , $C = \pi r + 2r$
- Central Angle = 180°

Arc of a Circle

- Arc of a circle is a part of the Circumference of the circle.

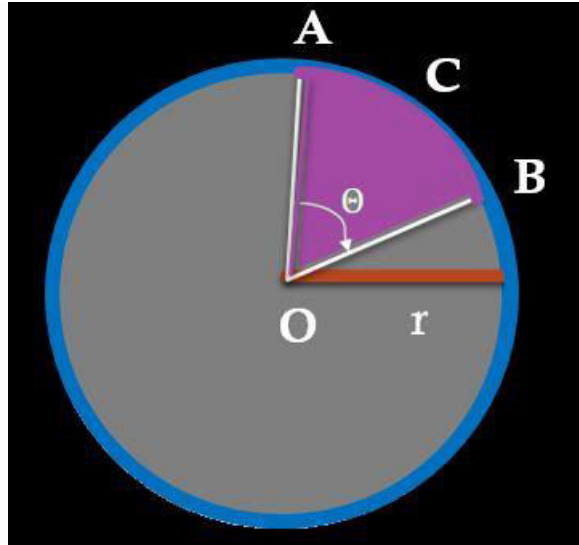


- Length of Arc AB, which subtends angle θ at the center,

$$\overset{\frown}{AB} = \frac{\theta}{360^\circ} * 2 \pi r$$

Sector of Circle

- Sector of a circle is a part of the circle made by the arc of the circle and the two radii connecting the arc to the center of the circle.



- Area of sector OACB, which subtends angle θ at the center,

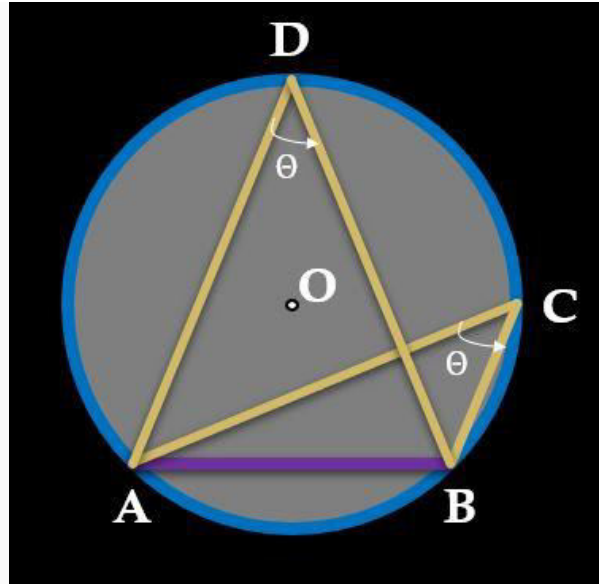
$$\text{Area of OACB} = \frac{\theta}{360^\circ} * \pi r^2$$

- Circumference of Sector OACB is given by

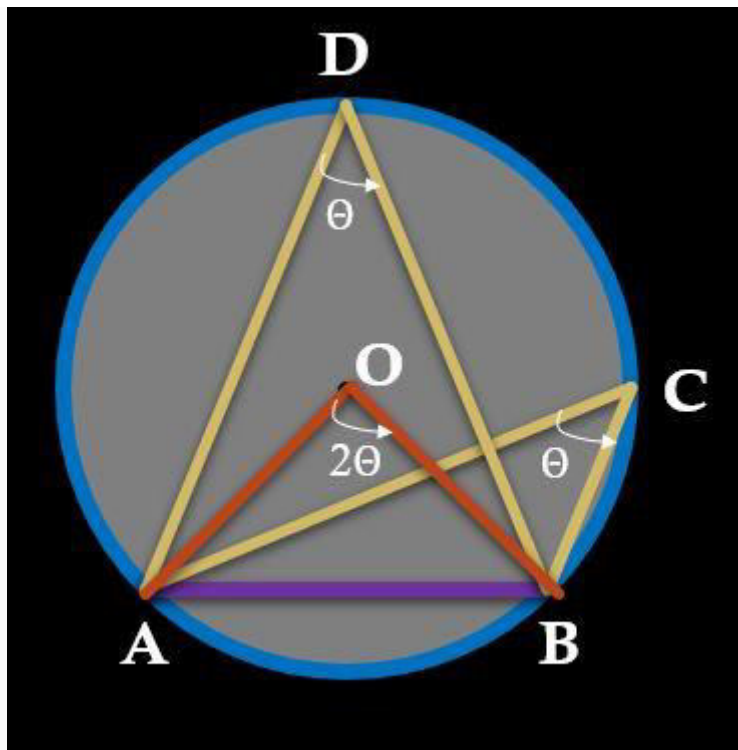
$$\text{Circumference of OACB} = \frac{\theta}{360^\circ} * 2 \pi r + 2r$$

Properties of Circles

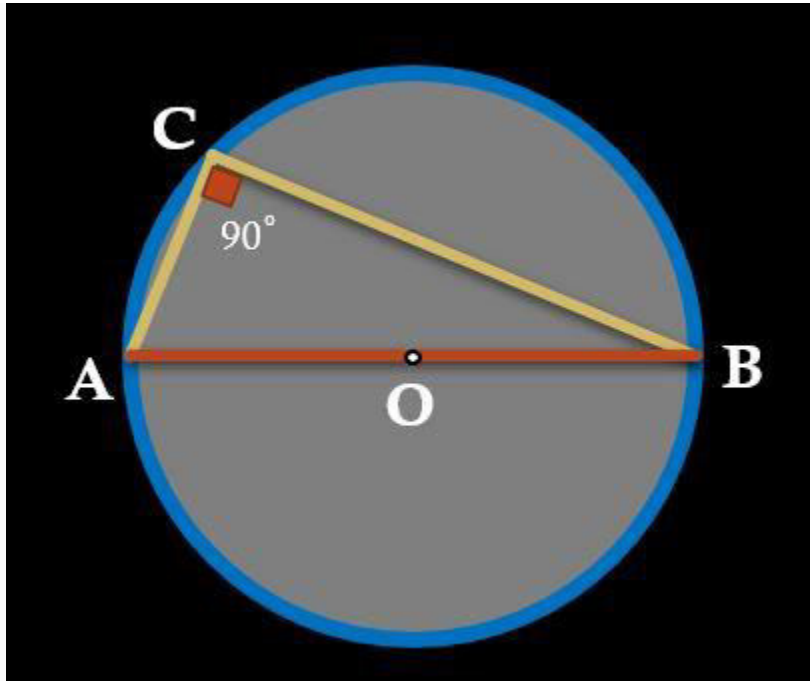
- **PROP 1:** A Chord subtends same angle at any point on the circle.



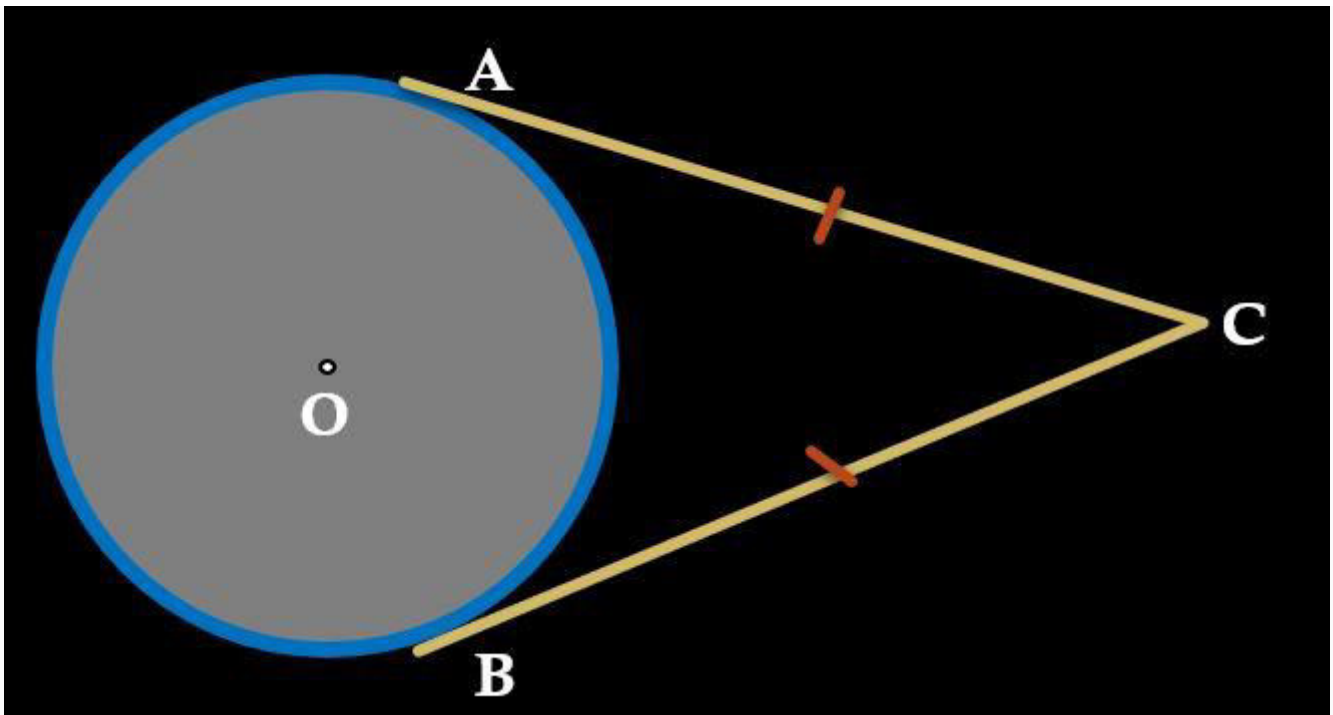
- **PROP 2:** Angle subtended by the chord at the center is twice the angle subtended by the chord at any other point on the circle.



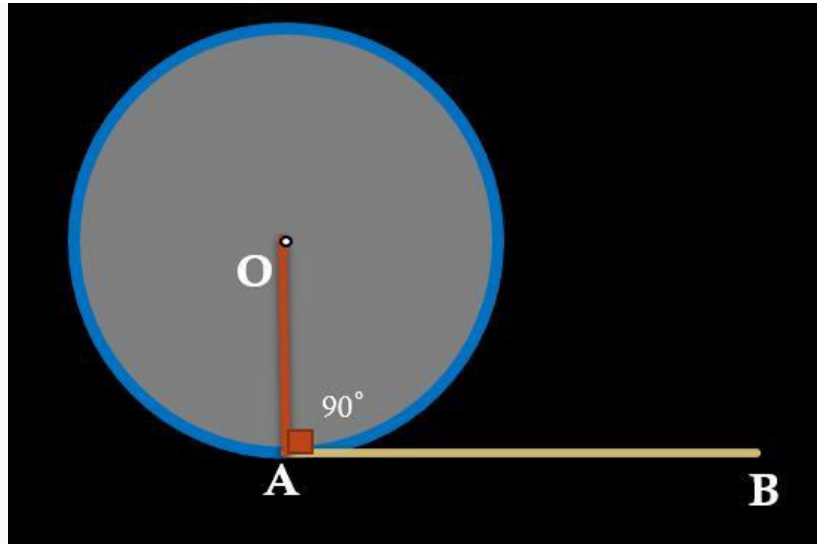
- **PROP 3:** Diameter subtends 90° at any point on the circle



- **PROP 4:** From an external point there are only two tangents which can be drawn to a circle and the length of these tangents is equal.

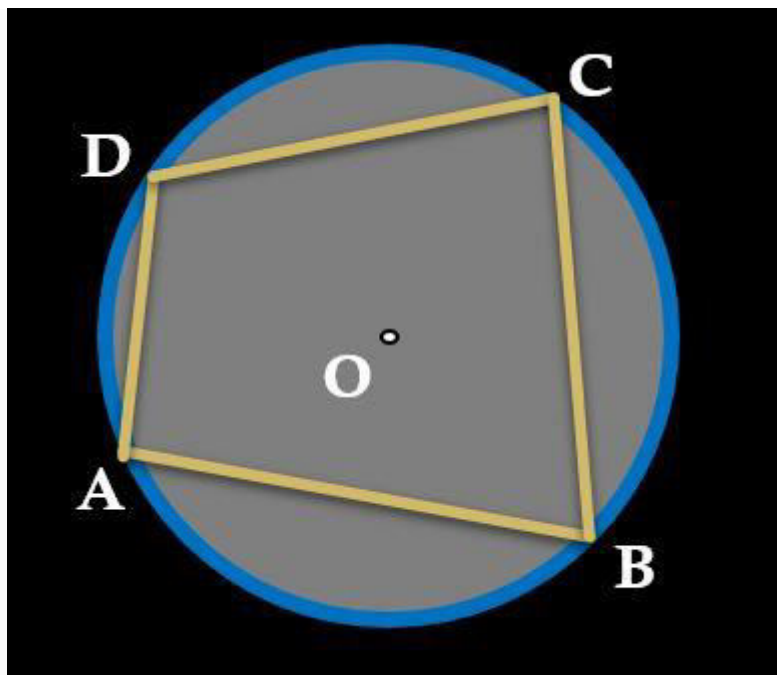


- **PROP 5:** A tangent always makes 90° with the line joining the point of tangency (point of intersection of the tangent with the circle) to the center of the circle.



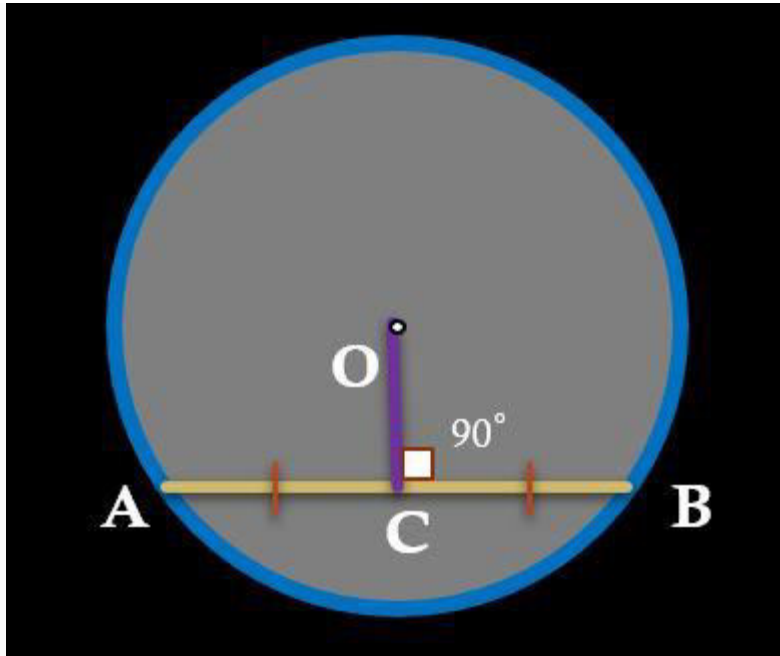
- **PROP 6: Cyclic Quadrilateral**

- A quadrilateral whose all 4 vertices lie on the circumference of the circle is called a Cyclic Quadrilateral.

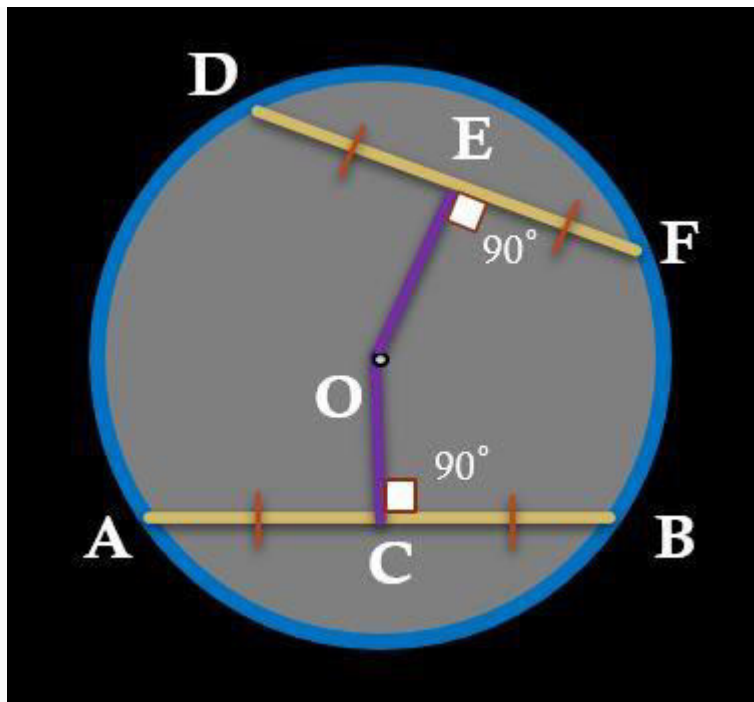


- **Sum of all the angles of Cyclic Quadrilateral = 360°**
 $\angle A + \angle B + \angle C + \angle D = 360^\circ$
- **Sum of diagonally opposite angles = 180°**
 $\angle A + \angle C = 180^\circ$
 $\angle B + \angle D = 180^\circ$

- **PROP 7:** Perpendicular drawn from the center of the circle to a chord bisects the chord.



- **PROP 8:** Equal chords are equidistant from the center. Or
Chords which are equidistant from the center are equal.



- **PROP 9:** Equal chords subtend same angle at the center of the circle. Or

Chords which subtend same angle at the center of the circle are equal.

