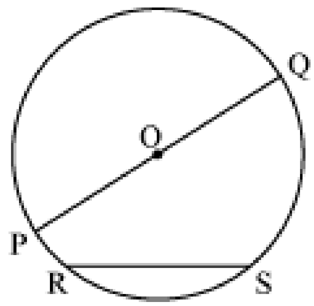
Circles

- **Circle:** Circle is a simple closed curve.



1. The fixed point O is the centre of the circle.

2. The fixed distance OP = OQ is the **radius** of the circle.

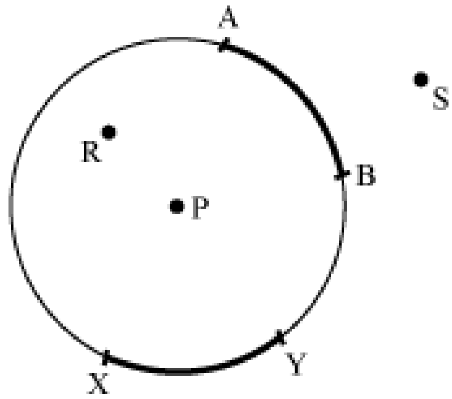
3. The distance around the circle is its **circumference**.

4. A line joining any two points on a circle is known as **chord**. In the given figure, RS and PQ are the chords.

5. The chord passing through the centre of a circle is called **diameter**. The diameter of a circle divides it into two semicircles.

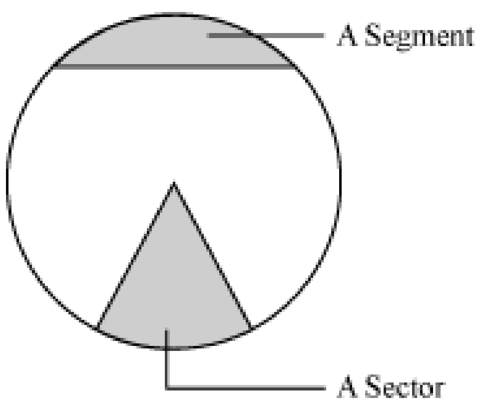
6. The diameter of a circle is the longest chord of the circle and it is twice the radius.

7. The portions on a circle are known as arcs. In the figure, XY and AB are arcs.

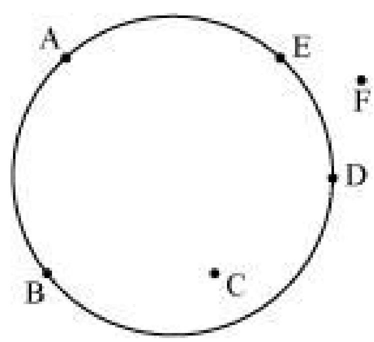


8. The region in the interior of a circle enclosed by a chord and an arc is known as **segment.**

9. The region in the interior of a circle enclosed by an arc on one side and a pair of radii on the other side is called **sector.**



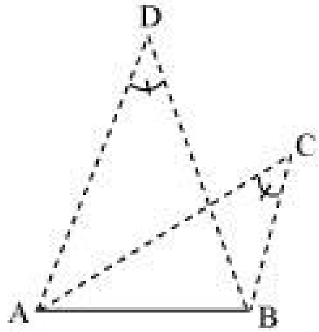
- A set of points that lie on a common circle are known as **concyclic points**.



Here, points A, B, D and E are concyclic points.

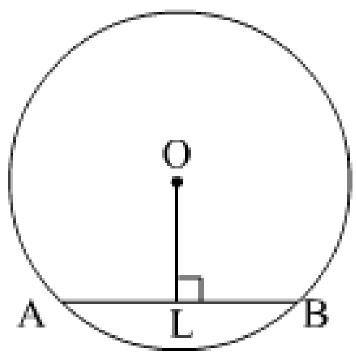
- If a line segment joining two points subtends equal angles at two other points lying on the same side of the line segment then the four points are concyclic.

In the given figure, if ∠ACB = ∠ADB then the points A, B, C and D are concyclic as C and D lie on the same side of the line segment.



- Perpendicular drawn from the centre of a circle to a chord bisects the chord.

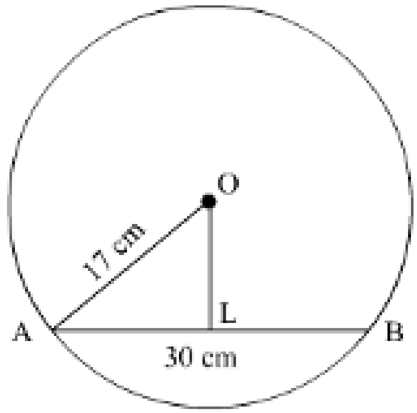
  In the given figure, AL will be equal to LB if OL ⊥ AB, where O is the centre of the circle.



  Converse of this property also holds true, which states that the line joining the centre of the circle to the mid-point of a chord is perpendicular to the chord.

Example:

In the given figure, OL⊥AB. If OA = 17 cm and AB = 30 cm then find the length of OL.



Solution:

We know that the perpendicular drawn from the centre of a circle to a chord bisects the chord.

∴ AL = BL = 15 cm

Now in right-angled triangle OLA, using Pythagoras theorem

$(OA)^2 = (OL)^2 + (AL)^2$

$\Rightarrow (17)^2 = (OL)^2 + (15)^2$

$\Rightarrow (OL)^2 = (17)^2 - (15)^2$

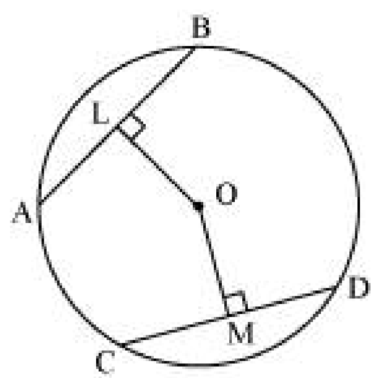
$\Rightarrow (OL)^2 = 289 - 225$

$\Rightarrow OL = \sqrt{64}$

∴ OL = 8 cm

- Equal chords of a circle (or congruent circles) are equidistant from the centre of the circle.

In the given figure, OL will be equal to OM if AB = CD, where O is the centre of the circle.

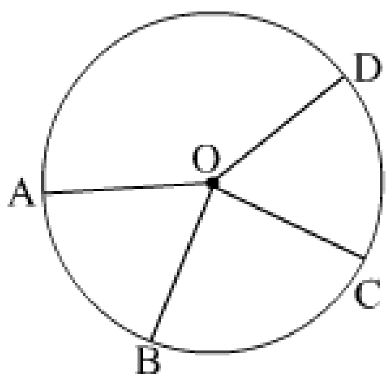


Converse of the property also holds true, which states that chords which are equidistant from the centre of a circle are equal in length.

- There is one and only one circle passing through three given non-collinear points. Therefore, at least three points are required to construct a unique circle.

- Congruent arcs subtend equal angles at the centre of the circle.

  In the given figure, ∠AOB will be equal to ∠COD if arcs AB and CD are congruent.

  Converse of the property is also true, which states that two arcs subtending equal angles at the centre of the circle are congruent.