FlexiPrep

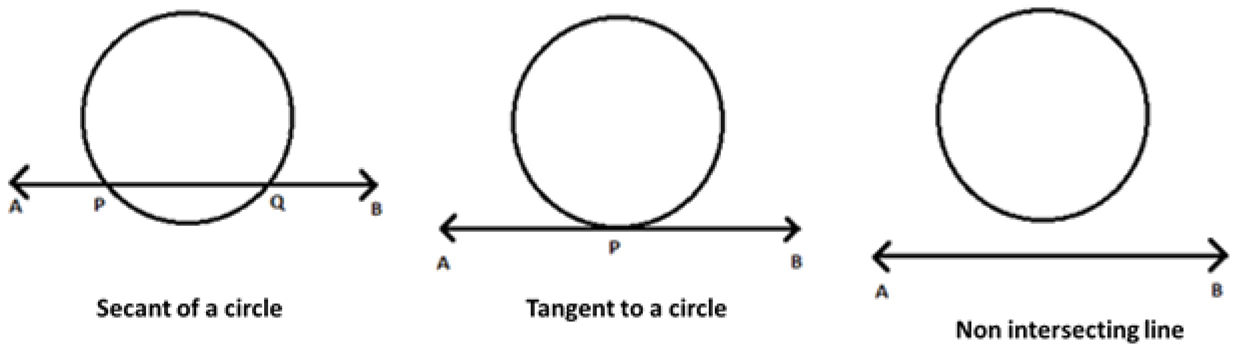
Radius of a Circle and Chord: Radius of a Circle and Solved Example

Radius of a Circle

A circle can be defined as locus of a point moving in a plane, in such a manner that its distance from a fixed point is always constant. The fixed point is known as the center of the circle and distance between any point on the circle and its center is called the radius of a circle.

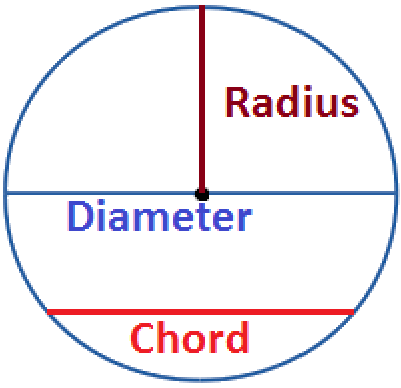
Given a line and a Circle, it could either be touching the circle or non-touching.

Consider any line AB and a circle. Then according to the relative positions of the line and the circle, three possibilities can arise as shown in the given figure.



Line AB intersects the given circle at two distinct points P and Q. The line AB in this case is referred to as secant of the circle. Points P and Q lie on the circumference of the circle, but they do not pass through center of the circle 'O', hence line segment PQ is known as a chord of the circle as its endpoints lie on the circle.

Therefore, chord of a circle can be defined as a line segment joining any two distinct points on circle's circumference. A chord passing through the center of circle is known as diameter of the circle and it is the largest chord of the circle. This diameter is twice that of the radius of a circle i.e. $D = 2r$, where 'D' is the diameter and 'r' is the radius.



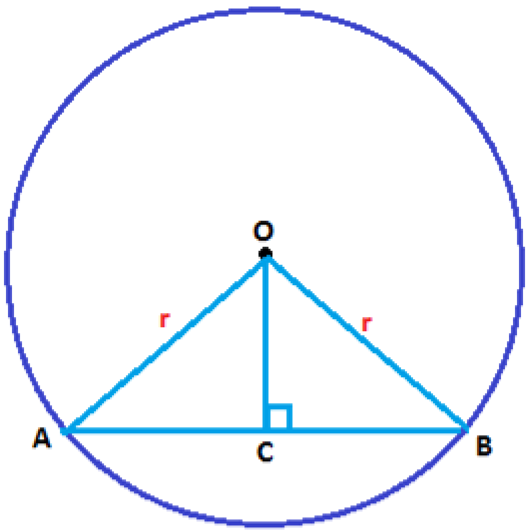
Radius of a circle $= \frac{Diameter}{2}$

Or,

Diameter of a circle $= 2 \times radius$

Let us discuss few important theorems and their proofs related to chord of circle.

Theorem 1: The perpendicular line drawn from the center of a circle to a chord bisects the chord.



Given: $AB = \ Chord; \ OC \perp AB$

To prove: $AC = BC$

Construction: Draw $OA \ and \ OB$

Proof:

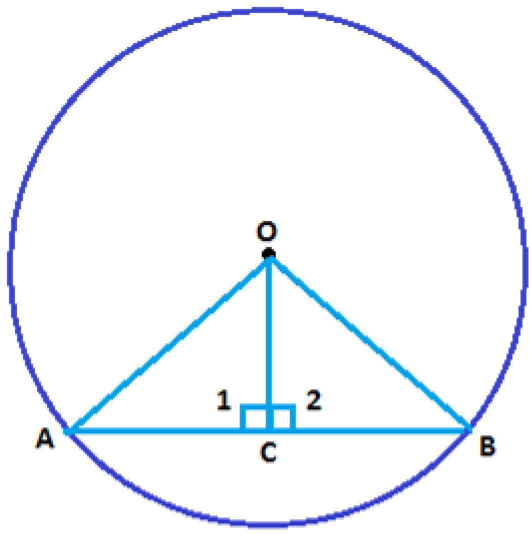
Sr No.	Statement	Reason
In $\Delta OAC \ and \ \Delta \ OBC$		

1	$OA = OB$	Radii of the same circle
2	$OC = OC$	Common
3	$\angle OCA = \angle OCB$	Each angle measure $90°$
4	$\Delta OAC \cong \Delta OBC$	By RHS congruence criterion
5	$AC = CB$	By CPCT (Corresponding parts of congruent triangles)

The perpendicular line drawn from the center of a circle to a chord bisects the chord.

The converse of the above theorem is also true.

Theorem 2: The line drawn through the center of the circle to bisect a chord is perpendicular to the chord.



Given: C is the midpoint of the chord AB of the circle with center of circle at O

To prove: $OC \perp AB$

Construction: Join $OA,\ OB\ and\ OC$

Proof:

Sr. No	Statement	Reason
$In\ \Delta\ OAC\ and\ \Delta\ OBC$		
1.	$OA = OB$	Radii of the same circle

2.	$OC = OC$	Common
3.	$AC = BC$	Given
4.	$\Delta OAC \cong \Delta OBC$	SSS Axion of congruency
5.	$\angle 1 = \angle 2$	Corresponding parts of congruent triangle
6.	$\angle 1 + \angle 2 = 180°$	Linear pair Axion
7.	$\angle 1 = \angle 2 = 90°$	From statement 5 and 6
8.	$OC \perp AB$	Following the above statements

C is the midpoint of the chord AB of the circle with center of circle at O

Solved Example

Let us see some solved problems on radius and chord of a circle.

Example: Find the radius of the circle if its diameter is 24 cm.

Solution:

Given,

Diameter of circle = 16 cm

We have formula to find the radius

$$Radius\ of\ circle\ = \frac{Diameter}{2}$$

Put the value of diameter,

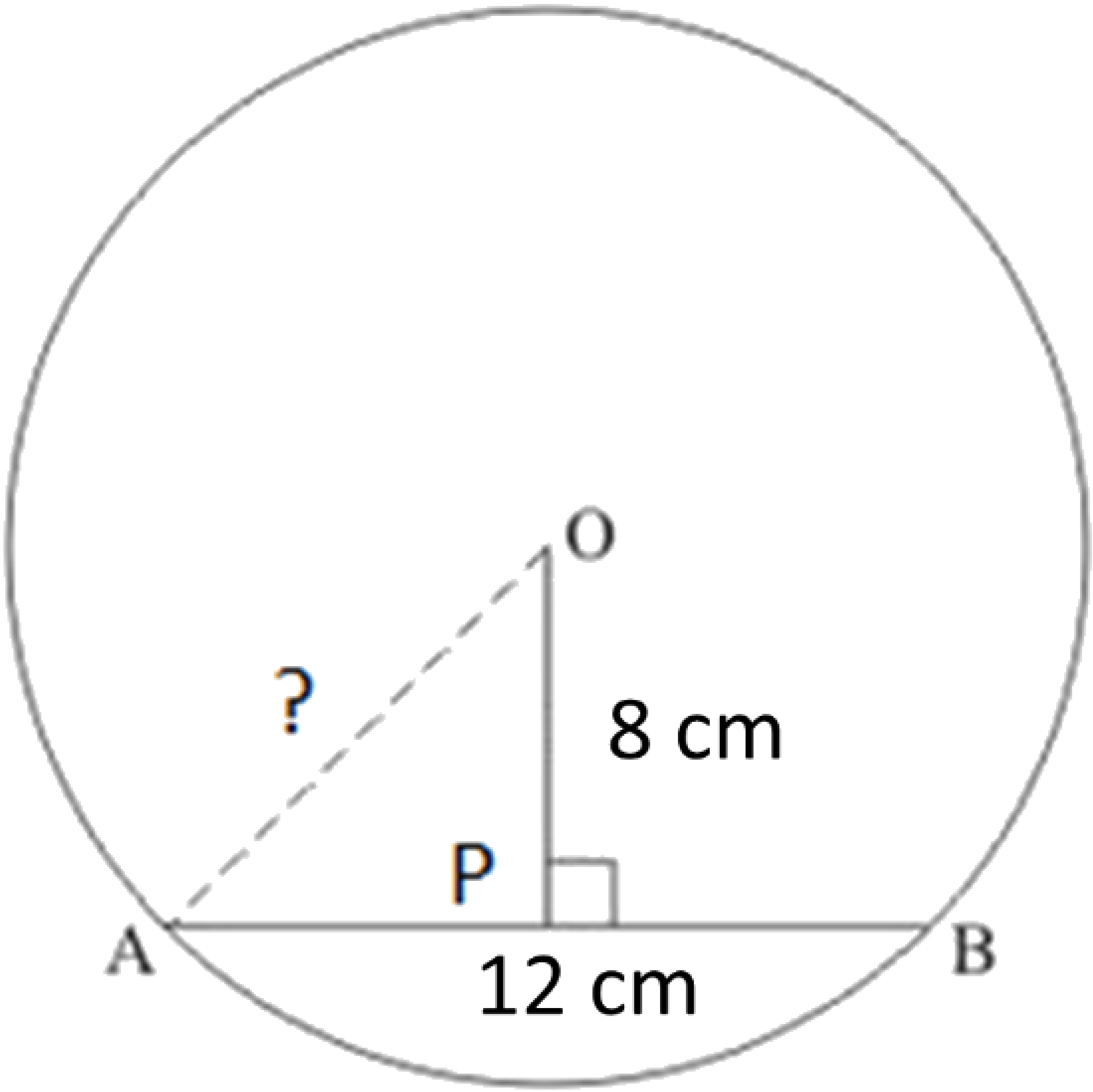
$$= \frac{24}{2}$$

$$= 12\ cm$$

Example 2: If the length of the chord of a circle is 12 cm and the perpendicular distance from the center to the chord is 8 cm, then what is the radius of the circle?

Solution:

Let us draw a circle as per the given information.



Length of the chord $= AB = 12\ cm$

Perpendicular distance $OP = 8\ cm$

Radius $= OA$

We know that the, the perpendicular line drawn from the center of a circle to a chord bisects the chord.

$$AP = PB = \frac{AB}{2}$$

$$= \frac{12}{2}$$

$$= 6\ cm$$

In triangle OPA,

By Pythagoras theorem,

$$OA^2 = OP^2 + AP^2$$

Put the value,

$$OA^2 = 8^2 + 6^2$$

$$OA^2 = 64 + 36$$

$$OA^2 = 100$$

$$OA = 10$$

Therefore, radius of the circle is 10 cm.