

CLASS X : CHAPTER - 10

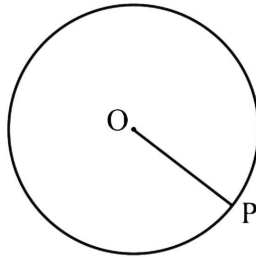
CIRCLES

NCERT NICHOOD

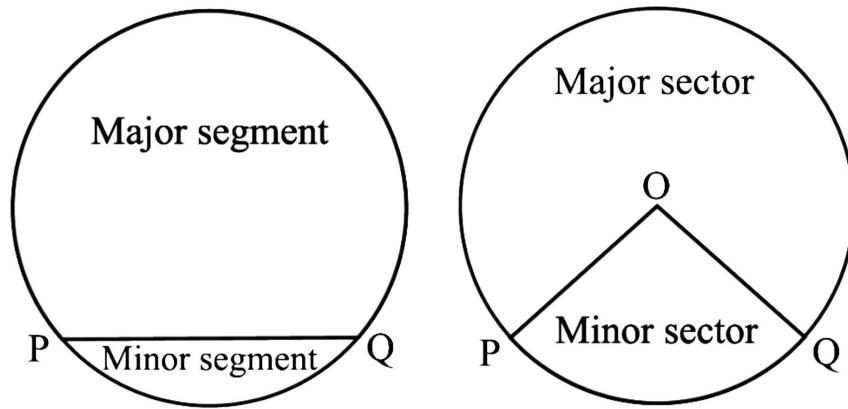
Circle

The collection of all the points in a plane, which are at a fixed distance from a fixed point in the plane, is called a circle.

- The fixed point is called the **centre** of the circle and the fixed distance is called the **radius** of the circle. In the below figure, O is the centre and the length OP is the radius of the circle.



- The line segment joining the centre and any point on the circle is also called a **radius** of the circle.
- A circle divides the plane on which it lies into three parts. They are: (i) inside the circle, which is also called the **interior** of the circle; (ii) the **circle** and (iii) outside the circle, which is also called the **exterior** of the circle. The circle and its interior make up the **circular region**.
- The chord is the line segment having its two end points lying on the circumference of the circle.
- The chord, which passes through the centre of the circle, is called a **diameter** of the circle.
- A **diameter is the longest chord and all diameters have the same length, which is equal to two times the radius**.
- A piece of a circle between two points is called an **arc**.
- The longer one is called the **major arc** PQ and the shorter one is called the **minor arc** PQ.
- The length of the complete circle is called its **circumference**.
- The region between a chord and either of its arcs is called a **segment** of the circular region or simply a **segment** of the circle. There are two types of segments also, which are the **major segment** and the **minor segment**.
- The region between an arc and the two radii, joining the centre to the end points of the arc is called a **sector**. The minor arc corresponds to the **minor sector** and the major arc corresponds to the **major sector**.
- In the below figure, the region OPQ is the minor sector and remaining part of the circular region is the major sector. When two arcs are equal, that is, each is a semicircle, then both segments and both sectors become the same and each is known as a **semicircular region**.



Points to Remember :

- A circle is a collection of all the points in a plane, which are equidistant from a fixed point in the plane.
- Equal chords of a circle (or of congruent circles) subtend equal angles at the centre.
- If the angles subtended by two chords of a circle (or of congruent circles) at the centre (corresponding centre) are equal, the chords are equal.
- The perpendicular from the centre of a circle to a chord bisects the chord.
- The line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.
- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle (or of congruent circles) are equidistant from the centre (or corresponding centres).
- Chords equidistant from the centre (or corresponding centres) of a circle (or of congruent circles) are equal.
- If two arcs of a circle are congruent, then their corresponding chords are equal and conversely, if two chords of a circle are equal, then their corresponding arcs (minor, major) are congruent.
- Congruent arcs of a circle subtend equal angles at the centre.
- The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.
- Angles in the same segment of a circle are equal.
- Angle in a semicircle is a right angle.
- If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, the four points lie on a circle.
- The sum of either pair of opposite angles of a cyclic quadrilateral is 180° .
- If the sum of a pair of opposite angles of a quadrilateral is 180° , then the quadrilateral is cyclic.

Secant to a Circle

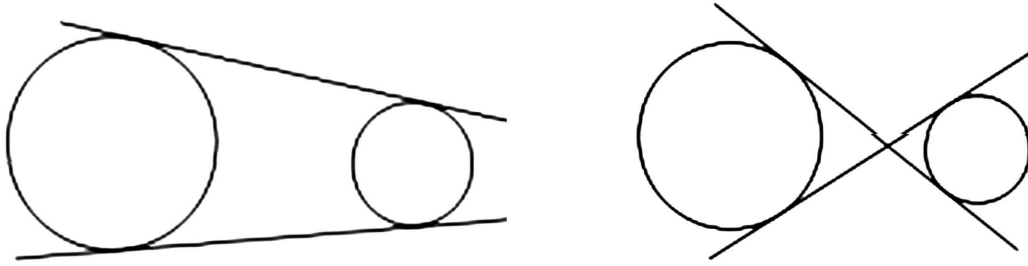
A secant to a circle is a line that intersects the circle at exactly two points.

Tangent to a Circle

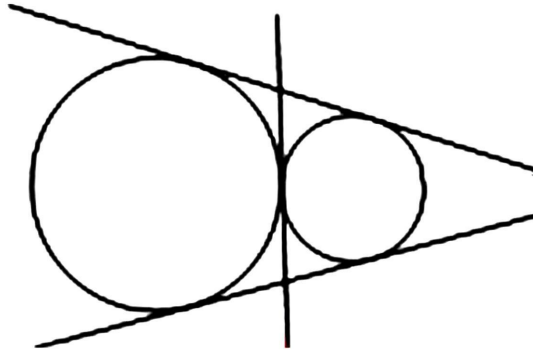
A tangent to a circle is a line that intersects the circle at only one point.

Given two circles, there are lines that are tangents to both of them at the same time.

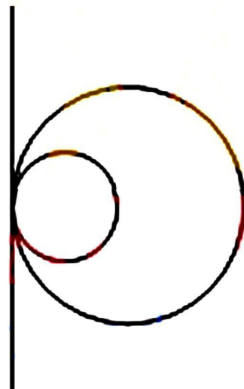
☞ If the circles are separate (do not intersect), there are four possible common tangents:



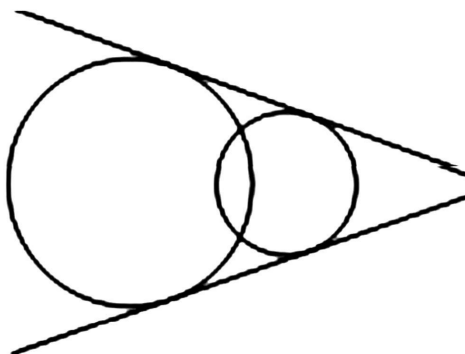
☞ If the two circles touch at just one point, there are three possible tangent lines that are common to both:



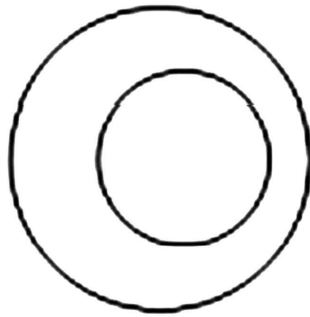
☞ If the two circles touch at just one point, with one inside the other, there is just one line that is a tangent to both:



☞ If the circles overlap - i.e. intersect at two points, there are two tangents that are common to both:



☞ If the circles lie one inside the other, there are no tangents that are common to both. A tangent to the inner circle would be a secant of the outer circle.



- ☞ The tangent to a circle is perpendicular to the radius through the point of contact.
- ☞ *The lengths of tangents drawn from an external point to a circle are equal.*
- ☞ The centre lies on the bisector of the angle between the two tangents.
- ☞ “If a line in the plane of a circle is perpendicular to the radius at its endpoint on the circle, then the line is tangent to the circle”.