NOTES

- NOTES WITH MIND MAPS -

MATHEMATICS

(CIRCLES)

10TH

Circles

1. Introduction to Circle

A **circle** is the locus of a point which lies in the plane in such a manner that its distance from a fixed point in the plane is constant. The fixed point is called the **centre** and the constant distance is called the **radius** of the circle.

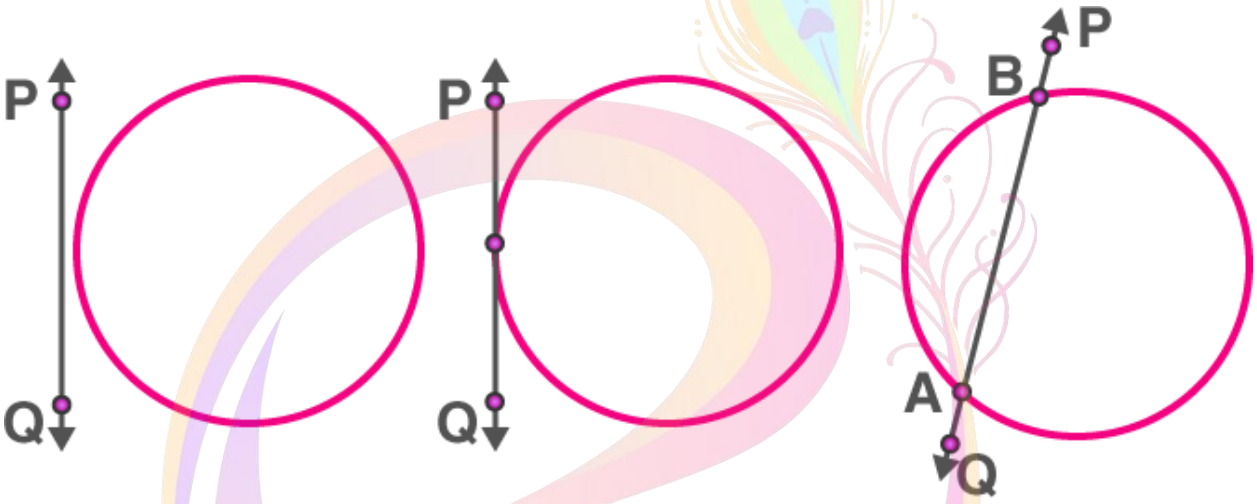
Circle and line in a plane

For a circle and a line on a plane, there can be three possibilities.

they can be non-intersecting

they can have a single common point: in this case, the line touches the circle.

they can have two common points: in this case, the line cuts the circle.

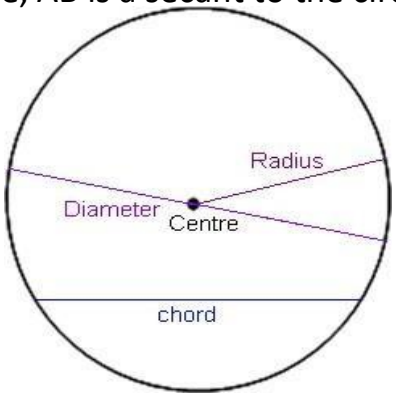


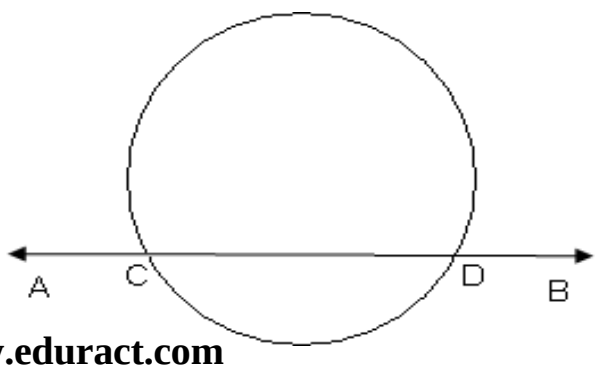
(i) Non intersecting (ii) Touching (iii) Intersecting

2. Parts of the circle

- A line segment that joins any two points lying on a circle is called the **chord** of the circle.
- A chord passing through the centre of the circle is called **diameter** of the circle.
- A line segment joining the centre and a point on the circle is called **radius** of the circle.
- A line which intersects a circle at two distinct points is called a **secant** of the circle.

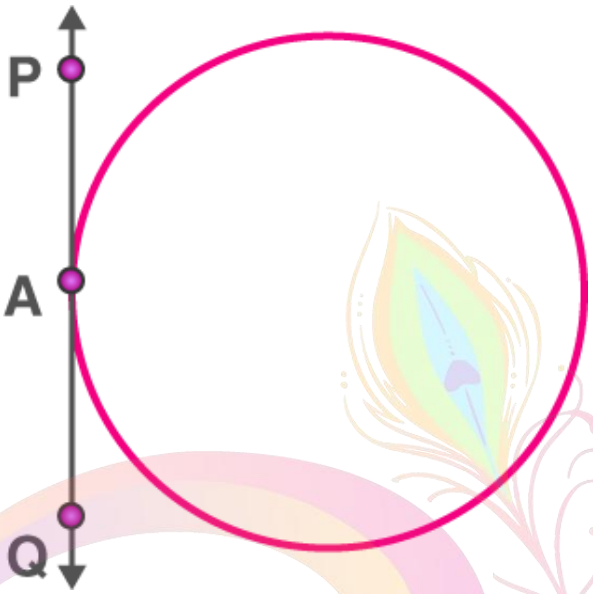
In the figure, AB is a secant to the circle.





3. Tangent to the circle

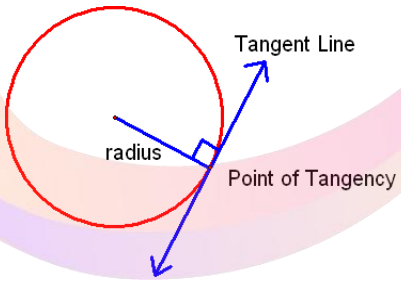
A **tangent** to the circle is a line that intersects the circle (touches the circle) at only one point. The word 'tangent' comes from the Latin word 'tangere', which means to touch. The common point of the circle and the tangent is called **point of contact**.



In the figure, AB is a tangent to the circle and P is the point of contact.

4. Important facts about tangent

- The tangent to a circle is a special case of the secant, when the two end points of its corresponding chord coincide.
- The tangent at any point of a circle is perpendicular to the radius through the point of contact. This point of contact is also called as point of tangency.



- A line drawn through the end of a radius (point on circumference) and perpendicular to it is a tangent to the circle.

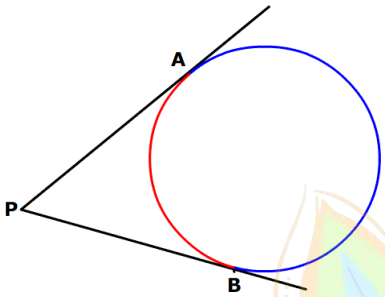
5. Number of tangents on a circle

- There is no tangent possible to a circle from the point (or passing through a point) lying inside the circle.
- There are **exactly two tangents** possible to a circle **through a point outside the circle**.
- At any point on the circle, there can be one and only one tangent possible.

6. Length of the tangent

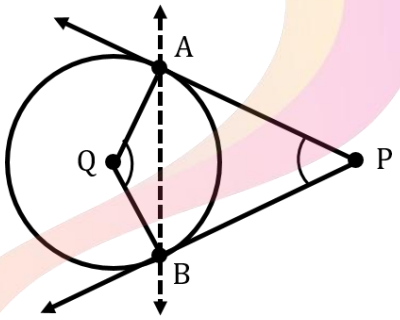
The length of the segment of the tangent from the external point P and the point of contact with the circle is called the **length of the tangent**.

- The lengths of tangents drawn from an external point to the circle are equal.
- The figure shows two equal tangents (*PA = PB*) from an external point *P*.



7. Angle between two tangents from an external point

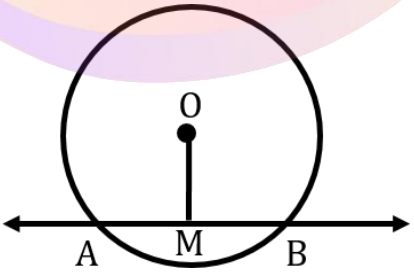
- The centre of a circle lies on the bisector of the angle between the two tangents drawn from an external point.
- Angle between two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.



In the figure, angle P and angle Q are supplementary.

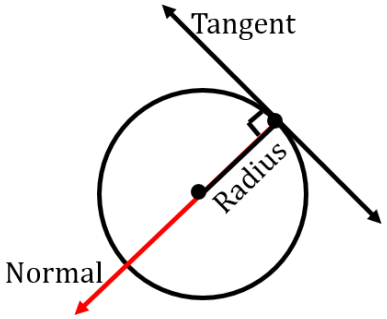
8. Perpendicular from the centre

Perpendicular drawn from the centre to any chord of the circle, divides it into two equal parts. In the figure, OM is perpendicular to AB and AM = MB.



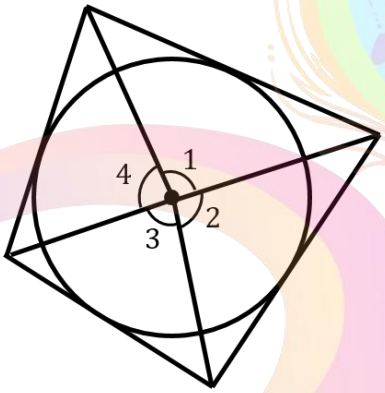
9. Normal to the circle

The line containing the radius through the point of contact is called the normal to the circle at that point.



10. Inscribed circle

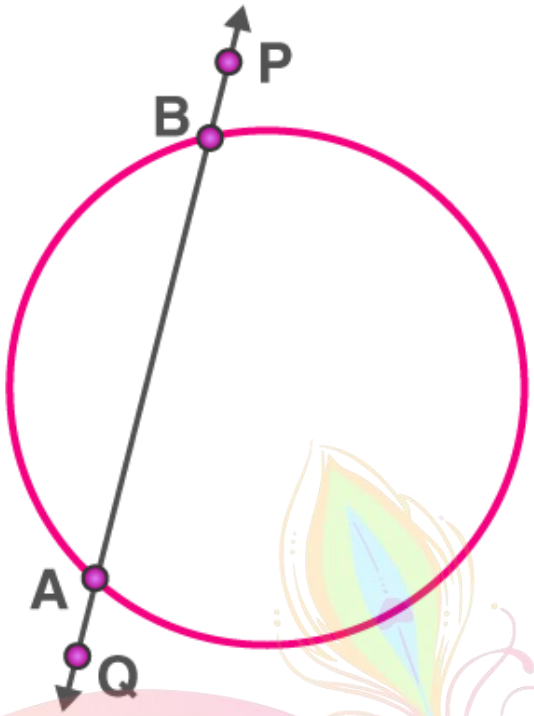
Opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.



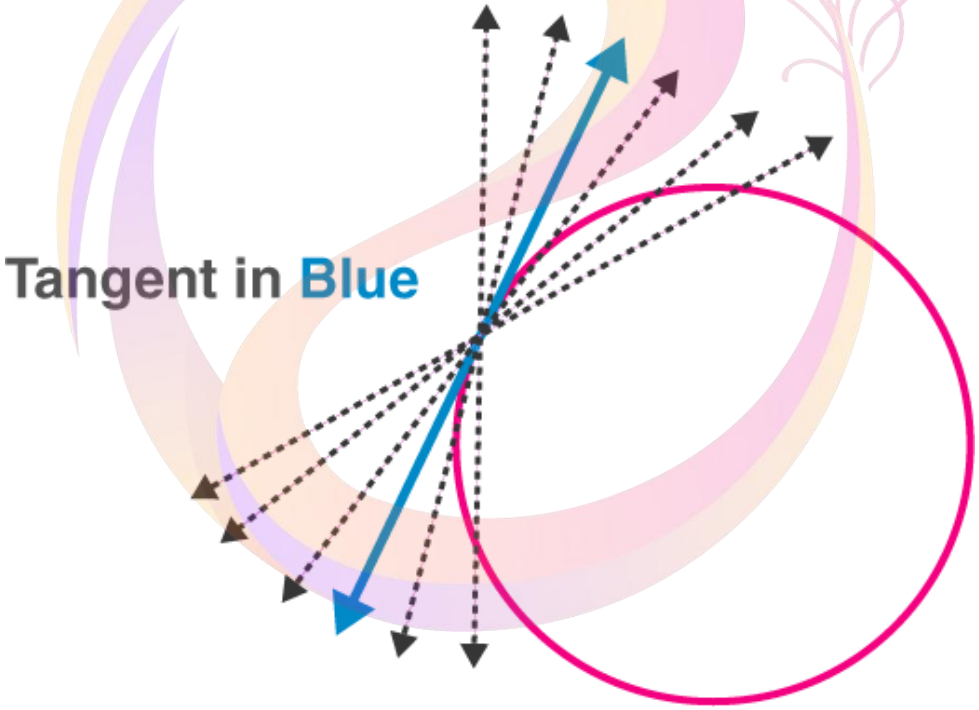
In the figure, angles 1 and 3 are supplementary. Accordingly, angles 2 and 4 are supplementary.

Secant

A secant to a circle is a line that has two points in common with the circle. It cuts the circle at two points, forming a chord of the circle.



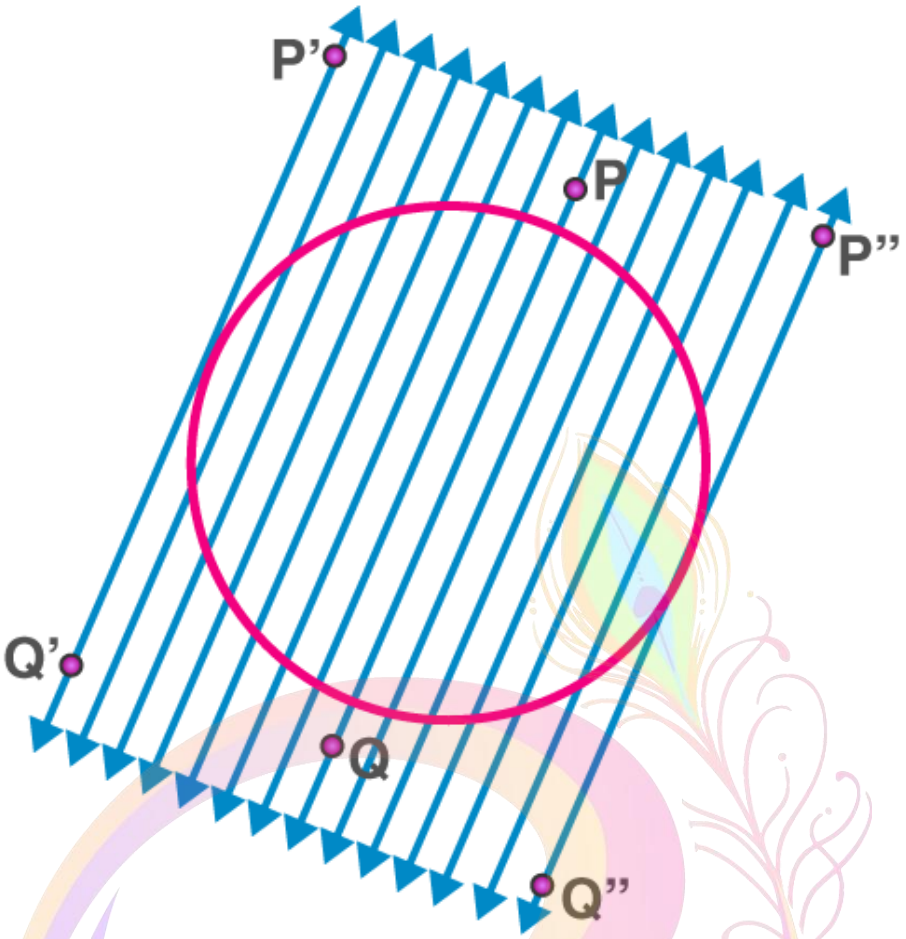
Tangent as a special case of Secant



The tangent to a circle can be seen as a special case of the secant when the two endpoints of its corresponding chord coincide.

Two parallel tangents at most for a given secant

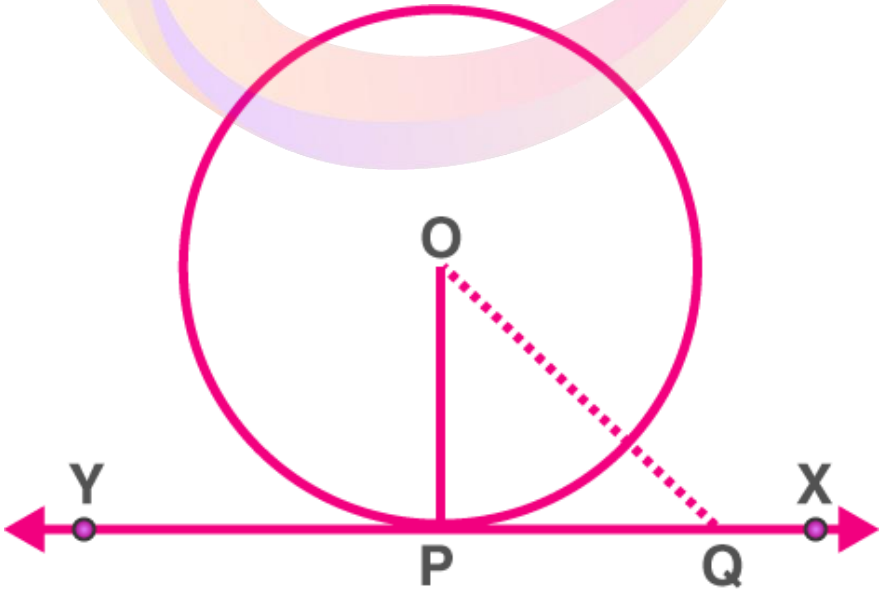
For every given secant of a circle, there are exactly two tangents which are parallel to it and touches the circle at two diametrically opposite points.



Theorems

Tangent perpendicular to the radius at the point of contact

Theorem: The theorem states that "the tangent to the circle at any point is the perpendicular to the radius of the circle that passes through the point of contact".

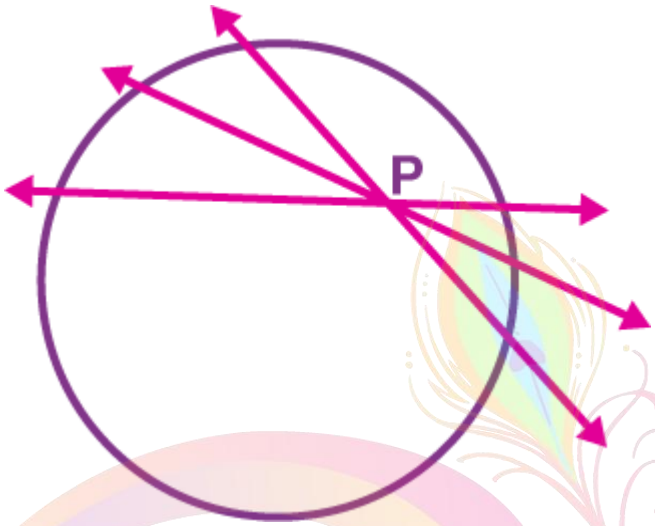


CIRCLES
Class 10th Mathematics

Here, O is the centre and OP⊥XY.

The number of tangents drawn from a given point

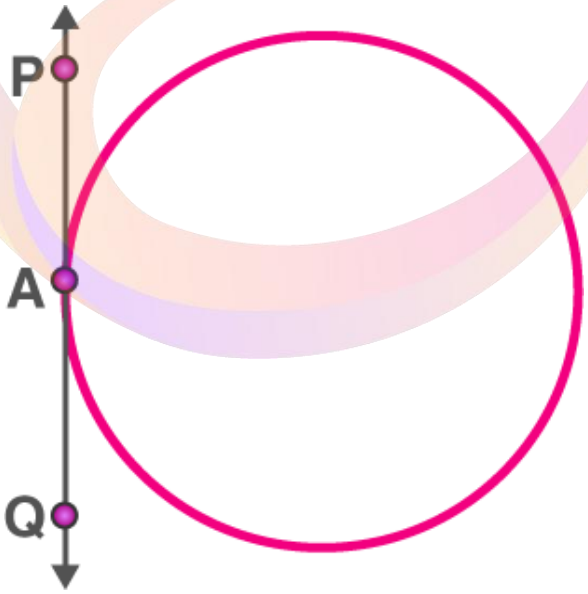
If the point is in an interior region of the circle, any line through that point will be a secant. So, no tangent can be drawn to a circle which passes through a point that lies inside it.



No tangent can be drawn to a circle from a point inside it

AB is a secant drawn through the point S

When a point of tangency lies on the circle, there is exactly one tangent to a circle that passes through it.



A tangent passing through a point lying on the circle