Chapter- 10

CIRCLES

STUDY NOTES

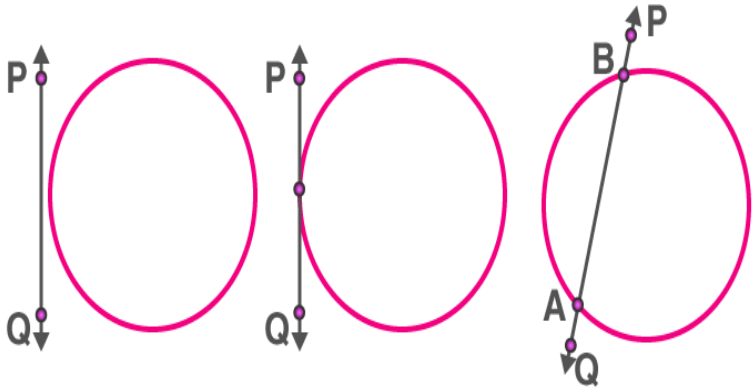
Circle and line in a plane

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

i) they can be **non-intersecting**

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

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

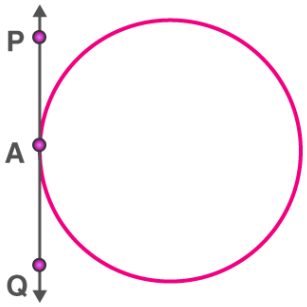


(i) Non intersecting (ii) Touching (iii) Intersecting

Tangent

A **tangent to a circle** is a line which touches the circle at exactly one point. For every point on the circle, there is a unique tangent passing through it.

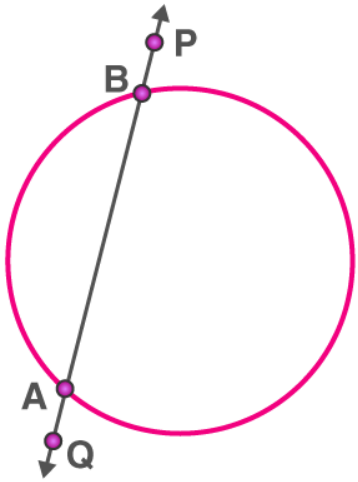
tangent to a circle is a line which touches the circle at exactly one point. For every point on the circle, there is a unique tangent passing through it.



Tangent

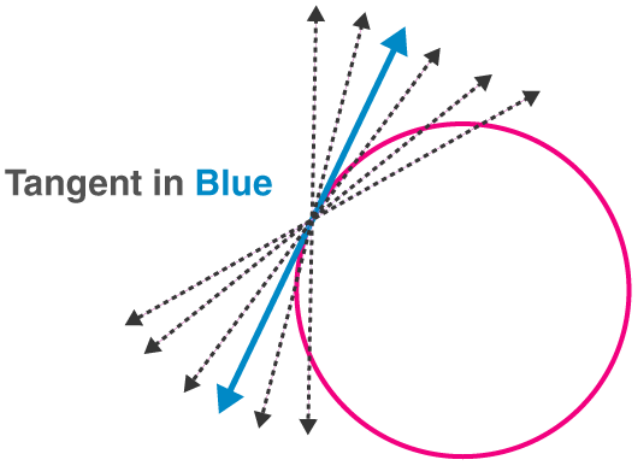
Secant

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



Secant

Tangent as a special case of Secant

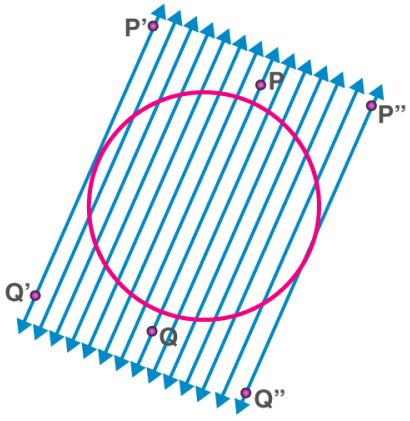


Tangent as a special case of Secant

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.**

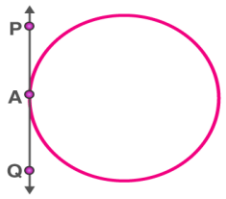


The number of tangents drawn from a given point

i) 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.

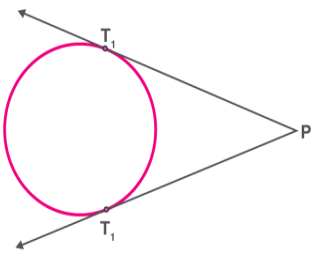
AB is a secant drawn through the point S

ii) 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

iii) When the point lies outside of the circle, there are **accurately two tangents** to a circle through it

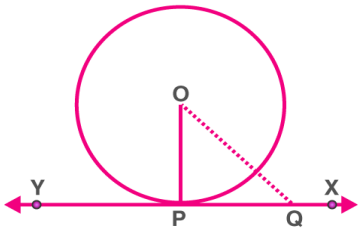


Tangents to a circle from an external point

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".

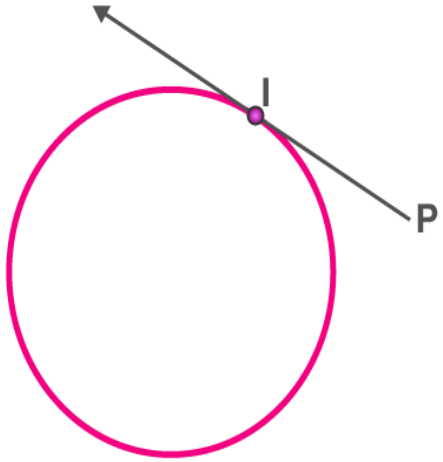


Tangent and radius

Here, O is the center and OP⊥XY.

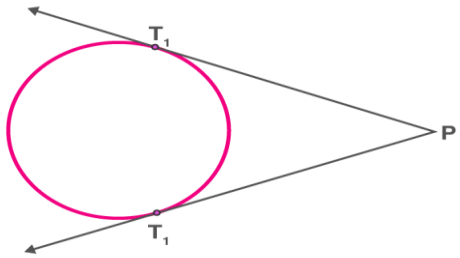
Length of a tangent

The length of the tangent from the point (Say P) to the circle is defined as the segment of the tangent from the external point **P** to the point of tangency **I** with the circle. In this case, PI is the tangent length.



Lengths of tangents drawn from an external point

Theorem: Two tangents are of equal length when the tangent is drawn from an external point to a circle.



Tangents to a circle from an external point

$PT_1=PT_2$