CLASS 9 MATHS – CHAPTER 9

CIRCLES – ALL PROPERTIES & THEOREMS

Basic Definitions

- **Circle**: Set of all points in a plane at a fixed distance from a fixed point
- **Centre**: Fixed point of the circle
- **Radius**: Distance from center to any point on the circle
- **Diameter**: Chord passing through the center
- **Chord**: Line segment joining any two points on a circle
- **Arc**: A part of the circumference of a circle

Chord Properties

- Equal chords subtend equal angles at the center
- Chords equidistant from the center are equal
- The perpendicular from the center to a chord bisects the chord
- A line through the center that bisects a chord is perpendicular to it

Angle Properties of a Circle

- Angle subtended by an arc at the center is **twice** the angle subtended at the circle

$$\angle AOB = 2\angle ACB$$

- Angles in the same segment of a circle are equal
- Angle in a semicircle is **90°**

Cyclic Quadrilateral Properties

- A quadrilateral whose all vertices lie on a circle is cyclic
- Sum of opposite angles of a cyclic quadrilateral is **180°**

$$\angle A + \angle C = 180°$$

- Exterior angle of a cyclic quadrilateral equals the interior opposite angle

Radius & Diameter Properties

• All radii of a circle are equal

• Diameter is the longest chord of a circle

• Every diameter divides the circle into two equal semicircles

Arc & Segment Properties

• Equal arcs subtend equal angles at the center.

• Greater arcs subtend greater angles

• A chord which is not a diameter divides the circle into a **major segment** and **minor segment**

• Angle in the major segment of a circle is always less than 90°

CIRCLES – KEY THEOREMS (QUICK VIEW)

Chords & Centre	Angles in a Circle	Tangent Rules
‣ Equal chords → equal angles at center ‣ Equal angles → equal chords ‣ Centre ⊥ chord → chord bisected ‣ Centre bisects chord → ⊥ chord ‣ Equal distance from center → equal chords ‣ Equal chords → equal distance from center	‣ Angle at center = 2 × angle at circle ‣ Same segment → equal angles ‣ Semicircle → 90° angle	‣ Radius ⊥ tangent at contact point ‣ 1 tangent from point *on* circle ‣ 0 tangent from point *inside* circle ‣ 2 tangents from point *outside* circle