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Circle Theorems

IGCSE Mathematics

The Panda Math Tutor

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1 Introduction to Circle Theorems

Note

Circle theorems describe the special angle and length relationships that arise from points, lines, and angles within and around a circle. They are a major topic in IGCSE Mathematics and appear regularly in examinations.
In this chapter, we will explore:

- Key vocabulary and parts of a circle
- The eight essential circle theorems
- Tangent properties
- The alternate segment theorem
- Chain reasoning with multiple theorems
- Applications and worked exam-style problems

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2 Parts of a Circle

Definition

Key vocabulary you must know:

- **Centre (O):** The fixed point equidistant from every point on the circle.
- **Radius:** A line segment from the centre to any point on the circle. All radii of the same circle are equal.
- **Diameter:** A chord passing through the centre; equal to twice the radius: $d = 2r$.
- **Chord:** A straight line segment with both endpoints on the circle.
- **Arc:** A part of the circumference. The *minor arc* is the shorter part; the *major arc* is the longer part.
- **Circumference:** The total perimeter of the circle.
- **Segment:** A region bounded by a chord and an arc. The *minor segment* is smaller; the *major segment* is larger.
- **Sector:** A region bounded by two radii and the arc between them.

- **Tangent:** A straight line touching the circle at exactly one point (the *point of tangency*).
- **Cyclic quadrilateral:** A quadrilateral whose four vertices all lie on a circle.

Note

Two important angle types:

- An **angle at the centre** is formed by two radii meeting at O.
- An **inscribed angle** (angle at the circumference) is formed by two chords meeting at a point on the circle.
- Both are said to be *subtended* by the arc (or chord) between their two outer endpoints.

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3 The Eight Circle Theorems

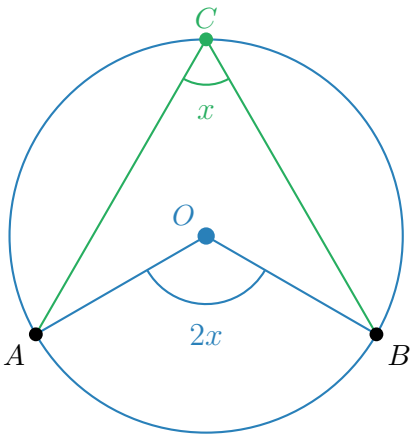
3.1 Theorem 1: Angle at the Centre

Angle at the Centre is Twice the Angle at the Circumference

The angle subtended at the **centre** of a circle is **twice** the angle subtended at the **circumference** by the same arc.

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

where O is the centre and C is any point on the **major** arc AB.



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