Exercise walk-through

Circle theorems I ▪ E4.7

eXercise

You must be able to

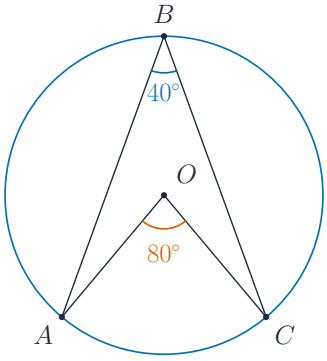
- use “angle at the centre = twice the angle at the circumference”
- use “angles in the same segment are equal” and the cyclic-quadrilateral rule
- use the semicircle and tangent–radius right angles

Method — Circle theorems

- Angle at **centre** $= 2\times$ angle at **circumference** (same arc).
- Angles in the **same segment** are equal; opposite angles of a **cyclic quadrilateral** add to $180°$.
- Angle in a **semicircle** $= 90°$; tangent meets radius at $90°$.
- **Worked:** circumference angle $40° \rightarrow$ centre angle $= 2 \times 40 = 80°$.

Answer shapes: **M1** a correct method, **A1** the correct answer.

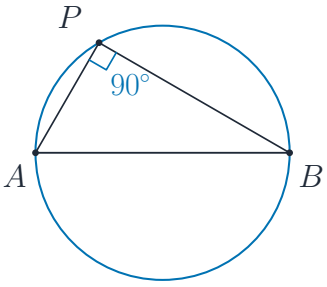
Method — Circle theorems



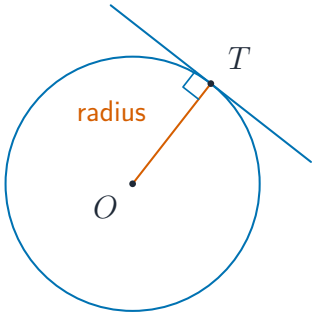
angle at centre $= 2\times$ angle at circumference

Angle at the centre is twice the angle at the circumference

Method — Circle theorems



angle in a semicircle $= 90°$



tangent meets radius $= 90°$

Further circle theorems: angle in a semicircle and the tangent

Practice 2.1 ▪ 1 mark

The angle at the circumference standing on an arc is $35°$. Find the angle at the centre on the same arc.

Solution 2.1

Method: Circle theorems

Worked steps

$2 \times 35 = 70^\circ$ B1.

Practice 2.2 ▪ 1 mark

A triangle is drawn with one side a diameter. State the angle at the point on the circle.

Solution 2.2

Method: Circle theorems

Worked steps

90° (angle in a semicircle) B1.

Practice 2.3 ▪ 2 marks

In a cyclic quadrilateral, one angle is $85°$. Find the opposite angle.

Solution 2.3

Method: Circle theorems

Worked steps

opposite angles of a cyclic quadrilateral add to $180°$: $180 - 85 = 95°$ **M1** **A1** *for* $95°$.

Exam-style 3.1 ▪ 2 marks

A, B, C lie on a circle, centre O. The angle AOC at the centre is 130°. Find the angle ABC at the circumference, giving a reason.

Solution 3.1

Method: Circle theorems

Worked steps

angle $ABC = \frac{1}{2} \times 130 = 65^\circ$ (reason: angle at the centre is twice the angle at the circumference) **M1** **A1** *for* 65° *with reason.*

Exam-style 3.2 ▪ 3 marks

PQRS is a cyclic quadrilateral. Angle $PQR = 95^\circ$ and angle $QRS = 70^\circ$. Find angles *PSR* and *SPQ*.

Solution 3.2

Method: Circle theorems

Worked steps

opposite angles add to $180°$: $PSR = 180 - 95 = 85°$; $SPQ = 180 - 70 = 110°$

M1 A1 A1 *for the cyclic-quadrilateral rule; for* $85°$*; for* $110°$.