HIGHER ONLY

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Name ..... Class .....

G10: Circle theorem proofs

Prove and apply circle theorems with reasons

20 marks · 25 minutes · Non-calculator

1) *AB* is a diameter of a circle with centre *O*, and *C* is on the circle. Prove that angle *AOC* is twice angle *ABC*.

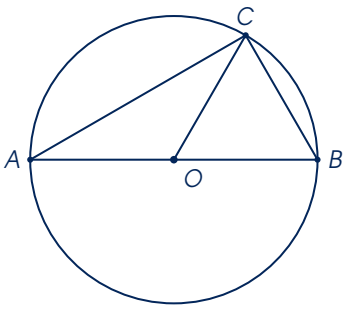
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[Question 1: 3 marks]

2) AB is a diameter with centre O. Prove that angle ACB is 90°.



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[Question 2: 3 marks]

3) Use the angle at the centre theorem to prove that opposite angles of a cyclic quadrilateral add up to 180°.

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[Question 3: 3 marks]

4) A, B and C lie on a circle with centre O. Angle $ACB = 40°$. Explain why angle $AOB = 80°$.

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[Question 4: 2 marks]

5) Two angles in the same segment are marked 50° and 60°. Explain why this cannot be correct.

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[Question 5: 2 marks]

6) Explain why a tangent and the radius at the point of contact are perpendicular.

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[Question 6: 2 marks]

7) *TA* and *TB* are tangents from *T* to a circle with centre *O*. Angle *ATB* = 40°. Show that angle *AOB* = 140°, giving reasons.

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[Question 7: 3 marks]

8) Describe the alternate segment theorem in words.

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[Question 8: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Proof	$OB = OC$ so triangle OBC is isosceles (M1); exterior angle $AOC = 2 \times \angle OBC$ (M1); C1.
2	Proof	Triangles OAC, OBC isosceles (M1); $2x + 2y = 180$ (M1); $x + y = 90$ (C1).
3	Proof	Angles at centre $2a$ and $2c$ (M1); $2a + 2c = 360$ (M1); $a + c = 180$ (C1).
4	Explanation	Angle at centre is twice the angle at circumference (C2).
5	Explanation	Angles in the same segment are equal (C2).
6	Explanation	Tangent meets the circle once; the radius is the shortest distance (C2).
7	Shown	$\angle OAT = \angle OBT = 90°$ (M1); quadrilateral sum 360° (M1); $360 - 220$ (C1).
8	Explanation	Angle between tangent and chord equals angle in the alternate segment (C2).