HIGHER

# 8.8D Proof of the Circle Theorems: Fluency and Exam Drill

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** AB is a diameter of a circle with centre O. C is a point on the circumference. Work out the size of angle ACB. Give a brief reason.

**(Total for Question 1 is 2 marks)**

**2** In a circle with centre O, angle AOB = 136 degrees. Point C lies on the circumference on the major arc AB. Work out angle ACB.

**(Total for Question 2 is 2 marks)**

**3** Give a short proof that the angle at the centre is twice the angle at the circumference standing on the same arc. Use radii in your explanation.

**(Total for Question 3 is 3 marks)**

**4** Points A, B, C and D lie on the same circle with A, B fixed and C and D on the same side of chord AB. Angle ACB = 37 degrees. Work out angle ADB. Give a reason.

**(Total for Question 4 is 2 marks)**

**5** ABCD is a cyclic quadrilateral. Angle ABC = 68 degrees. Work out angle ADC and give a reason.

**(Total for Question 5 is 3 marks)**

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**6** Prove that opposite angles of a cyclic quadrilateral sum to 180 degrees. You may use the fact that the angle at the centre is twice the angle at the circumference.

**(Total for Question 6 is 3 marks)**

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**7** A line is tangent to a circle at A. B and C are points on the circumference so that B and C are distinct from A and lie on the circle. Show that the angle between the tangent at A and the chord AB is equal to the angle in the opposite arc at C, that is angle ACB.

**(Total for Question 7 is 3 marks)**

# Mark scheme · 8.8D Proof of the Circle Theorems: Fluency and Exam Drill

## Question 1

- **B1** 90 degrees cao
- **B1** reason: angle in a semicircle is a right angle oe
- **Answer: 90 degrees; angle in a semicircle is a right angle.**

## Question 2

- **M1** use angle at centre = 2 x angle at circumference (or divide 136 by 2) oe
- **A1** 68 degrees cao
- **Answer: 68 degrees**

## Question 3

- **M1** state OA = OC and OB = OC (radii), so triangles OAC and OBC are isosceles oe
- **M1** deduce angle OCA = angle OAC and angle OBC = angle OCB from the isosceles triangles oe
- **A1** angle AOB = 2 x angle ACB cso
- **Answer: Proof: OA = OC and OB = OC so triangles OAC and OBC are isosceles. Thus OCA = OAC and OBC = OCB. Adding these equal angles shows angle AOB = 2 x angle ACB. (cso)**

## Question 4

- **M1** identify angles ACB and ADB subtend the same arc AB (angles in same segment)
- **A1** 37 degrees cao
- **Answer: 37 degrees; angles in the same segment are equal.**

## Question 5

- **M1** state opposite angles in a cyclic quadrilateral sum to 180 degrees oe
- **M1** calculate 180 - 68 oe
- **A1** 112 degrees cao
- **Answer: 112 degrees; opposite angles in a cyclic quadrilateral sum to 180 degrees.**

## Question 6

- **M1** join the diagonals or consider the arc subtended by two opposite angles and use angle at centre twice circumference
- **M1** express each opposite angle as half of the same arc(s) so they add to half + half = whole
- **A1** sum = 180 degrees cso
- **Answer: Proof: Using angle at centre twice angle at circumference, the two opposite angles subtend the same full arc and so their halves add to the whole: sum = 180 degrees. (cso)**

## Question 7

- **M1** join OA and OB and use OA = OB (radii) so triangle OAB is isosceles and angle OAB = (180 - angle AOB)/2 oe
- **M1** use angle at centre = 2 x angle at circumference to write angle AOB = 2 x angle ACB and deduce angle OAB = 90 - angle ACB oe
- **A1** therefore angle between tangent at A and chord AB = angle ACB cso
- **Answer: Angle between tangent at A and chord AB = angle ACB.**