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Name:

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# PROOF OF CIRCLE THEOREMS

## GCSE
## Edexcel
## Mathematics
## Grade 8/9

| Mark | Score (%) |
| --- | --- |
| | |

### Materials

For this paper you must have:

- Ruler
- Pencil, Rubber, Protractor and Compass
- Scientific calculator, which you are expected to use when appropriate

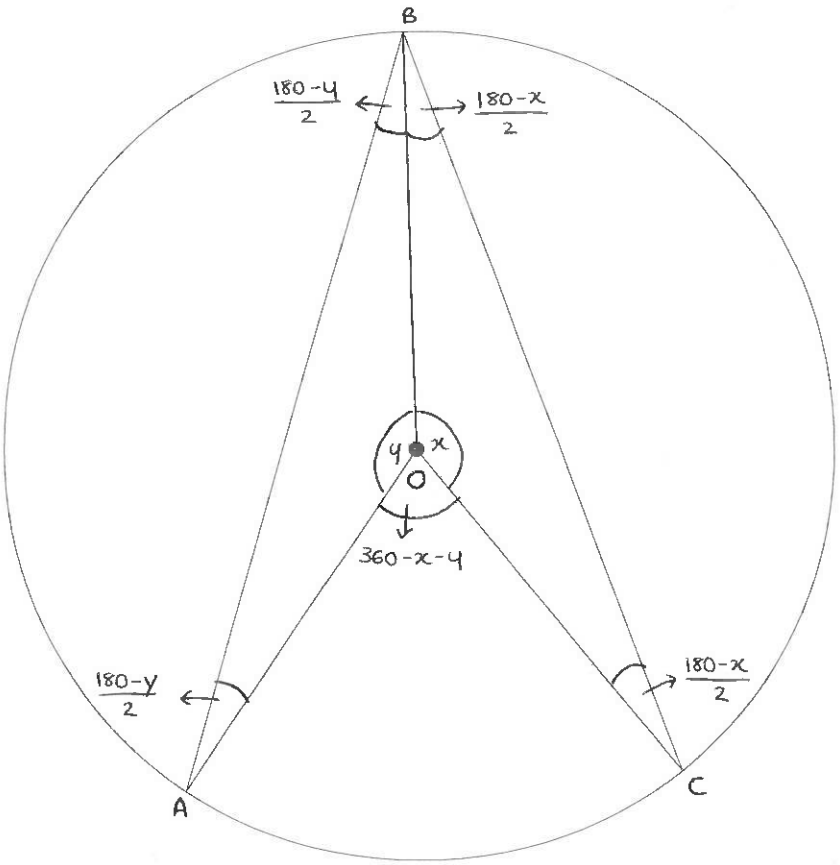
### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown
- Do all rough work in this book. Cross out any rough work you don't want to be marked

### Information

- The marks for the questions are shown in brackets

1

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Prove that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference.

Angle BOC = $x$

Angle BOA = $y$

$\therefore$ Angle AOC = $360 - x - y$

2 angles in isosceles triangle are the same

$\therefore$ Angles OBC and OCB = $\frac{180 - x}{2}$

$\therefore$ Angles OBA and OAB = $\frac{180 - y}{2}$

Angle ABC = $\frac{180 - x}{2} + \frac{180 - y}{2}$

$= 90 - \frac{1}{2}x + 90 - \frac{1}{2}y$

$= 180 - \frac{1}{2}x - \frac{1}{2}y$

$360 - x - y = 2(180 - \frac{1}{2}x - \frac{1}{2}y)$

$360 - x - y = 2(180 - \frac{1}{2}x - \frac{1}{2}y)$

**(Total for question 1 is 4 marks)**

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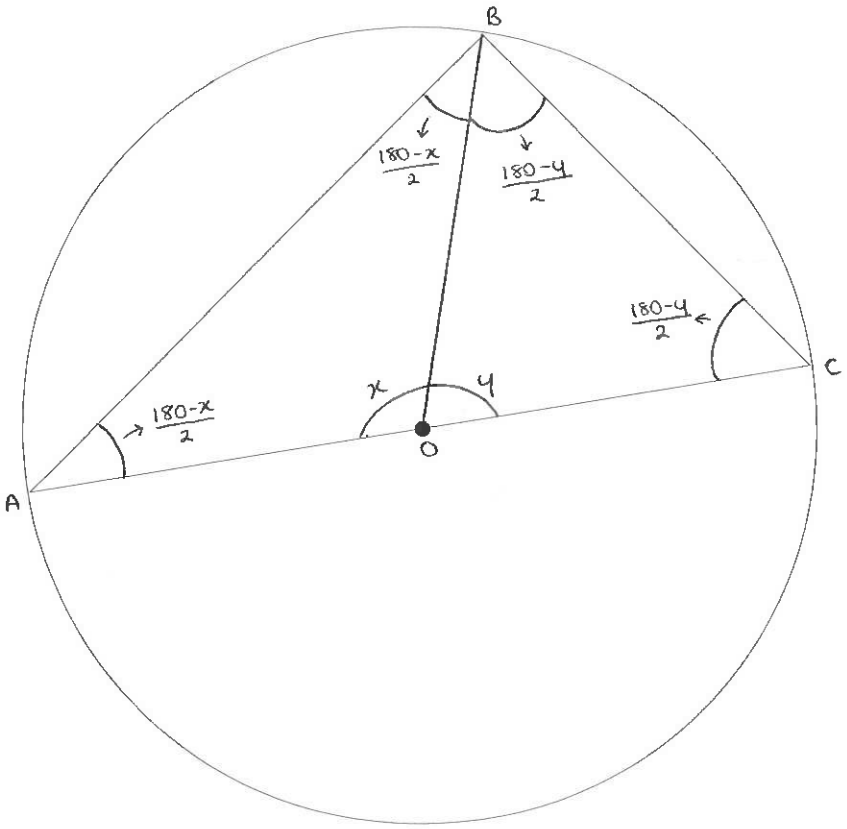
2




Prove the angle subtended at the circumference by a semicircle is a right angle.

Angle AOB = $x$

Angle COB = $y$

$\therefore x + y = 180^\circ$ $\Rightarrow$ angles in a straight line add up to 180°

2 angles in an isosceles triangle are the same

$\therefore$ Angles ABO and BAO = $\frac{180-x}{2}$

$\therefore$ Angles CBO and BCO = $\frac{180-y}{2}$

Angle ABC = $\frac{180-x}{2} + \frac{180-y}{2}$

$= 90 - \frac{1}{2}x + 90 - \frac{1}{2}y$

$= 180 - \frac{1}{2}x - \frac{1}{2}y$

If $x + y = 180^\circ$, then $\frac{1}{2}x + \frac{1}{2}y = 90^\circ$

$\therefore$ Angle ABC = $180 - (\frac{1}{2}x + \frac{1}{2}y)$

$= 180 - 90$

$= 90^\circ$

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

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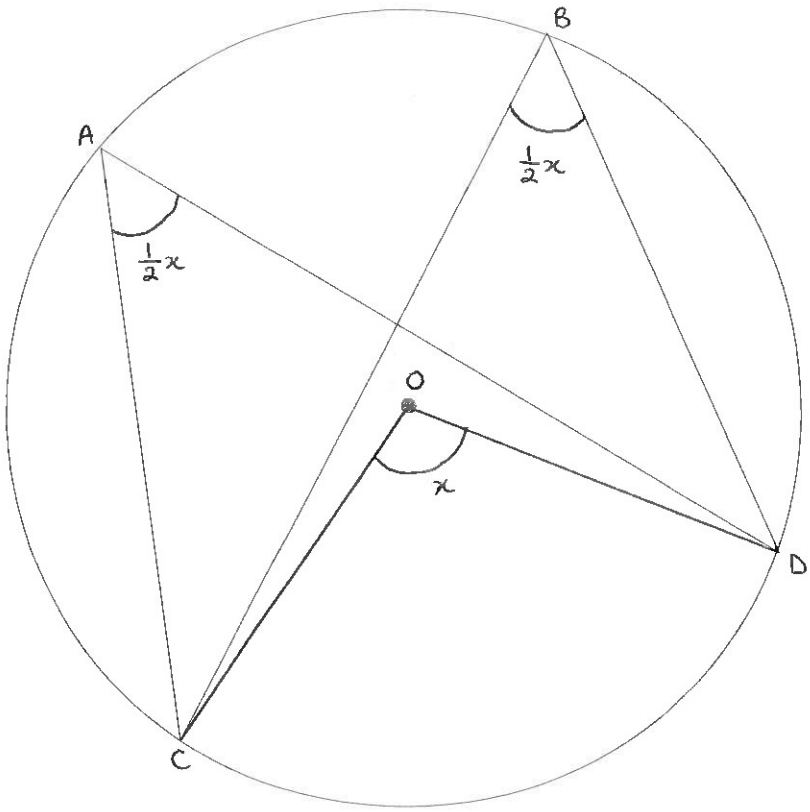
3




Prove that angles in the same segment are equal.

Angle COD $= x$

Angles CAD and CBD $= \frac{1}{2}x \Rightarrow$ angles at circumference are half of the angle at the centre

$\therefore \frac{1}{2}x = \frac{1}{2}x$

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**(Total for question 3 is 4 marks)**

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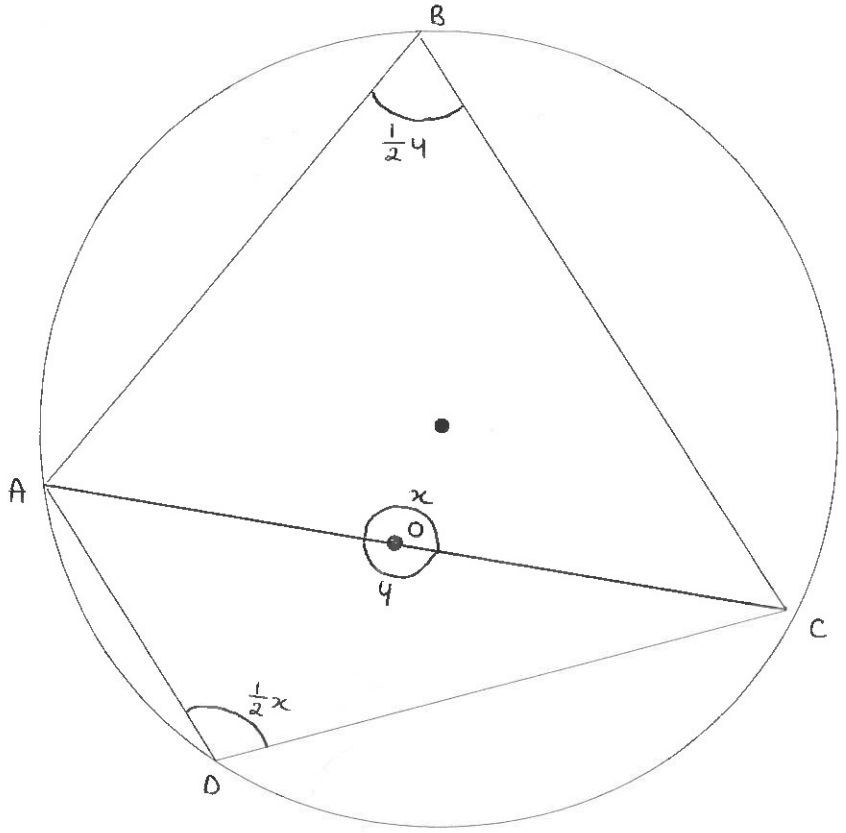
4

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Prove that opposite angles of a cyclic quadrilateral sum to 180°

let angle AOC (top) = $x$

let angle AOC (bottom) = $y$

Angle $x + y = 360°$ $\Rightarrow$ angle at a point is 360°

Angle ADC = $\frac{1}{2}x$

and Angle ABC = $\frac{1}{2}y$ $\Rightarrow$ angles at a circumference is half of the angle at the centre

If $x + y = 360°$, then $\frac{1}{2}x + \frac{1}{2}y = 180°$

**(Total for question 4 is 4 marks)**

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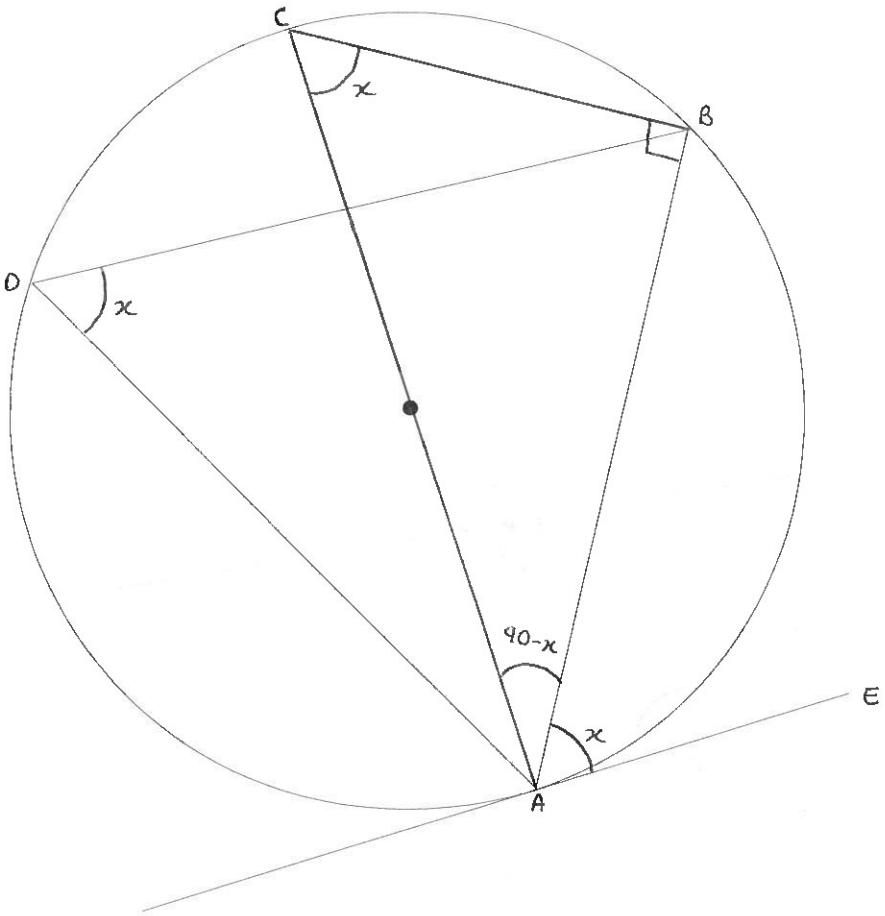
5




Prove the alternate segment theorem.

let Angle BAE = $x$

$\therefore$ Angle BAC = $90 - x$ $\Rightarrow$ when tangent meets radius is 90°

$\therefore$ Angle ACB = $x$ $\Rightarrow$ angles in a triangle add up to 180°

$\therefore 180 - 90 - (90 - x) = 90 - 90 + x = x$

$\therefore$ Angle ADB = $x$ $\Rightarrow$ angles in same segment are equal

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**(Total for question 10 is 2 marks)**

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