

# Circle Theorems

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## 1. Worked example

**The angle at the centre of a circle is  $140^\circ$ . Find the angle at the circumference subtended by the same arc. Give a reason.**

Step 1 · Angle at the centre is twice the angle at the circumference

$$140^\circ \div 2 = 70^\circ$$

**Answer:  $70^\circ$  (angle at centre =  $2 \times$  angle at circumference)**

Check:  $2 \times 70 = 140$  ✓

## 2. Now try one with the steps

**ABCD is a cyclic quadrilateral with angle  $A = 95^\circ$ . Find angle C. Give a reason.**

Step 1 · A and C are opposite

**Answer:**

## 3. Practice

Show your working. The marks tell you how much is expected.

1. A triangle is drawn in a semicircle with the diameter side. What is the angle opposite the diameter? [1]

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2. The angle at the centre is  $120^\circ$ . Find the angle at the circumference on the same arc. [1]

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3. The angle at the circumference is  $35^\circ$ . Find the angle at the centre on the same arc. [1]

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4. Two opposite angles of a cyclic quadrilateral are  $95^\circ$  and  $x$ . Find  $x$ . [1]

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5. What angle does a tangent make with the radius at the point of contact? [1]

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6. Two tangents are drawn to a circle from the same external point. What do you know about their lengths? [1]

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7. An angle in a segment is  $42^\circ$ . What is another angle subtended by the same chord in the same segment? [1]

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8. What does the perpendicular from the centre of a circle to a chord do to the chord? [1]

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9. O is the centre and A, B are on the circle. Angle  $AOB = 100^\circ$ . Find angle OAB. [2]

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10. Tangents from P touch a circle with centre O at A and B. Angle  $APB = 50^\circ$ . Find angle AOB. [3]

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11. The angle between a tangent and a chord is  $72^\circ$ . Find the angle in the alternate segment. [1]

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12. ABCD is a cyclic quadrilateral with angle  $A = 2x$  and angle  $C = x + 30^\circ$ . Find angle A. [3]

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13. A chord 16 cm long is in a circle of radius 10 cm. How far is the chord from the centre, in cm? [3]

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14. AB is a diameter and C is on the circle. Angle  $CAB = 35^\circ$ . Find angle ABC. [2]

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15. Prove that the angle in a semicircle is  $90^\circ$ . (Hint: join the point on the circle to the centre.) [4]

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#### 4. Before you hand it in

##### Angle at the circumference = $2 \times$ angle at the centre

The CENTRE angle is the bigger one: centre =  $2 \times$  circumference.

##### Giving the angle without a reason

State the theorem in words, e.g. 'opposite angles of a cyclic quadrilateral add up to  $180^\circ$ '.

##### Using 'angles in the same segment' when the angles are on opposite sides of the chord

Angles must be on the SAME side of the chord. Opposite sides relate through the cyclic quadrilateral rule instead.

##### Treating a quadrilateral when one vertex is not on the circle

A cyclic quadrilateral needs ALL four vertices on the circle. Check before using the  $180^\circ$  rule.