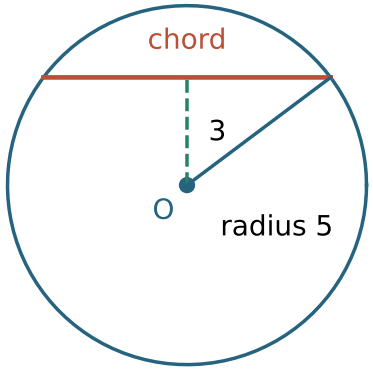
Exercise walk-through

4.5.1 Circles

AQA · GCSE · Mathematics

Figure: Congruence, similarity and circles (2)

Circle of radius 5: distances use one consistent scale

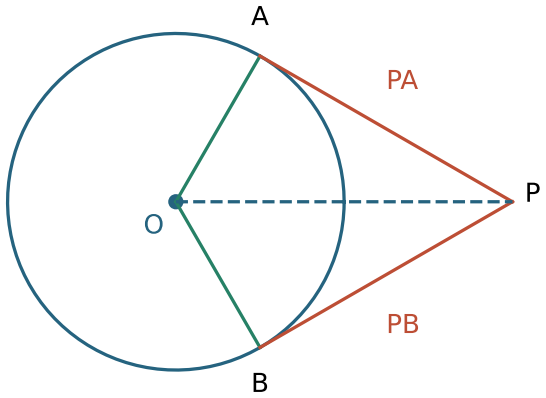


Perpendicular bisects chord: half-length 4

- Radius 5, distance 3: half the chord is $\sqrt{(5^2 - 3^2)} = 4$, so the chord is 8
- Match each part of the diagram to the text.

Figure: Congruence, similarity and circles (4)

Shared OP and equal radii → RHS → PA = PB



- Equal radii, shared OP and right angles give congruent triangles (RHS), so PA = PB
- Match each part of the diagram to the text.

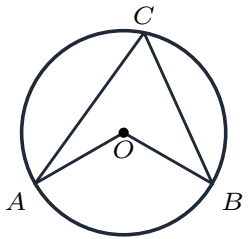
Perimeter, area and volume

- Triangle: $\frac{1}{2} \times b \times h$, where h is the **perpendicular height** .
- Parallelogram: $b \times h$.
- Trapezium: $\frac{1}{2}(a+b)h$, where a and b are the parallel sides.
- Circle: $A = \pi r^2$, and the **circumference** is $C = 2\pi r = \pi d$.

$$\text{arc length} = \frac{\theta}{360} \times 2\pi r \qquad \text{sector area} = \frac{\theta}{360} \times \pi r^2$$

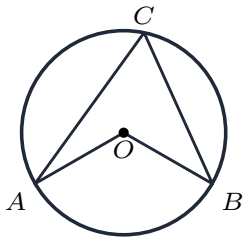
Exercise 2.1

2.1 *(H)* The angle at the centre on arc AB is $140°$. Work out the angle at the circumference on the same arc. [1]



Exercise 2.1

2.1 *(H)* The angle at the centre on arc AB is 140°. Work out the angle at the circumference on the same arc. [1]



2.1

- $140° \div 2 = \mathbf{70}°$: the angle at the centre is twice the angle at the circumference

Exercise 2.2

2.2 *(H)* Angles ADB and ACB stand on the same chord AB, in the same segment. $ADB = 42°$. Write down ACB. [1]



2.3 *(H)* $ABCD$ is a cyclic quadrilateral with angle $A = 75°$. Work out angle C. [1]



2.4 *(H)* AB is a diameter and C is on the circle. Angle $CAB = 35°$. Work out angle ABC. [2]



2.5 *(H)* PT is a tangent touching the circle at A, with centre O and T on the tangent. Angle $AOT = 58°$. Work out angle ATO. [2]



Exercise 2.2

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2.2

- **42°**: angles in the same segment are equal

2.3

- $180° - 75° =$ **105°**: opposite angles of a cyclic quadrilateral add to 180°

Full solution on next slide

Full solution 2.2

2.2

- **42**°: angles in the same segment are equal

2.3

- $180° - 75° = \mathbf{105}°$: opposite angles of a cyclic quadrilateral add to 180°

2.4

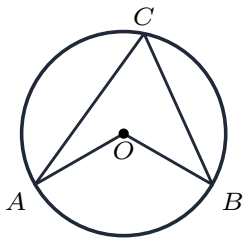
- $ACB = 90°$: the angle in a semicircle
- $ABC = 180° - 90° - 35° = \mathbf{55}°$: angles in a triangle

2.5

- $OAT = 90°$: a tangent meets a radius at right angles
- $ATO = 180° - 90° - 58° = \mathbf{32}°$: angles in a triangle

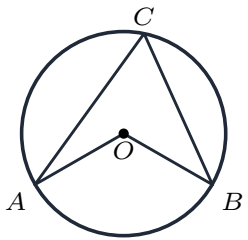
Exercise 3.1

3.1 *(H)* Kai says the angle at the circumference is twice the angle at the centre. Explain his mistake. [1]



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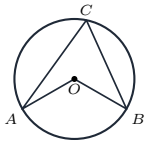


3.1

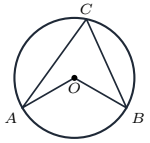
- it is the other way round: the angle at the **centre** is twice the angle at the circumference on the same arc

Setup for exercise 3.2

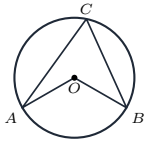
3.2 *(H)* O is the centre. Angle $AOB = 124°$ and C is on the major arc. Work out angle ACB and angle OAB, giving reasons. [3]



3.3 *(H)* $ABCD$ is a cyclic quadrilateral. Angle $ABC = (2x + 10)°$ and angle $ADC = (3x - 5)°$. Work out x and angle ABC. [3]

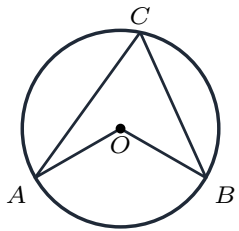


3.4 *(H)* Two tangents from P touch a circle, centre O, at A and B. Angle $APB = 48°$. Work out angle AOB and angle PAB, giving reasons. [3]



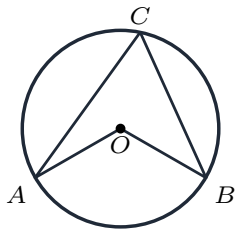
Exercise 3.2

3.5 *(H)* A tangent touches a circle at A. B and C are on the circle. The angle between the tangent and chord AB is $64°$, on the side away from C, and angle $BAC = 50°$. Work out angles ACB and ABC, giving reasons. [4]



Exercise 3.2

3.5 *(H)* A tangent touches a circle at A. B and C are on the circle. The angle between the tangent and chord AB is $64°$, on the side away from C, and angle $BAC = 50°$. Work out angles ACB and ABC, giving reasons. [4]



3.2

- $ACB = 124° \div 2 = \mathbf{62}°$: angle at the centre is twice the angle at the circumference
- $OA = OB$ (radii), so triangle OAB is isosceles
- $OAB = (180° - 124°) \div 2 = \mathbf{28}°$

3.3

Full solution on next slide

Full solution 3.2

3.2

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- $OA = OB$ (radii), so triangle OAB is isosceles
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3.3

- opposite angles of a cyclic quadrilateral: $(2x + 10) + (3x - 5) = 180$
- $5x + 5 = 180$, so $\boldsymbol{x = 35}$
- $ABC = 2 \times 35 + 10 = \mathbf{80}°$

3.4

- $OAP = OBP = 90°$ (tangent meets radius), so $AOB = 360° - 90° - 90° - 48° = \mathbf{132}°$ (angles in a quadrilateral)
- $PA = PB$ (tangents from a point), so $PAB = (180° - 48°) \div 2 = \mathbf{66}°$

3.5

- $ACB = \mathbf{64}°$: alternate segment theorem
- $ABC = 180° - 64° - 50°$: angles in a triangle
- $ABC = \mathbf{66}°$