



Circle theorems

About 45 minutes No calculator 39 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 16 [2 marks]
- The angles of a triangle are $(2x - 3)^\circ$, $(x + 13)^\circ$ and $(4x + 9)^\circ$. Find the size of the largest angle.
- Rationalise the denominator and simplify $\frac{2}{2+\sqrt{3}}$.

Answer

Answer

- A3** From chapter 18 [2 marks] **A4** From chapter 18 [2 marks]
- There are about 975 birds in an island. 25 of them are caught, tagged and released. Later 78 birds are caught. Estimate how many of these are tagged.
- For some data the lower quartile is 25 and the upper quartile is 37. An outlier is more than $1.5 \times$ the interquartile range above the upper quartile. Is 51 an outlier?

Answer

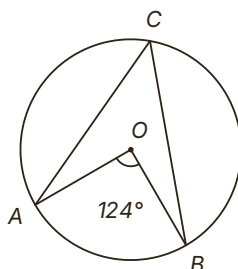
Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

O is the centre of the circle. Angle $AOB = 124^\circ$. Work out angle ACB .

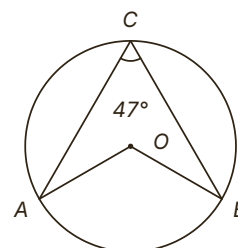


Not drawn accurately

Hint The angle at the centre is twice the angle at the circumference.

B1 O is the centre of the circle. [2 marks]

Angle $ACB = 47^\circ$. Work out angle AOB . Give a reason for your answer.

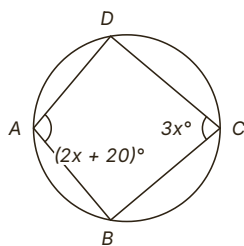


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Answer

EXAMPLE 2

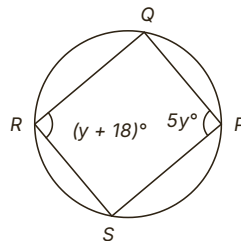
$ABCD$ is a cyclic quadrilateral. Work out angle DAB .



Not drawn accurately

Hint Opposite angles add up to 180° .

B2 $PQRS$ is a cyclic quadrilateral. [3 marks]
Work out angle SPQ .

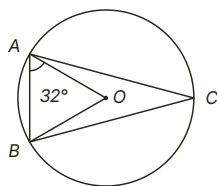


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Answer

c Practice

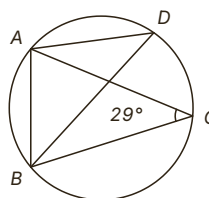
C1 O is the centre. Work out angle ACB . [3 marks]



Not drawn accurately

Answer

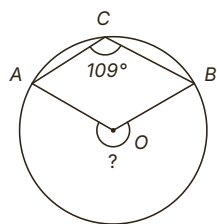
C2 Work out angle ADB . Give a reason for your answer. [2 marks]



Not drawn accurately

Answer

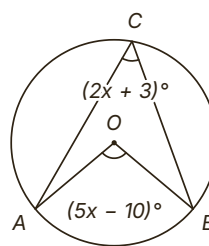
C3 O is the centre. Work out the reflex angle AOB . [2 marks]



Not drawn accurately

Answer

C4 O is the centre. Work out the value of x . [3 marks]



Not drawn accurately

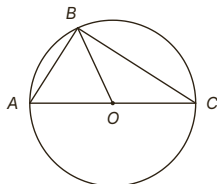
Answer

D Exam-style questions

- D1** Ali draws a quadrilateral $ABCD$ with angle $DAB = 70^\circ$ and angle $BCD = 120^\circ$. He says, "I can draw a circle that passes through A, B, C and D ." [2 marks]

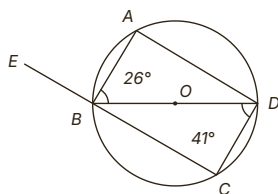
Explain why Ali is wrong.

- D2** A, B and C are points on a circle with centre O . AC is a diameter. Prove that angle $ABC = 90^\circ$. You must give a reason for each stage of your working. [4 marks]



Not drawn accurately

- D3** BD is a diameter of the circle with centre O . CBE is a straight line. [2 marks]



Not drawn accurately

- (a) Write down angle BAD . Give a reason for your answer. [2 marks]

Answer

- (b) Work out angle ABC . You must show your working. [3 marks]

Answer

- (c) Work out angle ABE . Give a reason for your answer. [2 marks]

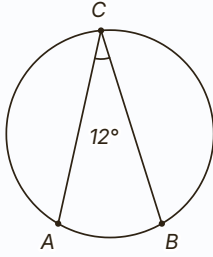
Answer

Total for D3: 7 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** A , B and C are vertices of a regular polygon whose vertices all lie on the circle. [3 marks]
 A is next to B . Angle $ACB = 12^\circ$. How many sides has the polygon?



Not drawn accurately

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Join A and B to the centre O . Find angle AOB .
Hint 2 Angle $AOB = 2 \times 12 = 24^\circ$ (angle at the centre).
Hint 3 Each side makes 24° at the centre, and these add up to 360° .

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can use the angle at the centre and the angle in a semicircle. ☐ ☐ ☐

I can use cyclic quadrilaterals and angles in the same segment. ☐ ☐ ☐

I can prove a circle theorem, with reasons. ☐ ☐ ☐