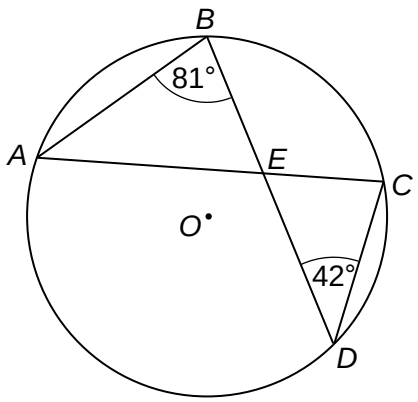
Circle Theorems

SCAN ME

REVISE THIS TOPIC

1 *A*, *B*, *C* and *D* are points on a circle, centre *O*.



1 (a) Write down the size of angle *CAB*. **[1 mark]**

Answer 42 degrees

1 (b) Write down the size of angle *ACD*. **[1 mark]**

Answer 81 degrees

1 (c) Write down the size of angle *AEB*. **[1 mark]**

Answer 57 degrees

1 (d) Write down the size of angle *BEC*. **[1 mark]**

Answer 123 degrees

4

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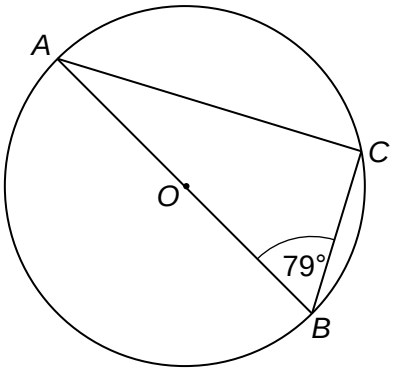
2 *A*, *B*, and *C* are points on a circle, centre *O*.

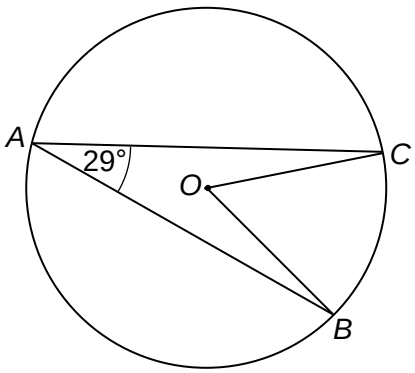


Work out the size of angle *CAB*.
Give a reason for your answer. **[2 marks]**

Answer 11 degrees

Reason The angle in a semicircle is 90°
Angles in a triangle add to 180°

3 *A*, *B*, and *C* are points on a circle, centre *O*.



Work out the size of angle *COB*.
Give a reason for your answer. **[2 marks]**

Answer 58 degrees

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

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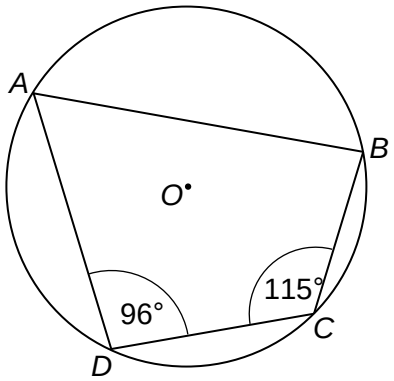
4 *A*, *B*, *C* and *D* are points on a circle, centre *O*.

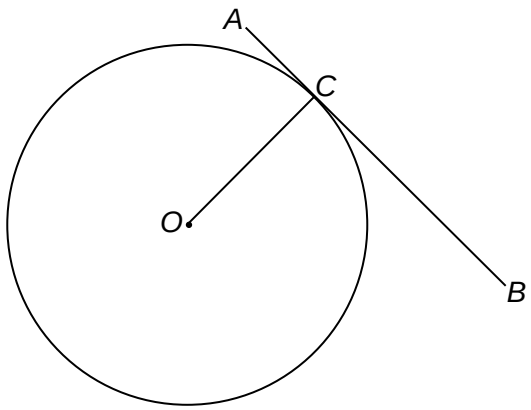


Work out the size of angle *ABC*.
Give a reason for your answer. **[2 marks]**

Answer 84 degrees

Reason Opposite angles in a cyclic quadrilateral add to 180°

5 *A*, *B*, and *C* are points on a circle, centre *O*.
AB is a tangent.



Work out the size of angle *OCB*. **[2 marks]**
Give a reason for your answer.

Answer 90 degrees

Reason A tangent meets a radius at 90°

8

Turn over ►

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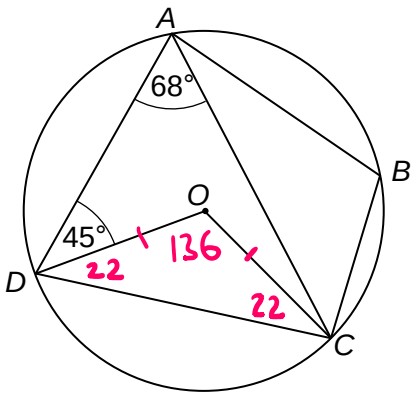
6 *A*, *B*, *C* and *D* are points on a circle, centre *O*.



Work out the size of angle *ABC*.
Give reasons for your answer.

[4 marks]

Angle DOC = 136°

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

Angle ODC = Angle OCD = 22°

Base angles in an isosceles triangle are equal

Angle ADC = 22 + 45
= 67

Angle ABC = 180 − 67
= 113

Opposite angles in a cyclic quadrilateral add to 180°

Answer 113 degrees

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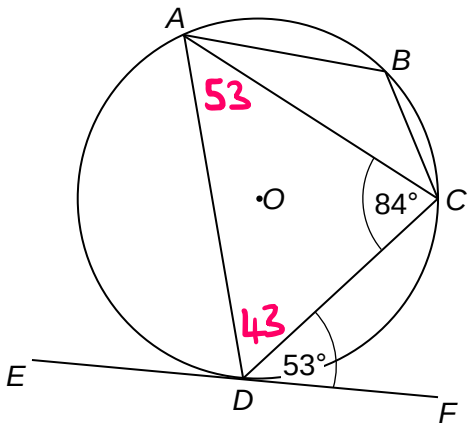
7 *A*, *B*, *C* and *D* are points on a circle, centre *O*.
EF is a tangent.



Work out the size of angle *ABC*.
Give reasons for your answer.

[4 marks]

Angle DAC = 53°
Alternate segment theorem
Angle ADC = 43°
Angles in a triangle add to 180°
Angle ABC = 180 − 43
= 137°
Opposite angles in a cyclic quadrilateral add to 180°

Answer 137 degrees

8

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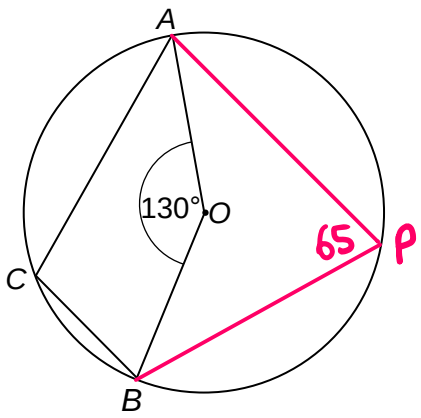
8 *A*, *B*, and *C* are points on a circle, centre *O*.



Work out the size of angle *ACB*.
Give reasons for your answer.

[3 marks]

Angle APB = 65°

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

Angle ABC = 180 − 65

= 115

Opposite angles in a cyclic quadrilateral add to 180°

Answer 115 degrees

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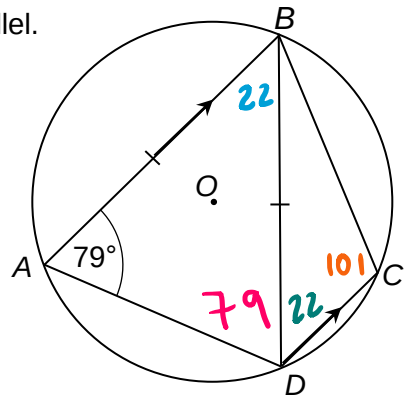
9 *A*, *B*, *C* and *D* are points on a circle, centre *O*.
BA = *BD*
AB and *DC* are parallel.



Work out the size of angle *DBC*.
Give reasons for your answer. **[5 marks]**

Angle BAD = Angle BDA = 79°

Base angles in an isosceles triangle are equal

Angle ABD = 22°

Angles in a triangle add to 180°

Angle BDC = Angle ABD

Alternate angles are equal

Angle ABC = 180 − 43

= 137°

Opposite angles in a cyclic quadrilateral add to 180°

Angle DBC = 57°

Angles in a triangle add to 180°

Answer 57 degrees

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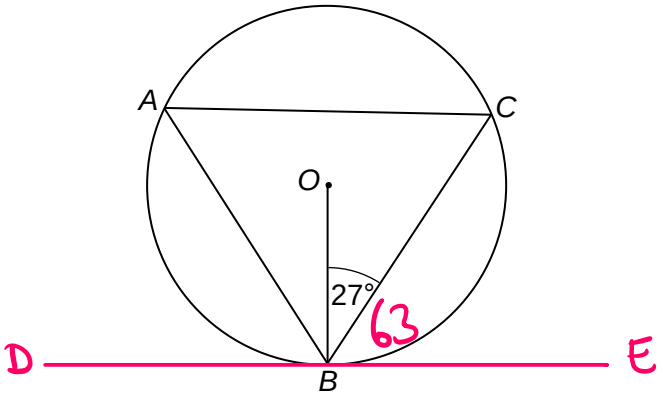
10 *A*, *B*, and *C* are points on a circle, centre *O*.



Work out the size of angle *BAC*.
Give reasons for your answer. **[4 marks]**

Angle CBE = 90 - 27
= 63°
A tangent meets a radius at 90°

Angle BAC = 63°
Alternate segment theorem

Answer 63 degrees

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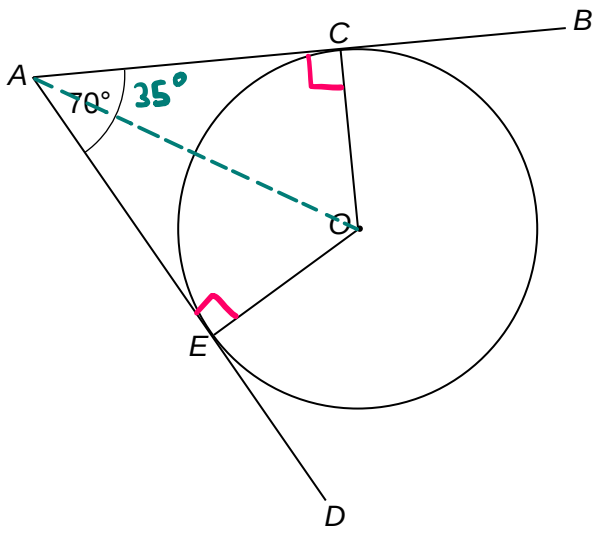
11 *C* and *E* are points on a circle, centre *O*.
AB and *AD* are tangents.



11 (a) Work out the size of angle *COE*. **[2 marks]**

Angle AEO = Angle ACO = 90°

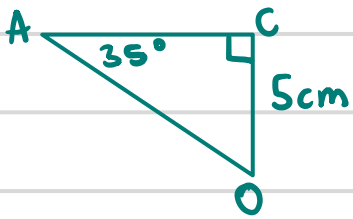
A tangent meets a radius at 90°

Angle COE = 110° Angles in a quadrilateral add to 360°

Answer 110 degrees

11 (b) *OC* = 5 cm
Work out the length of *CA* to 1 decimal place. **[2 marks]**

Angle CAO = 35°



$\tan(35) = \frac{5}{CA}$

$CA = \frac{5}{\tan(35)}$

CA = 7.1407...

Answer 7.1 cm

8

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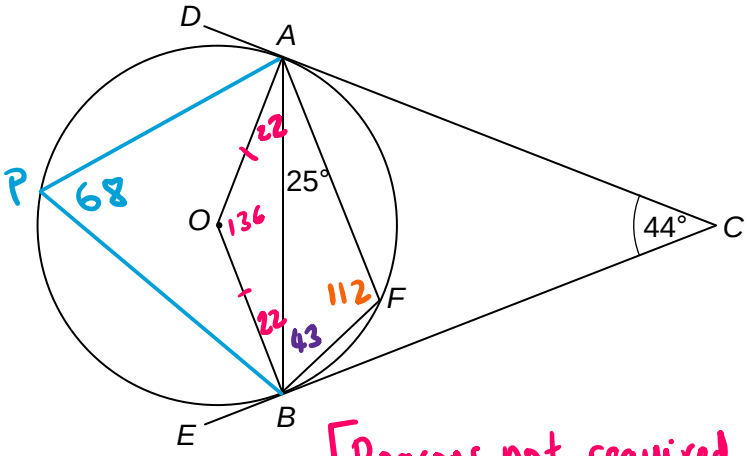
12 *A* and *B* are points on a circle, centre *O*.
DC and *EC* are tangents.



[Reasons not required in this Q]

Work out the size of angle *FBC*.

[4 marks]

Angle AOB = 136° A tangent meets a radius at 90° and angles in a quadrilateral add to 360°

Angle ABO = Angle BAO = 22°
Base angles in an isosceles triangle are equal

Angle APB = 68°
The angle at the centre is twice the angle at the circumference.

Angle AFB = 112° Opposite angles in a cyclic quadrilateral add to 180°

Angle ABF = 43° Angles in a triangle add to 180°

Angle FBC = 25° A tangent meets a radius at 90°

Answer 25 degrees

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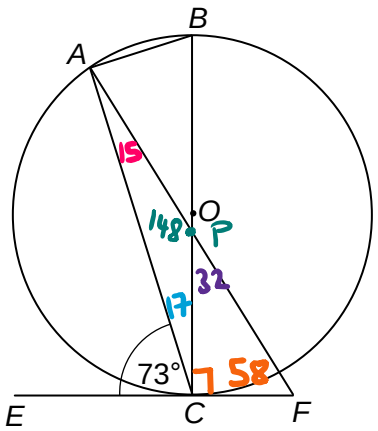
13 *A*, *B*, and *C* are points on a circle, centre *O*.
EF is a tangent.
Angle *FAB* = 5 × Angle *CAF*.



[Reasons not required in this Q]

Work out the size of angle *AFC*.

[4 marks]

Angle ACB = 90° The angle in a semicircle is 90°

90 ÷ 6 = 15

Angle CAF = 15°

Angle ECB = 90° Angle ACB = 17°

A tangent meets a radius at 90°

Angle APC = 148° Angles in a triangle add to 180°

Angle CPF = 32° Angles on a straight line add to 180°

Angle AFC = 58° Angles in a triangle add to 180°

Answer 58 degrees

8

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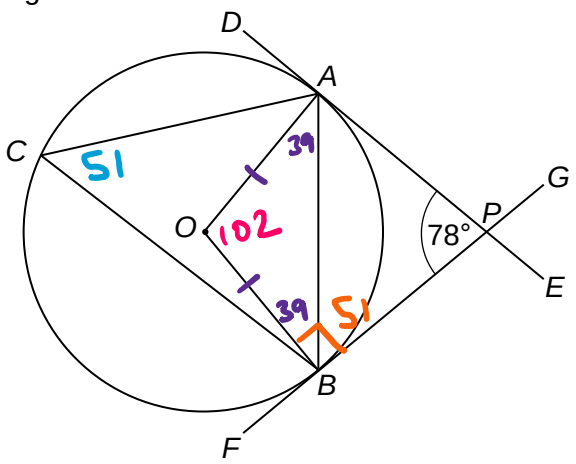
14 *A*, *B*, and *C* are points on a circle, centre *O*.
DE and *FG* are tangents.



[Reasons not required in this Q]

14 (a) Work out the size of angle *ACB*. **[2 marks]**

Angle AOB = 102° A tangent meets a radius at 90° and angles in a quadrilateral add to 360°

Angle ACB = 51° Angle at the circumference is half the angle at the centre

Answer 51 degrees

14 (b) Work out the size of angle *ABP*. **[2 marks]**

Angle ABO = Angle BAO = 39°

Base angles in an isosceles triangle are equal

Angle ABP = 90 - 39 = 51

A tangent meets a radius at 90°

Answer 51 degrees

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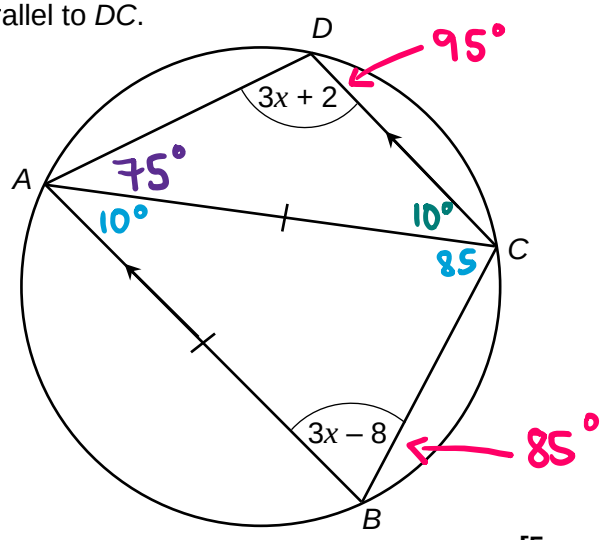
15 *A*, *B*, *C* and *D* are points on a circle, centre *O*.
ABCD is a trapezium with *AB* parallel to *DC*.
AB = *AC*



Work out the size of angle *DAC*.

[5 marks]

[Reasons not required in this Q]

$3x + 2 + 3x - 8 = 180°$

Opposite angles in a cyclic quadrilateral add to 180°

$6x - 6 = 180$

$6x = 186$

$x = 31°$

$3(31) + 2 = 95$

$3(31) - 8 = 85$

Angle ACB = Angle ABC = 85

Angle CAB = 10° Angles in a triangle add to 180°

Angle DCA = Angle CAB alternate angles are equal

Angle DAC = 75° Angles in a triangle add to 180°

Answer 75 degrees

9

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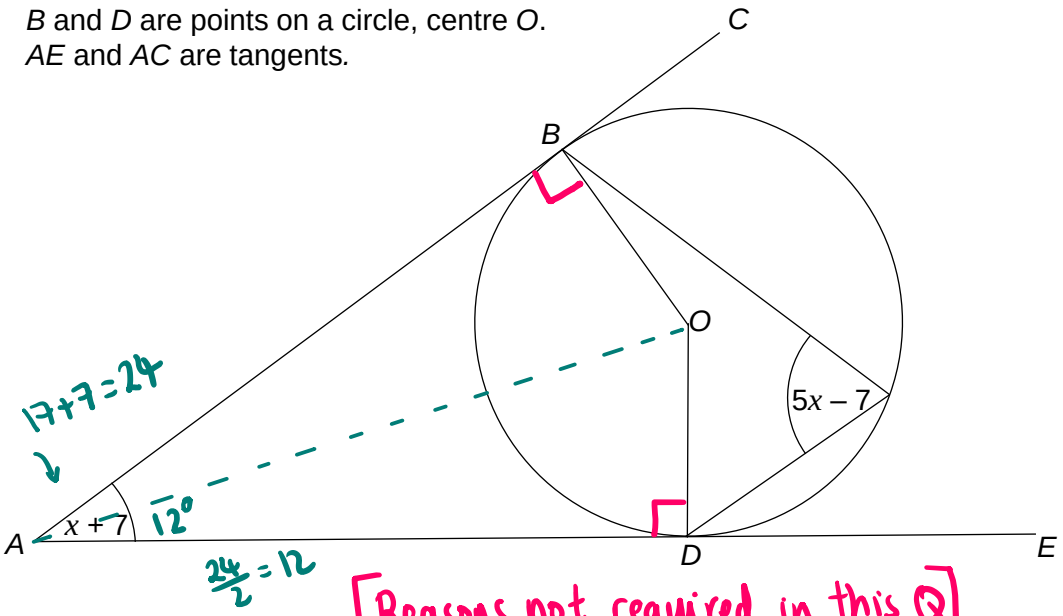
16 *B* and *D* are points on a circle, centre *O*.
AE and *AC* are tangents.



16 (a) Work out the value of x [Reasons not required in this Q] **[3 marks]**

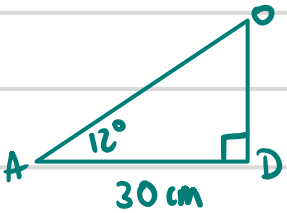
Angle BOD = 2(5x−7)
(twice angle at circumference)
Angle BOD = 180 − (x+7)
(angles in quadrilateral add to 360°)

10x − 14 = 180 − x − 7
10x − 14 = 173 − x
11x = 187
x = 17

Answer 17 degrees

16 (b) *AD* = 30 cm
Work out the length of *OD* to 3 significant figures. **[3 marks]**

BAD = 24°
OAD = 12°



tan(12) = OD/30
OD = 30 tan(12)

Answer 3.38 cm

6

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