

Circle theorems

Exam questions

Higher tier

Please write clearly in block capitals.

Name

Class **Teacher**

Time allowed: 60 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 13): you must not use a calculator.
- **Section B** (questions 14 and 15): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 52.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
TOTAL	

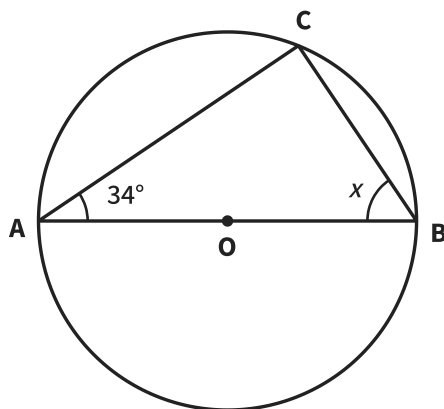
Section A



You must not use a calculator

Do not
write
outside
the box

- 1 A, B and C are points on a circle, centre O.
AB is a diameter of the circle.



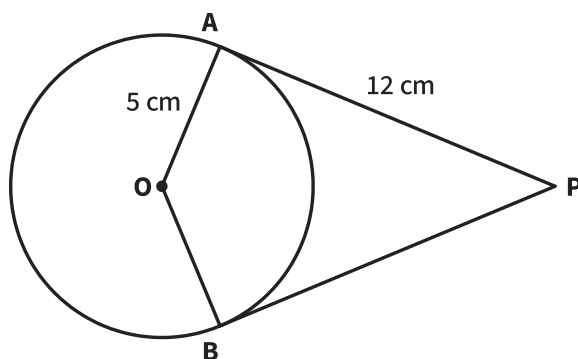
Not drawn accurately

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

Answer _____ degrees
[3 marks]

2

A and B are points on a circle, centre O.
 PA and PB are tangents to the circle.
 $OA = 5\text{ cm}$ and $PA = 12\text{ cm}$



Not drawn accurately

- (a) Write down the size of angle OAP.
 Give a reason for your answer.

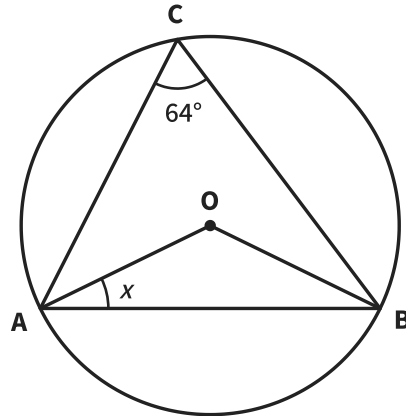
Answer _____ degrees
[2 marks]

- (b) Work out the length of OP.

Answer _____ cm
[2 marks]

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



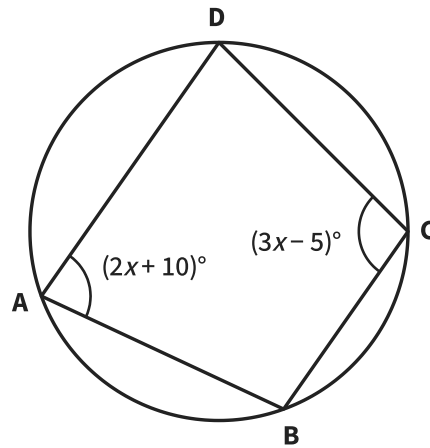
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Work out the size of angle x .
Give reasons for your answer.

Answer _____ degrees
[3 marks]

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- 4 A, B, C and D are points on a circle.



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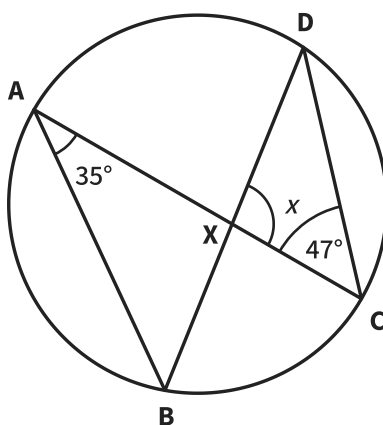
Work out the value of x .
Give a reason for your answer.

$x =$ _____

[3 marks]

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- 5 A, B, C and D are points on a circle.
AC and BD meet at X.



Not drawn accurately

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

Answer _____ degrees
[3 marks]

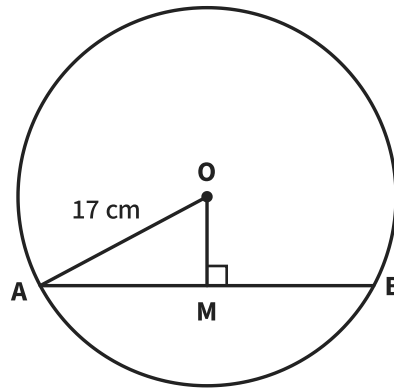
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6

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

The radius of the circle is 17 cm and the chord AB is 30 cm long.

M is the point on AB so that OM is perpendicular to AB.



Not drawn accurately

Work out the length of OM.

Give a reason for your answer.

Answer _____ cm

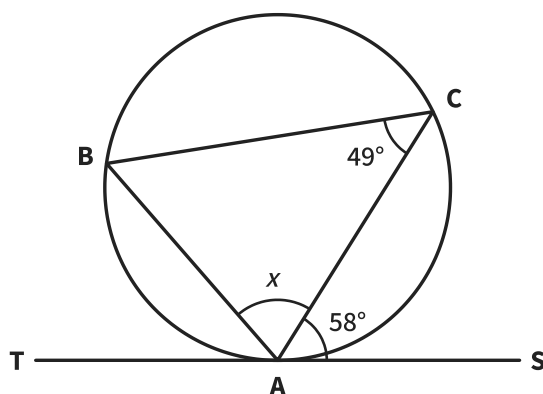
[3 marks]

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7

A, B and C are points on a circle.
SAT is a tangent to the circle at A.

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Not drawn accurately

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

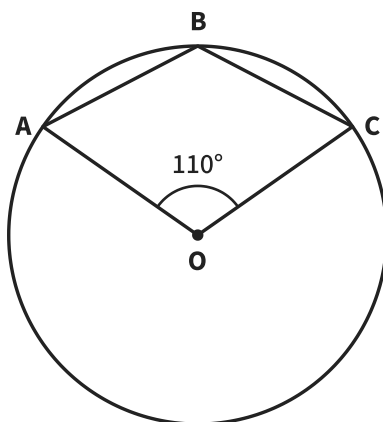
Answer _____ degrees
[3 marks]

8

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

Sam says,

"Angle $ABC = 180^\circ - 110^\circ = 70^\circ$ because opposite angles of a cyclic quadrilateral add up to 180° "



Not drawn accurately

(a) Explain why Sam is wrong.

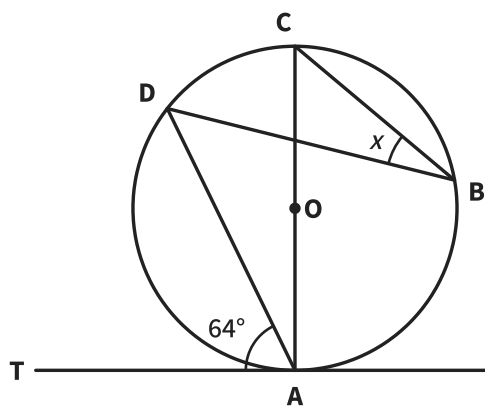
[1 mark]

(b) Work out the size of angle ABC.

Answer _____ degrees
[2 marks]

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- 9 A, B, C and D are points on a circle, centre O.
AC is a diameter of the circle.
TA is a tangent to the circle at A.



Not drawn accurately

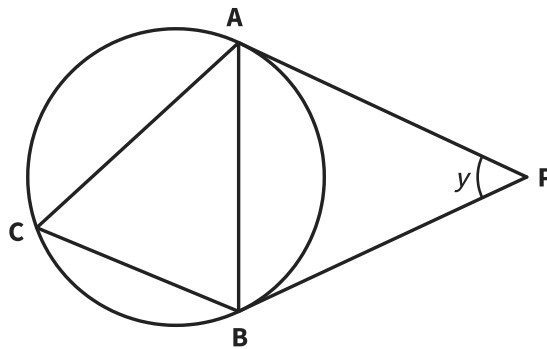
Work out the size of angle x .
Give reasons for your answer.

Answer _____ degrees
[3 marks]

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10

A, B and C are points on a circle.
 PA and PB are tangents to the circle.
 Angle APB = y



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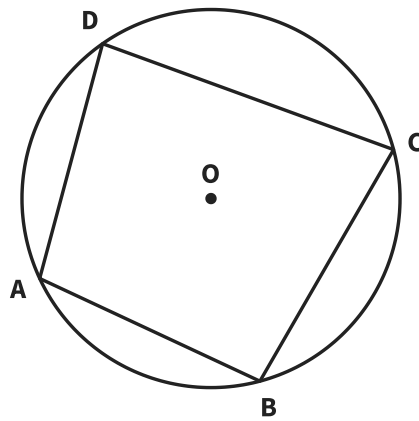
Show that angle ACB = $90^\circ - \frac{y}{2}$

Give reasons for each stage of your working.

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[4 marks]

- 11** ABCD is a cyclic quadrilateral.
O is the centre of the circle.



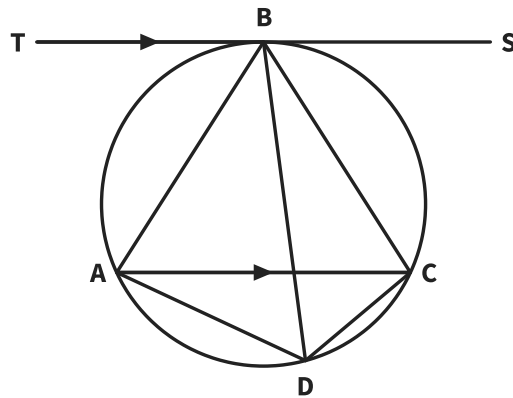
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Prove that the opposite angles of a cyclic quadrilateral add up to 180°
You may use the theorem that the angle at the centre is twice the angle at the circumference.

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[4 marks]

- 12** A, B, C and D are points on a circle.
TBS is a tangent to the circle at B.
AC is parallel to TBS.



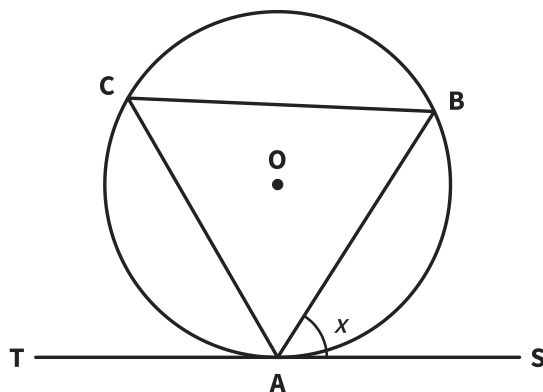
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Prove that BD bisects angle ADC.

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the box

[4 marks]

- 13** A, B and C are points on a circle, centre O.
 TAS is a tangent to the circle at A.
 Angle $BAS = x$



Not drawn accurately

Prove that angle $ACB = x$

You may use the facts that the angle in a semicircle is 90° and the angle between a tangent and a radius is 90°

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[4 marks]

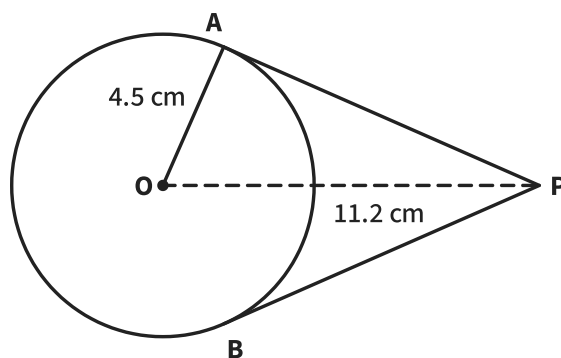
Section B



You may use a calculator

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- 14** A and B are points on a circle, centre O.
PA and PB are tangents to the circle.
OA = 4.5 cm and OP = 11.2 cm



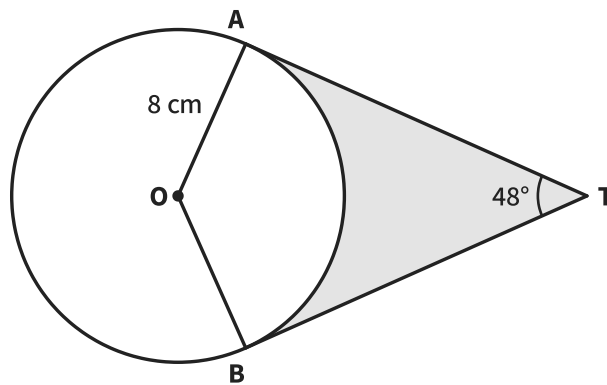
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Work out the size of angle APB.
Give your answer to 1 decimal place.

Answer _____ degrees
[3 marks]

- 15** A and B are points on a circle, centre O, radius 8 cm.
 TA and TB are tangents to the circle.
 Angle ATB = 48°

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write
outside
the box



Not drawn accurately

Work out the area of the shaded region.
 Give your answer to 3 significant figures.

Answer _____ cm^2

[5 marks]

END OF QUESTIONS