GCSE · Edexcel · Maths

3 hours 46 questions

Exam Questions

Circle Theorems

Angles at Centre & Circumference / Angle in a Semicircle / Theorems with Chords & Tangents / Angles in Cyclic Quadrilaterals / Angles in the Same Segment / The Alternate Segment Theorem / Circle Theorem Proofs

Medium (17 questions)	/59
Hard (13 questions)	/52
Very Hard (16 questions)	/74
Total Marks	**/185**

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Medium Questions

1

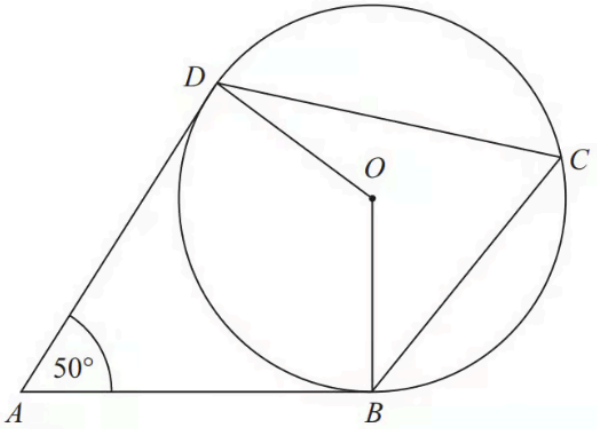


Diagram **NOT** accurately drawn

B, C and D are points on the circumference of a circle, centre O. AB and AD are tangents to the circle.

Angle $DAB = 50°$

Work out the size of angle BCD.
Give a reason for each stage in your working.

(4 marks)

2

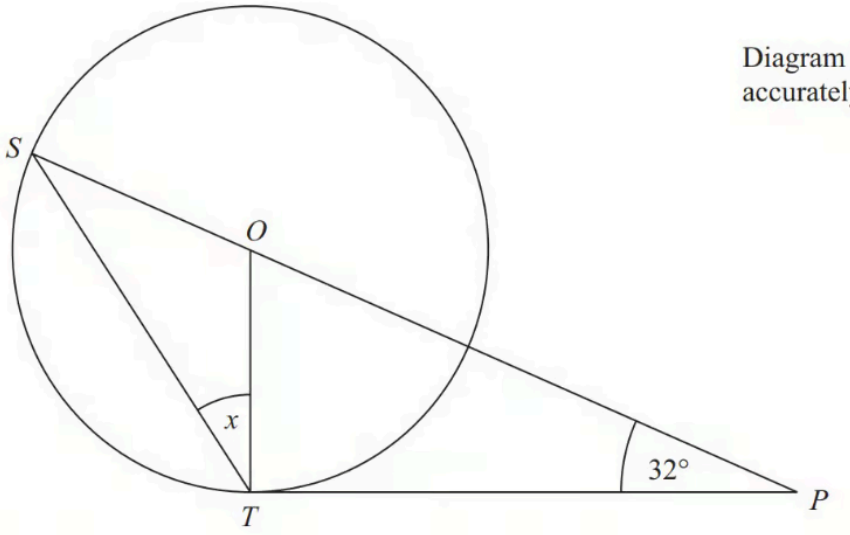


Diagram **NOT** accurately drawn

S and T are points on the circumference of a circle, centre O.
PT is a tangent to the circle.
SOP is a straight line.

Angle $OPT = 32°$

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

(5 marks)

3

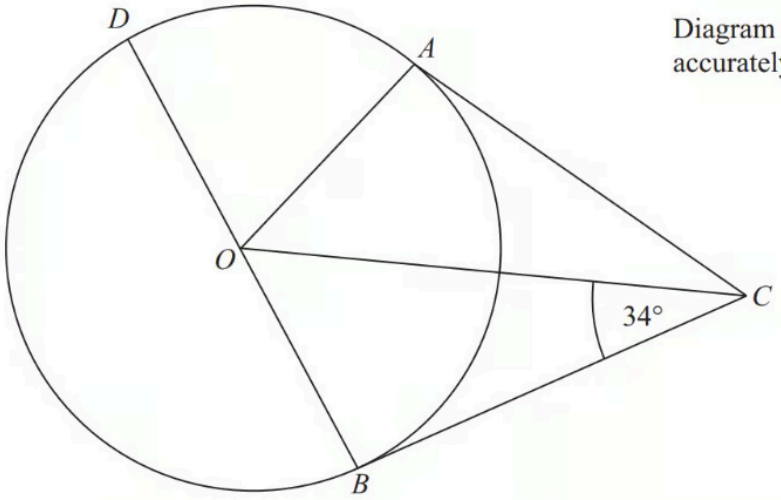


Diagram **NOT** accurately drawn

A, B and D are points on the circumference of a circle, centre O. BOD is a diameter of the circle.
BC and AC are tangents to the circle.
Angle $OCB = 34°$.

Work out the size of angle DOA.

(3 marks)

4

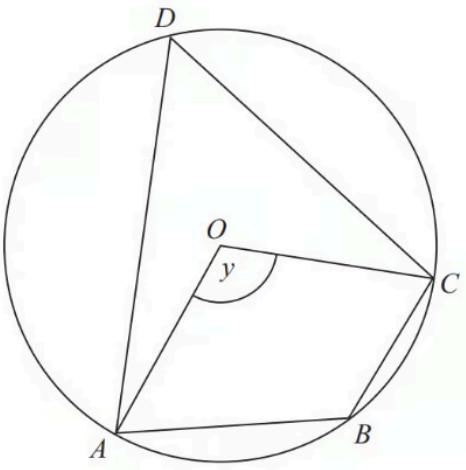


Diagram **NOT** accurately drawn

A, B, C and D are points on the circumference of a circle, centre O.

Angle $AOC = y$.

Find the size of angle ABC in terms of y.
Give a reason for each stage of your working.

(4 marks)

5

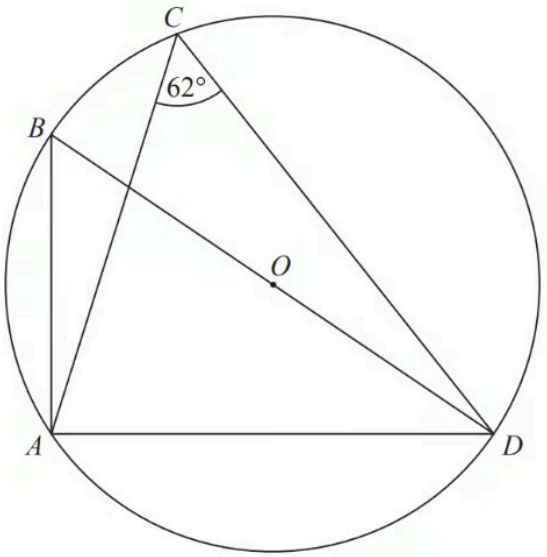


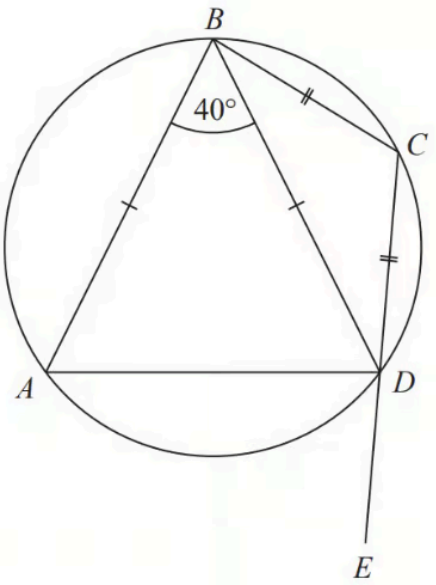
Diagram **NOT** accurately drawn

A, B, C and D are points on the circumference of a circle, centre O.
BOD is a straight line.
Angle $ACD = 62°$

Find the size of angle ADB.
Give a reason for each stage in your working.

(4 marks)

6 The points A, B, C and D lie on a circle.
CDE is a straight line.



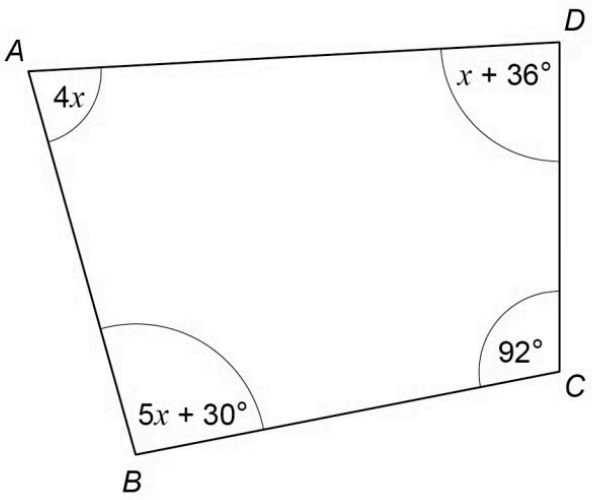
$BA = BD$
$CB = CD$
Angle $ABD = 40°$

Work out the size of angle ADE.
You must give a reason for each stage of your working.

(5 marks)

7 $ABCD$ is a quadrilateral.

Not drawn accurately

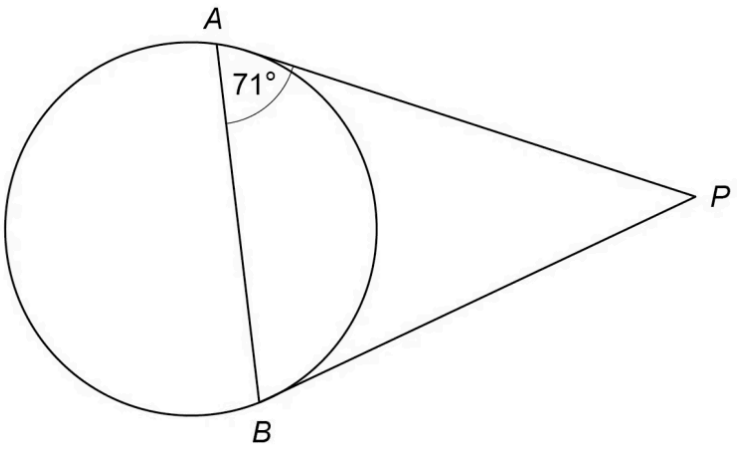


Prove that $ABCD$ is **not** a cyclic quadrilateral.

(4 marks)

8 A and B are points on a circle.

PA and PB are tangents.



Not drawn accurately

Work out the size of angle APB.

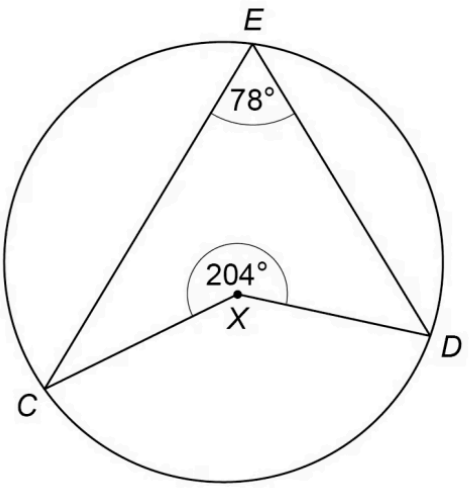
.....degrees

(2 marks)

9 C, D and E are points on a circle.

$XC = XD$.

Not drawn accurately



Is X the centre of the circle?
Tick a box.

☐ Yes ☐ No

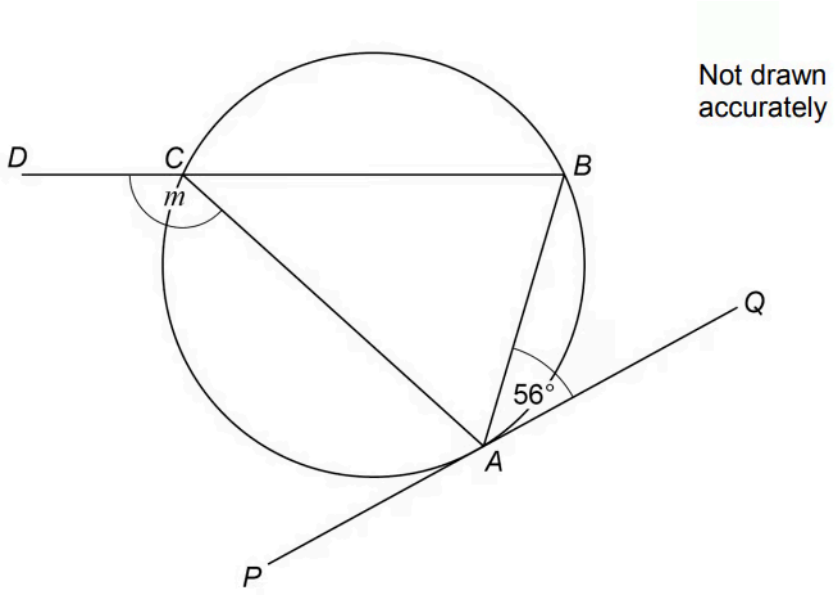
Show working to support your answer.

(2 marks)

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

DCB is a straight line.

PAQ is a tangent to the circle.



Sam is trying to work out the size of angle m. Here is his working.

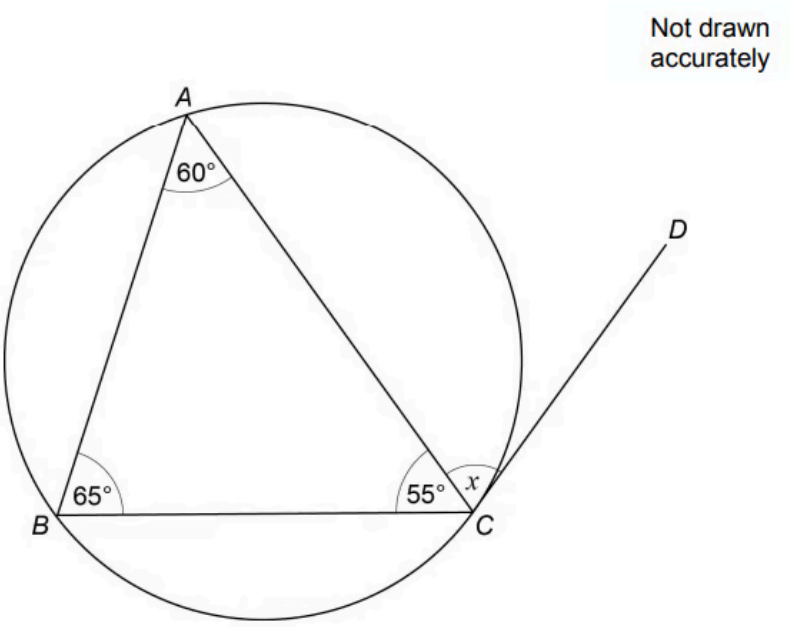
angle $ACB = 56°$	angles in the same segment are equal
$m = 180° - 56°$	angles at a point on a straight line add up to 180°
$m = 124°$	

Make a criticism of his working.

(1 mark)

11 A, B and C are points on a circle.

CD is a tangent to the circle.

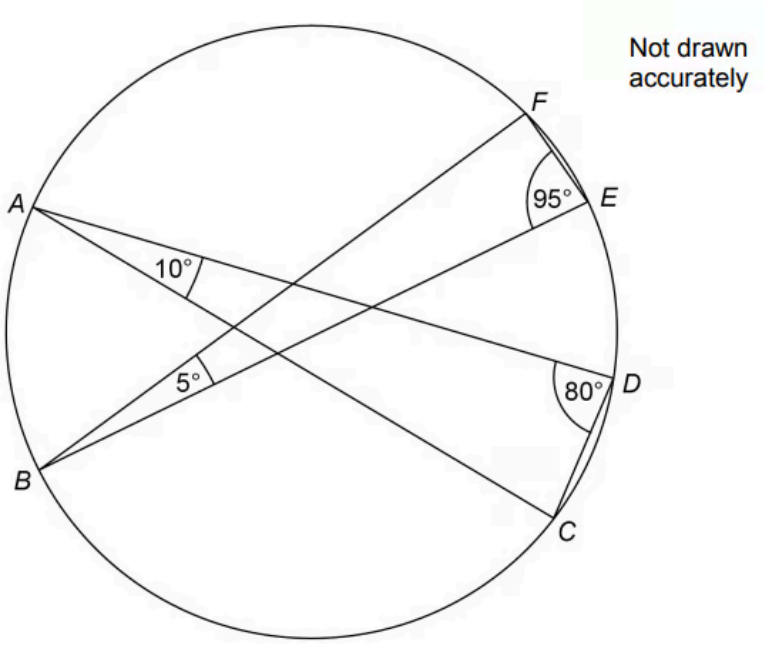


Write down the size of angle x.
Give a reason for your answer.

.....degrees

(2 marks)

12 A, B, C, D, E and F are points on a circle.



Choose the line that is a diameter of the circle.

A. BE

B. AD

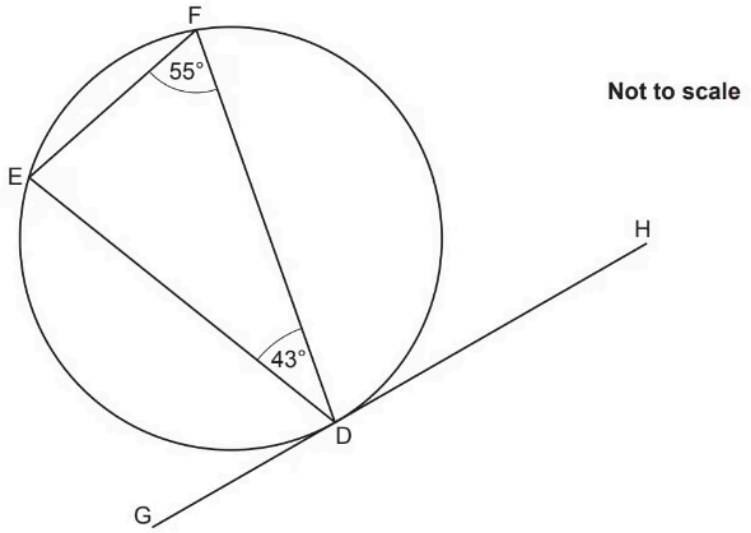
C. AC

D. BF

(2 marks)

13 In the diagram,

- E, F and D are points on the circumference of the circle
- G, D and H lie on a tangent to the circle
- angle EFD = 55°
- angle FDE = 43°.

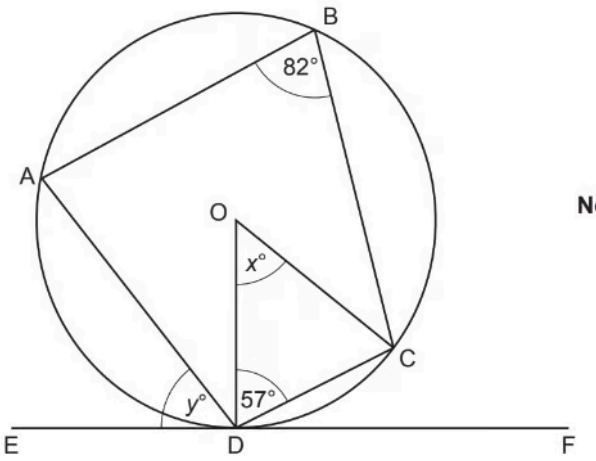


Explain why angle HDF is 82°.

(4 marks)

14 (a) The diagram shows a circle, centre O.

Points A, B, C and D lie on the circumference of the circle.
EDF is a tangent to the circle.
Angle ABC = 82° and angle ODC = 57°.



Not to scale

Work out the value of x.

x = ...

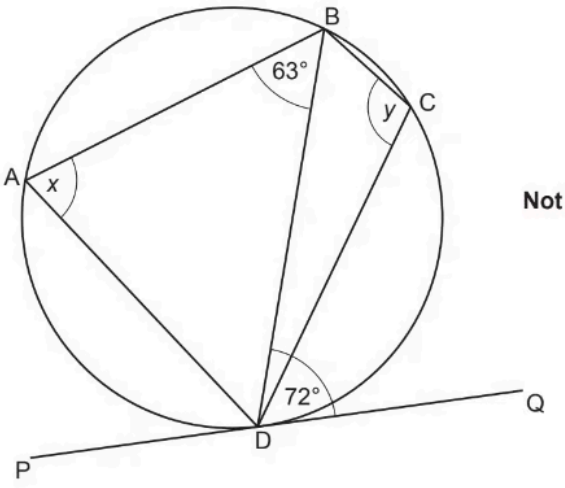
(2 marks)

(b) Work out the value of y.

y = ...

(3 marks)

15 (a) A, B, C and D are points on the circumference of a circle.



PQ is a tangent to the circle at D.
Angle BDQ = 72° and angle ABD = 63°.

Work out angle *x*.
Give a reason for your answer.

Angle x = ...° because .....

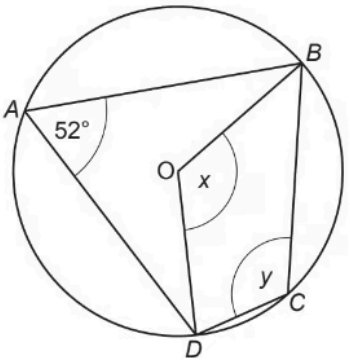
(2 marks)

(b) Work out angle *y*.
Give a reason for your answer.

Angle *y* = ...° because .....

(2 marks)

16 (a) A, B, C and D are points on the circumference of a circle, centre O.



Not to scale

Angle BAD = 52°.

Work out angle *x*.
Give a reason for your answer.

x = ... ° reason .....

(2 marks)

(b) Work out angle *y*.
Give a reason for your answer.

y = ... ° reason .....

(2 marks)

17 D, E, F and G are points on a circle, centre O

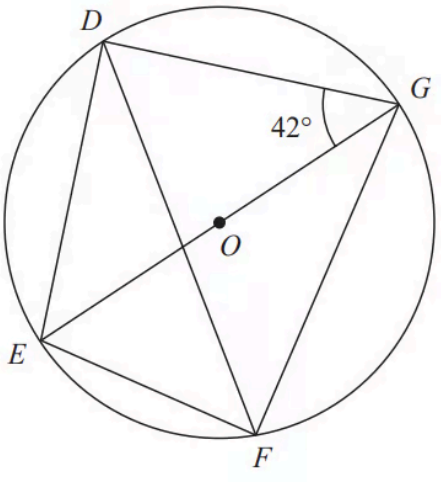


Diagram **NOT** accurately drawn

EOG is a diameter of the circle.
Angle $EGD = 42°$

Calculate the size of angle DFG
Give a reason for each stage of your working.

Angle DFG = ...

(4 marks)

Hard Questions

1

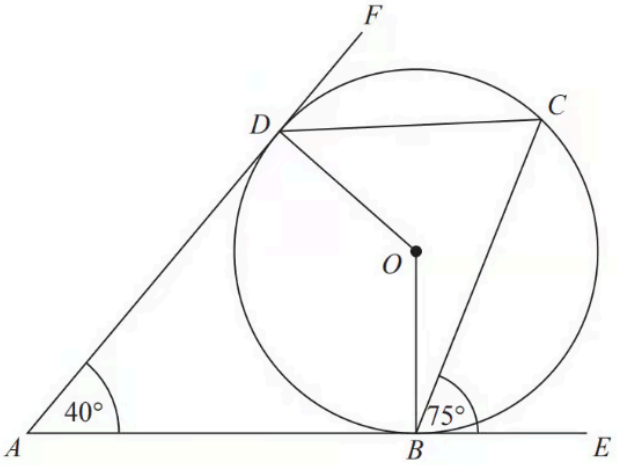


Diagram **NOT** accurately drawn

B, C and D are points on the circumference of a circle, centre O. ABE and ADF are tangents to the circle.

Angle $DAB = 40°$
Angle $CBE = 75°$

Work out the size of angle ODC.

(3 marks)

2

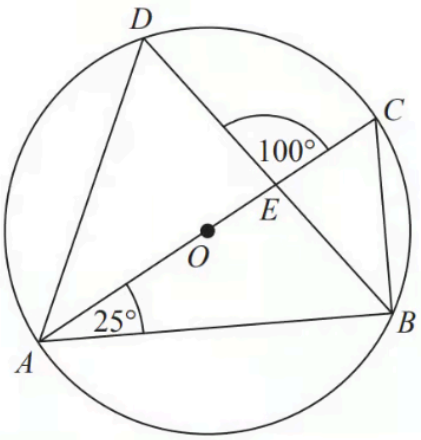


Diagram **NOT** accurately drawn

A, B, C and D are points on the circumference of a circle, centre O.
AC is a diameter of the circle.
AC and BD intersect at E.

Angle $CAB = 25°$
Angle $DEC = 100°$

Work out the size of angle DAC.
You must show all your working.

(4 marks)

3

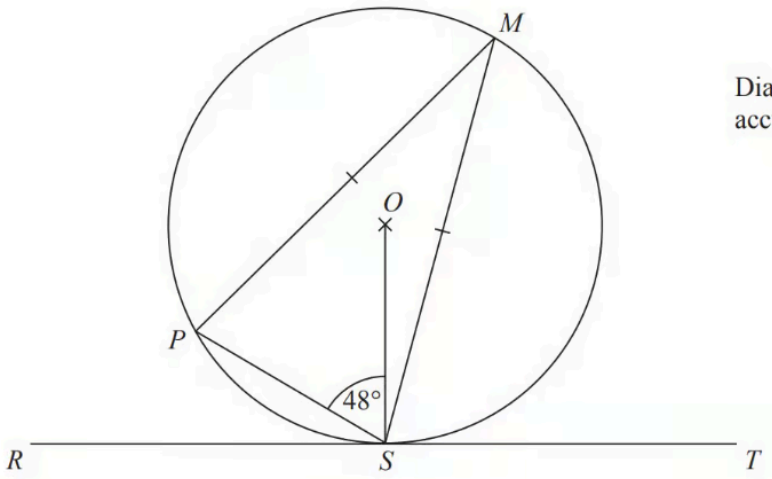


Diagram **NOT** accurately drawn

P, M and S are points on a circle, centre O.
RST is a tangent to the circle.

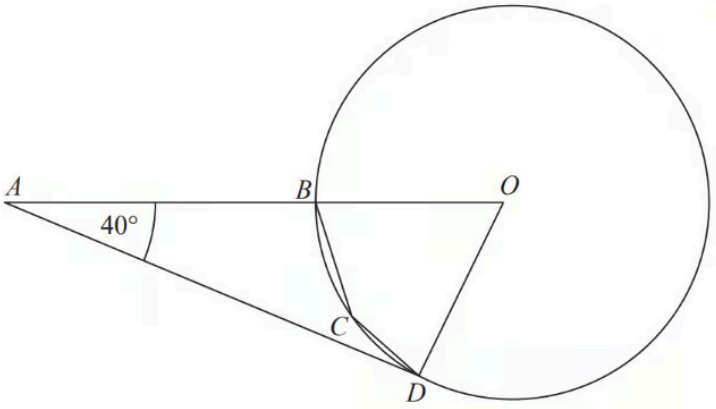
Angle $PSO = 48°$
$MP = MS$

Work out the size of angle MST.
Give reasons for each stage of your working.

(5 marks)

4

Diagram **NOT** accurately drawn

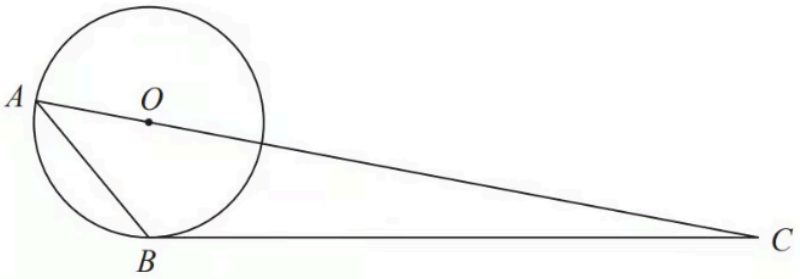


B, C and D are points on the circumference of a circle, centre O. ABO is a straight line.
AD is the tangent at D to the circle.
Angle $DAO = 40°$

Work out the size of angle BCD.
Give a reason for each stage of your working.

(5 marks)

5



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

BC is a tangent to the circle.
AOC is a straight line.
Angle $ABO = x°$.

Find the size of angle ACB, in terms of x.
Give your answer in its simplest form.
Give reasons for each stage of your working.

(5 marks)

6

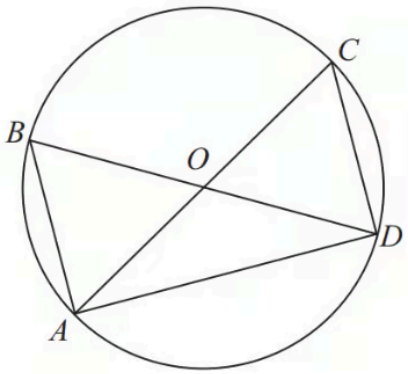


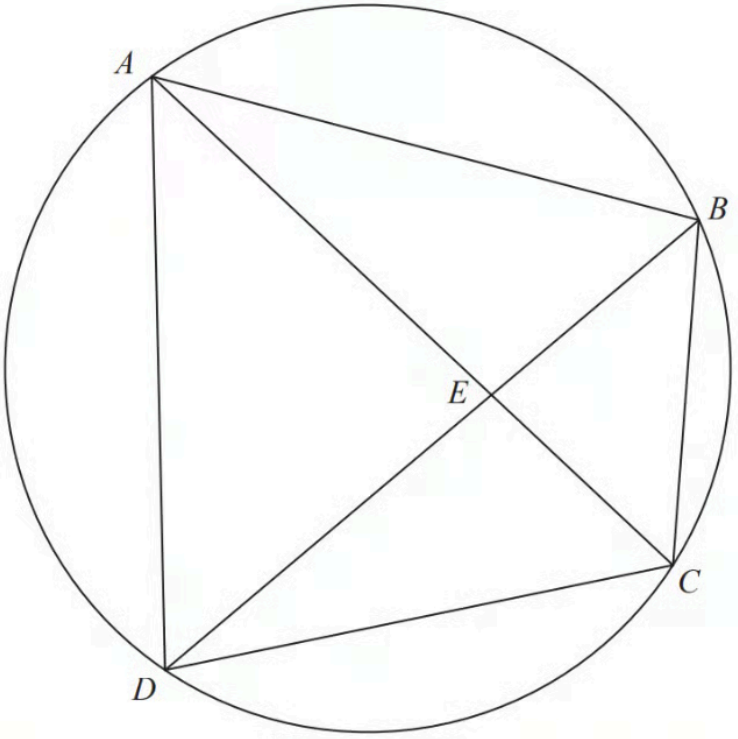
Diagram **NOT** accurately drawn

AOC and BOD are diameters of a circle, centre O.

Prove that triangle ABD and triangle DCA are congruent.

(3 marks)

7 A, B, C and D are four points on the circumference of a circle.



AEC and BED are straight lines.
Prove that triangle ABE and triangle DCE are similar.
You must give reasons for each stage of your working.

(3 marks)

8

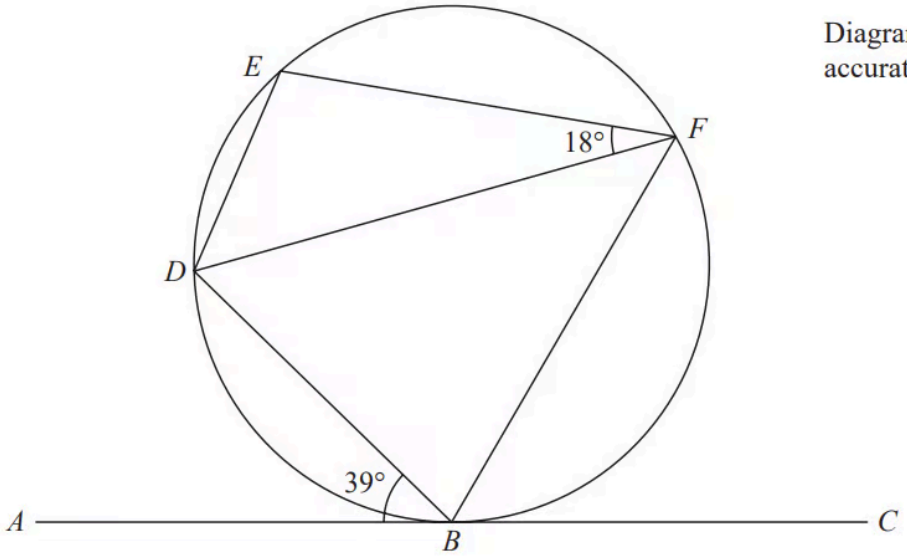


Diagram **NOT** accurately drawn

B, D, E and F are points on a circle.

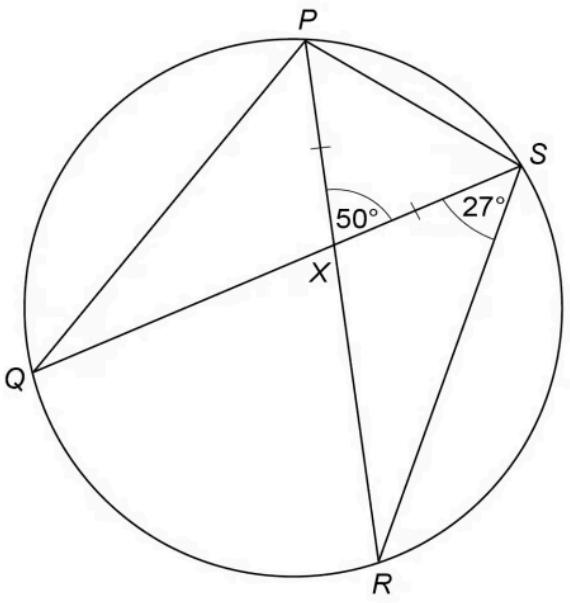
ABC is the tangent at B to the circle.
Angle $ABD = 39°$
Angle $EFD = 18°$

Work out the size of angle BDE.
Give reasons for your working.

(4 marks)

9 P, Q, R and S are points on a circle.

PXR and QXS are straight lines.
$PX = SX$



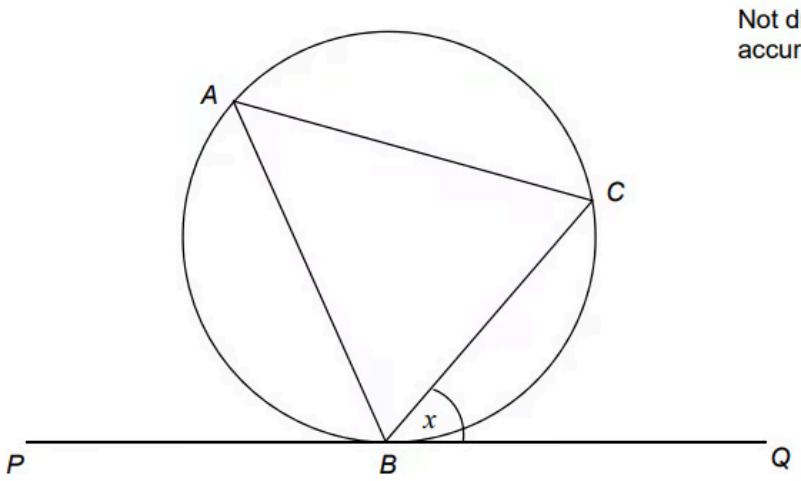
Not drawn accurately

Prove that QS is **not** a diameter of the circle.

(4 marks)

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

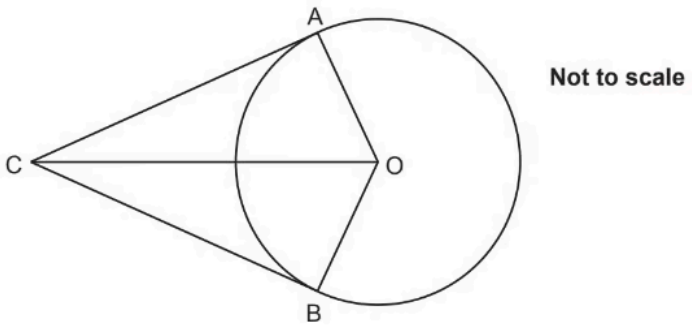
- BC bisects angle ABQ.
- PBQ is a tangent to the circle.



Angle $CBQ = x$
Prove that $AC = BC$

(3 marks)

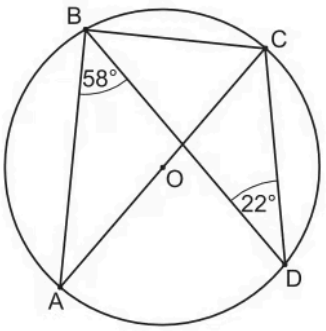
11 A and B are points on the circumference of a circle, centre O.
CA and CB are tangents to the circle.



Prove that triangle OAC is congruent to triangle OBC.

(4 marks)

12 (a) A, B, C and D are points on the circumference of a circle, centre O.
AC is a diameter of the circle.
Angle ABD = 58°.
Angle CDB = 22°.



Not to scale

Work out the sizes of angle ACD and ACB, giving reasons for your answers.

Angle ACD = ...°

(2 marks)

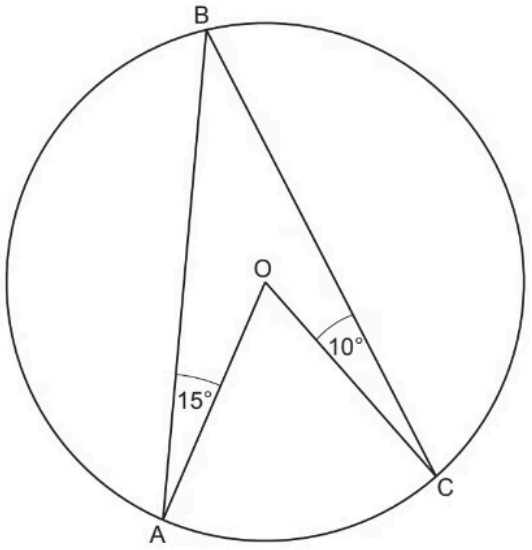
(b) Angle ACB = ...°

(3 marks)

13 In the diagram,

- A, B and C are points on the circumference of a circle
- O is the centre of the circle

- angle OAB = 15°
- angle BCO = 10°.



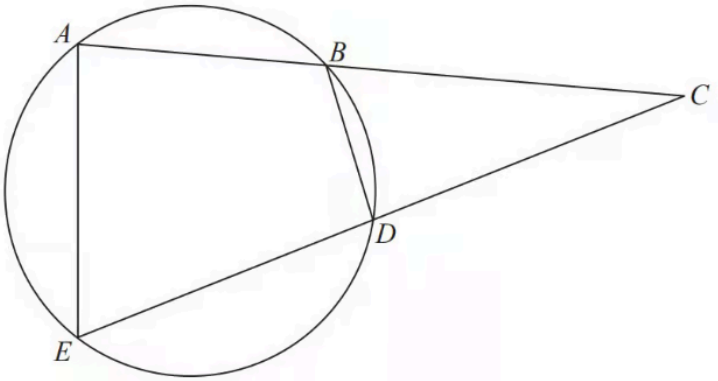
Not to scale

Calculate the acute angle AOC.

(4 marks)

Very Hard Questions

1

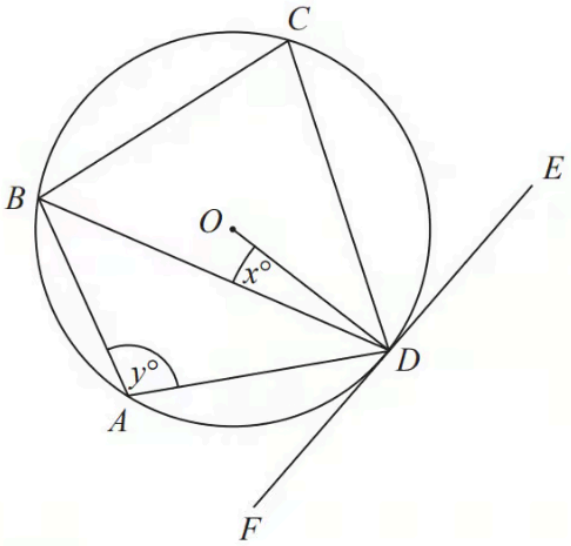


A, B, D and E are points on a circle.
ABC and EDC are straight lines.

Prove that triangle BCD is similar to triangle ECA.
You must give reasons for your working.

(5 marks)

2 (a)



A, B, C and D are points on the circumference of a circle, centre O.
FDE is a tangent to the circle.

Show that $y - x = 90$
You must give a reason for each stage of your working.

(3 marks)

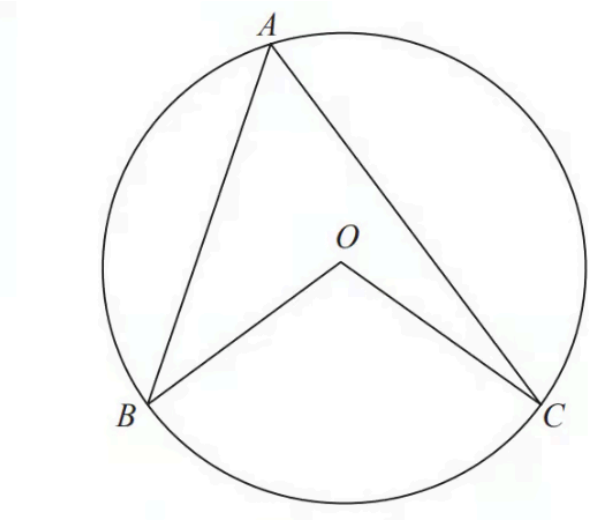
(b) Dylan was asked to give some possible values for x and y.

He said, "y could be 200 and x could be 110, because 200 − 110 = 90"

Is Dylan correct?
You must give a reason for your answer.

(1 mark)

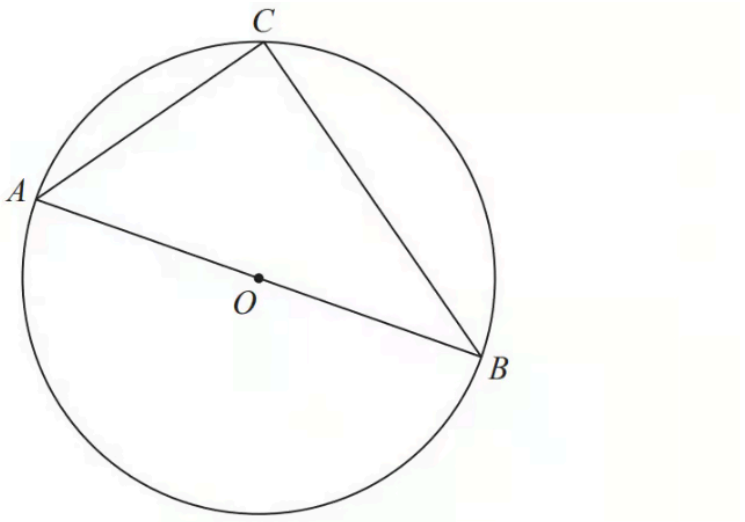
3 A, B and C are points on the circumference of a circle centre O.



Prove that angle BOC is twice the size of angle BAC.

(4 marks)

4

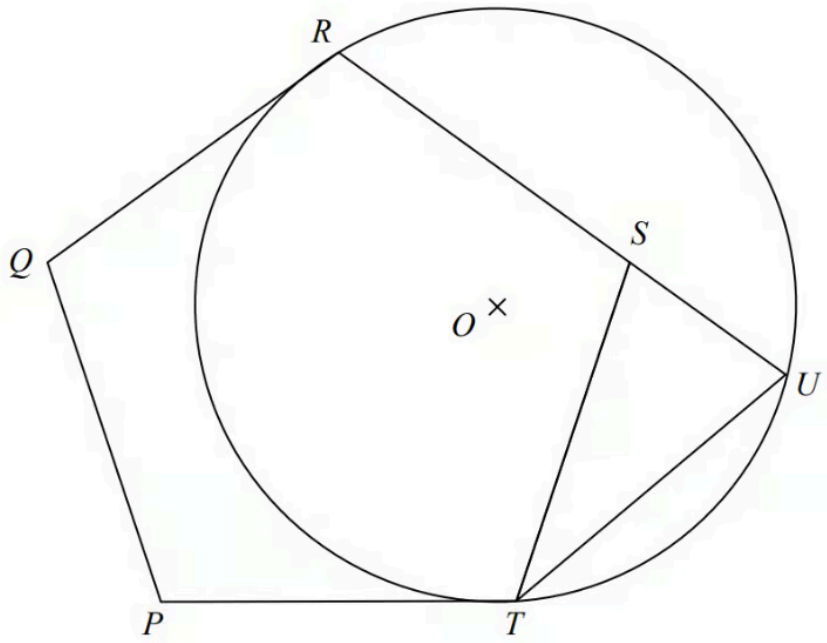


A, B and C are points on the circumference of a circle, centre O. AOB is a diameter of the circle.

Prove that angle ACB is $90°$
You must **not** use any circle theorems in your proof.

(4 marks)

5



$PQRST$ is a regular pentagon.
R, U and T are points on a circle, centre O.
QR and PT are tangents to the circle.
RSU is a straight line.

Prove that $ST = UT$.

(5 marks)

6

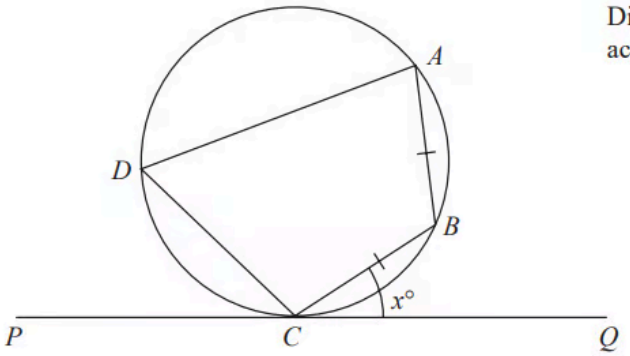


Diagram **NOT** accurately drawn

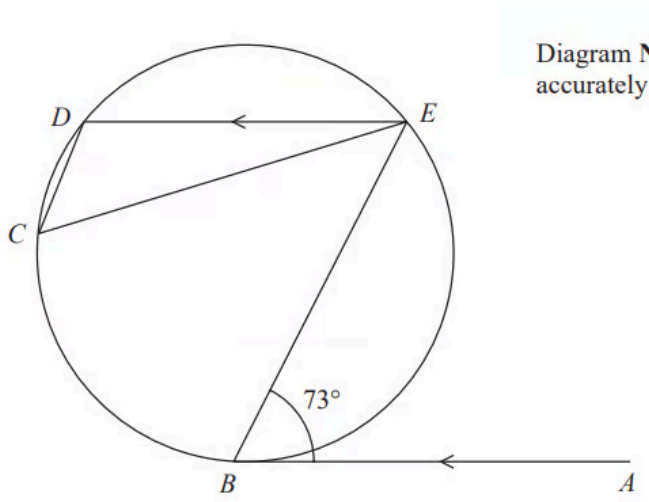
A, B, C and D are points on a circle.
PCQ is a tangent to the circle. $AB = CB$.

Angle $BCQ = x°$

Prove that angle $CDA = 2x°$
Give reasons for each stage in your working.

(5 marks)

7



B, C, D and E are points on a circle.

AB is the tangent at B to the circle.
AB is parallel to ED.
Angle $ABE = 73°$

Work out the size of angle DCE.
Give a reason for each stage of your working.

(5 marks)

8

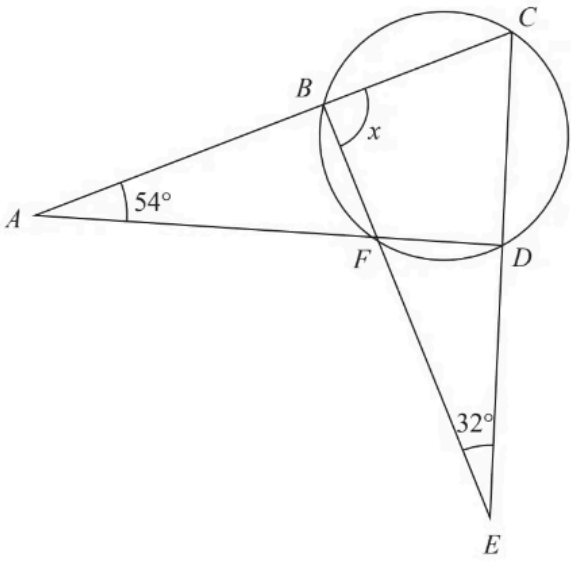


Diagram **NOT** accurately drawn

B, C, D and F are points on a circle.
ABC, AFD, BFE and CDE are straight lines.

Work out the size of angle x.
Show your working clearly.

x = ...

(4 marks)

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

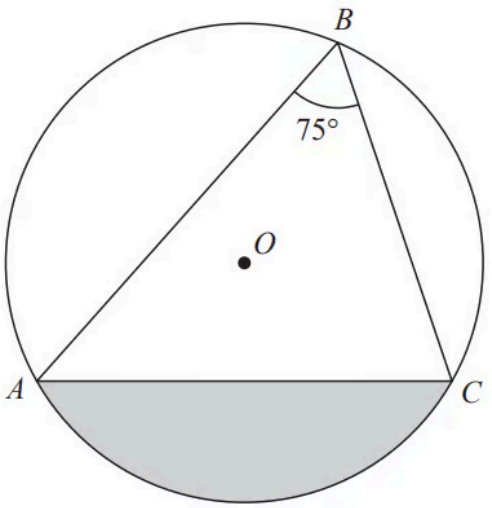


Diagram **NOT** accurately drawn

Angle $ABC = 75°$

The area of the shaded segment is 200cm^2

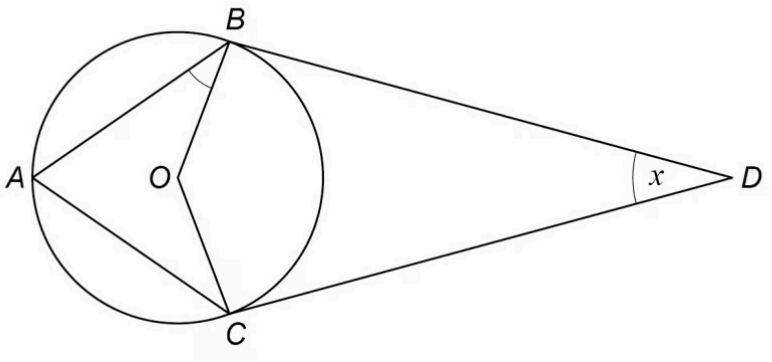
Calculate the radius of the circle.
Give your answer correct to 3 significant figures.

..... cm

(5 marks)

10 A, B and C are three points on the circumference of a circle, centre O.

BD and CD are tangents to the circle.
$ABDC$ is a kite.
Angle BDC is x



Not drawn accurately

Prove that angle ABO is $45° - \frac{x}{4}$

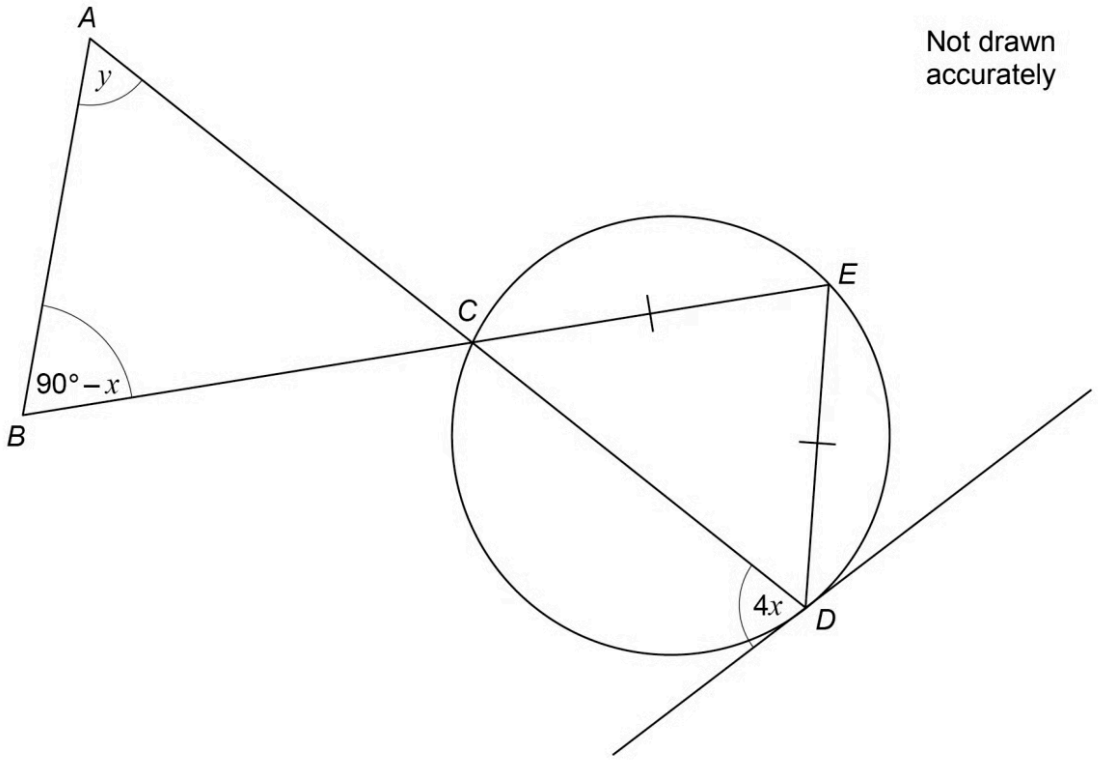
(4 marks)

11 C, D and E are points on a circle.

$CE = DE$

The tangent at D is shown.

ACD and BCE are straight lines.



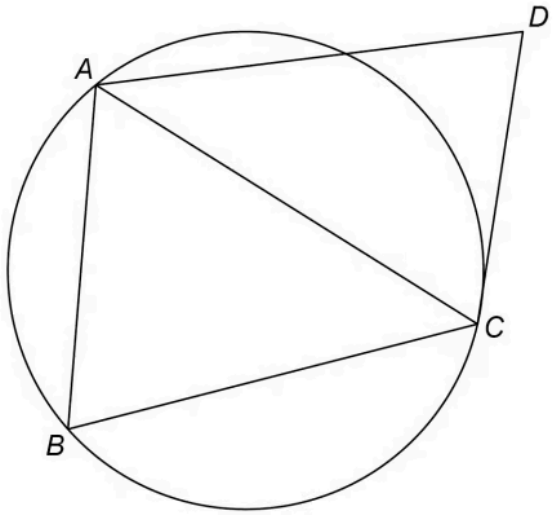
Prove that $y = 3x$

(4 marks)

12 (a) A, B and C are points on a circle.

CD is a tangent.

Not drawn accurately



Assume that triangle ABC is isosceles with $AC = BC$

Prove that AB is parallel to DC.

(4 marks)

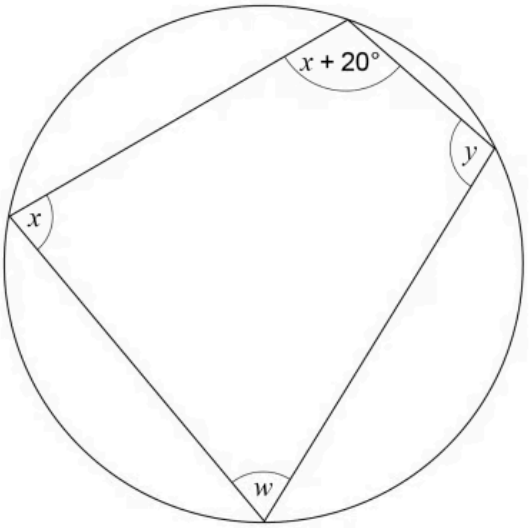
(b) In fact, triangle ABC is equilateral.

Tick the **two** boxes for the statements that **must** be correct.

☐	AB is parallel to DC
☐	AC bisects angle BCD
☐	AC bisects angle BAD

(1 mark)

13 Here is a cyclic quadrilateral.



Not drawn accurately

$x : y = 5 : 7$

Work out the size of angle w.

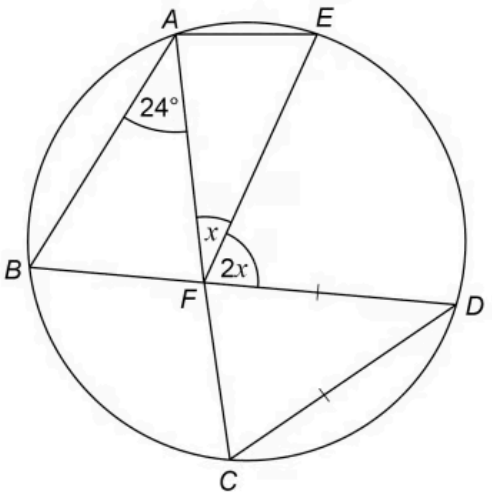
.....degrees

(4 marks)

14 A, B, C, D and E are points on a circle.

BFD and AFC are straight lines.

$DC = DF$



Not drawn accurately

Work out the size of angle x.

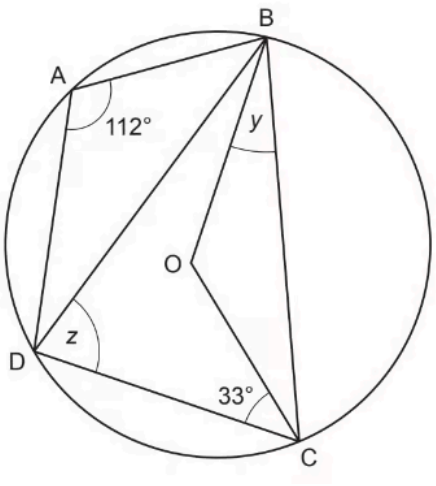
You **must** show your working which may be on the diagram.

.....degrees

(4 marks)

15 (a) A, B, C and D are points on the circumference of a circle, centre O.

Angle BAD = 112° and angle DCO = 33°.



Not to scale

Show that angle $y = 35°$.
Give reasons for each stage of your working.

(4 marks)

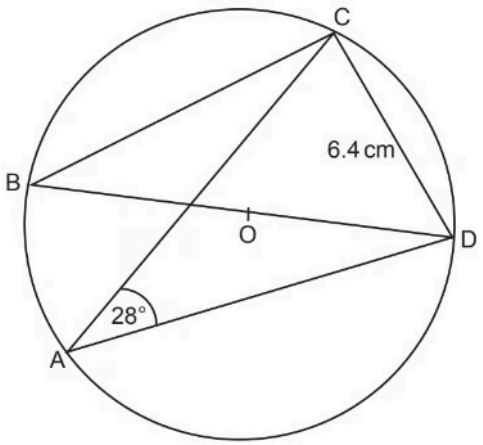
(b) Work out angle z.

Give reasons for your answer.

Angle z = ... ° because .....

(3 marks)

16 A, B, C and D are points on the circumference of a circle, centre O.



Not to scale

Angle CAD = 28° and CD = 6.4cm.
BD is a diameter of the circle.

Calculate the area of the circle.

..... cm^2

(5 marks)