Name:

Exam Style Questions

Circle Theorems

Corbettmaths

Equipment needed: Calculator, pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

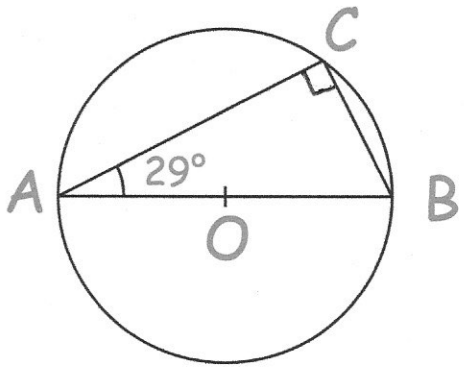
Video Tutorial

www.corbettmaths.com/contents

Videos 64, 65

Answers and Video Solutions

1. (a) In the diagram below, O is the centre of the circle and A, B and C are points on the circumference.



Angle A = 29°

Work out the size of angle B.

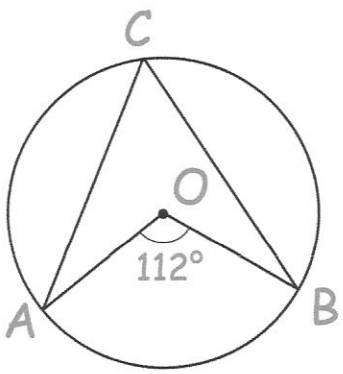
90 + 29 = 119

180 − 119 = 61

61 .....°

(1)

(b) A, B and C are three points on the circumference of another circle.
O is the centre of the circle.



Angle AOB = 112°

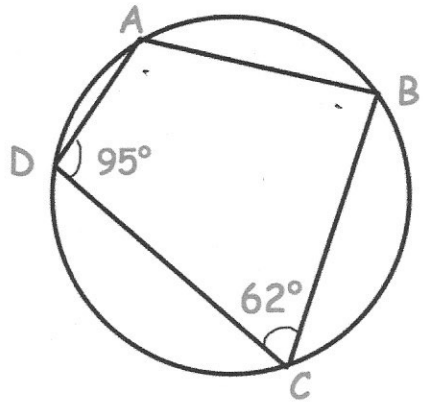
Work out the size of angle ACB.

112 ÷ 2 = 56

56 .....°

(1)

2. A, B, C and D are points on the circumference on a circle.



(a) Find the size of angle DAB.

$180 - 62 = 118°$

118 .....°

(1)

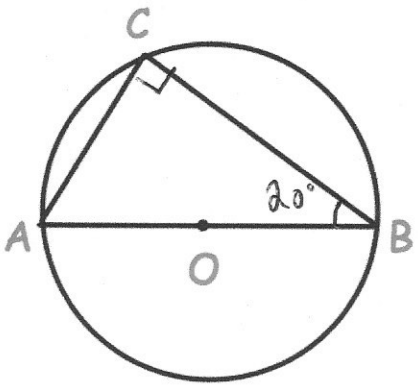
(b) Find the size of angle ABC.

$180 - 95 = 85$

85 .....°

(1)

3. A circle with centre O, has points A, B and C on the circumference.
Angle ABC = 20°



Find the size of angle BAC.

$90 + 20 = 110$

$180 - 110 = 70$

70 .....°

(1)

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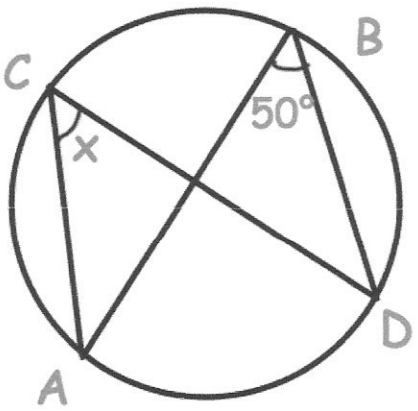
4. A, B, C and D are points on the circumference of a circle.

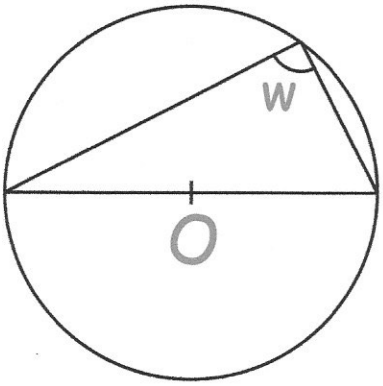


Find x, the size of angle ACD.

50 .....°

(1)

5. (a) In the diagram, O is the centre of the circle.

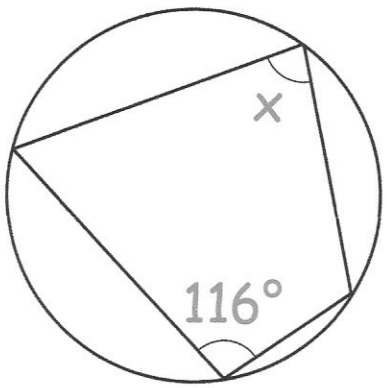


Write down the value of w.

90 .....°

(1)

(b)



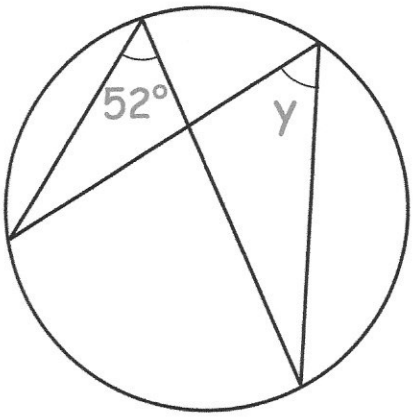
Write down the value of x.

$180 - 116 = 64$

64 .....°

(1)

(c)



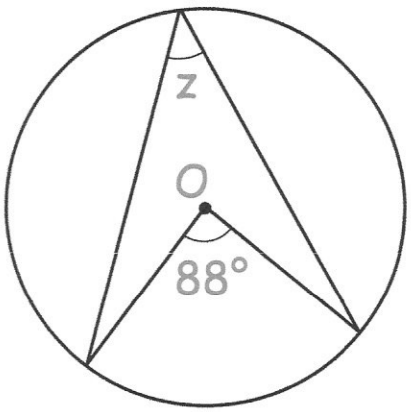
Write down the value of y.

52

.....°

(1)

(d) In the diagram, O is the centre of the circle.



Write down the value of z.

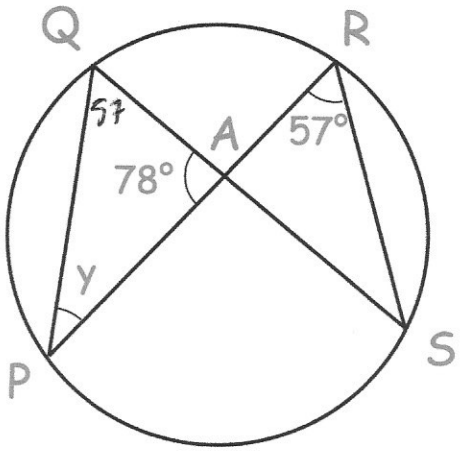
88 ÷ 2 = 44

44

.....°

(1)

6. P, Q, R and S are four points on the circumference of a circle.
PR meets QS at A.
Angle PRS = 57° and Angle PAQ = 78°



Work out the value of angle y.
Include your method.

78 + 57 = 135

180 − 135 = 45

45 .....°

(3)

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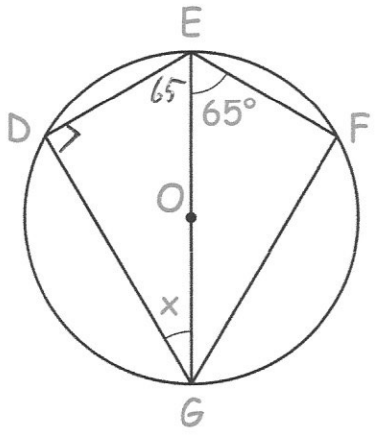
7. The diagram shows points D, E, F and G on the circumference of a circle.
EG is a diameter.
DEFG is a kite.



Work out the value of x.

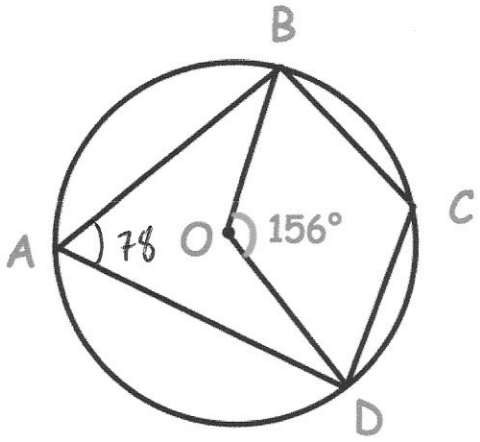
90 + 65 = 155

180 − 155

25 .....°

(2)

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



Work out the size of angle BCD.
You must show your workings.

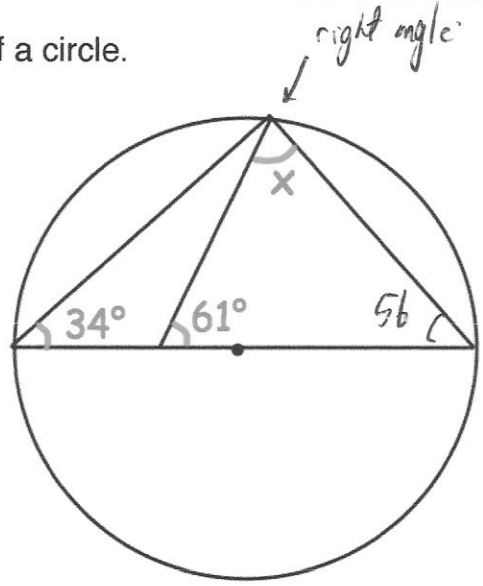
156 ÷ 2 = 78

180 − 78 = 102

102 °

(4)

9. AB is the diameter of a circle.



Work out the value of x.

90 + 34 = 124

180 − 124 = 56

56 + 61 = 117

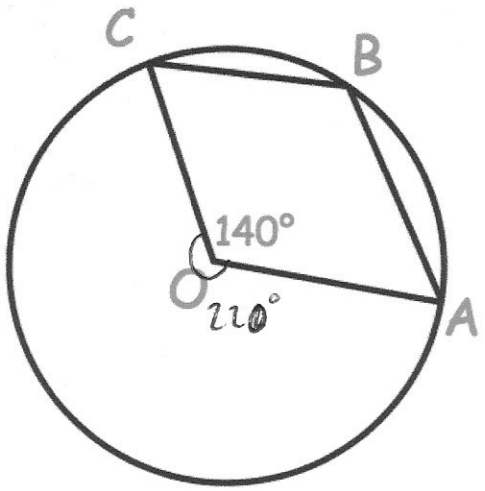
180 − 117 = 63

63 °

(3)

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

Angle AOC is 140°

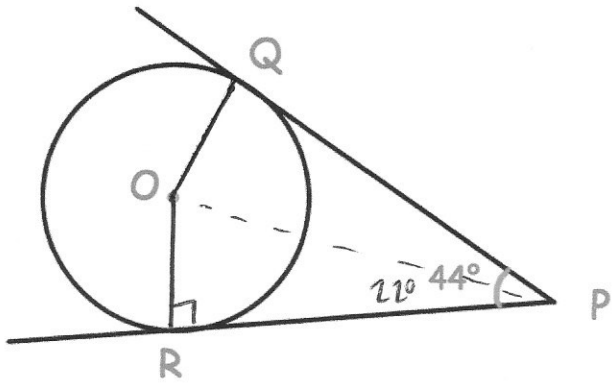


Explain why angle ABC is 110°

Reflex angle AOC = 220°, since 360 - 140 = 220°
as angles at a point add to 360°.
Angle ABC is half reflex angle AOC, 220 ÷ 2 = 110°

(2)

11. Q and R are points on a circle, centre O.
PQ and PR are tangents to the circle.



Work out the size of angle POR.

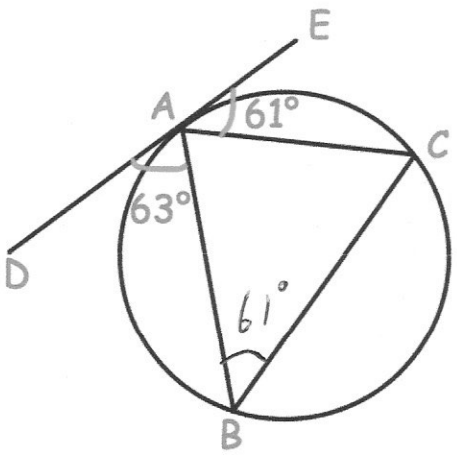
$90 + 22 = 112$

$180 - 112 = 68$

68 .....°

(3)

12.

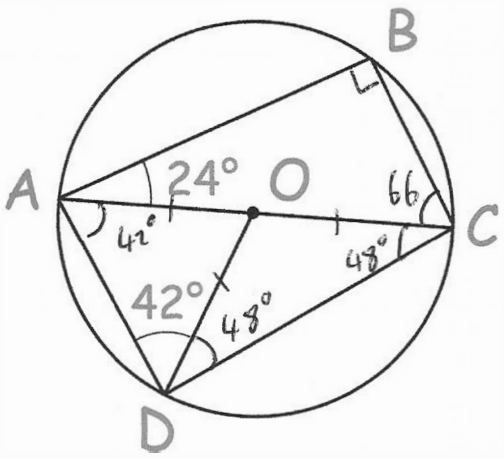


DAE is a tangent to a circle.
Write down the size of angle ABC.

61 .....°

(1)

13.



In the diagram O is the centre of the circle.
AOC is a straight line.
Angle BAO is 24° and Angle ADO is 42°

(a) Find the size of angle CAD.

42 .....°

(1)

(b) Find the size of angle ACB.

$24 + 90 = 114$

$180 - 114 = 66°$

66 .....°

(1)

(c) Find the size of angle BCD.

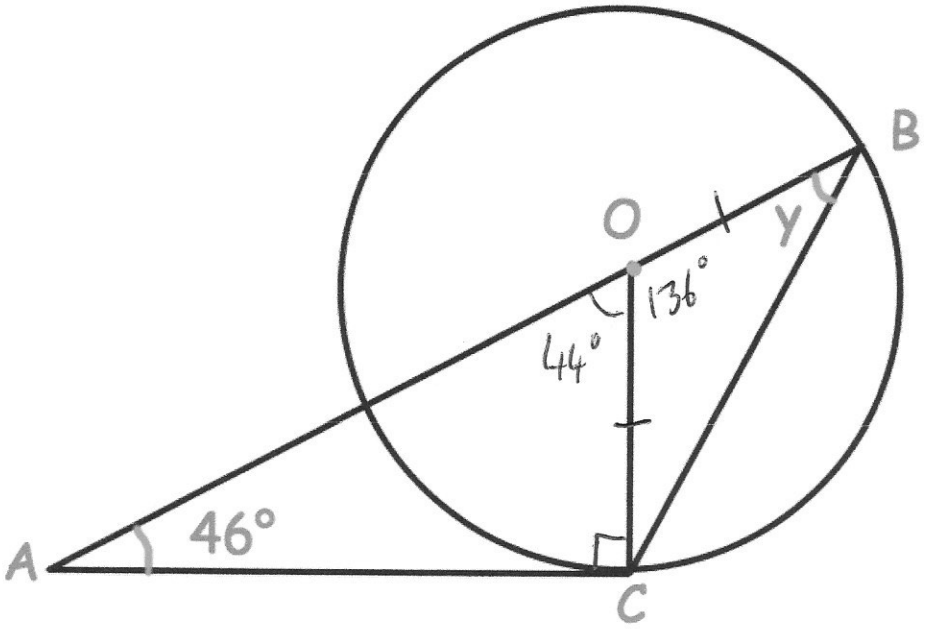
$42 + 24 = 66°$

$180 - 66 = 114$

114 .....°

(1)

14.



AOB is a straight line.
B and C are points on the circumference of a circle, centre O.
AC is a tangent to the circle.

Work out the size of the angle y.

$90 + 46 = 136$

$180 - 136 = 44°$

$180 - 44 = 136$

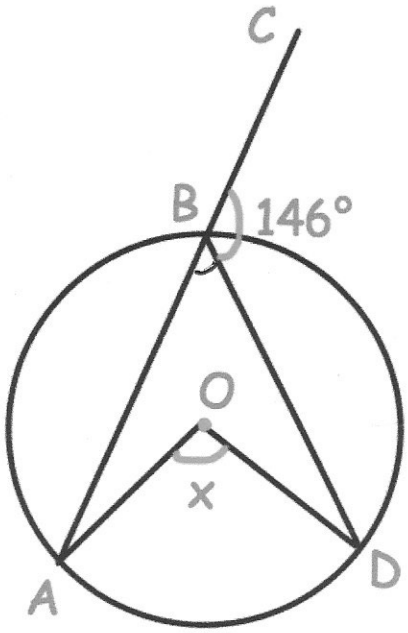
$180 - 136 = 44$

$44 \div 2 = 22$

22 .....°

(4)

15.



Shown is a circle with centre O.
ABC is a straight line.
Angle CBD is 146°

Find the size of angle AOD.

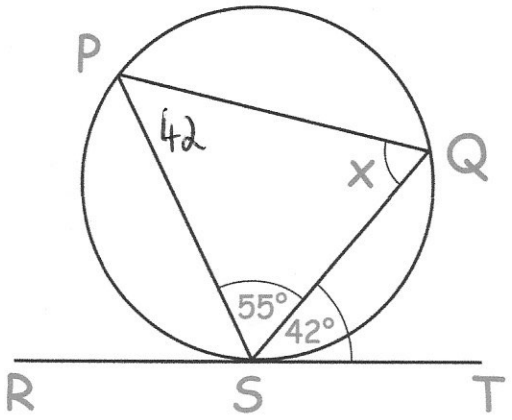
180 − 146 = 34

34 × 2 = 68

68 .....°

(3)

16. RT is a tangent to the circle at S.



$42+55=97$

$180-97=83°$

Calculate the value of x.

Give reasons for your answer.

$\angle SPQ = 42°$ (Alternate segment theorem)

$\angle PQS = 83°$ (Angles in a triangle add to 180°)

83 .....°

(3)

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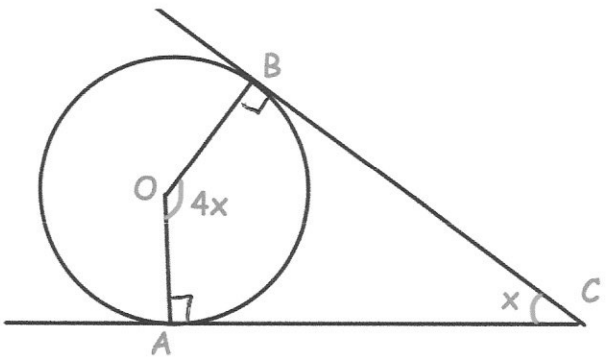
17. AC and BC are tangents to the circle with centre O.



Find the size of x.

$4x + x + 90 + 90 = 360$

$5x + 180 = 360$

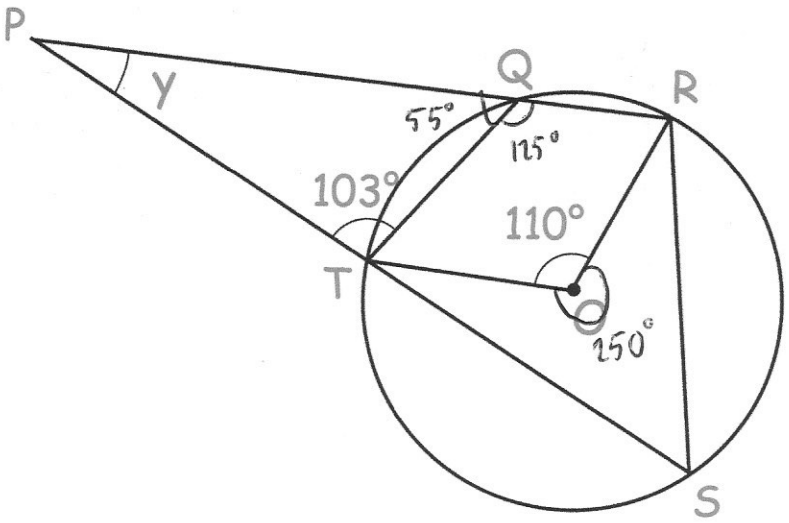
$5x = 180$

$x = 36$

36 .....°

(3)

18. Q, R, S and T are points on the circumference of a circle, centre O.



360 - 110 = 250
250 ÷ 2 = 125
180 - 125 = 55
103 + 55 = 158
180 - 158 = 22°

PQR and PTS are both straight lines.

Find the size of angle RPS.
You must show all of your working.

Reflex ∠ROT = 250° as the angles at a point add to 360°

∠RQT = 125° angle at centre is twice angle at circumference.

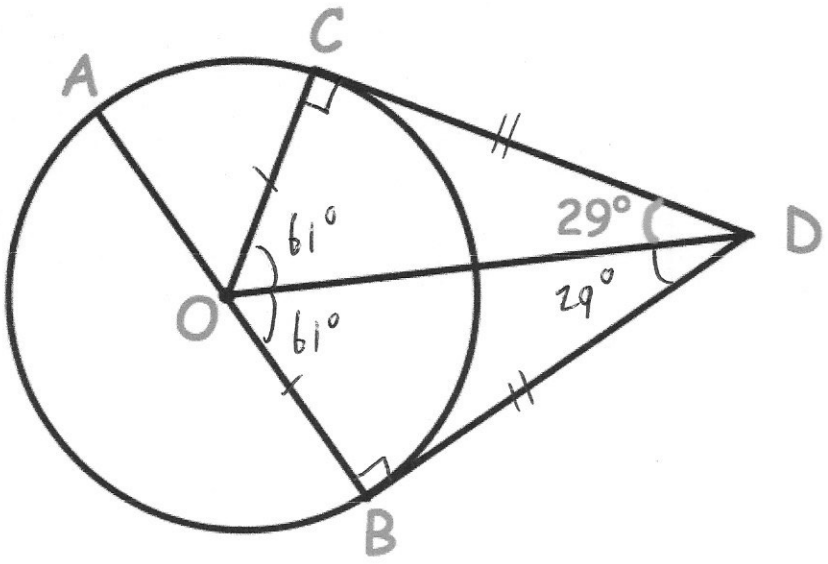
∠PQT = 55° angles in a straight line add to 180°.

∠RPS = 22° angles in a triangle add to 180°

22 .....°

(3)

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



AOB is a diameter of the circle.
CD and BD are tangents to the circle.
Angle CDO = 29°

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

CD = BD as tangents to a circle are equal length.

OC = OB both radii

∴ ∠ODB = ∠ODC = 29° as a kite has a line of symmetry

∠OCD & ∠OBD = 90° tangent and radius meet at 90°

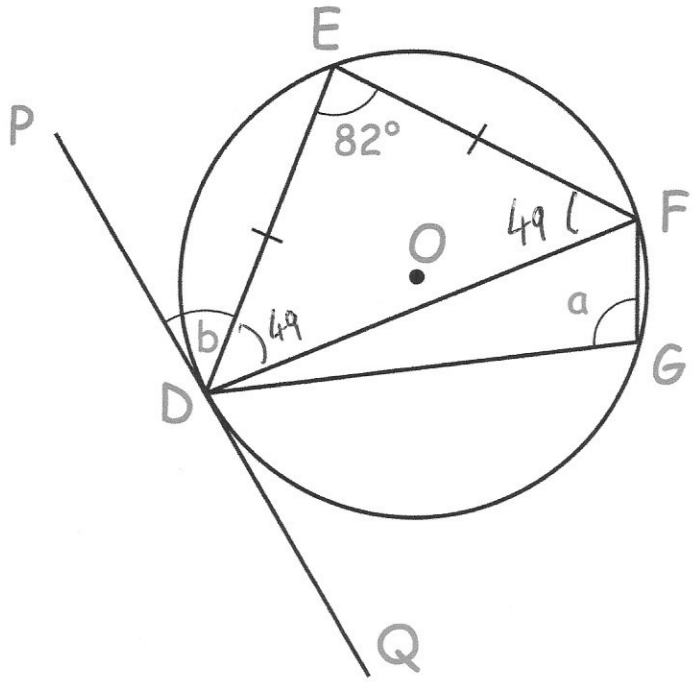
∠DOC = ∠BOD = 61° angles in a triangle add to 180°

∠AOC = 180 − 61 − 61 = 58° angles in a straight line add to 180°

58 °

(4)

20. DEFG is a cyclic quadrilateral.
PDQ is a tangent at D.
O is the centre of the circle.
DEF is an isosceles triangle.



(a) Work out the value of a.

$180 - 82 = 98$

98 .....°

(2)

(b) Work out the value of b.

$180 - 82 = 98$

$98 \div 2 = 49°$

49 .....°

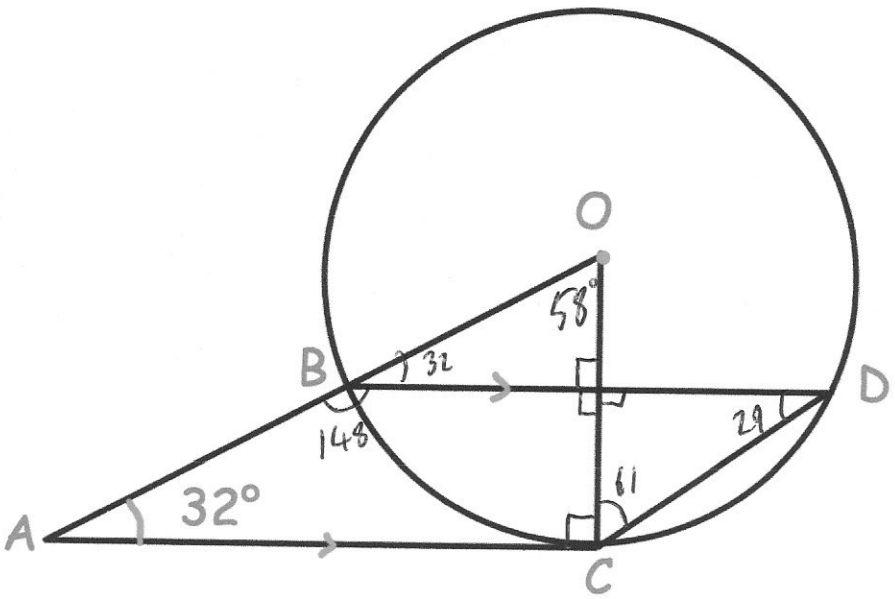
(3)

(c) Write down the name of the circle theorem used in part (b)

Alternate segment theorem.

(1)

21.



Shown is a circle, centre O.
B, C and D are points on the circumference.

ABO is a straight line.
AC is a tangent to the circle.

(a) Work out angle AOC.

$90 + 32 = 122$

$180 - 122 = 58°$

58 .....°

(2)

(b) Work out angle BDC.

$58 \div 2 = 29$

29 .....°

(3)

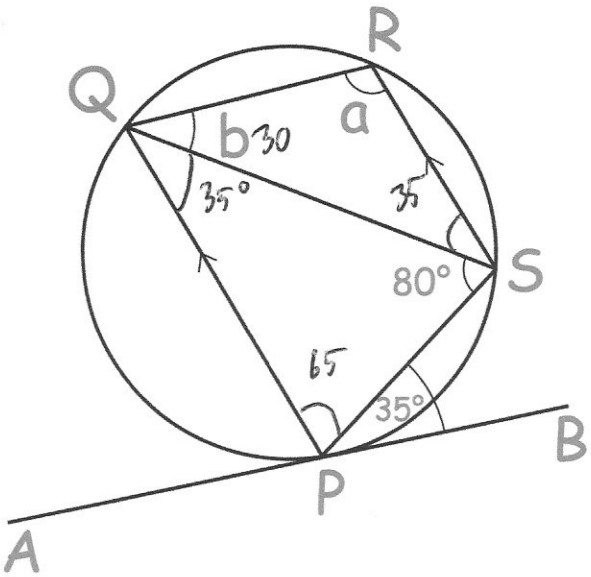
(c) Work out angle ACD.

$90 + 61 = 151$

151 .....°

(1)

22. PQRS is a cyclic quadrilateral.
APB is a tangent to the circle at P.
PQ is parallel to SR.
Angle SPB = 35° and angle PSQ = 80°



(a) Work out the size of angle QRS.

$180 - 65 = 115$

115 °

(4)

(b) Work out the size of angle RQS.

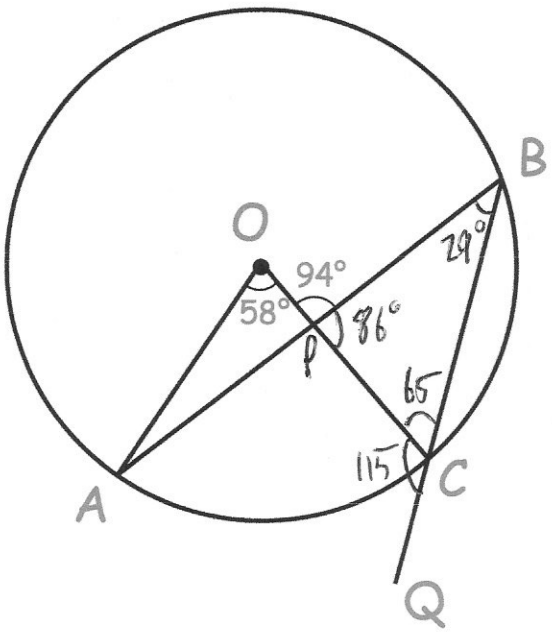
$180 - 115 = 65°$

$65 - 35 = 30$

30 °

(2)

23.



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

BCQ is a straight line.

Work out the size of angle OCQ.
Clearly explain each step of your solution.

$\angle ABC = 29°$ angle at circumference is half the size of the angle at the centre.

$\angle BPC = 86°$ angles in a straight line add to 180°

$\angle OCB = 65°$ angles in a triangle add to 180°

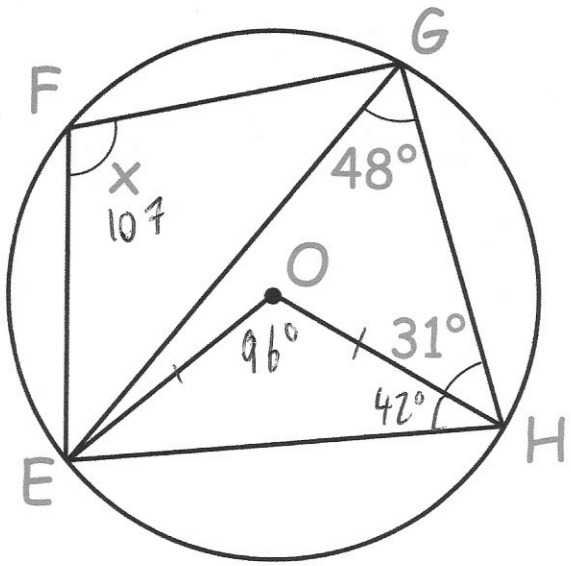
$\angle OCQ = 115°$ angles in a straight line add to 180°

115 .....°

(4)

24. E, F, G and H are points on the circumference of a circle with centre O.

Angle OHG = 31°
Angle EGH = 48°



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

$\angle EOH = 96°$ angle at centre is twice the angle at the circumference.

$\angle OHE = 42°$ $\triangle OEH$ is isosceles and $\angle OEH = \angle OHE$.

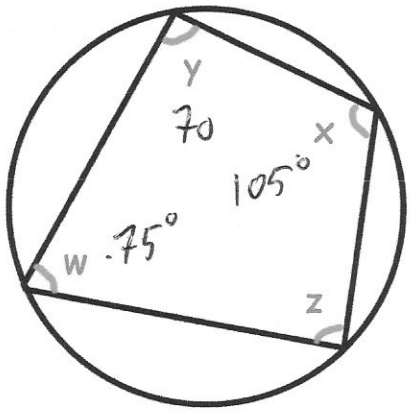
$\angle GHE = 73°$ $\angle OHG + \angle OHE$.

$\angle EFG = 107°$ opposite angles of cyclic quadrilaterals add to 180°.

107 °

(4)

25



$w : x = 5 : 7$

$x : y = 3 : 2$

Work out the size of angle z.

w & x add to 180°.

5 + 7 = 12

180 ÷ 12 = 15

5 × 15 = 75°

7 × 15 = 105°

105 ÷ 3 = 35

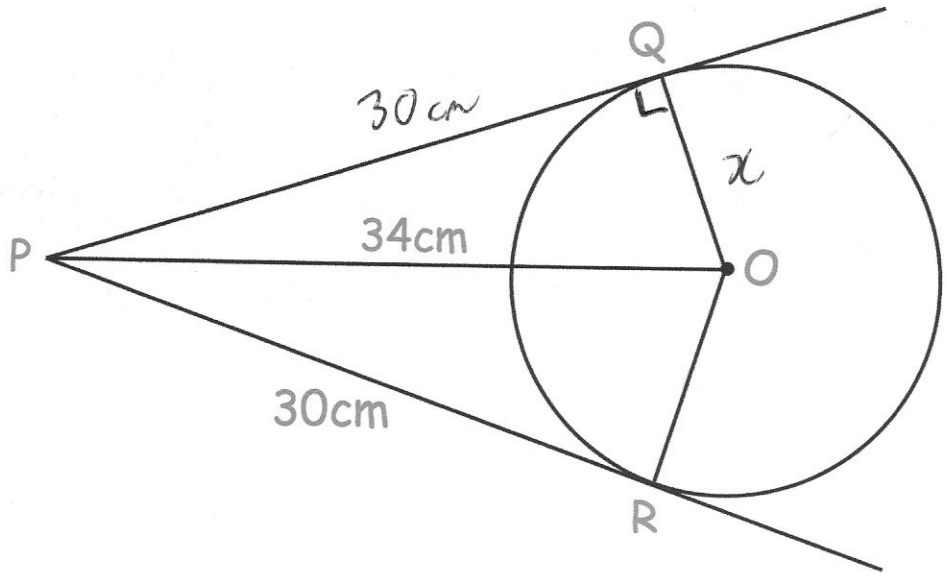
35 × 2 = 70

180 − 70

$z =$ 110 °

(5)

26.



Q and R are points on the circumference of a circle with centre O.

PQ and PR are tangents to the circle.

PR = 30cm
OP = 34cm

(a) Calculate the length of OQ.

$30^2 + x^2 = 34^2$

$900 + x^2 = 1156$

$x^2 = 256$

$x = 16$

16 cm

(3)

(b) Calculate the circumference of the circle.
Give your answer to 1 decimal place.

$C = \pi \times d$

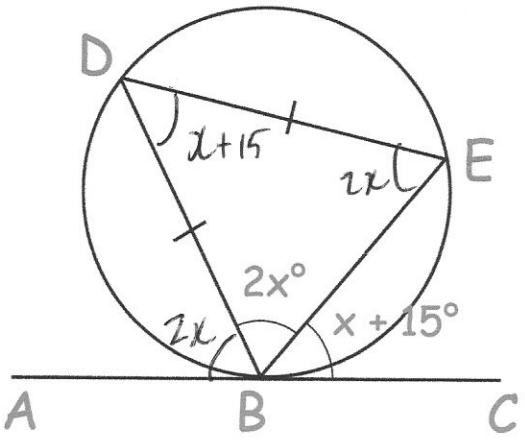
$= \pi \times 32$

$= 100.530...$

100.5 cm

(2)

27.



B, D and E are points on the circumference of a circle.
AC is a tangent to the circle at point B.

Angle DBE = 2x° Angle CBE = x + 15°

Work out the size of angle ABD.

$(x+15) + 2x + 2x = 180$

$5x + 15 = 180$

$5x = 165$

$x = 33$

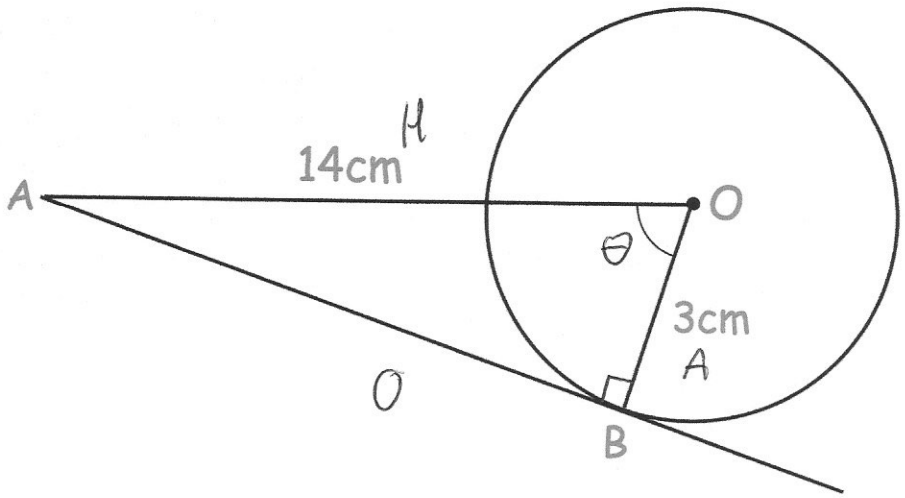
$2 \times 33 = 66°$

66

.....

(5)

28.



B is a point on the circumference of a circle with centre O.

AB is a tangent to the circle.

OA = 14cm and OB = 3cm

Calculate the size of angle AOB.

$\cos\theta = \frac{3}{14}$

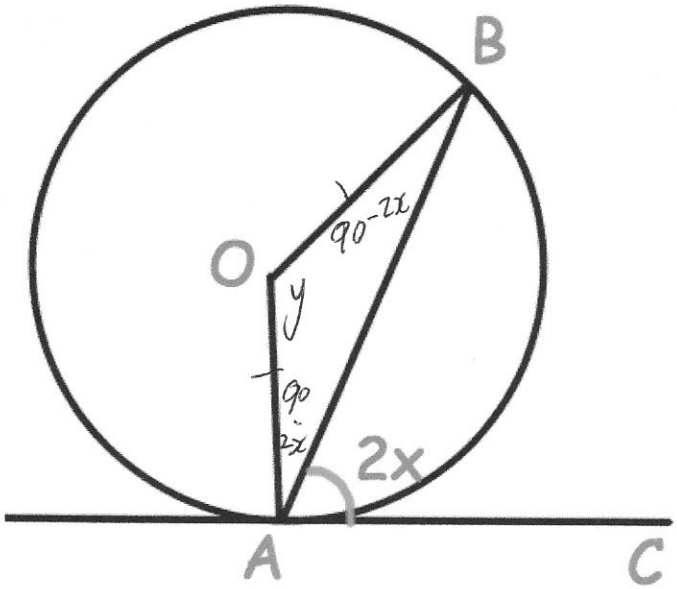
$\theta = \cos^{-1}\left(\frac{3}{14}\right)$

$= 77.62637..$

77.63°

(3)

29.



A and B are points on the circumference of a circle, centre O.
CA is a tangent to the circle.
Angle CAB = 2x

Prove that angle AOB = 4x
Give reasons for each stage of your working.

$\angle OAC = 90°$ Angle between radius & tangent is 90°.

$\therefore \angle OAB = 90 - 2x$

$\triangle OAB$ is isosceles.

$\therefore \angle OBA = 90 - 2x$

$\angle OBA + \angle OAB + \angle AOB = 180°$ Angles in a triangle add to 180°.

$(90 - 2x) + (90 - 2x) + y = 180°$

$180 + y - 4x = 180$

$y = 4x$ $\angle AOB = 4x$ QED

(4)