

Circle Theorems

Mark Scheme

Level	GCSE
Subject	Maths
Exam Board	Edexcel GCSE
Topic	Circle Theorems
Grade Level	Grade 6
Booklet	Mark Scheme

Time Allowed: 69 minutes

Score: /57

Percentage: /100

Grade Boundaries:

1.

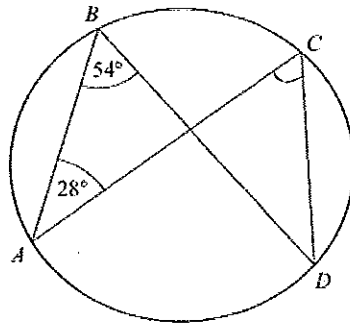


Diagram NOT
accurately drawn

A, B, C and D are points on the circumference of a circle.
Angle $ABD = 54^\circ$.
Angle $BAC = 28^\circ$.

(i) Find the size of angle ACD .

.....54..... $^\circ$

(ii) Give a reason for your answer.

.....angles from the same points (in the
.....same segment) are equal.....

(3 marks)

2.

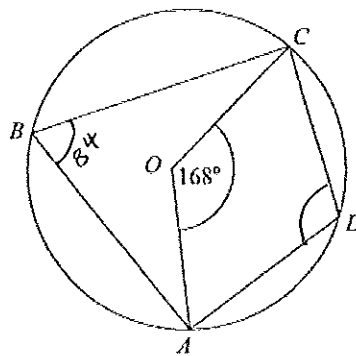


Diagram NOT
accurately drawn

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

Angle $AOC = 168^\circ$

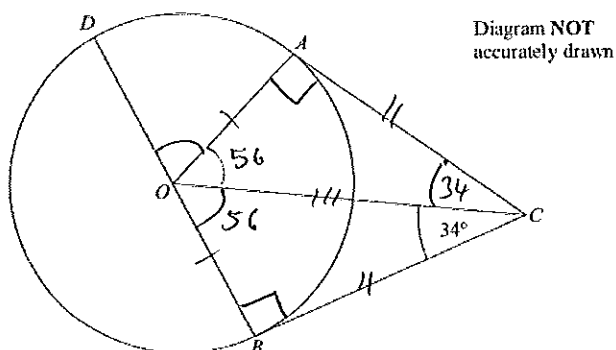
Work out the size of angle ADC .

You must give reasons for your working.

$\hat{ABC} = 84^\circ$ (Angle at centre is double angle at circumference)
 $\hat{ADC} = 180 - 84 = 96^\circ$ (opp. angles in cyclic quadrilateral add to 180°)
.....96..... $^\circ$

(4 marks)

3.



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 $OCB = 34^\circ$.

$$\hat{OAC} + \hat{OBC} = 90^\circ \text{ (tangent meets radius)}$$

Work out the size of angle DOA .

$$\hat{BOC} = 56^\circ \text{ (Angles in triangle add to } 180^\circ)$$

$$\hat{AOC} = \hat{BOC} \text{ (congruent triangles)}$$

$$180 - 56 - 56 = 68^\circ \text{ (Angles on a straight line = } 180^\circ)$$

$$\dots\dots\dots 68^\circ \dots\dots\dots$$

(4 marks)

4.

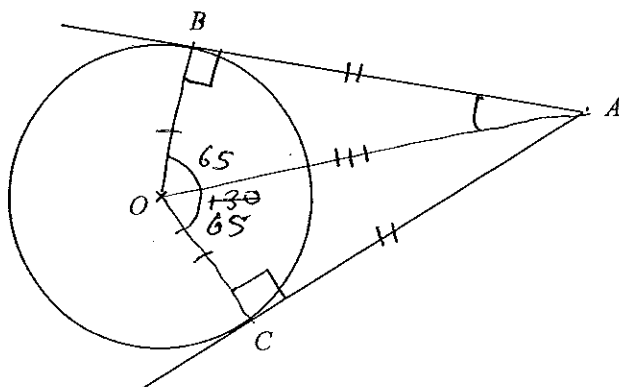


Diagram NOT accurately drawn

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

AB and AC are tangents to the circle.

Angle $BOC = 130^\circ$.

Work out the size of angle BAO .

$$\dots\dots\dots 25^\circ \dots\dots\dots$$

(4 marks)

5.

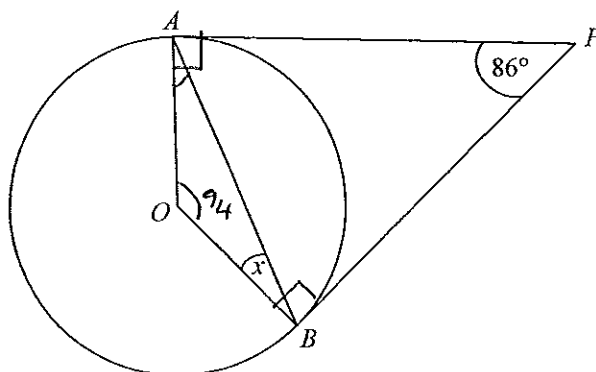


Diagram NOT accurately drawn

A and B are points on the circumference of a circle, centre O .
 PA and PB are tangents to the circle.
 Angle APB is 86° .

Work out the size of the angle marked x .

$$360 - 90 - 90 - 86 = 94^\circ$$

$$\frac{180 - 94}{2}$$

$$43^\circ$$

(3 marks)

6.

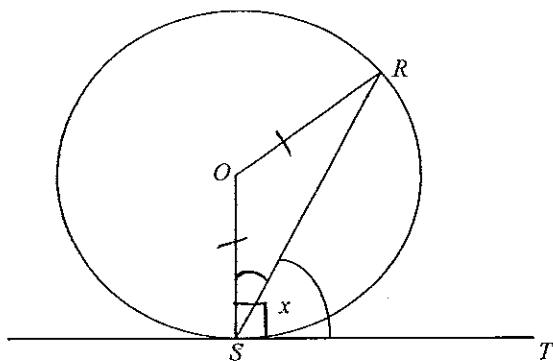


Diagram NOT accurately drawn

R and S are two points on a circle, centre O .
 TS is a tangent to the circle.
 Angle $RST = x$.

Prove that angle $ROS = 2x$.

You must give reasons for each stage of your working.

$$\begin{aligned} \angle OST &= 90^\circ \text{ (tangent meets radius)} \\ \angle OSR &= 90 - x \\ \angle ORS &= 90 - x \text{ (isosceles triangle)} \\ \angle ROS &= 180 - (90 - x) - (90 - x) \\ &= 180 - 90 + x - 90 + x \\ &= 2x \end{aligned}$$

(Angle in a triangle add up to 180°)

(4 marks)

7.

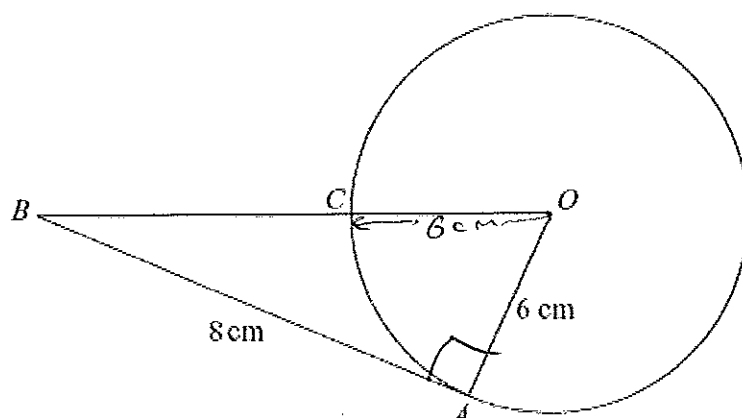


Diagram NOT
accurately drawn

In the diagram, O is the centre of the circle.
 A and C are points on the circumference of the circle.
 BCO is a straight line.
 BA is a tangent to the circle.

$$AB = 8 \text{ cm.}$$

$$OA = 6 \text{ cm.}$$

(a) Explain why angle OAB is a right angle.

Where a tangent meets a radius is 90°

(1)

(b) Work out the length of BC .

$$\begin{aligned} OB^2 &= 6^2 + 8^2 \\ OB^2 &= 100 \\ OB &= \sqrt{100} = 10 \text{ cm} \end{aligned}$$

$$10 - 6 = 4$$

4cm
(3)

(4 marks)

8.

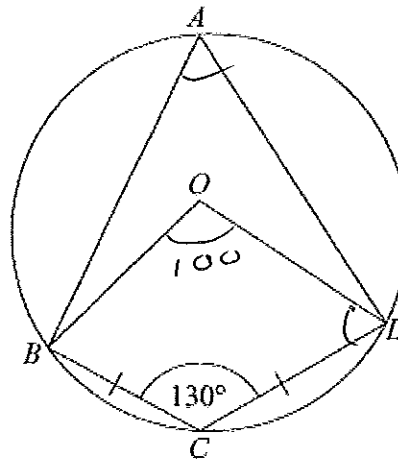


Diagram NOT
accurately drawn

A, B, C and D are points on a circle, centre O .
 $BC = CD$.
 Angle $BCD = 130^\circ$.

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

opposite angles in a cyclic quadrilateral
 add up to 180°

.....50.....
 (2)

- (b) Work out the size of angle ODC .
 Give reasons for your answer.

$\hat{BOD} = 100^\circ$ (angle at centre is double angle
 at circumference)

$$\frac{360 - 100 - 130}{2} = 65$$

angles in quadrilateral
 add up to 360°

$$\angle BO = \angle DO$$

.....65.....
 (4)

(6 marks)

9.

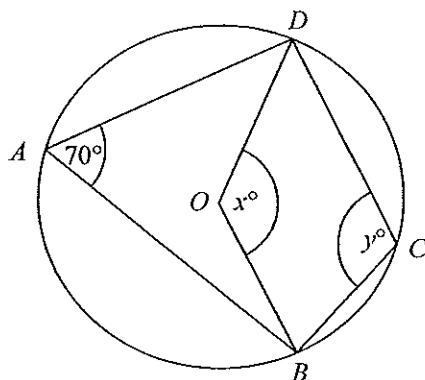


Diagram NOT accurately drawn

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

Angle $BAD = 70^\circ$.

Angle $BOD = x^\circ$.

Angle $BCD = y^\circ$.

- (a) (i) Work out the value of x .

$$x = 140$$

- (ii) Give a reason for your answer.

angle at centre is double the angle at the circumference

(2)

- (b) (i) Work out the value of y .

$$y = 110$$

- (ii) Give a reason for your answer.

opposite angles in a cyclic quadrilateral add up to 180°

(2)

(4 marks)

10.

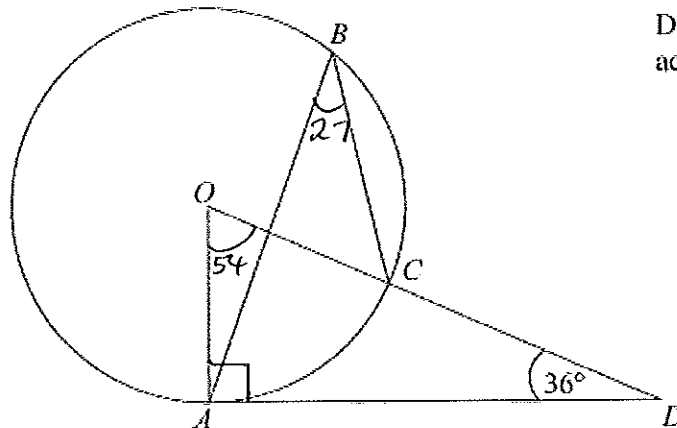


Diagram NOT
accurately drawn

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

DCO is a straight line.
 DA is a tangent to the circle.

Angle $ADO = 36^\circ$

(a) Work out the size of angle AOD .

.....54.....
(2)

(b) (i) Work out the size of angle ABC .

.....27.....

(ii) Give a reason for your answer.

.....the angle at the circumference is half
the angle at the centre.....

(3)

(4 marks)

11.

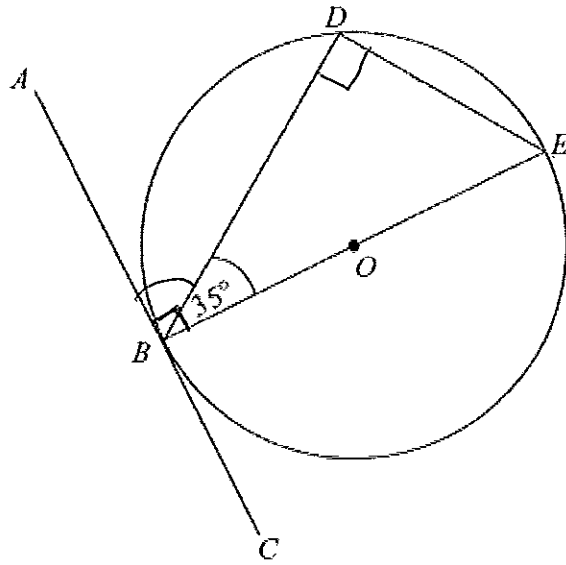


Diagram NOT
accurately drawn

B , D and E are points on a circle centre O .
 ABC is a tangent to the circle.
 BE is a diameter of the circle.
Angle $DBE = 35^\circ$.

(a) Find the size of angle ABD .

Give a reason for your answer.

where a tangent meets a radius it is
a 90° angle

.....55.....
(2)

(b) Find the size of angle DEB .

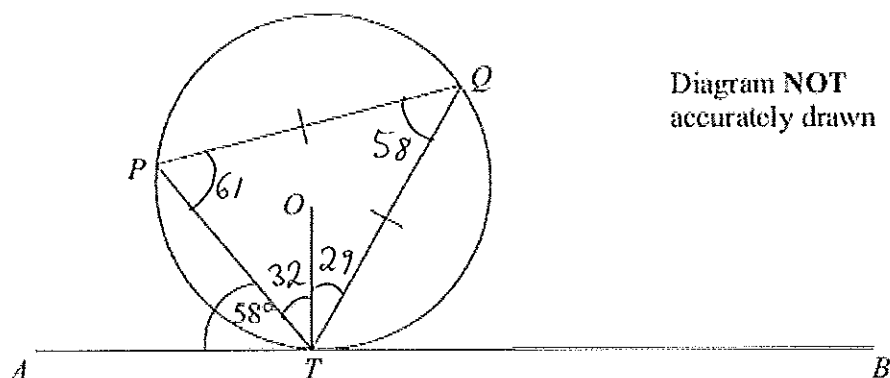
Give a reason for your answer.

Alternate segment theorem.

.....55.....
(2)

(4 marks)

12.



P , Q and T are points on the circumference of a circle, centre O .
The line ATB is the tangent at T to the circle.

$$PQ = TQ.$$

$$\text{Angle } ATP = 58^\circ.$$

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

$$\hat{PQT} = 58^\circ \quad (\text{Alternate segment theorem})$$

OTP = 32° tangent meets radius at 90° angle
 $90 - 58 = 32$

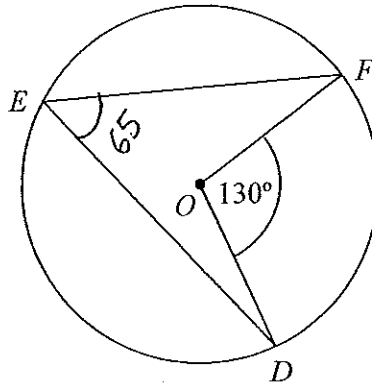
$\angle P T Q$ and $\angle Q T P = 61^\circ$ (angles in triangle add to 180, angles at base of isosceles triangle are equal)

$$OTQ = 29^\circ (61 - 32)$$

29

(4 marks)

13. (a)



D , E and F are points on the circumference of a circle, centre O .
Angle $DOF = 130^\circ$.

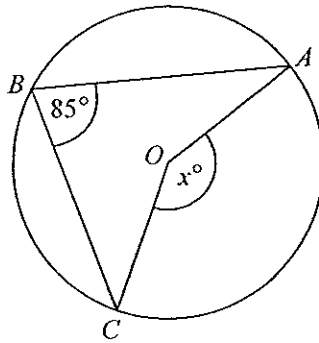
- (i) Work out the size of angle DEF .

..... 65°

- (ii) Give a reason for your answer.

..... angle at circumference is half
angle at centre

(2)



(b)

In the diagram, A , B and C are points on the circumference of a circle, centre O .
Angle $ABC = 85^\circ$.

- (i) Work out the size of the angle marked x° .

..... 170°

- (ii) Give a reason for your answer.

..... angle at centre is double angle at
circumference

(2)

(4 marks)

*14.

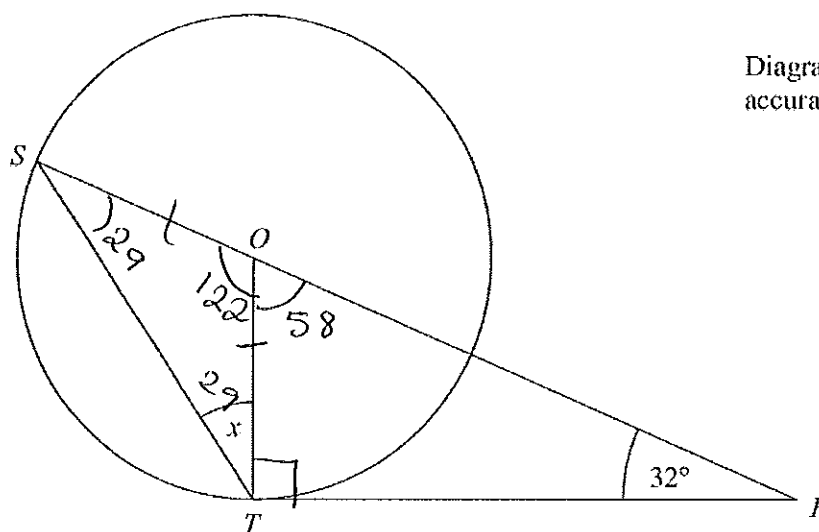


Diagram NOT
accurately drawn

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 $OPT = 32^\circ$.

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

$$\hat{TOP} = 58^\circ \quad (\text{Angles in a triangle add up to } 180^\circ)$$

$$\hat{OTP} = 90^\circ \quad (\text{tangent meets radius})$$

$$\hat{SOT} = 122^\circ \quad (\text{angles on a straight line add up to } 180^\circ)$$

$$\hat{OTS} = 29^\circ \quad (\text{angles at base of isosceles triangle are equal})$$

.....°

(Total 5 marks)