In the style of:

Edexcel GCSE

Mathematics A

Circle Theorems

Higher Tier

Past Paper Style Questions
Arranged by Topic

Paper Reference

1MA0/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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1. *ABCD* is a cyclic quadrilateral within a circle centre *O*.
   XY is the tangent to the circle at *A*.
   Angle *XAB* = 58°
   Angle *BAD* = 78°
   Angle *DBC* = 34°
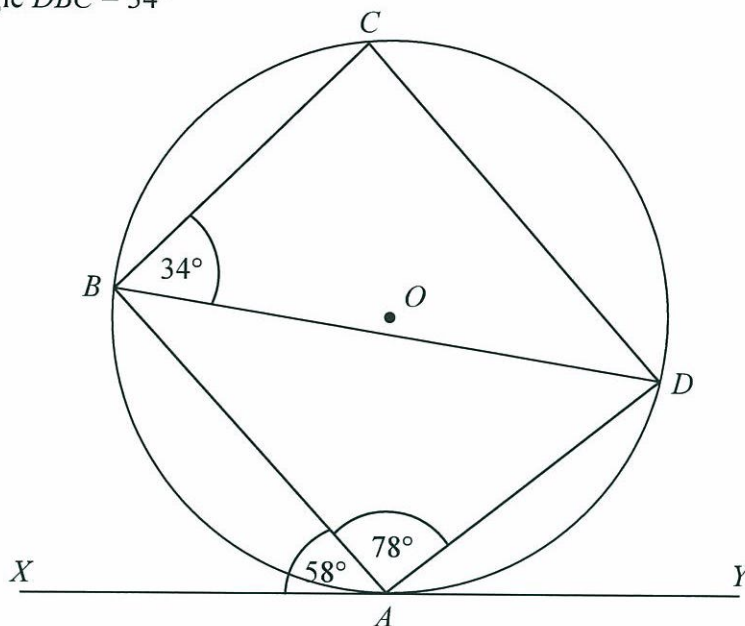

Diagram **NOT** accurately drawn

Prove that *AB* is parallel to *CD*.

$A\hat{D}B = 58°$ —— Angle in opposite segment is the same.

$A\hat{B}D = 44°$ —— Angles of a triangle add to 180°

$B\hat{C}D = 102°$ —— Opposite angles of a cyclic quadrilateral add to 180°

$B\hat{D}C = 44°$ —— Angles of a triangle add to 180°

(5)

$A\hat{B}D = B\hat{D}C = 44°$

Since alternate angles between two parallel lines are equal, AB must be parallel to CD.

2.(a) Here is a circle with centre *O*.

Diagram **NOT**
accurately drawn

O
B
104°
x
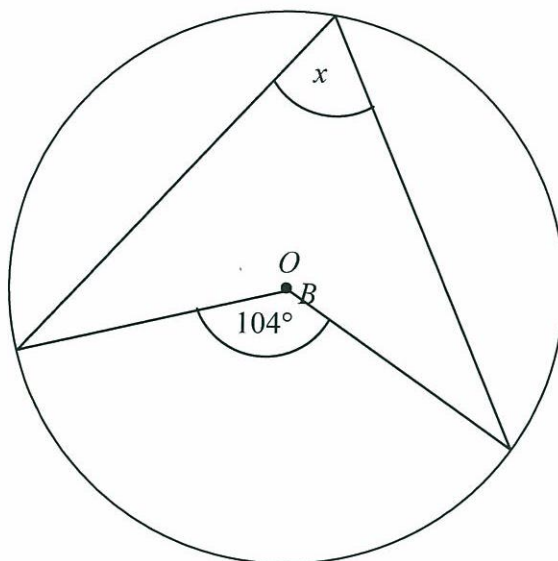
Write down the value of *x*.

52 .... degrees

(1)

(b) Here is a different circle.

Diagram **NOT**
accurately drawn

28°
40°
y
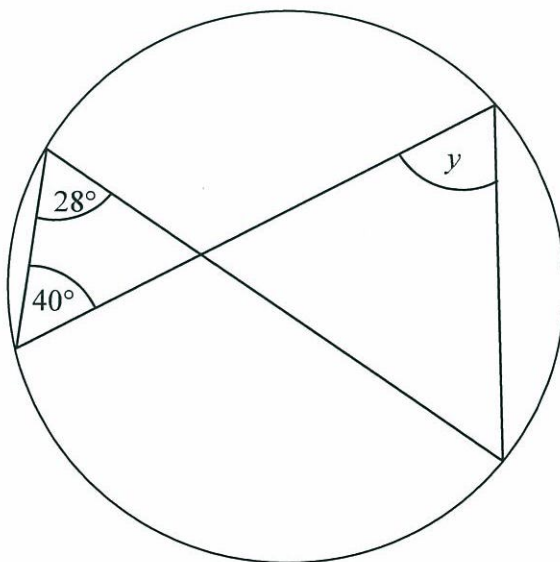
Write down the value of *y*.

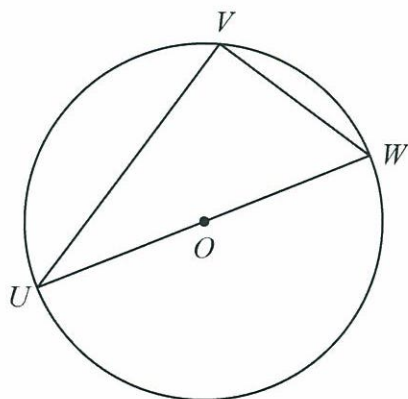28 .... degrees

(1)

3.

Diagram **NOT** accurately drawn

U, V and W are points on the circumference of a circle, centre O. UW is a diameter of the circle.

(a) (i) Write down the size of angle UVW.

90 °

(ii) Give a reason for your answer.

Lines drawn from either end of a diameter to a point on the circumference form a right-angle where they meet.

(2)

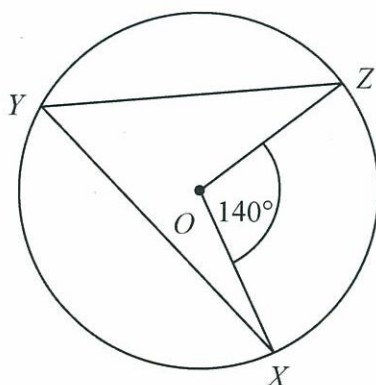Diagram **NOT** accurately drawn

X, Y and Z are points on the circumference of a circle, centre O.
Angle $XOZ = 140°$.

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

70 °

(ii) Give a reason for your answer.

The angle subtended by an arc at the centre of a circle is twice the angle subtended by the same arc at any other point on the circumference (Double angle theorem) (2)
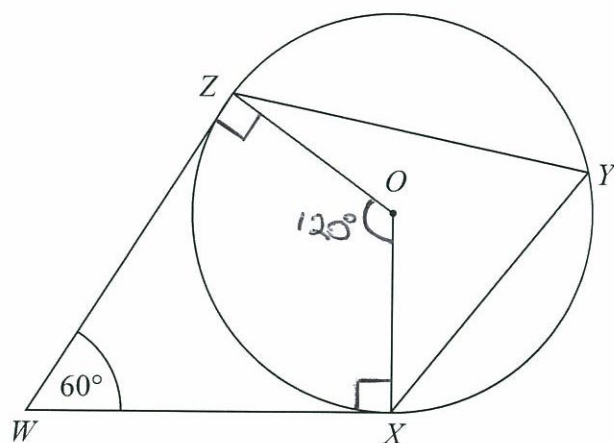
(Total 4 marks)

Diagram **NOT**
accurately drawn

X, Y and Z are points on the circumference of a circle, centre O.
WX and WZ are tangents to the circle.

Angle ZWX = 60°

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

$$O\hat{Z}W = O\hat{X}W = 90°$$ — A radius and tangent of
a circle form a right-angle
at their point of contact on the
circumference.

$$X\hat{O}Z = 120°$$ given by $360 - 2(90) - 60 = 120$
since angles of a quadrilateral must
add to 360°.
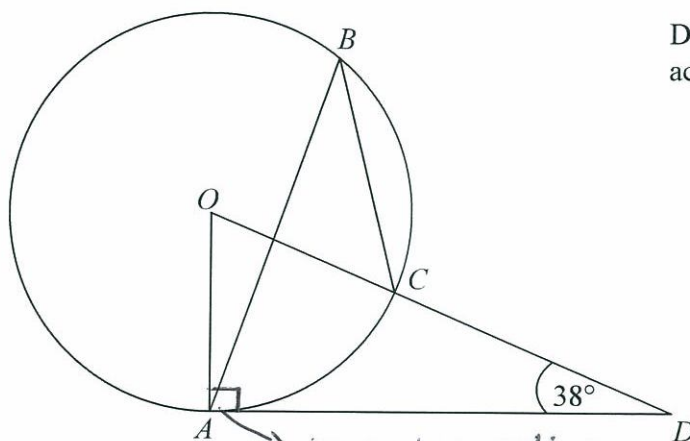
Finally, $X\hat{Y}Z = 60°$ — Double angle theorem.
The angle subtended by arc/chord XZ at the
centre, O, must be twice the size of the angle

(Total 4 marks)

subtended by arc XZ at Y — a point on the circumference
and in the same segment as O with regards to chord

XZ .

5.

Diagram **NOT**
accurately drawn

tangent & radius form a right-angle through point of contact.

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* = 38°

(a) Work out the size of angle *AOD*.

$$A\hat{O}D = 180 - 90 - 38 = 52°$$

_____52_____ °

(2)

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

$$\frac{1}{2}(52) = 26°$$

_____26_____ °
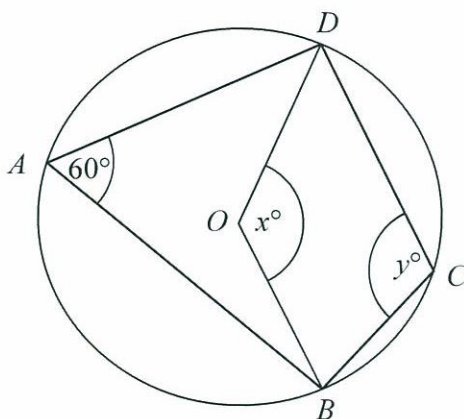
(ii) Give a reason for your answer.

Double angle theorem — See answer to q 3.6.ii
for full explanation of double angle theorem.

(3)

(Total 5 marks)

6.

Diagram **NOT** accurately drawn

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

Angle $BAD = 60°$.

Angle $BOD = x°$.

Angle $BCD = y°$.

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

$x = $ 120°

(ii) Give a reason for your answer.

Double angle theorem as per answer to q. 3. b. ii

(2)

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

$180 - 60 = 120°$

$y = $ 120°

(ii) Give a reason for your answer.

Opposite angles of a cyclic quadrilateral add to 180°
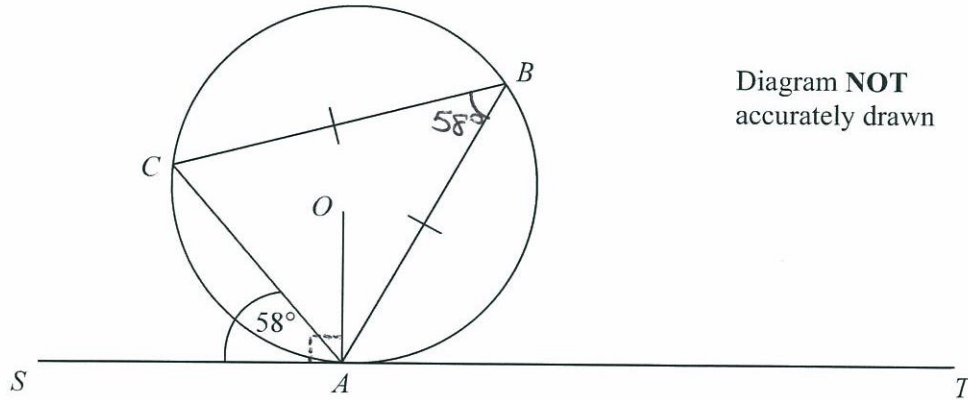
(2)

(Total 4 marks)

7.

Diagram **NOT**
accurately drawn

A, *B* and *C* are points on the circumference of a circle, centre *O*.
The line *SAT* is the tangent at *A* to the circle.

CB = *AB*.
Angle *ATP* = 60°.

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

$A\hat{B}C = C\hat{A}S = 58°$ — Angle in the opposite segment
is equal, i.e. the angle between a
chord and a tangent is the same as the
angle subtended by the same chord in the
opposite segment.

$B\hat{A}C = A\hat{C}B = \frac{180-58}{2} = 61°$ — Base angles of an
isosceles triangle are equal.

$O\hat{A}B = 58 + 61 - 90 = 29°$ — The angle between tangent
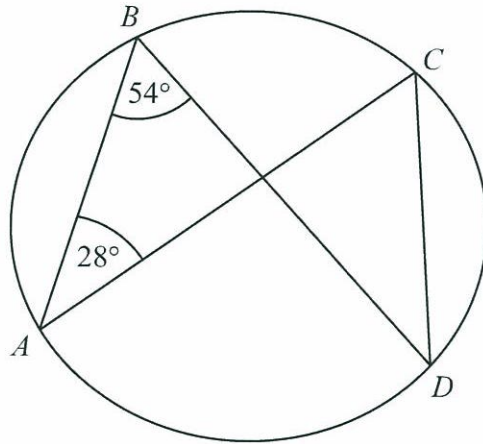SAT and radius OA must be 90°

........29........°

(Total 5 marks)

8.

Diagram **NOT** accurately drawn

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

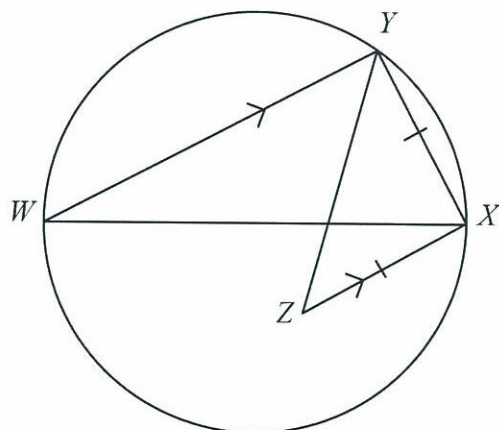(i) Find the size of angle ACD.

54 °

(ii) Give a reason for your answer.

The angles subtended by an arc at points on the circumference in the same segment must be equal.

(Total 2 marks)

9.

Diagram **NOT** accurately drawn

WX is a diameter of a circle.
Y is a point on the circle.
Z is the point inside the circle such that *ZX* = *XY* and *XZ* is parallel to *YW*.
Find the size of angle *XZY*.
You must give reasons for your answer.

$W\hat{Y}X = 90°$ —— Lines drawn from either end of a diameter to a point on the circumference form a right-angle where they meet.

$Z\hat{X}Y = 90°$ —— Interior angles between two parallel lines add to 180°

$X\hat{Z}Y = \dfrac{180 - 90}{2} = 45°$

.......45....... ° **Q9**

(Total 4 marks)

Triangle X Y Z is an isosceles triangle.
Angles of any triangle add to 180° and base angles of an isosceles triangle are equal.

10. ABCD is a cyclic quadrilateral.
AE is a tangent at A.
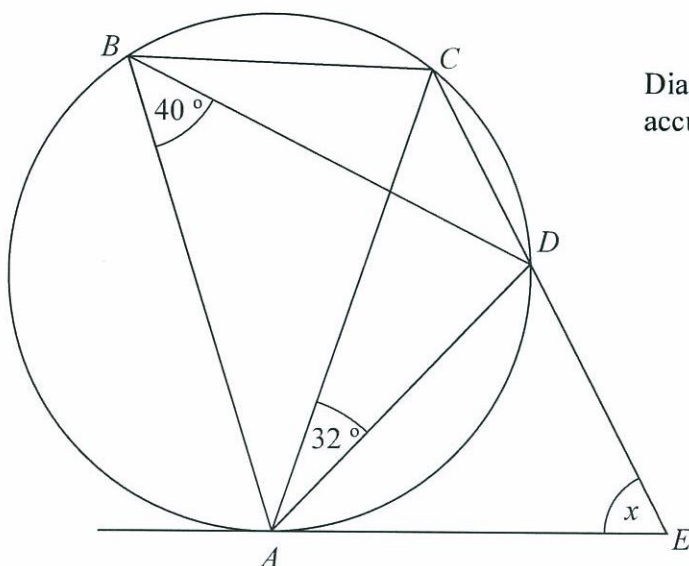CDE is a straight line.
Angle CAD = 32°
Angle ABD = 40°

Diagram **NOT**
accurately drawn

Work out the size of angle AED, marked x, on the diagram.
You **must** show your working.
Give reasons for any angles you work out.

$A\hat{C}D = A\hat{B}D = 40°$ —— Angles in the same segment are equal.

$A\hat{D}C = 180 - 32 - 40 = 108°$ — Angles of a triangle add to 180°

$A\hat{D}E = 180 - 108 = 72°$ — Angles across a straight line are Supplementary (i.e. add to 180°).

$D\hat{A}E = 40°$ —— Angle in the opposite segment theorem.

$x = 180 - 72 - 40 = 68°$ — Angles of a triangle add to 180°.

..........68.......... degrees

(Total 5 marks)

11.

Diagram **NOT** accurately drawn
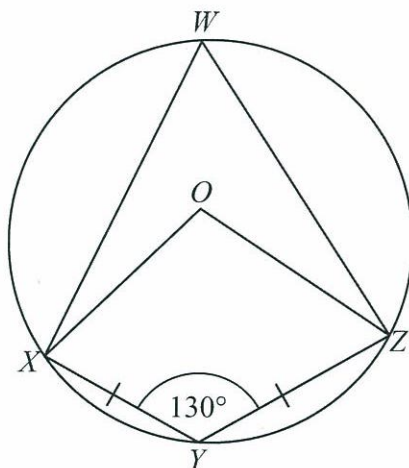
W, X, Y and Z are points on a circle, centre O.

XY = YZ.

Angle XYZ = 130°.

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

$X\hat{W}Z = 180 - 130 = 50°$

since opposite angles of a cyclic quadrilateral add to 180°

................**50**.............. °

(2)

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

$X\hat{O}Z = 2(50) = 100°$ — Double-angle theorem.

As O is the centre, both OX and OZ represent the radius of the circle, i.e. OX = OZ. Also XY = YZ, as indicated and so OXYZ is a quadrilateral known more specifically as a kite.

$O\hat{Z}Y = \dfrac{360 - 130 - 100}{2}$

$= 65°$ — Angles of any quadrilateral add to 360° and the non-vertex angles of a kite are equal.

................**65**.............. °

(4)

(Total 6 marks)