Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Circle theorems

Time allowed: 45 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2, Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 37

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 37 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

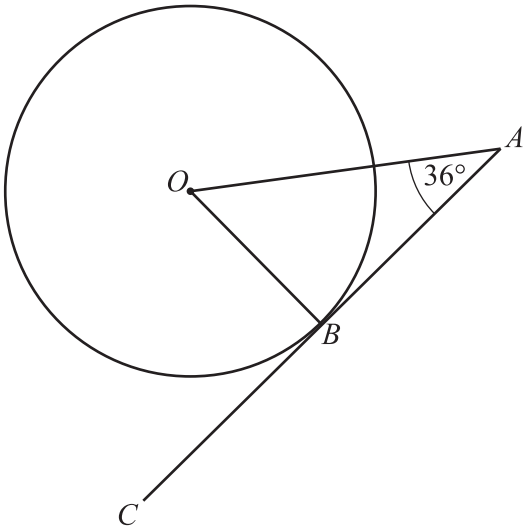
Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1



NOT TO SCALE

B is a point on the circle, centre O.
ABC is a tangent to the circle at B and angle $OAB = 36°$.

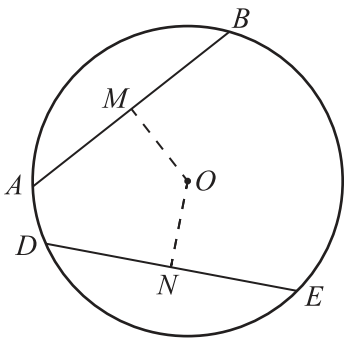
Work out the size of angle AOB.

Angle $AOB =$ ..... [1]

Circle theorems Click for more variations

1	54	**1**	

2



NOT TO SCALE

The diagram shows a circle, centre O.
AB and DE are chords of the circle.
M is the mid-point of AB and N is the mid-point of DE.
$AB = DE = 9$ cm and $OM = 5$ cm.

Find ON.

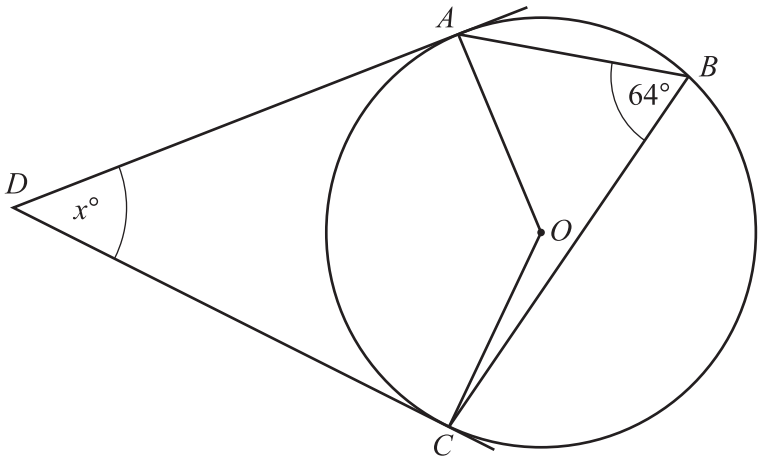
$ON =$ ..... cm [1]

Circle theorems Click for more variations

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2	5	**1**	

3



NOT TO SCALE

A, B and C are points on the circumference of a circle with centre O.
DA and DC are tangents to the circle.
Angle $ABC = 64°$.

Work out the value of x.

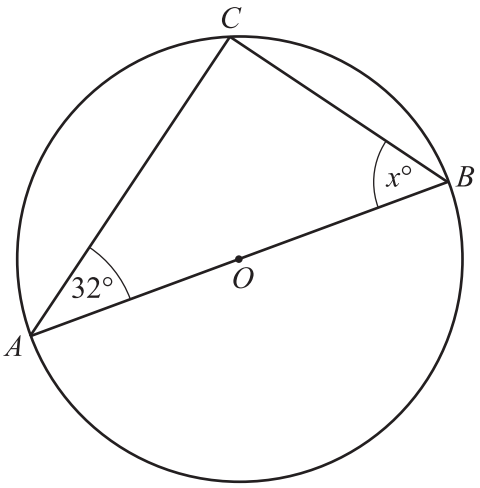
$x =$ ..... [2]

Circle theorems Click for more variations

3	52	**2**	**M1** for $360 - 90 - 90 - 128$ oe or **B1** for [obtuse angle] $AOC = 128$ or AOD or $COD = 64$ or DAO or $DCO = 90$

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4



NOT TO SCALE

The diagram shows a circle, centre O, diameter AB.
A, B and C lie on the circumference of the circle.

(a) Write down the mathematical name of the line AC.

..... [1]

(b) Find the value of x.
Give a geometrical reason for your answer.

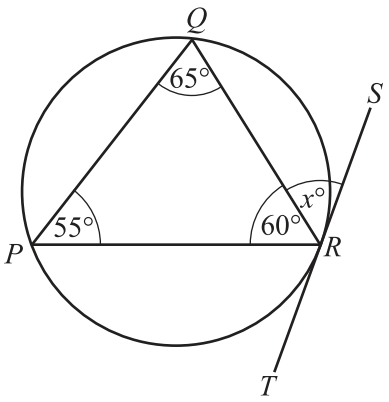
x = ... because ..... [2]

(a) 2D shapes (b) Circle theorems Click for more variations

4(a)	Chord	**1**	
4(b)	58	**1**	
	Angle in a semicircle = 90°	**1**	

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5



NOT TO SCALE

P, Q and R are points on a circle.
ST is a tangent to the circle at R.

(a) Write down the value of x.
Give a geometrical reason for your answer.

x = ... because.....

..... [2]

(b) Another tangent from the point S touches the circle at V.

Give a geometrical reason why triangle SVR is isosceles.

.....

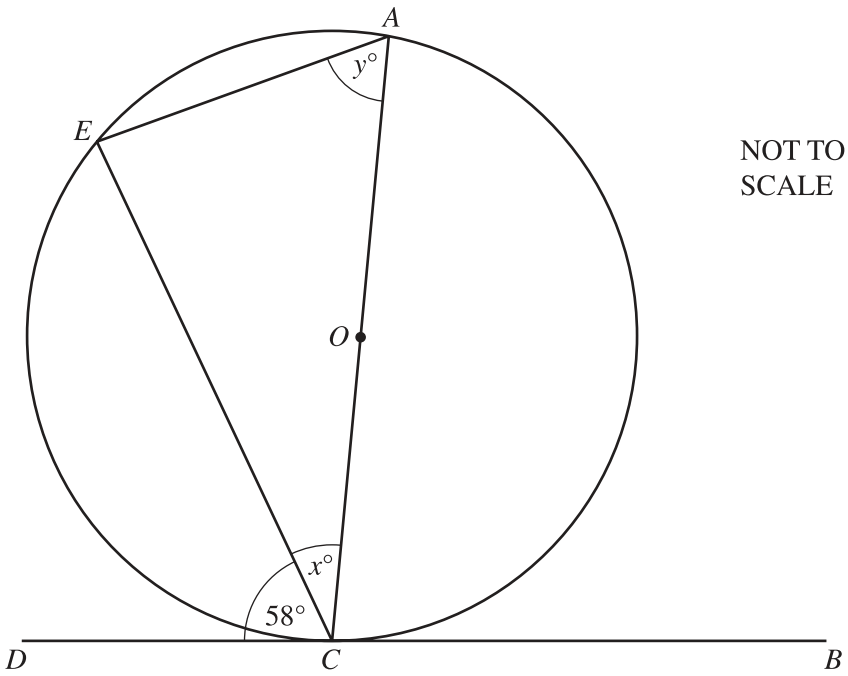
..... [1]

(a) Circle theorems (b) Circle theorems Click for more variations

5(a)	55 Alternate segment theorem	**2**	**B1** for 55
5(b)	Tangents from an external point are equal in length	**1**	

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6



NOT TO SCALE

AC is a diameter of a circle, centre *O*.
BCD is a tangent to the circle and *E* is a point on the circumference.
Angle *ECD* = 58°.

Work out the value of

(a) *x*,

Answer(a) x = ... [2]

(b) *y*.

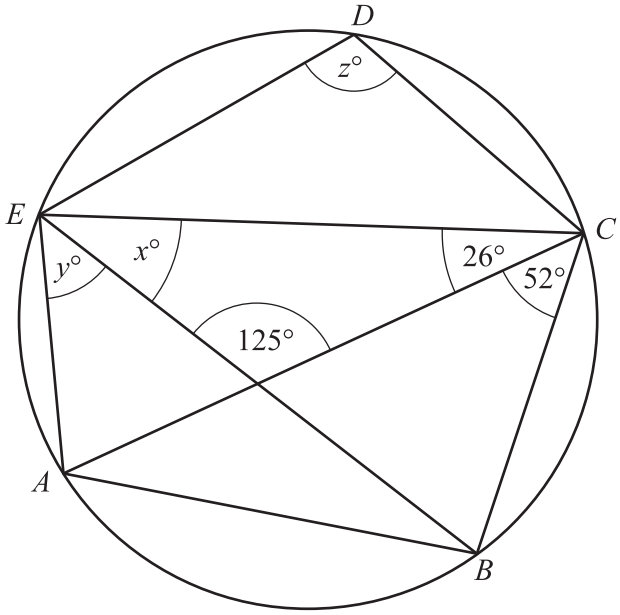
Answer(b) y = ... [2]

(a) Circle theorems (b) Circle theorems Click for more variations

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6	**(a)**	[*x* =] 32	**2**	**M1** for angle *OCD* = 90° soi (or angle *OCB* = 90°)
	(b)	[*y* =] 58	**2ft**	**M1** for angle *AEC* = 90° soi Follow through 90 – their (a)

7



NOT TO SCALE

A, B, C, D and E lie on a circle.

Find the values of x, y and z.

$x =$ .....

$y =$ .....

$z =$ .....

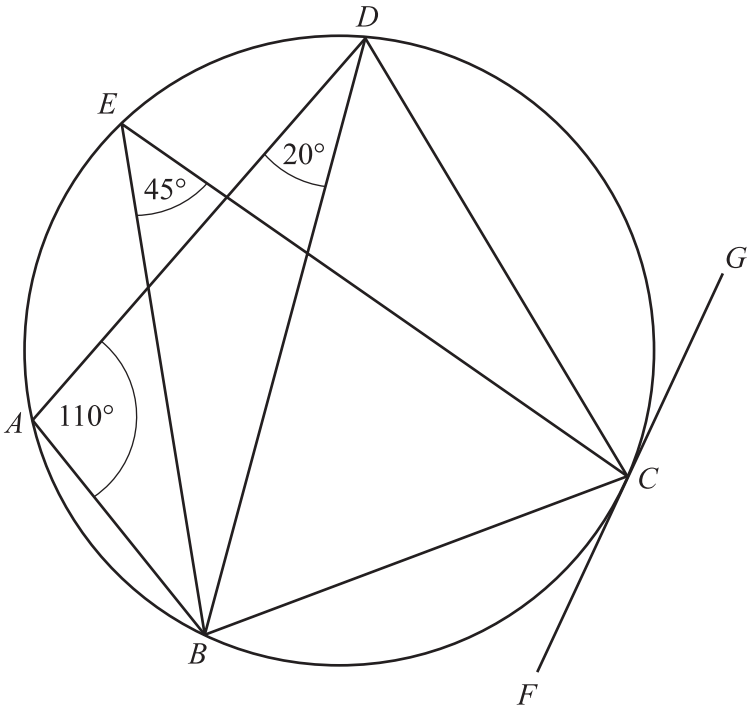
[4]

Circle theorems Click for more variations

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7	[x =] 29 [y =] 52 [z =] 107	**4**	**B1** for 29 **B1** for 52 **B2FT** for 107 or for z = *their* x + *their* y + 26 or **B1** for $\angle EAC = 73$ or $\angle EBC = 73$ or **B1FT** for $\angle EAC = 180 - (\textit{their } x + \textit{their } y + 26)$

8



NOT TO SCALE

A, B, C, D and E lie on a circle.
FG is a tangent to the circle at C.
Angle $BAD = 110°$, angle $ADB = 20°$ and angle $BEC = 45°$.

(a) Find angle BCD.
Give a geometrical reason for your answer.

Angle BCD = ... because .....

..... [2]

(b) **(i)** Find angle DBC.

Angle DBC = ... [2]

(ii) Find angle DCG.

Angle DCG = ... [1]

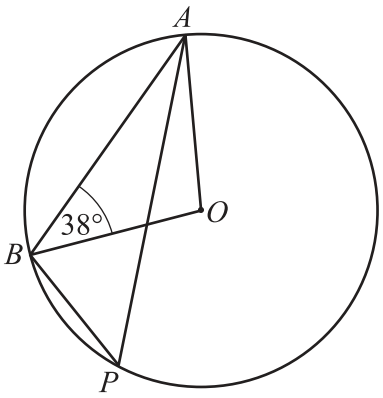
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(a) Circle theorems (b)(i) Circle theorems (b)(ii) Circle theorems Click for more variations

8(a)	70 **and** opposite angles of a cyclic quadrilateral sum to 180 oe	**2**	**B1** for 70 or for a fully correct reason
8(b)(i)	65	**2**	**FT** 180 – 45 – *their* 70 for 2 marks **B1** for angle *BDC* = 45 or **M1** for 180 – 45 – *their* 70 oe or for 180 – (20 + 45) – (180 – (110 + 20)) oe
8(b)(ii)	65	**1**	**FT** *their* **(b)(i)**

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9 (a)



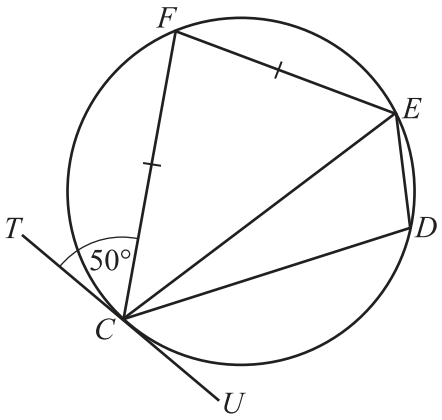
NOT TO SCALE

A, B and P are points on a circle, centre O and angle $OBA = 38°$.

Find angle APB.

Angle APB = ... [3]

(b)



NOT TO SCALE

$CDEF$ is a cyclic quadrilateral and $FC = FE$.
TU is a tangent to the circle at C and angle $TCF = 50°$.

Find

(i) angle EFC,

Angle EFC = ... [2]

(ii) angle CDE.

Angle CDE = ... [1]

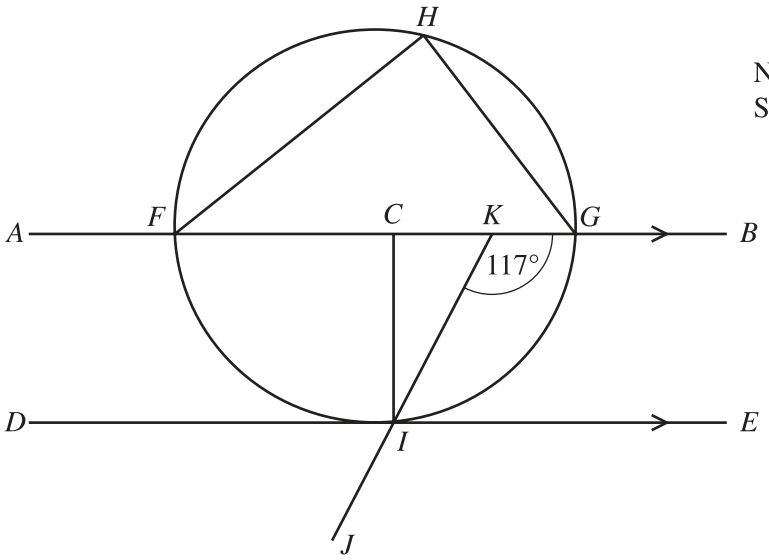
(a) Circle theorems (b)(i) Circle theorems (b)(ii) Circle theorems Click for more variations

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9(a)	52°	**3**	**M1** for $180 - 2 \times 38$, implied by 104 **M1** for *their AOB* ÷ 2
9(b)(i)	80°	**2**	**B1** for *FEC* =50 or *FCE* = 50
9(b)(ii)	100°	**1**	**FT** 180 – *their* **(i)**

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10



The points F, G, H and I lie on a circle, centre C.
FG is a diameter and DE is a tangent to the circle at I.
DE is parallel to AB and angle $GKI = 117°$.

Complete the following statements.

(a) Angle FKI = ... because .....

..... [2]

(b) Angle FHG = ... because .....

..... [2]

(c) Angle EIJ = ... because .....

..... [2]

(d) Angle CIE = ... because .....

..... [2]

(a) Basic angle properties (b) Circle theorems (c) Angles in parallel lines (d) Circle theorems

Click for more variations

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10	**(a)**	63 (Angles on a straight) line (add to) 180	**1** **1**	
	(b)	90 (Angle in a) semi circle	**1** **1**	
	(c)	117 Corresponding (angles)	**1** **1**	
	(d)	90 Tangent and radius	**1** **1**	

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