MATHEMATICS (EXTENDED) 0580
IGCSE MAY/JUNE 2020

REVISION 7

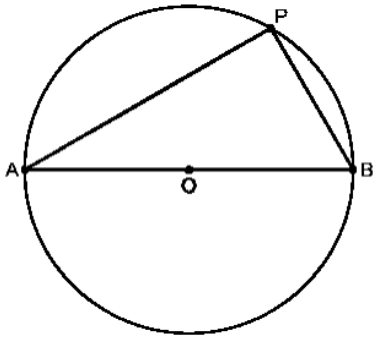
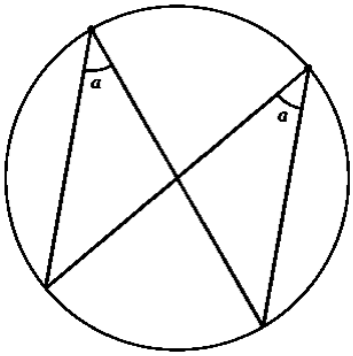
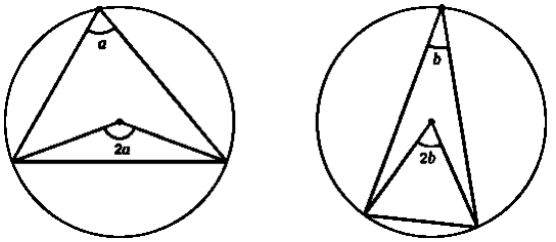
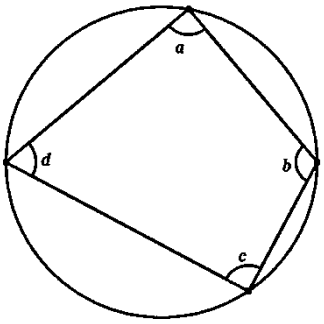
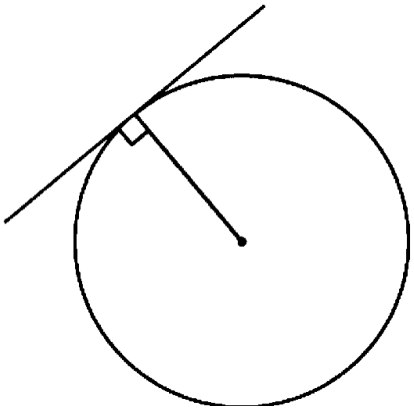
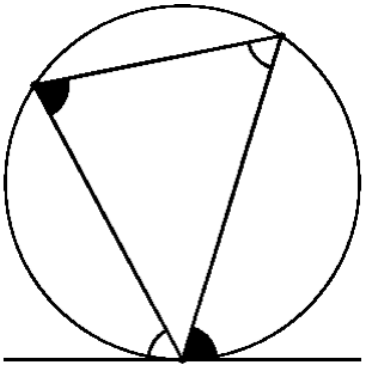
ANGLE AND CIRCLE PROPERTIES

NOTES:

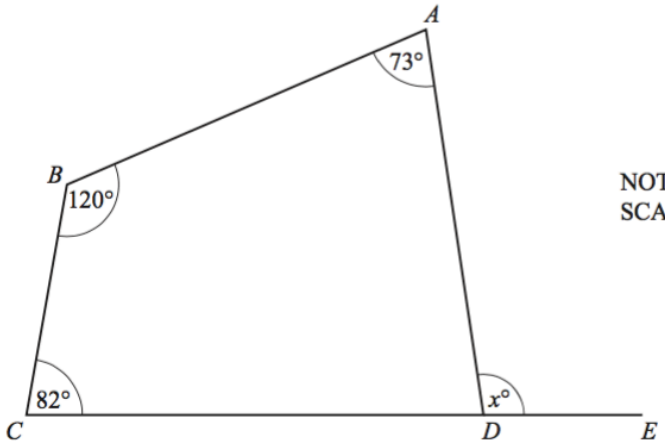
Basic Angle Properties

***Angles at a point*:** **The sum is 360°.**	***Angles at a point on a straight line*:** **The sum is 180°**
***Angles at a point on intersecting straight lines*: Opposite/Vertical angles**	***Angles formed within parallel lines*:** **Alternate and Corresponding Angles**
Angles in a Triangle: **The sum of angles in a triangle is 180°**	***Angles in a Triangle/Quadrilateral:*** **The sum of angles in a quadrilateral is 360°.**
Angles in a Polygon	

Angle Properties of Circles

***Angle in a semi-circle* is a right angle.**	***Angles in the same segment* are equal.**
	
Angle at the centre of the circle is twice the angle at the circumference.	***Angles in opposite segments* are supplementary/cyclic quadrilaterals.**
	$a + c = 180°$ $b + d = 180°$ 
***Angle between the tangent and radius/diameter of a circle* is right angle**	***Alternate segment theorem***
	

1.



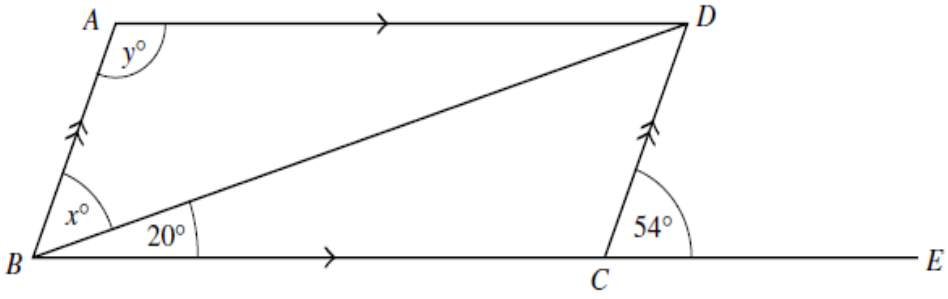
NOT TO SCALE

The diagram shows a quadrilateral *ABCD*.
CDE is a straight line.

Find the value of *x*.

Answer: ..... [2]

2.



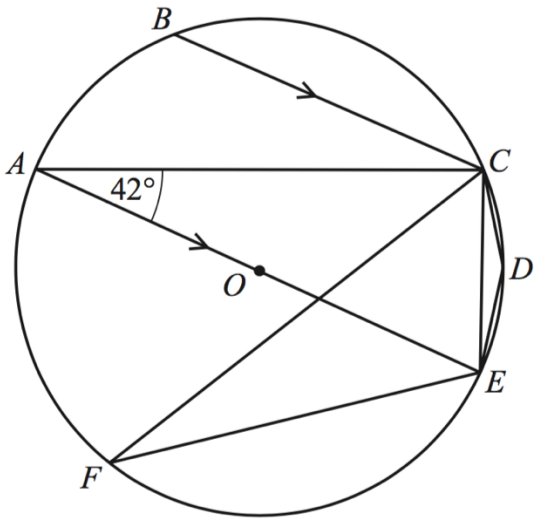
NOT TO SCALE

ABCD is a parallelogram and *BCE* is a straight line. Angle *DCE* = 54° and angle *DBC* = 20°.
Find *x* and *y*.

Answer: *x* = ...

y =..... [2]

3. **(a)** A, B, C, D, E and F are points on the circumference of a circle with centre O.
AE is a diameter of the circle.
BC is parallel to AE and angle $CAE = 42°$.



Giving a reason for each answer, find

(i) angle BCA

Answer: .....

Reason: ..... [2]

(ii) angle ACE

Answer: .....

Reason: ..... [2]

(iii) angle CFE

Answer: .....

Reason: ..... [2]

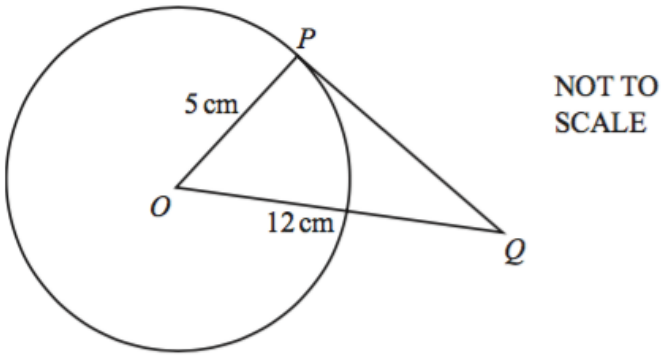
(ii) angle CDE

Answer: .....

Reason: ..... [2]

(b) In the diagram, O is the centre of the circle and PQ is a tangent to the circle at P.
$OP = 5$ cm and $OQ = 12$ cm.

Calculate PQ.



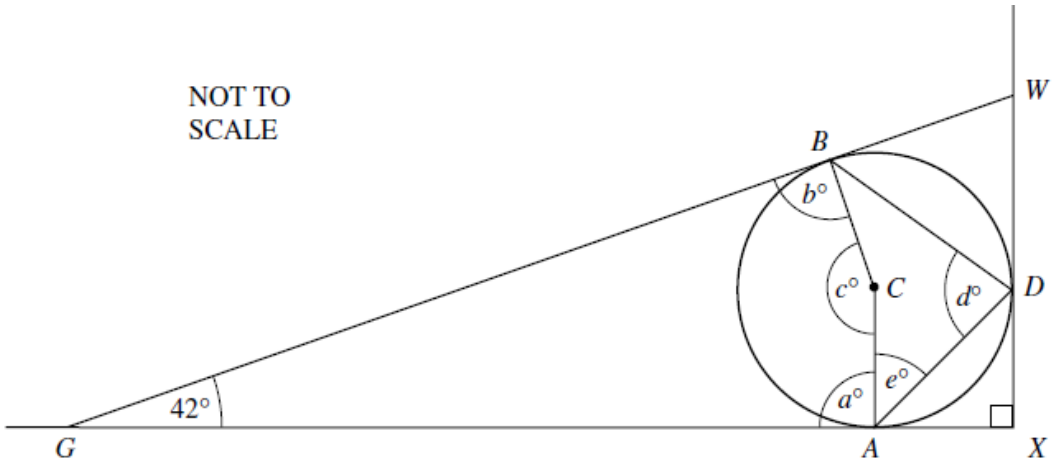
Answer: ..... [3]

4. A seven-sided polygon has one interior angle of 90°.
The other six interior angles are all equal.

Calculate the size of one of the six equal angles.

Answer: ..... [2]

5.



A sphere, centre C, rests on horizontal ground at A and touches a vertical wall at D. A straight plank of wood, GBW, touches the sphere at B, rests on the ground at G and against the wall at W. The wall and the ground meet at X. Angle $WGX = 42°$.

(a) Find the values of a, b, c, d and e marked on the diagram.

Answer: $a =$ ..... [1]

$b =$ ..... [1]

$c =$ ..... [1]

$d =$ ..... [1]

$e =$ ..... [1]

(b) Write down one word which completes the following sentence.
'Angle CGA is 21° because triangle GBC and GAC are .....'. [1]

(c) The radius of the sphere is 54 cm.
(i) Calculate the distance GA. Show all your working. [3]

Answer: ..... [3]

(ii) Show that $GX = 195$ cm correct to the nearest centimetre. [2]

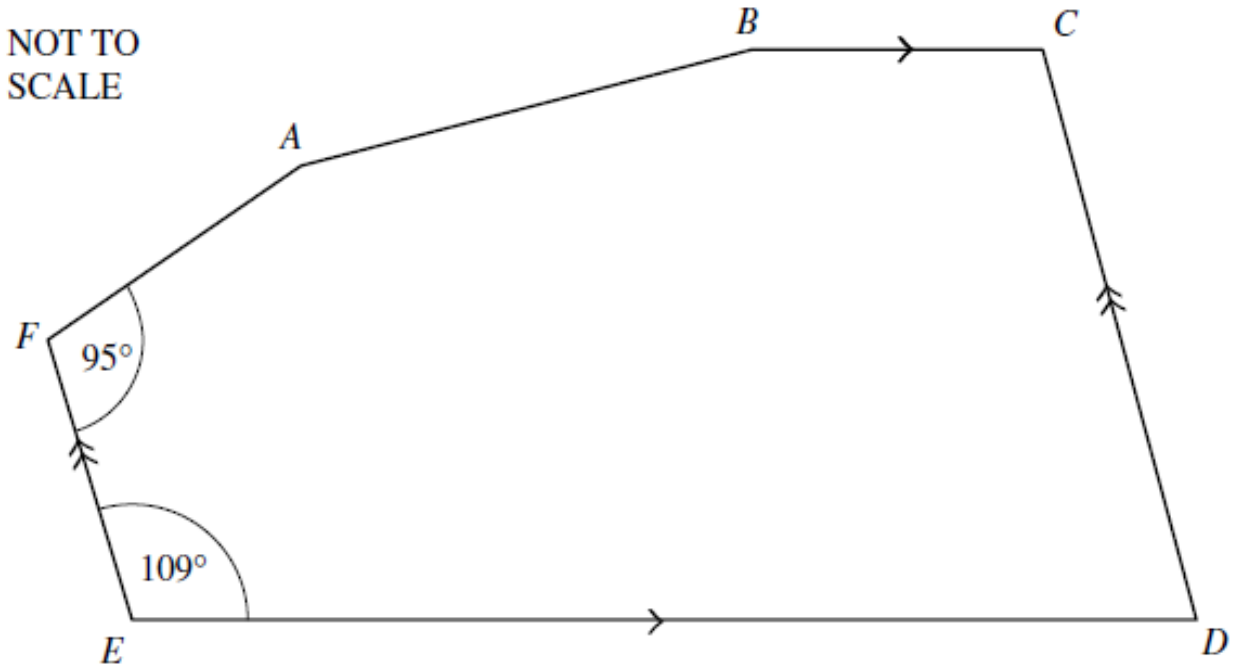
(iii) Calculate the length of the plank GW.

Answer: …… [3]

(iv) Find the distance BW.

Answer: …… [1]

6.



In the hexagon *ABCDEF*, *BC* is parallel to *ED* and *DC* is parallel to *EF*.
Angle *DEF* = 109° and angle *EFA* = 95°.
Angle *FAB* is equal to angle *ABC*.
Find the size of

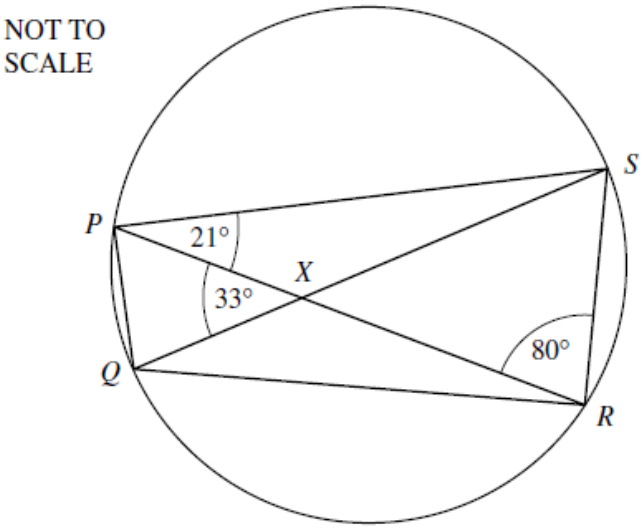
(a) angle *EDC*

Answer: ..... [1]

(b) angle *FAB*

Answer: ..... [2]

7.



PQRS is a cyclic quadrilateral. The diagonals *PR* and *QS* intersect at *X*.
Angle *SPR* = 21°, angle *PRS* = 80° and angle *PXQ* = 33°.

Calculate

(a) angle *PQS*

Answer: ..... [1]

(b) angle *QPR*

Answer: ..... [1]

(c) angle *PSQ*

Answer: ..... [1]

8. Quadrilaterals *P* and *Q* each have diagonals which are

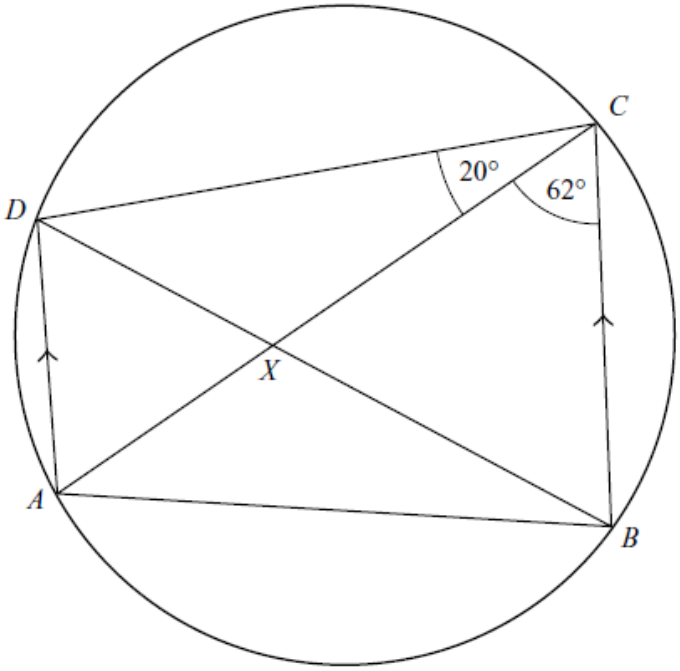
- are unequal
- intersect at right angles.

P has two lines of symmetry. *Q* has one line of symmetry.

(a) What type of quadrilateral is *P*? What type of quadrilateral is *Q*? [2]

(b) In quadrilateral *P*, an angle between one diagonal and a side is $x°$.
Write down, in terms of x, the four angles of *P*.
[2]

9.



NOT TO SCALE

ABCD is a cyclic quadrilateral.
AD is parallel to *BC*. The diagonals *DB* and *AC* meet at *X*.
Angle *ACB* = 62° and angle *ACD* = 20°.

Calculate

(a) angle *DBA*

Answer: ..... [1]

(b) angle *DAB*

Answer: ..... [1]

(c) angle *DAC*

Answer: ..... [1]

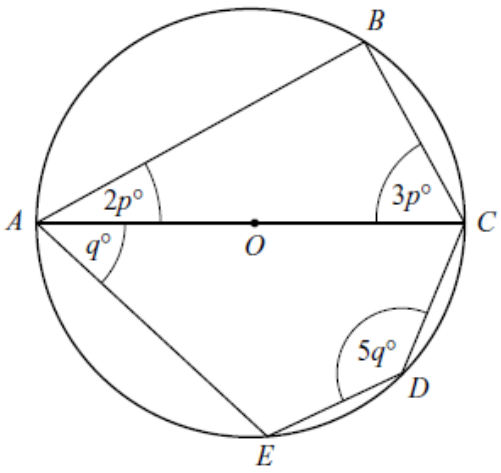
(d) angle *AXB*

Answer: ..... [1]

(e) angle *CDB*

Answer: ..... [1]

10.



A, *B*, *C*, *D* and *E* lie on a circle, centre *O*.
AOC is a diameter.
Find the value of

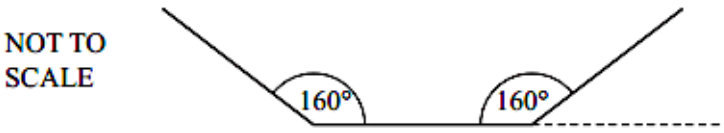
(a) *p*

Answer: ..... [2]

(b) *q*

Answer: ..... [2]

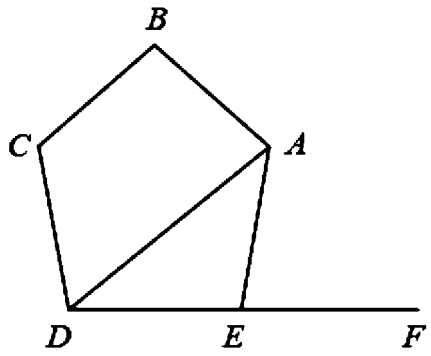
11.



The diagram shows part of a regular polygon.
Each interior angle of the polygon is 160°.
Calculate the number of sides of the polygon.

Answer: ..... [3]

12.



ABCDE is a regular pentagon.
DEF is a straight line.
Calculate

(a) angle *AEF*

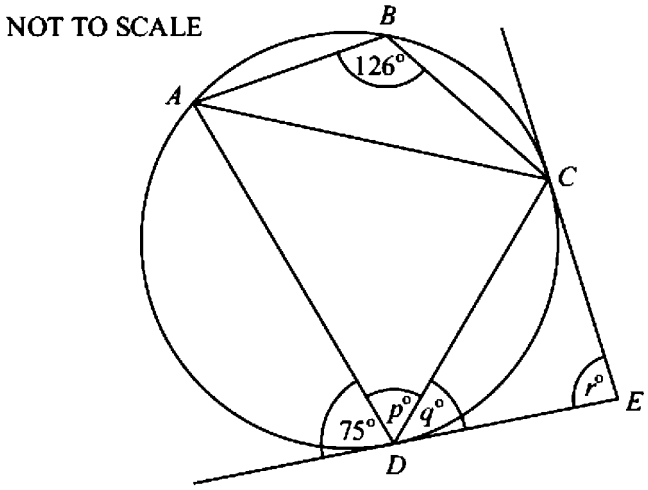
Answer: ..... [2]

(b) angle *DAE*

Answer: ..... [1]

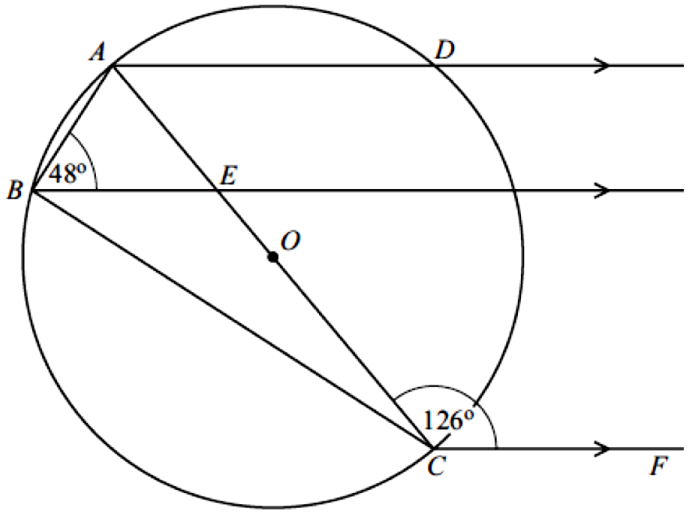
13.

ABCD is a cyclic quadrilateral.
The tangents at *C* and *D* meet at *E*.
Calculate the values *p*, *q* and *r*.



Answer: ..... [3]

14.



NOT TO SCALE

A, B, C and D lie on a circle centre O. AC is a diameter of the circle.
AD, BE and CF are parallel lines.
Angle $ABE = 48°$ and angle $ACF = 126°$.
Find

(a) angle DAE

Answer: ..... [1]

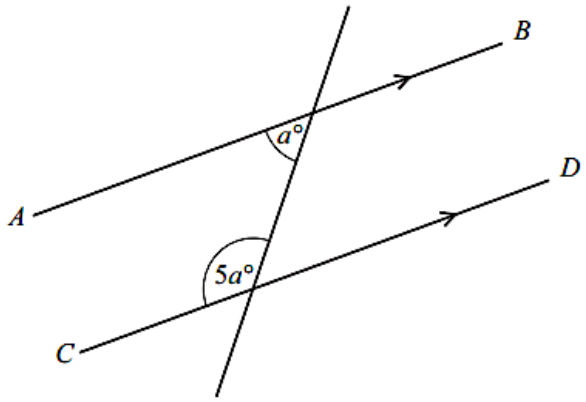
(b) angle EBC

Answer: ..... [1]

(c) angle BAE

Answer: ..... [1]

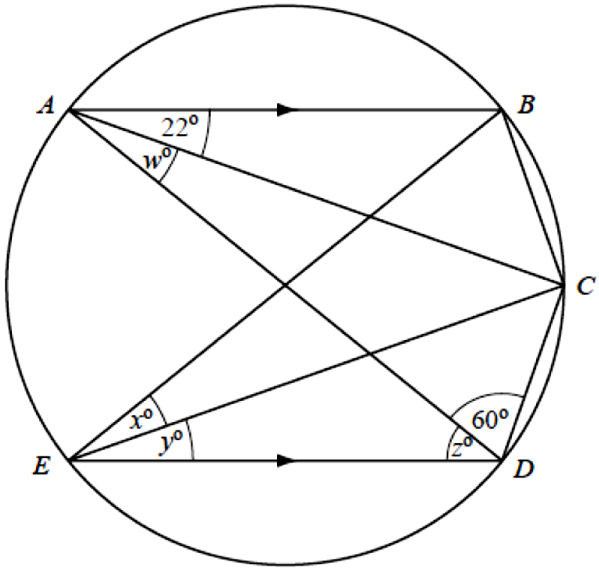
15. In the diagram AB is parallel to CD.
Calculate the value of a.



NOT TO SCALE

Answer: ..... [2]

16.



NOT TO SCALE

AD is a diameter of the circle *ABCDE*.
Angle *BAC* = 22° and angle *ADC* = 60°.
AB and *ED* are parallel lines.
Find the values of *w*, *x*, *y* and *z*.

Answer: *w* = ... [1]

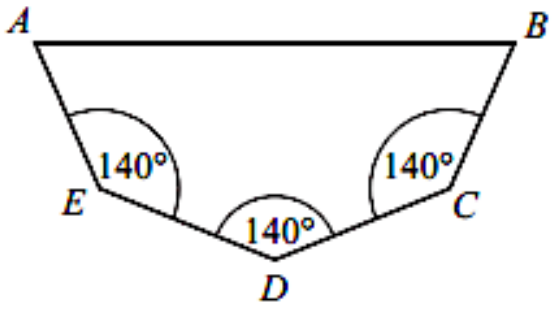
x = ... [1]

y = ... [1]

z = ... [1]

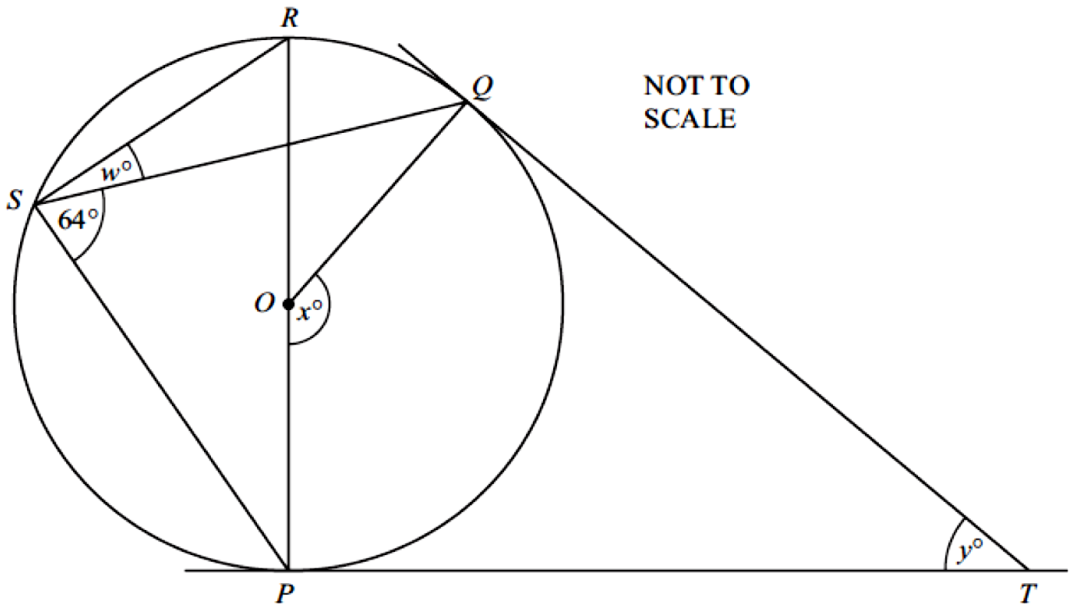
17.

The pentagon has three angles which are each 140°.
The other two interior angles are equal.
Calculate the size of one of these angles.



Answer: ..... [3]

18.



P, *Q*, *R* and *S* lie on a circle, centre *O*.
TP and *TQ* are tangents to the circle.
PR is a diameter and angle *PSQ* = 64°.

(a) Work out the values of *w* and *x*.

Answer: *w* = ... [1]

x = ... [1]

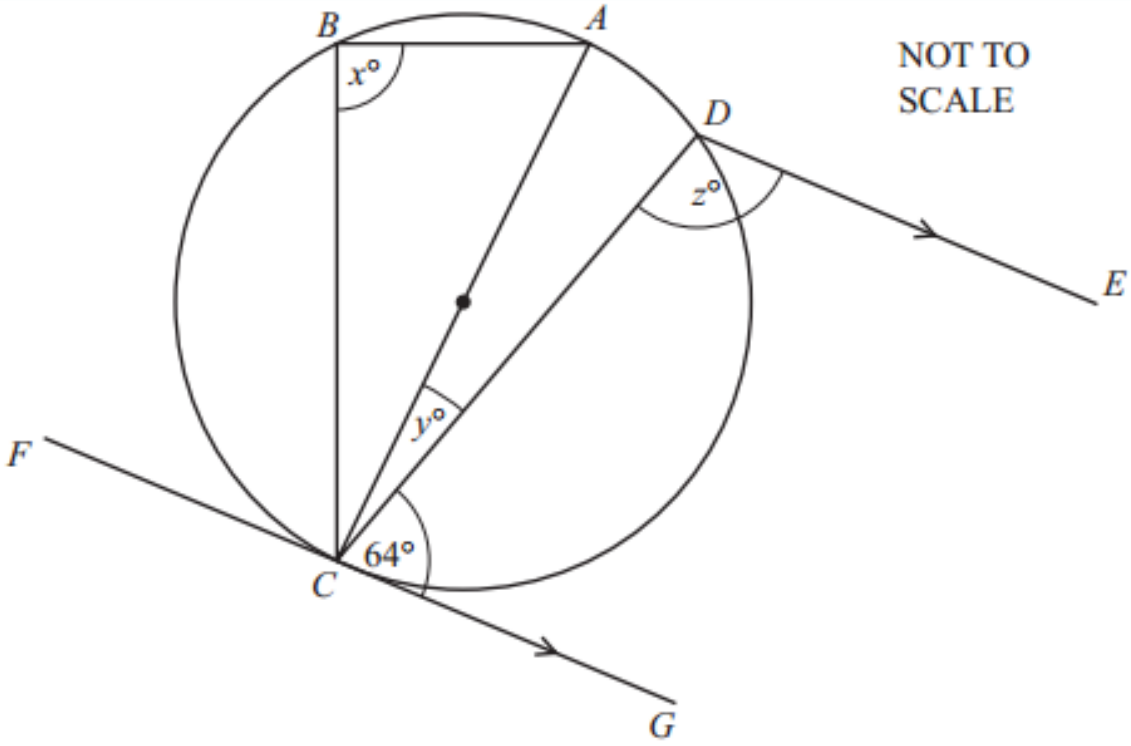
(b) Showing all your working, find the value of *y*.

Answer: *y* = ... [2]

19. The interior angle of a regular polygon is 8 times as large as the exterior angle.
Calculate the number of sides of the polygon.

Answer: ..... [3]

20.



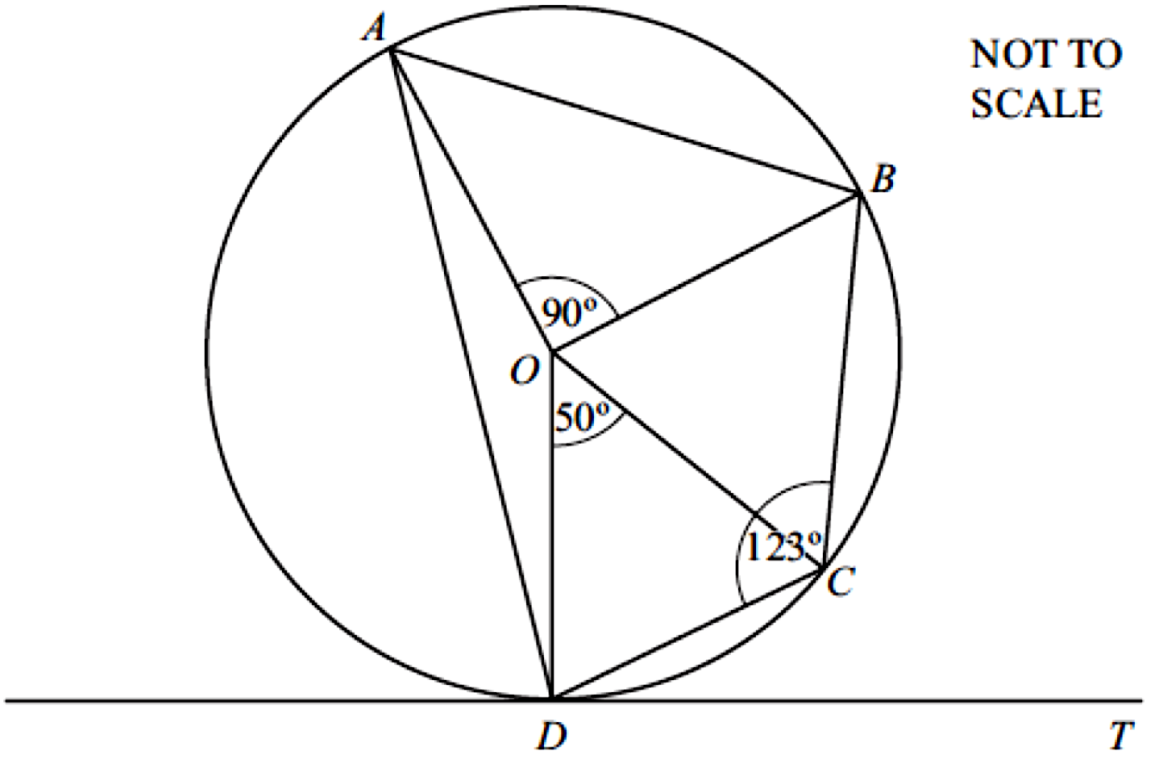
A, *B*, *C* and *D* lie on a circle. *AC* is a diameter.
FCG is a tangent to the circle at *C*. *DE* is parallel to *CG*.
Find the values of *x*, *y* and *z*.

Answer: $x =$ .....

$y =$ .....

$z =$ ..... [5]

21.



The points A, B, C and D line on a circle centre O.
Angle $AOB = 90°$, angle $COD = 50°$ and angle $BCD = 123°$.
The line DT is a tangent to the circle at D.

Find

(a) angle OCD

Answer: ..... [1]

(b) angle TDC

Answer: ..... [1]

(c) angle ABC

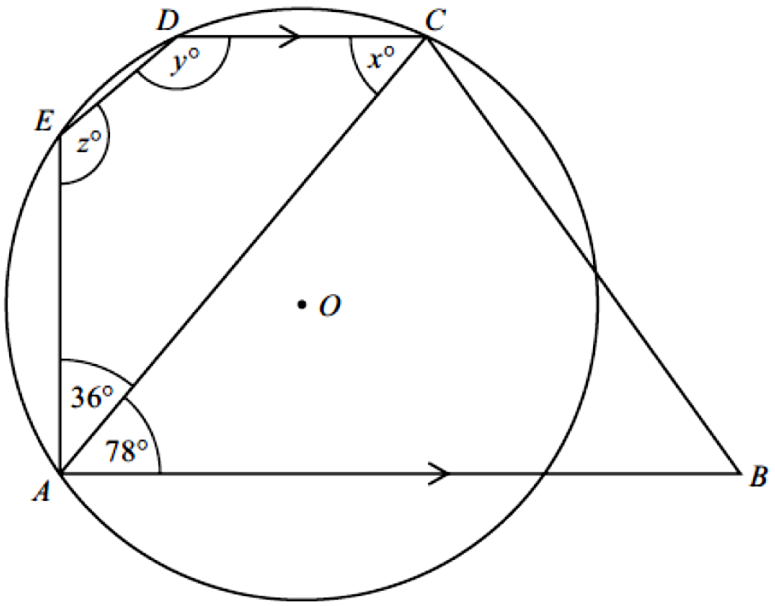
Answer: ..... [1]

(d) angle AOC

Answer: ..... [1]

22.

NOT TO SCALE



ABCDE is a pentagon.
A circle, centre *O*, passes through the points *A*, *C*, *D* and *E*.
Angle *EAC* = 36°, angle *CAB* = 78° and *AB* is parallel to *DC*.

(a) Find the values of *x*, *y* and *z*, giving a reason for each. [6]

(b) Explain why *ED* is **not parallel** to *AC*. [1]

(c) Find the value of angle *EOC*.

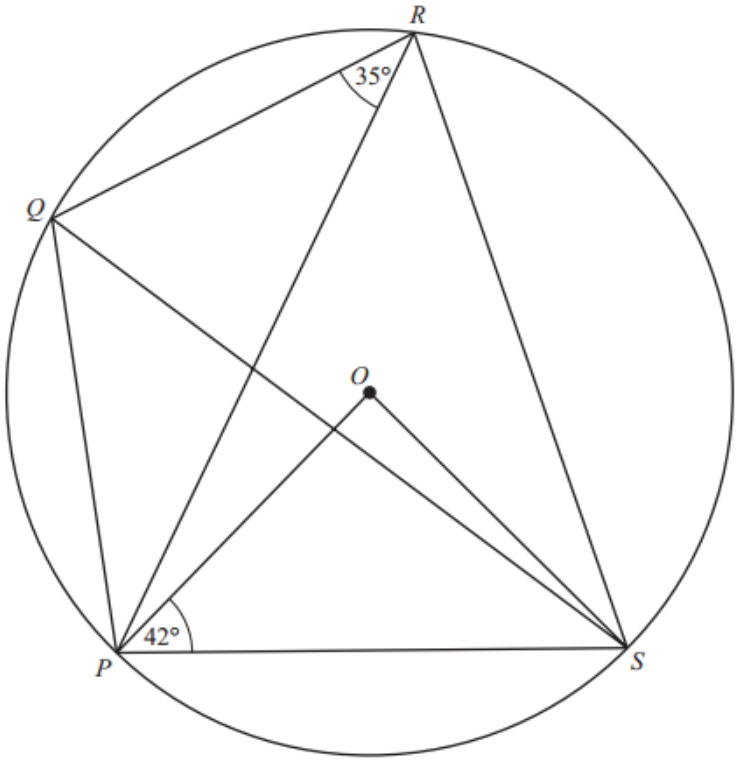
Answer: ..... [1]

(d) *AB* = *AC*.
Find the value of angle *ABC*.

Answer: ..... [1]

23.

(b)



P, Q, R and S lie on a circle, centre O.
Angle $OPS = 42°$ and angle $PRQ = 35°$.

Calculate

(a) angle POS

Answer: ..... [1]

(b) angle PRS

Answer: ..... [1]

(c) angle SPQ

Answer: ..... [1]

(d) angle PSQ

Answer: ..... [1]