

Surname	
Other Names	
Candidate's Signature	

## GCSE 9 - 1 Questions

### Circle Theorems - Proofs and Reasons 3

**Calculator Not Allowed**

#### INSTRUCTIONS TO CANDIDATES

- Write your name in the space provided.
- Write your answers in the spaces provided in this question paper.
- Answer ALL questions.
- Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
- You should have a ruler, compass and protractor where required.

**Total Marks :**

1) E, F, G and H all lie on the circumference of a circle with centre C.

Angle FGE =  $81^\circ$       Angle GPF =  $77^\circ$

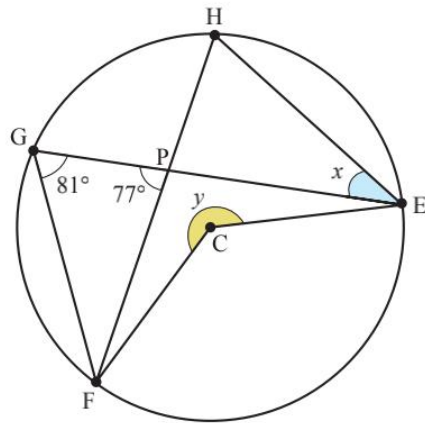


Diagram is  
NOT to scale

(i) Find the size,  $x$ , of angle HEG. *Justify your answer.*

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(ii) Find the size,  $y$ , of reflex angle ECF. *Justify your answer.*

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- 2) Q, V and W all lie on the circumference of a circle with centre C. PQR is a tangent to the circle at point Q.

The lines PVW and QCW are straight.

Angle QPV =  $40^\circ$

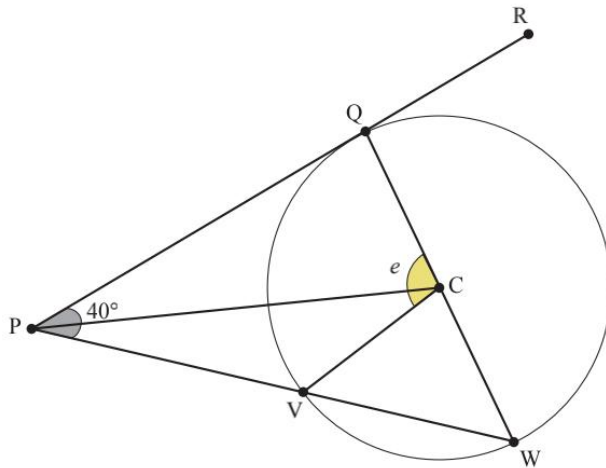


Diagram is  
NOT to scale

Find the size,  $e$ , of angle QCV.

Justify your answer with clear geometric reasoning.

3)(a) ABCD is a cyclic quadrilateral and CE is a straight line.

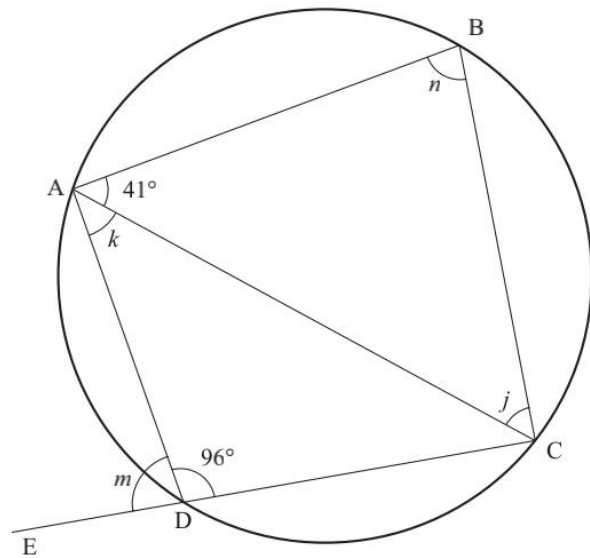


Diagram is  
NOT to scale

- (i) Calculate the size of angle  $m$  in the diagram above.  
*Justify your answer with clear geometric reasoning.*

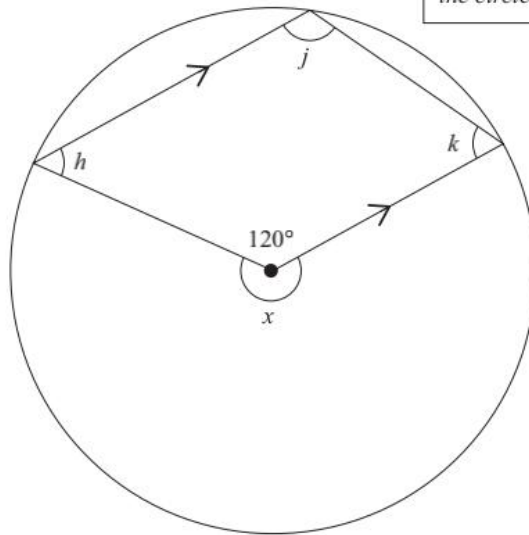
[3]

- (ii) Calculate the size of angle  $j$  in the diagram above.  
*Justify your answer with clear geometric reasoning.*

[3]

(b)

Diagram is NOT to scale.  
The dot is the centre of the circle.



- (i) Show that angle  $j = 120^\circ$ .  
Explain your method clearly, and give geometric reasons for each step.

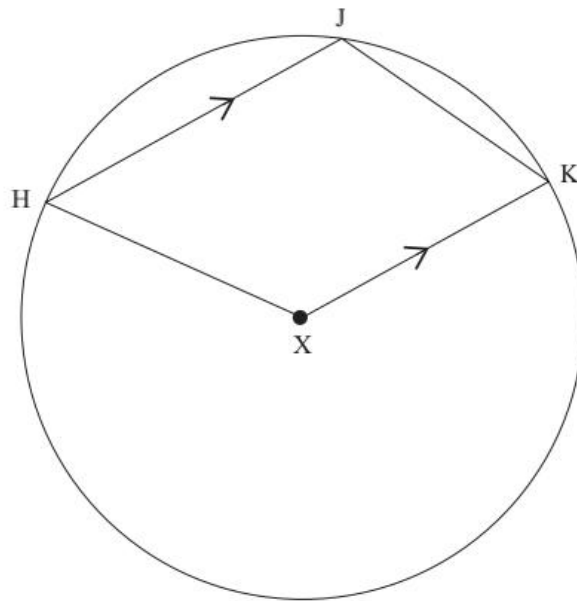
[3]

- (ii) Find the sizes of angle  $h$  and angle  $k$ .

[3]

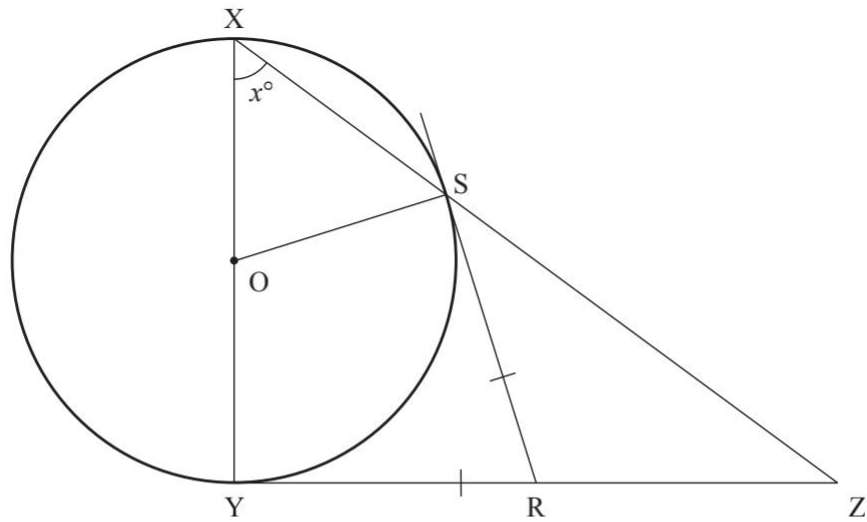
- (iii) Explain how we know from parts (i) and (ii) that the quadrilateral on the previous page must actually be a rhombus.

You may wish to use the diagram below, which has the corners labelled.



[2]

4)



The points S, X, and Y are on the circumference of a circle centre O.

XY is a diameter of the circle.

YZ and SR are tangents to the circle.

$RS = RY$

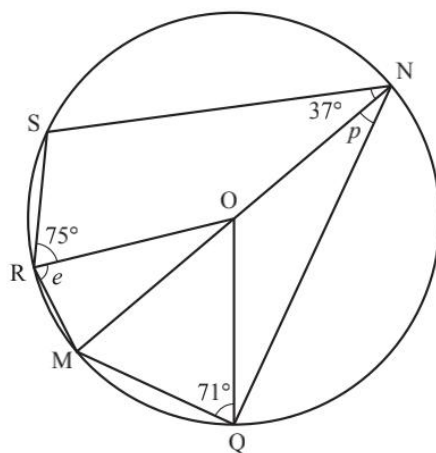
Angle  $YXZ = x^\circ$

Prove that  $YR = RZ$

[4]

- 5) (a) In the diagram below, the line MN passes through the centre of the circle, O.  
 Angle MQO is  $71^\circ$ , angle SNO is  $37^\circ$  and angle SRO is  $75^\circ$ .

Diagram is  
NOT to scale



- (i) Find the size of angle  $p$ .  
 Justify your answer with clear geometric reasoning.

[4]

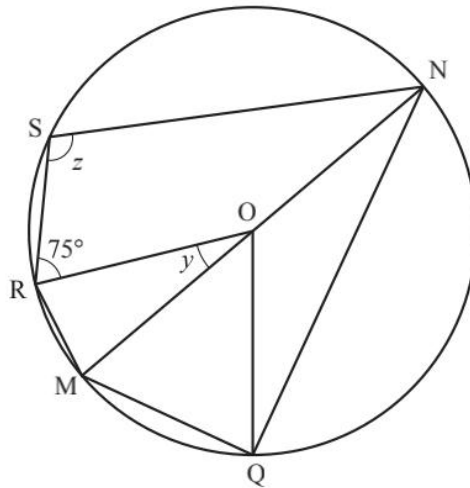
- (ii) Find the size of angle  $e$ .  
 Justify your answer with clear geometric reasoning.

[4]



(iii) In the diagram below, angle SRO is  $75^\circ$ .

Diagram is  
NOT to scale

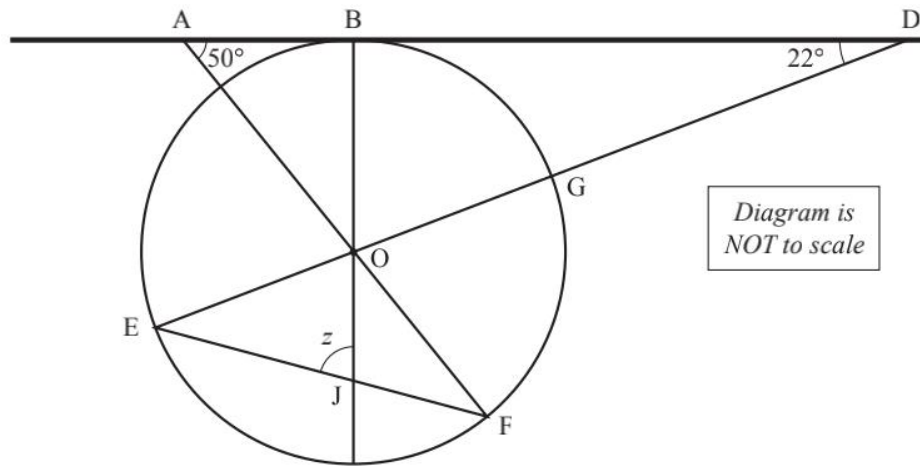


Find an expression for  $z$  in terms of  $y$ .

*Justify your answer with clear geometric reasoning.*

[4]

- (b) A circular hoop is hung with wires running through it.  
 O is the centre of the circular hoop.  
 Angle  $OAB = 50^\circ$   
 Angle  $ODB = 22^\circ$



Calculate the size,  $z$ , of angle  $EJO$ .

*Justify your answer with clear geometric reasoning.*

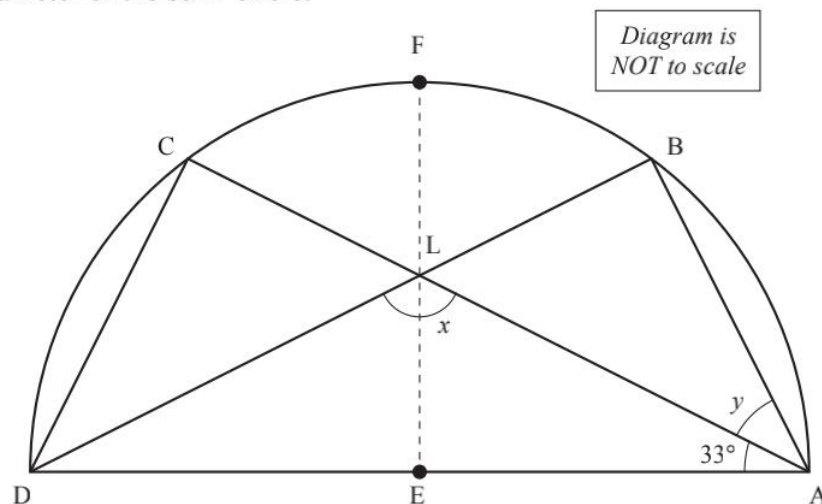
[4]

6) (a) A climbing frame is made from a semi-circle and triangles.

The climbing frame is symmetrical about FE.

Angle CAD =  $33^\circ$

AD is the diameter of the semi-circle.



(i) Calculate the size,  $x$ , of the angle ALD.

*Justify your answer with clear geometric reasoning.*

[3]

(ii) Calculate the size,  $y$ , of angle BAC.

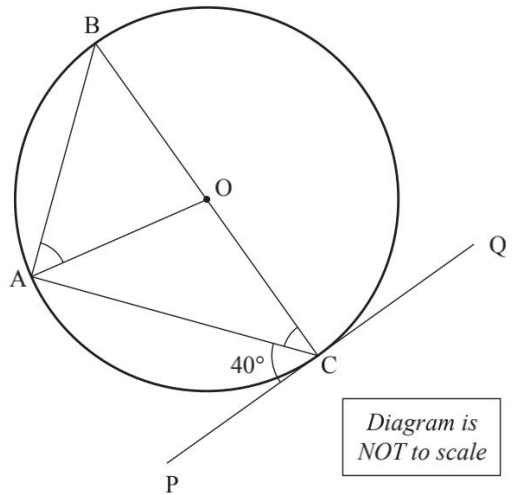
*Justify your answer with clear geometric reasoning.*

[4]

- (b) A, B, and C are on the circumference of a circle with centre O. BOC is a diameter.

QCP is a tangent to the circle.

Angle ACP =  $40^\circ$ .



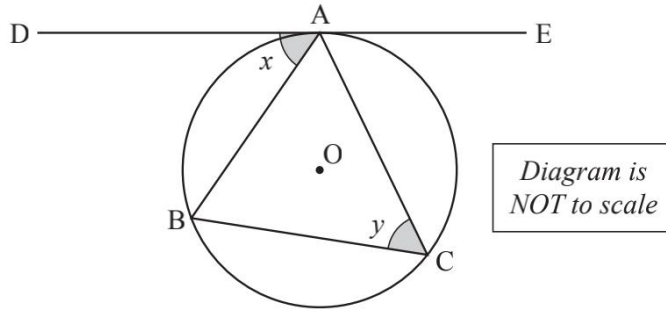
- (i) Find the size of angle ACO.  
Justify your answer with clear geometric reasoning.

[2]

- (ii) Find the size of angle OAB.  
Justify your answer with clear geometric reasoning.

[3]

- (c) A triangle ABC is drawn inside a circle.  
O is the centre of the circle.  
DE is a tangent to the circle. Point A is where DE touches the circle.



Prove that angle  $x$  equals angle  $y$ .

*Justify your answer with clear geometric reasoning.*

[4]

- 7) In the diagram below, straight line SRT is the tangent to the circle at the point R.  
The triangle UVR is isosceles, with  $UV = RV$ .  
Angle  $UVR = 38^\circ$ .

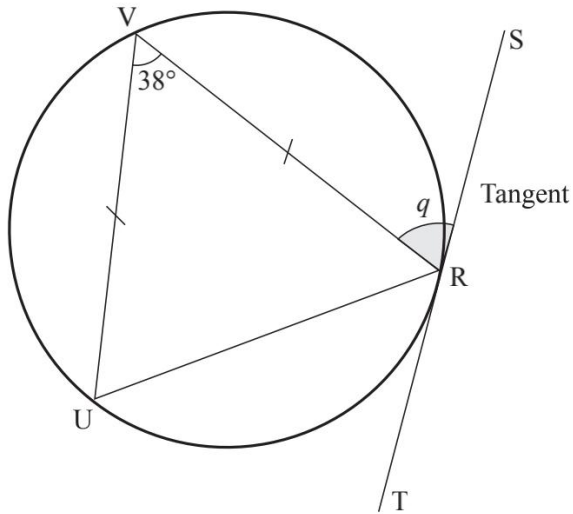


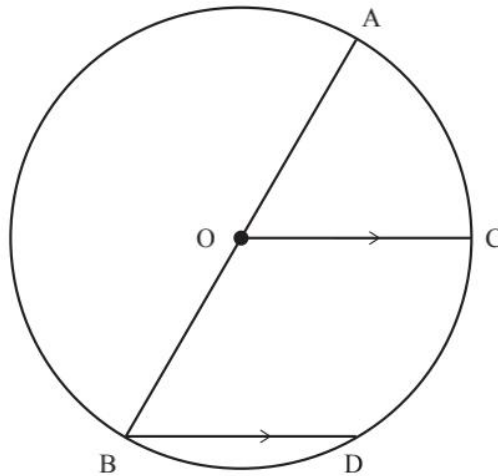
Diagram is  
NOT to scale

Calculate the size,  $q$ , of angle VRS.

Justify your answer with clear geometrical reasoning.

[3]

- 8) (a) Point O is the centre of the circle.  
Lines OC and BD are parallel.  
 $OC = BD$



*Diagram is  
NOT to scale*

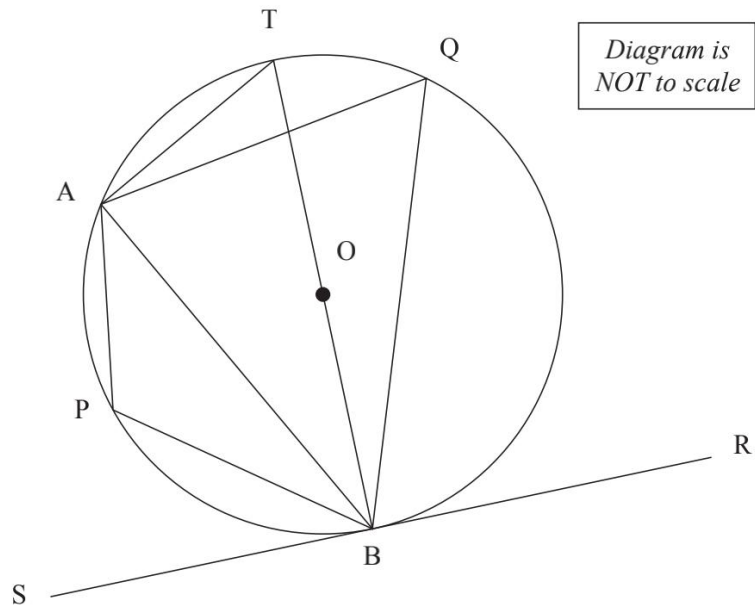
Prove that the length of the straight line AC equals the length of the straight line OD.  
*Justify your answer with clear geometric reasoning.*

[4]

(b)

In the diagram below, the line SR is a tangent to the circle.

The line BT passes through O, the centre of the circle.



Prove that angle ABS equals angle AQB.

*Justify your answer with clear geometric reasoning.*

[4]