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NZQA

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# Level 1 Mathematics and Statistics, 2015

## 91031 Apply geometric reasoning in solving problems

9.30 a.m. Monday 9 November 2015
Credits: Four

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| Apply geometric reasoning in solving problems. | Apply geometric reasoning, using relational thinking, in solving problems. | Apply geometric reasoning, using extended abstract thinking, in solving problems. |

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

**You should attempt ALL the questions in this booklet.**

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–11 in the correct order and that none of these pages is blank.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

**TOTAL**

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## QUESTION ONE

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(a) A clothes drying rack has two horizontal levels on which the clothes can be hung as shown by lines AE and HI on the diagram below.

AE is parallel to HI and parallel to the ground JN.

The rack is symmetrical around the line CL.

BC = CF

Angle KCL = 24°

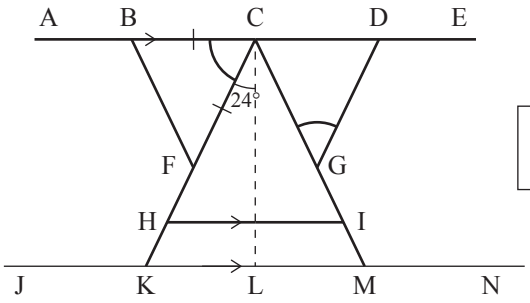


*Diagram is NOT to scale*

(i) Find the size of angle BCF.

Justify your answer with clear geometric reasoning.

(ii) Find the size of angle DGC.

Justify your answer with clear geometric reasoning.

(iii) The height of AE above the ground is 1.2 m.

Pippa says the length KL is 0.53 m.

Show that she is correct.

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(iv) What is the length of CK?

(v) CH is two-thirds of CK.

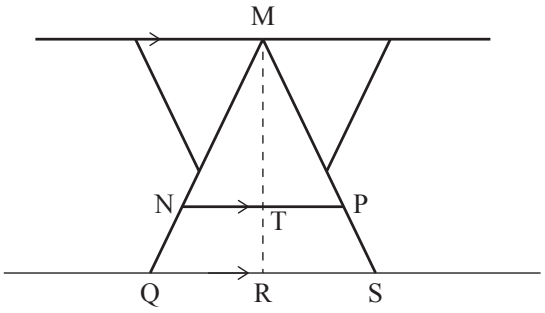
Find the length of HI.

Justify your answer with clear geometric reasoning.

(b) For another clothes drying rack:

MN : NQ = a : b

Compare the area of triangles MNP and MQS.



## QUESTION TWO

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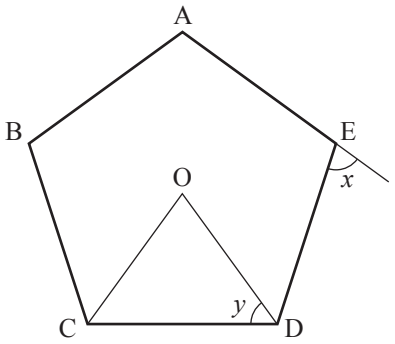
(a) ABCDE is a regular pentagon with centre O.




(i) Find the value of $x$ and explain your answer.

(ii) Find the value of $y$.

Justify your answer with clear geometric reasoning.

(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°.

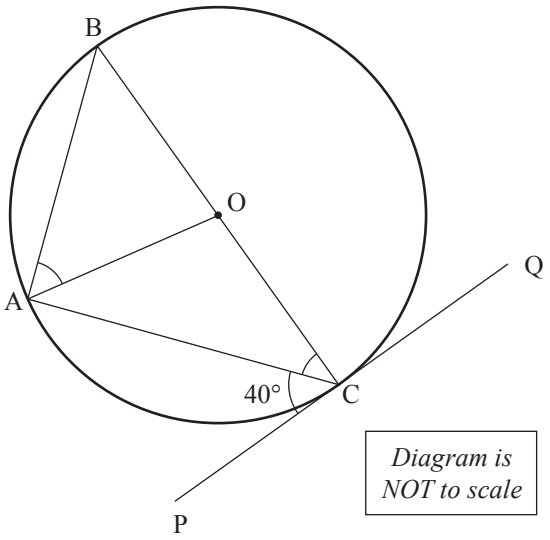



*Diagram is NOT to scale*

(i) Find the size of angle ACO.

Justify your answer with clear geometric reasoning.

(ii) Find the size of angle OAB.

Justify your answer with clear geometric reasoning.

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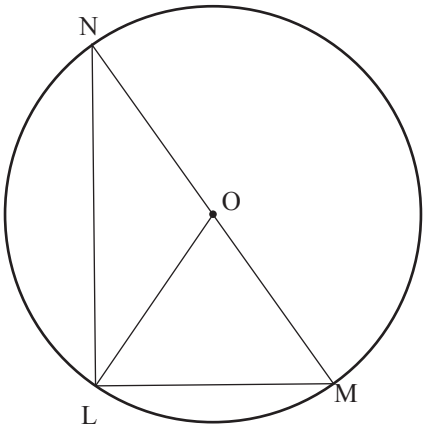
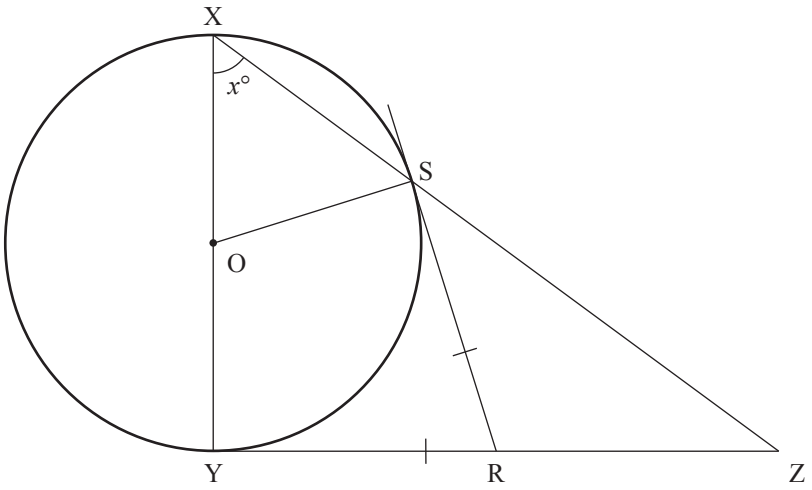
(iii) The points L, M, and N lie on the circumference of a circle centre O. NOM is a diameter.




If OL = $x$ cm and LOM = $a°$, calculate the length of NL in terms of $x$ and $a$.

Justify your answer with clear geometric reasoning.

(c)




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 = $x°$

Prove that YR = RZ

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## QUESTION THREE

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(a) (i) A farmer wants to climb a ladder to check the water in a tank.

He uses a 3 metre ladder and places it so that the top of the ladder just reaches the top of the tank.

The top of the tank is 2.9 metres from the ground.

He wants the angle of the ladder to the ground to be less than 80°.

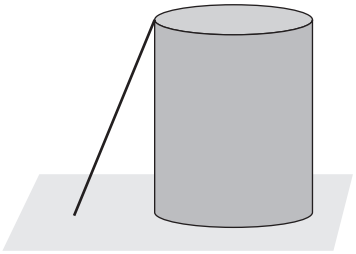

*Diagram is NOT to scale*

Is the ladder long enough to meet this requirement?

(ii) How far is the foot of this ladder from the base of the tank?

Assume that the tank is sitting on level ground.

(iii) If the farmer places the ladder at 80° to the ground, how much of the ladder is above the top of the tank?

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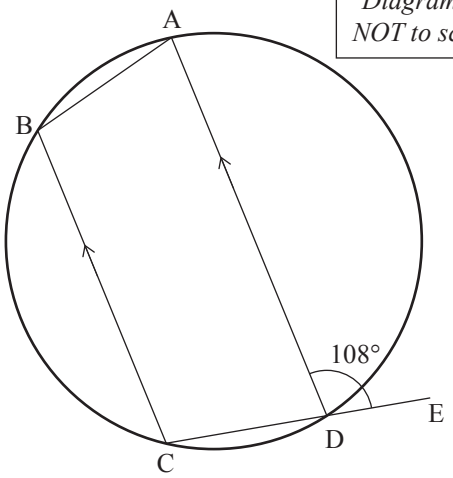
(b) (i) A trapezium has two sides that are parallel.

ABCD is an isosceles trapezium with its vertices on the circumference of a circle.

Angle EDA = 108°.

*Diagram is NOT to scale*



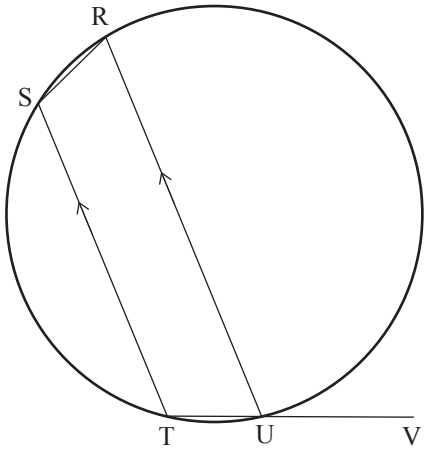

Find the size of angle ECB.

Justify your answer with clear geometric reasoning.

(ii) RSTU is any trapezium with its vertices on the circumference of a circle.

Determine any geometrical facts about RSTU and prove that these are true for all such trapeziums.

Justify your answers with clear geometric reasoning.



(c) An aeroplane is flown 40 km on a bearing of 310° from airstrip A to airstrip B.

It then turns and flies 45 km due north to airstrip C.

The plane then heads directly to airstrip D, which is 135 km due north of its starting point at airstrip A.

For the final leg of the flight path of the plane, how far does it need to fly, and what is the bearing of the final leg of the flight path?

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**Extra paper if required.**
**Write the question number(s) if applicable.**

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