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Level 1 Mathematics and Statistics 2022

91031 Apply geometric reasoning in solving problems

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 room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2 – 16 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

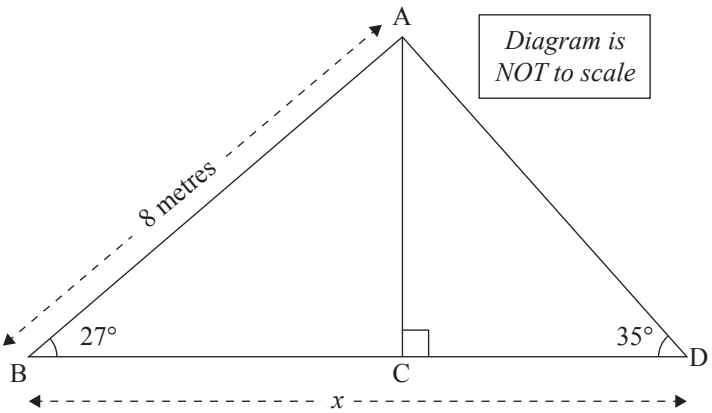
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

QUESTION ONE

(a) The diagram below represents the upper section of a crane.

Angle ABC = 27°. Angle ADC = 35°. AB = 8 metres.

Angle ACB = 90°.

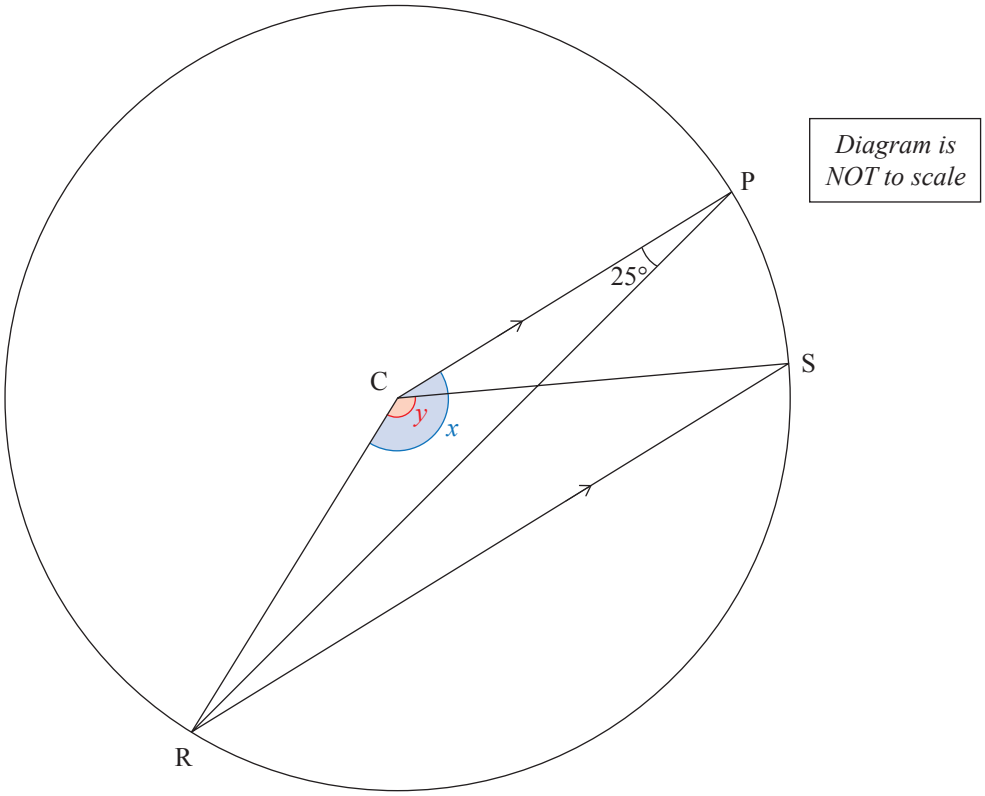


www.worldcargonews.com/

Calculate the length, x, from B to D.

Show your working clearly.

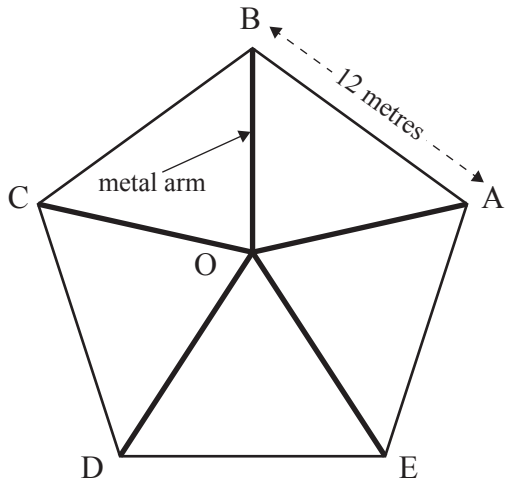
(b) The points P, R, and S all lie on the circumference of a circle, with centre C.
The line CP is parallel to the line RS. Angle CPR = 25°.



(i) Find the size, x, of angle RCP.
Justify your answer.

(ii) Find the size, y, of angle RCS.
Justify your answer.

(c) (i) Part of the winding mechanism of a crane is shown below.



The shape of the winding mechanism is a regular pentagon, with each outside length measuring 12 metres from corner to corner, as shown above.

The winding mechanism has 5 metal arms. Each arm is attached to the centre of the mechanism and to the corner of the pentagon.

What is the total length of all five metal arms?

Show your working clearly.

(ii) When the winding mechanism is in the shape of a regular n-sided polygon, each outside length measures $2z$ metres from corner to corner.

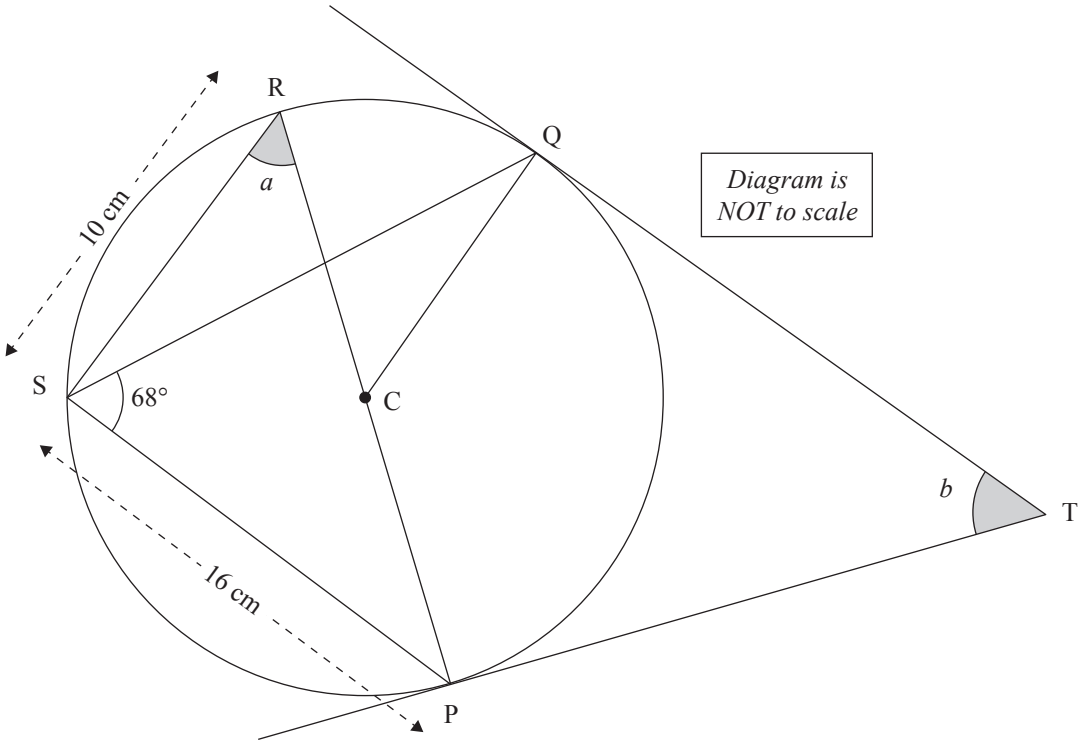
Calculate the total length of all the metal arms.

Give your answer in terms of n and z.

Show your working clearly.

QUESTION TWO

(a) The points P, Q, R, and S all lie on the circumference of circle, with centre C.
TP and TQ are tangents to the circle. PCR is a diameter of the circle.
Angle PSQ is 68°. RS = 10 cm. PS = 16 cm.



(i) Find the size, *a*, of the angle PRS.
Show your working clearly.

(ii) Find the size, b, of the angle PTQ.

Justify your answer with clear geometric reasoning.

(b) The points P, Q, R, and S all lie on the circumference of a circle, with centre C.
Angle PQR = 72°. Angle PRS = 28°.

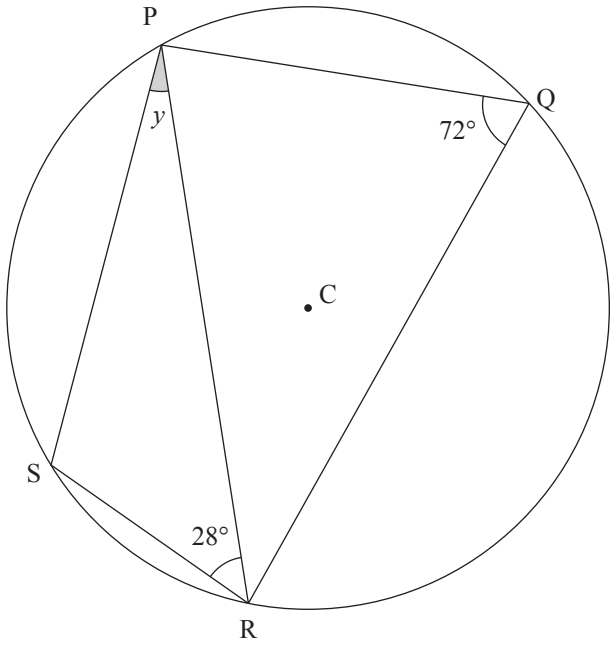


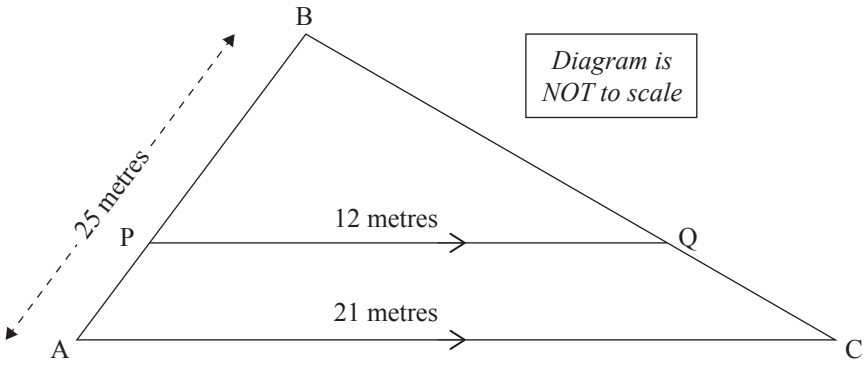
Diagram is NOT to scale

Find the size, y, of angle SPR.

Justify your answer.

(c) Lines PQ and AC are parallel to each other.

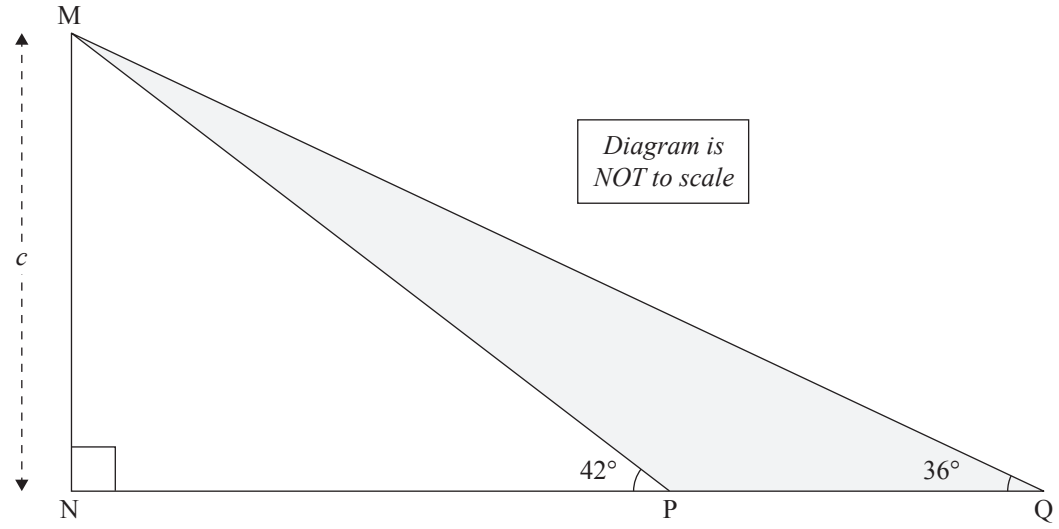
PQ = 12 metres. AC = 21 metres. AB = 25 metres.



Find the length of BP.

Show your working clearly.

(d) Angle NPM = 42°. Angle NQM = 36°. Angle MNP = 90°. MN = c metres



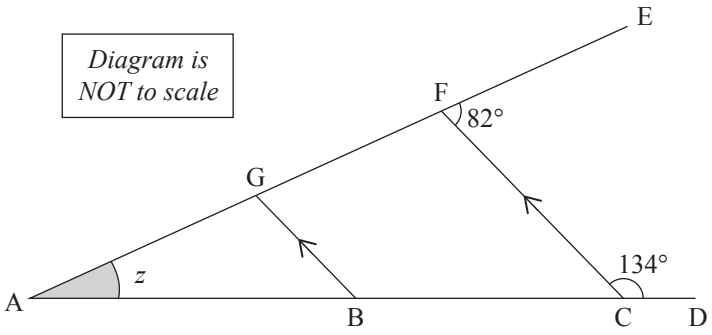
Find the perimeter of the shaded region MPQ, giving your answer in terms of c.

Show your working clearly.

Show all working to 4 decimal places.

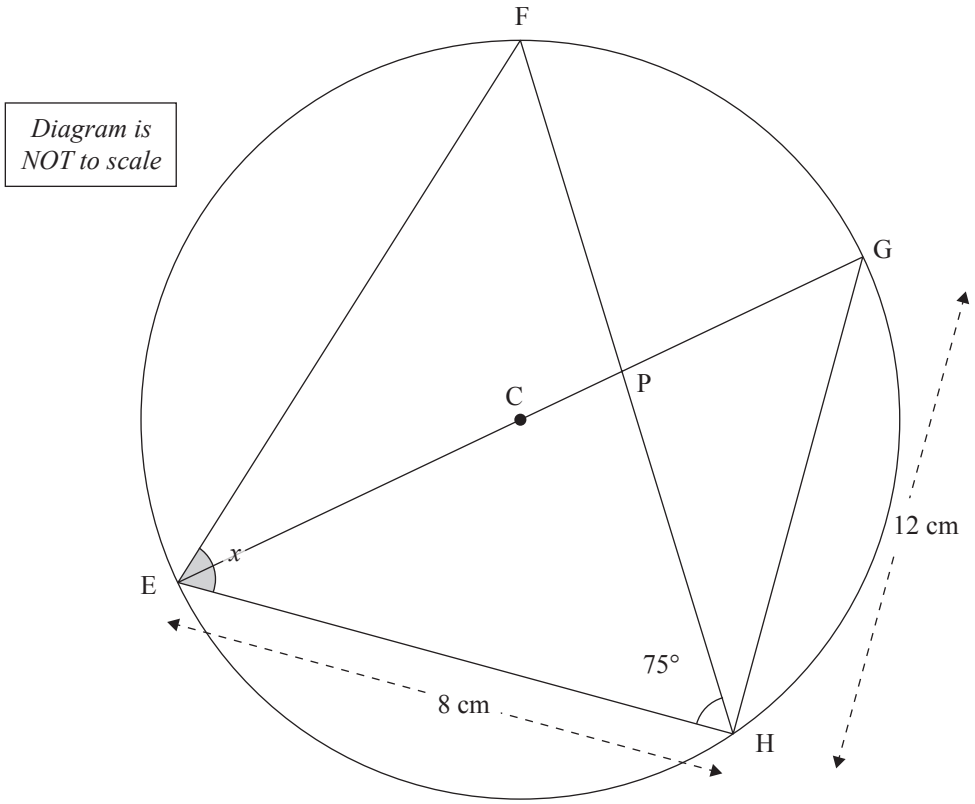
QUESTION THREE

(a) Angle EFC = 82°. Angle FCD = 134°. Lines BG and CF are parallel.
Lines AGFE and ABCD are both straight.



Find the size, z, of angle GAB.
Justify your answer.

(b) The points E, F, G, and H all lie on the circumference of a circle, with centre C.
EH = 8 cm. GH = 12 cm. Angle EHF = 75°.

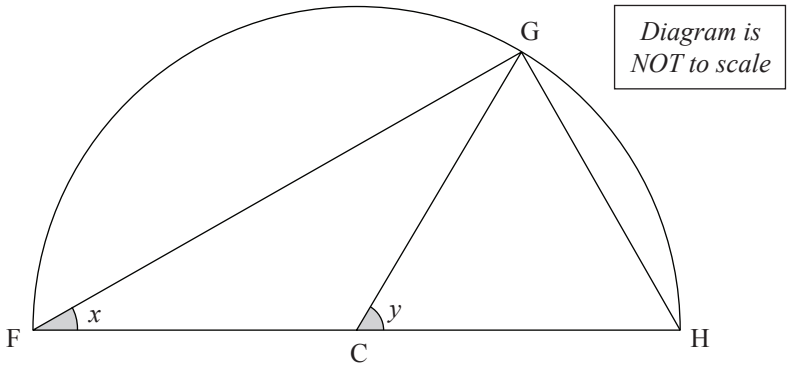


(i) Calculate the length, EG, of the diameter of the circle.
Show your working clearly.

(ii) Find the size, *x,* of angle FEH.

Justify your answer with clear geometric reasoning.

(c) The points F, G, H all lie on the circumference of a semi-circle, with centre C.
Angle GFH = x. Angle GCH = y. Line FCH is straight.



Find the size, y, of angle GCH, giving your answer in terms of x.
Justify your answer with clear geometric reasoning.

(d) Three ships, K, L, and M, are floating on the surface of the sea, as shown in the diagram below.
The bearing of L from K is 126°. The angle LKM = 111°.
KM = 4.4 km. KL = 9.8 km.

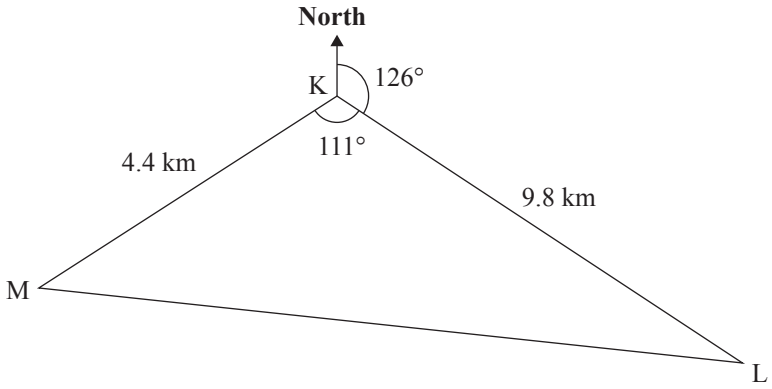


Diagram is NOT to scale

Find the distance AND bearing of M from L.
Show your working clearly.

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

QUESTION NUMBER