

See back cover for an English translation of this cover

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91031M



910315



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

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KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

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Tohua tēnei pouaka  
mēnā KĀORE koe i  
tuhi kōrero ki tēnei  
pukapuka

## Te Pāngarau me te Tauanga, Kaupae 1, 2022

### 91031M Te whakahāngai whakaaro āhuahanga i te wā e whakaoti rapanga ana

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakahāngai whakaaro āhuahanga i te wā e whakaoti rapanga ana.	Te whakahāngai whakaaro āhuahanga, mā roto i te whakaaro pānga, i te wā e whakaoti rapanga ana.	Te whakahāngai whakaaro āhuahanga, mā roto i te whakaaro waitara e whānui ana, i te wā e whakaoti rapanga ana.

Tirohia kia kitea ai e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau o runga ake i tēnei whārangi.

**Me whakamātau koe i ngā tūmahi KATO A kei roto i tēnei pukapuka.**

Whakaaturia ngā whiriwhiringa KATO A.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–31, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (X/X). Ka poroa pea taua wāhanga ka mākahia ana te pukapuka.

**HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.**

(a) Kei te whakaata te hoahoa kei raro nei i te wāhanga o runga o tētahi wakahiki.  
Koki  $ABC = 27^\circ$ . Koki  $ADC = 35^\circ$ .  $AB = 8$  mita.  
Koki  $ACB = 90^\circ$ .

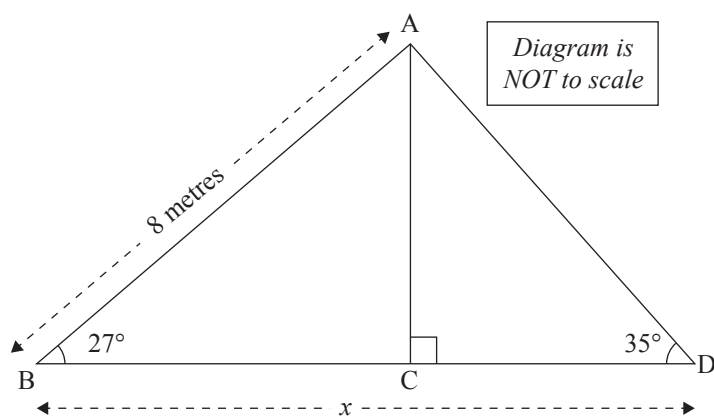


## QUESTION ONE

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

Angle ABC =  $27^\circ$ . Angle ADC =  $35^\circ$ . AB = 8 metres.

Angle ACB =  $90^\circ$ .

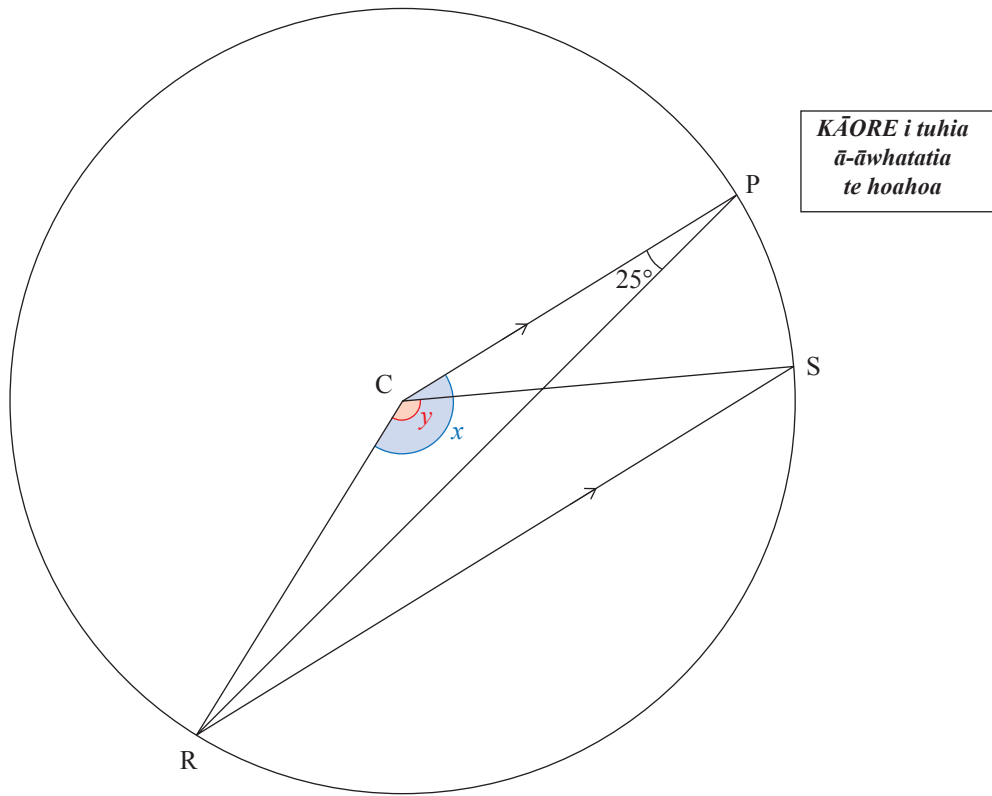


[www.worldcargonews.com/](http://www.worldcargonews.com/)

Calculate the length,  $x$ , from B to D.

*Show your working clearly.*

- (b) Kei te paenga o tētahi porowhita ngā pūwāhi P, R, me S e tau ana, ā, ko C te pokapū. E whakarara ana te rārangi CP ki te rārangi RS. Koki  $CPR = 25^\circ$ .



- (i) Whiriwhiria te rahi,  $x$ , o te koki RCP.  
Parahautia tō whakautu.

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- (ii) Whiriwhiria te rahi,  $y$ , o te koki RCS.  
Parahautia tō whakautu.

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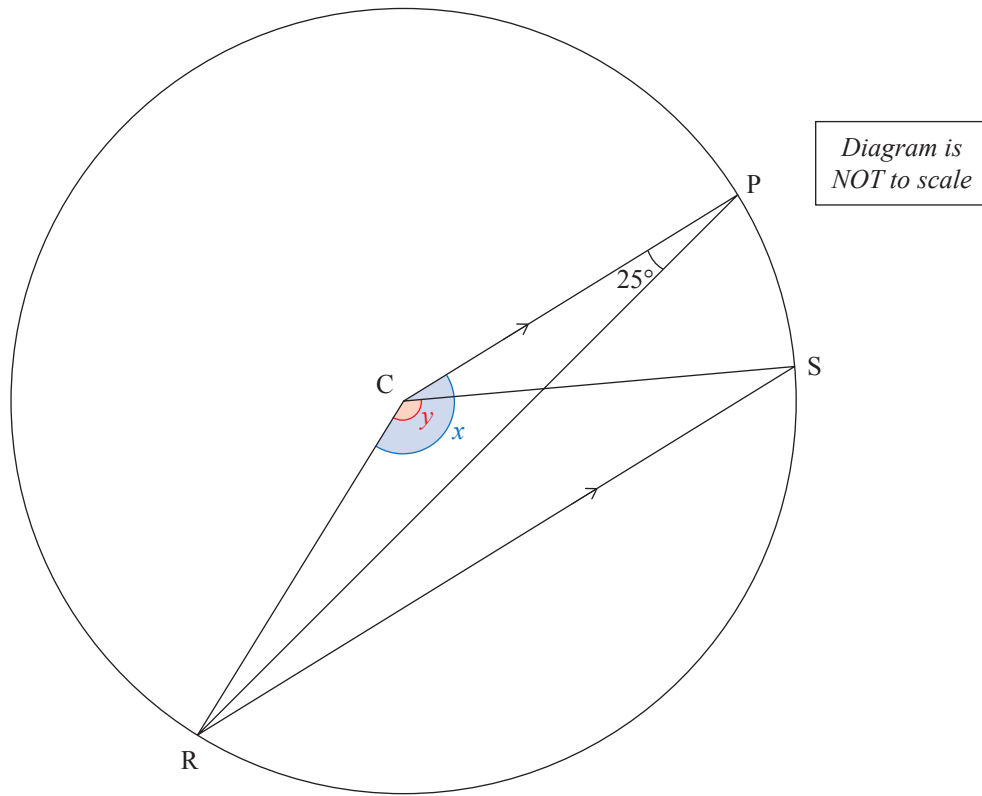
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- (b) The points P, R, and S all lie on the circumference of a circle, with centre C.  
The line CP is parallel to the line RS. Angle CPR =  $25^\circ$ .



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

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

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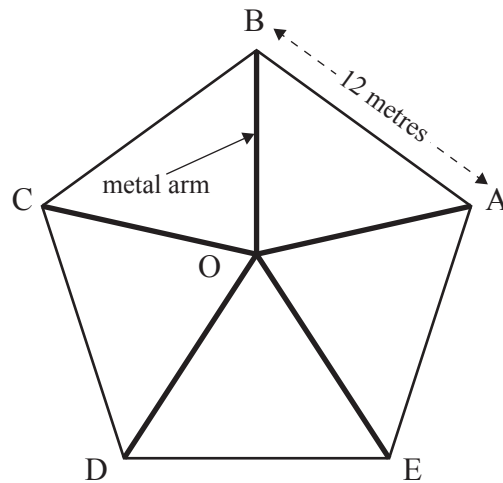
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- (c) (i) Part of the winding mechanism of a crane is shown below.



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.*

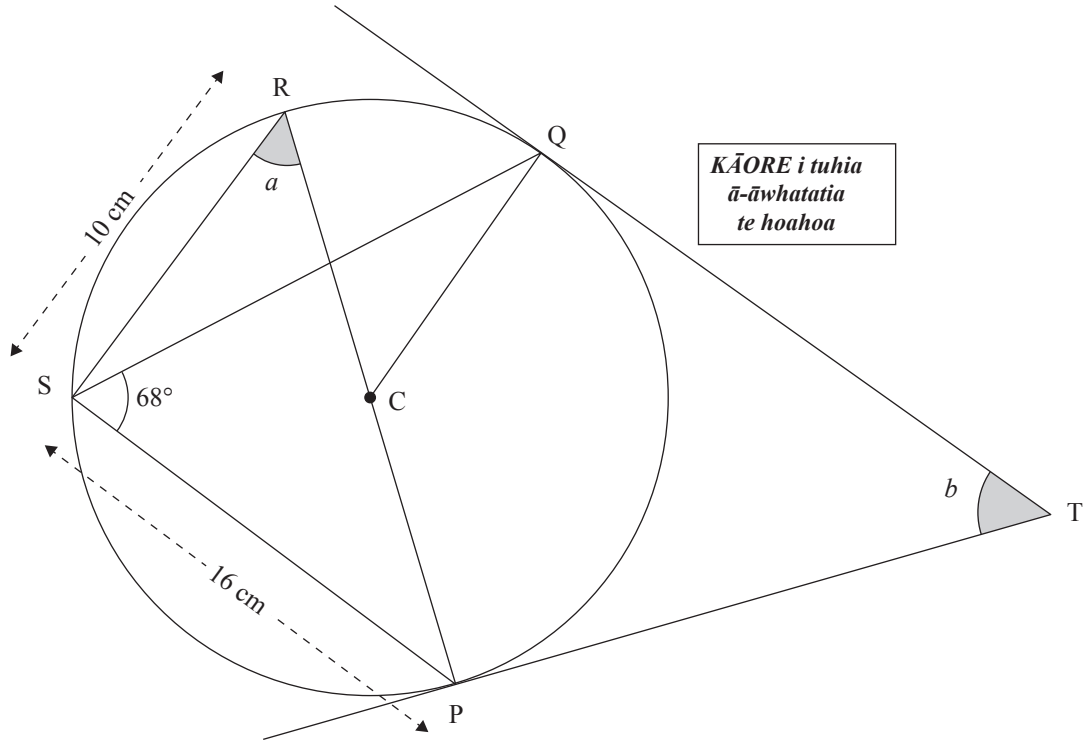




- Show your working clearly.*

## TE TŪMAHI TUARUA

- (a) Kei te paenga o tētahi porowhita ngā pūwāhi P, Q, R me S e tau ana, ā, ko C te pokapū. He pātapa te TP me te TQ ki te porowhita. Ko PCR te whitianga o te porowhita. Koki  $\text{PSQ} = 68^\circ$ .  $\text{RS} = 10 \text{ cm}$ .  $\text{PS} = 16 \text{ cm}$ .



- (i) Whiriwhiria te rahi,  $a$ , o te koki PRS.  
Āta whakaaturia ō whiriwhiringa.

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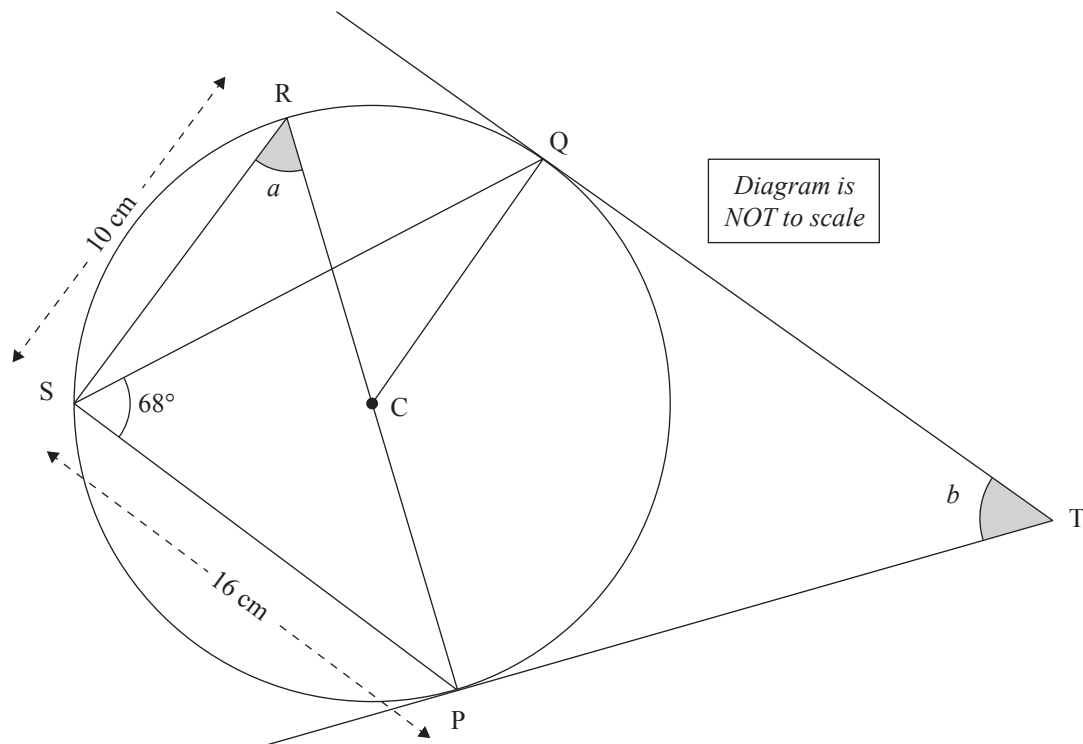
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(ii) Whiriwhiria te rahi,  $b$ , o te koki PTQ.

Parahautia tō whakautu ki te whakaaro āhuahanga e mārama ana.

## QUESTION TWO

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



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

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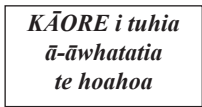
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- (ii) Find the size,  $b$ , of the angle PTQ.

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 =  $72^\circ$ . Angle PRS =  $28^\circ$ .

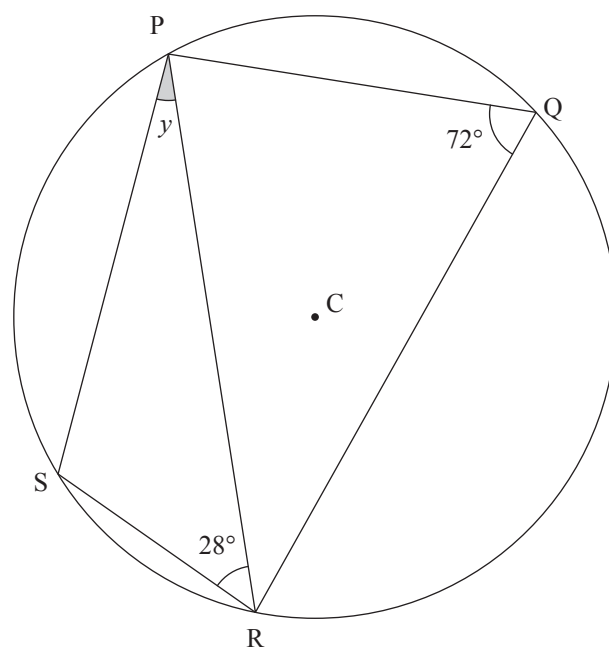


Diagram is  
NOT to scale

Find the size,  $y$ , of angle SPR.

Justify your answer.

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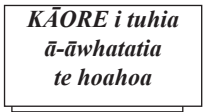
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- PQ = 12 mita. AC = 21 mita. AB = 25 mita.

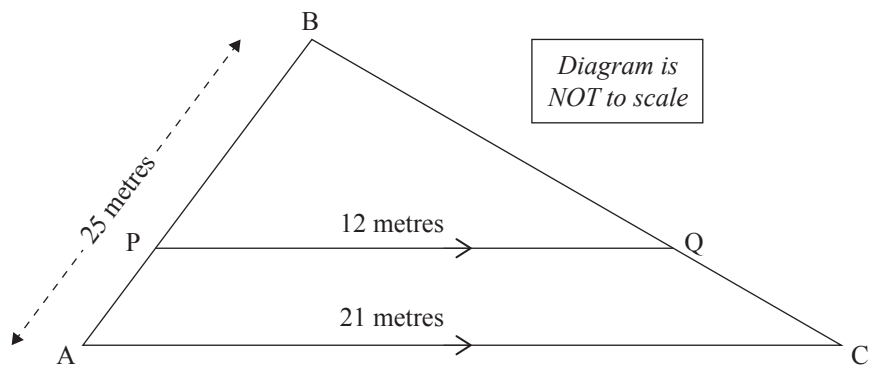


*Āta whakaaturia ō whiriwhiringa.*



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

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



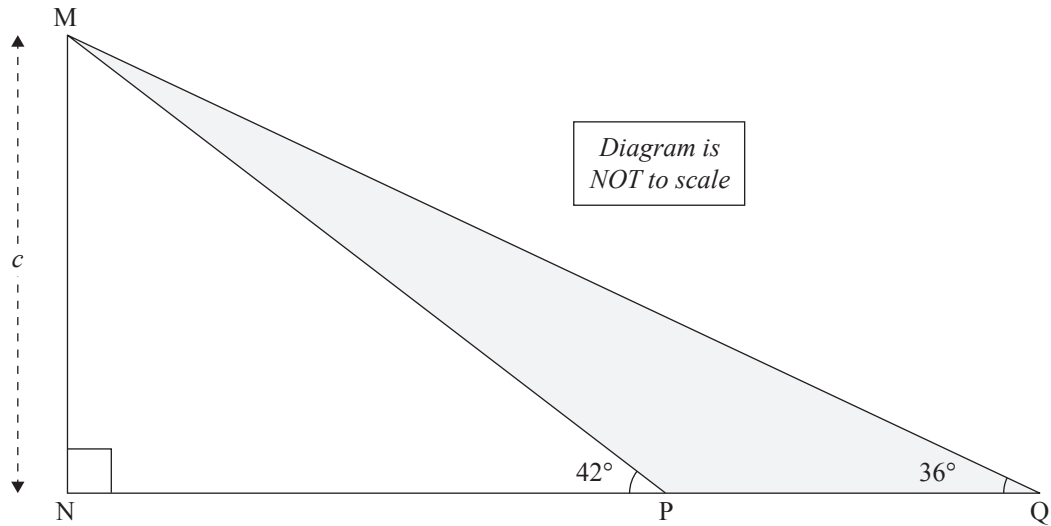
Find the length of BP.

*Show your working clearly.*

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- KĀORE i tuhia  
ā-āwhatatia  
te hoahoa*

*Āta whakaaturia ō whiriwhiringa.*

- (d) Angle NPM =  $42^\circ$ . Angle NQM =  $36^\circ$ . Angle MNP =  $90^\circ$ . MN =  $c$  metres



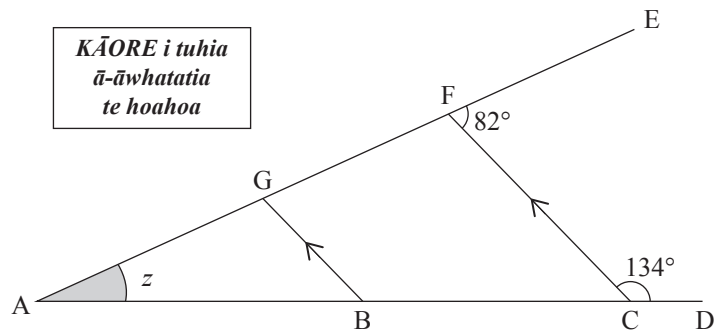
Find the perimeter of the shaded region MPQ, giving your answer in terms of  $c$ .

*Show your working clearly.*

Show all working to 4 decimal places.

## TE TŪMAHI TUATORU

- (a) Koki  $\text{EFC} = 82^\circ$ . Koki  $\text{FCD} = 134^\circ$ . E whakarara ana ngā rārangi BG me CF. E torotika ana ngā rārangi AGFE me ABCD.



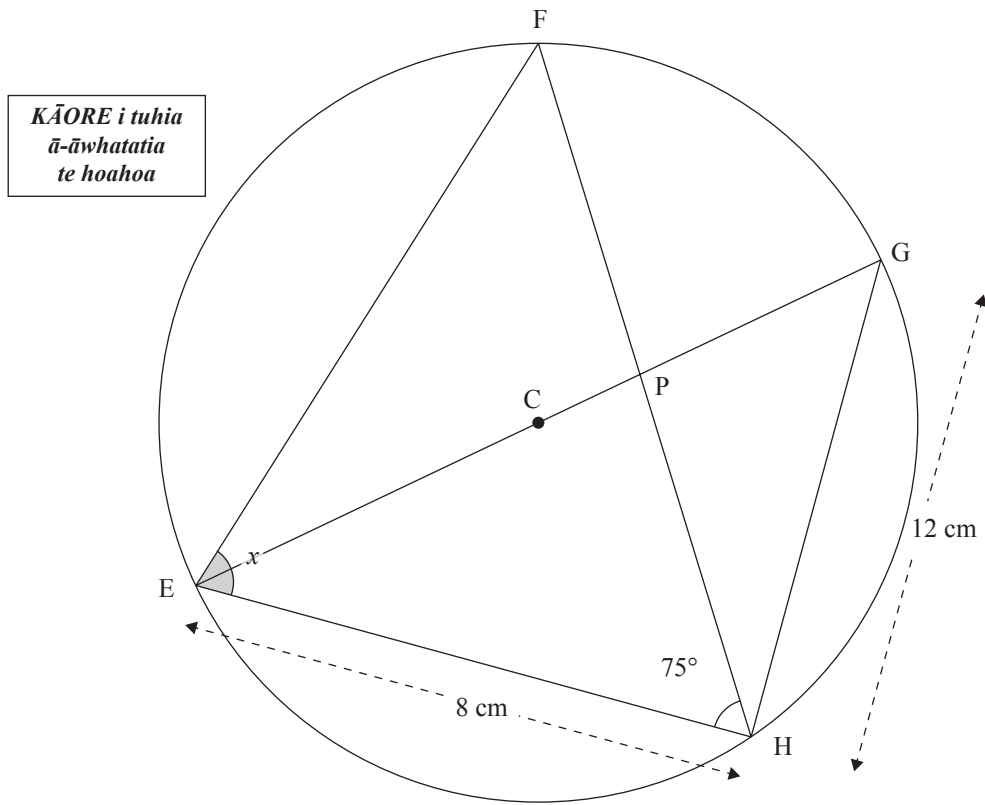
Whiriwhiria te rahi,  $z$ , o te koki GAB.

Parahautia tō whakautu.

- [illegible]

Justify your answer.

- (b) Kei te paenga o tētahi porowhita ngā pūwāhi E, F, G me H e tau ana, ā, ko C te pokapū.  
 $EH = 8 \text{ cm}$ .  $GH = 12 \text{ cm}$ . Koki  $\angle EHF = 75^\circ$ .



- (i) Tātāia te roa, EG, o te whitianga o te porowhita.  
 Āta whakaaturia ō whiriwhiringa.

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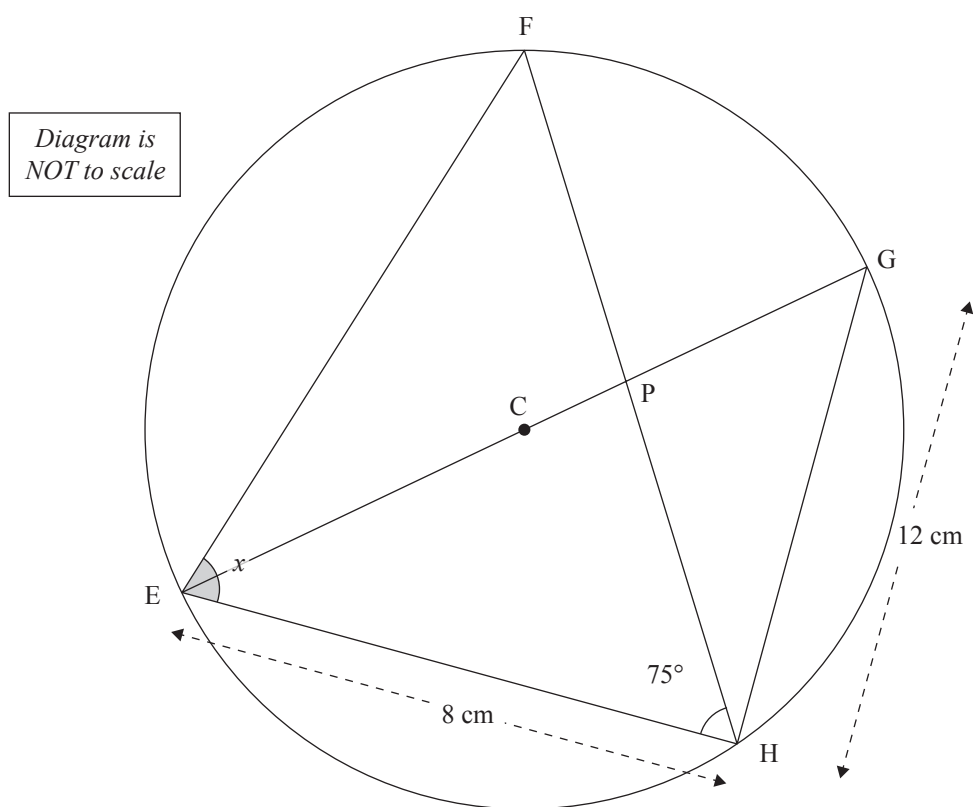
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- (b) The points E, F, G, and H all lie on the circumference of a circle, with centre C.  
 $EH = 8$  cm.  $GH = 12$  cm. Angle  $EHF = 75^\circ$ .



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

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(ii)

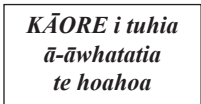
Parahautia tō whakautu ki te whakaaro āhuahanga e mārama ana.



- (ii)

Justify your answer with clear geometric reasoning.

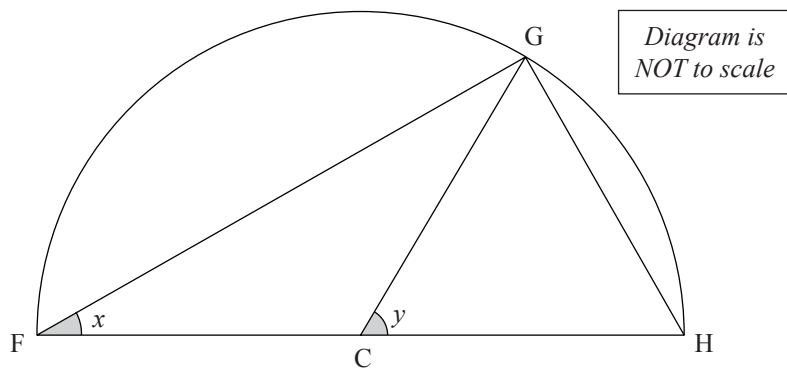
- Koki GFH =  $x$ . Koki GCH =  $y$ . E torotika ana te rārangi FCH.



Whiriwhiria te rahi,  $y$ , o te koki GCH, tuhia hoki tō whakautu e ai ki a  $x$ .

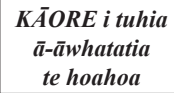
Parahautia tō whakautu ki te whakaaro āhuahanga e mārama ana.

- (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.



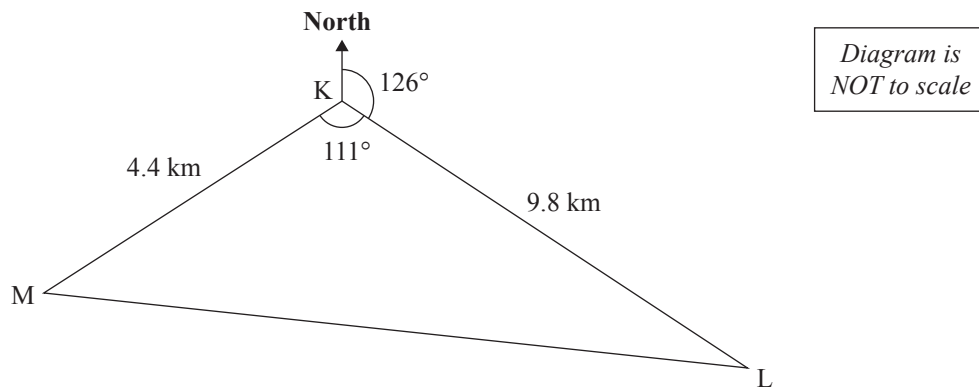
Find the size,  $y$ , of angle GCH, giving your answer in terms of  $x$ .  
Justify your answer with clear geometric reasoning.

- $$KM = 4.4 \text{ km. } KL = 9.8 \text{ km.}$$



*Āta whakaaturia ō whiriwhiringa.*

- (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  $126^\circ$ . The angle  $LKM = 111^\circ$ .  $KM = 4.4$  km.  $KL = 9.8$  km.



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

**He whārangi anō ki te hiahiatia.  
Tuhia te tau tūmahi mēnā e hāngai ana.**

TE TAU  
TŪMAHI

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

QUESTION  
NUMBER

*English translation of the wording on the front cover*

## Level 1 Mathematics and Statistics 2022

### 91031 Apply geometric reasoning in solving problems

Credits: Four

91031M

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 2–31 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.**