See back cover for an English translation of this cover

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91031M

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SUPERVISOR'S USE ONLY

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 1, 2013

91031M Te whakahāngai whakaaro āhuahanga whaitake hei whakaoti rapanga

9.30 i te ata Rāapa 13 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakahāngai whakaaro āhuahanga whaitake hei whakaoti rapanga.	Te whakahāngai whakaaro āhuahanga whaitake mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai whakaaro āhuahanga whaitake mā te whakaaro waitara hōhonu hei whakaoti rapanga.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

Whakaaturia ngā mahinga KATOA.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–23 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

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

TAPEKE

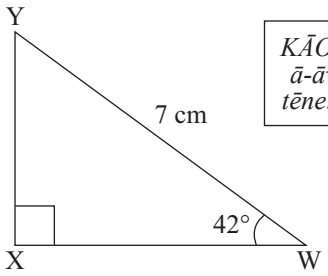
MĀ TE KAIMĀKA ANAKE

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

(a) (i)

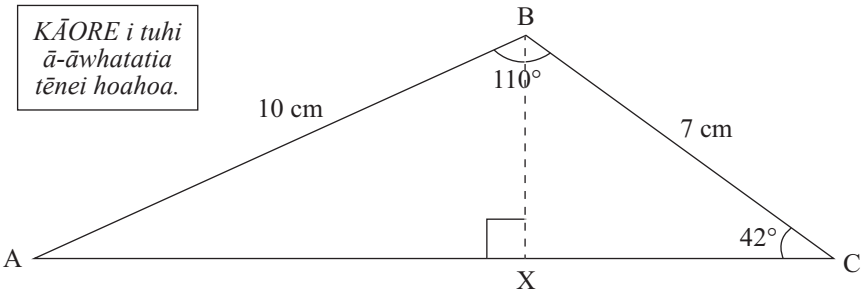


KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

Tātaihia te roa o te taha XW i roto i te tapatoru XYW.

(ii) Kei te hiahia a Frank ki te kimi i te roa o te taha AC i roto i tētahi tapatoru ehara i te tapatoru hāngai. Ka tutuki i a ia tēnei mā te whakawehe i te tapatoru ki ētahi tapatoru hāngai iti ake e 2.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.



Tātaihia te roa o te taha AC, mā te whakamahi i tō whakautu mō te roa o te XW mai i te wāhanga (i).

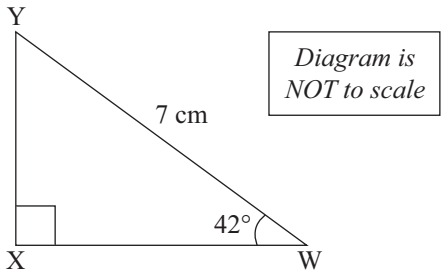
Āta whakaaturia ō mahinga.

You are advised to spend 60 minutes answering the questions in this booklet.

ASSESSOR'S USE ONLY

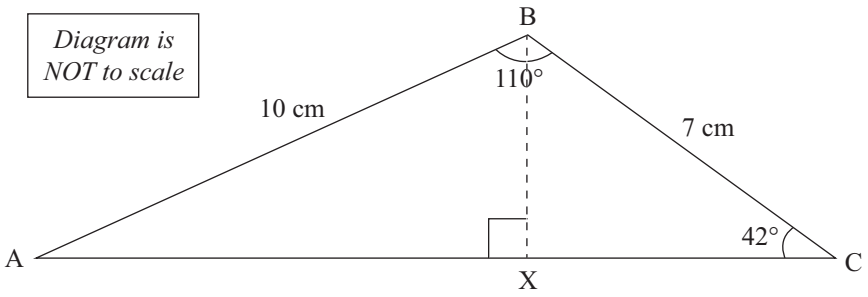
QUESTION ONE

(a) (i)



Find the length of side XW in triangle XYW.

(ii) Frank wants to find the length of the side AC in a triangle that is not right-angled. He does this by dividing the triangle into 2 smaller right-angled triangles.



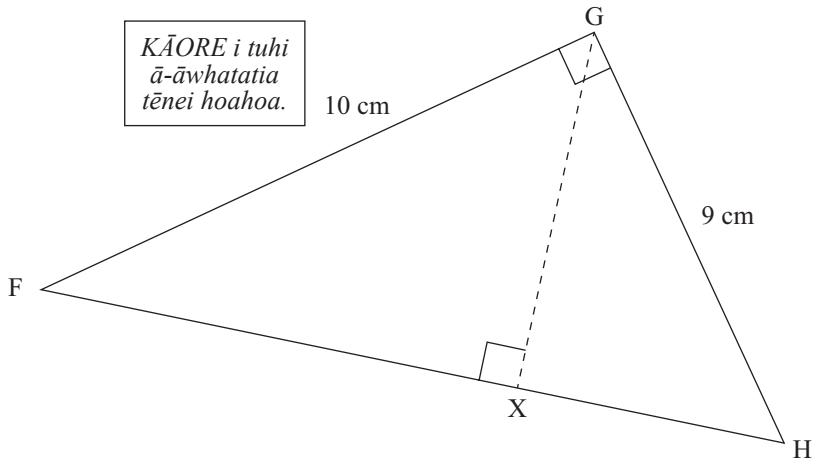
Find the length of side AC, using your answer for the length of XW from part (i).

Show your working clearly.

(b) He tapatoru hāngai te tapatoru FGH.

MĀ TE KAIMĀKA ANAKE

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

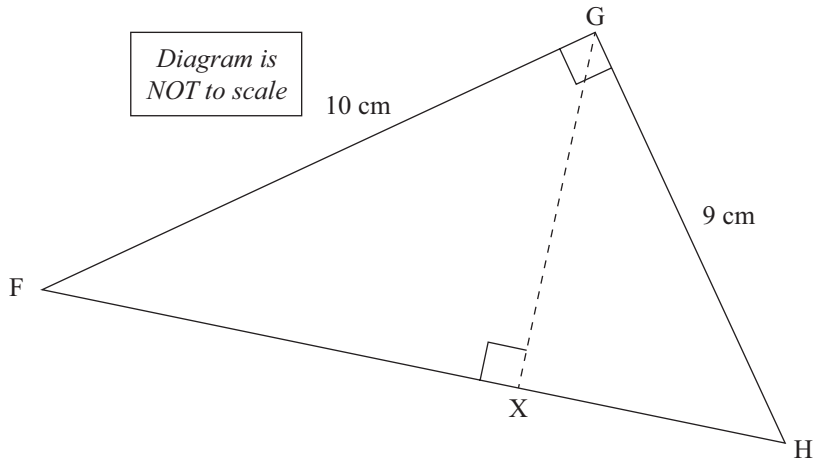


(i) Whakaaturia kia 42° te koki GFH, ki te putu tata rawa.

(ii) Whakamahia te pākoki hei whakaatu kei te tika te Ture a Pythagoras mō te tapatoru FGH.

ASSESSOR'S USE ONLY

(b) Triangle FGH is a right-angled triangle.



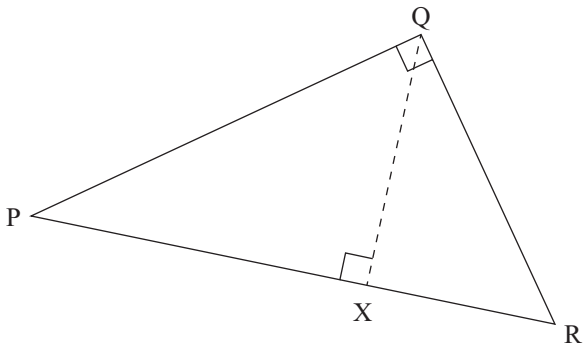
(i) Show that angle GFH is 42°, to the nearest degree.

(ii) Use trigonometry to show that Pythagoras' Rule is true for triangle FGH.

(c) Ka whakamahia e Frank te tikanga i raro hei hāpono i te Ture a Pythagoras mō ngā tapatoru hāngai katoa.

MĀ TE KAIMĀKA ANAKE

Ka tīmata ia me tēnei hoahoa:



Tuatahi, ka whakamahia e ia te katoa o te tapatoru, PQR:

$\frac{PQ}{PR} = \cos(\angle QPR)$

Kātahi ka whakamahia e ia te tapatoru PXQ:

$\frac{PX}{PQ} = \cos(\angle QPR)$

Nō reira ko $\frac{PQ}{PR} = \frac{PX}{PQ}$

Ko $PQ^2 = PX.PR$ (arā, ka whakareatia a PX ki te PR)

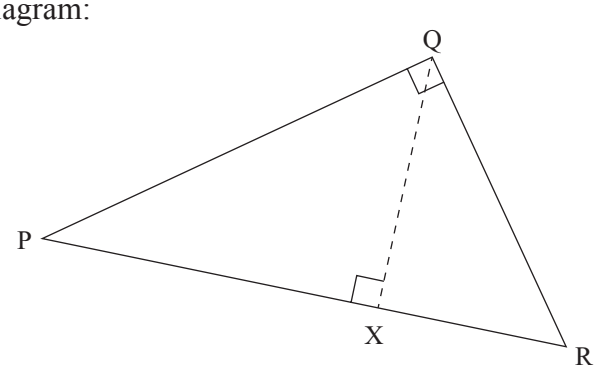
(i) Mā tētahi tikanga ōrite, whakaaturia ko $QR^2 = RX.PR$

(ii) Whakamahia ngā hua i runga hei hāpono i te Ture a Pythagoras mō te tapatoru PQR.

ASSESSOR'S USE ONLY

(c) Frank uses the method below to prove Pythagoras' Rule for any right-angled triangle.

He starts with this diagram:



First he uses the whole triangle, PQR:

$$\frac{PQ}{PR} = \cos(\angle QPR)$$

Then, he uses triangle PXQ:

$$\frac{PX}{PQ} = \cos(\angle QPR)$$

Therefore $\frac{PQ}{PR} = \frac{PX}{PQ}$

So $PQ^2 = PX.PR$ (ie PX multiplied by PR)

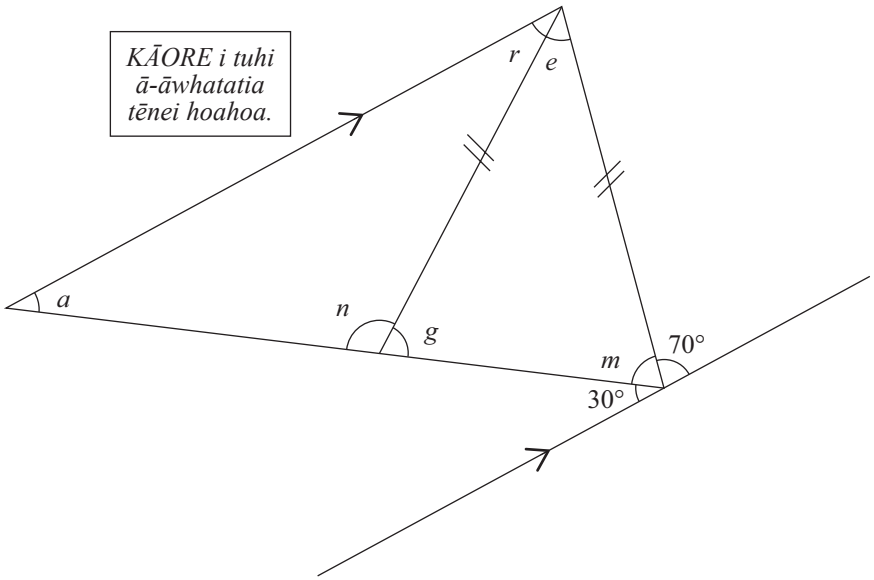
(i) In a similar way, show that $QR^2 = RX.PR$

(ii) Use the results above to prove Pythagoras' Rule for triangle PQR.

PĀTAI TUARUA

MĀ TE KAIMĀKA ANAKE

(a)



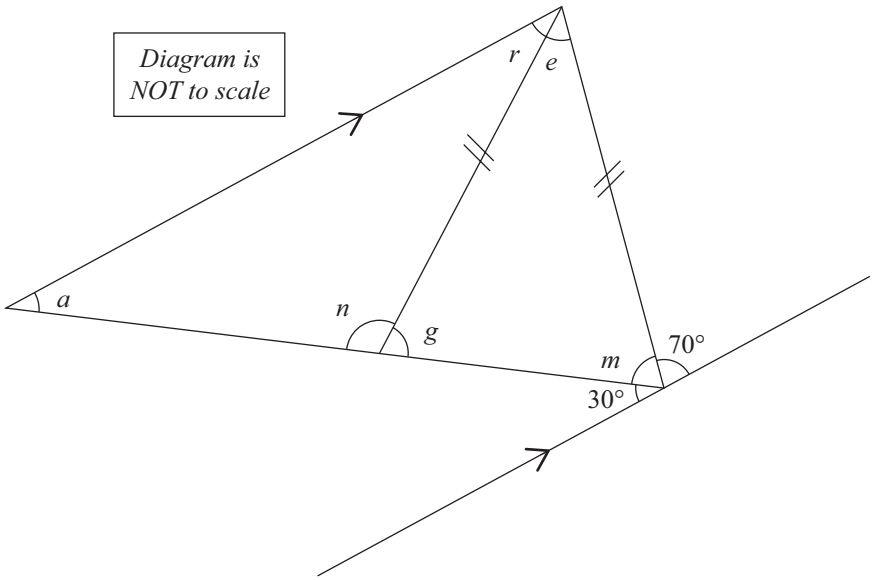
Tātaihia te rahi o te koki *e*.

Āta whakamāramahia tō tikanga, ka homai ngā pūtake āhuahanga mō ia hipanga.

QUESTION TWO

ASSESSOR'S USE ONLY

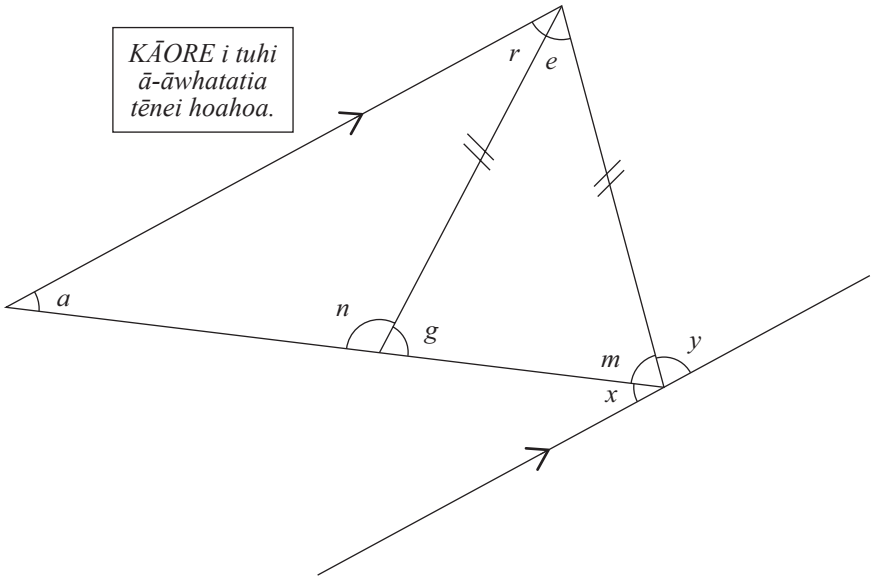
(a)



Find the size of angle *e*.

Explain your method clearly, and give geometric reasons for each step.

(b)



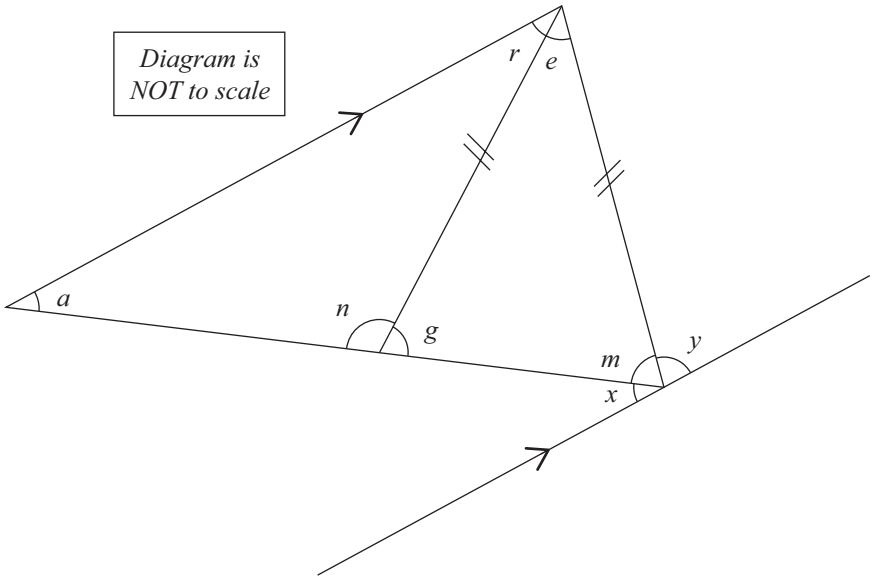
Kimihia he kīanga mō te rahi o te koki *r*, e pā ana ki ngā koki *x* me *y*.

Āta whakamāramahia tō tikanga, ka homai ngā pūtake āhuahanga mō ia hipanga.

MĀ TE KAIMĀKA ANAKE

(b)

ASSESSOR'S USE ONLY

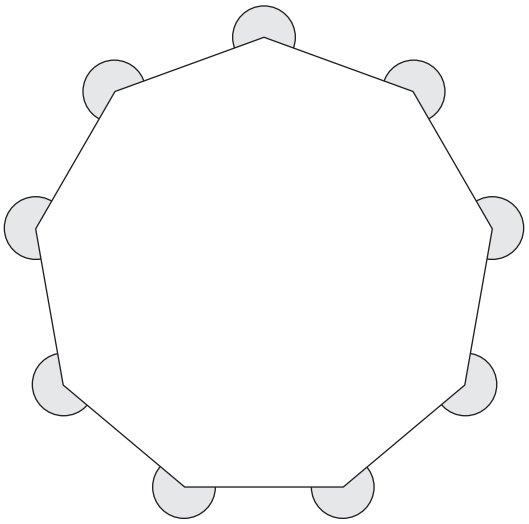


Find an expression for the size of angle r, in terms of angles x and y.

Explain your method clearly, and give geometric reasons for each step.

(c) He tapaiwa rite te āhua i raro, e 9 ngā taha o te āhua.

MĀ TE KAIMĀKA ANAKE



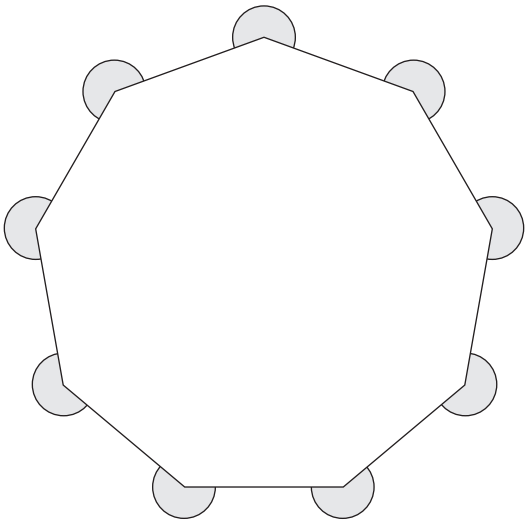
Ko ngā "koki taitapa" o te tapaiwa ngā koki kei waho o ia akitu. E kaurukutia ana ki te kiwikiwi i roto i te hoahoa.

(i) E hia te nui o **ia** "koki taitapa" i roto i tētahi tapaiwa rite?

Āta whakamāramahia tō tikanga, ka homai ngā pūtake āhuahanga mō ia hipanga.

ASSESSOR'S USE ONLY

(c) The shape below is a regular nonagon, a 9-sided shape.



The "edge angles" of the nonagon are the angles on the outside of each vertex. They are shaded in grey on the diagram.

(i) How large is **each** "edge angle" in a regular nonagon?

Explain your method clearly, and give geometric reasons for each step.

(ii) Whakaaturia mai ko te kīanga mō te tapeke o ngā "koki taitapa" o ngā tapamaha **katoa** me ngā taha e n he:

Te tapeke o ngā "koki taitapa" (ā-putu) = $180(n + 2)$

MĀ TE KAIMĀKA ANAKE

(ii) Show that the expression for the total of the "edge angles" of **any** polygon with n sides is:

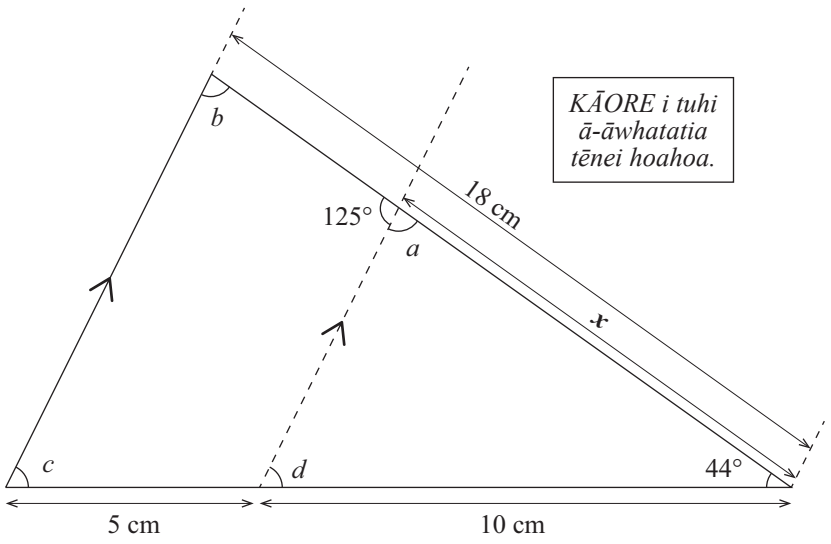
Total of the "edge angles" (in degrees) = $180(n + 2)$

ASSESSOR'S USE ONLY

PĀTAI TUATORU

MĀ TE KAIMĀKA ANAKE

(a)



(i) Tātaihia te rahi o te koki *c*.

Āta whakamāramahia tō tikanga, ka homai ngā pūtake āhuahanga mō ia hipanga.

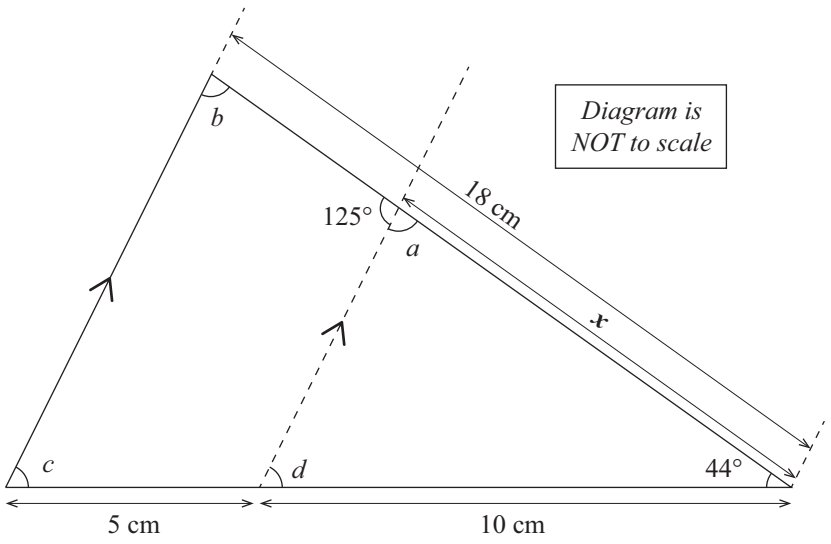
(ii) Tātaihia te roa o ***x*** i roto i tēnei hoahoa.

Āta whakamāramahia mai tō tikanga, ka homai ngā putake āhuahanga.

QUESTION THREE

ASSESSOR'S USE ONLY

(a)



(i) Find the size of angle c.

Explain your method clearly, and give geometric reasons for each step.

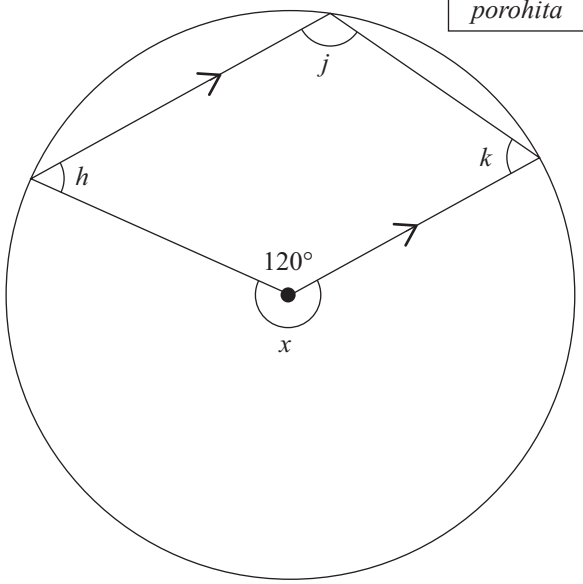
(ii) Find the length marked $\boldsymbol{x}$ in this diagram.

Explain your method clearly, and give geometric reasons.

(b)

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

Ko te ira te pū o te porohita



(i) Whakaaturia ko te koki $j = 120°$.

Āta whakamāramahia tō tikanga, ka homai ngā pūtake āhuahanga mō ia hipanga.

(ii) Tātaihia ngā rahi o koki *h* me koki *k*.

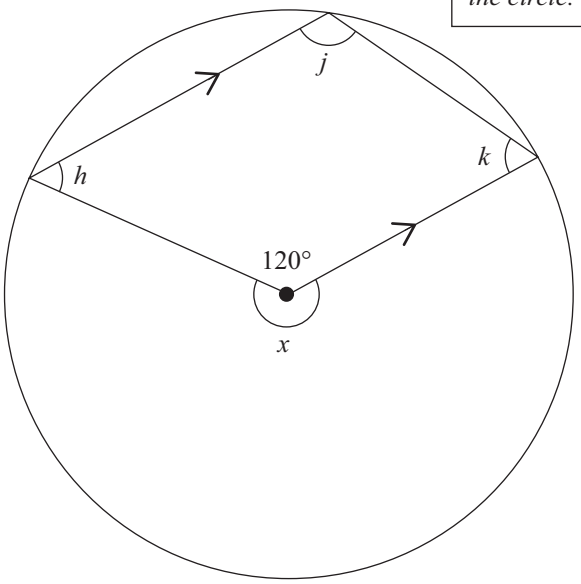
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(b)

Diagram is NOT to scale.

The dot is the centre of the circle.



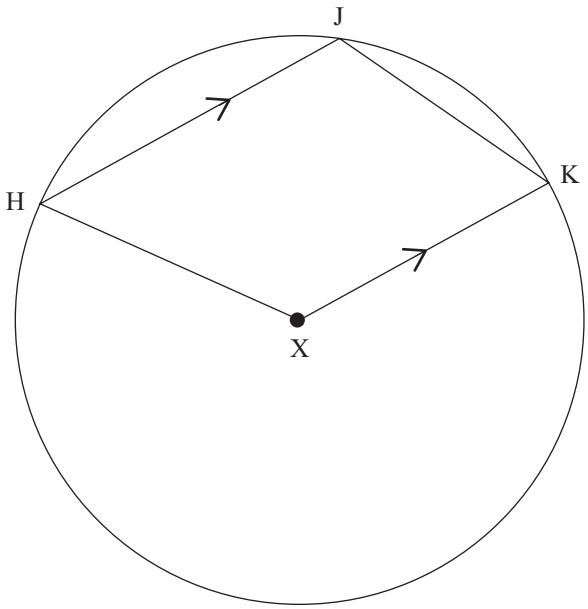
(i) Show that angle $j = 120°$.

Explain your method clearly, and give geometric reasons for each step.

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

(iii) Whakamāramahia mai he aha tātou i mōhio ai mai i ngā wāhanga (i) me (ii) ko te tapawhā o te whārangi o mua he tapawhā whakarara rite.

Ka hiahia pea koe ki te whakamahi i te hoahoa i raro, i tapaia ai ngā koko[2].



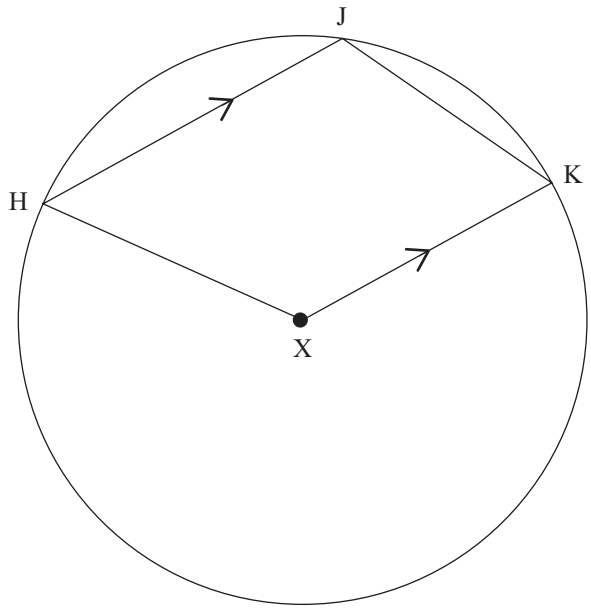
MĀ TE KAIMĀKA ANAKE

[2] kōkonga

ASSESSOR'S USE ONLY

(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.



He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 1 Mathematics and Statistics, 2013

91031 Apply geometric reasoning in solving problems

9.30 am Wednesday 13 November 2013
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.

91031M

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 2–23 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.