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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 1, 2012

91031M Te whakahāngai whakaaro āhuahanga whaitake hei whakaoti rapanga

9.30 i te ata Rāapa 14 Whiringa-ā-rangi 2012
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 2−25 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

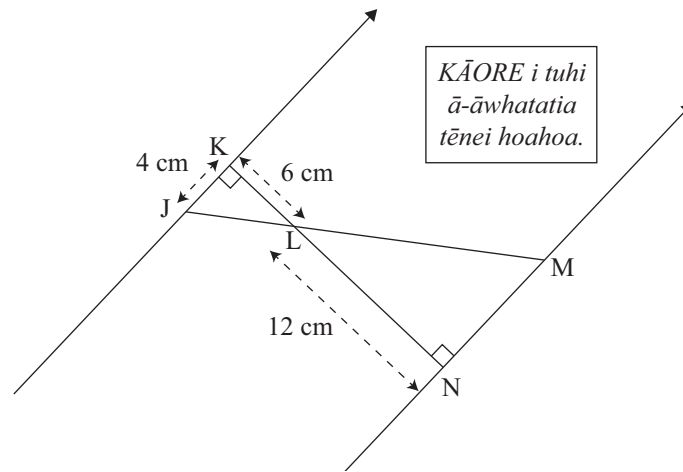**HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.**

TAPEKE

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

PĀTAI TUATAHI

(a)   E tūhura ana a Marcus i ngā koki i te hoahoa i raro nei:

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

(i)   Ka tātaihia e Marcus he 56.3° (1dp) te koki KJL.

He tika rānei tāna?

Āta whakamāramahia ō whakaaro whaitake.

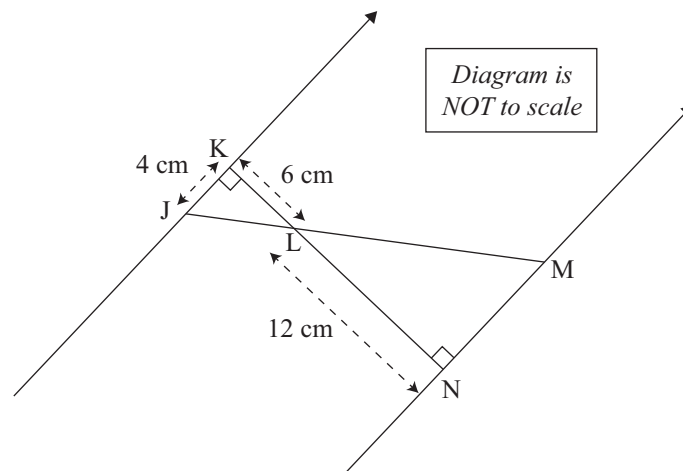(ii)   Tātaihia te rahi o te koki MLN.

Homai ngā pūtake āhuahanga.

(iii)   Tātaihia te roa o te rārangi MN.

Me whakaatu e koe ō mahinga, ā, homai ngā pūtake.

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

QUESTION ONE

(a) Marcus is investigating the angles in the diagram below:

Diagram is NOT to scale

4 cm   K   6 cm
J
L
12 cm
M
N

(i) Marcus calculates that angle KJL is 56.3° (1dp).

Is he correct?

Explain your reasoning clearly.
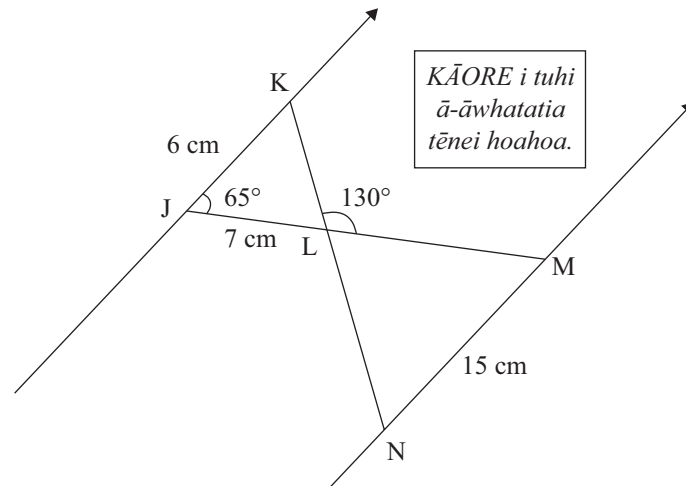
(ii) Find the size of angle MLN.

Give geometric reasons.

(iii) Find the length of the line MN.

You must show your working and give reasons.
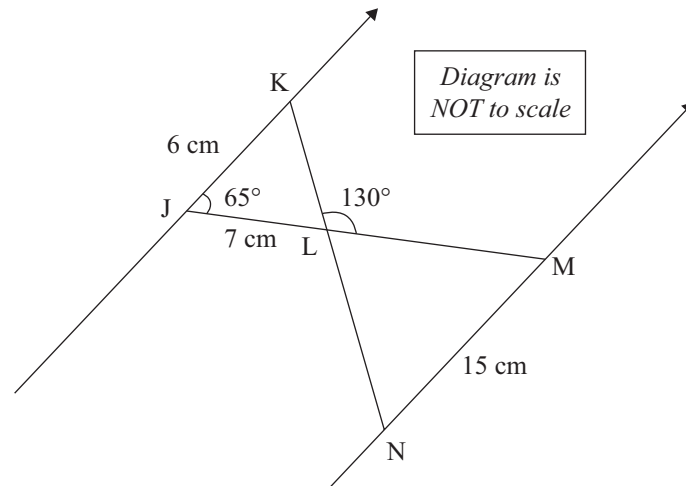
(b) Ka tuhia e Marcus tētahi atu hoahoa:

K

6 cm

J 65°

7 cm L

130°

M

N

15 cm

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

Tātaihia te rahi o te koki LNM.

Homai ngā pūtake āhuahanga.

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(c) Ka whakaaro a Marcus mēnā e tika ana ētahi āhuatanga i te hoahoa o mua ake **i ngā wā katoa**. Ka tūhura ia mā te huri i te ingoa o te koki KJL ki te *x*.

K

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

J x

L

M

N

(i) He waerite te tapatoru JKL me te tapatoru LMN.

Whakaatu mai me whakarara a JK ki NM.

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(b) Marcus draws another diagram:

Diagram is NOT to scale

Find the size of angle LNM.

Give geometric reasons.

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(c) Marcus wonders if some of the properties in the diagram on the previous page are **always** true. He investigates by renaming angle KJL as x.

Diagram is NOT to scale

(i) Both triangle JKL and triangle LMN are isosceles.

Show that JK must be parallel to NM.

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(ii) Mai i te wāhanga (i) ka mōhio tātou mēnā he waerite te tapatoru JKL, me whakarara a JK ki NM.

Mēnā e whakarara ana a JK ki NM, me waerite te tapatoru JKL i ngā wā katoa?
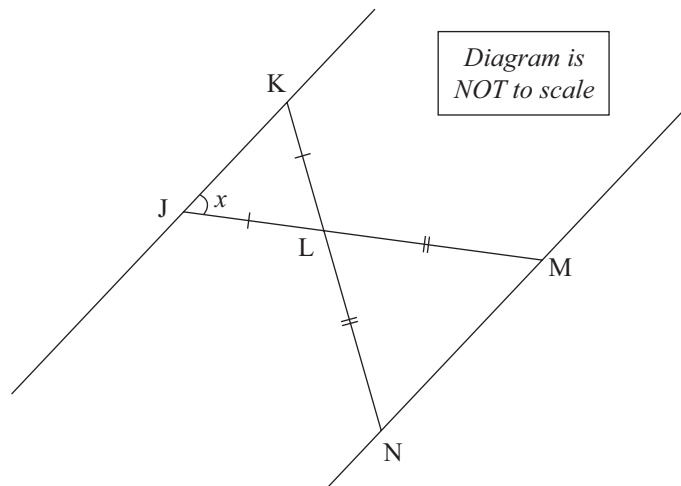
Tērā pea ka hiahia koe ki te whakamahi i ēnei hoahoa.

(ii) From part (i) we know that if triangle JKL is isosceles, JK must be parallel to NM.

If JK is parallel to NM, must triangle JKL always be isosceles?
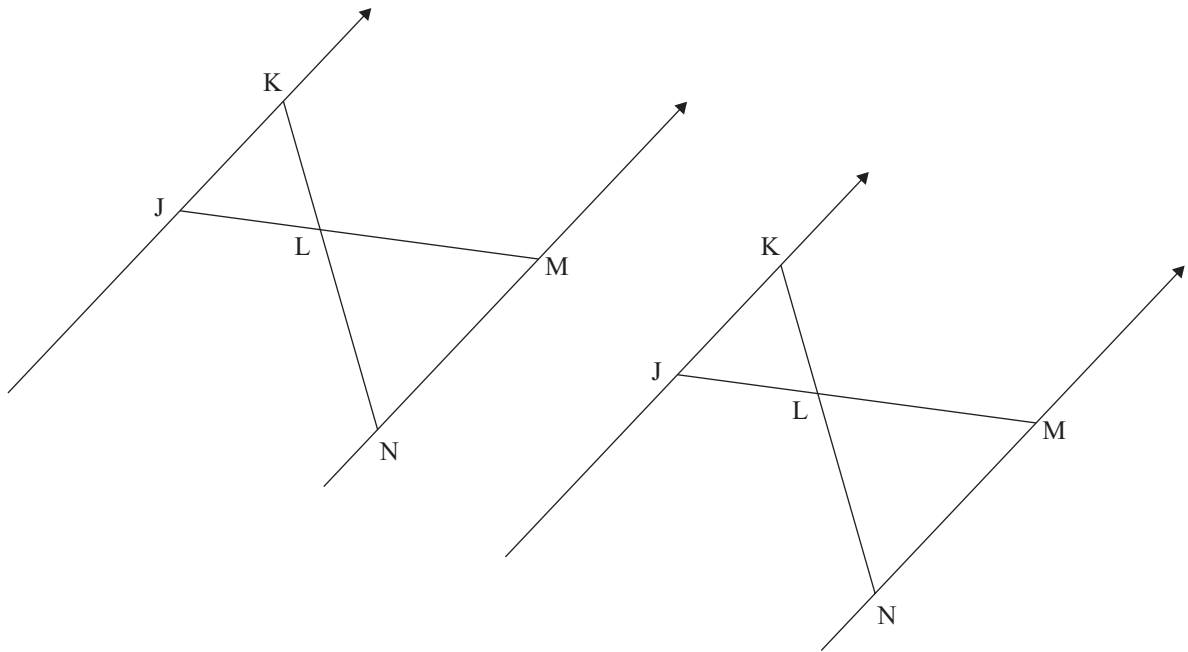
You may wish to use the diagrams supplied.
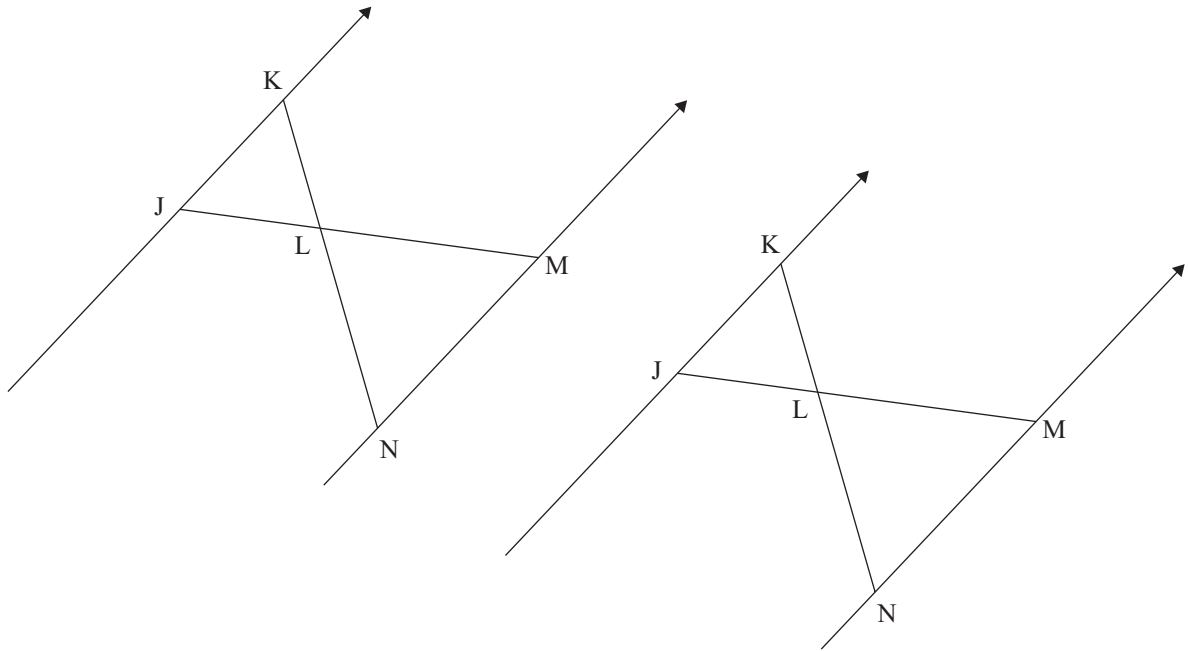
PĀTAI TUARUA

Kei te whakarite a Pita i ngā hoahoa o tētahi ara tapatoru mō te whakataetae poti tere. I ia ara, ka tohua te tīmatanga me te mutunga o te ara ki te S.

(a)   I tana hoahoa tuatahi he 2800 mita whakaterāwhiti (ki te ahunga o 090°) te haere o ngā poti mai i S ki te tautohu A.

Kātahi ka ahu atu rātou ki te raki mō te 2800 mita ki te tautohu T, i mua i te hokinga atu ki S.

Kua tuhia tēnei ara i raro nei:

T

RAKI

2800 m

2800 m

S

A
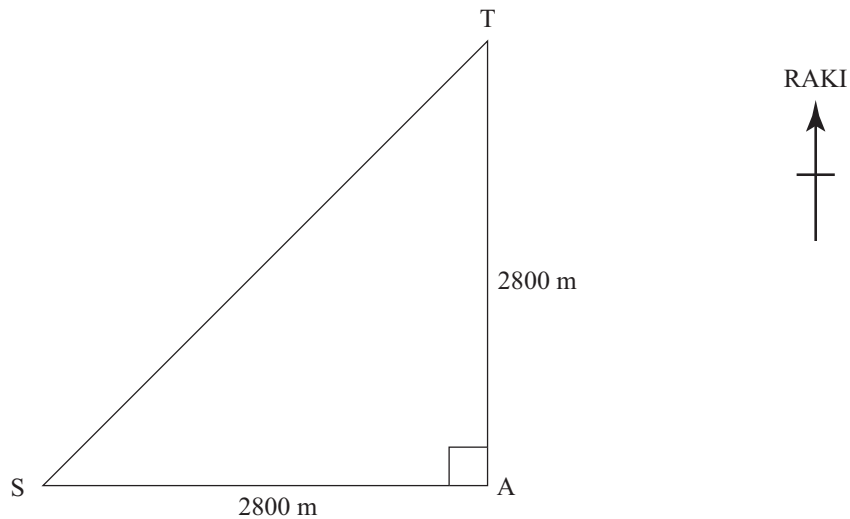
(i)   He aha te roa tapeke o te ara?

(ii)   Whakamārama he aha i 045° ai te ahunga o T mai i S.

Homai ngā pūtake āhuahanga.

QUESTION TWO
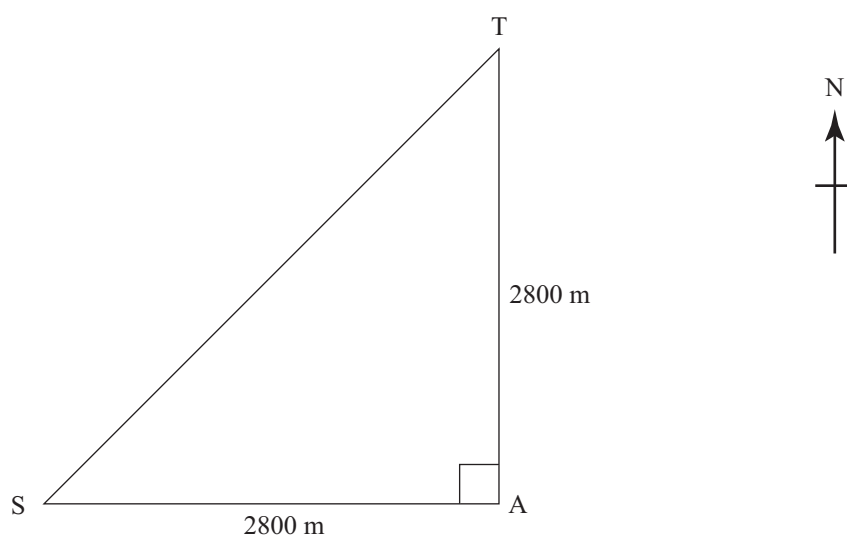
Pita is working on designs for a triangular course for a jet-boat race. On each course, S marks the start and the finish of the course.

(a) His first design has the boats travelling for 2800 m due East (on a bearing of 090°) from S to marker A.

Then they travel North for another 2800 m to marker T, before returning to S.

This course is drawn below:

(i) What is the total length of the course?

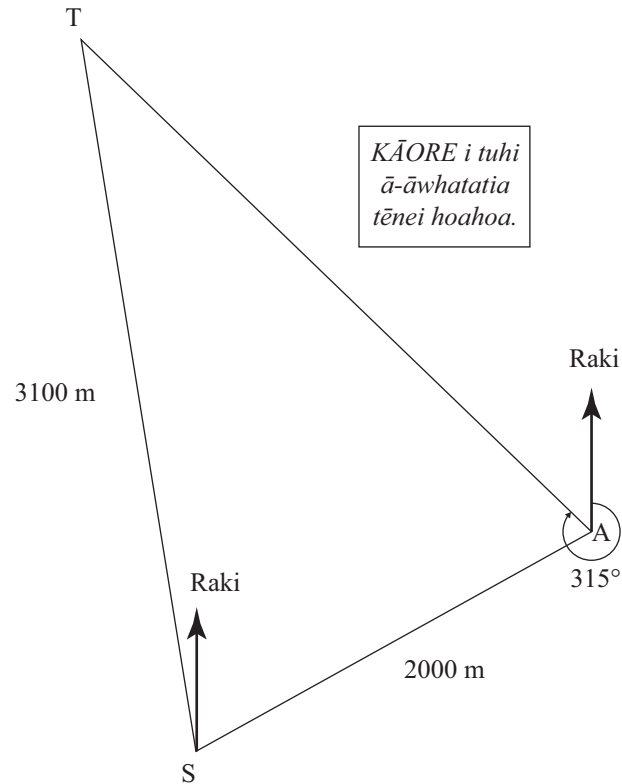(ii) Explain why the bearing of T from S is 045°.

Give geometrical reasons.

(b) Kua whakaritea te hoahoa tuarua a Pita pēnei:

Tīmataria i S, ka 2000 mita te haere i te ahunga o te 045° kia tae atu ki A.

Mai i A, ka haere i te ahunga o te 315° kia tae atu ki T.

Ka mutu, ka 3100 mita te hoki tōtika atu ki S.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

T

3100 m

Raki

A

315°

Raki

2000 m

S

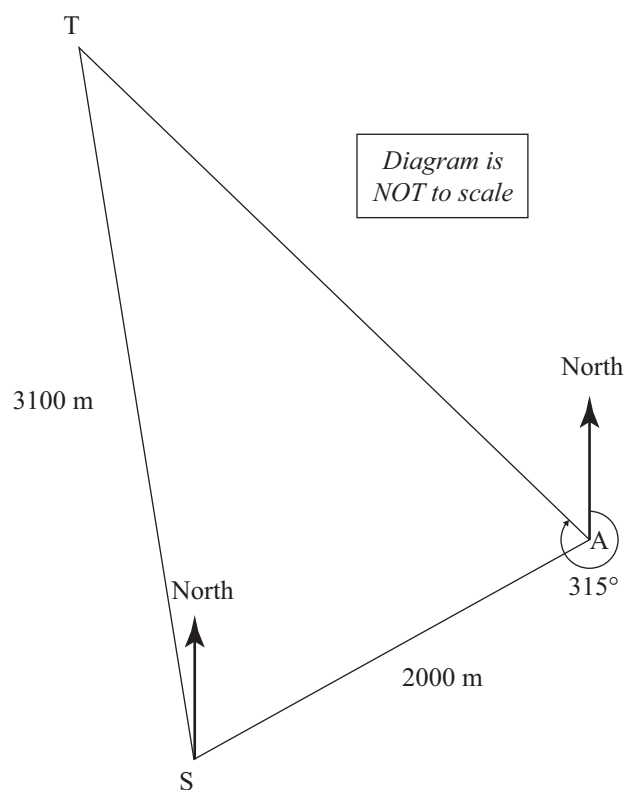(i) He aha te roa tapeke o tēnei ara?

(ii) He aha te ahunga o T mai i S?

(b)   Pita's second design is constructed as follows:

Start at S, travel for 2000 m on a bearing of 045° to reach A.

From A, travel on a bearing of 315° to reach T.

Finally, travel the 3100 m straight back to S.

T

*Diagram is
NOT to scale*

North

3100 m

A

315°

North

2000 m

S

(i)   What is the total length of this course?

_____

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(ii)   What is the bearing of T from S?

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(c) Ko ēnei ngā tohutohu ki ngā poti mō te hoahoa whakamutunga a Pita:

Tīmataria i S, ā, ka 2800 mita te haere i te ahunga o te 050° ki te tautohu A

Mai i A, ka 2800 mita te haere i te ahunga o 330° ki T

Ka mutu, hoki tōtika atu ki S.
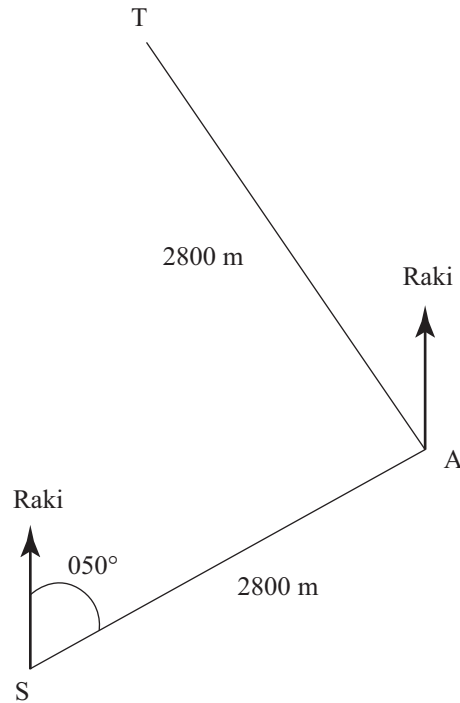
(i) Ka tātaihia e Pita he 100° te koki SAT.

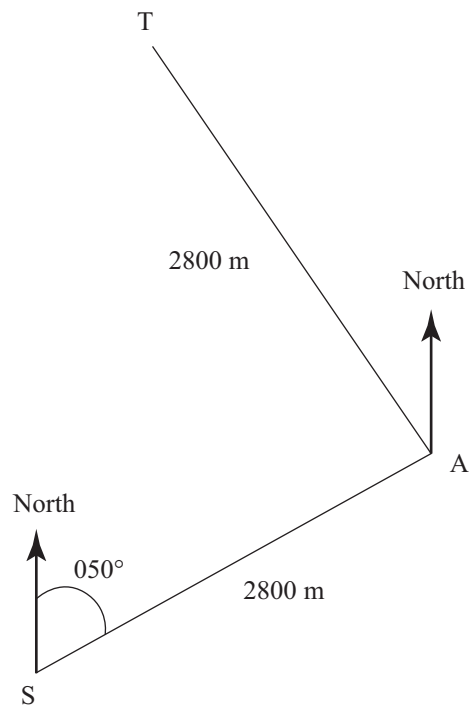Whakamahia te whakaaro āhuahanga whaitake hei whakamārama he aha i tika ai tāna.

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(ii) Tātaihia te roa tapeke o tēnei ara. Āta whakaaturia ō mahinga.

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(c) Pita's final design has these directions for the boats:

Start at S and travel for 2800 m on a bearing of 050° to marker A

From A, travel for another 2800 m on a bearing of 330° to T

Finally, head straight back to S.

(i) Pita calculates that angle SAT is 100°.

Use geometric reasoning to explain why he is correct.
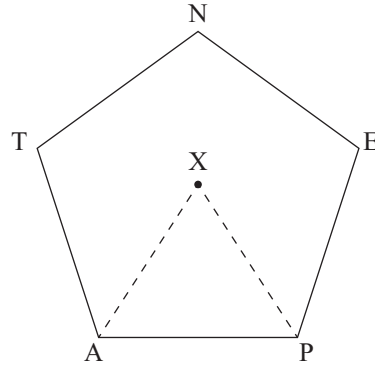
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(ii) Find the total length of this course. Show your working clearly.

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PĀTAI TUATORU

Ka hangaia e Amy tētahi taparima rite.

He 10 cm te roa o ia taha.

Ko X te pū o te taparima rite.

N

T   X   E

A   P

(a)   Ka ine a Amy i te koki APE, ā, ka kitea he 110° pū te koki.

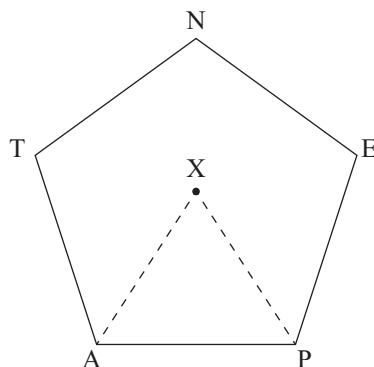He tika rānei tēnei?

Homai ngā pūtake āhuahanga.

(b)   He aha te momo tapatoru o te tapatoru APX? (Homai ngā pūtake āhuahanga.)

QUESTION THREE

Amy constructs a regular pentagon.

Each side is 10 cm long.

X is the centre of the pentagon.
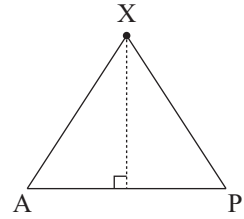

(a) Amy measures the angle APE and finds it to be exactly 110°.

   Is this correct?

   Give geometric reasons.

(b) What type of triangle is triangle APX? (Give geometric reasons.)
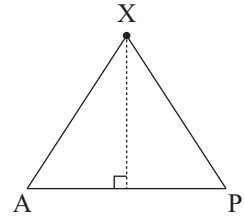
(c) (i) Tātaihia te teitei o te tapatoru APX.

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(ii) Tātaihia te horahanga o te taparima rite katoa.
(Horahanga o tētahi tapatoru = ½ pūtake × teitei.)

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(iii) Me kī, e n ngā taha o tētahi **taparau** rite, ā, he 10 cm te roa o ia taha.

Whiriwhiria tētahi kīanga mō te horahanga o te taparau.

Āta whakamāramahia ō whakaaro whaitake.

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(c) (i) Find the height of triangle APX.

X

A   P

_____

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(ii) Find the area of the whole pentagon. (Area of a triangle = ½ base × height.)

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(iii) Suppose a regular **polygon** has *n* sides and each side is 10 cm long.

Find an expression for the area of the polygon.

Explain your reasoning clearly.
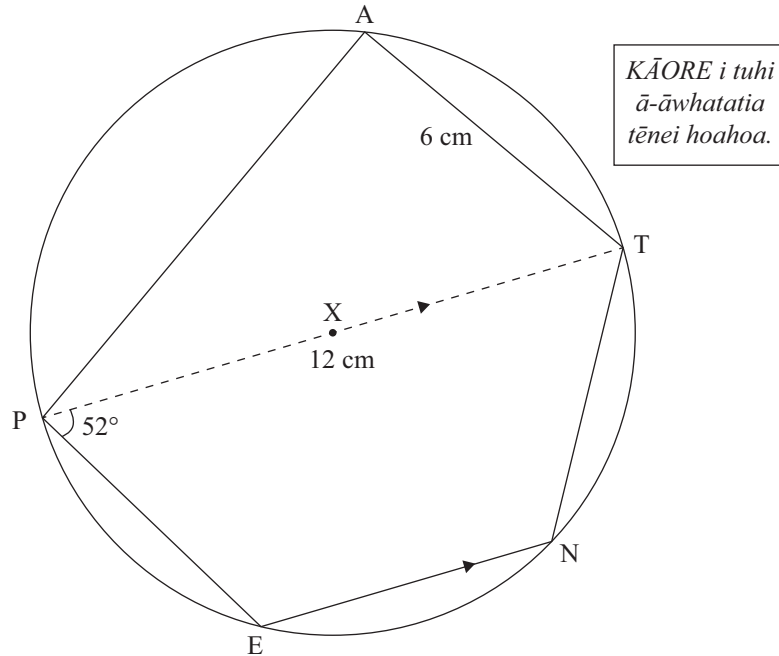
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(d) Ka tuhia e Amy tētahi atu taparima, he taparima o tētahi porowhita rāwaho engari ehara i te rite.

E whakarara ana a PT ki EN.

He whitianga a PXT.

Ko X te pū o te porowhita.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa.

(i)   Hei tā Amy he 90° te koki PAT.

He tika rānei tāna?

Homai ngā pūtake āhuahanga.

(ii) Tātaihia te rahi o te koki NXE.

Homai ngā pūtake āhuahanga.

(iii)   Me kī, ko te koki XPE = w.

Ka taea te whakaatu ko te koki NXE = $4w - 180°$.

I runga anō i tēnei tātai, he aha tō whakaaro mō te āhua o te rahi o te koki w?

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(d) Amy draws another pentagon which is cyclic but not regular.

PT is parallel to EN.

PXT is a diameter.

X is the centre of the circle.

Diagram is NOT to scale
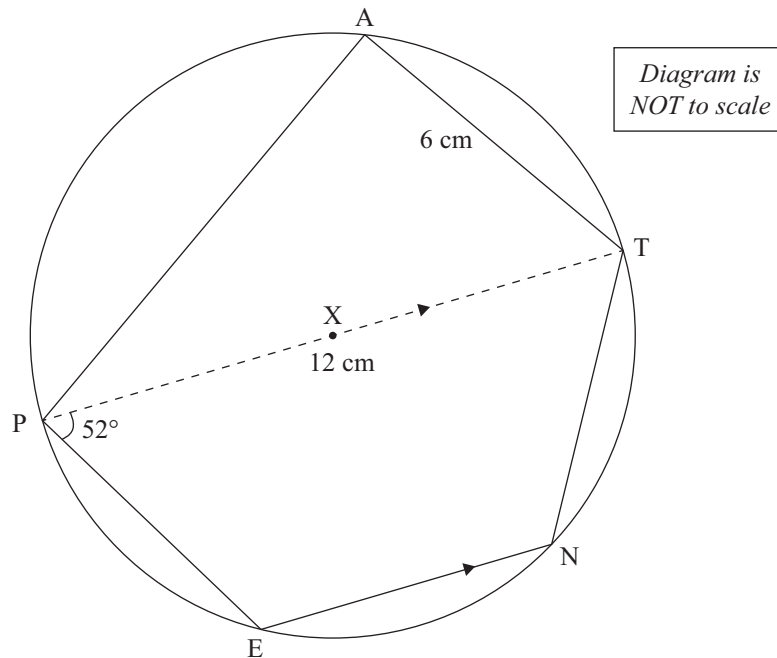
(i) Amy thinks that angle PAT is 90°.

Is she correct?
Give a geometric reason.

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(ii) Calculate the size of angle NXE.
Give geometric reasons.

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(iii) Suppose angle XPE = *w*.

It can be shown that angle NXE = 4*w* – 180°.

From this formula, what does this tell you about the size of angle *w*?

ASSESSOR'S USE ONLY

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

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

QUESTION
NUMBER

Level 1 Mathematics and Statistics, 2012

91031 Apply geometric reasoning in solving problems

9.30 am Wednesday 14 November 2012
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 2–25 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.