91031M

910315

1

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Te Pāngarau me te Tauanga, Kaupae 1, 2016

91031M Te whakahāngai whakaaro āhuahanga whaitake hei whakaoti rapanga

9.30 i te ata Rāpare 17 Whiringa-ā-rangi 2016
Whiwhinga: Whā

Paetae	Kaiaka	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 mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Whakaaturia ngā mahinga KATOA.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia te (ngā) whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–25 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

TE SKY TOWER

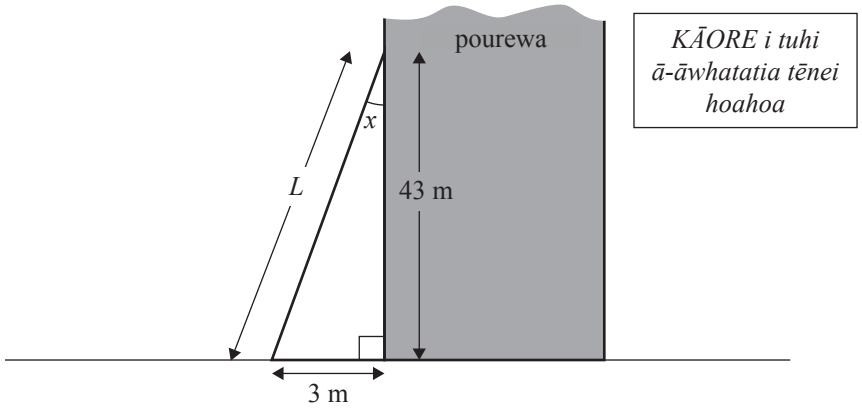
MĀ TE KAIMĀKA ANAKE

www.wotif.co.nz/New-Zealand.d133.Destination-Travel-Guides

Ko te Sky Tower o Tāmaki Makaurau te hanganga ā-ringa teitei rawa i te Tuakoi Tonga.

TŪMAHI TUATAHI

(a) E tautokohia ana te kaupapa o te pourewa e ngā poutoko e waru.
E L mita te roa o ēnei poutoko, ā, he 3 mita te tawhiti mai i te pourewa i te papa.
Ka hono atu ngā pou ki te pourewa i te 43 m i runga ake o te papa.



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

(i) Tātaihia te roa, L, o te poutoko mai i te papa ki te pourewa.

THE SKY TOWER

ASSESSOR'S USE ONLY

www.wotif.co.nz/New-Zealand.d133.Destination-Travel-Guides

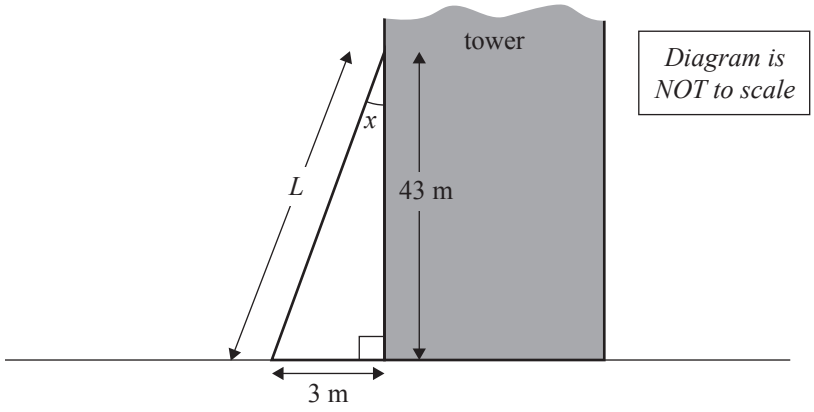
Auckland's Sky Tower is the tallest man-made structure in the Southern Hemisphere.

QUESTION ONE

(a) The base of the tower is supported by 8 legs.

These legs are L metres long and are 3 metres away from the tower at ground level.

The legs join the tower 43 m above ground level.



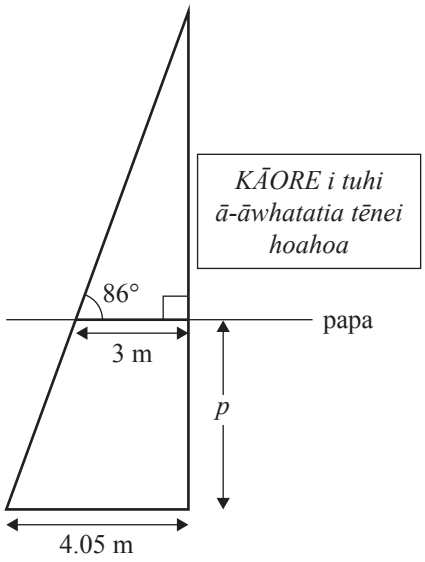
(i) Calculate the length, L, of the leg from the ground to the tower.

MĀ TE KAIMĀKA ANAKE

(ii) Whakamahia te pākoki hei tātai i te rahi o te koki x, e tūtaki ai te poutoko ki te pourewa.

(iii) Ka heke ngā pou o te pourewa ki raro i te papa.

Ko te tawhiti whakapae mai i te pourewa ki te pito whakararo o te poutoko i raro i te papa he 4.05 mita.



Tātaihia a p, te tawhiti poutū e titi ana ngā poutoko ki te whenua.

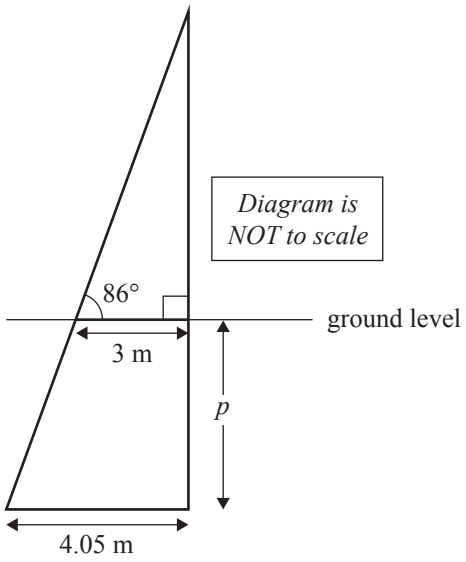
Āta whakaaturia ō mahinga.

ASSESSOR'S USE ONLY

(ii) Use trigonometry to calculate the size of angle x, where the leg joins the tower.

(iii) The legs of the tower go below ground level.

The horizontal distance from the tower to the bottom of the leg under the ground is 4.05 metres.



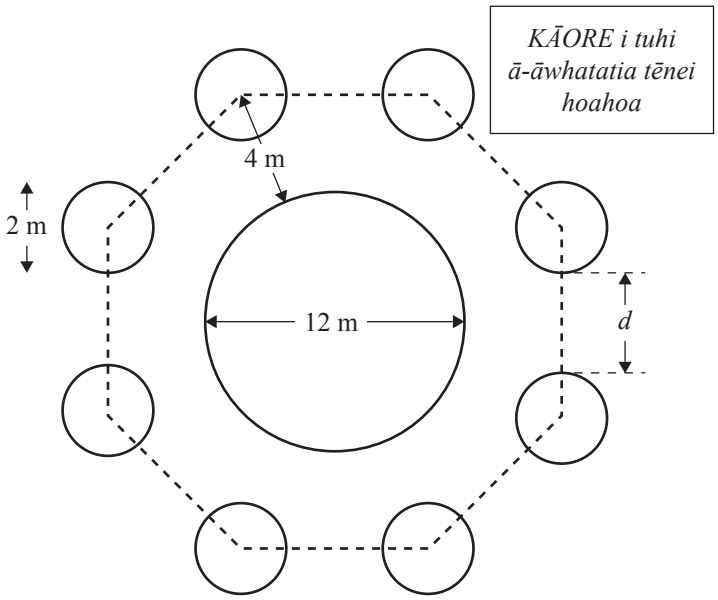
Calculate p, the vertical distance that the legs are built into the ground.

Show your working clearly.

(b) Ko ngā pū o ngā poutoko porowhita e 8 ka noho hei tapawaru rite.

He 12 mita te whitianga o te pourewa, ā, he 2 mita te whitianga o ia poutoko.

Ko te tawhiti mai i te taha o waho o te pourewa ki te pū o ngā poutoko i te papa he 4 mita.



Tātaihia te tawhiti poto rawa, *d*, i waenga i ngā poutoko pātata i te papa.

Āta whakaaturia ō mahinga.

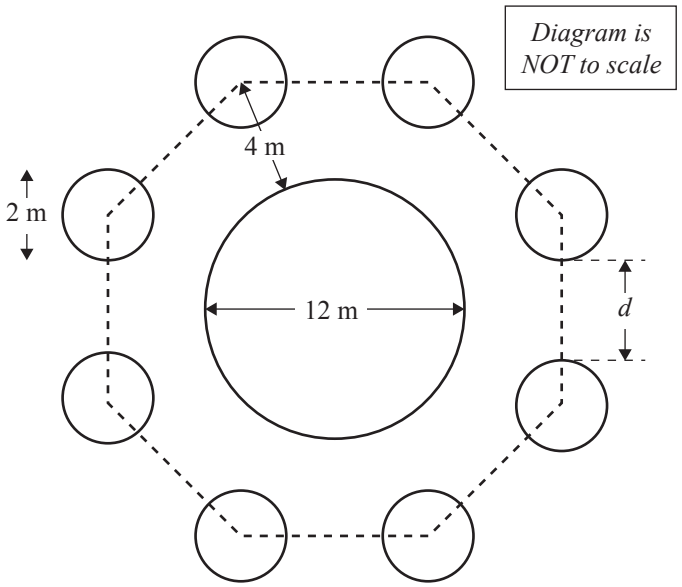
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(b) The centres of the 8 circular legs form a regular octagonal shape.

The tower has a diameter of 12 metres and each leg has a diameter of 2 metres.

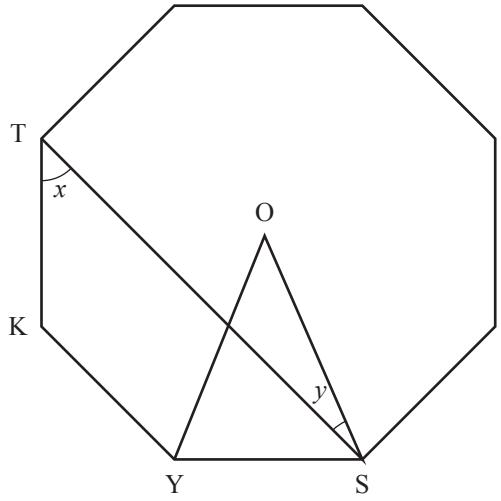
The distance from the outside edge of the tower to the centre of the legs at the ground is 4 metres.



Calculate the shortest distance, d, between adjacent legs at ground level.

Show your working clearly.

(c) Kei raro e whakaaturia ana tētahi hoahoa māmā o te wāhi o ngā poutoko hei tapawaru rite. Kei te pokapū o te tapawaru te pūwāhi O.



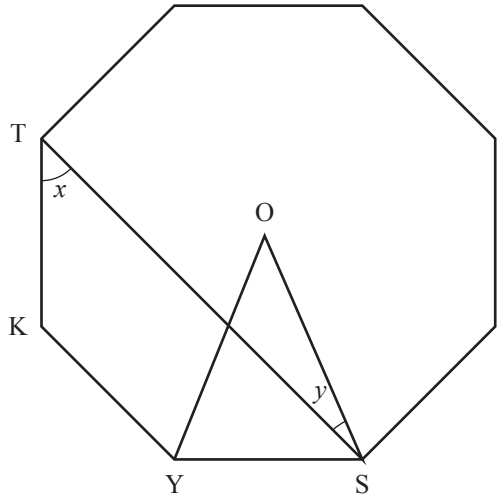
Whakaaturia mai he haurua te koki y i te rahinga o te koki x.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(c) A simplified diagram of the position of the legs is shown below as a regular octagon. Point O is at the centre of the octagon.



Show that angle y is half the size of angle x.

Justify your answer with clear geometric reasoning.

TŪMAHI TUARUA

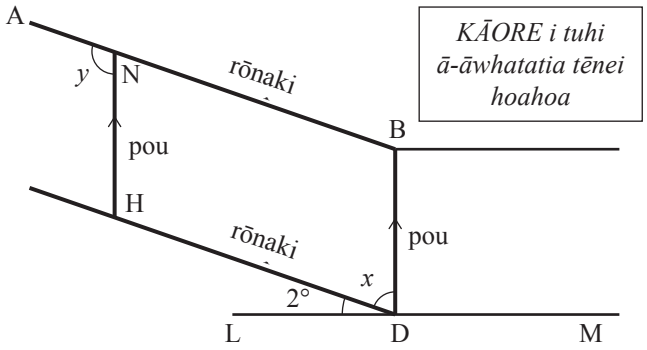
He tūnga waka kei raro i te Sky Tower he mea hanga i ngā rōnaki.

Kei te koki 2° ngā rōnaki.

E ōrite ana te whakatūhia o ngā pou poutū i ngā rōnaki kia noho kaha ai.

MĀ TE KAIMĀKA ANAKE

(a) He whakarara ngā pou katoa tētahi ki tētahi. He huapae a LM.



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

(i) Tātaihia te rahi o te koki x i te hoahoa i runga nei.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

(ii) Tātaihia te rahi o te koki y i te hoahoa i runga nei.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

QUESTION TWO

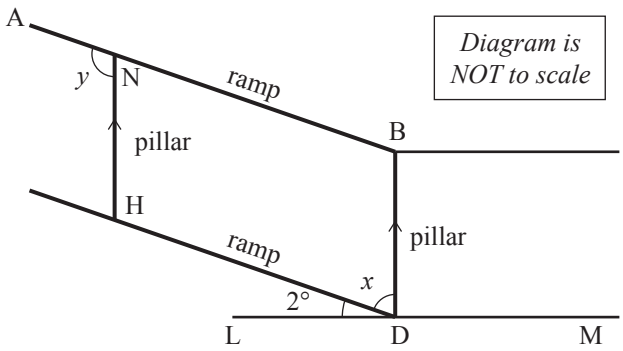
ASSESSOR'S USE ONLY

Below the Sky Tower is a car park made of ramps.

The ramps are at a 2° angle.

There are vertical pillars regularly placed along the ramps for strength.

(a) All pillars are parallel to each other. LM is horizontal.



(i) Calculate the size of angle x in the diagram above.

Justify your answer with clear geometric reasoning.

(ii) Calculate the size of angle y in the diagram above.

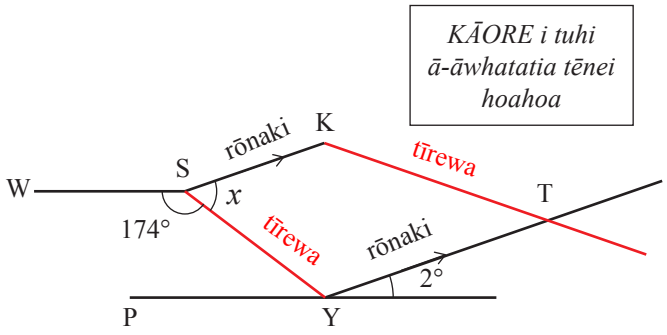
Justify your answer with clear geometric reasoning.

MĀ TE KAIMĀKA ANAKE

(iii) He tīrewa atu anō i tētahi wāhanga o te rōnaki hei taupua, e ai ki te hoahoa i raro. He whakarara ngā rārangi SK me YT.

Ko te koki WSY he 174°.

He huapae ngā rārangi WS me PY.



Tātaihia te rahi o te koki *x* i te hoahoa i runga nei.

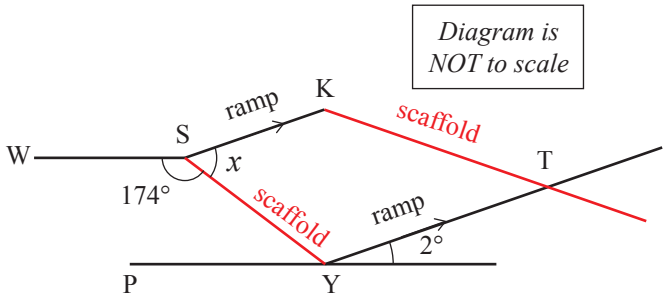
Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

ASSESSOR'S USE ONLY

(iii) Part of the ramp had extra scaffolding added for support, as shown in the diagram below. The lines SK and YT are parallel.

Angle WSY is 174°.

The lines WS and PY are both horizontal.



Calculate the size of angle x in the diagram above.

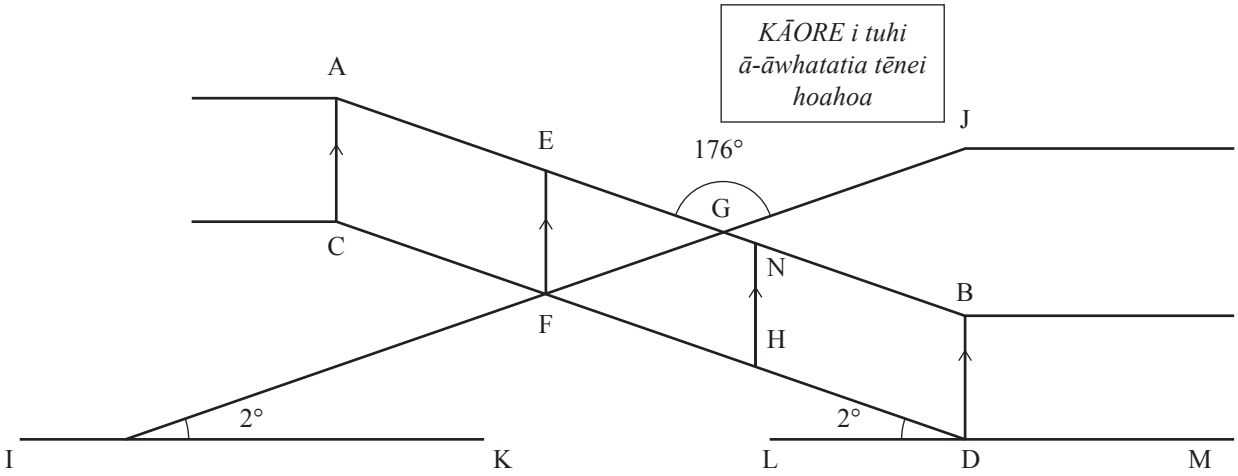
Justify your answer with clear geometric reasoning.

MĀ TE KAIMĀKA ANAKE

(iv) Mai i te taha, e rite ana te tūnga waka ki te hoahoa i raro.

Ko te koki EGJ he 176°.

He huapae a IK me LM.



Hāponotia kei te whakarara ngā rārangi AB me CD.

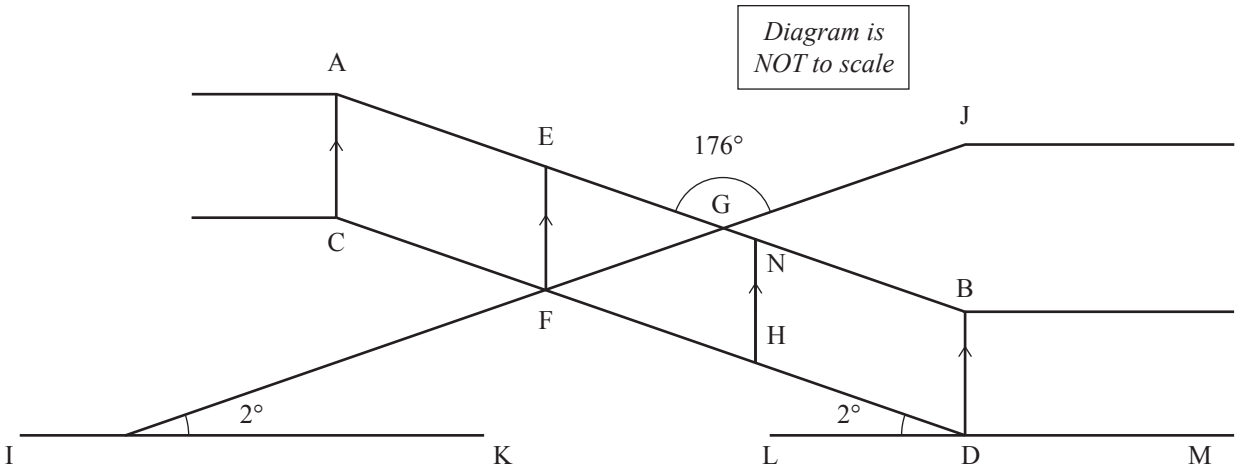
Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

ASSESSOR'S USE ONLY

(iv) From the side, the carpark looks like the diagram below.

Angle EGJ is 176°.

IK and LM are horizontal.



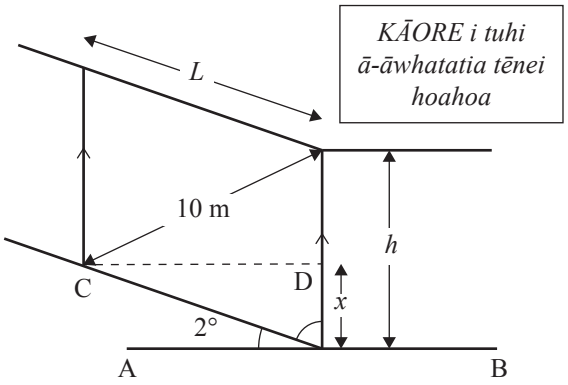
Prove that the lines AB and CD are parallel.

Justify your answer with clear geometric reasoning.

(b) Ko te roa e rere ana i te taiheke i waenga i ngā pou e rua he L mita.

Ko te tawhiti hauroki mai i runga o tētahi pou teitei rawa ki te kaupapa o te pou teitei i muri mai he 10 m.

He huapae a AB me CD.



(i) Kimihia te teitei, x, e ai ki te roa L.

Āta whakaaturia ō mahinga.

(ii) Tātaihia a h, te teitei ā-mita o tētahi pou, e ai ki a L.

Āta whakaaturia ō mahinga.

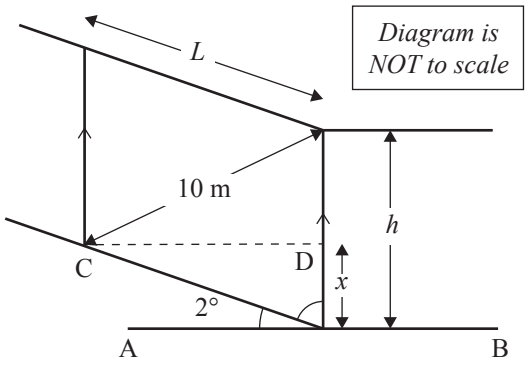
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(b) The length along the slope between two pillars is L metres.

The diagonal distance between the top of one pillar and the base of the next higher pillar is 10 m.

AB and CD are horizontal.



(i) Find the height, x, in terms of the length L.

Show your working clearly.

(ii) Calculate h, the height in metres of a pillar, in terms of L.

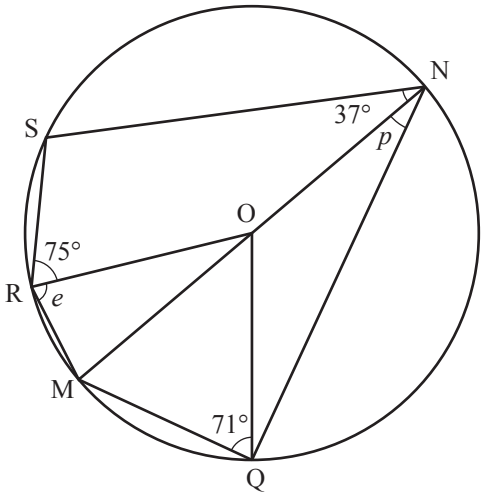
Show your working clearly.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) I te hoahoa i raro, ko te rārangi MN ka rere mā te pokapū o te porowhita, O.
Ko te koki MQO he 71°, ko te koki SNO he 37° me te koki SRO he 75°.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa



(i) Kimihia te rahi o te koki *p*.
Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

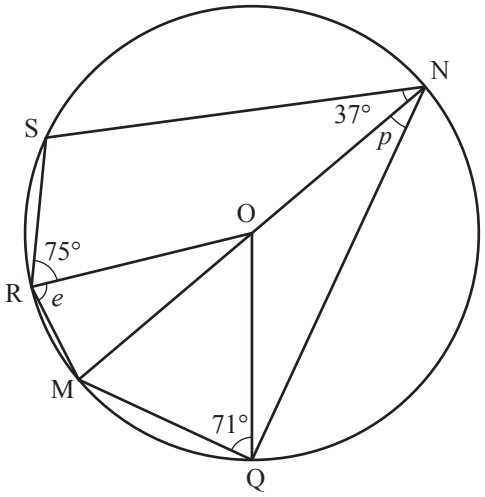
(ii) Tātaihia te rahi o te koki *e*.
Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

QUESTION THREE

ASSESSOR'S USE ONLY

(a) In the diagram below, the line MN passes through the centre of the circle, O.
Angle MQO is 71°, angle SNO is 37° and angle SRO is 75°.

Diagram is NOT to scale



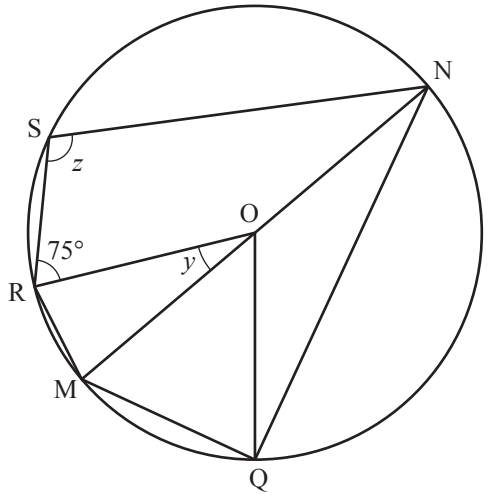
(i) Find the size of angle p.
Justify your answer with clear geometric reasoning.

(ii) Find the size of angle e.
Justify your answer with clear geometric reasoning.

(iii) Kei te hoahoa i raro, ko te koki SRO he 75°.

MĀ TE KAIMĀKA ANAKE

KĀORE i tuhi ā-āwhatatia tēnei hoahoa



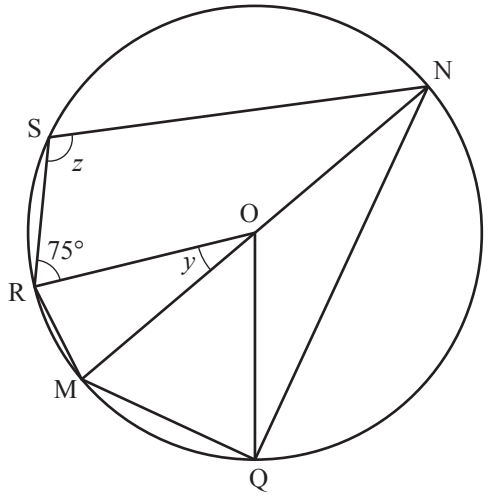
Kimihia tētahi kīanga mō z e pā ana ki y.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

ASSESSOR'S USE ONLY

(iii) In the diagram below, angle SRO is 75°.

Diagram is NOT to scale

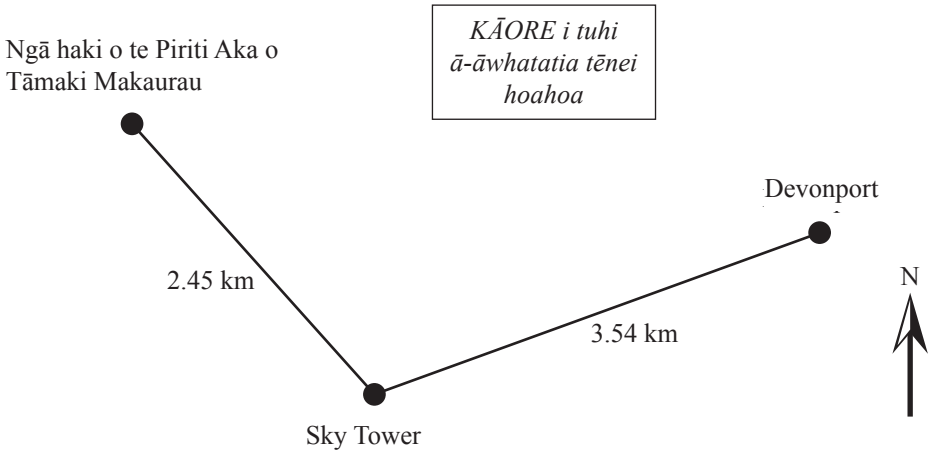


Find an expression for z in terms of y.

Justify your answer with clear geometric reasoning.

(b) Ko te ahunga o Devonport he 059° me te 3.54 km mai i te Sky Tower.

Ko te ahunga o ngā haki o te Piriti Aka o Tāmaki Makaurau he 322° me te 2.45 km mai i te Sky Tower.



Tātaihia te ahunga mai i ngā haki kei te Piriti Aka o Tāmaki Makarau ki Devonport.

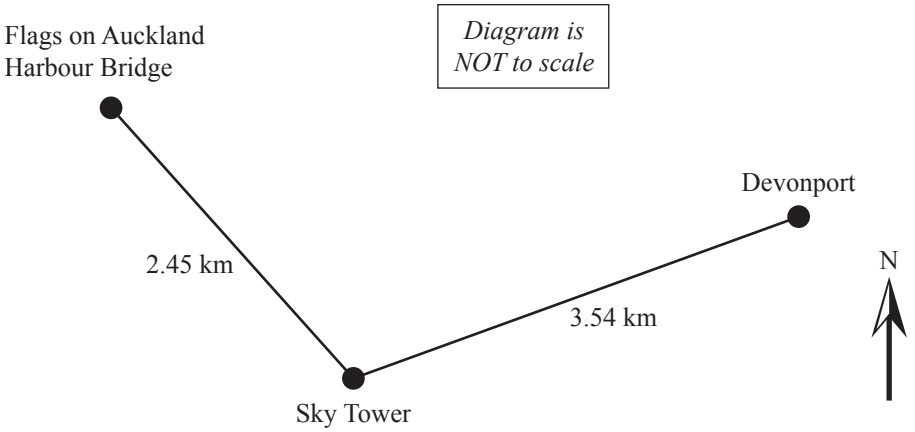
Āta whakaaturia ō mahinga.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(b) Devonport is at a bearing of 059° and 3.54 km from the Sky Tower.

The flags on the Auckland Harbour Bridge are at a bearing of 322° and 2.45 km from the Sky Tower.



Calculate the bearing from the flags on the Auckland Harbour Bridge to Devonport.

Show your working clearly.

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

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, 2016

91031 Apply geometric reasoning in solving problems

9.30 a.m. Thursday 17 November 2016
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 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.