91031M

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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, 2018

91031M Te whakahāngai whakaaro āhuahanga whaitake hei whakaoti rapanga

9.30 i te ata Rātū 20 Whiringa-ā-rangi 2018
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 2–23 kei roto i tēnei pukapuka, ā, 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

NGĀ PAPATĀKARO

MĀ TE KAIMĀKA ANAKE

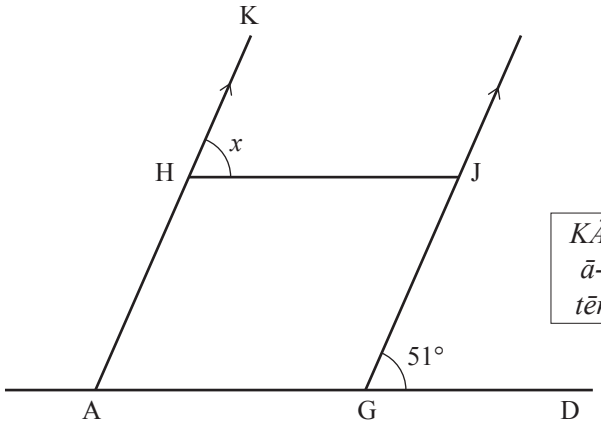
TŪMAHI TUATAHI

(a) E whakaaturia ana i raro he wāhanga anga pikipiki papatakāro.

He whakarara te AH me te GJ.

He huapae te AG me te HJ.

Koki JGD = 51°



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

(i) Tātaihia te rahi, *x*, o te koki JHK.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

PLAYGROUNDS

ASSESSOR'S USE ONLY

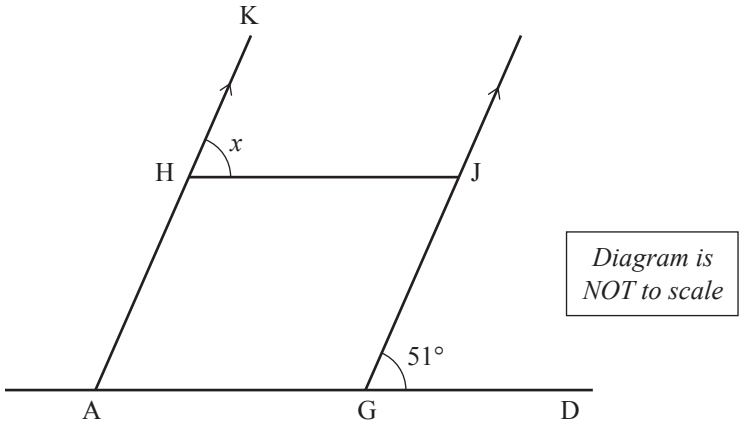
QUESTION ONE

(a) Part of a playground climbing frame is shown below.

AH and GJ are parallel.

AG and HJ are horizontal.

Angle JGD = 51°

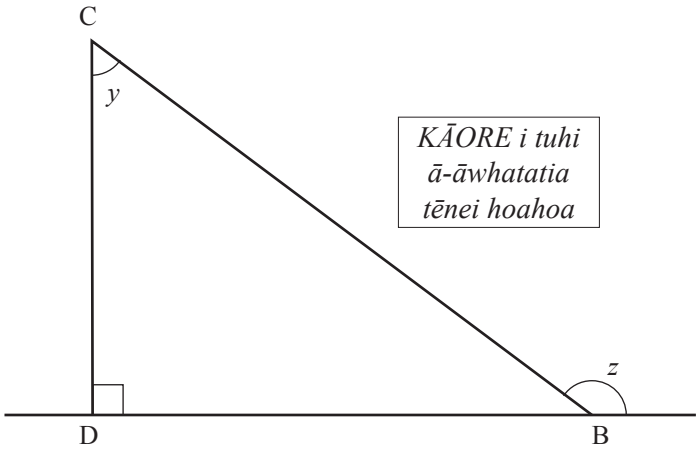


(i) Calculate the size, x, of angle JHK.

Justify your answer with clear geometric reasoning.

(ii) E whakaaturia ana tētahi atu wāhanga o tētahi anga pikipiki.

MĀ TE KAIMĀKA ANAKE

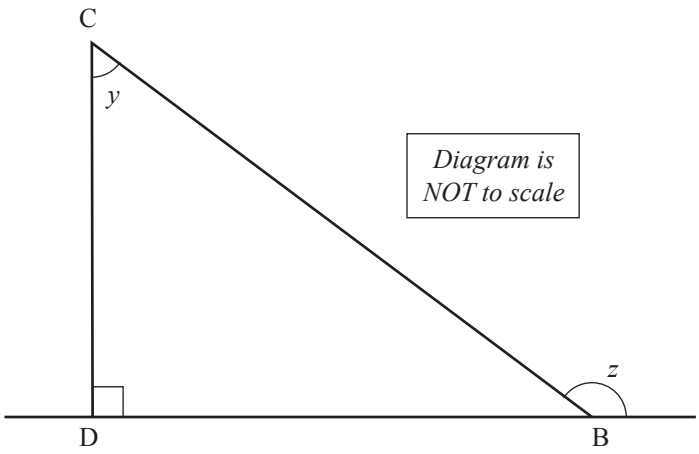


Tuhia te koki *z* e ai ki *y*.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

ASSESSOR'S USE ONLY

(ii) Another part of a climbing frame is shown below.



Write the angle z in terms of y.

Justify your answer with clear geometric reasoning.

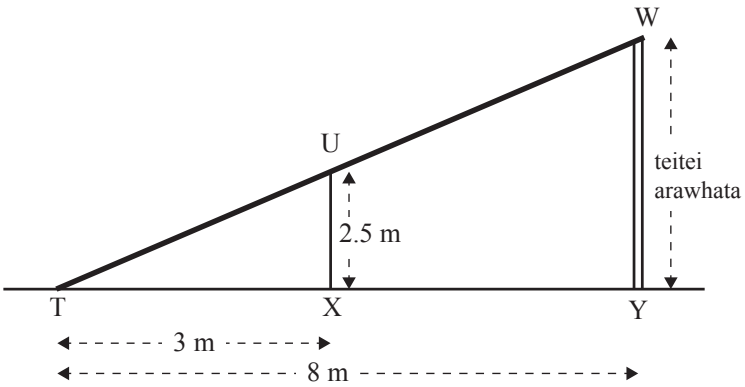
(b) Kua hangaia he retireti ki tētahi puna kaukau mai i tētahi anga tapatoru me te arawhata poutū.

He huapae a TY me te 8 m te roa.

He 3 m te roa o TX.

He 2.5 m te teitei o XU.

He poutoko poutū a XU me YW.



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

MĀ TE KAIMĀKA ANAKE

E kī ana ngā ture hou o te kaunihera ko te retireti me mātua:

- whai koki (UTX) iti iho i te 60° ki te wai, ME TE
- whai arawhata e iti iho te teitei i te 5 mita.

Me rapu mēnā e ū ana tēnei retireti ki ēnei ture e RUA o te kaunihera.

Whakaaturia ō mahinga katoa, ā, kia mārama te tuku i tō whakataunga.

ASSESSOR'S USE ONLY

(b) A slide into a pool is made from a triangular frame with a vertical ladder.

TY is horizontal and 8 m long.

TX is 3 m long.

XU is 2.5 m high.

XU and YW are both vertical supports.

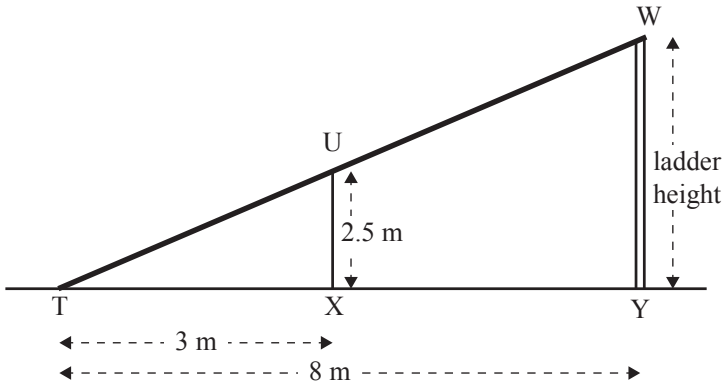


Diagram is NOT to scale

New council rules state that a slide must have:

- an angle (UTX) of less than 60° with the water AND
- a ladder height of less than 5 metres.

Find out whether or not this slide passes BOTH of these council regulations.

Show your working and state your final conclusion clearly.

(c) He mahere tā Madalyn mō tētahi papatākaro o te takiwā kei roto ko tētahi rua kirikiri (ko O), tētahi tārere (ko G), tētahi tiemi[1] (ko X) me te retireti (ko F).

MĀ TE KAIMĀKA ANAKE

Raki

KĀORE i tuhi ā-āwhatatia tēnei hoahoa

He **ōrite te tawhiti** o te tārere, tiemi, me te retireti mai i te pokapū o te rua kirikiri.

He 130° te ahunga o te retireti mai i te rua kirikiri.

He 285° te ahunga o te tiemi mai i te rua kirikiri.

He 350° te ahunga o te tārere mai i te rua kirikiri.

I te tū a Madalyn i te tiemi me te anga atu ki te tārere.

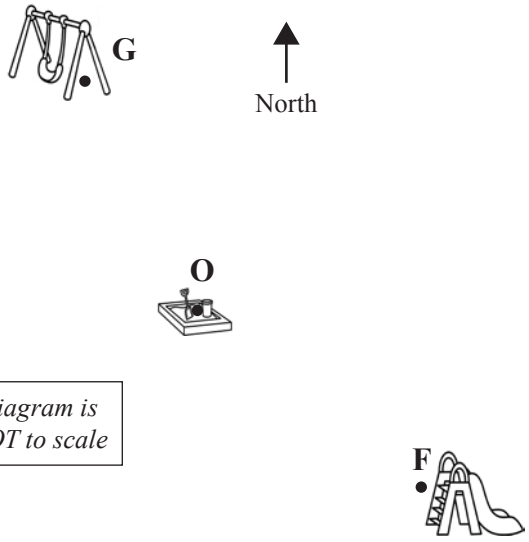
He aha te koki iti rawa ka hurihia e ia kia anga atu ia ki te retireti?

Whakaaturia ō mahinga katoa me te whakamahi i te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

[1] tīeke

ASSESSOR'S USE ONLY

(c) Madalyn has a plan of a local playground which has a sandpit (labelled O), swing (labelled G), seesaw (labelled X), and slide (labelled F).



The swing, seesaw, and slide are all the **same distance** from the centre of the sandpit.

The slide is on a bearing of 130° from the sandpit.

The seesaw is on a bearing of 285° from the sandpit.

The swing is on a bearing of 350° from the sandpit.

Madalyn was standing at the seesaw and facing the swing.

What is the smallest angle she would turn to face the slide?

Show your working and justify your answer with clear geometric reasoning.

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

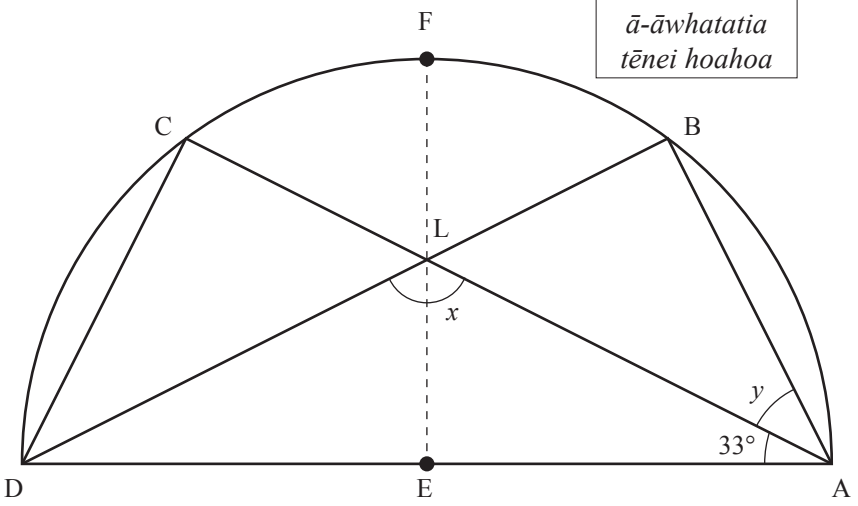
(a) He mea hanga he anga pikipiki mai i te porohita haurua me ngā tapatoru.

Kua hangarite te anga pikipiki huri noa i te FE.

Koki CAD = 33°

□□ AD te whitianga o te porohita haurua.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa



(i) Tātaihia te rahi, *x*, o te koki ALD.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

(ii) Tātaihia te rahi, *y*, o te koki BAC.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

QUESTION TWO

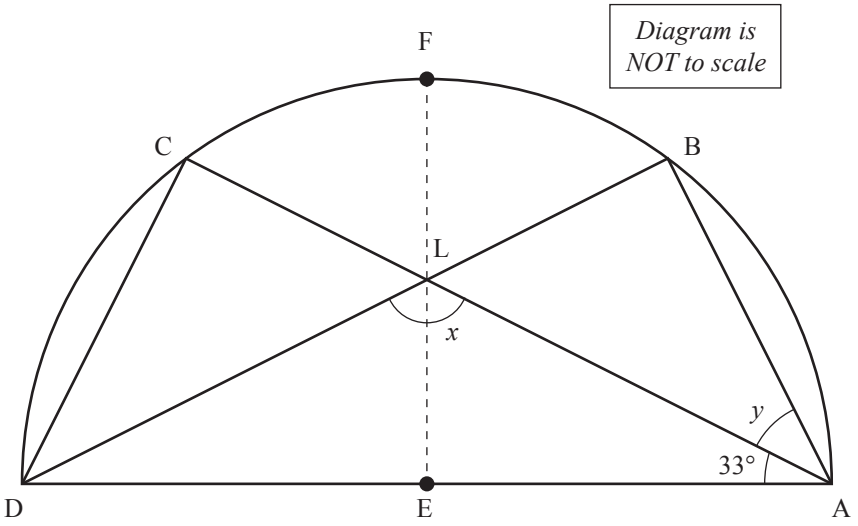
ASSESSOR'S USE ONLY

(a) A climbing frame is made from a semi-circle and triangles.

The climbing frame is symmetrical about FE.

Angle CAD = 33°

AD is the diameter of the semi-circle.



(i) Calculate the size, x, of the angle ALD.

Justify your answer with clear geometric reasoning.

(ii) Calculate the size, y, of angle BAC.

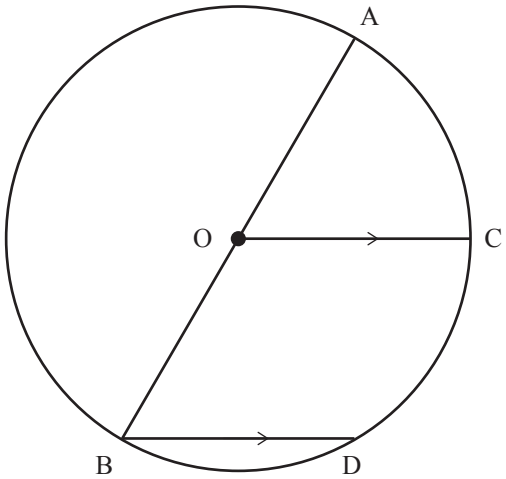
Justify your answer with clear geometric reasoning.

(b) Kei te hoahoatia he tāpare pikipiki porohita anō.

Ko O te pū o te porohita.

He whakarara ngā rārangi OC me te BD.

OC = BD



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

Hāponotia ka ōrite te roa o te rārangi torotika AC ki te roa o te rārangi torotika OD.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(b) Another circular climbing frame is being designed.

Point O is the centre of the circle.

Lines OC and BD are parallel.

OC = BD

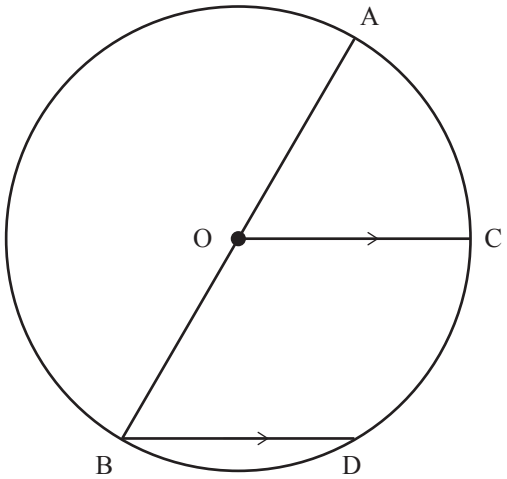


Diagram is NOT to scale

Prove that the length of the straight line AC equals the length of the straight line OD.

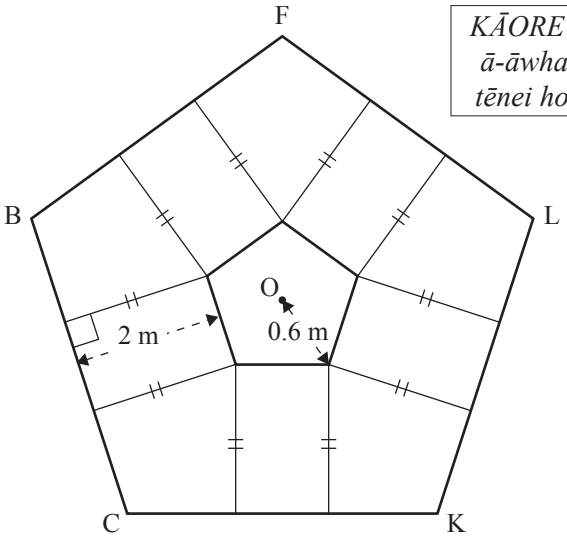
Justify your answer with clear geometric reasoning.

(c) Kei te hiahia tētahi kaihoahoa ki te waihanga i tētahi anga me tētahi taparima rite iti iho i roto i tētahi taparima rite nui ake.

MĀ TE KAIMĀKA ANAKE

Ko te pūwāhi O ko:
- te pū o ngā taparima e rua
- 0.6 mita mai i te akitu o te taparima iti ake.

Ko ngā pou mai i ngā akitu o te taparima iti ake ki te taha o te taparima nui ake he:
- 2 mita te roa
- kia koki hāngai ki ngā taha o te taparima nui ake.



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

Tātaihia te roa o FL, tētahi taha o te taparima rite nui ake.

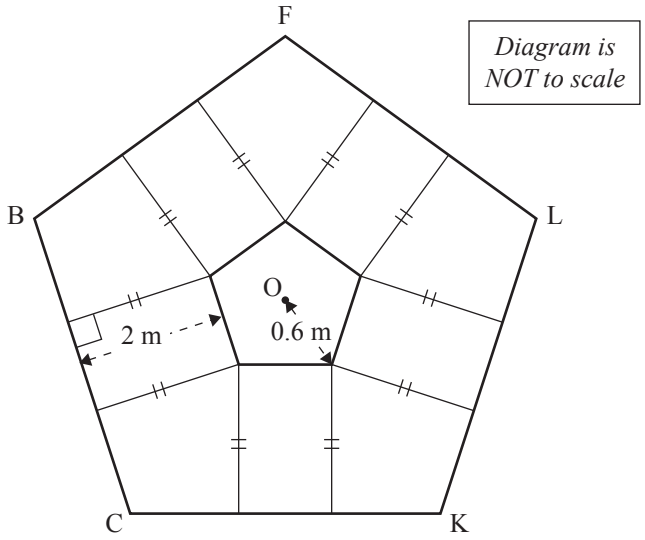
Āta whakaaturia ō mahinga.

ASSESSOR'S USE ONLY

(c) A designer wants to create a frame with a small regular pentagon inside a larger regular pentagon.

Point O is:
- the centre of both pentagons
- 0.6 metres from the vertex of the smaller pentagon.

Poles from the vertices of the smaller pentagon to the side of the larger pentagon are:
- 2 metres long
- at right angles to the sides of the larger pentagon.



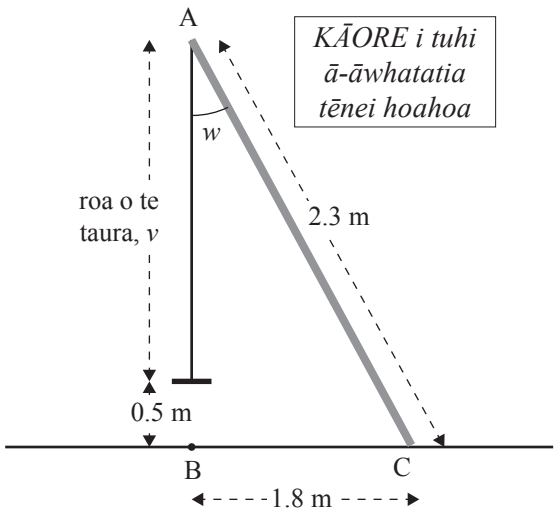
Calculate the length of FL, one side of the larger regular pentagon.

Show your working clearly.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) Kua hangaia he tārere mai i tētahi pou 2.3 m te roa, ka whakatītahatia mai i te whenua.
He 0.5 m mai i te papa te tūru tārere.
He rārangi huapae a BC, 1.8 m te roa.
He poutū a AB.



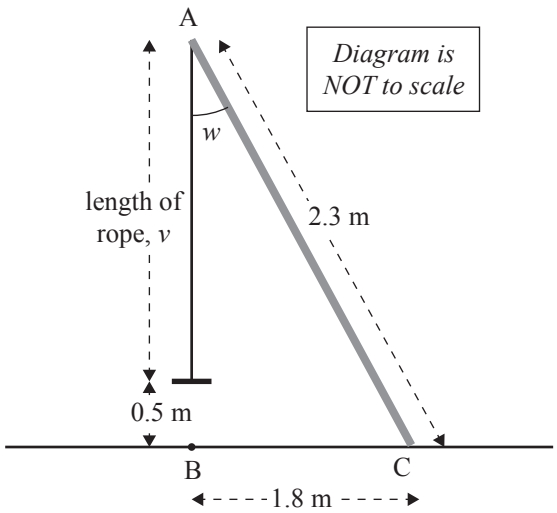
(i) Tātaihia te rahi, *w*, o te koki CAB
Āta whakaaturia ō mahinga.

(ii) Tātaihia te roa o te taura, *v*, e pupuri ana i te tūru tārere.
Āta whakaaturia ō mahinga.

QUESTION THREE

ASSESSOR'S USE ONLY

(a) A swing is made from one pole 2.3 m long, placed at an angle in the ground.
The swing seat is 0.5 m off the ground.
BC is a horizontal line of length 1.8 m.
AB is vertical.



(i) Calculate the size, w, of angle CAB.
Show your working clearly.

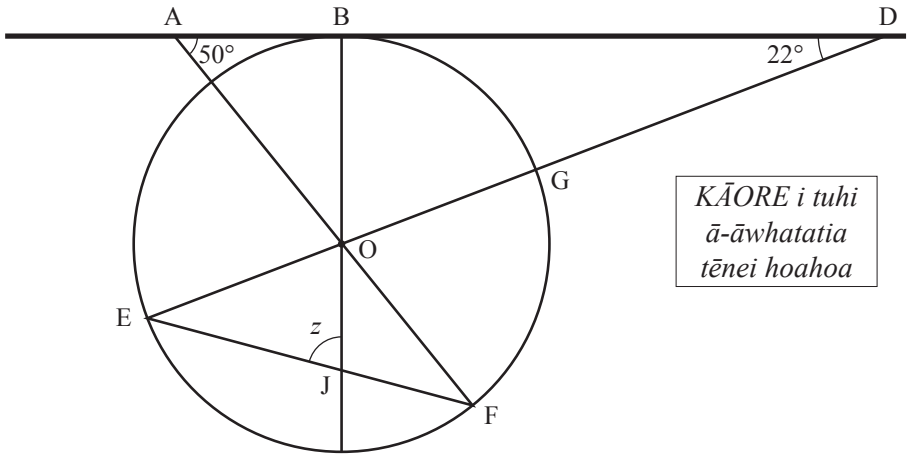
(ii) Calculate the length of the rope, v, holding the swing seat.
Show your working clearly.

(b) Kua iri tētahi tarawhiti porohita me ngā waea e rere ana i roto.

Ko O te pū o te porohita.

Koki OAB = 50°

Koki ODB = 22°



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

Tātaihia te rahi, *z*, o te koki EJO.

Whakamahia te whakaaro āhuahanga mārama hei parahau i tāu tuhinga.

MĀ TE KAIMĀKA ANAKE

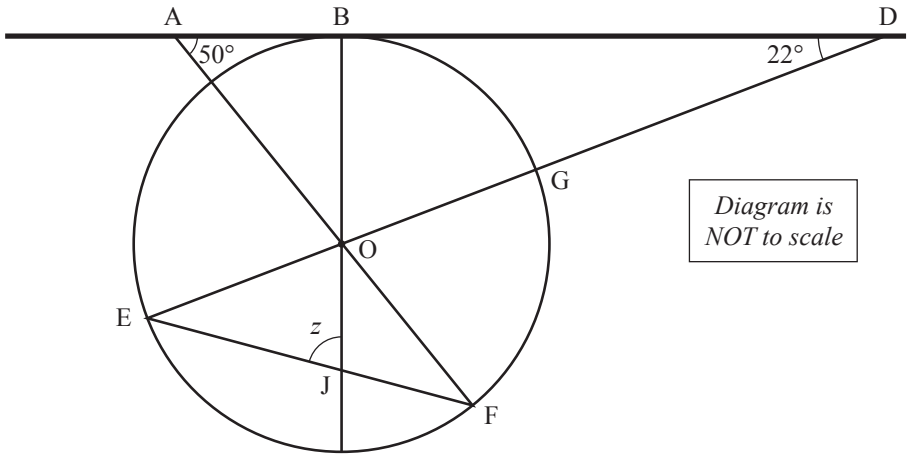
ASSESSOR'S USE ONLY

(b) A circular hoop is hung with wires running through it.

O is the centre of the circular hoop.

Angle OAB = 50°

Angle ODB = 22°



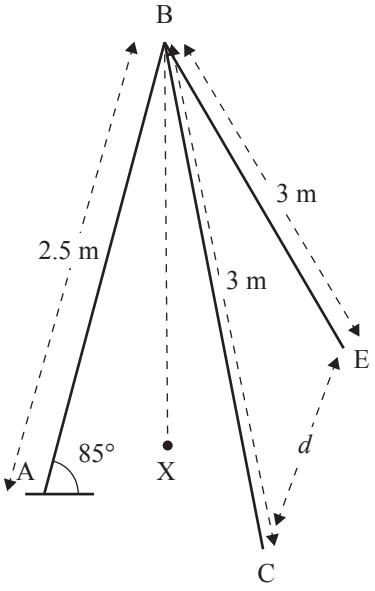
Calculate the size, z, of angle EJO.

Justify your answer with clear geometric reasoning.

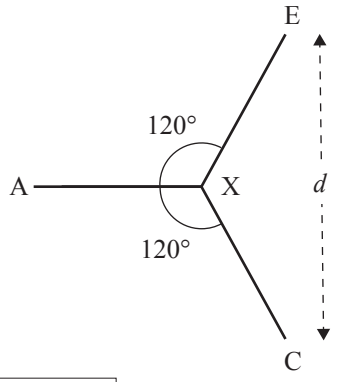
(c) He anga taha-toru a ABCE, ā, i hangaia e ai ki ngā kōrero i raro:

- He 2.5 m te roa o te pou AB i runga ake i te whenua, ā, ka uru ki te whenua i te 85°.
- He 3 m te roa o ngā pou CB me EB i runga ake i te whenua.
- He ōrite te wehenga o ngā pou e toru i te 120° hurinoa i te pokapū X (kei raro tonu i te pūwāhi B).

Tirohanga kōtaha



Tirohanga mai i runga



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

Tātaihia a *d*, te tawhiti i waenga i a C me E i te papa.

Āta whakaaturia ō mahinga.

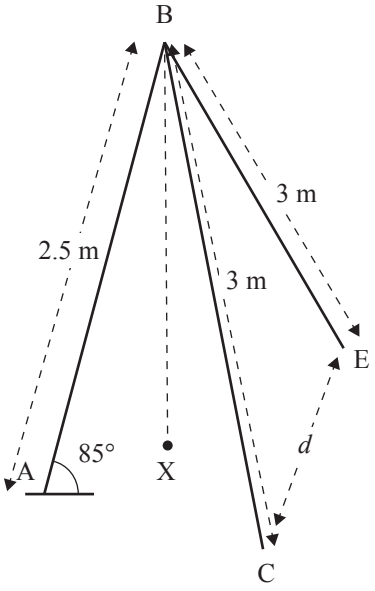
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

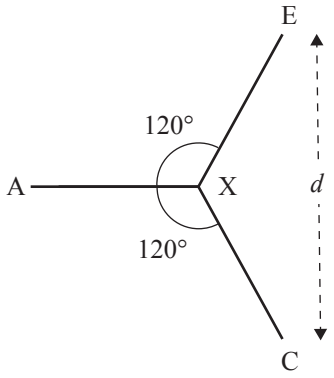
(c) ABCE is a three-sided frame and it is built as stated below:

- Pole AB is 2.5 m long above the ground and it enters the ground at 85°.
- Poles CB and EB are both 3 m long above the ground.
- The three poles are equally spaced out at 120° about the central point X (which is directly below point B).

Side view



Top view



Diagrams are NOT to scale

Calculate *d*, the distance between C and E at ground level.

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, 2018

91031 Apply geometric reasoning in solving problems

9.30 a.m. Tuesday 20 November 2018
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 2–23 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.