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90940M

909405

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Pūtaiao, Kaupae 1, 2014

90940M Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa

9.30 i te ata Rāhina 10 Whiringa-ā-rangi 2014
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o te pūhanga manawa.

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.

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 2–29 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

MĀ TE KAIMĀKA ANAKE

Tērā pea ka whai hua ēnei tikanga tātai ki a koe.

$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A} \qquad \Delta E_{\text{p}} = mg\Delta h$$

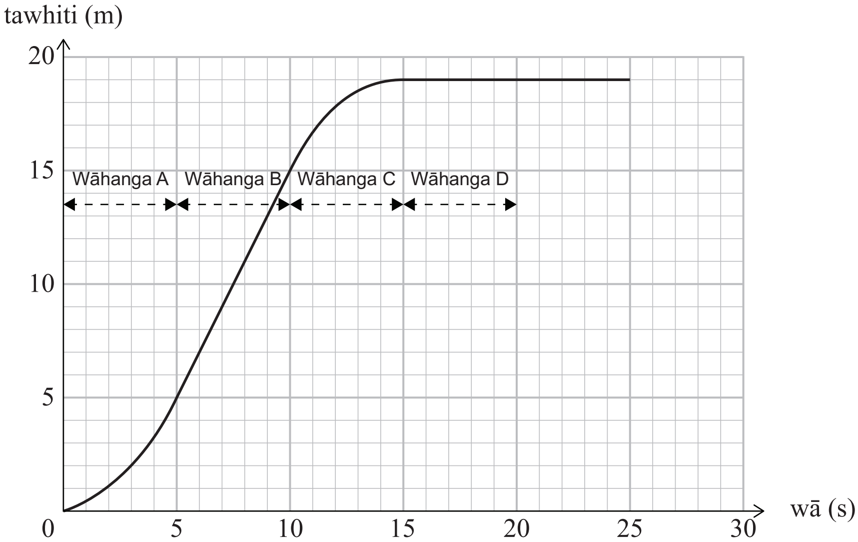
$$E_{\text{k}} = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

PĀTAI TUATAHI: EKE PAHIKARA

E 99 kg te papatipu tōpū o te kaieke pahikara me tōna pahikara.

(a) Whakaaturia ko te taumaha tōpū ko te 990 N.

(b) I tuhia te ara o te kaieke pahikara ki te kauwhata tawhiti / wā i raro nei.



(i) Whakaahuahia te nekehanga o te kaieke pahikara i ia wāhanga o A, B, C, me D.
Kāore te tātaihanga e hiahiatia.

Wāhanga A:

Wāhanga B:

MĀ TE KAIMĀKA ANAKE

Wāhanga C:

Wāhanga D:

(ii) Tātaihia te tere o te kaieke pahikara i te Wāhanga B.

(c) Ka hīkina ake he pahikara he 20 kg te papatipu ki runga whatanga[1] 1.5 mita te teitei. He 3 hēkona te roa ki te hiki i te pahikara.

Tātaihia te ngoi e hiahiatia ana ki te hiki i te pahikara ki runga i te whatanga.

I mua i tō tātaitai i te ngoi, me:

- whakatau e koe te tōpana taumaha o te pahikara
- tātai te mahi ka oti ki te hiki i te pahikara.

[1] tarenga

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You may find the following formulae useful.

$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A} \qquad \Delta E_{\text{p}} = mg\Delta h$$

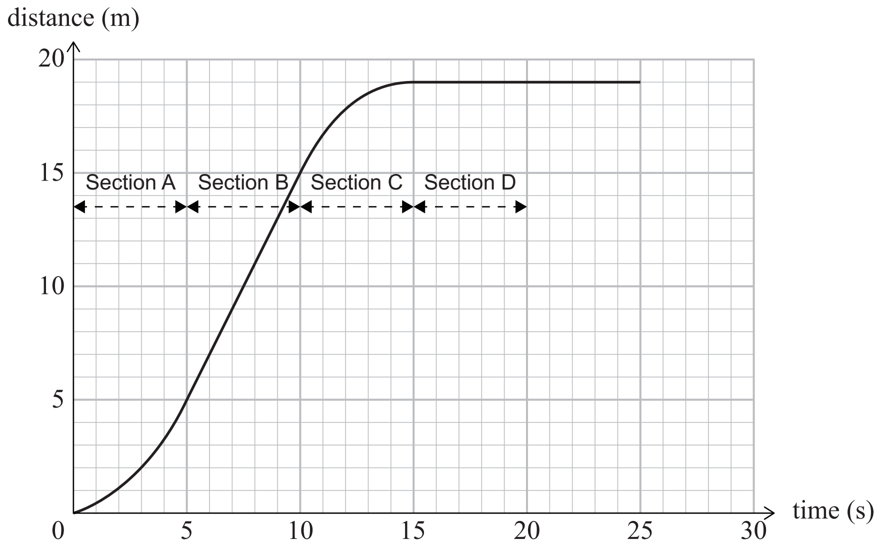
$$E_{\text{k}} = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10\ \text{N kg}^{-1} \qquad P = \frac{W}{t}$$

QUESTION ONE: CYCLING

A cyclist and bike have a combined mass of 99 kg.

(a) Show that the combined weight is 990 N.

(b) The cyclist's journey was plotted on the distance / time graph below.



(i) Describe the motion of the cyclist in each of sections A, B, C, and D.

No calculations are required.

Section A:

Section B:

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Section C:

Section D:

(ii) Calculate the cyclist's speed during Section B.

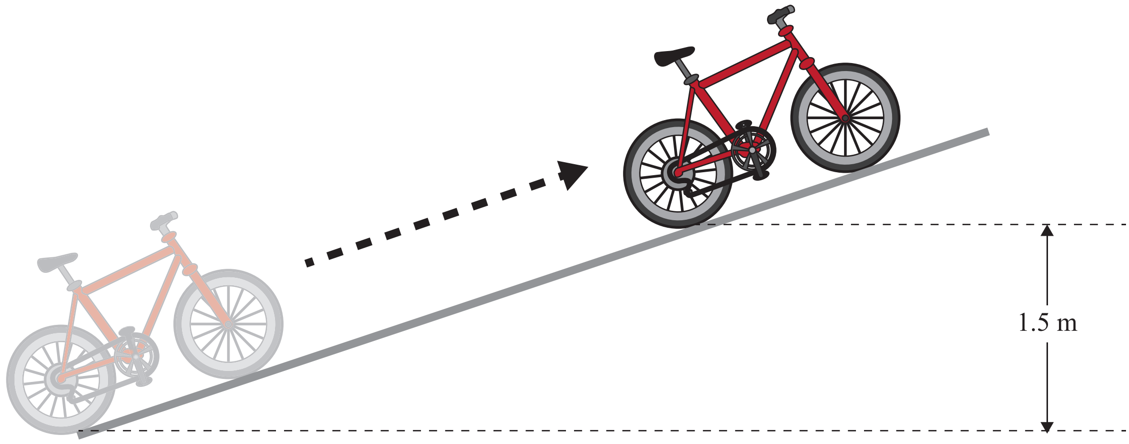
(c) A bike with a mass of 20 kg is lifted onto a shelf that is 1.5 metres high. It takes 3 seconds to lift the bike.

Calculate the power required to lift the bike onto the shelf.

Before you calculate the power, you will need to:

- determine the weight force of the bike
- calculate the work done in lifting the bike.

(d) I pana haeretia e te tangata taua pahikara anō ki runga rōnaki kia tae anō ki te 1.5 m te teitei. He roa ake te wā ki te mahi i tēnei tēnā ki te hiki i te pahikara i te wāhanga (c).

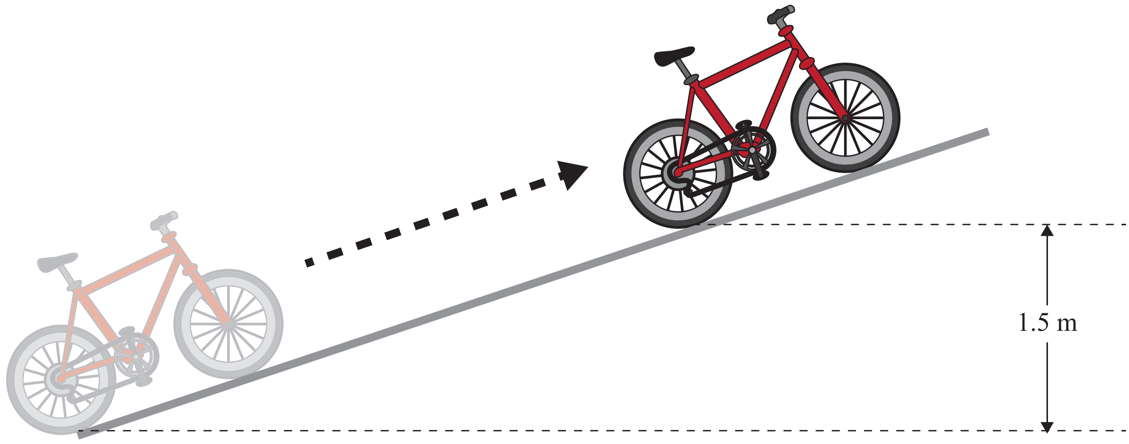


Whakamāramahia mai mēnā he nui ake, he iti ake rānei te ngoi e hiahiatia ana ki te pana i te pahikara ki runga rōnaki tēnā ki te hiki tika atu ki taua teitei anō.

I tō whakautu me kōrero koe mō te tōpana me te pūngao:

MĀ TE KAIMĀKA ANAKE

(d) A person pushed the same bike up a ramp so that it was also at a height of 1.5 m. It took them a longer time to do this than lifting the bike in part (c).



Explain whether the power needed to push the bike up the ramp is more or less than when it is lifted straight up to the same height.

In your answer you should refer to force and energy.

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PĀTAI TUARUA: TAONGA Ā-WHARE

E whakaaturia ana he nohoanga (15.0 kg) me te tūru waewae (15.0 kg) i raro nei.

E whā ngā waewae o te nohoanga e pā ana ki te papa, ēngari kāore he waewae o te pūtake o te tūru waewae ka mutu kei te pā katoa ki te papa.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

http://st.houzz.com/simgs/e0217bad0e26c829_4-5482/modern-armchairs.jpg

(a) He 6 hēkona te roa ki te pana i te tūru waewae e 8.0 m ki tētahi taha o te rūma.

Tātaihia te tere toharite o te tūru waewae i te wā e panahia ana.

(b) I panahia haerehia te tūru waewae i te whare.

Tohua te kōrero tika i raro nei ka whakamārama i tō kōwhiringa.

A. He māmā ake ki te pana haere i te tūru waewae i te whāriki tēnā i te papa rākau.

B. He māmā ake ki te pana haere i te tūru waewae i te papa rākau tēnā i te whāriki.

Tuhia te reta o te kōrero tika: ☐

Whakamāramahia mai he aha koe i tohu ai i tēnei kōrero.

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QUESTION TWO: FURNITURE

A chair (15.0 kg) and footstool (15.0 kg) are shown below.

The chair has four legs in contact with the floor, whereas the base of the footstool does not have legs and is entirely in contact with the floor.

For copyright reasons, this resource cannot be reproduced here.

http://st.houzz.com/simgs/e0217bad0e26c829_4-5482/modern-armchairs.jpg

(a) It took 6 seconds to push the footstool a distance of 8.0 m across a room.

Calculate the average speed of the footstool as it is pushed.

(b) The footstool was pushed around the house.

Select the correct statement below and then explain your choice.

A. It is easier to push the footstool across carpet than across a wooden floor.

B. It is easier to push the footstool across a wooden floor than across carpet.

Write the letter of the correct statement: ☐

Explain why you have selected this statement.

MĀ TE KAIMĀKA ANAKE

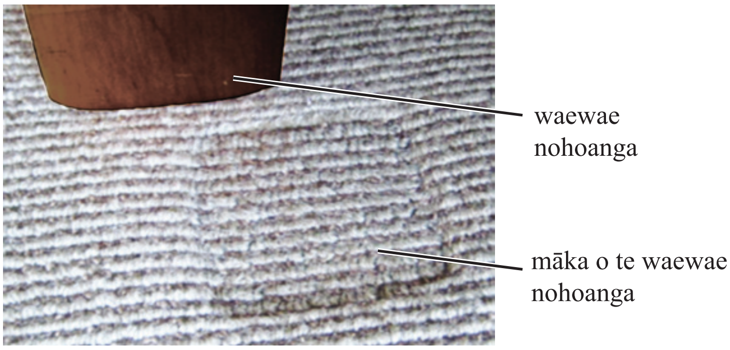
(c) Ko te horahanga o ia waewae o te nohoanga e pā ana ki te papa he 0.001 m^2.

Tātaihia te pēhanga o te nohoanga (15.0 kg te papatipu) ki runga i te whāriki.

I roto i tō whakautu me whakatau:

- te horahanga o ngā waewae o te nohoanga e pā ana ki te papa
- te tōpana taumaha o te nohoanga
- te pēhanga e tau ana ki te whāriki.

(d) I noho he tangata ki te nohoanga kātahi ia ka noho anō ki te tūru waewae mō te wā ōrite. I kitea he hōhonu ake ngā māka o ngā waewae nohoanga i roto i te whāriki tēnā i te tūru waewae, ahakoa he ōrite te papatipu o te nohoanga me te tūru waewae.



Whakamāramahia mai ēnei rerekētanga e ai ki te pēhanga, te tōpana, me te horahanga mata.

He wāhi anō mō tō whakautu ki tēnei pātai kei te whārangi 12.

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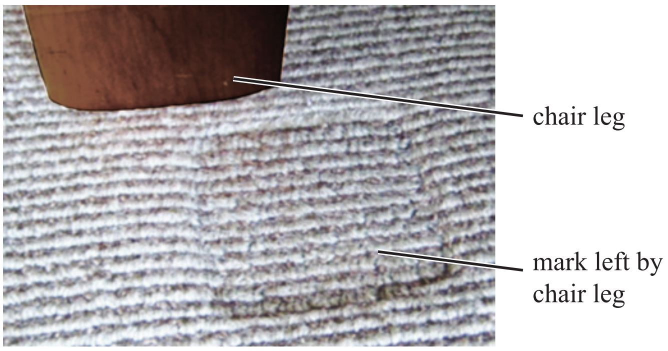
(c) The area of each chair leg in contact with the floor is 0.001 m^2.

Calculate the pressure that the chair (mass 15.0 kg) exerts on the carpet.

In your answer you must determine:

- the area of the chair legs in contact with the floor
- the weight force of the chair
- the pressure acting on the carpet.

(d) A person sat on the chair and then sat on the footstool for the same period of time. They noticed that the chair legs left deeper marks in the carpet than the footstool did, although both the chair and footstool have the same mass.



Explain these differences in terms of pressure, force, and surface area.

There is more space for your answer to this question on page 13.

MĀ TE KAIMĀKA ANAKE

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MĀ TE KAIMĀKA ANAKE

PĀTAI TUATORU: HANGA WHARE

I te wā i hangaia tētahi whare, i hīkina ake te tāhuhu roa kia tau mā te wakahiki.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

http://www.countyofplumas.com/images/pages/N632//lifting%20beam.jpg

(a) Tātaihia te mahi ka oti i te hiki i te tāhuhu ko tōna taumaha he 6000 N ki te 50 m te tawhiti.

(b) Whakamāramahia he aha i kore ai e oti he mahi i te wā e tāiri[2] ana me te kore nekeneke.

[2] tārewa

QUESTION THREE: CONSTRUCTION

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During the construction of a building, a long beam was lifted into place using a crane.

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http://www.countyofplumas.com/images/pages/N632//lifting%20beam.jpg

(a) Calculate the work done in lifting the beam with a weight of 6000 N through a distance of 50 m.

(b) Explain why there is no work being done when the beam is hanging in the air without moving.

MĀ TE KAIMĀKA ANAKE

(c) I te hiki papa tētahi atu wakahiki. I whati te taura, ā, he 12 m te takahanga atu o ngā papa 150 kg ki te whenua.

E 15 000 J te pūngao neke o ngā papa i mua tonu i te taunga atu ki te whenua i raro.

He rerekē tēnei mai i te nui o te pūngao i te wā e tāiri ana ngā papa i te wakahiki.

Whakamāramahia he aha i rerekē ai te pūngao o te papa i a ia e tāiri ana i te wakahiki ki te pūngao i mua tonu i te taunga atu ki te whenua.

http://theagregator.com/wp-content/uploads/2013/09/crane1.jpg

I tō whakautu, me:

- whakaingoa te momo pūngao kei ngā papa i te wā e tāiri ana i te wakahiki
- tātai te nui o te pūngao o ngā papa i te wā e tāiri ana i te wakahiki
- tātai te rerekētanga i waenga i te pūngao neke o ngā papa i mua tonu i te taunga atu ki te whenua me te pūngao o ngā papa i te wā e tāiri ana i te wakahiki
- parahau te rerekētanga o te pūngao o ngā papa i te wā e tāiri ana i te wakahiki me te wā i mua tonu i te taunga atu ki te whenua.

He wāhi anō mō tō whakautu ki tēnei pātai kei te whārangi 18.

(c) Another crane was lifting wood. The cable broke, and 150 kg of wood fell 12 m to the ground below.

The wood had 15 000 J of kinetic energy just before it landed on the ground below.

This was different from the amount of energy the wood had when it was hanging from the crane.

Explain why there is a difference in the energy the wood had when it was hanging from the crane compared to just before it hit the ground.

For copyright reasons, this resource cannot be reproduced here.

http://theagregator.com/wp-content/uploads/2013/09/crane1.jpg

In your answer you should:

- name the type of energy the wood had when it was hanging from the crane
- calculate how much energy the wood had when it was hanging from the crane
- calculate the difference between the kinetic energy of the wood just before hitting the ground and the energy the wood had when it was hanging from the crane
- justify the difference in energy of the wood when it was hanging from the crane and then just before it hit the ground.

There is more space for your answer to this question on page 19.

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MĀ TE KAIMĀKA ANAKE

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MĀ TE KAIMĀKA ANAKE

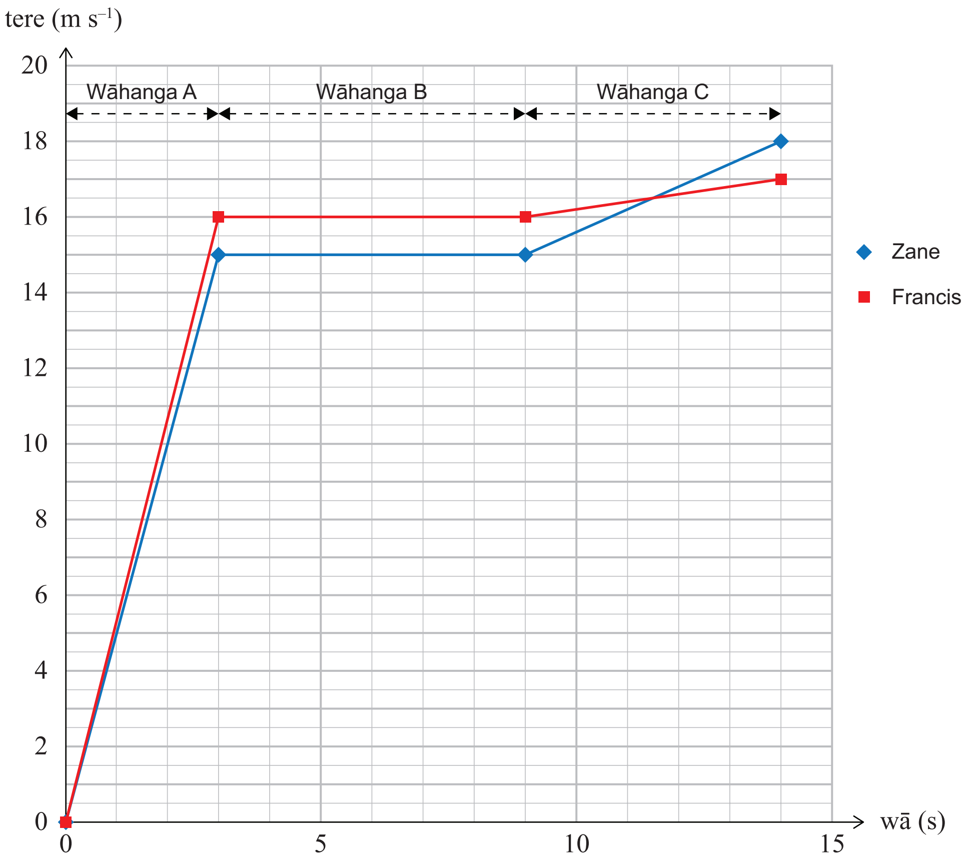
PĀTAI TUAWHĀ: TE WHAKATAETAE KĀTA TERE

E rua ngā kāta tere e rēhi ana i te papa rēhi.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

http://static2.stuff.co.nz/1377664598/017/9098017.jpg

Kei raro te kauwhata tere / wā mō ia kāta tere. E whakaaturia ana te kauwhata o Zane ki te kikorangi, ā, ko tō Francis ki te whero.



(a) Tātaihia te whakaterenga o Zane i roto i ngā hēkona tuatahi e 3.

MĀ TE KAIMĀKA ANAKE

(b) (i) Ki te whakaahua i raro, tātuhia ka tapa i ngā tōpana KATOA e pā ana ki te kāta tere o Zane i te **Wāhanga B** o te kauwhata. He papatahi me te huapae te papa rēhi.

Me mātua whakaatu ō tapanga i ngā rahinga o ia tōpana.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

www.kartsport.org.nz/Images/News/13GoProKSNZNatsYamJnrMarcusArmstrong-1.jpg

(ii) Matapakihia ngā tōpana e pā ana ki te kāta tere o Zane e taea ai te whakamārama i te nekehanga i te Wāhanga B o te kauwhata.

Ka haere tonu te Wāhanga Tuawhā i te whārangi 24.

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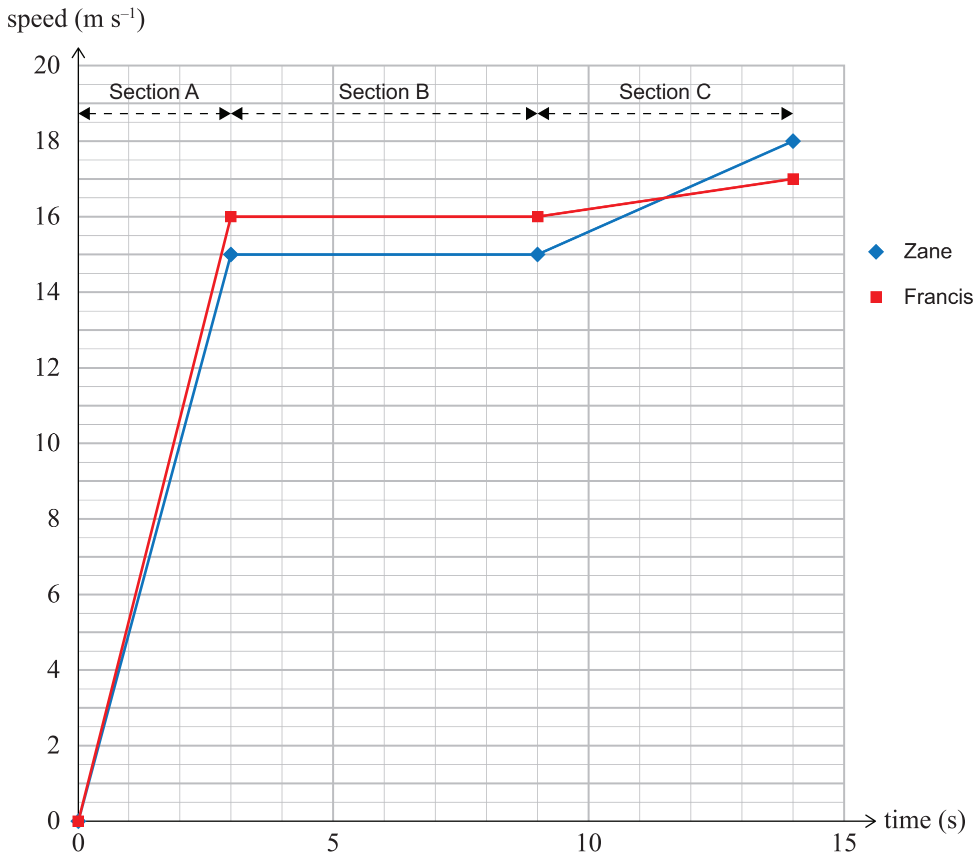
QUESTION FOUR: GO-CART RACING

Two go-carts were racing on a track.

http://static2.stuff.co.nz/1377664598/017/9098017.jpg

A speed / time graph is shown below for each go-cart. Zane's graph is shown in blue, and Francis's in red.



(a) Calculate the acceleration of Zane in the first 3 seconds.

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(b) (i) On the photo below, draw and label ALL the forces acting on Zane's go-cart in **Section B** of the graph. The track is flat and horizontal.

Ensure that your labels show the relative sizes of the forces.

For copyright reasons, this resource cannot be reproduced here.

www.kartsport.org.nz/Images/News/13GoProKSNZNatsYamJnrMarcusArmstrong-1.jpg

(ii) Discuss the forces that are acting on Zane's go-cart to explain its motion in Section B of the graph.

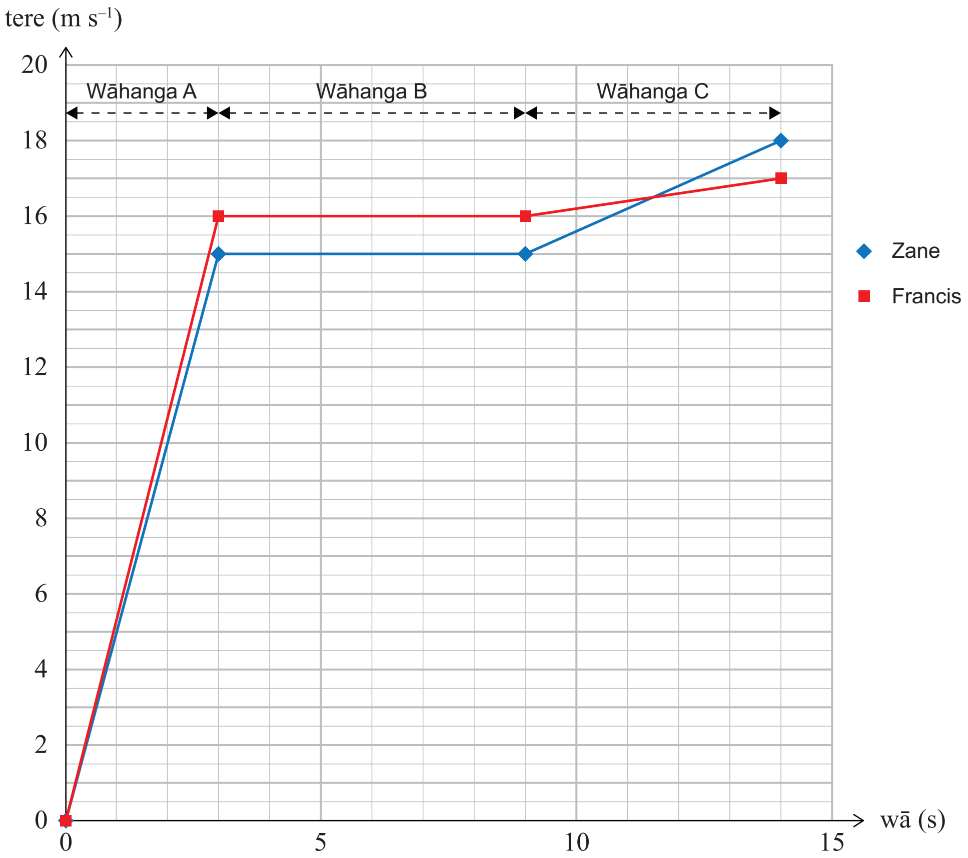
Question Four continues on page 26.

(c) Whakamāramahia ko tēhea te kāta tere i tuatahi te huri 200 m i te papa rēhi.

I tō whakautu, me:

- whakamahi ngā mōhiohio o te kauwhata
- whakaatu ngā mahinga katoa mō ngā tātaihanga
- whakataurite te tawhiti o Zane rāua ko Francis i te paunga o te 14 hēkona.

Te kauwhata mai i te whārangi 20



MĀ TE KAIMĀKA ANAKE

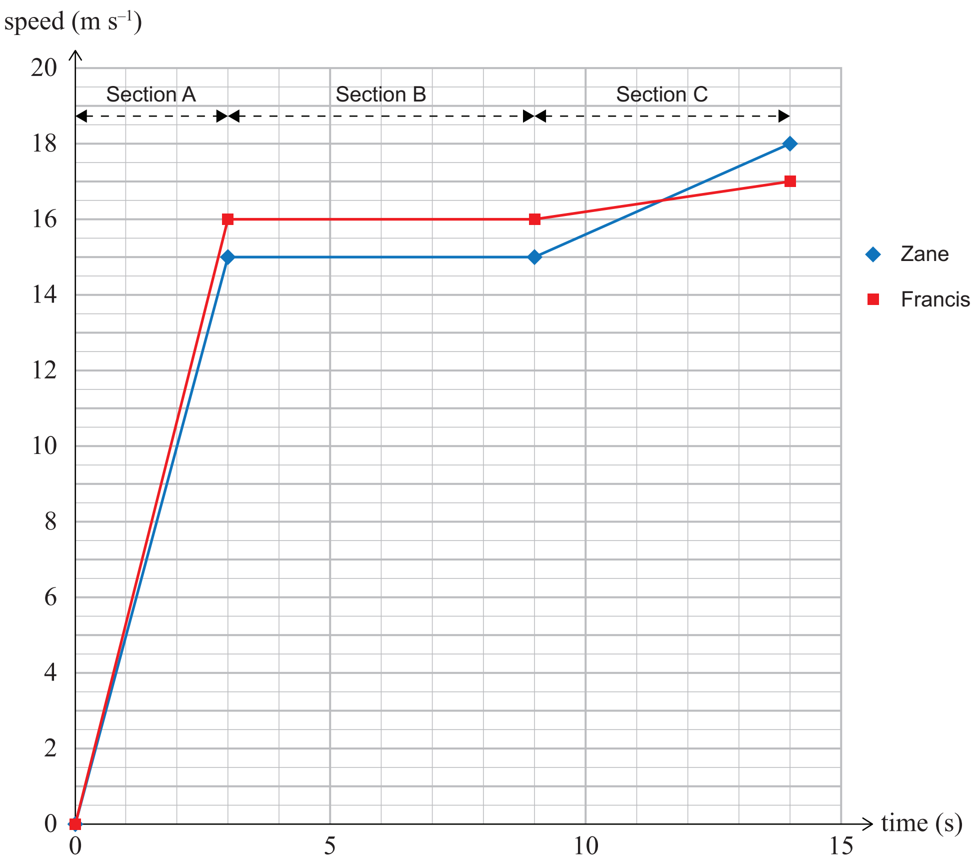
ASSESSOR'S USE ONLY

(c) Explain which go-cart travelled 200 m around the track first.

In your answer you should:

- use the information in the graph
- show all working for the calculations
- compare the distances travelled by Zane and Francis by the end of 14 s.

Graph from page 21



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

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

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English translation of the wording on the front cover

Level 1 Science, 2014

90940 Demonstrate understanding of aspects of mechanics

9.30 am Monday 10 November 2014
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of mechanics.	Demonstrate in-depth understanding of aspects of mechanics.	Demonstrate comprehensive understanding of aspects of mechanics.

90940M

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.

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 2–29 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.