See back cover for an English translation of this cover

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90940M

909405

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!

Tohua tēnei pouaka mēnā KĀORE koe i tuhituhi i roto i tēnei pukapuka

Pūtaiao, Kaupae 1, 2021

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

Ngā 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 kei tō pepa whakauru ki te tau kei runga ake nei.

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

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te wāhi wātea kei muri i te pukapuka nei.

Tirohia mehemea kei roto nei ngā whārangi 2–19 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

Kaua e tuhi ki roto i tētahi wāhi kauruku whakahāngai (✂). Ka tapahia pea tēnei wāhi ina mākahia te pukapuka.

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

Tērā pea ka whai hua ēnei tātai ki a koe.

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

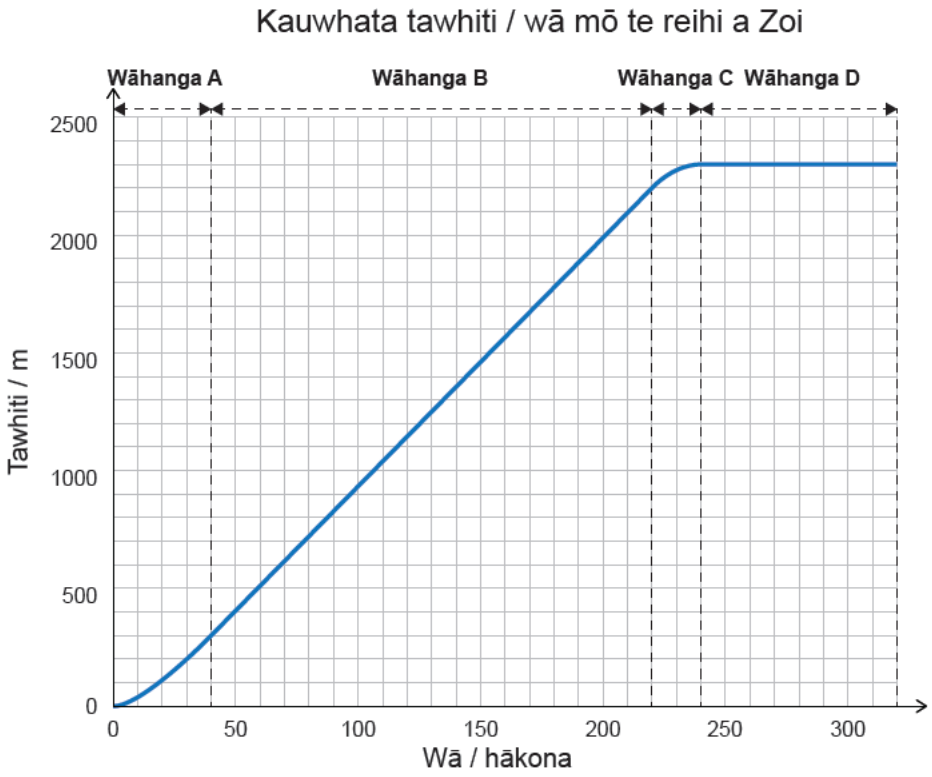
$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

TŪMAHI TUATAHI: PAPARETI

Kei te reihi papareti a Zoi i ngā maunga.

Mātāpuna: www.odt.co nz/sport/winter-olympics/wanaka-snowboarder-misses-out-medal

Ka whakaatu te kauwhata tawhiti-wā i te reihi a Zoi.



(a) Whakaahuatia te nekehanga a Zoi i ngā wāhanga e whā.

Wāhanga A: _____

Wāhanga B: _____

Wāhanga C: _____

Wāhanga D: _____

(b) E hia te roa o te katoa o te haerenga a Zoi?

(c) Tātaihia te tere o Zoi i te Wāhanga B.

(d) He 3000 m te roa o tētahi atu reihi. He 5 m s^{-1} te tere toharite o Zoi.

Tātaihia te wā e oti ai i a ia te reihi.

(e) Kia hoki atu ia ki tōna motukā, ka mau hū hukapapa a Zoi.

Ko te horahanga mata o tētahi hū hukapapa he 0.15 m^2, ā, ko te horahanga mata o tētahi hū hīkoi he 0.03 m^2. He 570 N te taumaha o Zoi.

Mātāpuna: www.piratesofpowder.com/best-snowshoes/

Tātaihia te pēhanga ka pā ki te hukapapa mō:

Tētahi hū hukapapa:

Tētahi hū hīkoi:

Whakamāramahia mai te take he māmā ake te hīkoi i roto i te hukapapa mā ngā hū hukapapa.

You may find the following formulae useful.

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

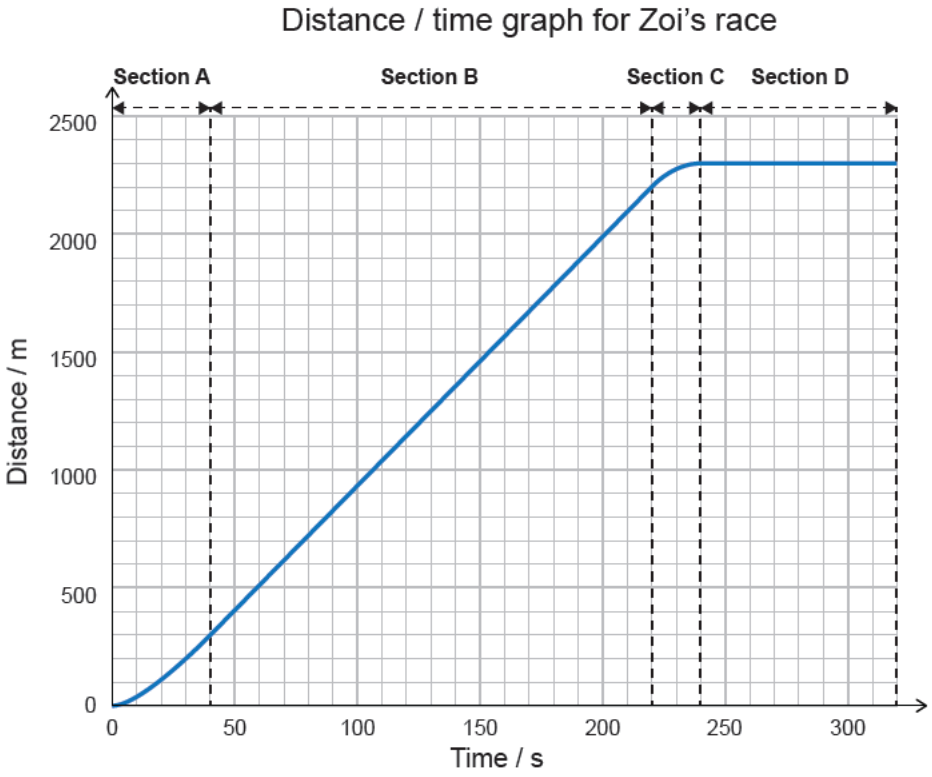
$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

QUESTION ONE: SNOWBOARDING

Zoi is snowboard racing in the mountains.

Source: www.odt.co nz/sport/winter-olympics/wanaka-snowboarder-misses-out-medal

The distance-time graph below shows Zoi's race.



(a) Describe the motion of Zoi in the four sections.

Section A: _____

Section B: _____

Section C: _____

Section D: _____

(b) How long does Zoi's total journey take?

(c) Calculate the speed of Zoi in Section B.

(d) Another race is 3000 m long. Zoi averaged a speed of 5 m s^{-1}.

Calculate the time it would take her to finish the race.

(e) To get back to her car, Zoi wears snowshoes.

The surface area of one snowshoe is 0.15 m^2, and the surface area of one walking shoe is 0.03 m^2. Zoi has a weight of 570 N.

Source: www.piratesofpowder.com/best-snowshoes/

Calculate the pressure on the snow for:

One snowshoe:

One walking shoe:

Explain why using snowshoes makes it easier to walk in the soft snow.

TŪMAHI TUARUA: TE KUHU ANA

www.doc.govt.nz/globalassets/images/places/nelson-tasman/harwoods-hole/harwoods-hole-1200.jpg

Kua whakarite a Pete rāua ko Manaia ki te heke mā tētahi taura ki rō ana. He 80 kg te papatipu o Pete me ana taputapu pikipiki.

(a) (i) Tātaihia te taumaha o Pete me ana taputapu pikipiki.

(ii) Mā te whakamahi i a Pete hei tauira, whakamāramahia te rerekētanga i waenga i te papatipu me te taumaha.

(b) Ina tae atu a Manaia ki te 100 mita mai i te papa o te ana, ka taka tana rama 1 kg te taumaha mai i tana peketua.

(i) Tātaihia te pūngao moe tō ā-papa o te rama i te 100 m i runga ake o te papa.

(ii) He aha te momo pūngao kei te rama i te wā e taka ana?

QUESTION TWO: CAVING

www.doc.govt.nz/globalassets/images/places/nelson-tasman/harwoods-hole/harwoods-hole-1200.jpg

Pete and Manaia have decided to climb down a rope into a cave. Pete and his climbing equipment have a mass of 80 kg.

(a) (i) Calculate the weight of Pete and his climbing equipment.

(ii) Using Pete as an example, explain the difference between mass and weight.

(b) When Manaia is 100 metres from the bottom of the cave, her 1 kg torch falls out of her backpack.

(i) Calculate the gravitational potential energy the torch has 100 m above the ground.

(ii) What type of energy does the torch gain as it falls?

(iii) Tātaihia te tere mōrahi o te rama i te taunga ki te papa.

(Hei aha te parenga hau.)

(c) Kia puta ai i te ana, me piki i tētahi taura he 170 m te roa.

Mō Pete, he 80 kg te papatipu, he 2200 hēkona te roa.

Mō Manaia, he 75 kg te papatipu, he 2000 hēkona te roa.

(i) Tātaihia te mahi i oti i a Pete rāua ko Manaia.

(ii) Tātaihia te kaha i whakaputaina e Pete rāua ko Manaia.

(iii) Whakamāramahia mai ko wai o rāua he nui ake te mahi, ā, ko wai te mea he nui ake te whakaputa kaha.

(iii) Calculate the maximum speed at which her torch will hit the ground.
(Air resistance can be ignored.)

(c) To get out of the cave, they need to climb up a 170 m rope.
Pete, mass 80 kg, takes 2200 seconds.
Manaia, mass 75 kg, takes 2000 seconds.

(i) Calculate the work done by both Pete and Manaia.

(ii) Calculate the power output by both Pete and Manaia.

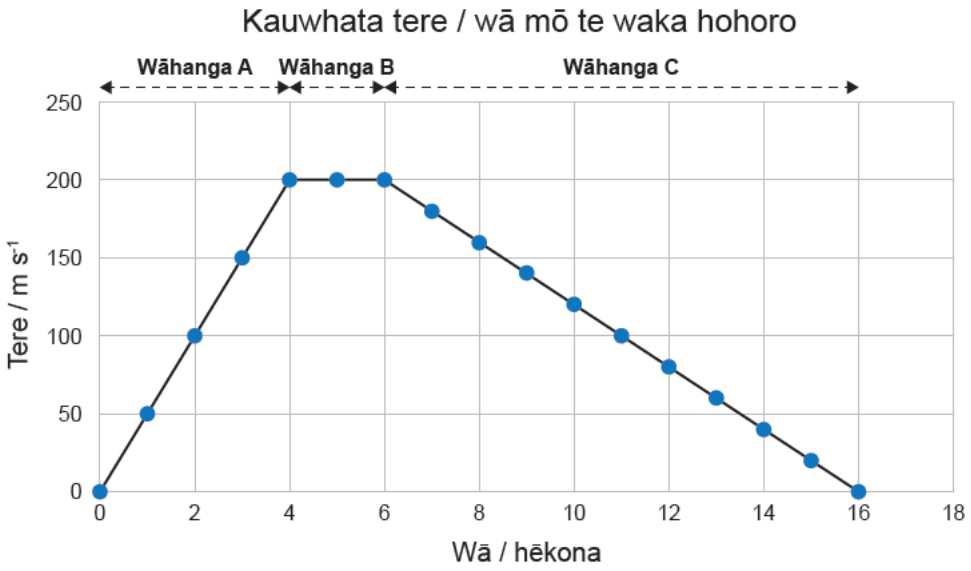
(iii) Explain who does more work, and also who uses more power.

TŪMAHI TUATORU: WAKA HOHORO

Mātāpuna: www.classicandsportscar.com/classifieds/motorsport/race-cars/dragsters/1964-fuller-roberts-starlite-iii-top-fuel-dragster/9306628

He mea hanga ngā waka hohoro kia tino tere te haere i ngā tawhiti poto.

Kei raro iho ko te kauwhata tere/wā o tētahi waka hohoro.



(a) He aha te tere mōrahi o te waka hohoro?

_____ m s^{-1}

(b) (i) Mā te whakamahi i te kauwhata, whakaaturia ko te whakaterenga o te waka hohoro i ngā hēkona tuatahi e 4 he 50 m s^{-2}.

(ii) Ko te papatipu o te waka hohoro ko te 1050 kg.

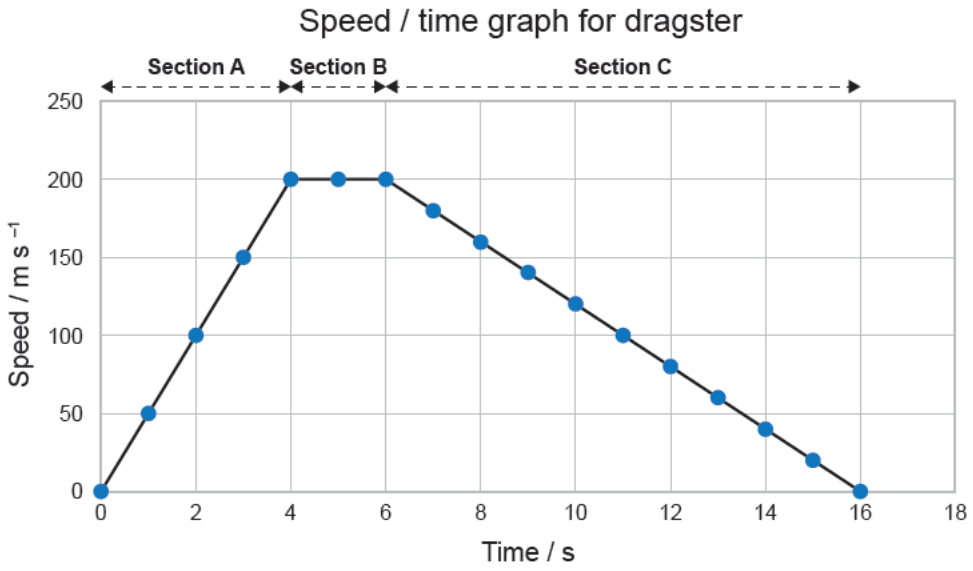
Tātaihia te tōpana tapeke e hiahiatia ana hei whakatere ake i te waka hohoro i te 50 m s^{-2}.

QUESTION THREE: DRAGSTERS

Source: www.classicandsportscar.com/classifieds/motorsport/race-cars/dragsters/1964-fuller-roberts-starlite-iii-top-fuel-dragster/9306628

Dragsters are designed to travel short distances very quickly.

Below is a speed / time graph of a dragster.



(a) What is the maximum speed of the dragster?

_____ m s^{-1}

(b) (i) Using the graph, show the acceleration of the dragster in the first 4 seconds is 50 m s^{-2}.

_____

_____

(ii) The mass of the dragster is 1050 kg.

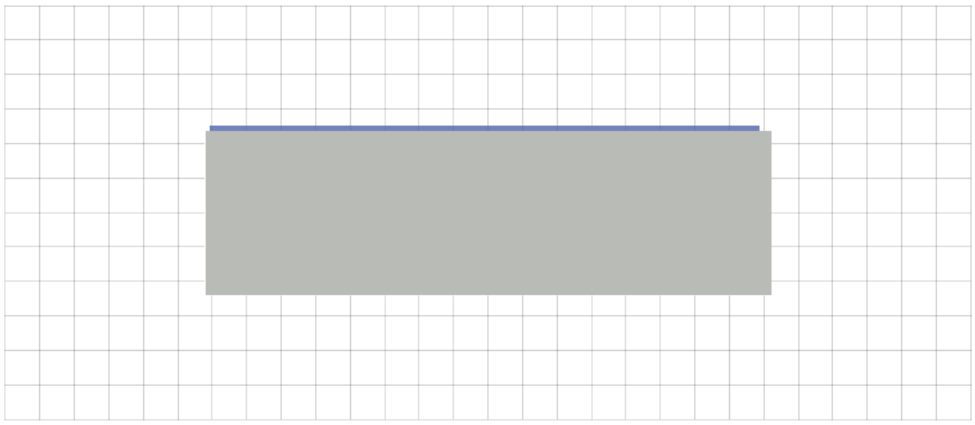
Calculate the net force required to accelerate the dragster at 50 m s^{-2}.

_____

_____

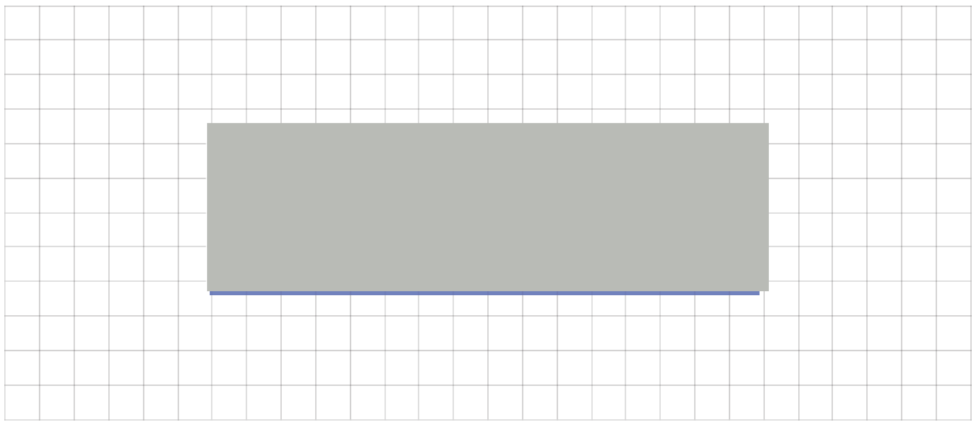
_____

(iii) Ki te hoahoa i raro, tātuhia me te tapa i ngā pere hei whakaatu i te rahi me te ahunga o ngā tōpana poutū me te whakapae ka pā ki te waka hohoro ina whakatere ake i te Wāhanga A.



Ki te hiahia koe ki te tātuhi anō i tō urupare, whakamahia te hoahoa i te whārangi 15.

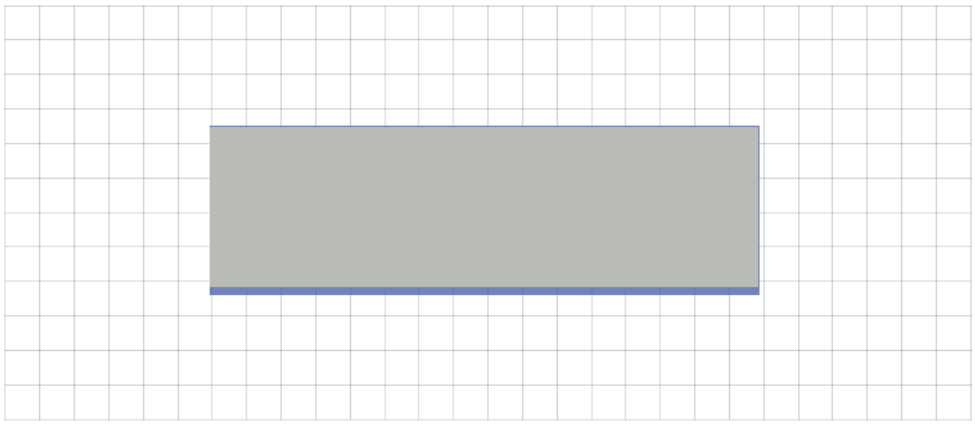
(iv) Ki te hoahoa i raro, tātuhia me te tapa i ngā pere hei whakaatu i te rahi me te ahunga o ngā tōpana poutū me te whakapae ka pā ki te waka hohoro ina whakapōturi haere i te Wāhanga C.



Ki te hiahia koe ki te tātuhi anō i tō urupare, whakamahia te hoahoa i te whārangi 15.

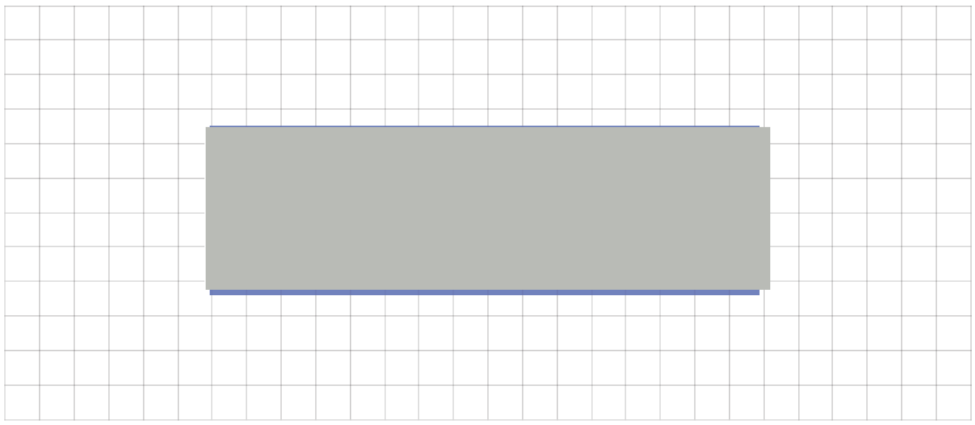
Kei te whārangi 14 ka haere tonu te Tūmahi Tuatoru.

(iii) On the diagram below, draw and label arrows to show the size and direction of the vertical and horizontal forces on the dragster as it accelerates in Section A.



If you need to redraw your response, use the diagram on page 17.

(iv) On the diagram below, draw and label arrows to show the size and direction of the vertical and horizontal forces on the dragster as it decelerates in Section C.



If you need to redraw your response, use the diagram on page 17.

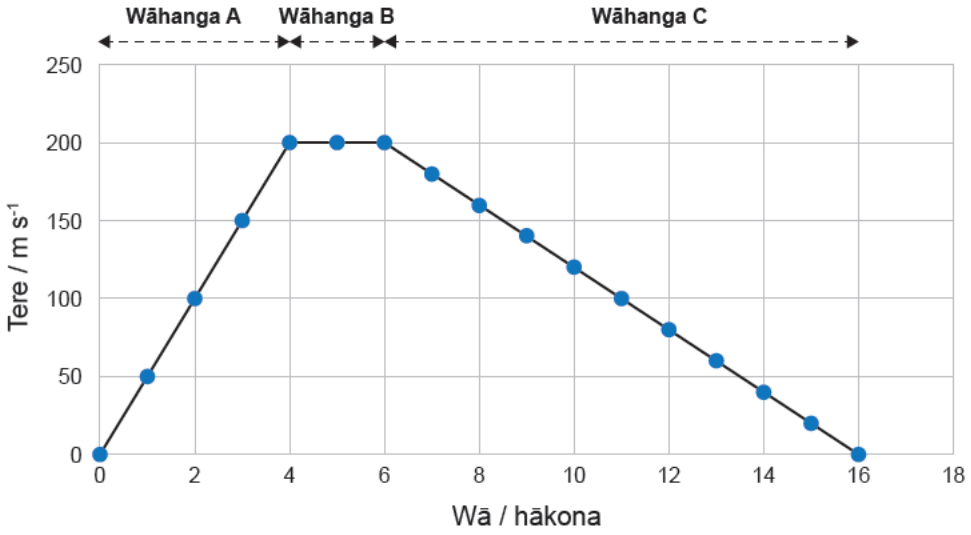
Question Three continues on page 16.

(c) Whakamahia ai e ngā waka hohoro tētahi heketau kia āta haere ai.

http://markjrebilas.com/blog/fast-cars-high-winds-and-the-best-save-i-ever-shot-nhra-vegas/

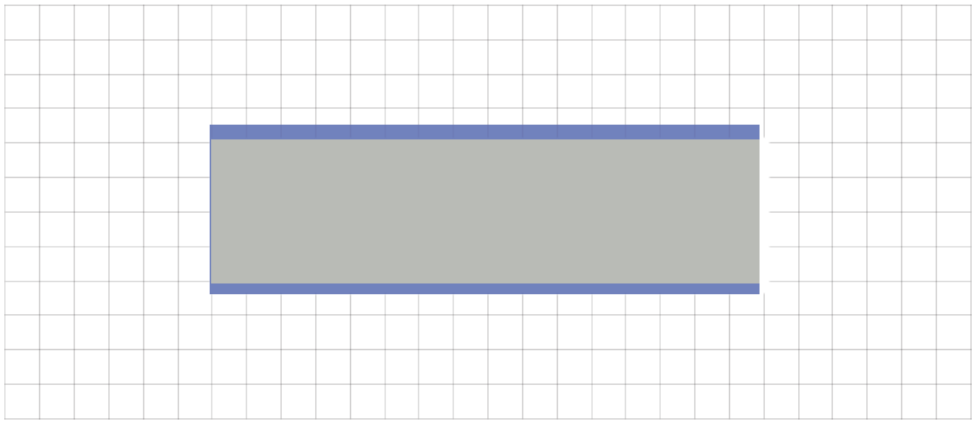
Mā te whakamahi i te kauwhata i raro, whakatauritea te rahi me te ahunga o te tōpana more kei te Wāhanga A ki te Wāhanga C.

(Kāore e hiahiatia ana he tātaitanga.)

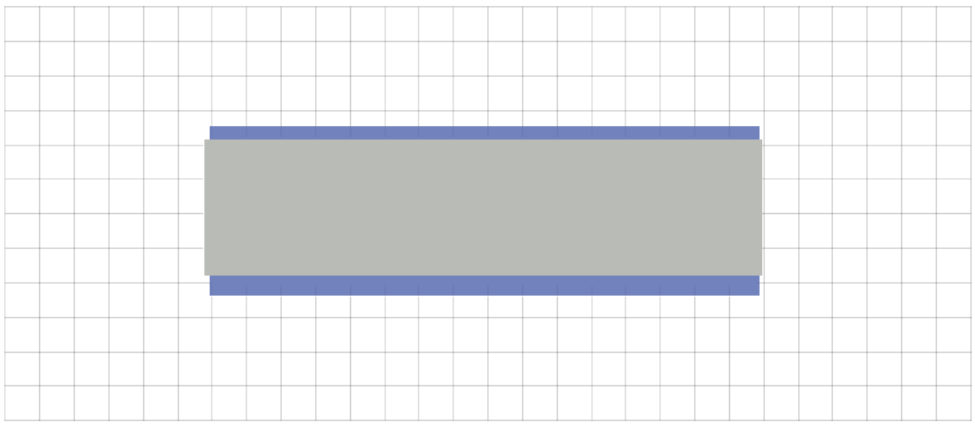


HE HOAHOA WĀTEA

Ki te hiahia koe kia tuhia anō tō urupare ki te Tūmahi Tuatoru (b)(iii), tuhia ki te hoahoa i raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.



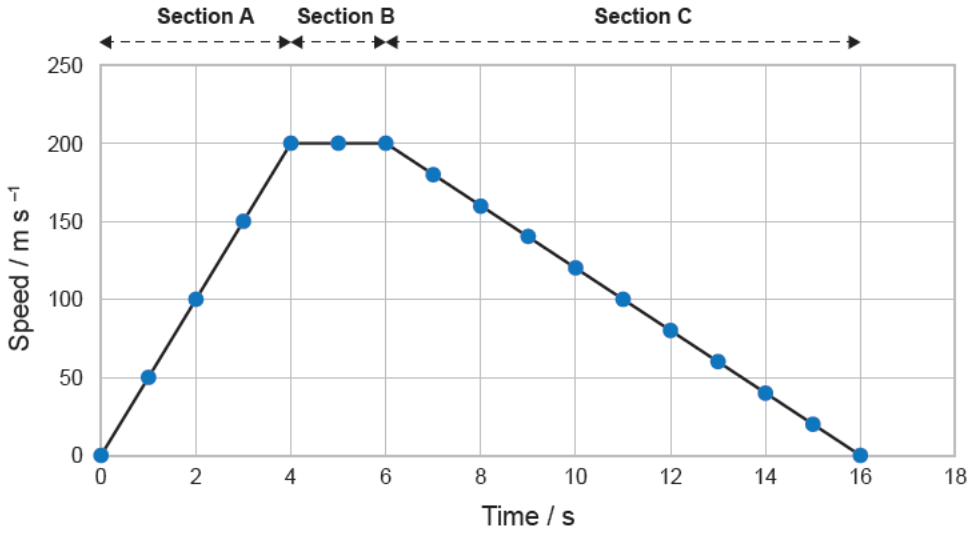
Ki te hiahia koe kia tuhia anō tō urupare ki te Tūmahi Tuatoru (b)(iv), tuhia ki te hoahoa i raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.



(c) Dragsters use a parachute to slow them down.

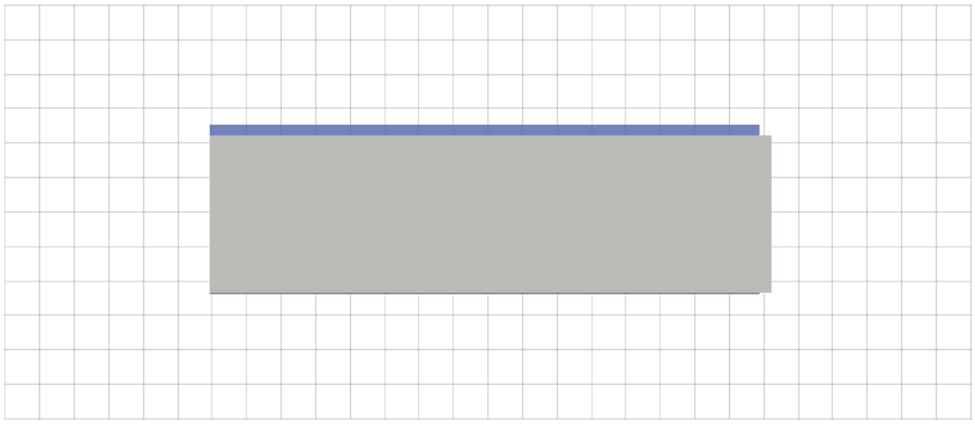
http://markjrebilas.com/blog/fast-cars-high-winds-and-the-best-save-i-ever-shot-nhra-vegas/

Using the graph below, compare the size and direction of the net force in Section A with Section C. (No calculations are required.)

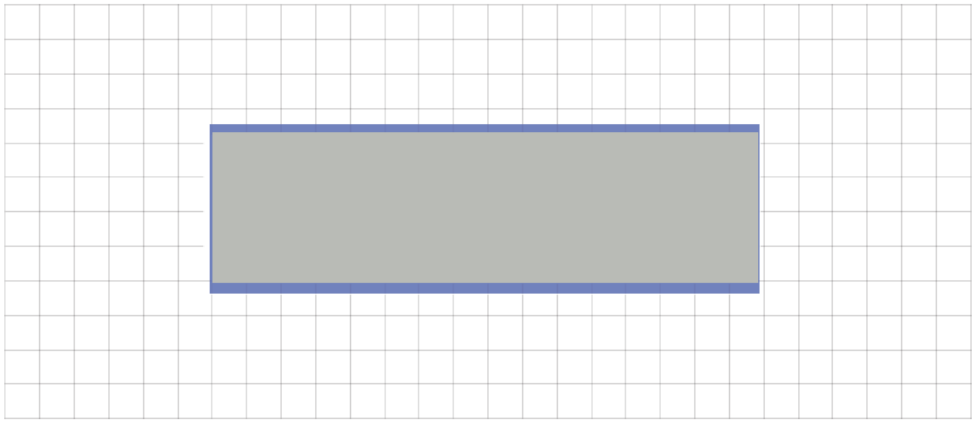


SPARE DIAGRAMS

If you need to redraw your response to Question Three (b)(iii), use the diagram below. Make sure it is clear which answer you want marked.



If you need to redraw your response to Question Three (b)(iv), use the diagram below. Make sure it is clear which answer you want marked.



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

TAU TŪMAHI

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

QUESTION NUMBER

English translation of the wording on the front cover

Level 1 Science 2021

90940M Demonstrate understanding of aspects of mechanics

Credits: Four

90940M

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.

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 room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–19 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.