90940M

909405

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

1

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Pūtaiao, Kaupae 1, 2018

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

9.30 i te ata Rāpare 15 Whiringa-ā-rangi 2018
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 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.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia 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 2–19 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

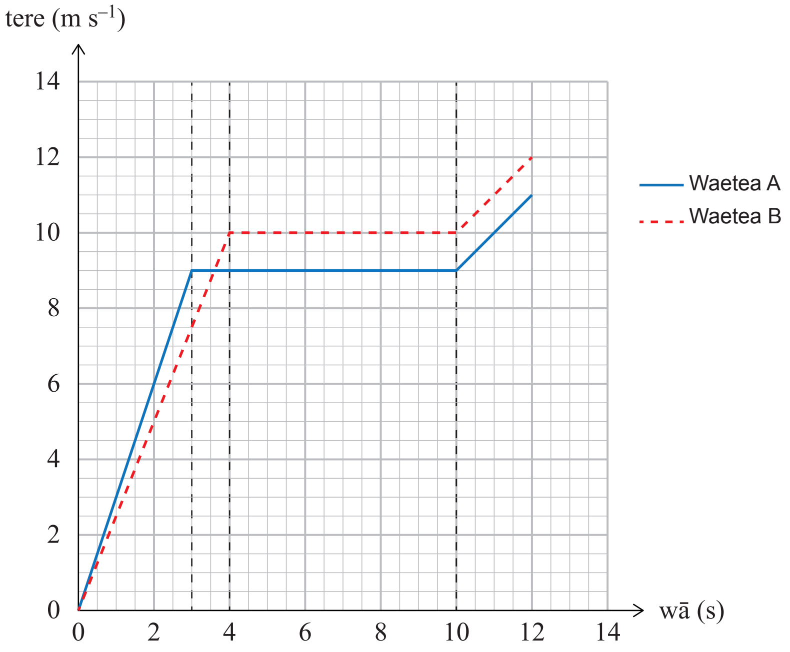
Tērā pea ka whai hua ēnei tikanga tātai ki a koe.

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

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

TŪMAHI TUATAHI

E whakaatu ana te kauwhata tere-wā i ngā waetea[1] e rua i roto i tētahi tauomaoma 100 m.



(a) Mai i te kauwhata, kei a wai o rāua te whakaterenga nui ake i te 3 hēkona tuatahi?

Whakamāramatia tō tuhinga.

Kāore te tātaitanga i te hiahiatia.

(b) Mā te whakamahi i te kauwhata, tātaihia te whakaterenga o te Waetea A i te 3 hēkona tuatahi.

[1] kaiomaoma

(c) (i) Whakamahia ngā mōhiohio o te kauwhata ki te whakataurite i te tere ME te whakatere o te Waetea A me te Waetea B i ngā 10 hēkona tuatahi.

(ii) Whakamahia ngā mōhiohio o te kauwhata me ngā tātaitai hei whakaatu ko tēhea waetea, Waetea A, Waetea B rānei, i tuatahi i roto i te 100 m.

(d) He 200 cm^2 (0.0200 m^2) te horahanga mata o **ia** waewae o Waetea A, ā, ka totohu atu ki te ara tauoma**.** Ka tōpūtia ana, he 13 000 Pa te pēhanga ka puta i ngā waewae.

Tātaihia te **taumaha** o Waetea A.

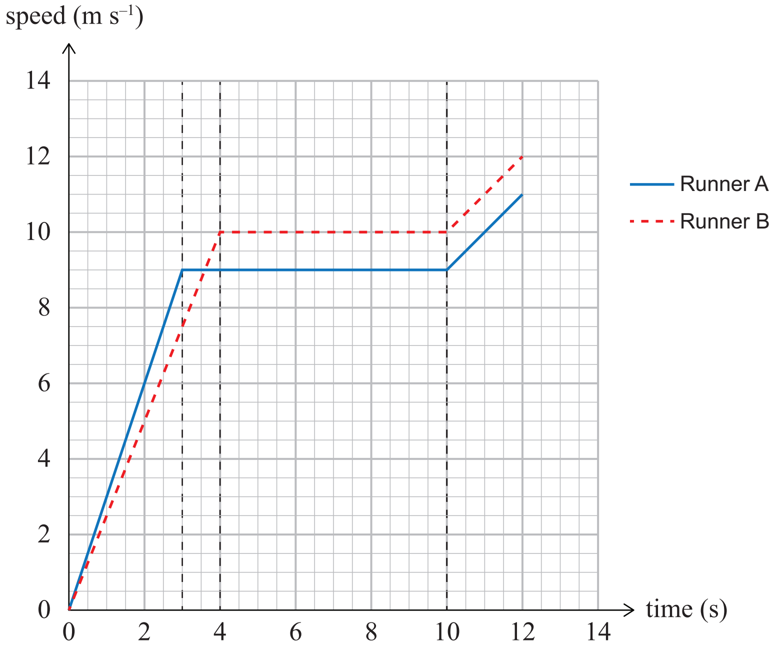
You may find the following formulae useful.

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

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

QUESTION ONE

The speed-time graph shows the motion of two runners in a 100 m race.



(a) From the graph, which runner has the greater acceleration in the first 3 seconds?

Explain your answer.

Calculations are not required.

(b) Using the graph, calculate Runner A's acceleration during the first 3 seconds.

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(c) (i) Use the information in the graph to compare the speed AND acceleration of Runner A and Runner B in the first 10 seconds.

(ii) Use the information in the graph and calculations to show which runner, Runner A or Runner B, finished the 100 m first.

(d) **Each** of Runner A's feet has a surface area of 200 cm^2 (0.0200 m^2), which sink into the track. Together, the feet exert a pressure of 13 000 Pa.

Calculate the **weight** of Runner A.

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUARUA

Ko te papatipu tōpū o Willow me tōna pahikara kake maunga he 82 kg. Ka whakatere ia i te tīmatanga o tōna tauomaoma i te 0.80 m s^{-2}.

(a) Tātaihia te tōpana more e pā ana ki te pahikara me te kaieke ina whakatere ana.

(b) (i) Tātuhia me te tapa i ngā pere ki te hoahoa i raro hei whakaatu i ngā tōpana KATOA e pā ana ki a Willow me tōna pahikara i a ia ka whakatere.

https://commons.wikimedia.org/w/index.php?curid=24096670

(ii) Whakamāramatia mai te rahinga o ngā tōpana ka pā ina **whakatere ana** a Willow me tōna pahikara.

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QUESTION TWO

Willow and her mountain bike have a combined mass of 82 kg. She accelerates at the start of a race at 0.80 m s^{-2}.

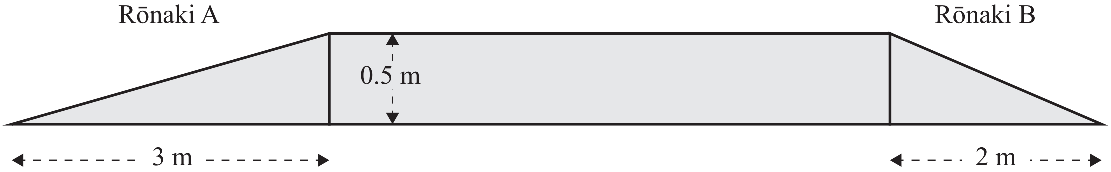
(a) Calculate the net force acting on the bike and rider when accelerating.

(b) (i) Draw and label arrows on the diagram below to show ALL the forces acting on Willow and her bike when accelerating.

https://commons.wikimedia.org/w/index.php?curid=24096670

(ii) Explain the size of the forces involved when Willow and her bike are **accelerating**.

(c) I kōwhiri a Willow ko tēhea o ngā rōnaki e rua me eke ia mā runga i tōna pahikara kia tae ki runga o te auroro. He poto ake te wā mō te whakamahi i te Rōnaki B.



(i) He nui ake, iti ake, ōrite rānei te **mahi** me oti kia tae atu ai ki runga o te **Rōnaki A** ki te mahi me oti kia tae atu ki runga o te Rōnaki B?

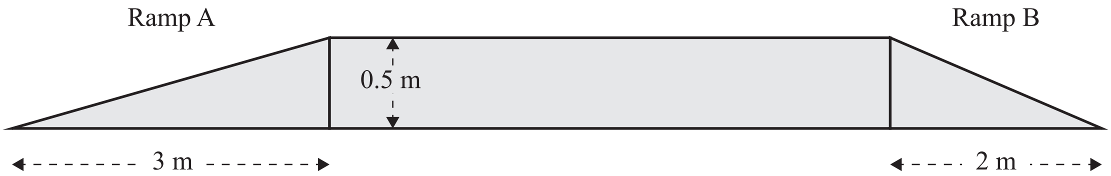
Whakamāramatia tō tuhinga.

(ii) Whakamāramatia mai he pēhea te rerekē o ngā rōnaki e rua e ai ki te **tōpana** me te **ngoi** e hiahiatia ana kia eketia.

Kāore te tātaitanga i te hiahiatia.

MĀ TE KAIMĀKA ANAKE

(c) Willow had to choose between two ramps to ride her bike to the top of an incline. It takes less time to use Ramp B.



(i) Is the **work** needed to get to the top of **Ramp A** more, less, or the same as the work needed to get to the top of Ramp B?

Explain your answer.

(ii) Explain how the two ramps differ in terms of the **force** and **power** needed to ride up them.

Calculations are not required.

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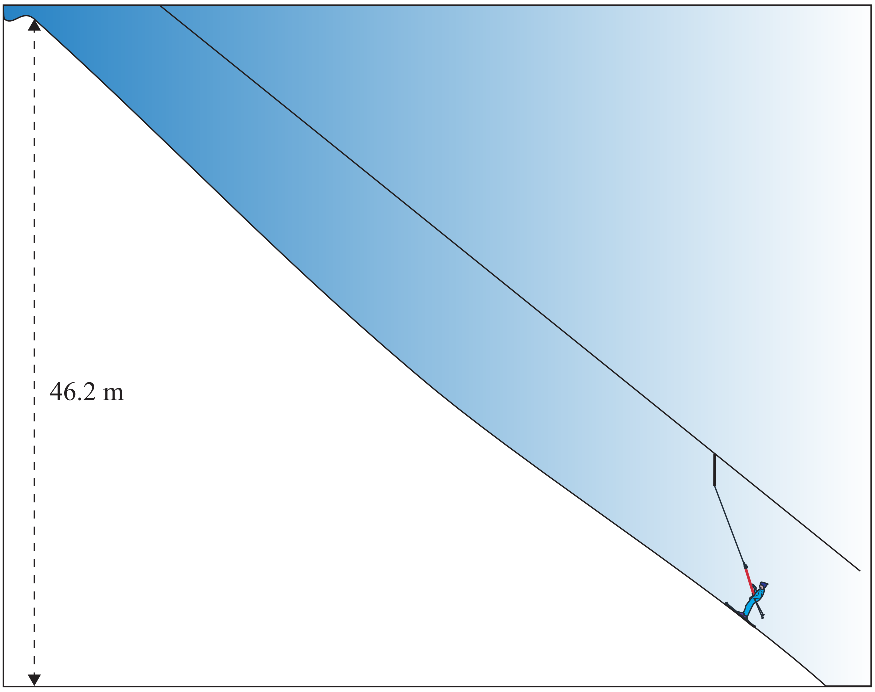
TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE



Kei te retireti hukapapa a Mārama, ā, ka whakamahia e ia he tō reti kia eke atu ia ki runga o te rōnaki.

Ka kūmea a Mārama e te tō reti ki runga o te rōnaki ki tētahi teitei o te 46.2 m. He 62 kg te papatipu tōpū o Marama me ana taputapu retireti.

(a) Tātaihia te mahi i oti kia tae atu ai a Mārama ki runga o te rōnaki.

(b) He 525 s te roa mō te tō i a Mārama ki runga ake o te rōnaki.

Tātaihia te ngoi e hiahiatia ana kia tae atu ai a Mārama ki runga.

Mō tēnei tūmahi, me waiho te waku.

QUESTION THREE

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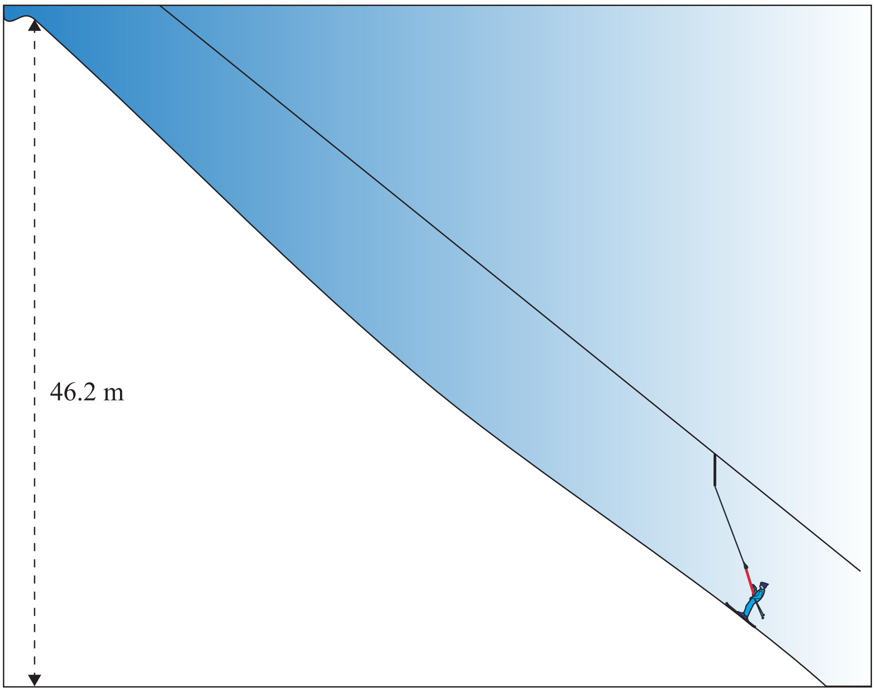


Marama is snow skiing and uses a ski tow to get to the top of the slope.

The ski tow pulls Marama up the slope to a height of 46.2 m. The combined mass of Marama and her ski gear is 62 kg.

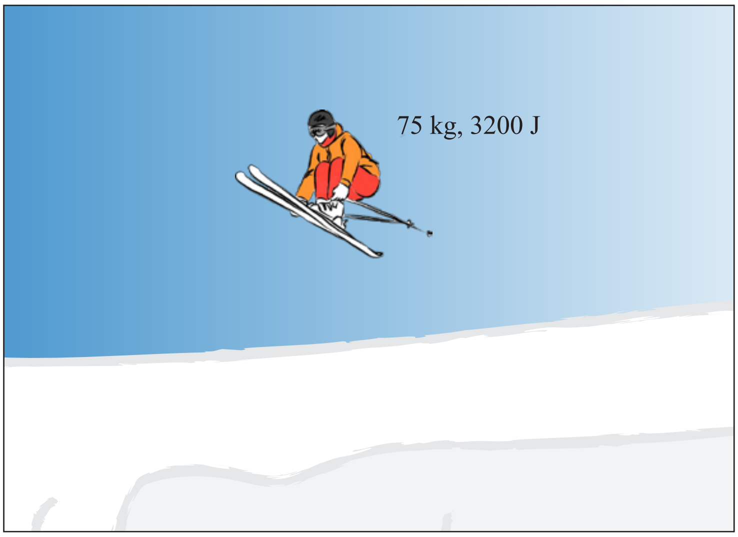
(a) Calculate the work done for Marama to reach the top of the slope.

(b) It takes 525 s for the tow to pull Marama to the top of the slope.

Calculate the power needed to get Marama to the top.

For this question, ignore friction.

(c) He 75 kg te papatipu o Jake, ā, kei te peke ia.



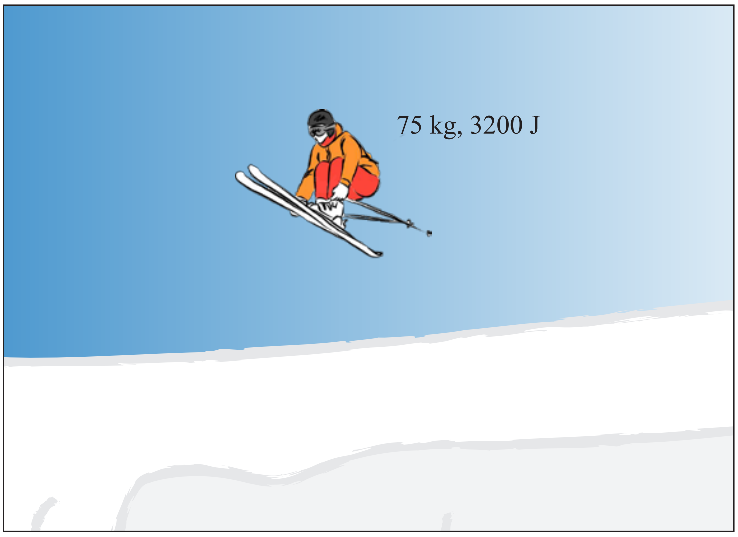
He 3200 J tōna pūngao moe tō ā-papa i te wāhanga runga rawa o tōna eke.

(i) Tātaihia tōna tere whakararo (poutū) i mua tata tonu i tōna taunga, ā, ko te whakapae ka pūmau te pūngao.

(ii) Whakamāramatia he aha i pōturi ake ai te tere ake o Jake i tērā i tātaihia i te wāhanga (i).

Ka haere tonu te Tūmahi Tuatoru i te whārangi 14.

(c) Jake has a mass of 75 kg and is doing a jump.



He has 3200 J of gravitational potential energy at the top of his flight.

(i) Calculate his downward (vertical) speed just before he lands, assuming energy is conserved.

(ii) Explain why Jake's actual speed when he lands is slower than that calculated in part (i).

Question Three continues on page 15.

(d) Ka huria e Jake ōna retihuka ki ngā mea whānui ake. He 10 cm te whānui o ngā retihuka e ai ki ngā retihuka noa o te 5 cm. He ōrite te roa o ngā takirua retihuka e rua.

Whakamāramatia te take he aha i kore ai e tino totohu a Jake ki roto i te hukapapa i a ia e whakamahi ana i ngā retihuka whānui.

Kāore te tātaitanga i te hiahiatia.

(d) Jake changes to his wide skis. The skis measure 10 cm in width compared with normal skis of 5 cm. Both sets of skis are the same length.

Explain why Jake does not sink into the snow as much when he uses his wide skis.

Calculations are not required.

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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

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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

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English translation of the wording on the front cover

Level 1 Science, 2018

90940 Demonstrate understanding of aspects of mechanics

9.30 a.m. Thursday 15 November 2018
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 and clearly number the question.

Check that this booklet has pages 2–19 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.