See back cover for an English translation of this cover

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90940M

909405

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Pūtaiao, Kaupae 1, 2013

90940M Te whakaatu māramatanga ki ngā āhuatanga o te pūnaha pūkahakaha

9.30 i te ata Rāhina 18 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o te pūnaha pūkahakaha.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o te pūnaha pūkahakaha.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o te pūnaha pūkahakaha.

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 te KATOA o ngā pātai 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 2–25 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

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

MĀ TE KAIMĀKA ANAKE

Tērā pea ka whai hua ēnei tikanga tātai māu.

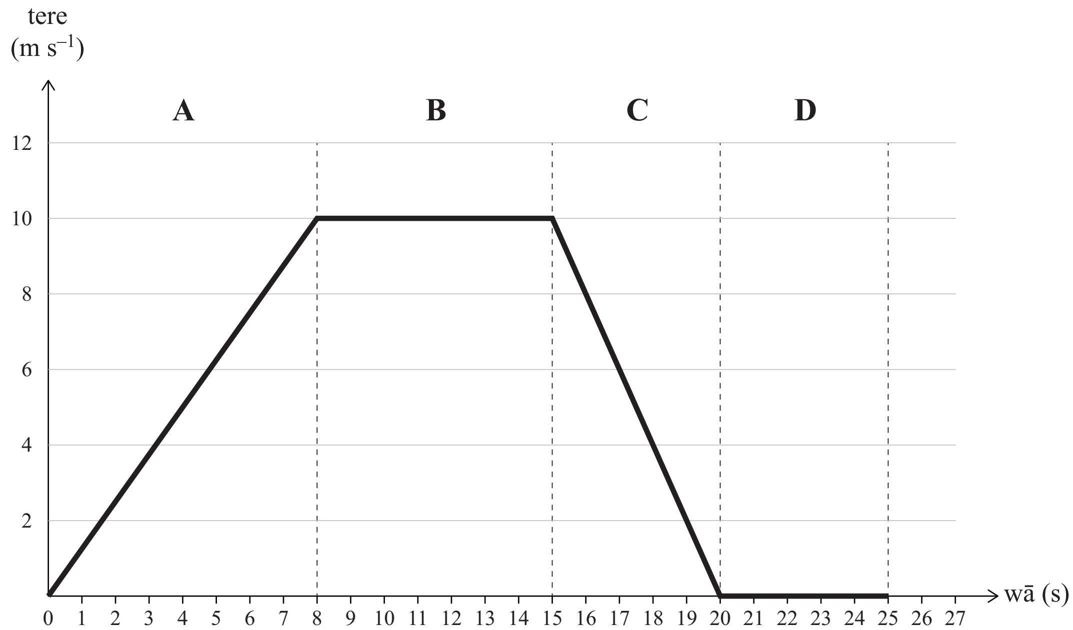
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A}$$

$$\Delta E_{\text{p}} = mg\Delta h \qquad E_{\text{k}} = \frac{1}{2}mv^2 \qquad W = Fd \qquad P = \frac{W}{t}$$

Ko te uara o g ko 10 m s^{-2}

PĀTAI TUATAHI: TE KAIOMA

E tuhia ana te tere o te kaioma mō te 25 hēkona, e kauwhatatia ana i raro.



(a) Whakaahuatia te nekehanga o te kaioma i ngā wāhanga A, B, C, me D.

I tō whakautu me whai whakaahua ME ngā tātaitainga hāngai.

Wāhanga A:

Wāhanga B:

Wāhanga C:

Wāhanga D:

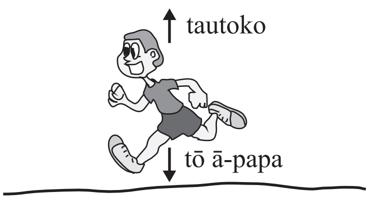
(b) I ngā hoahoa i raro, tuhia me te tapa i ngā tōpana pana me te waku ka pā atu ki te kaioma i ngā wāhanga A, B, me C.

I tō whakautu me:

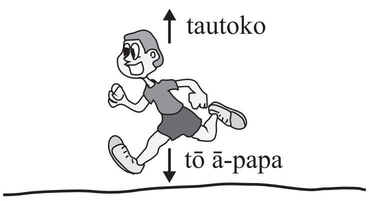
- whakamahi ngā pere hei whakaatu i ngā ahunga o ngā tōpana pana me te waku
- tuhituhi i te taha o ia hoahoa mēnā e nui ake te pana i te waku, mēnā e ōrite ana te pana ki te waku, mēnā e iti ake rānei te pana i te waku.

Kua oti kē te mahi i ngā tōpana tō ā-papa me te tautoko.

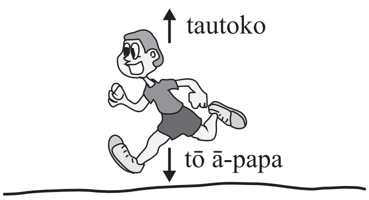
Wāhanga A



Wāhanga B



Wāhanga C:



You are advised to spend 60 minutes answering the questions in this booklet.

ASSESSOR'S USE ONLY

You may find the following formulae useful.

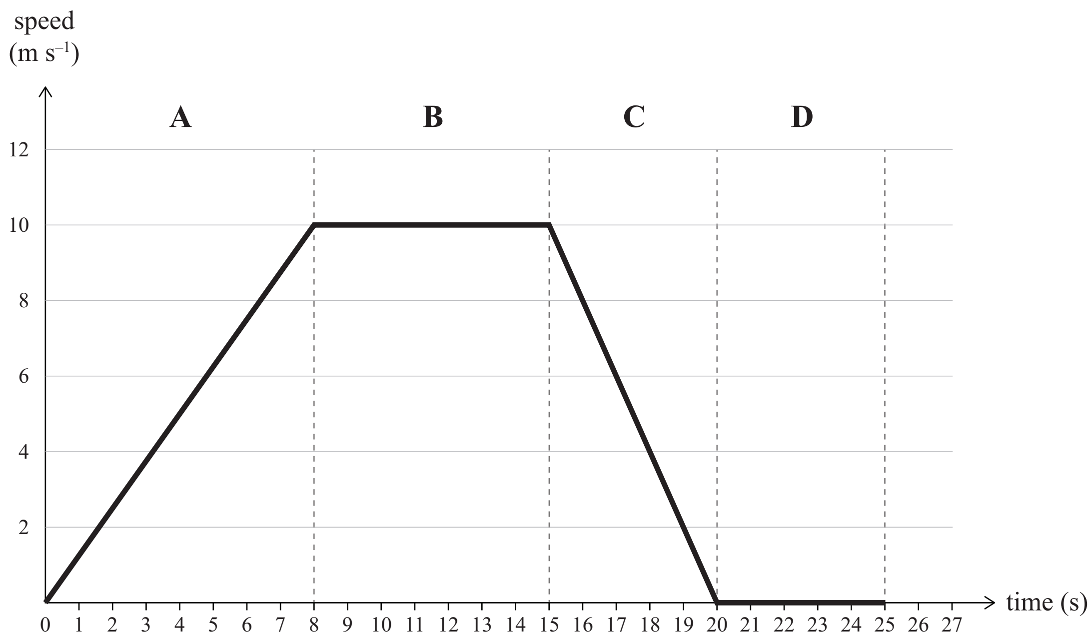
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A}$$

$$\Delta E_{\text{p}} = mg\Delta h \qquad E_{\text{k}} = \frac{1}{2}mv^2 \qquad W = Fd \qquad P = \frac{W}{t}$$

The value of g is given as 10 m s^{-2}

QUESTION ONE: THE RUNNER

A runner's speed is recorded for 25 seconds and graphed below.



(a) Describe the motion of the runner through sections A, B, C, and D.

Your answers should include descriptions AND any relevant calculations.

Section A:

Section B:

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Section C: ______________________________

Section D: ______________________________

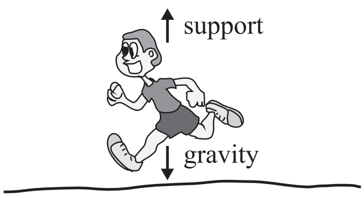
(b) On the diagrams below, draw and label the thrust and friction forces acting on the runner in sections A, B, and C.

In your answer you should:

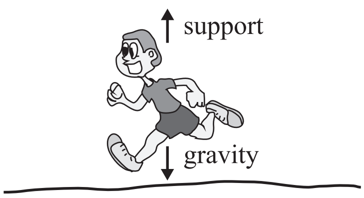
- use arrows to show the directions of the thrust and friction forces
- beside each diagram, state if thrust is greater than friction, thrust is equal to friction, or if thrust is less than friction.

The gravity and support forces have been done for you.

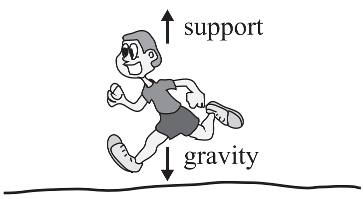
Section A



Section B



Section C



MĀ TE KAIMĀKA ANAKE

(c) Tirohia ō hoahoa tōpana i te wāhanga (b), ka whakamārama i te hono i waenga i te tōpana more e pā atu ki te kaioma i ngā wāhanga A, B me te C o te kauwhata, me te momo nekehanga.

I tō whakautu me:

- whakaahua he aha te tikanga o te tōpana more
- whakamārama i te hono i waenga i te tōpana more me te nekehanga mō IA wāhanga
- whakataurite i te ahunga o te tōpana more me te ahunga o te nekehanga mō IA wāhanga.

(c) Referring to your force diagrams in part (b), explain the link between the net force acting on the runner in sections A, B, and C of the graph, and the type of motion.

In your answer you should:

- describe what is meant by net force
- explain the link between net force and motion for EACH section
- compare the direction of the net force and the direction of the motion for EACH section.

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(d) Tātaihia te tapeke o te tawhiti ka omahia e te kaioma.

Hei āwhina i a koe i ō whakautu, ka tāruatia te kauwhata i raro mai i te whārangi 2.

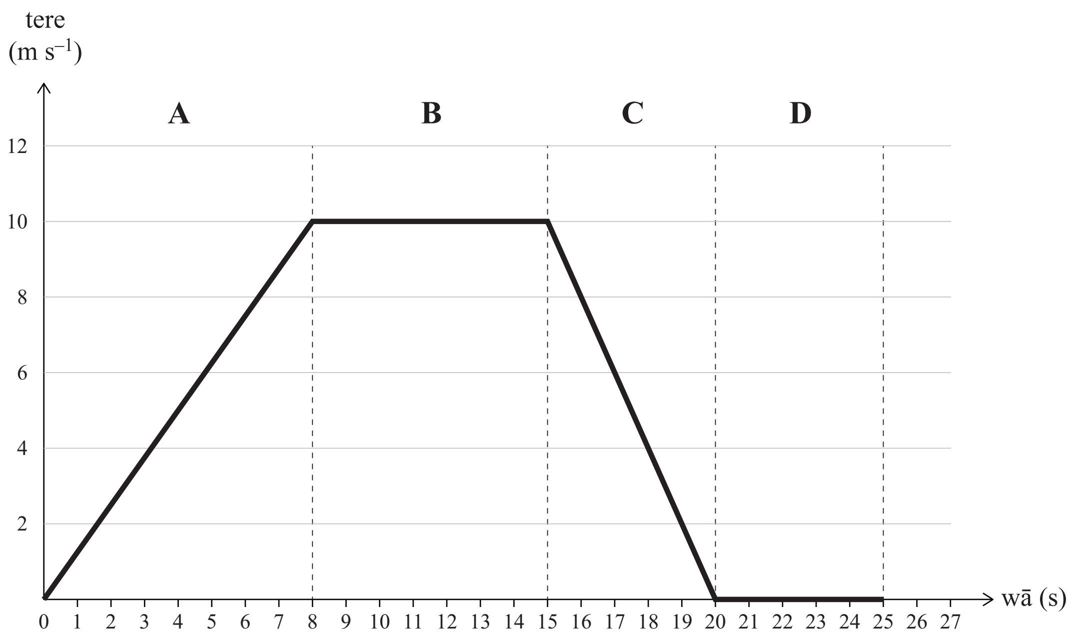
Tawhiti ka omahia, wāhanga A:

Tawhiti ka omahia, wāhanga B:

Tawhiti ka omahia, wāhanga C:

Tawhiti ka omahia, wāhanga D:

Tapeke o te tawhiti i omahia:



MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(d) Calculate the total distance the runner travels.

To assist you in your answers, the graph from page 4 is repeated below.

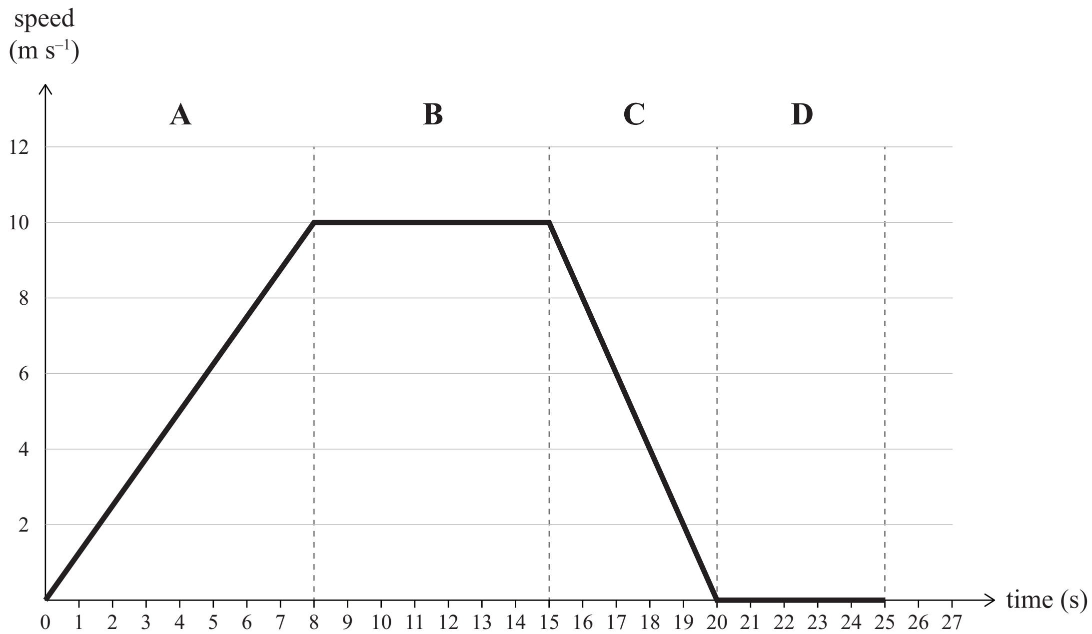
Distance travelled, section A: ______________________________

Distance travelled, section B: ______________________________

Distance travelled, section C: ______________________________

Distance travelled, section D: ______________________________

Total distance travelled: ______________________________



PĀTAI TUARUA: TE WHAKATAKA I TĒTAHI PŌRO

MĀ TE KAIMĀKA ANAKE

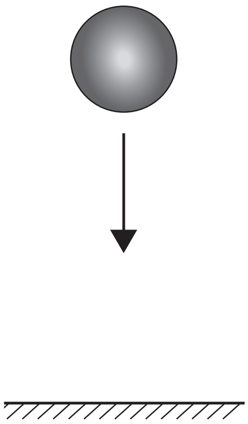
I roto i tētahi whakamātauranga akomanga, ka whakatakahia he pōro ki te papa.

I mua i te whakatakanga o te pōro, kāore i te neke, ā, he pūngao moe tō ā-papa anake tōna (E_p). I te takanga o te pōro, ka whakawhitihia te pūngao moe tō ā-papa ki te pūngao neke (E_k).

He 100 karamu te papatipu o te pōro.

(a) Whakaotihia ngā tapanga mō te hoahoa i raro hei whakaatu i ngā huringa pūngao i te takanga o te pōro.

Me kī kua huri te pūngao moe tō ā-papa ki te pūngao neke **anake**.



I runga rawa: $E_p = 0.2$ J $E_k = 0$ J

I waenga pū: $E_p =$ __________ $E_k =$ __________

I mua tonu i te taunga ki te papa: $E_p =$ __________ $E_k =$ __________

(b) Ka kī atu te kaiako ki ngā ākonga he 2 m s^{-1} te tere o te pōro i mua tata tonu i te taunga ki te papa. Ka pātaihia ngā ākonga kia matapaetia e rātou te tere o te pōro i waenga pū mai i ngā kōwhiringa e toru:

Kōwhiringa 1: He **iti ake** te tere i te 1 m s^{-1}.

Kōwhiringa 2: He **ōrite** te tere ki te 1 m s^{-1}.

Kōwhiringa 3: He **nui ake** te tere i te 1 m s^{-1}.

Tuhia te kōwhiringa tika, whakamāramahia tō whakutu, ā, ka whakamahi i ngā tātai pūngao hei tautoko i tō whakautu.

Me kī kei te pūmau te pūngao.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

QUESTION TWO: DROPPING A BALL

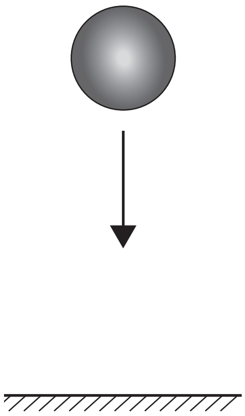
In a classroom experiment, a ball is dropped onto the floor.

Before the ball is dropped, it is not moving, and has only gravitational potential energy (E_p). As the ball falls, the gravitational potential energy is converted into kinetic energy (E_k).

The ball has a mass of 100 grams.

(a) Complete the labels for the diagram below to show the energy changes as the ball is dropped.

Assume that the gravitational potential energy is changed **only** into kinetic energy.



At the top: $E_p = 0.2$ J $E_k = 0$ J

Halfway: $E_p =$ __________ $E_k =$ __________

Just before it hits the floor: $E_p =$ __________ $E_k =$ __________

(b) The teacher tells the students that the ball will be travelling at 2 m s^{-1} just before it hits the floor. The students are asked to predict the speed of the ball halfway down from three options:

Option 1: The speed is **less** than 1 m s^{-1}.

Option 2: The speed is **equal** to 1 m s^{-1}.

Option 3: The speed is **greater** than 1 m s^{-1}.

State the correct option, explain your answer, and support your answer using energy calculations.

You may assume conservation of energy.

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(c) Whakamāramahia te take e **pōturi ake** te haere o te pōro i te 2 m s^{-1} i mua tata tonu i te taunga ki te papa.

Kāore e hiahiatia he tātaitanga.

I tō whakautu me:

- whakaahua i ngā huringa pūngao katoa ka pā mai i te takanga o te pōro
- whakamārama he aha te take ka pōturi ake te tere i te 2 m s^{-1} nā ngā huringa pūngao.

MĀ TE KAIMĀKA ANAKE

(c) Explain why the ball will really be travelling **slower** than 2 m s^{-1} just before it hits the floor.

No calculation is required.

In your answer you should:

- describe all the energy changes that occur as the ball falls
- explain why the energy changes mean the speed is slower than 2 m s^{-1}.

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MĀ TE KAIMĀKA ANAKE

PĀTAI TUATORU: TE HIKI POUAKA

He 2500 kirokaramu te papatipu o tētahi pouaka i roto i tētahi whare putunga.

(a) Whakamāramahia mai te rerekētanga i waenga i te taumaha me te papatipu.

(b) Tātaihia te taumaha o te pouaka.

Ka hīkina ake te pouaka e tētahi mīhini hiki kia 4 mita ki runga tonu kia utaina atu ai ki tētahi pae. Ka pau te 5 hēkona te pouaka te hiki i te rerenga aumoa.

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

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(c) Tātaihia te mahi ka oti i te hikinga ake o te pouaka ki te 4 m te teitei, kātahi ka tātai i te kaha e hiahiatia ana e te mīhini hiki kia hīkina ai ki tēnei teitei.

Mahi:

Kaha:

QUESTION THREE: LIFTING BOXES

A box in a warehouse has a mass of 2 500 kg.

(a) Explain the difference between weight and mass.

(b) Calculate the weight of the box.

A forklift lifts the box 4 metres straight up so it can be placed on a shelf. It takes 5 seconds to lift the box at a constant rate.

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http://www.123rf.com/stock-photo/

(c) Calculate the work done to lift the box to the height of 4 m, and then calculate the power needed by the forklift to lift it to this height.

Work:

Power:

(d) Kimihia te **tere toharite** o te pouaka i tana nekehanga ake ki te pae 4 m te teitei.

(e) Whakamāramahia he pēhea te pānga ki te kaha e hiahiatia ana hei hiki i te pouaka mēnā ka pūruatia te tere o te hiki i te pouaka.

I tō whakautu me whai whakaaro ki te pānga o te whakatere ake ki te roa o te wā.

MĀ TE KAIMĀKA ANAKE

(d) Find the **average speed** of the box as it moves up to the 4 m high shelf.

(e) Explain how the power needed to lift the box would be affected if the box was lifted at twice the speed.

In your answer you should consider how increased speed affects the time taken.

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MĀ TE KAIMĀKA ANAKE

PĀTAI TUAWHĀ: TE WHAKANGAHAU I ROTO I TE HUKAPAPA

Ka whakarite tētahi whānau kia haere ki tētahi papa hukapapa mō te rā. Ka rīhihia e te matua tētahi papareti huka māna me ētahi panuku huka mā tana tamāhine.

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

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Me kī he **tapawhā hāngai** te hanga o te papareti huka me te panuku huka.

He 80 kirokaramu te papatipu tōpū o te matua me te papareti huka.

(a) Tātaihia te pēhanga ka puta i te matua me te papareti huka i runga i te hukapapa.

Me whakauru ki tō whakautu he:

- tātaitainga horahanga
- tātaitanga o te pēhanga.

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QUESTION FOUR: FUN IN THE SNOW

A family decides to spend a day at a snow field. The father hires a snowboard for himself and a pair of skis for his daughter.

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Assume the snowboard and skis are **rectangular** in shape.

The father and snowboard have a combined mass of 80 kg.

(a) Calculate the pressure exerted by the father and snowboard on the snow.

Your answer should include:

- an area calculation
- a calculation of the pressure.

(b) Ka kite te matua kua hōhonu ake te totohu haere o tana tamāhine i runga i ana panuku huka ki roto i te hukapapa i a ia i runga i tana papareti huka.

He 58 kirokaramu te papatipu tōpū o te tamāhine me ngā panuku huka.

Whakamāramahia he aha i hōhonu ake ai te totohu o te tamāhine i runga i ana panuku huka ki roto i te hukarere tēnā i tana matua i runga i tana papareti huka.

I tō whakautu me:

- tātai i te pēhanga ka puta i te tāmahine me ana panuku huka i runga i te hukapapa
- whakataurite i te pēhanga ka puta i te tamāhine me te matua (mai i te wāhanga (a)) i runga i te hukapapa
- whakamārama i te rerekētanga pēhanga e pā ana ki te tōpana ME te horahanga
- whakamārama mai he pēhea te pānga o te pēhanga ki te hōhonu o te totohu o te tangata ki roto i te hukapapa.

(b) The father notices that his daughter on her skis has sunk further into the snow than he has on his snowboard.

The daughter and the skis have a combined mass of 58 kg.

Explain why the daughter on her skis sinks further into the snow than her father on his snowboard.

In your answer you should:

- calculate the pressure exerted by the daughter and her skis on the snow
- compare the pressure exerted by the daughter and father (from part (a)) on the snow
- explain the difference in pressure in terms of force AND area
- explain how pressure relates to how far the person will sink in the snow.

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He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau 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, 2013

90940 Demonstrate understanding of aspects of mechanics

9.30 am Monday 18 November 2013
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 2–25 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.