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

Pūtaiao, Kaupae 1, 2011

90940 Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa

9.30 i te ata Rāhina 21 Whiringa-ā-rangi 2011
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae 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 whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

Whakaaturia ngā mahinga KATOA.

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 2–23 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

Tērā pea ka whai hua ēnei ture 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 uira o g ko 10 m s^{-2}

You may find the following formulae useful.

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

$$\Delta E_p = mg\Delta h \qquad E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad P = \frac{W}{t}$$

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

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

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI: TE HEKERANGI

Ka peke tētahi kaihekerangi e 75 kirokaramu tōna papatipu i tētahi waka rererangi i te 4 000 m te teiteitanga i runga ake o te papamoana.

http://riverdaughter.files.wordpress.com/2009/07/free-fall1.jpg

(a) Ka taka te kaihekerangi i te mamao o te 2 400 m i ngā hēkona 60 tuatahi. Tātaihia te tere toharite o te kaihererangi i tēnei wā.

Tere toharite = ____________ m s^{-1}

(b) Whakamāramahia te nekehanga poutū o te kaihekerangi **i muri tata tonu iho** i tana pekenga i te waka rererangi (i mua i te tuwheratanga o te hekerangi).

I tō whakautu:

- tuhia me te tapa i te (ngā) tōpana poutū i runga i te kaihekerangi me te whakaatu i ngā rahinga ki te pikitia kei te taha matau
- whakaahuahia te tōpana poutū more me te kī mēnā kei te taurite, tahatahi rānei te (ngā) tōpana.
- whakaahuahia te nekehanga poutū o te kaihekerangi
- whakamāramahia he pēhea te pānga o te tōpana poutū more ki te nekehanga poutū.

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

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QUESTION ONE: PARACHUTING

A parachutist of mass 75 kg jumps from a plane at a height of 4 000 m above sea level.

For copyright reasons, this resource cannot be reproduced here.

http://riverdaughter.files.wordpress.com/2009/07/free-fall1.jpg

(a) The parachutist falls through a distance of 2 400 m during the first 60 seconds. Calculate the average speed of the parachutist during this time.

Average speed = ____________ m s^{-1}

(b) Explain the vertical motion of the parachutist **just after** she jumps out of the plane (before the parachute opens).

In your answer you should:

- draw and label the vertical force(s) acting on the parachutist and show their relative sizes on the image to the right
- describe the net vertical force and state whether the force(s) are balanced or unbalanced
- describe the vertical motion of the parachutist
- explain how the net vertical force affects the vertical motion.

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(c) Ina hipa te 60 hēkona, ka kumea e te kaihekerangi te taura, ā, ka tuwhera tana hekerangi.

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

http://www.wallpaper-free.eu/wallpapers/parachute/parachute001_1400x1050.jpg

Whakamāramahia mai he pēhea e **whakaitihia** te tere o te kaihekerangi e te hekerangi i muri tata tonu iho i te tuwheratanga mai.

I tō tuhinga me matapaki e koe:

- ka pēhea e rerekē ai te nekehanga o te kaihekerangi ina whakatuwheratia te hekerangi
- te pānga o te nui o te hekerangi ki te nekehanga
- te pānga o te hekerangi ki te tōpana poutū more.

MĀ TE KAIMĀKA ANAKE

(c) After the 60 seconds, the parachutist pulls the cord and opens her parachute.

For copyright reasons, this resource cannot be reproduced here.

http://www.wallpaper-free.eu/wallpapers/parachute/parachute001_1400x1050.jpg

Explain how the parachute **reduces** the speed of the parachutist when it is just opened.

In your answer you should consider:

- how the motion of the parachutist changes when the parachute is opened
- the effect of the size of the parachute on the motion
- the effect of the parachute on the net vertical force.

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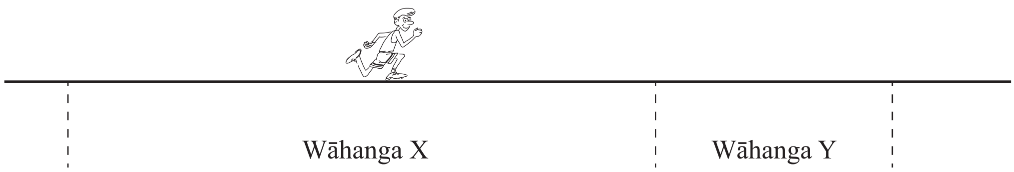
MĀ TE KAIMĀKA ANAKE

PATAI TUARUA: TE OMA



Ka oma tētahi tama ki runga i tētahi ara, pēnei e kitea ki runga rā.

I te wāhanga X, ka oma ia i tētahi **tere pūmau** o te 2 m s^{-1} mō te 15 hēkona.

I te wāhanga Y, ka oma ia me te **whakaterenga pūmau** o te 0.2 m s^{-2}.

(a) Tātaihia te tōpana more e pā ki te tama (e 60 kirokaramu tōna papatipu) i te **wāhanga Y**.

Homai he waeine tōtika i tō whakautu.

Te tōpana mōre e pā ana ki te tama i te wāhanga Y = ______ (______)
waeine

(b) 12.5 m te oma a te tama i te wāhanga Y i roto i te 5 hēkona.

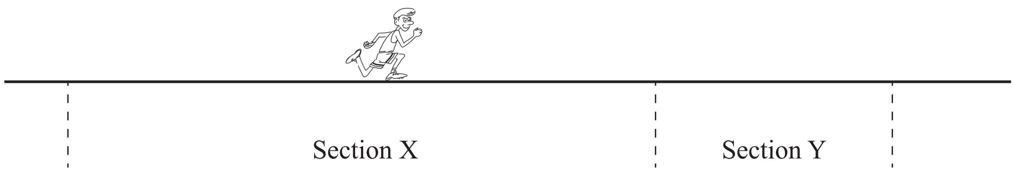
Tātaihia te kaha e hiahiatia ana e te tama ki te whakaputa i te whakatere pūmau o te 0.2 m s^{-2} i roto i te 5 hēkona i te wāhanga Y.

Homai he waeine tōtika i tō whakautu.

Te kaha e hiahiatia ana e te tama i te wāhanga Y = ______ (______)
waeine

ASSESSOR'S USE ONLY

QUESTION TWO: RUNNING



A boy runs along a track, as shown above.

During section X, he runs with a **constant speed** of 2 m s^{-1} for 15 seconds.

During section Y, he runs with a **constant acceleration** of 0.2 m s^{-2}.

(a) Calculate the net force acting on the boy (mass 60 kg) during **section Y**.

Give an appropriate unit with your answer.

Net force acting on the boy during section Y = ______________ (________)
unit

(b) The boy runs 12.5 m during section Y in 5 seconds.

Calculate the power required by the boy to produce the constant acceleration of 0.2 m s^{-2} in 5 seconds during section Y.

Give an appropriate unit with your answer.

Power required by the boy during section Y = ______________ (________)
unit

MĀ TE KAIMĀKA ANAKE

(c) (i) Tātaihia te tere o te tama i tana taenga atu ki te pito o te wāhanga Y.

Te tere i te pito o te wāhanga Y = ______________ m s^{-1}

(ii) Whakamahia tēnei mōhiohio me ētahi atu e whakaratoa ana i roto i te pātai hei whakaoti i te kauwhata tere / wā i raro.

I tō kauwhata, me:

- tapa ngā uara tere ki te tuaka poutū
- tuhi he rārangi ki te kauwhata hei whakaatu i ngā tere mō te wāhanga X **me** te wāhanga Y.

Ki te hiahia koe ki te tuhi anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 20.

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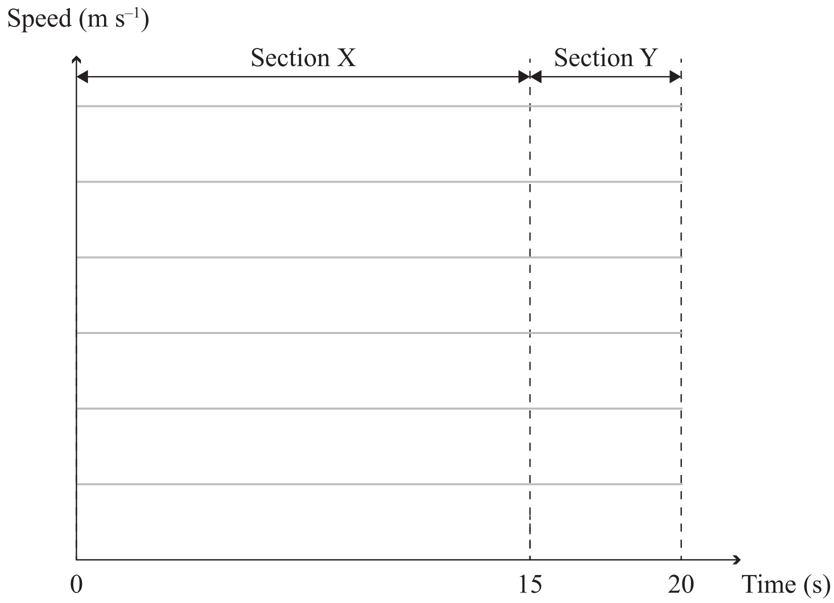
(c) (i) Calculate the speed of the boy as he reaches the end of section Y.

Speed at the end of section Y = ______________ m s^{-1}

(ii) Use this and the other information provided in the question to complete the speed/time graph below.

On your graph, you should:

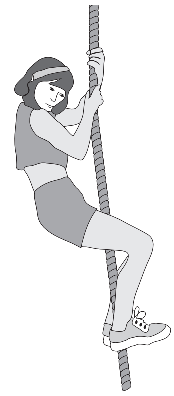
- label the speed values on the vertical axis
- draw a line on the graph to show the speeds for section X **and** section Y.



If you need to redraw this graph, use the grid on page 21.

PĀTAI TUATORU: PIKI TAURA

MĀ TE KAIMĀKA ANAKE



Ka whakamahia e tētahi kōtiro 60 kirokaramu te papatipu ngā pūngao 5 100 J ina piki ia i tētahi taura poutū.

(a) Tātaihia te teitei mōrahi ka taea e te kōtiro te eke.

(b) He 8 mita noa iho te teitei i eke ai te kōtiro.

Whakamāramahia he aha **i kore ai** te **pūngao** i whakamahia e te kōtiro i te wā piki e ōrite ki te mahi i oti i a ia ki te eke ki te teitei poutū o te 8 m.

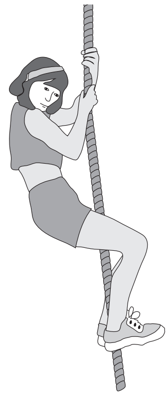
I tō tuhinga me:

- whakaingoa i te momo pūngao kei te kōtiro i a ia e 8 m i runga ake o te papa
- tātai i te mahi i oti kia tae ki tētahi teitei 8 m i runga ake o te papa
- tātai i te rerekētanga i waenga i te mahi i oti me te pūngao i whakapaua e te kōtiro
- whakamārama i pau te pūngao e "ngaro" ana ki hea, ā, he aha i pēnei ai.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

QUESTION THREE: ROPE CLIMBING



A girl of mass 60 kg uses 5 100 J of energy when she climbs a vertical rope.

(a) Calculate the maximum height it would be possible for the girl to reach.

(b) In reality, the girl reaches a height of only 8 m.

Explain why the **energy** used by the girl during the climb does **not** equal the work she does to reach the vertical height of 8 m.

In your answer you should:

- name the type of energy the girl has when she is 8 m above the ground
- calculate the work done to reach a height of 8 m above the ground
- calculate the difference between the work done and the energy used by the girl
- explain where the "missing" energy has gone, and why this occurs.

ASSESSOR'S USE ONLY

PĀTAI TUAWHĀ: NGĀ PŪTU WHUTUPŌRO

Ngā pūtu **kore** matihao.

Ngā pūtu **whai** matihao.

Ka whakamahia e tētahi ākonga e 40 kirokaramu te papatipu ngā pūtu whutupōro i runga ake.

Kei te pūtu **kore** matihao KOTAHI te horahanga mata o te 165 cm^2 (0.0165 m^2) ina **pā** ki te papa.

Kei te pūtu KOTAHI **whai** matihao e ono te horahanga mata o te 6 cm^2 (0.0006 m^2) ina **pā** ki te papa.

(a) Tātaihia te pēhanga ka puta ki te tū ia ki tōna waewae KOTAHI noa iho ki runga i tētahi **papa mārō**, mō te pūtu **kore** matihao ME te pūtu **whai** matihao.

Homai he waeine tōtika i tō whakautu.

(i) Kore matihao: ______________________

____

____

Te pēhanga ka puta i te waewae KOTAHI mō te pūtu **kore** matihao = __________ (________)
waeine

(ii) Whai matihao: ______________________

____

____

Te pēhanga ka puta i te waewae KOTAHI mō te pūtu **whai** matihao = __________ (________)
waeine

ASSESSOR'S USE ONLY

QUESTION FOUR: FOOTBALL BOOTS

Boot **without** studs.

Boot **with** studs.

A student of mass 40 kg uses the football boots shown above.

ONE boot **without** studs has a surface area of 165 cm^2 (0.0165 m^2) in **contact** with the ground.

ONE boot **with** six studs has a surface area of only 6 cm^2 (0.0006 m^2) in **contact** with the ground.

(a) Calculate the pressure exerted if the student stands on ONE foot on a **hard surface**, for the boot **without** studs AND for the boot **with** studs.

Give an appropriate unit with your answers.

(i) Without studs: ______________________________

____

____

Pressure exerted by ONE foot for the boot **without** studs = ____________ (________)
unit

(ii) With studs: ______________________________

____

____

Pressure exerted by ONE foot for the boot **with** studs = ____________ (________)
unit

(b) Matapakihia te **huapai** ki te ākonga ina oma ia i runga papa tākaro **otaota ngāwari** me te mau pūtu whai matihao, **tēnā** i te mau pūtu rahinga ōrite kore matihao.

I tō tuhinga me:

- whakataurite te pēhanga ka puta ki te papa i te pūtu whai matihao ME te pūtu kore matihao
- whakamārama te hononga i waenga i te horahanga mata me te pēhanga i puta
- whakamārama ka pēhea te rerekētanga o ngā pēhanga e āwhina ai i te ākonga ki te oma i runga i te papa ngāwari ake pēnei i te otaota.

MĀ TE KAIMĀKA ANAKE

(b) Discuss the **advantage** gained by the student when running on a **soft grass** football field while wearing the boots with studs **compared** to wearing boots of the same size without studs.

In your answer you should:

- compare the pressure exerted on the ground by the boot with the studs AND the boot without studs
- explain the relationship between surface area and pressure exerted
- explain how the difference in pressures would help the student run on a softer surface like grass.

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MĀ TE KAIMĀKA ANAKE

Ki te pīrangi koe ki te tuhi anō i te kauwhata mai i te Pātai Tuarua (c), tuhia ki te tukutuku i raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.

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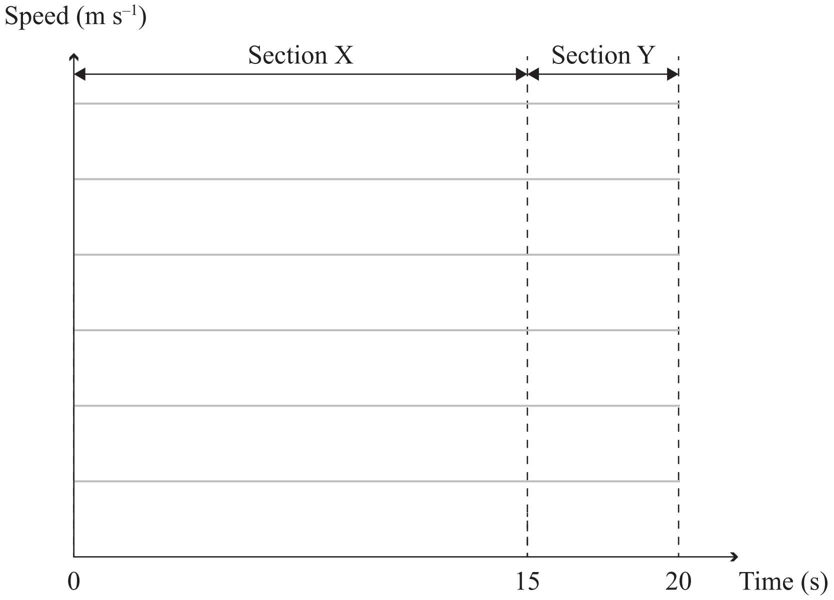
If you need to redraw the graph from Question Two (c), draw it on the grid below. Make sure it is clear which graph you want marked.



He wāhi anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

Extra space 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, 2011

90940 Demonstrate understanding of aspects of mechanics

9.30 am Monday 21 November 2011
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.

Show ALL working.

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 2–23 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.