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, 2012

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

9.30 i te ata Rāhina 19 Whiringa-ā-rangi 2012
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 (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 2–23 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

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

Tērā pea ka whai hua ēnei tātai māu.

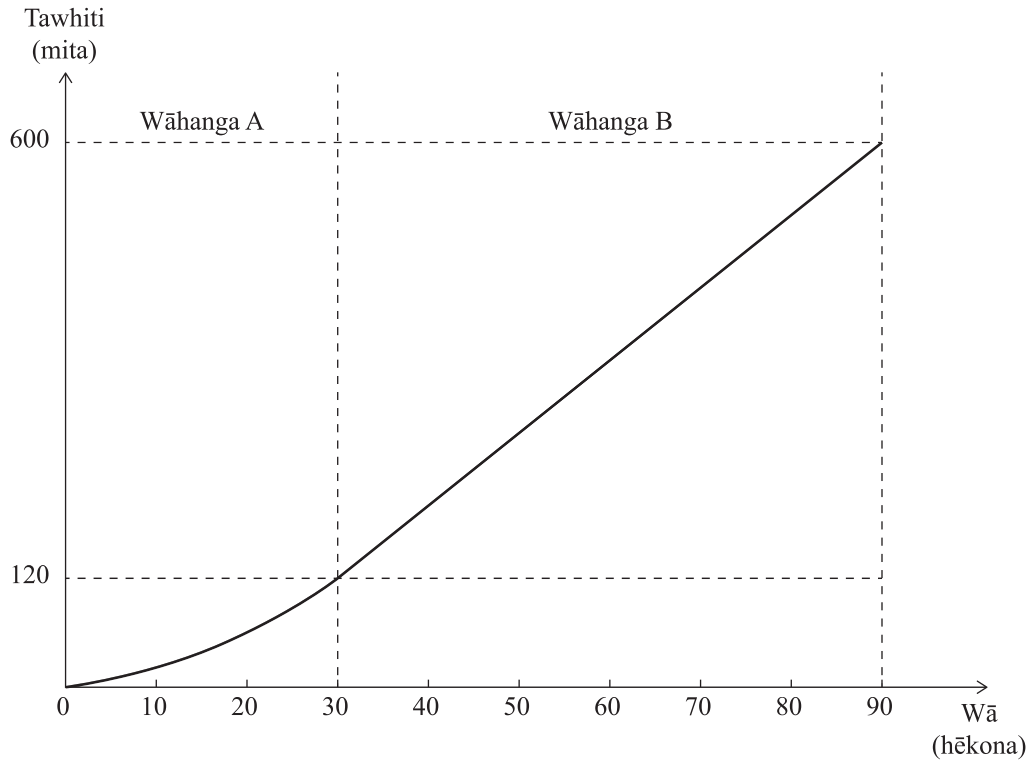
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A}$$

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

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

PĀTAI TUATAHI: TE TARAKIHANA

Ka taraiwa haere tētahi wahine i tōna tarakihana i tētahi onepū ki te tiki i te poti o tōna hoa. Ka whakaatu te kauwhata tawhiti-wā o raro nei i tētahi wāhanga o te haerenga.



(a) Whakamahia ngā mōhiohio mai i te kauwhata kia tātaihia te **tere toharite** o te tarakihana i te 90 hēkona (s).

tere toharite = ________________ m s^{-1}

MĀ TE KAIMĀKA ANAKE

(b) Whakaahuatia te **nekenga** o te tarakihana i te **wāhanga B**, ā, whakamārama mai he aha te mea e mōhio ana tātou mō ngā tōpana ka pā atu ki te tarakihana i tēnei wā.

(c) Ko te papatipu tapeke o te tarakihana me te kaitaraiwa ko te 1660 kg.

Tātaihia te **tere** o te tarakihana i te **mutunga** o te wāhanga A, kātahi ka tātaihia te **tōpana tapeke** e pā atu ki te tarakihana i te **wāhanga A** o te kauwhata.

tōpana tapeke = ______________ N

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

You may find the following formulae useful.

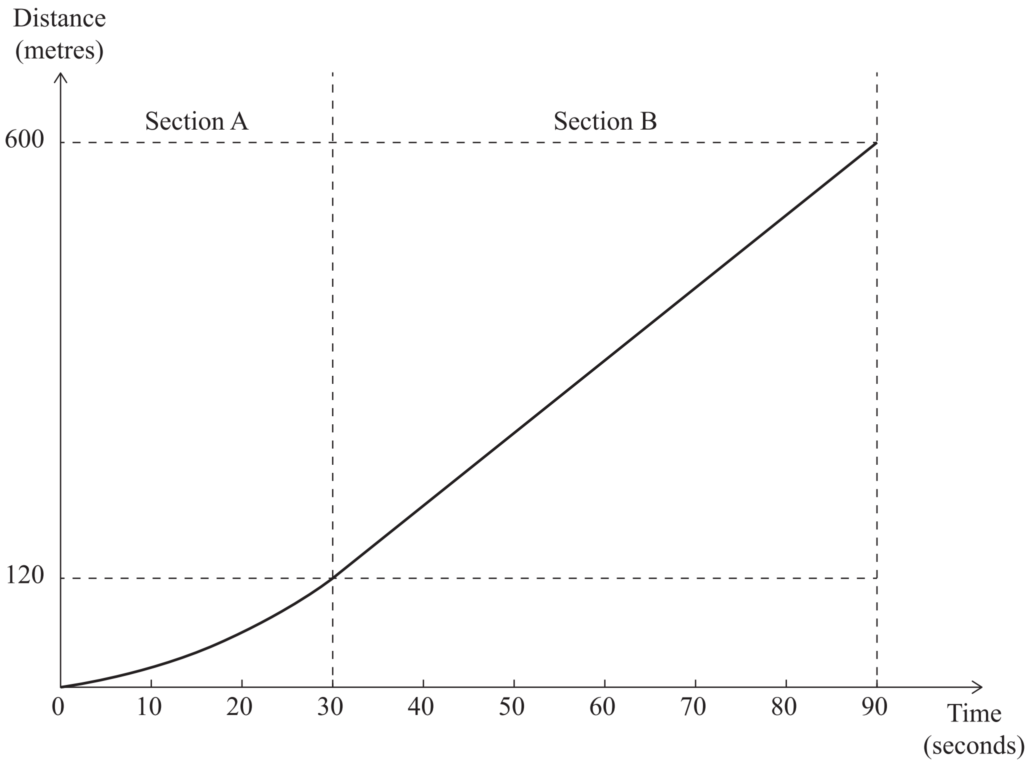
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{\text{net}} = ma \qquad P = \frac{F}{A}$$

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

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

QUESTION ONE: THE TRACTOR

A woman drives her tractor down a sandy beach to pick up her friend's boat. The distance-time graph below shows part of the journey.



(a) Use the information from the graph to calculate the **average speed** of the tractor during the 90 seconds.

average speed = ______________ m s^{-1}

ASSESSOR'S USE ONLY

(b) Describe the **motion** of the tractor in **section B**, and explain what this tells us about the forces acting on the tractor during this time.

(c) The total mass of the tractor and driver is 1660 kg.

Calculate the **speed** of the tractor at the **end** of section A, and then calculate the **net force** acting on the tractor during **section A** of the graph.

net force = ______________ N

(d) I a ia i te onepū ka kite te wahine i tētahi motokā (*papatipu* = 1100 kg) kua tapoko ki te one.

Ka whakaatu te whakaahua o raro nei i ngā tauira takahanga o te taea o muri o te tarakihana me te taea o muri o te motokā.

tauira takahanga tarakihana

tauira takahanga motokā

Whakatauritea ngā **tauira** rerekē o te taea tarakihana ME te taea motokā e ai ki te tōpana, te horahanga mata me te pēhanga ka pāngia.

Whakamahia tēnei whakatauritenga hei whakamārama he aha i tapoko ai te motokā i te onepū, ENGARI anō te tarakihana.

MĀ TE KAIMĀKA ANAKE

(d) While on the sandy beach the woman sees a car (m = 1100 kg) that is stuck in the sand.

The photos below show the tread patterns of the tractor's rear tyre and the car's rear tyre.


tractor tread


car tread

Compare the different **treads** of the tractor tyre AND car tyre in terms of force, surface area and pressure applied.

Use this comparison to explain why the car gets stuck in the sand, BUT the tractor does not.

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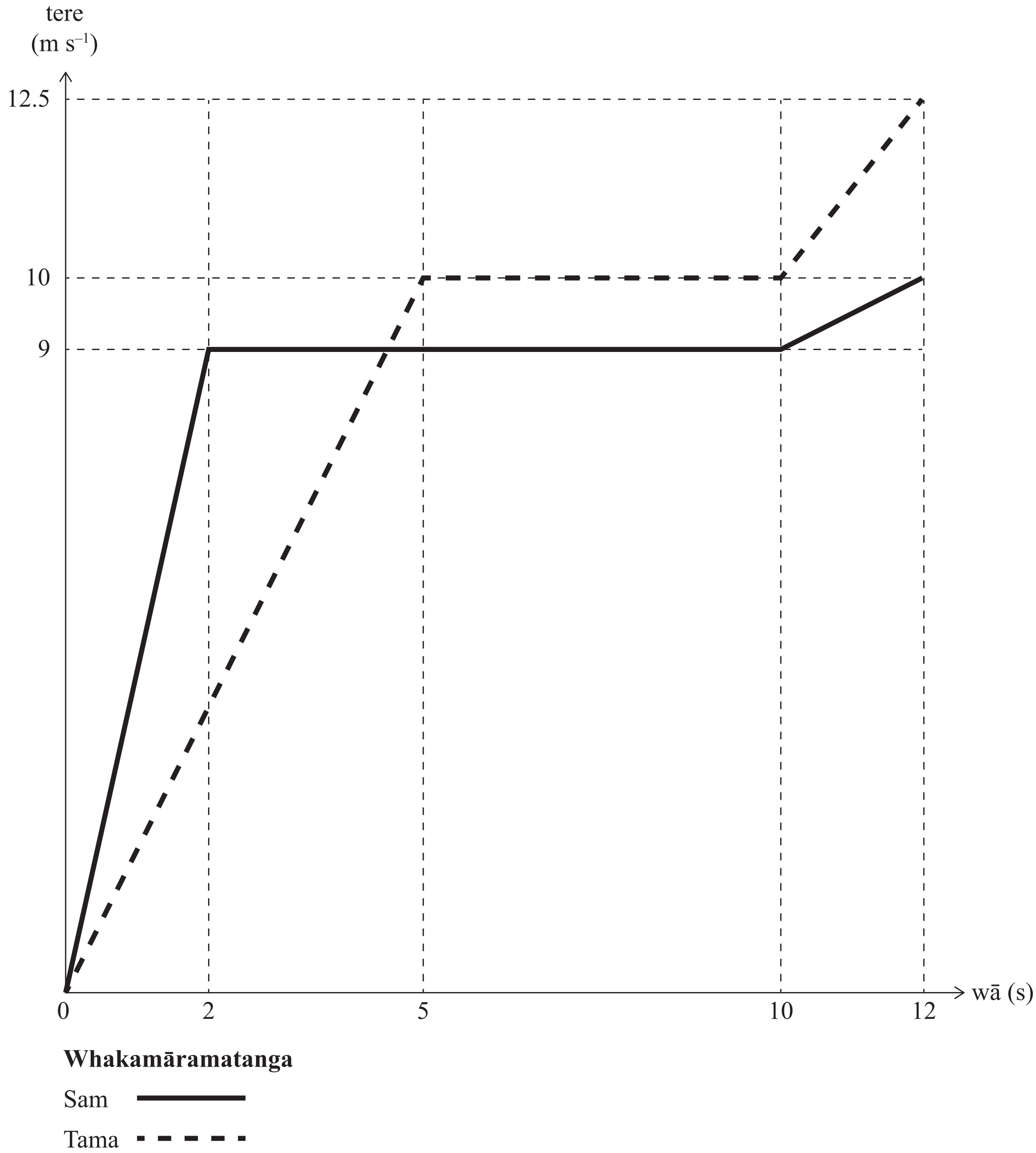
PĀTAI TUARUA: TAUOMAOMA 100 MITA

I te rangi o te kaiaka, ka uru atu ētahi hoa tokorua nei ki te tauomaoma 100 mita. Ka whakaaturia e te kauwhata tere-wā i raro tētahi wāhanga 12 hēkona o tā rāua tauomaoma.



(a) Mai i te kauwhata, kei a wai te whakaterenga nui ake i te 2 hēkona tuatahi?

Homai he pūtake ki tō whakautu.

Kāore te tātai e whai wāhi ana.

MĀ TE KAIMĀKA ANAKE

(b) Ka whakatere a Sam mō ngā 2 hēkona tuatahi o te tauomaoma.

I tēnei wā, he 9 m te tawhiti o tōna haere. Ko tōna papatipu he 60 kg.

Mā te whakamahi i te kauwhata, tātaihia te **whakatere** o Sam i ngā 2 hēkona tuatahi, KĀTAHI ka tātaihia te **mahi i oti** ki te oma 9 m te tawhiti.

te mahi i oti = ______ J

(c) (i) Whakamahia ngā mōhiohio i te kauwhata kia whakatauritea te tere ME te whakatere o Sam rāua ko Tama i ngā **10 hēkona tuatahi**.

Te tere me te whakatere o Sam: ______

Te tere me te whakatere o Tama: ______

Te whakatauritenga o Sam rāua ko Tama: ______

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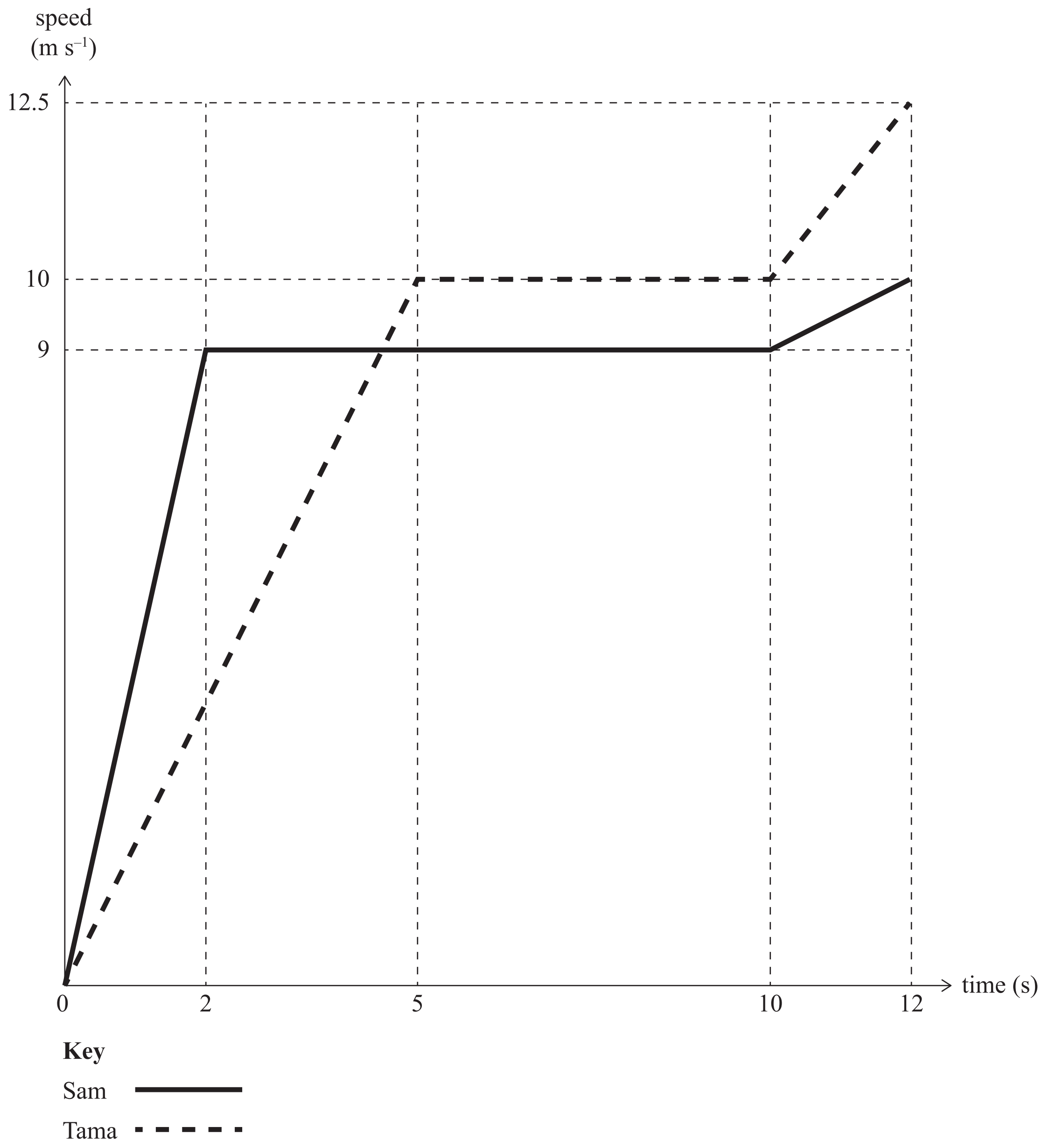
QUESTION TWO: 100 METRE RACE

On athletics day, two friends compete in the same 100 metre race. The speed-time graphs for 12 seconds of their race are shown below.



(a) From the graph, who has the greater acceleration in the first 2 seconds?

Give a reason with your answer.

No calculation is required.

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(b) Sam accelerates for the first 2 seconds of the race.

During this time, he covers a distance of 9 m. His mass is 60 kg.

Using the graph, calculate Sam's **acceleration** during the first 2 seconds, AND then calculate the **work done** to cover the distance of 9 m.

work done = ______________ J

(c) (i) Use the information in the graph to compare the speed AND acceleration of Sam and Tama in the **first 10 seconds**.

Sam's speed and acceleration: ______________

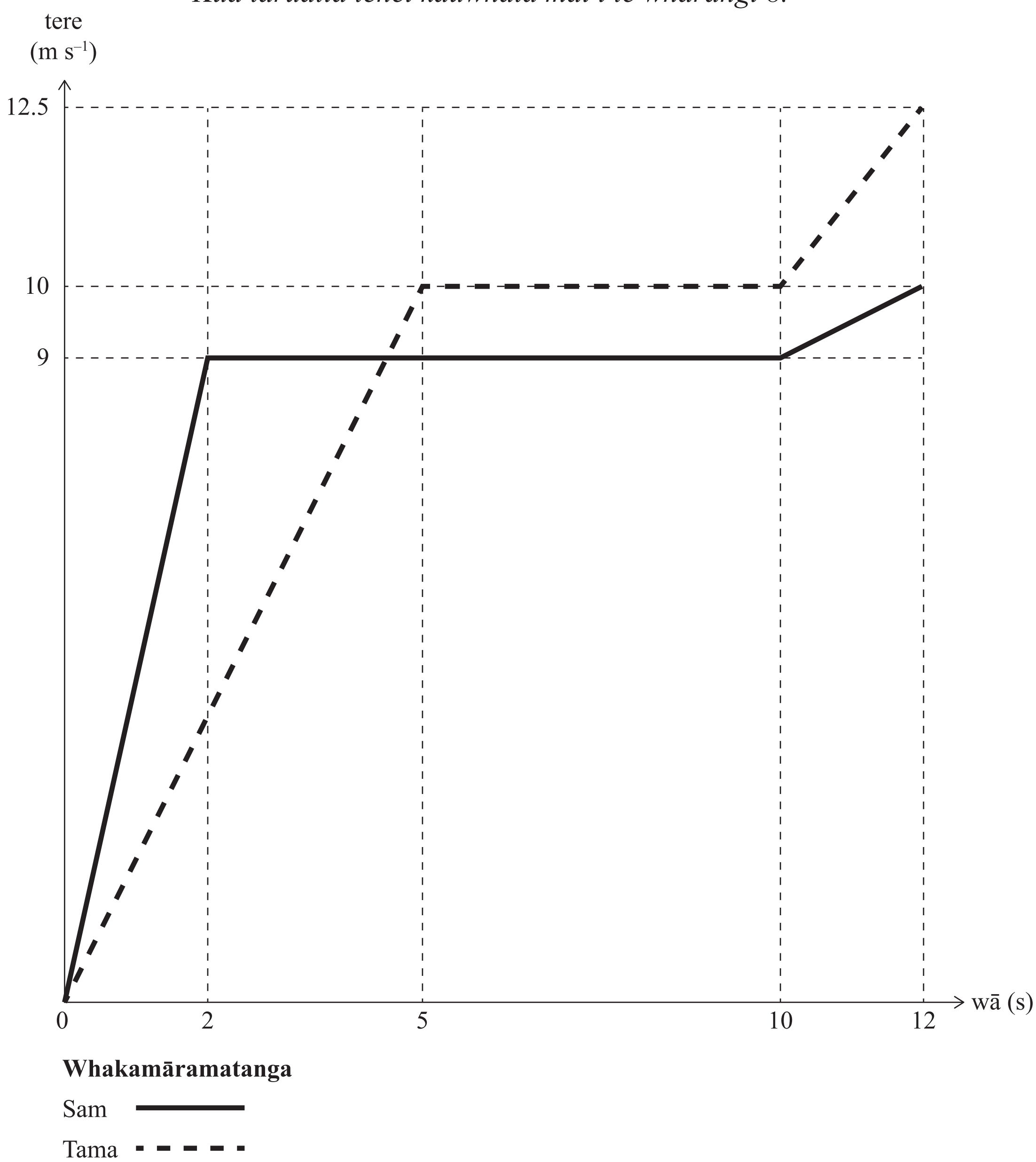
Tama's speed and acceleration: ______________

Comparison of Sam and Tama: ______________

(ii) I te 12 hēkona, ka oti i tētahi o ngā kaiomaoma te tauomaoma 100 mita.

Whakamahia ngā mōhiohio o te kauwhata me ngā tātai e whai wāhi ana ki te whakaatu ko wai te kaiomaoma, ko Sam, ko Tama rānei, i oti i te 12 hēkona.

Kua tāruatia tēnei kauwhata mai i te whārangi 8.



(ii) At 12 seconds, one of the runners has finished the 100 metre race.

Use the information in the graph and any necessary calculations to show which runner, Sam or Tama, finished at 12 seconds.

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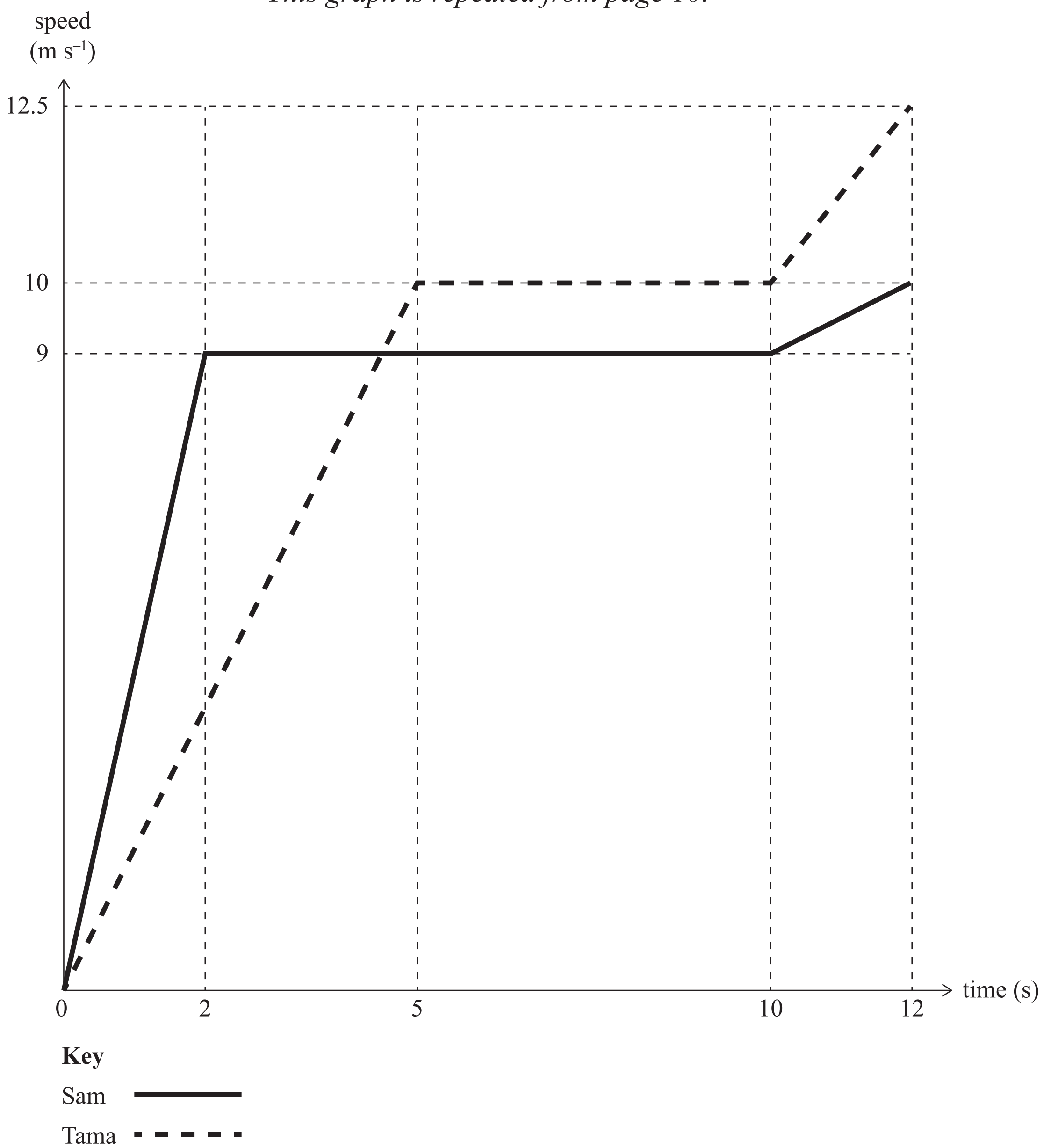
This graph is repeated from page 10.

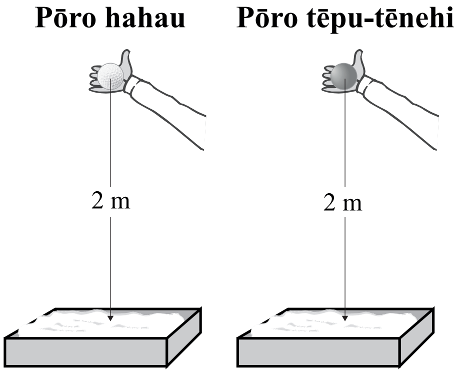


MĀ TE KAIMĀKA ANAKE

PĀTAI TUATORU: NGĀ RUA

I pīrangi ētahi ākonga ki te tūhura i te waihangatanga o ngā rua.

E rua ngā pōro rerekē i whakatakahia e rātou – he pōro hahau (*papatipu* = 0.046 kg), he pōro tēpu-tēnehi (*papatipu* = 0.003 kg) hoki, mai i te 2 m te teitei ki roto ki tētahi ipu kī ana i te puehu parāoa.



(a) Tātaihia te **taumaha** o te pōro hahau.

taumaha = ____________ N

(b) Ka whakaatu te atahanga i tētahi tauira o te rua ka hangaia e te pōro hahau.

I kite ngā ākonga ka hōhonu ake te rua ka hangaia e te pōro hahau i tērā o te pōro tēpu-tēnehi **i ngā wā katoa**.

Whakamāramahia he aha e hōhonu ake ai te rua ka hangaia e te pōro hahau ki tērā o te pōro tēpu-tēnehi, ahakoa **he ōrite te rahi me te hanga**, ā, **he ōrite hoki te teitei** whakatakanga o ngā pōro.

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

http://juliebeane.blogspot.com /2011/04/projects-and-baseball.html

MĀ TE KAIMĀKA ANAKE

(c) E ai ki te ture mō te pūmau o te pūngao, tātaihia te tere o te **pōro hahau** i tōna tukinga ki te puehu parāoa.

tere = ______________ m s^{-1}

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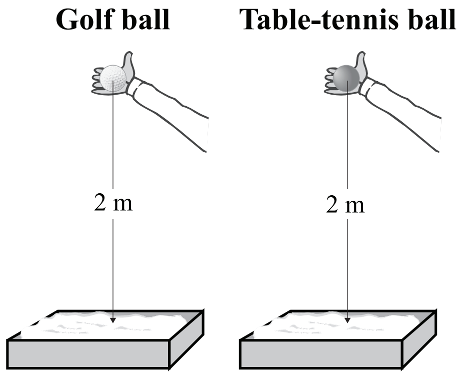
QUESTION THREE: CRATERS

Some students wanted to investigate how craters form.

They dropped two different balls – a golf ball (m = 0.046 kg) and a table-tennis ball (m = 0.003 kg), from a height of 2 m into a container filled with flour.



(a) Calculate the **weight** of the golf ball.

weight = ________________ N

(b) The image shows an example of a crater produced by the golf ball.

The students found that the golf ball **always** produced a deeper crater than the table-tennis ball.

Explain why the golf ball produces a deeper crater than the table-tennis ball, even though the balls are the **same size and shape**, and dropped from the **same height**.

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http://juliebeane.blogspot.com /2011/04/projects-and-baseball.html

(c) Assuming conservation of energy calculate the speed of the **golf ball** when it hits the flour.

speed = ____________ m s^{-1}

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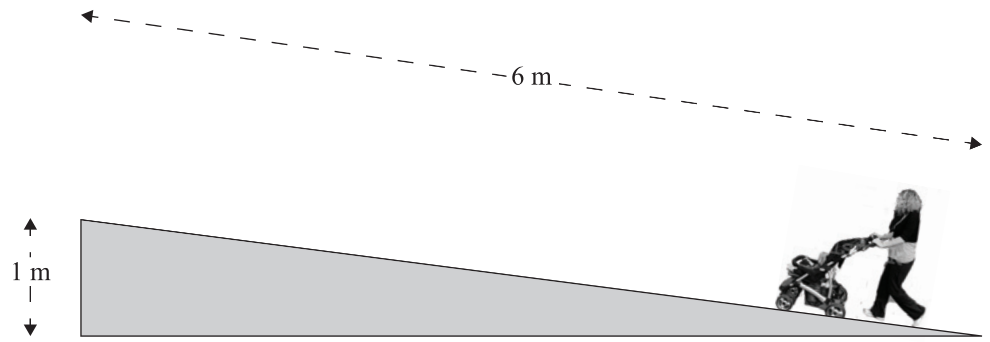
PĀTAI TUAWHĀ: NGĀ ARA RŌNAKI

Ka panaia tētahi tamaiti i roto i tētahi paki e tētahi wahine i runga i tētahi ara rōnaki e whakaaturia ana i raro nei. He 100 N te kaha o te tōpana o te pana o te wahine i te paki ki runga i te ara rōnaki.



(a) Tātaihia te **mahi i oti** ki te pana i te paki me te tamaiti ki runga i te ara rōnaki.

te mahi i oti = ______________ J

(b) Kāore e ōrite ana te pūngao ka whiwhi mā te pana i te paki me te tamaiti (*papatipu* = 55 kg) ki runga rawa o te ara rōnaki ki te mahi i oti.

Whakamārama he aha i kore ōrite ai ēnei uara e rua.

I tō whakautu me:

- whakaingoa ngā momo pūngao kei te paki, hei te wā ka tae atu ki runga rawa o te ara rōnaki
- tātai te rerekētanga i waenga i te mahi i oti me te pūngao i runga rawa o te ara rōnaki
- whakamārama ki hea pau ai te pūngao "ngaro", ā, he aha i pēnei ai.

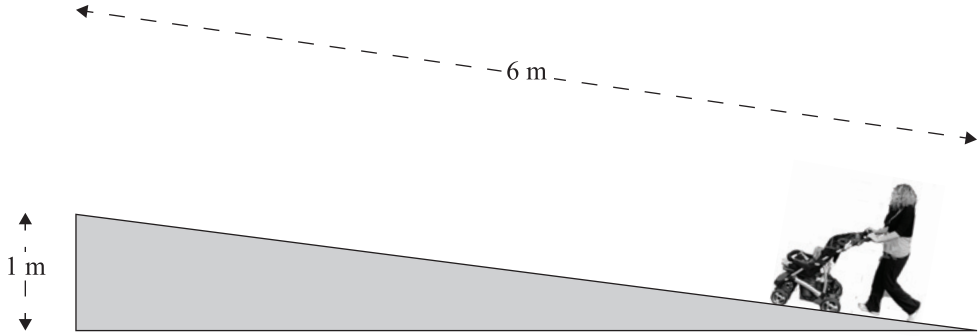
(c) Whakamāramahia, e ai ki te tōpana me te pūngao, he aha e **māmā ake** ai te pana i te paki me te tamaiti ki runga i te ara rōnaki **tēnā** ki te hiki ake.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

QUESTION FOUR: RAMPS

A woman pushes a child in a buggy up a ramp as shown below. The woman pushes the buggy up the ramp with a force of 100 N.



(a) Calculate the **work done** to push the buggy and child up the ramp.

work done = ______________ J

(b) The energy gained by the buggy and child (m = 55 kg) at the top of the ramp does not equal the work done.

Explain why these two values are not equal.

In your answer you should:

- name the type of energy the buggy has, when it reaches the top of the ramp
- calculate the difference between the work done and the energy at the top of the ramp
- explain where the "missing" energy has gone and why this occurs.

(c) Explain, in terms of force and energy, why it is **easier** to push the buggy and child up a ramp **than** to lift it straight up.

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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, 2012

90940 Demonstrate understanding of aspects of mechanics

9.30 am Monday 19 November 2012
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 2–23 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.