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91171M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

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Ahupūngao, Kaupae 2, 2016

91171M Te whakaatu māramatanga ki te pūhanga manawa

9.30 i te ata Rātū 15 Whiringa-ā-rangi 2016
Whiwhinga: Ono

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki te pūhanga manawa.	Te whakaatu māramatanga hōhonu ki te pūhanga manawa.	Te whakaatu māramatanga matawhānui ki 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.

Tirohia mēnā kei a koe te Rau Rauemi L2–PHYSMR.

Ki roto i ō tuhinga, whakamahia ngā whiriwhiringa tohutau mārama, ngā kupu, ngā hoahoa hoki, tētahi, ētahi rānei o ēnei, ki hea hiahiatia ai.

Me hoatu te wae tika o te Pūnaha Waeine ā-Ao (SI) ki ngā tuhinga tohutau.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia te (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 2–15 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

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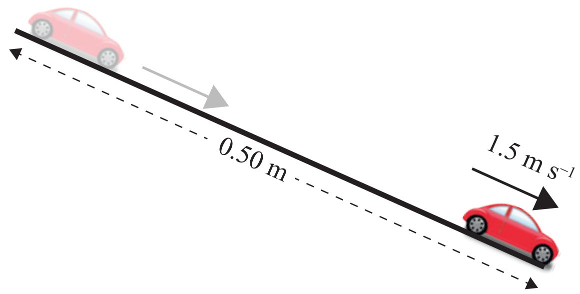
TŪMAHI TUATAHI: NEKEHANGA

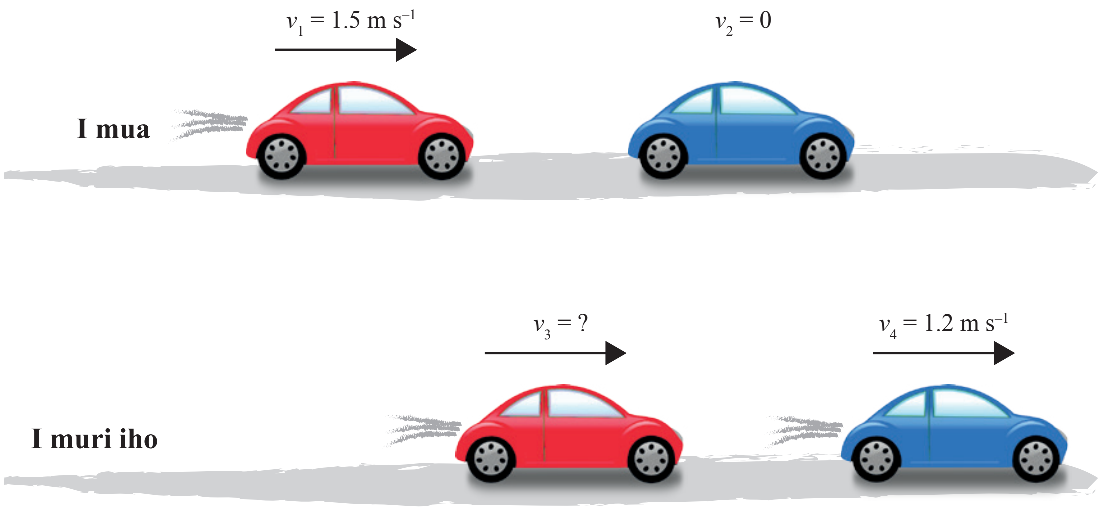


Ka tukuna e Sarah he waka whero, mai i te okioki, kia heke i tētahi rōnaki he 0.50 m te roa.

Ka āta whakatere haere te waka whero ka eke ki te tere o te 1.5 m s^{-1} ina tae atu ki raro o te rōnaki.

(a) Tātaihia te whakaterenga o te waka whero i te wā ka heke haere i te rōnaki.

I raro i te rōnaki, he papatahi te ara. Ka tuki te waka whero, e neke ana i te tere o te 1.5 m s^{-1}, ki tētahi waka kikorangi kei te tū noa. Ko te papatipu o te waka whero he 0.050 kg, ā, ko te papatipu o te waka kikorangi he 0.040 kg.



(b) Mēnā ko te tere o te waka kikorangi i muri i te tukinga he 1.2 m s^{-1}, tātaihia te tere o te waka whero i muri i te tukinga.

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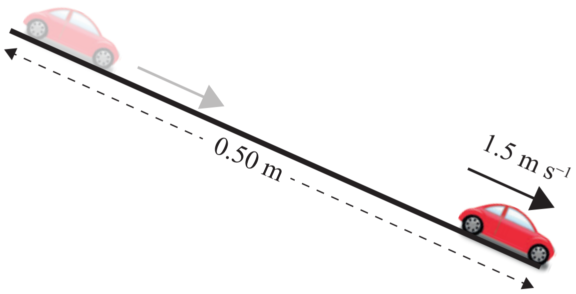
QUESTION ONE: MOTION

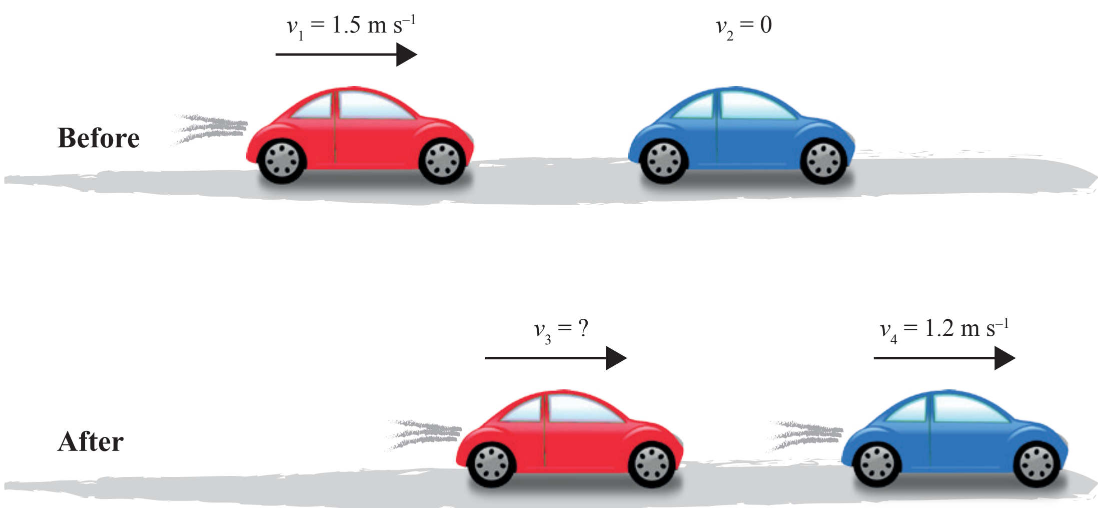


Sarah releases a red car, from rest, down a ramp of length 0.50 m.

The red car accelerates steadily and reaches a speed of 1.5 m s^{-1} when it gets to the bottom of the ramp.

(a) Calculate the acceleration of the red car as it moves down the ramp.

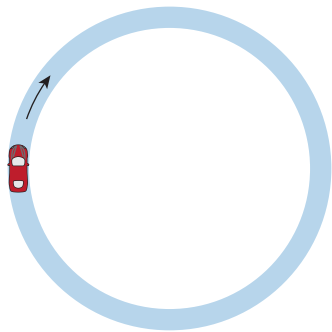
At the bottom of the slope, the track is flat. The red car, moving with the speed of 1.5 m s^{-1}, collides with a stationary blue car. The mass of the red car is 0.050 kg, and the mass of the blue car is 0.040 kg.



(b) If the velocity of the blue car after the collision is 1.2 m s^{-1}, calculate the velocity of the red car after the collision.

(c) Mēnā he 0.08 hēkona te roa o te tukinga, tātaihia te tōpana toharite ka pā i te waka whero ki te waka kikorangi.

(d) I tētahi atu wā i te haere te waka whero i tētahi wāhanga porowhita o te ara i tētahi tere aumou.



(i) Whakaingoahia te tōpana e pā ana ki te waka, me te tātuhi i tētahi pere whai tapanga ki te hoahoa i runga ake hei whakaatu i te ahunga o te tōpana e pā ana ki te waka i te wā tonu e whakaaturia ana.

(ii) Matapakitia te pānga o te tōpana ki te rahi me te ahunga o te tere o te waka whero.

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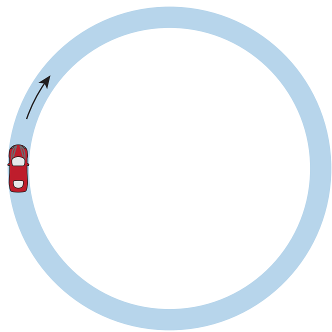
(c) If the duration of the collision was 0.08 seconds, calculate the average force that the red car exerts on the blue car.

(d) On another occasion the red car was going round a circular part of the track at a constant speed.



(i) Name the force acting on the car, and draw a labelled vector on the diagram above to show the direction of the force acting on the car at the instant shown.

(ii) Discuss the effect of the force on the size and direction of the velocity of the red car.

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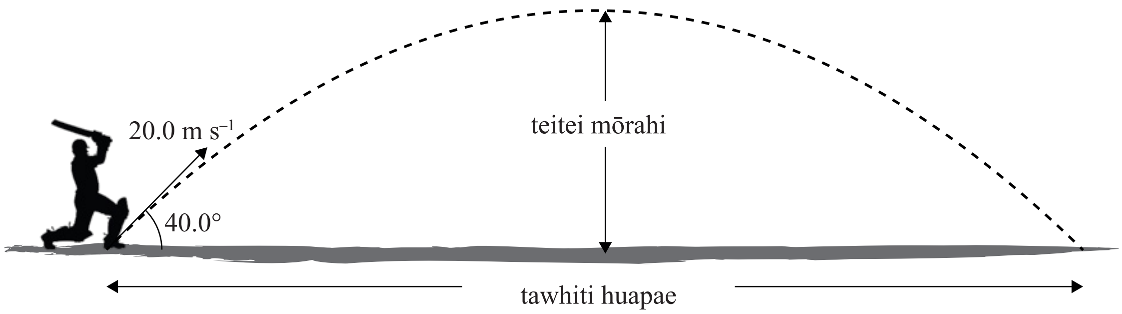
TŪMAHI TUARUA: NEKEHANGA TĪTERE

I te wā o tētahi kēmu kirikiti i haua e tētahi kaipatu te pōro i tētahi koki o te 40.0° ki te papa me te tere o te 20.0 m s^{-1}, e whakaaturia ana i raro.

www.wallpaperzworld.com/Cricket-Batsman-wallpaper_1576_original-view



(a) Whakaaturia ko te wāhanga whakatepoutū tīmata o te tere o te pōro ko te 12.9 m s^{-1}.

(b) Tātaihia te wā mō te pōro ki te tae ki tōna teitei mōrahi.

(c) Tātaihia te tawhiti huapae ka rere te pōro i mua i te tukinga ki te whenua.

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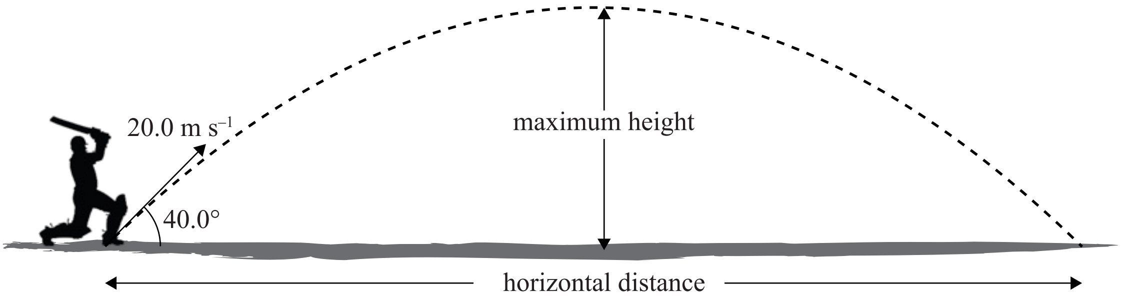
QUESTION TWO: PROJECTILE MOTION

During a cricket game a batsman hits the ball at an angle of 40.0° with the ground at a velocity of 20.0 m s^{-1}, as shown below.

www.wallpaperzworld.com/Cricket-Batsman-wallpaper_1576_original-view



(a) Show that the initial vertical component of the ball's velocity is 12.9 m s^{-1}.

(b) Calculate the time it takes the ball to reach its maximum height.

(c) Calculate the horizontal distance travelled by the ball before it hits the ground.

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(d) Tuhia he whakamāramatanga matawhānui o te pānga o te tōpana, ngā tōpana rānei, e pā ana ki te pōro i te wā kei te rere. Ko te whakapae he kore noa iho te parehau.

I tō tuhinga me:

- whakaahua i te nekehanga huapae
- matapaki i ngā pānga o te tōpana, o ngā tōpana rānei, ki te nekehanga huapae
- whakamārama i te nekehanga whakatepoutū
- matapaki i ngā pānga o te tōpana, o ngā tōpana rānei, ki te nekehanga poutū.

(d) Give a comprehensive explanation of the effect of the force(s) acting on the ball during its flight. Assume air resistance is negligible.

In your answer you should:

- describe the horizontal motion
- discuss the effect of force(s) on horizontal motion
- describe the vertical motion
- discuss the effect of force(s) on vertical motion.

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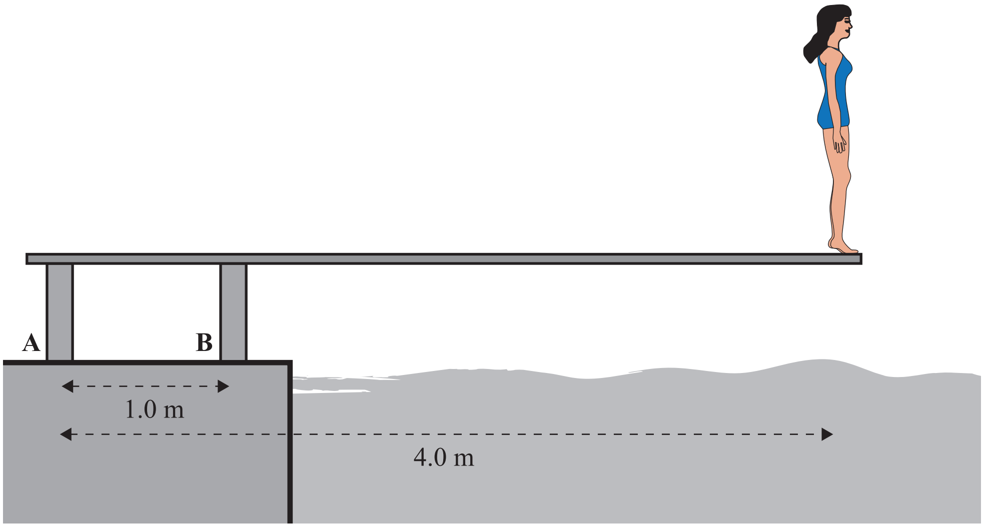
MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATORU: NGĀ TŌPANA WHAKAHURI ME TE PŪNGAO



Ka tū a Sarah ki te pito o te papa tirikohu ko tōna roa tapeke he 4.0 m. E mau ana te papa tirikohu ki ngā taupua e rua, **A** me **B**, ā, he 1.0 m te whānui o te wehe. He 10 kg te papatipu o te papa, ā, he 50 kg te papatipu o Sarah. Ko te whakapae he ōrite te tuari o te papatipu o te papa tirikohu.

(a) Tātaihia te tōpana whakahuri ka puta i a Sarah i te taupua **B**.

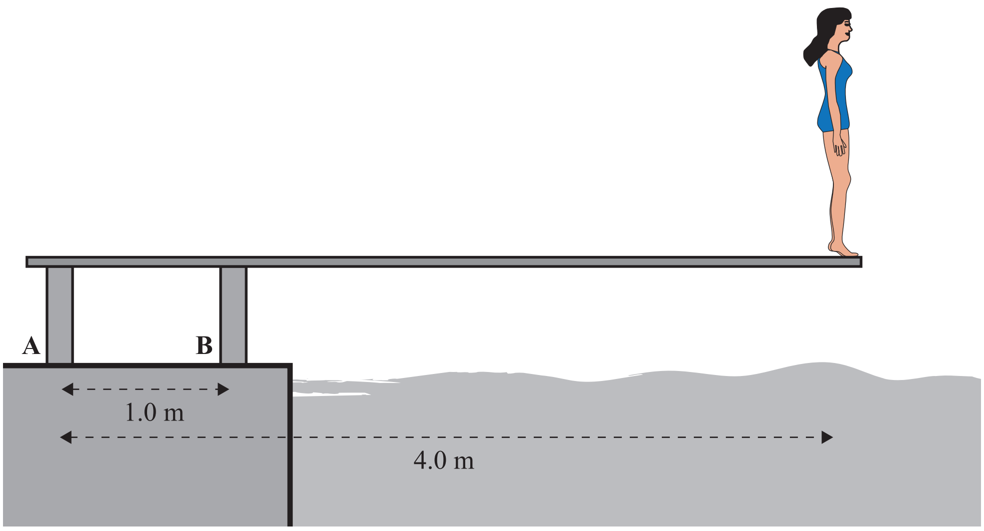
Tuhia ngā waeine i tō tuhinga.

(b) He aha te ahunga o te tōpana ka rato i te taupua **A**?

Whakamāramatia tō tuhinga.

Kāore e hiahiatia he tātaitanga.

QUESTION THREE: TORQUES AND ENERGY



Sarah stands at the end of a diving board of total length 4.0 m. The diving board is fixed to two supports, **A** and **B**, which are 1.0 m apart. The mass of the board is 10 kg and Sarah's mass is 50 kg. Assume the mass of the board is evenly distributed.

(a) Calculate the torque exerted by Sarah about support **B**.

Give units with the answer.

(b) What is the direction of the force supplied by support **A**?

Explain your answer.

No calculations are required.

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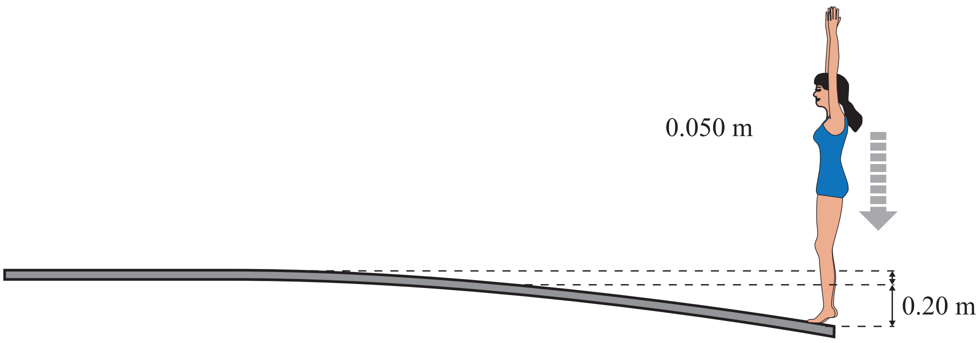
(c) He 0.050 m te tāwēwē o te papa tirikohu ina tū a Sarah i te pito o te papa.

Tātaihia te aumou pūniko o te papa (ko te whakapae he pūniko te āhua mahi o te papa).

(d) Ka peke ake a Sarah ka tau mai ki te papa, me te pēhi i te papa kia 0.20 m atu anō i mua i tana tirikohu ki te wai, e ai ki te pikitia i raro.



Tātaihia te tere o Sarah ina tau ia ki te papa, e pēhia ana e ia kia 0.20 m atu anō.

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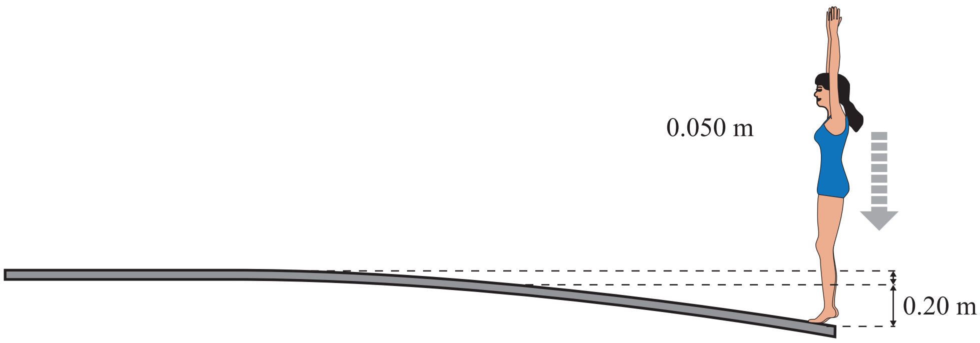
(c) The diving board sags 0.050 m when Sarah stands still on the end of the board.

Calculate the spring constant of the board (assuming the board acts like a spring).

(d) Sarah then jumps up and lands on the board, depressing it by a further 0.20 m before she dives into water, as shown below.



Calculate Sarah's speed when she lands on the board, causing it to depress it by a further 0.20 m.

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 2 Physics, 2016

91171 Demonstrate understanding of mechanics

9.30 a.m. Tuesday 15 November 2016
Credits: Six

91171M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of mechanics.	Demonstrate in-depth understanding of mechanics.	Demonstrate comprehensive understanding 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.

Make sure that you have Resource Sheet L2–PHYSMR.

In your answers use clear numerical working, words and/or diagrams as required.

Numerical answers should be given with an appropriate SI unit.

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 2–15 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.