2

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!

SUPERVISOR'S USE ONLY

Ahupūngao, Kaupae 2, 2015

91171M Te whakaatu māramatanga ki te pūhanga manawa

9.30 i te ata Rātū 17 Whiringa-ā-rangi 2015
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.

Mēna ka hiahia whārangi atu anō mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–21 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.

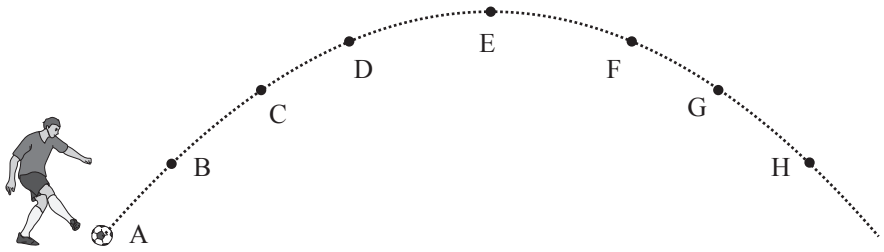
TAPEKE

MĀ TE KAIMĀKA ANAKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI: NGĀ TĪTERE

Ka whanaia e Roy tētahi pōro. E whakaatu ana te hoahoa i raro nei i te rere o te pōro. Me kī he kore noa iho te parenga hau[1].

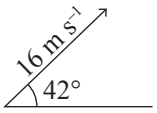


Ki te hiahia koe ki te tuhi anō i ngā pere whai tapanga, whakamahia te hoahoa wātea ki te whārangi 18.

(a) Ki te hoahoa tātuhia **ngā pere whai tapanga ki te roa tika**, hei whakaatu i ēnei e whai ake ana:

- te tōpana ka pā ki te pōro i te tūnga C me te tūnga G
- te wāhanga huapae o te tere o te pōro i te tūnga B me te tūnga H
- te wāhanga poutū o te tere o te pōro i te tūnga D me te tūnga F.

(b) Ka whanaia te pōro me te tere tuatahi o te 16 m s^{-1}, i te koki 42° ki te papa.



Tātaihia ngā wāhanga huapae me te poutū tuatahi o te tere o te pōro i te tūnga A.

(c) Tuhia ngā wāhanga huapae me te poutū o te tere o te pōro i te tūnga E.

Whakamāramahia ō tuhinga.

[1] ātetenga

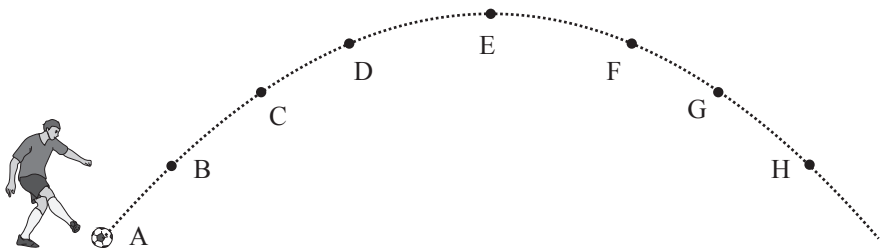
(d) Tātaihia te tawhiti huapae ka rere te pōro i mua i te hokinga ki te taumata i whanaia ai.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

QUESTION ONE: PROJECTILES

Roy kicks a ball. The diagram below shows the trajectory of the ball. You may assume air resistance to be negligible.

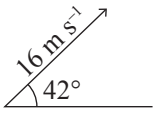


If you need to redraw your labelled arrows, use the spare diagram on page 19.

(a) On the diagram draw **labelled arrows** of **appropriate length** to show the following:

- the force on the ball at position C and at position G
- the horizontal component of the velocity of the ball at position B and at position H
- the vertical component of the velocity of the ball at position D and at position F.

(b) The ball is kicked with an initial velocity of 16 m s^{-1}, at an angle of 42° to the ground.



Calculate the initial horizontal and vertical components of the velocity of the ball at position A.

(c) State the horizontal and vertical components of the velocity of the ball at position E.

Explain your answers.

(d) Calculate the horizontal distance the ball travels before returning to the level from which it was kicked.

ASSESSOR'S USE ONLY

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUARUA: TE RETIRETI TIO

I runga i ngā here manatārua, kāore e whakaaetia te whakaaturanga o tēnei rauemi i konei.

http://sport-kid.net/ice-skating-fall-couple.html

Kei te retireti tio a Janet rāua ko Roy.

(a) I tētahi wā, kei te tū noa a Roy, ā, kei te reti atu a Janet ki a ia mai i muri me te hopu atu i ōna pakihiwi. Ko te tere o Janet i a ia e reti atu ana ki a Roy he 5.0 m s^{-1}, ā, ka reti tahi atu rāua ki te tere o te 2.2 m s^{-1} ki te ahunga i retia e Janet (me kī, e ahu ana ngā hū reti o Janet rāua ko Roy ki te ahunga reti). He 65 kg te papatipu o Roy.

(i) Tuhia te ture ahupūngao e hāngai ana ki tēnei āhuatanga.

(ii) Tātaihia te papatipu o Janet.

(iii) Whakamāramahia te take ka taea te whakamahi ō whakapae i a koe e tātai ana i te papatipu o Janet.

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QUESTION TWO: ICE SKATING

Janet and Roy are ice skating.

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http://sport-kid.net/ice-skating-fall-couple.html

(a) At one point, Roy is standing still, and Janet glides up to him from behind and grabs him by the shoulders. Janet's velocity as she glides up to Roy is 5.0 m s^{-1}, and together they glide off at a velocity of 2.2 m s^{-1} in the same direction as Janet was gliding (assume that both Janet's and Roy's skates are pointing in the direction of travel). Roy has a mass of 65 kg.

(i) State the law of physics that applies to this situation.

(ii) Calculate Janet's mass.

(iii) Explain why you can use the assumptions you made when calculating Janet's mass.

MĀ TE KAIMĀKA ANAKE

I muri i te unuhanga o ōna hū reti, ka peke mai a Janet ki te papa mai i tētahi tūpapa teitei.

(b) Tuhia he whakamāramatanga matawhānui mō ngā mea hei mahi mā Janet i a ia e tau ana, kia kore ai ia e whara.

Whakamahia tētahi ture tātai hei whakamārama i tō tuhinga.

(c) Ina peke mai a Janet, kei te pūmau tōna torohaki?

Whakamāramahia.

After removing her skates, Janet jumps down to the ground from a high bench.

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(b) Write a comprehensive explanation of what Janet needs to do while landing, so that she does not hurt herself.

Use a formula to explain your answer.

(c) When Janet jumps down, is her momentum conserved?

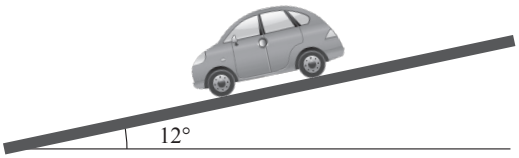
Explain.

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATORU: TE WAKA O JANET ME NGĀ PŪNIKO

Ka tae atu a Janet ki te kāinga. Ka whakatūhia tōna waka ki tētahi tauheke e 12° ki te huapae, e ai ki te hoahoa i raro.

(a) Tātuhia **ngā pere whai tapanga** hei whakaatu i ngā **tōpana takitahi** e pā ana ki te waka.



Ki te hiahia koe ki te tuhi anō i ngā pere whai tapanga, whakamahia te hoahoa wātea ki te whārangi 18.

(b) Whakamāramahia mai e ai ki ngā tōpana e pā ana ki te waka, he pēhea te tū noa o te waka ki te tauheke.

Ka taea e koe te tuhi te hoahoa whai pere hei āwhina i tō whakamārama.

MĀ TE KAIMĀKA ANAKE

(c) He 1500 kg te papatipu o te waka.

Whakamahia ngā tātai hei whakaatu he pēhea te mahi a ngā tōpana kia noho tū noa te waka i te wā e tū ana ki te tauheke.

Ka taea e koe te tātuhi hoahoa whai pere hei āwhina i tō tātai.

(d) He pūniko kei te hopa i roto i te whare o Janet rāua ko Roy. Ina noho a Roy ki te hopa, ka kōpeke ngā pūniko mā te 0.075 m.

Tātaihia te pūngao moe kūtorotoro e putu ana i ngā pūniko. (Ko te papatipu o Roy ko 65 kg.)

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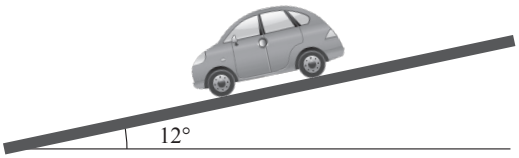
QUESTION THREE: JANET'S CAR AND SPRINGS

Janet arrives home. She parks the car on a slope that is at 12° to the horizontal, as shown in the diagram below.

(a) Draw **labelled arrows** to show the **individual forces** acting on the car.



If you need to redraw your labelled arrows, use the spare diagram on page 19.

(b) Explain in terms of forces acting on the car, how the car remains stationary on the slope.

You may draw a vector diagram to help your explanation.

ASSESSOR'S USE ONLY

(c) The mass of the car is 1500 kg.

Carry out calculations to show how forces keep the car stationary while it is parked on the slope.

You may draw a vector diagram to help your calculation.

(d) The sofa in Janet and Roy's house has springs. When Roy sits on the sofa, the springs compress by 0.075 m.

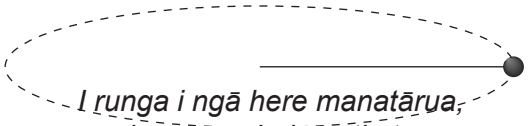
Calculate the elastic potential energy stored in the springs. (Roy has a mass of 65 kg.)

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUAWHĀ: NEKEHANGA POROHITA ME NGĀ TŌPANA WHAKAHURI

(a) Ka piua haerehia e Janet he pōro e herea ana ki tētahi taura kia āmiomio te huapae i runga ake i tōna māhunga.

Whakamāramahia te take e whakatere ana te pōro, ahakoa he tere aumou tana kōpiupiu.



I runga i ngā here manatārua, kāore e whakaaetia te whakaaturanga o tēnei rauemi i konei.

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(b) Ko te roa o te taura he 0.75 m. He 0.84 hēkona te roa o tētahi huringa kotahi o te pōro i tōna māhunga.

Tātaihia te whakaterenga o te pōro.

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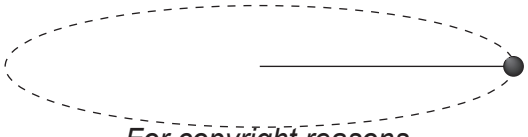
QUESTION FOUR: CIRCULAR MOTION AND TORQUES

(a) Janet swings a ball tied on a string in a horizontal circle above her head.

Explain why the ball is accelerating even though it is swinging at constant speed.



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(b) The length of the string is 0.75 m. It takes 0.84 seconds for the ball to go around her head once.

Calculate the acceleration of the ball.

MĀ TE KAIMĀKA ANAKE

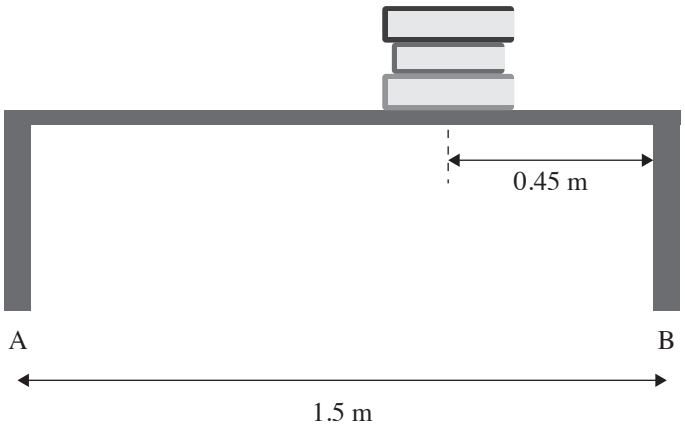
(c) Whakaingoatia te tōpana e whakatere ana i te pōro i te wā e huri āmiomio ana.

Whakamāramahia te take ka whakaterehia te pōro e te tōpana.

(d) E rua ngā papa o te tēpu mahi a Janet, kei ia pito. He putunga pukapuka ā Janet kei runga i tana tēpu.

Whakamahia ngā taipitopito i raro hei tātai i te tōpana tautoko e whakaratohia ana e te papa A o te tēpu mahi.

Te papatipu o te tēpu = 37 kg
Te roa o te tēpu = 1.5 m
Te papatipu o ngā pukapuka = 7.4 kg
Ko te taumaha o ngā pukapuka he 0.45 m te tawhiti mai i te pito B o te tēpu.
Me kī, he papatahi te tēpu mahi a Janet.



ASSESSOR'S USE ONLY

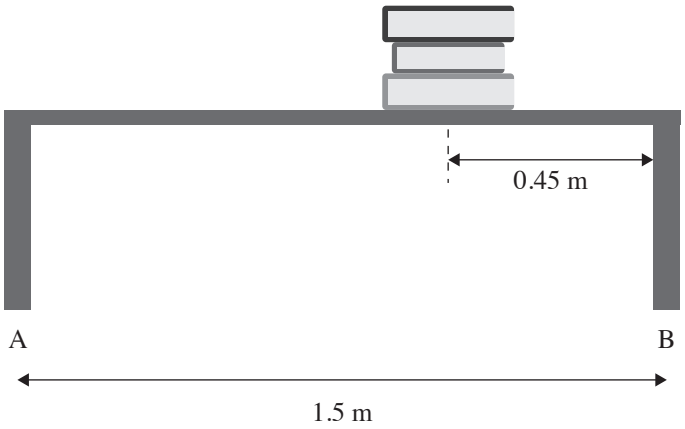
(c) Name the force that causes the ball to accelerate as it goes in a circle.

Explain why the force causes the ball to accelerate.

(d) Janet's study table has two panels, one at each end. Janet has a pile of books on her table.

Use the details given below to calculate the support force provided by panel A of the study table.

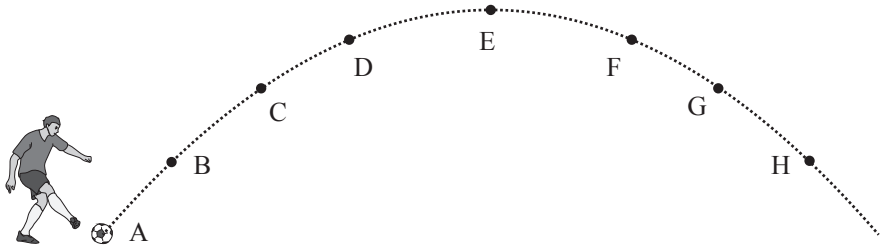
Mass of table = 37 kg
Length of table = 1.5 m
Mass of books = 7.4 kg
The weight of the books acts at a distance of 0.45 m from end B of the table.
Assume Janet's study table is uniform.



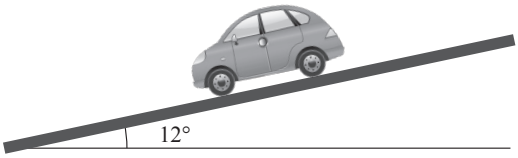
MĀ TE KAIMĀKA ANAKE

HE HOAHOA TĀPIRI

Ki te hiahia koe kia tuhia anō ō pere whai tapanga mō te hoahoa ki te Tūmahi Tuatahi (a), tuhia ki te hoahoa i raro nei. Kia mārama te tohu ko tēhea te hoahoa ka hiahia koe kia mākahia.



Ki te hiahia koe kia tuhia anō ō pere whai tapanga mō te hoahoa ki te Tūmahi Tuatoru (a), tuhia ki te hoahoa i raro nei. Kia mārama te tohu ko tēhea te hoahoa ka hiahia koe kia mākahia.



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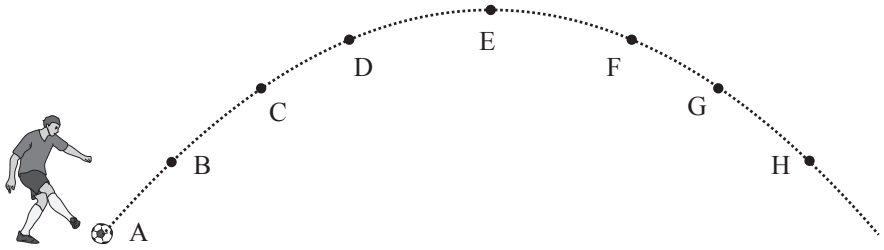
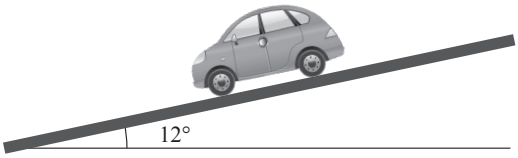
SPARE DIAGRAMS

If you need to redraw your labelled arrows on the diagram from Question One (a), draw them on the diagram below. Make sure it is clear which diagram you want marked.



If you need to redraw your labelled arrows on the diagram from Question Three (a), draw them on the diagram below. Make sure it is clear which diagram you want marked.



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, 2015

91171 Demonstrate understanding of mechanics

9.30 a.m. Tuesday 17 November 2015
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 2–21 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.