91171M

911715

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

2

SUPERVISOR'S USE ONLY

Ahupūngao, Kaupae 2, 2019

91171M Te whakaatu māramatanga ki te pūhanga manawa

9.30 i te ata Rāmere 8 Whiringa-ā-rangi 2019
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 Puka 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 2–21 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.

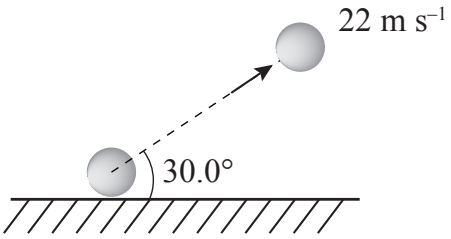
TAPEKE

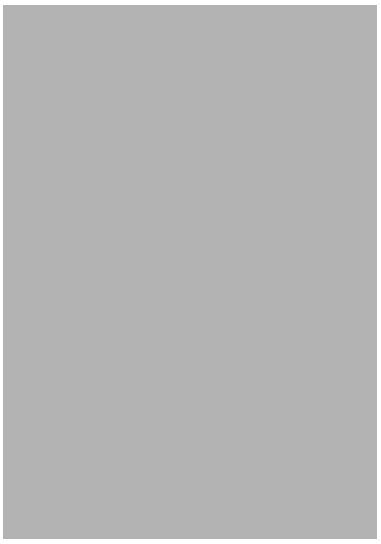
MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI: TE KĒMU HAKI

MĀ TE KAIMĀKA ANAKE

Kei te tākaro a Nicole mō te kapa haki o tōna kura. I roto i te kēmu ka pāhia e ia te pōro ki tōna hoa tākaro a Josie, kei te tawhiti atu ia. Kia taea ai tēnei, me whakarewa ia i te pōro ki te teitei tika kia rere ai, ā, kia tika te pāpaku iho kia haumaru ai. Ka hāua e ia te pōro ki te 22 m s^{-1} te tere i te koki o te 30°.





www.cranleigh.org/uncategorised/2013/04/cranleigh-girls-at-hockey-finals/

(a) Me whakaatu ko te tere poutū tīmata o te pōro he 11 m s^{-1}.

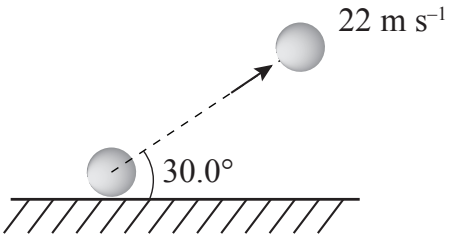
(b) Me whakaahua me te whakamārama i te nekehenga o te pōro. Me kōrero koe mō ngā tōpana e pā ana ki te pōro i te wā e rere ana i te hau takiwā.

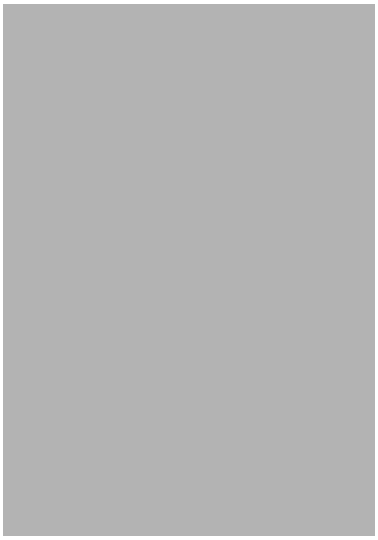
Ka taea e koe tētahi hoahoa te whakauru hei tautoko i tō whakamāramatanga.

QUESTION ONE: THE HOCKEY MATCH

ASSESSOR'S USE ONLY

Nicole is playing for her school hockey team. During the game she passes the ball to her teammate Josie, who is some distance away. To do this she has to raise the ball high enough to give it flight and low enough to keep it safe. She hits the ball with a velocity of 22 m s^{-1} at an angle of 30°.





www.cranleigh.org/uncategorised/2013/04/cranleigh-girls-at-hockey-finals/

(a) Show that the initial vertical velocity of the ball is 11 m s^{-1}.

(b) Describe and explain the motion of the ball. You should refer to any forces acting on it as it moves through the air.

You may include a diagram to support your explanation.

(c) Ka hāua te pōro e Josie ki te ūnga. Ka tuki te pōro ki te taha whakamuri o te neti ki te tere huapae o te 22 m s^{-1}. Ka whakatoro te pānga o te pōro i te neti mā te 15 cm. He 160 g te papatipu o te pōro.

Mā te whiriwhiri i te whakawhitinga o te pūngao mai i te pōro ki te neti, tātaihia te aumou pūniko o te neti.

MĀ TE KAIMĀKA ANAKE

(d) He 44 m te tawhiti o Josie mai i a Nicole i te wā i tukuna e Nicole te pōro ki a Josie i ngā wāhanga (a) me (b).

Ka tae atu te pōro ki a Josie i mua i te tūpanatanga?

Parahautia tō tuhinga mā te whakamahi i ngā tātaitanga tōtika.

ASSESSOR'S USE ONLY

(c) Josie shoots a goal. The ball hits the back of the net with a horizontal speed of 22 m s^{-1}. The impact makes the net stretch by 15 cm. The ball has a mass of 160 g.

By considering the transfer of energy from ball to net, calculate the spring constant of the net.

(d) Josie was 44 m away from Nicole when Nicole passed the ball to Josie in parts (a) and (b).

Will the ball reach Josie before it bounces?

Justify your answer using appropriate calculations.

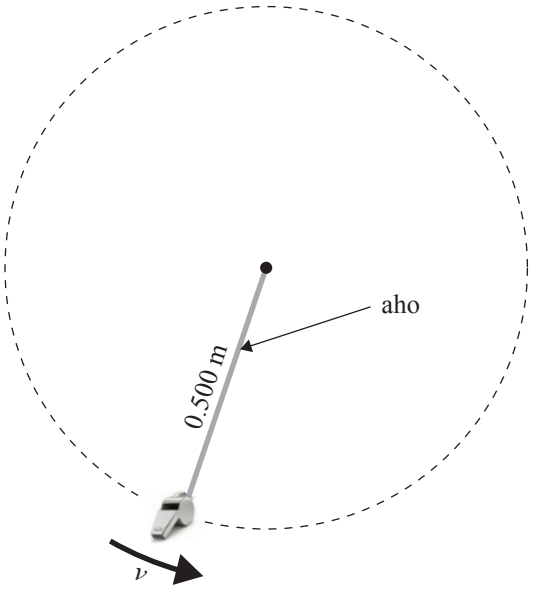
TŪMAHI TUARUA: TE WĀ HAURUA I TE KĒMU HAKI

MĀ TE KAIMĀKA ANAKE

Kei te tatari ngā kapa kia tīmata te wāhanga tuarua o te kēmu.

I te wā e tatari ana, ka piua e te kaiwawao tana wīhara kia huapae te hurihuri i runga ake i tōna māhunga. He 1.40 hēkona te roa wā mō ia huringa. He 40.0 g te papatipu o te wīhara maitai, ā, he 0.500 m te pūtoro o te porowhita e piua ana te wīhara ki te tere aumou.

Tirohanga mai i runga o te wīhara e piua ana



(a) Whakaaturia he 2.24 m s^{-1} te tere o te wīhara.

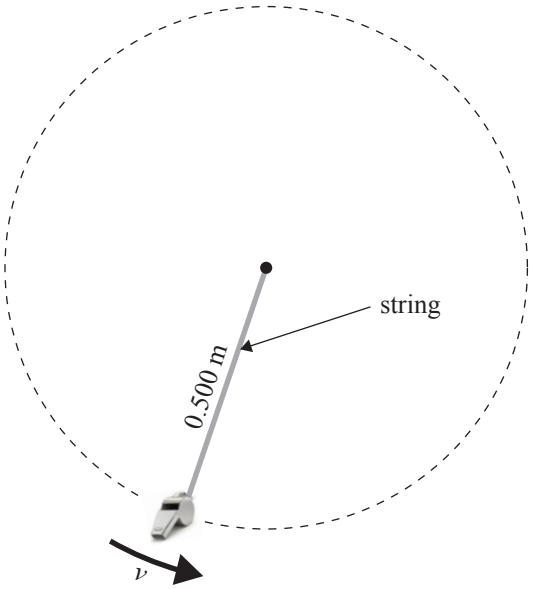
QUESTION TWO: HALF TIME AT THE HOCKEY MATCH

ASSESSOR'S USE ONLY

The teams are waiting for the second half of the game.

While waiting, the referee swings her whistle in a horizontal circle above her head. Each rotation takes 1.40 seconds. The metal whistle has a mass of 40.0 g and it is swung in a circle of radius 0.500 m at a constant speed.

Plan view of swinging whistle



(a) Show that the speed of the whistle is 2.24 m s^{-1}.

(b) Mā te whakarite i ngā tōpana huapae e pā ana ki te wīhara, whakamāramahia te take he aha e hurihuri tonu ai ki tētahi tere aumou.

MĀ TE KAIMĀKA ANAKE

(c) Ka whakahekea te tere o te wīhara ki te 1.0 m s^{-1}.

Whakaritea te rahi o te tōpanga huapae hou e pā ana ki te wīhara, ka whakamārama i te pānga pea ki te neke a te wīhara mēnā ka whakahekea te tere o te wīhara.

(b) By determining the horizontal forces on the whistle, explain why it continues to move in a circular motion at a constant speed.

ASSESSOR'S USE ONLY

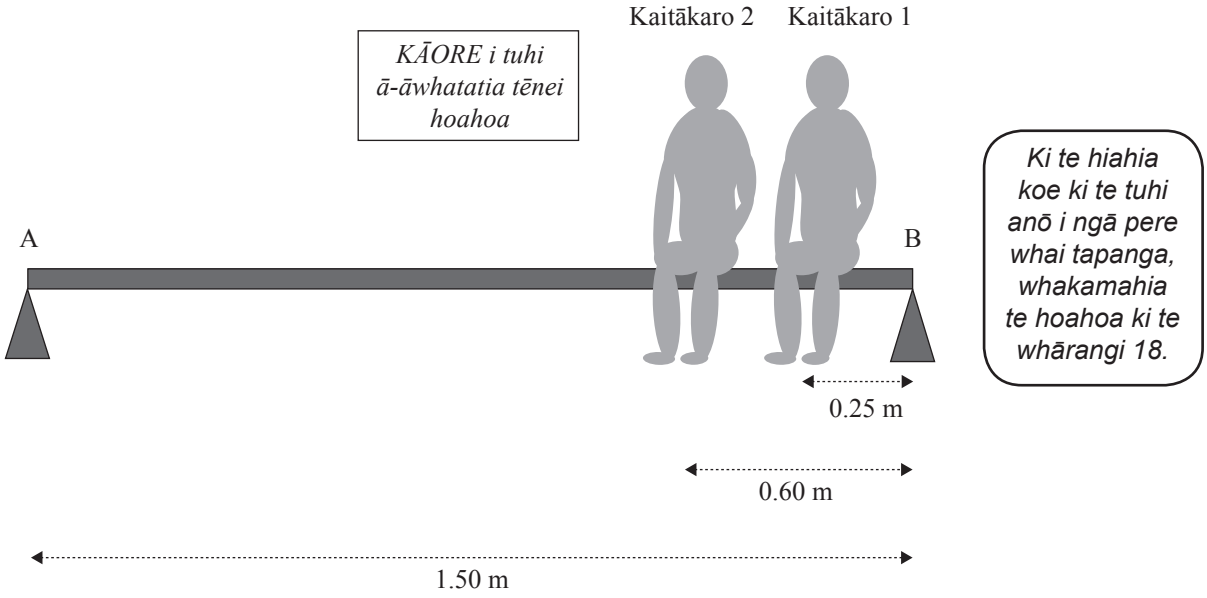
(c) The speed of the whistle is reduced to 1.0 m s^{-1}.

Determine the size of the new horizontal force on the whistle, and explain the likely result of reducing the speed on the motion of the whistle.

(d) Kei te tatari te kapa i te taha. E rua ngā kaitākaro kei te paenoho e noho ana, e ai ki te whakaaturanga.

He 1.50 m te roa o te paenoho, ā, he 10 kg te papatipu. He 60 kg te papatipu o ia kaitākaro. He 0.25 m te tawhiti o Kaitākaro 1 mai i te poutoko B, he 0.60 m te tawhiti o Kaitākaro 2 mai i te poutoko B.

www.dreamstime.com/stock-photography-soccer-players-bench-image2838632



KĀORE i tuhi ā-āwhatatia tēnei hoahoa

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

(i) Tuhia ngā pere whai tapanga e whakaatu ana i ngā tōpana katoa e pā ana ki te paenoho.

(ii) Mā te whakarite i ngā tōpana whakahuri mō te pūwāhi B, tātaihia ngā tōpana tautoko i ia pito o te paenoho.

He aha ō whakapae pūtake?

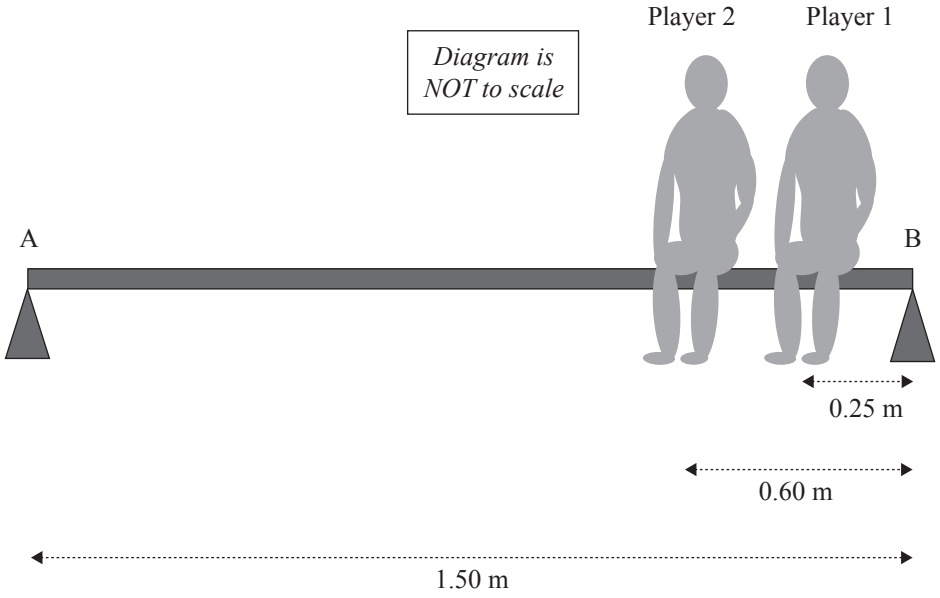
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(d) The team is waiting on the sideline. Two players sit on the bench, as shown.

The bench is 1.50 m long and has a mass of 10 kg. Each player has a mass of 60 kg. Player 1 is 0.25 m from the support B, Player 2 is 0.60 m away from support B.

www.dreamstime.com/stock-photography-soccer-players-bench-image2838632



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

(i) Draw labelled arrows showing all the forces acting on the bench.

(ii) By first determining the torques about point B, calculate the support forces at each end of the bench.

What assumptions have you made?

TŪMAHI TUATORU: TE WĀHANGA TUARUA

MĀ TE KAIMĀKA ANAKE

www.ahockeyworld.net/the-way-you-choose-the-penalty-corner-formation/

I roto i te kēmu haki, kei a Nicole te whiu kokonga. Ka hāua e ia te pōro tū noa ki ana hoa tākaro.

(a) Tuhia te ture tuatoru a Newton, e kōrero ana mō ngā tōpana ina tuki te pōro me te rākau a Nicole.

(b) Ina hahau ana i te pōro tū noa mō te whiu kokonga, ka hāua e Nicole mā te tere-rākau o te 18 m s^{-1}. Whai muri i te hahau i te pōro, ka anga whakamua tonu te rākau ki te 12 m s^{-1}.

He 600 g te papatipu o te rākau, ā, he 160 g te papatipu o te pōro.

Tātaihia te tere o te pōro.

He aha te/ngā whakapae pūtake ka tukuna i roto i tō tātaitanga?

Ka haere tonu te Tūmahi Tuatoru i te whārangi 14.

QUESTION THREE: THE SECOND HALF

ASSESSOR'S USE ONLY

www.ahockeyworld.net/the-way-you-choose-the-penalty-corner-formation/

Later in the hockey match, Nicole takes a penalty corner. She hits the stationary ball towards her teammates.

(a) State Newton's third law, which refers to the forces during the collision between the ball and Nicole's stick.

(b) When hitting the stationary ball for the penalty corner, Nicole hits with a stick-velocity of 18 m s^{-1}. After hitting the ball, the stick continues forward at 12 m s^{-1}.

The mass of the stick is 600 g and the mass of the ball is 160 g.

Calculate the velocity of the ball.

What assumption(s) are made in your calculation?

Question Three continues on page 15.

Ka tino whakamarutia ngā tautopenga, tae atu ki te whakamahi parewaewae, e ai ki te whakaahua.

www.sportskeeda.com/hockey/video-how-goalkeeper-savita-punia-won-india-their-first-women-s-hockey-asia-cup-in-13-years

MĀ TE KAIMĀKA ANAKE

(c) Ka hāua te pōro he 160 g te papatipu ki te ūnga, engari ka tuki kē ki ngā parewae o te tautopenga. He 30 m s^{-1} te tere tīmata o te pōro, ā, ko te wā o te tukinga he 0.02 s. Ka tūpana mai mā te tere o te 10 m s^{-1}.

Tātaihia te tōpana toharite o te pānga.

Goalkeepers are heavily protected, including the use of leg guards as shown.

www.sportskeeda.com/hockey/video-how-goalkeeper-savita-punia-won-india-their-first-women-s-hockey-asia-cup-in-13-years

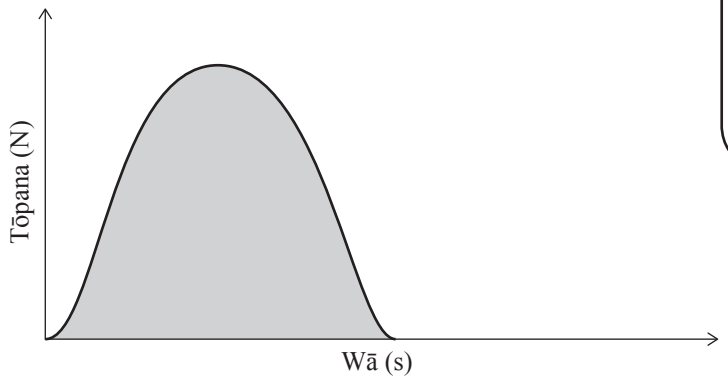
ASSESSOR'S USE ONLY

(c) The ball of mass 160 g is shot towards the goal, but hits the goalkeeper's leg guards instead. The ball has an initial velocity of 30 m s^{-1} and the time of the impact is 0.02 s. It rebounds with a velocity of 10 m s^{-1}.

Calculate the average force of the impact.

(d) E whakaatu ana te kauwhata i raro i te tōpana o te pānga i roto i te wā ina **kāore** i te mau parewae.

Ki te hiahia koe ki te tuhi anō i tō kauwhata, whakamahia te hoahoa i te whārangi 18.



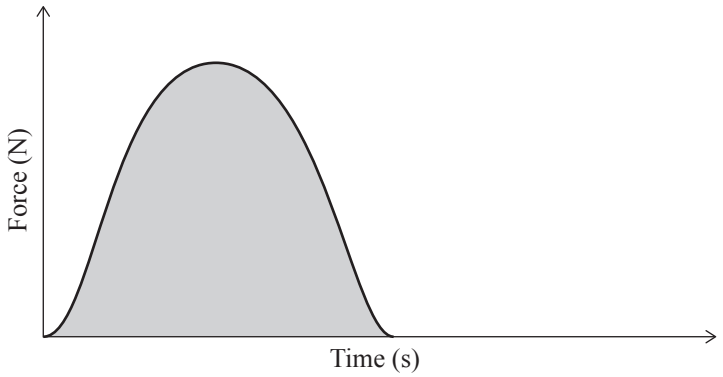
(i) Tāpirihia he kauwhata tuarua ki te hoahoa hei whakaatu i te pānga o ngā parewae ki te hanga o te kauwhata.

(ii) Parahautia tō tuhinga mā ngā mātāpono ahupūngao hei whakamārama he pēhea te whaikiko o ngā parewae ki te tautopenga.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(d) The graph below shows the force of impact over time when **no** leg guards are worn.



If you need to redraw your graph, use the diagram on page 19.

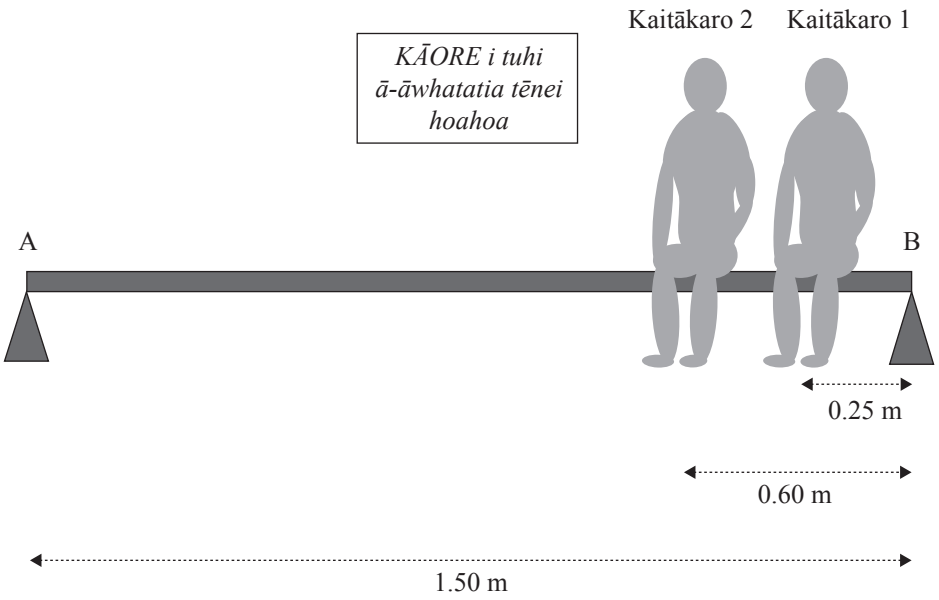
(i) Add a second graph to the diagram to show the effect that leg guards would have on the graph shape.

(ii) Justify your answer by using physics principles to explain how the leg guards benefit the goalkeeper.

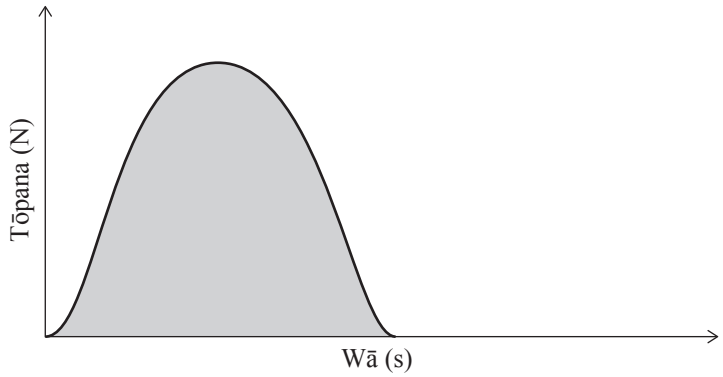
HE HOAHOA TĀPIRI

MĀ TE KAIMĀKA ANAKE

Ki te hiahia koe ki te tuhi anō i ngā pere whai tapanga ki te Tūmahi Tuarua (d)(i), whakamahia te hoahoa i raro nei. Kia mārama te tohu ko tēhea te hoahoa ka hiahia koe kia mākahia.



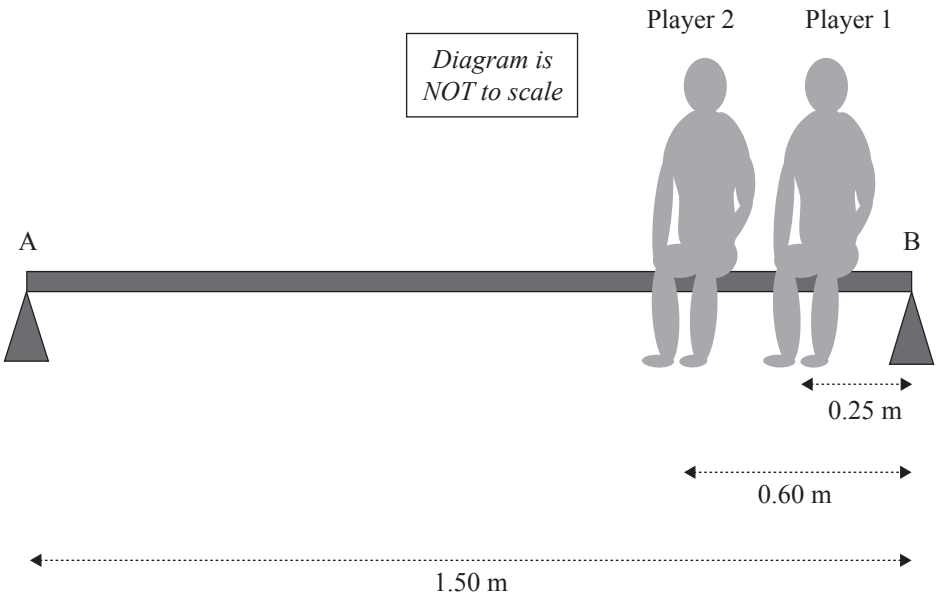
Ki te hiahia koe ki te tuhi anō i tō kauwhata ki te Tūmahi Tuatoru (d)(i), whakamahia te hoahoa i raro nei. Kia mārama te tohu ko tēhea te hoahoa ka hiahia koe kia mākahia.



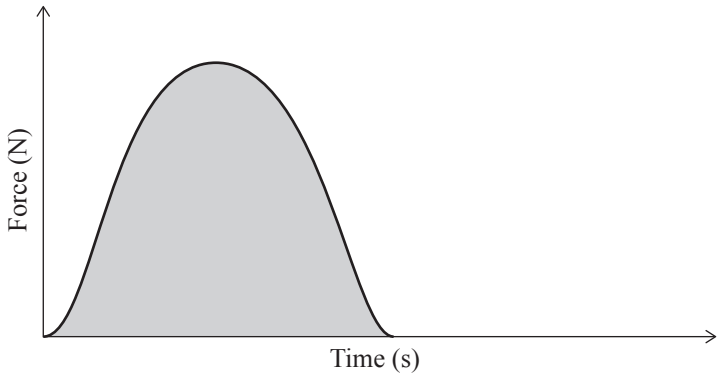
ASSESSOR'S USE ONLY

SPARE DIAGRAMS

If you need to redraw your labelled arrows for Question Two (d)(i), use the diagram below. Make sure it is clear which diagram you want marked.



If you need to redraw your graph for Question Three (d)(i), use 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

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Physics, 2019

91171 Demonstrate understanding of mechanics

9.30 a.m. Friday 8 November 2019
Credits: Six

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

91171M

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.