See back cover for an English translation of this cover

2

91171M

911715

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Ahupūngao, Kaupae 2, 2012

91171M Te whakaatu māramatanga ki te pūnaha pūkahakaha

2.00 i te ahiahi Rāapa 14 Whiringa-ā-rangi 2012
Whiwhinga: Ono

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakaatu māramatanga ki te pūnaha pūkahakaha.	Te whakaatu māramatanga hōhonu ki te pūnaha pūkahakaha.	Te whakaatu māramatanga matawhānui ki te pūnaha pūkahakaha.

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.

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

I ō whakautu, whakamahia ngā whiriwhiringa tohutau mārama, ngā kupu, ngā hoahoa hoki/rānei ki hea hiahiatia ai.

Me hoatu te wae tika o te Pūnaha o te Ao (SI) ki ngā whakautu tohutau.

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 2–19 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.

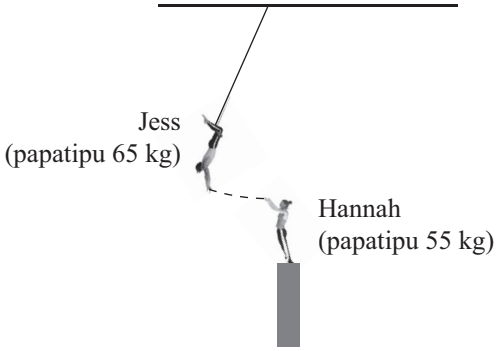
MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI: TE TĀRERE

He tohunga tārere a Jess kei te maninirau. Hei wāhanga o tāna whakaaturanga, ka tārewa ia mā tētahi taura roa, ā, ka tārere whakararo. Ina tae ia ki te pūwāhi hahaka rawa ka mamau ia i a Hannah, ā, ka neke tahi tonu rāua.

E 65 kg te papatipu o Jess.

E 55 kg te papatipu o Hannah.



(a) Whakaingoatia te rahinga hira ka pūmau tonu i te tāreretanga whakararo o Jess.

(b) Whakaingoatia te rahinga hira ka pūmau tonu ina mamau a Jess i a Hannah, ā, e neke tahi ana rāua.

(c) Whai muri tonu i te hopunga a Jess i a Hannah, ka neke tahi rāua i te tere o te 5.5 m s^{-1}.

Tātaihia te **teitei poutū** i taka ai a Jess.

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

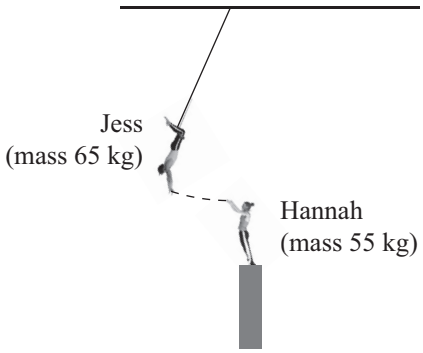
ASSESSOR'S USE ONLY

QUESTION ONE: THE TRAPEZE

Jess is a trapeze artist at the circus. As part of her act she hangs on a long rope and swings downwards. When she gets to the lowest point she grabs onto Hannah and they keep moving together.

Jess has a mass of 65 kg.

Hannah has a mass of 55 kg.



(a) Name the important quantity that is conserved as Jess swings down.

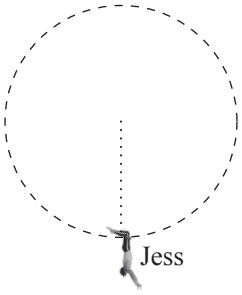
(b) Name the important quantity that is conserved as Jess grabs onto Hannah and they move together.

(c) Immediately after Jess grabs Hannah, they move together at a speed of 5.5 m s^{-1}.

Calculate the **vertical height** that Jess dropped down.

(d) I te hoahoa o raro tātuhia tētahi pere hei whakaatu i te ahunga o te tōpana renarena ina tae a Jess ki te pūwāhi hahaka rawa o tōna tārere.

MĀ TE KAIMĀKA ANAKE

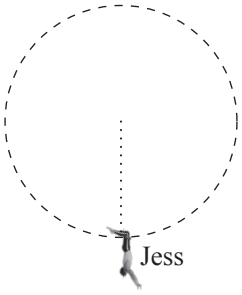


(e) E whai ana a Jess i te ara porowhitawhita i tana neke. Ina tae ki te pūwāhi hahaka rawa o tōna tārere, ā, i mua tonu i tōna mamaunga atu i a Hannah, he **nui ake** te tōpana renarena i te taura tērā i te tōpana tō ā-papa e pā ana ki a ia.

Whakamāramatia he aha ai.

ASSESSOR'S USE ONLY

(d) In the diagram below draw an arrow to show the direction of the tension force when Jess is at the lowest point in her swing.



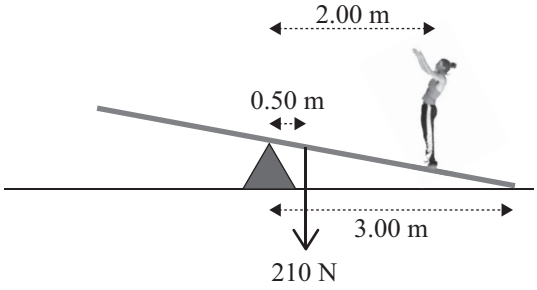
(e) Jess is moving in a circular path. When she gets to the lowest point in her swing, and just before she grabs onto Hannah, the tension force in the rope is **greater** than the gravity force acting on her.

Explain why.

PĀTAI TUARUA: TE TĪEMI

MĀ TE KAIMĀKA ANAKE

I te mahi ka whai muri, ka tū a Hannah (e 55 kg) ki runga ki tētahi tīemi.
E 210 N te taumaha o te tīemi.



(a) Tātaihia te **rahi** me te **ahunga** o te tōpana ka pākahatia e te papa ki te pito **matau** o te tīemi.

E whakaaturia ana ngā tawhiti katoa i te hoahoa.

(g = 9.8 m s^{-2})

te ahunga o te tōpana _____

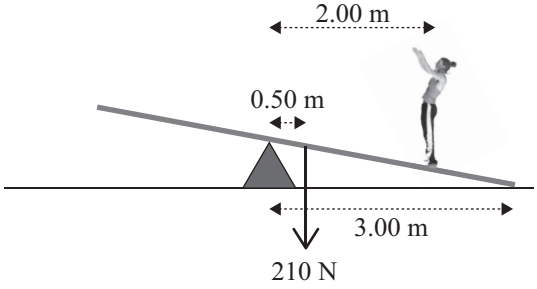
(b) Whakaawhiwhitia tō whakautu mō te wāhanga (a) ki te tau tika o ngā tau tāpua.

Homai te pūtake mō tō kōwhiringa o ngā tau tāpua i te wāhanga (a).

QUESTION TWO: THE SEE-SAW

ASSESSOR'S USE ONLY

In their next act, Hannah (55 kg) stands on a see-saw. The see-saw has a weight of 210 N.



(a) Calculate the **size** and **direction** of the force that the floor exerts on the **right hand** end of the see-saw.

All distances are shown on the diagram.

($g = 9.8$ m s^{-2})

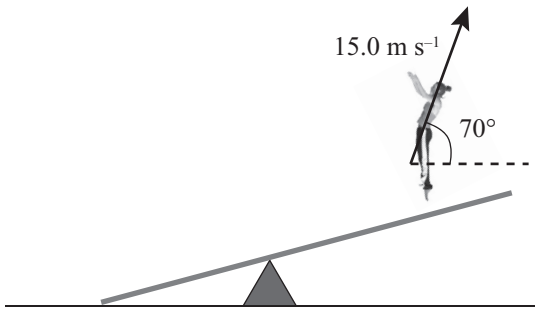
direction of the force _____

(b) Round your answer to part (a) to the correct number of significant figures.

State the reason for your choice of significant figures in part (a).

Ka taka poutūtū a Jess ki tērā o ngā pito, ā, ka whiua whakarunga a Hannah.

Ina tau a Jess ki te tīemi, ka whiua a Hannah ki runga me te tere o te 15.0 m s^{-1}, me te koki 70° ki te huapae pēnei i te hoahoa nei.



(c) Tātaihia te roa o te wā kia tae rā anō a Hannah ki te pūwāhi teitei rawa o tōna rerenga.

(d) Ina rewa ake a Hannah, ko te wāhanga huapae o tōna tere ko te 5.1 m s^{-1}.

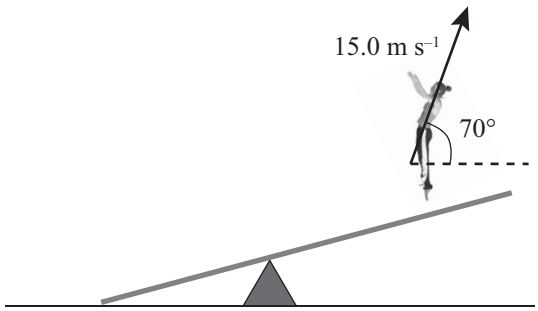
Tuhia te **rahi** me te **ahunga** o tana tere i te pūwāhi teitei rawa atu.

Whakamāramatia tō whakautu.

MĀ TE KAIMĀKA ANAKE

Jess drops vertically onto the other end, causing Hannah to be thrown into the air.

When Jess lands on the see-saw, Hannah is thrown into the air at a speed of 15.0 m s^{-1}, at an angle of 70° to the horizontal as shown in the diagram.



(c) Calculate the time that Hannah takes to reach the highest point of her trajectory.

(d) When Hannah takes off, the horizontal component of her velocity is 5.1 m s^{-1}.

State the **size** and **direction** of her velocity at the highest point.

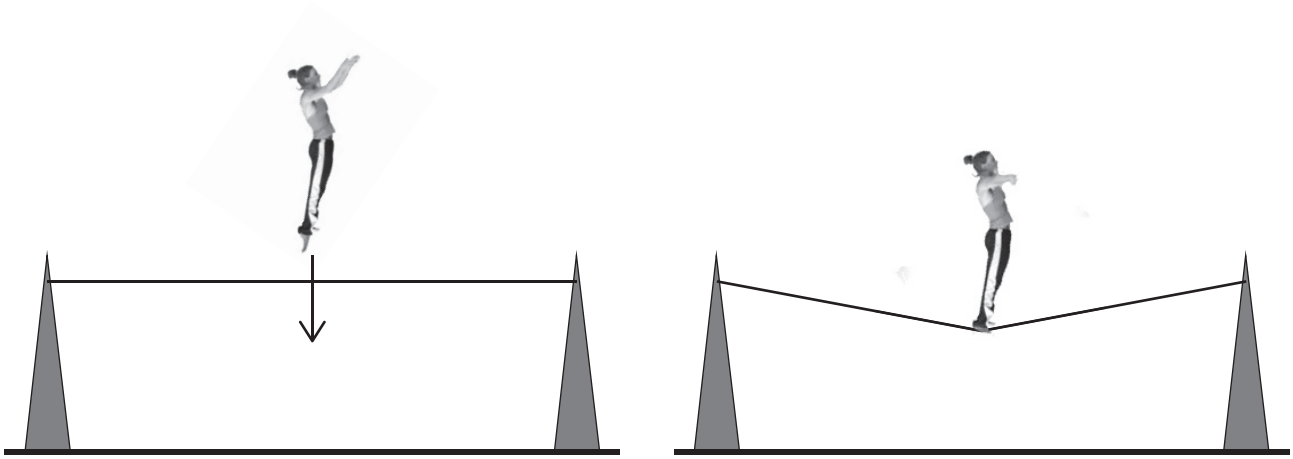
Explain your answer.

ASSESSOR'S USE ONLY

PĀTAI TUATORU: TE TAURA TĀWARIWARI

MĀ TE KAIMĀKA ANAKE

I te wāhanga tuarua o tōna whakaaturanga ka rere a Hannah i te rangi, ā, ka tau ki tētahi taura tāwariwari, e puritia ana me te renarena i waenganui i ngā toko e rua, pēnei i te hoahoa kei raro.



(a) Whakaingoatia ngā panoni pūngao matua ka pā mai ina taka a Hannah, Ā, i te wā ka tū mai ia.

E taka ana _____ → _____

E tū mai ana _____ → _____

(b) Kāore e pai ki a Hannah te taura mēnā he tānekaha[1] rawa ina tau ia.

Kōrerotia te ahunga o te tōpana o te taura ki a ia.

E ai rā ki te tōpana ka pā ki a Hannah, whakamāramatia he aha te take kia kaua e tānekaha rawa te taura ina tau ia ki runga.

Ahunga tōpana: _____

Whakamāramatanga: _____

_____

_____

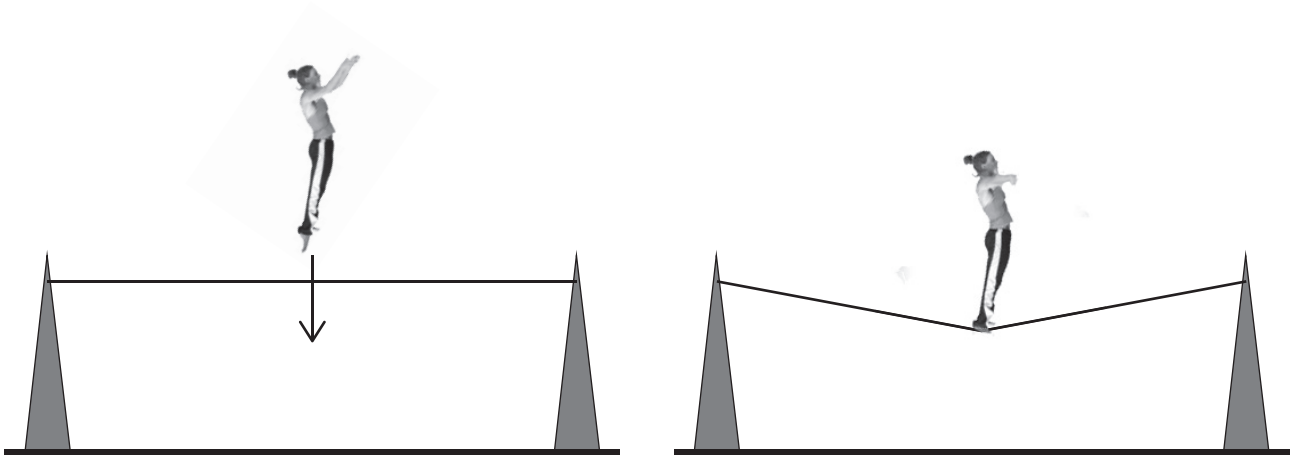
_____

[1] parakuku

QUESTION THREE: THE ELASTIC ROPE

ASSESSOR'S USE ONLY

In the second part of her act, Hannah flies through the air and lands on an elastic rope, which is held under tension between two supports, as shown in the diagram below.



(a) Name the main energy changes that occur as Hannah is falling AND as she is coming to a stop.

Falling _____ → _____

Stopping _____ → _____

(b) Hannah doesn't like the rope to be too tight when she lands on it.

State the direction of the force on her from the rope.

Explain, in terms of the force acting on Hannah, why the rope should not be too tight when she lands on it.

Direction of force: _____

Explanation: _____

_____

_____

_____

(c) Ka whakairihia tētahi taura tāwariwari i tētahi kauae[2] kia tārewa poutū mai. Ka tārewa poutū a Hannah i runga i te taura tāwariwari. Ka kūtorohia te taura mā te 0.60 mita i raro i tōna pūwāhi noa ina iri a Hannah mai i te taura.

Tātaitia te pūngao moe tāwariwari e pūmau ana i te taura tāwariwari.

(E 55 kg te papatipu o Hannah.)

MĀ TE KAIMĀKA ANAKE

[2] kurupae

(c) An elastic rope is suspended from a beam so that it is hanging vertically down. Hannah hangs vertically down on the elastic rope. The rope is stretched 0.60 m below its normal position when Hannah hangs from it.

Calculate the elastic potential energy stored in the elastic rope.

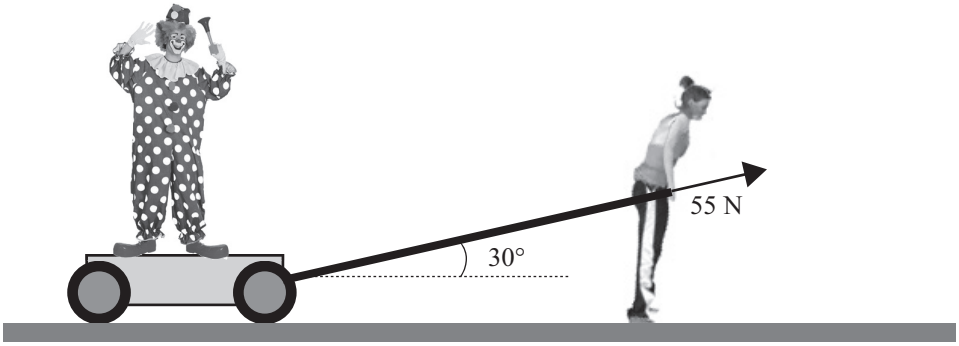
(Hannah has a mass of 55 kg.)

ASSESSOR'S USE ONLY

PĀTAI TUAWHĀ: TIARE TE HANGAREKA

MĀ TE KAIMĀKA ANAKE

Ka kuhu mai te hangareka, ā, e eke ana i tōna kōneke e tōia mai ana e Hannah. Ko te papatipu tōpū o te hangareka me te kōneke ko te 85 kg. Ka hanga te kakau o te kōneke i te koki 30° ki te huapae, pēnei i te hoahoa nei. Ka hoatu a Hannah i te tōpana 55 N ki te kakau.



(a) Tātaihia te rahi o te **wāhanga huapae** o te tōpana ki te kakau.

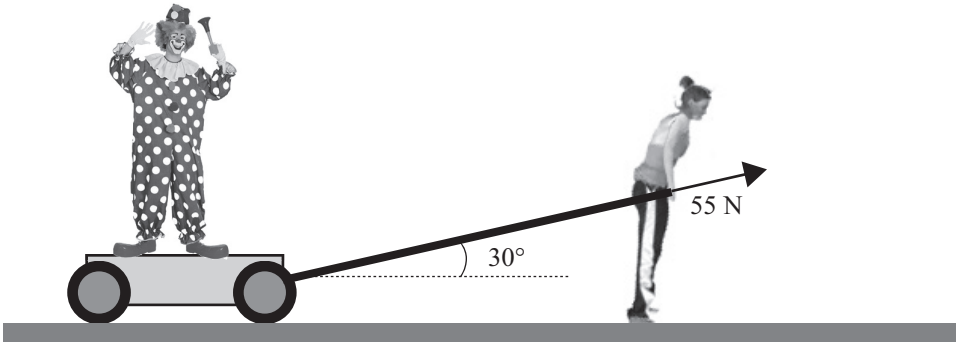
(b) He mea taurite te kōneke.

- Kōrerotia mai te tikanga o te "taurite" hei kīanga o ngā tōpana e mahi ana.
- Whakaahuatia tāna e kī ai mō te tere o te kōneke.
- Ki te hoahoa o runga, tātuhia he **pere whai tapanga** e whakaatu ana i te ahunga o ngā tōpana kore-poutū e mahi ana ki a Hannah.

QUESTION FOUR: CHARLIE THE CLOWN

ASSESSOR'S USE ONLY

The Clown makes his entrance riding on a cart pulled by Hannah. The clown and cart have a combined mass of 85 kg. The handle of the cart makes an angle of 30° to the horizontal as shown in the diagram below. Hannah applies a force of 55 N to the handle.



(a) Calculate the size of the **horizontal component** of the force on the handle.

(b) The cart is in equilibrium.

- State what "equilibrium" means in terms of the forces acting.
- Describe what it tells you about the velocity of the cart.
- On the diagram above, draw **labelled arrows** showing the direction of any non-vertical forces acting on Hannah.

(c) Whakamārama ka pēhea e taea ai e Hannah te whakatere i te kōneke me te hangareka, me te **kore** whakarerekē i te **rahinga** tōpana e whakapaua ana e ia ki te kakau. (Kāore e taea te whakaheke i te waku.)

MĀ TE KAIMĀKA ANAKE

(c) Explain how Hannah can make the cart and clown accelerate **without** changing the **size** of the force she exerts on the handle. (Reducing friction is not a possibility.)

ASSESSOR'S USE ONLY

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

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Physics, 2012

91171 Demonstrate understanding of mechanics

2.00 pm Wednesday 14 November 2012
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–PHYSR.

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 2–19 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.