See back cover for an English translation of this cover

1

91028M

910285

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 1, 2011

91028 Te tūhura i ngā pānga i waenganui i ngā papatau, ngā whārite me ngā kauwhata

9.30 i te ata Rāhina 14 Whiringa-ā-rangi 2011
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te tūhura i ngā pānga i waenganui i ngā papatau, ngā whārite me ngā kauwhata.	Te tūhura i ngā pānga i waenganui i ngā papatau, ngā whārite me ngā kauwhata mā te whakaaro whai pānga.	Te tūhura i ngā pānga i waenganui i ngā papatau, ngā whārite me ngā kauwhata mā te whakaaro waitara hōhonu.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

Whakaaturia ngā mahinga KATOA.

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 te pukaiti nei ngā whārangi 2–27 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

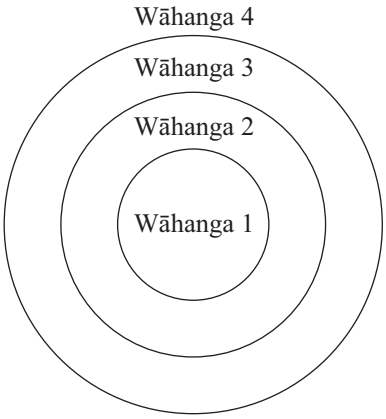
Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

MĀ TE KAIMĀKA ANAKE

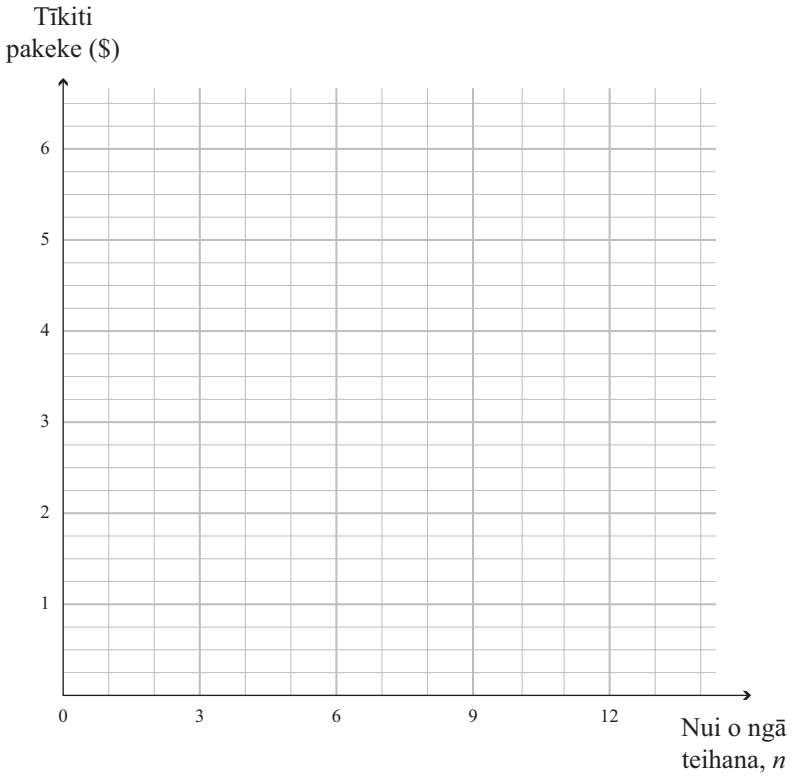
PĀTAI TUATAHI

(a) E whakaatu ana te papatau ō raro i te utu mō tētahi tīkiti tereina mai i te pokapū o te taone.

Te nui o ngā teihana, *n*	Tau wāhanga	Tīkiti kotahi (pakeke)
1 – 3	1	$2.00
4 – 6	2	$3.25
7 – 9	3	$4.50
10 – 12	4	$5.75



(i) Ki te tukutuku i raro, tuhia te kauwhata o ngā tīkiti tereina pakeke ki te nui o ngā teihana mai i te pokapū o te tāone.



Ki te hiahia koe ki te tā anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 22.

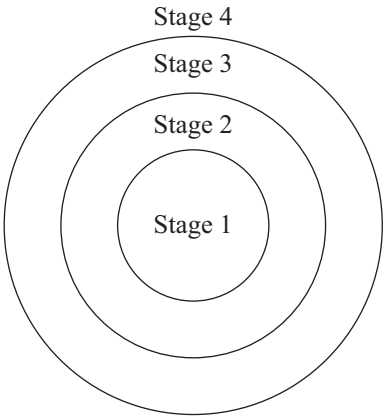
You are advised to spend 60 minutes answering the questions in this booklet.

ASSESSOR'S USE ONLY

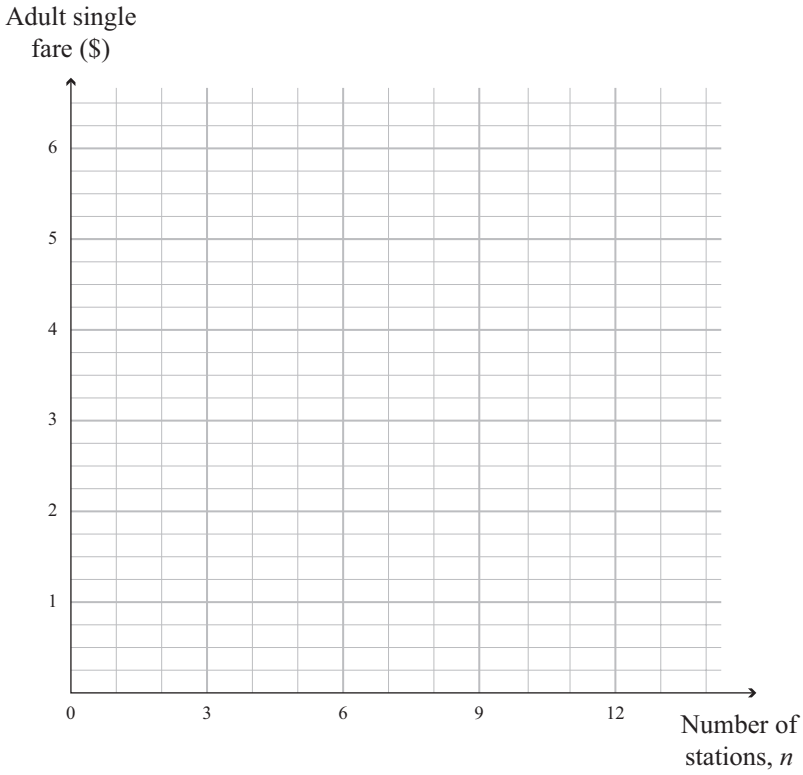
QUESTION ONE

(a) The table below gives the adult single train fares for travel from the centre of a city.

Number of stations, *n*	Stage number	Adult single fare
1 – 3	1	$2.00
4 – 6	2	$3.25
7 – 9	3	$4.50
10 – 12	4	$5.75



(i) On the grid below, sketch the graph of the adult train fares against the number of stations from the centre of the city.



If you need to redraw this graph, use the grid on page 23.

(ii) $1.50 te utu mō tētahi tīkiti tamaiti mō te wāhanga tuatahi.

Ki ia wāhanga, mō tētahi tamaiti, whakapikihia te utu mā te 75 hēneti.

Ki te tuhia tētahi kauwhata mō ngā tīkiti tamariki, whakaahuahia ngā ōritenga me ngā rerekētanga i waenganui i ngā kauwhata o ngā tīkiti tamariki me ngā tīkiti pakeke.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(ii) A child's fare is $1.50 for the first stage.

Each additional stage, for a child, increases the fare by 75 cents.

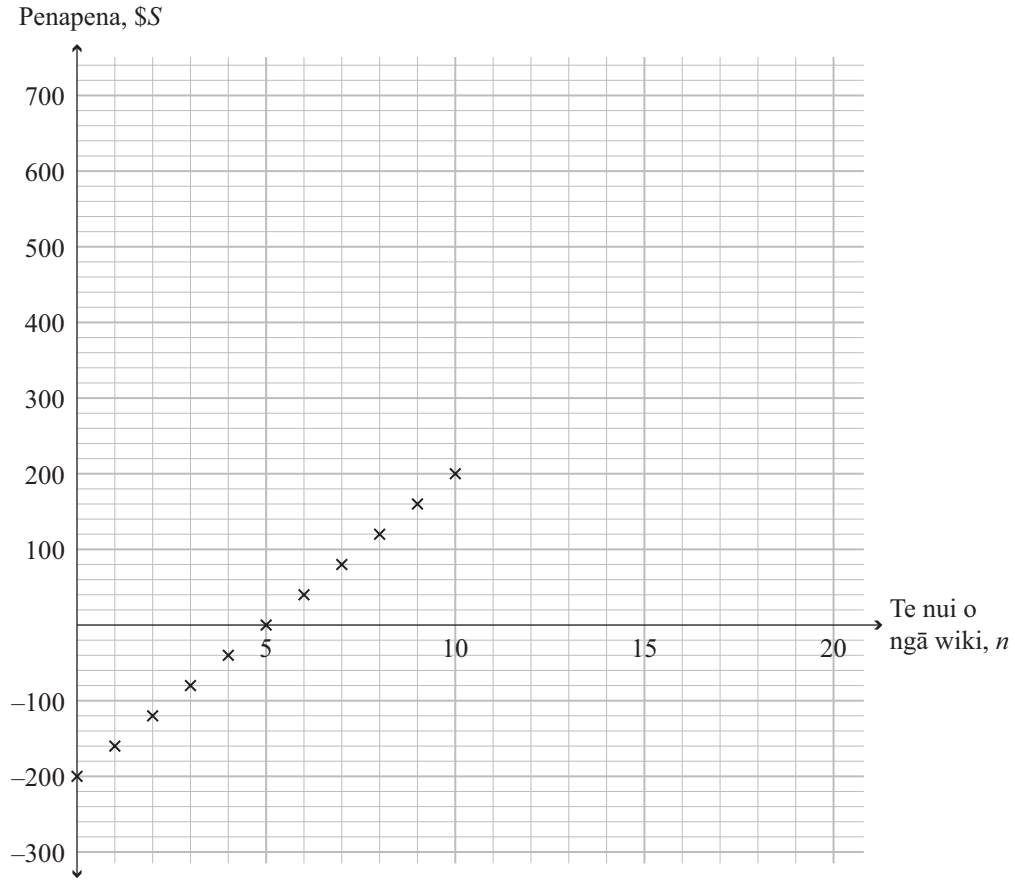
If a graph was drawn for the child's fares, describe the similarities and differences between the graphs of the child's fare and the adult's fare.

MĀ TE KAIMĀKA ANAKE

(b) Ka whiwhi i a Blake tētahi kape o tana pūrongo pēke me tana kite kua nui rawa tana tango moni (kei te noho nama ia ki te pēke).

Ka tīmatahia e ia tētahi mahere penapena pūtea.

E whakaatu ana te kauwhata i raro i te nui o ngā moni e wawata nei a Blake kia noho ki tana pūtea pēke $\$S$, mēnā ka whai ia i tana mahere penapena pūtea mō ngā wiki e n.



(i) E hia te nui e whakarite nei a Blake ka uru ki tana pūtea pēke i ia wiki?

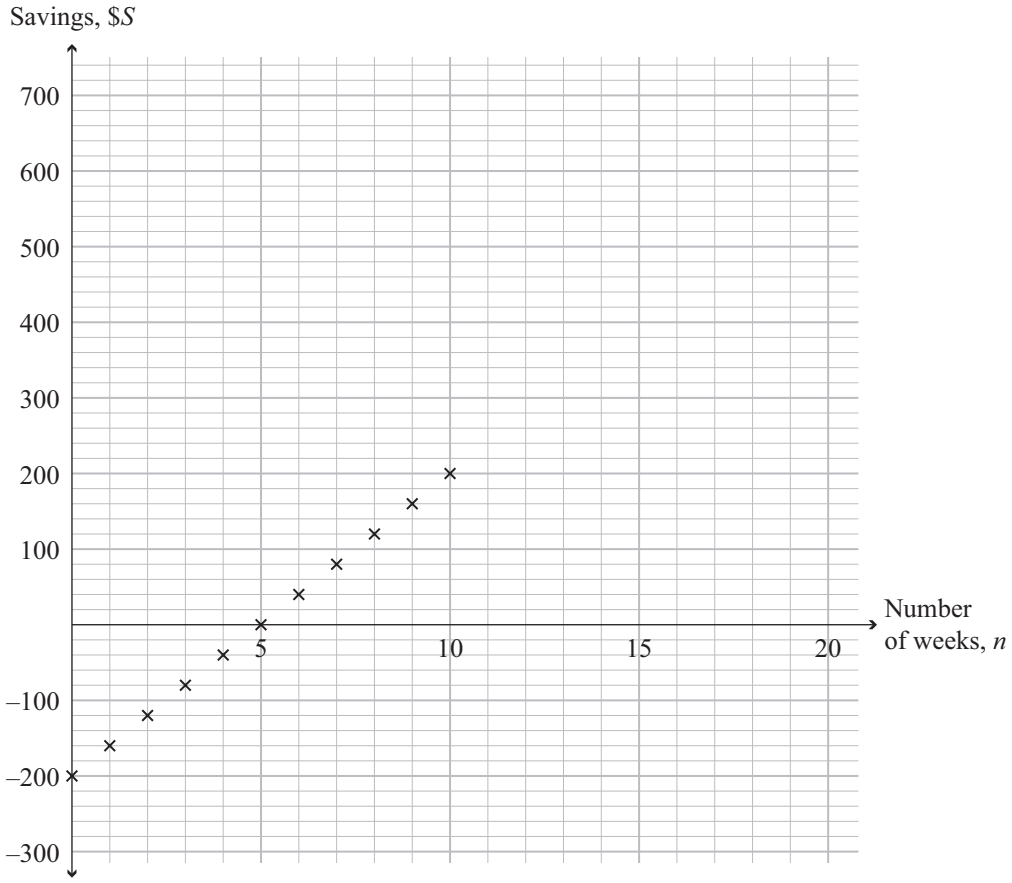
(ii) Homai te whārite mō te kauwhata o te mahere penapena a Blake e pā ana ki $\$S$, te nui ki te pūtea pēke a Blake, me n, te nui o ngā wiki whai muri i te tīmatanga o tana mahere penapena pūtea.

ASSESSOR'S USE ONLY

(b) Blake receives a copy of his bank statement and finds he is overdrawn (he has a negative amount in the bank).

He starts a saving plan.

The graph below shows the amount of money Blake hopes to have in his bank account, $\$S$, if he follows his savings plan for n weeks.



(i) How much does Blake plan to bank each week?

(ii) Give the equation for the graph of Blake's saving plan in terms of $\$S$, the amount in Blake's account, and n, the number of weeks after the start of his saving plan.

(iii) Ko te whakaaro o te kuia o Blake me nui ake ana moni penapena.

I te otinga o ngā wiki e 4 ka kī ia ki a ia mēnā he $300 kei roto i tana pūtea pēke whai muri i ngā wiki e 9, ka tuku ia i te $50 ki a ia.

Mai i te otinga o te wiki 4 ka whakapikihia e Blake te rahi o ana pūtea penapena ia wiki.

Ka tutuki i a ia te whāinga o tōna kuia, arā he $300 ki tana pūtea pēke, ā, ka pēkehia e ia te $50 a tōna kuia.

Ka penapena haere tonu ia i tēnei rahinga nui ake whai muri i te pēketanga o te $50 a tōna kuia.

Whakaahuahia te rerekētanga o te kauwhata mai i te wiki 4 haere ake.

Tīwhiri: ka taea tēnei mā te homai whārite mō ētahi wāhanga o te kauwhata.
Tērā pea he āwhina ki a koe mēnā ka tuhia te kauwhata mā te whakamahi i te tukutuku kei te whārangi 6.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(iii) Blake's grandmother thinks he should be saving more.

At the end of 4 weeks she tells him that if the amount in his bank account at the end of 9 weeks is $300, she will give him $50.

He increases the fixed amount he saves each week from the end of week 4.

He reaches his grandmother's target of $300 in his account and banks the $50 from his grandmother.

He continues saving at the increased rate after banking the $50 from his grandmother.

Describe how the graph changes from week 4 onwards.

Hints: you can do this by giving equations for some parts of the graph.
You may find it helpful to sketch the graph using the grid on page 7.

PĀTAI TUARUA

MĀ TE KAIMĀKA ANAKE

Kei te whakamahi a Emma i a Ian ki te waihanga i tētahi paparaho ki tōna whare.

Ka whakarato katoatia e Emma ngā papanga waihanga.

Ka utu ia i a Ian ki te $\$P$ mō ngā hāora, h, e mahi ana ia.

Ka utu anō ia i te haerenga atu o Ian ki tōna whare i ia rā.

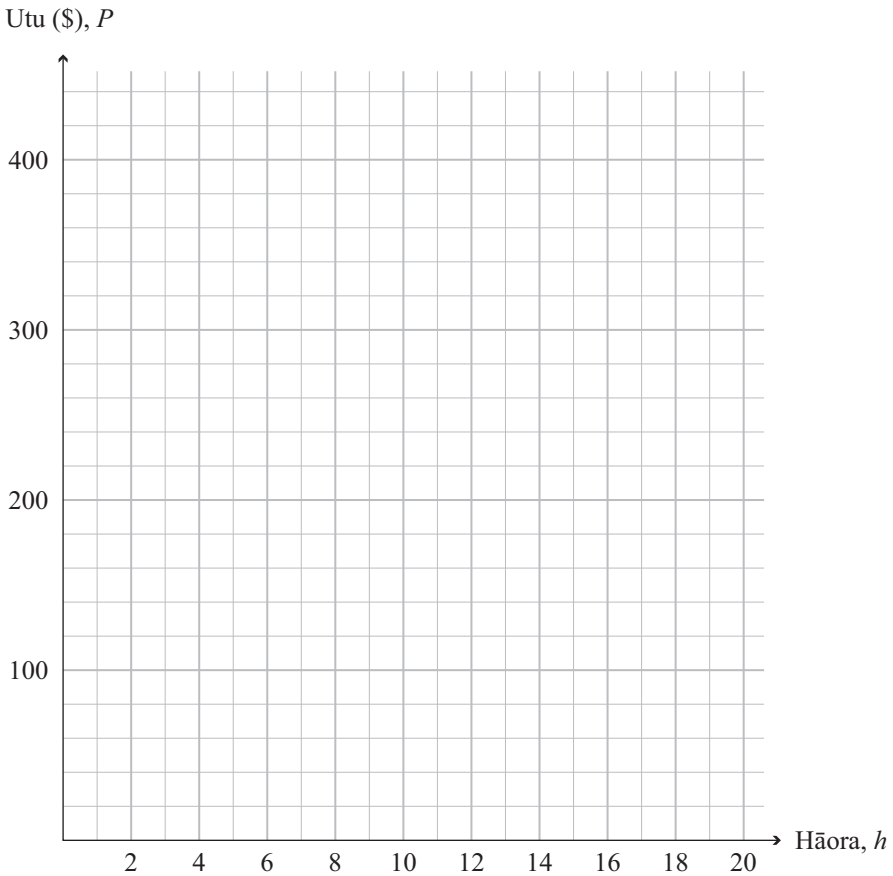
Ka mahi a Ian mō ngā hāora e 8 i ia rā.

Kei te mōhio a Ian he nui atu i te 4 hāora te roa mō te waihanga i te paparaho.

Hei āwhina i a Emma ki te tatau i te utu, ka hoatu a Ian i te papatau e whai ake nei:

Nui o ngā hāora mahi (h)	**Utu (P)**
4	$160
5	$185
6	$210
7	$235
8	$260
9	$345
10	$370

(a) Ki te tukutuku i raro, tuhia he kauwhata e whakaatu ana i te utu e tika ana mō te nui o ngā hāora mahi ka oti.



Ki te hiahia koe ki te tā anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 22.

QUESTION TWO

ASSESSOR'S USE ONLY

Emma is employing Ian to build a deck at her house.

She provides all the building material.

She pays Ian $\$P$ for the number of hours, h, that he works.

She also pays for Ian's travel to her home each day.

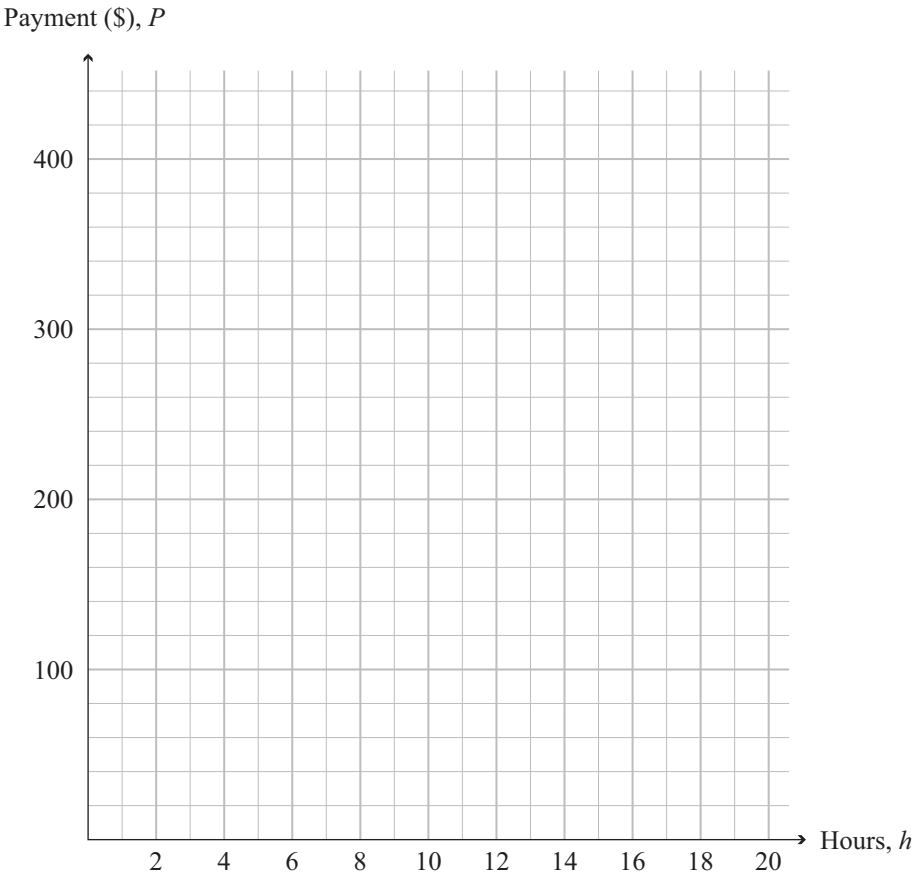
Ian works for 8 hours each day.

He knows the deck will take more than 4 hours to build.

To help Emma know how much she can expect to pay, Ian provides the following table:

Number of hours worked (h)	Payment (P)
4	\$160
5	\$185
6	\$210
7	\$235
8	\$260
9	\$345
10	\$370

(a) On the grid below, plot a graph showing the payment required for the number of hours worked.



If you need to redraw this graph, use the grid on page 23.

(b) E hia te utu a Ian mō ana haerenga i ia rā?

MĀ TE KAIMĀKA ANAKE

(c) Whakamāramahia mai he aha e tūpou ake ai te piki o te kauwhata whai muri i te 8 hāora.

(d) He aha te utu hei tūmanako mā Emma mēnā he 30 hāora te roa o te mahi?
Whakamāramahia tō tātaitanga.

(e) Ko Zarko te hoa noho tata o Emma, ā, ka kī a ia māna e waihanga te paparaho mōna. Kāre he utu mō ana haere, engari ko tana utu i te hāora he $35.

Pēhea te roa o te mahi mēnā he ōrite ngā utu ki a Zarko rāua ko Ian?
Whakamāramahia mai tō tātaitanga i tō whakautu.
Tīwhiri: he nui ake pea ngā otinga i te mea kotahi.

ASSESSOR'S USE ONLY

(b) How much does Ian charge for his travel each day?

(c) Explain why the graph rises more steeply after 8 hours.

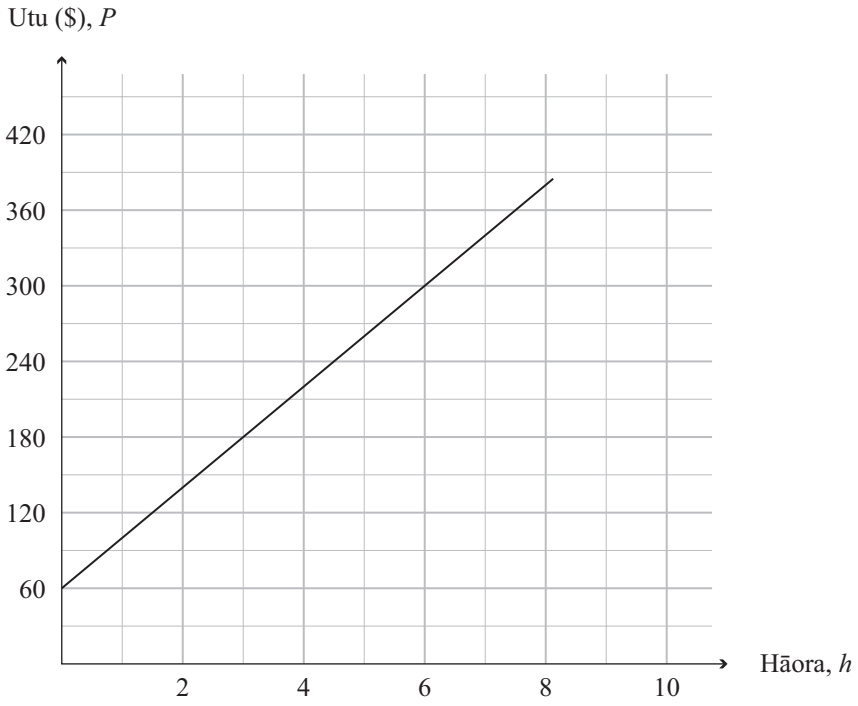
(d) What would Emma expect to pay if the work took 30 hours?
Explain your calculation.

(e) Zarko lives next door to Emma and says he could build the deck for her.
He does not need to be paid for his travel, but he charges $35 an hour.

How long would the work take if the payments to Zarko and Ian were the same?
Explain how you calculated your answer.
Hint: there may be more than one solution.

(f) Ka hoatu e tētahi atu kāmura tētahi kauwhata ki a Emma, e whakaatu ana i te rahi ka utua e ia mō ngā hāora mahi e 8.

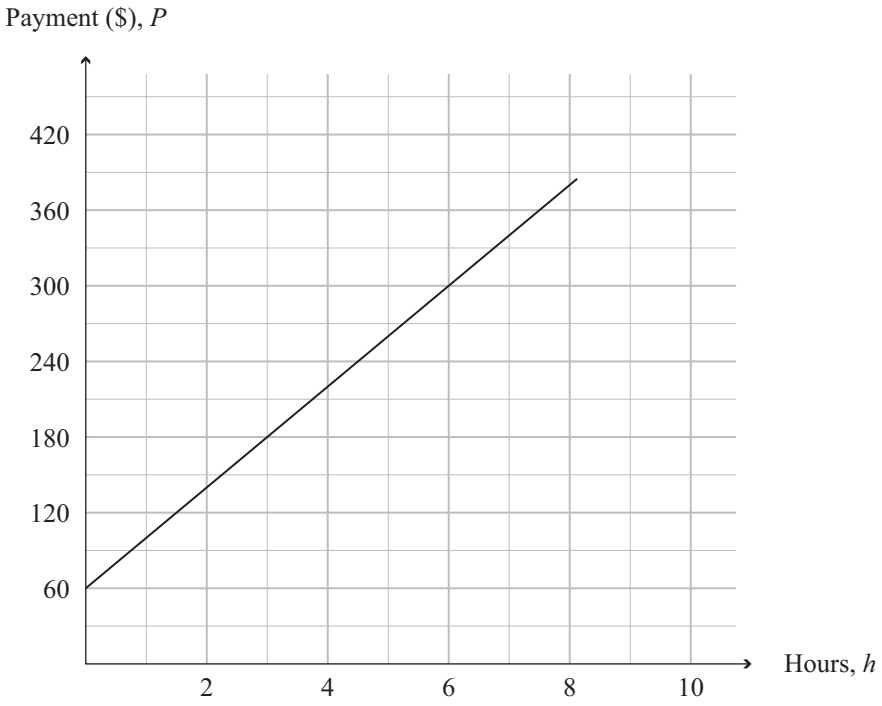
MĀ TE KAIMĀKA ANAKE



Homai te ture mō te utu ka whiwhi i tēnei kāmura mō ana hāora mahi e 8 tuatahi i mahi ia.

ASSESSOR'S USE ONLY

(f) Another builder gives Emma a graph, showing the amount she would charge for 8 hours work.



Give the rule for the payment that this builder would receive for the first 8 hours that she worked.

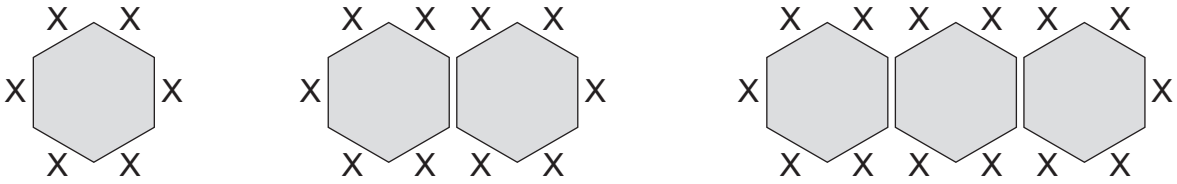
PĀTAI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) I te whakarite a Brad rāua ko Zara i ngā tēpu tapaono mō tā rāua mārena.

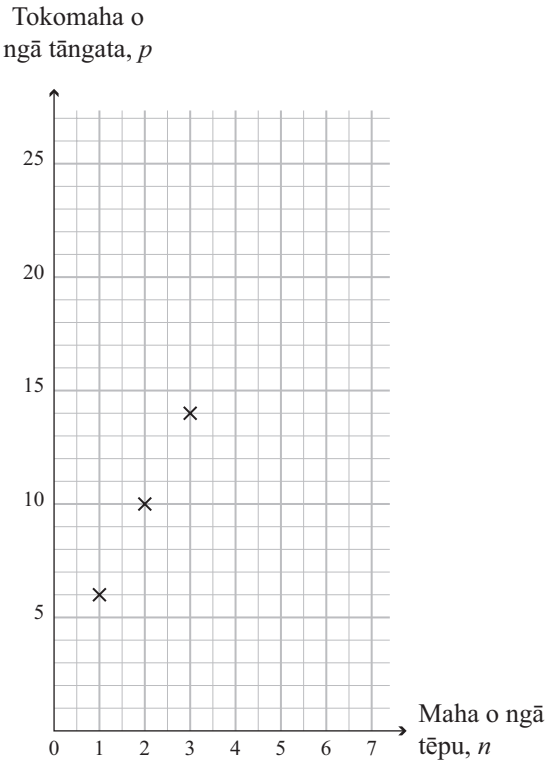
Ka whakamātau rawa rāua i ngā whakatakotoranga rerekē kia kitea ai e pēhea te rahi o ngā tāngata ka uru ina whakatakoto rārangitia ngā tēpu, pērā i te mahere nei.

Ka māka rāua i ngā wāhi e taea e te tangata te noho ki te X.



Ka kī a Brad ko te whārite mō te tapeke tāngata, p, mēnā e n ngā tēpu, ka tukuna mai i te whārite $p = 4n + 2$.

Ka tuhia e Zara tētahi kauwhata o te tokomaha o ngā tāngata, p, ki te maha o nga tēpu.



Whakamāramahia mai te whai pānga o te whārite me te kauwhata ki te tokomaha o ngā tāngata ka noho ki ngā tēpu.

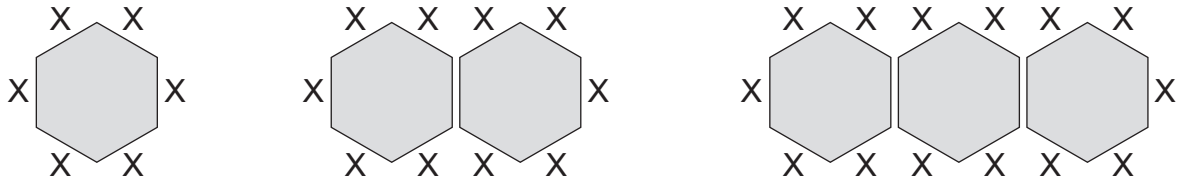
QUESTION THREE

ASSESSOR'S USE ONLY

(a) Brad and Zara were arranging hexagonal shaped tables for their wedding.

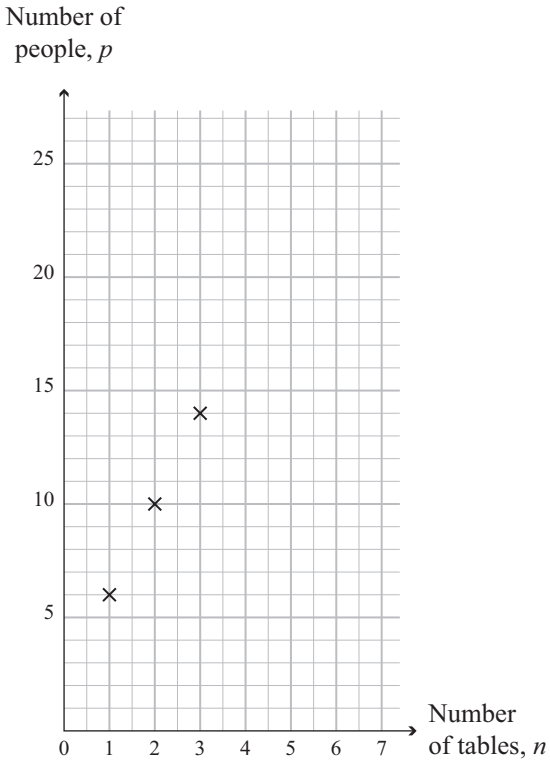
They try different arrangements of tables to see how many people they can fit when the tables are put next to each other, as shown in the diagram.

They mark where each person could sit with an X.



Brad says the equation for the total number of people, p, if there are n tables, is given by the equation $p = 4n + 2$.

Zara plots a graph of the number of people, p, against the number of tables.

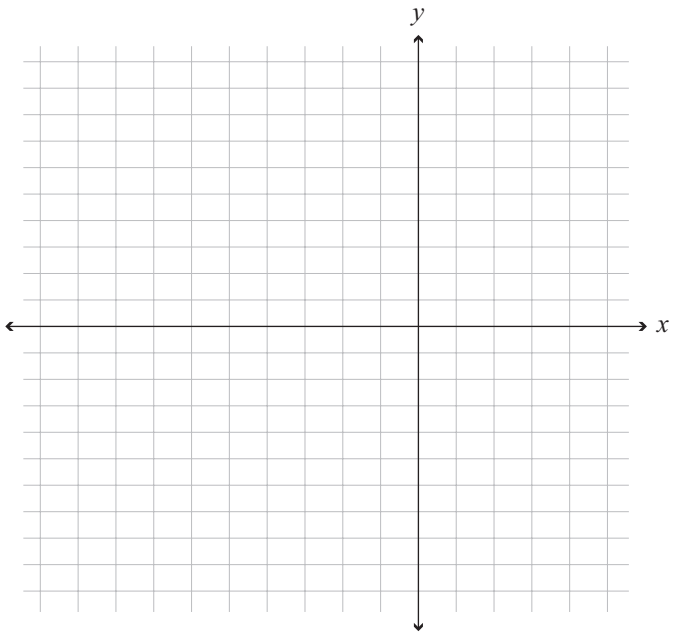


Explain how the equation and graph relate to the number of people at the tables.

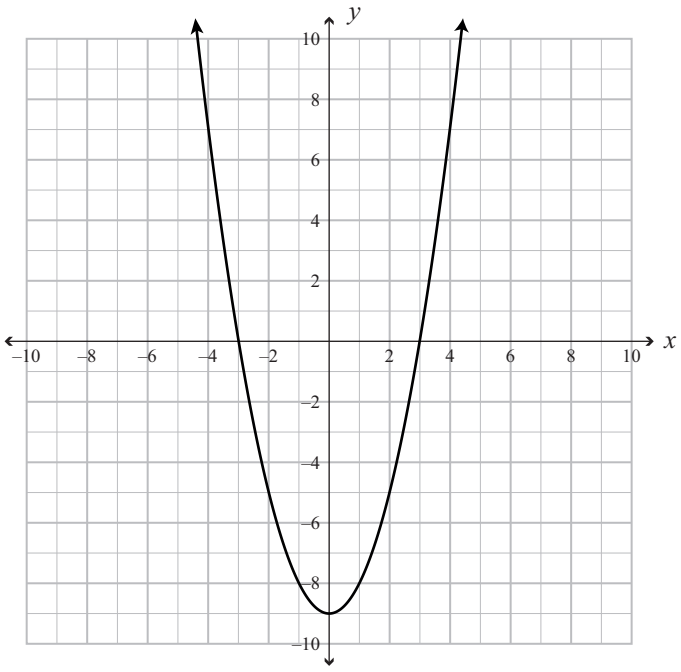
(b) Ki te tukutuku kei raro, tuhia te kauwhata o $y = -(x - 2)(x + 4)$

Ki te hiahia koe ki te tā anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 24.

MĀ TE KAIMĀKA ANAKE



(c) Mō te kauwhata kei raro, homai:



(i) ngā haukotinga o te x me te y

(ii) te whārite o te kauwhata.

(iii) Ka nekehia te unahi kia kotahi te wae ki te matau, ā, kia rua ngā wae whakarunga.

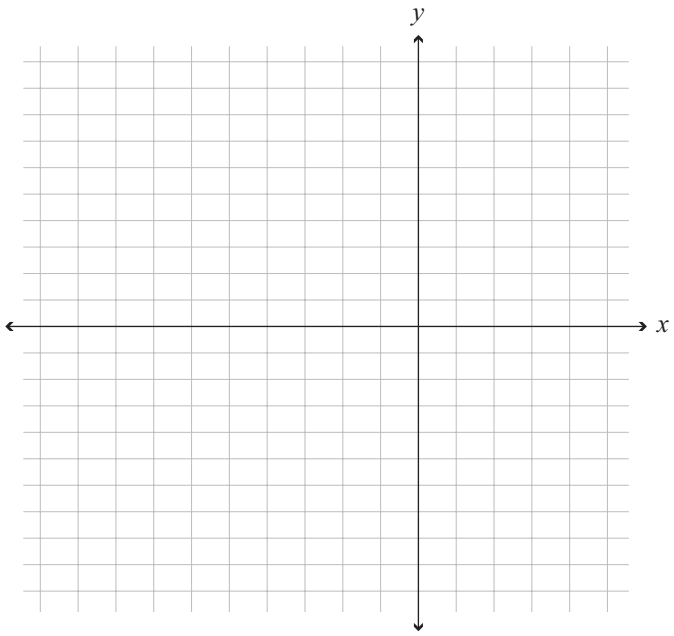
Homai te whārite māmā o te unahi ki tana tūnga hou ME te tuku mai i te haukotinga-y.

Whārite: _____ haukotinga-y: _____

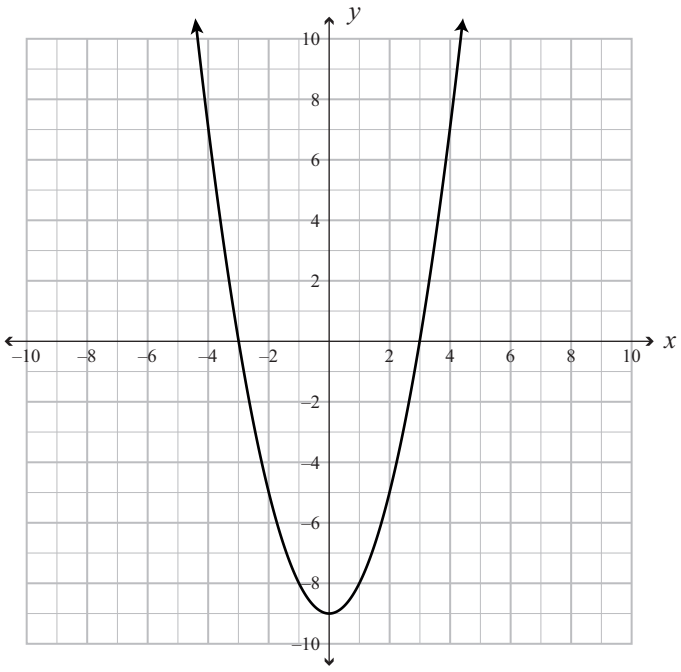
(b) On the grid below, sketch the graph of $y = -(x - 2)(x + 4)$

If you need to redraw this graph, use the grid on page 25.

ASSESSOR'S USE ONLY



(c) For the graph below, give:



(i) the x and y intercepts

(ii) the equation of the graph.

(iii) The parabola is moved 1 unit to the right and 2 units up.

Give the equation of the parabola in simplified form in its new position AND give the y-intercept.

Equation: _____ y-intercept: _____

MĀ TE KAIMĀKA ANAKE

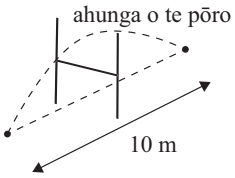
(d) (i) I tētahi papa tākaro, ka whanaia tētahi pōro kia whakatauiratia tōna ahunga e te whārite

$$h = -ax(x - 6)$$

ina ko ngā mita h te teitei o te pōro, i te wā ko ngā mita x te mamao mai i te pūwāhi i whanaia ai te pōro.

Mēnā e 2 m te teitei mōrahi o te pōro, he aha te uara o a?

(ii) Ka whanaia tētahi pōro mai i te papa tākaro, ā, 10 mita te taunga atu mai i te wāhi i whanaia te pōro ki tērā taha o te pou piro.



E 2 m te teitei o te pae o te pou piro mai i te papa.

Ina ka whiti te pōro i te pae, kua eke ki tana teitei mōrahi o te 2.5 m.

Homai te whārite mō te teitei ā-mita, h, o te pōro i runga ake i te papa me te mamao ā-mita, x, mai i te wāhi i whanaia te pōro, mēnā ka whakatauiratia te ahunga o te pōro ki tētahi unahi.

ASSESSOR'S USE ONLY

(d) (i) In a children's play park, a ball is kicked so that its flight path can be modelled by the equation

$$h = -ax(x - 6)$$

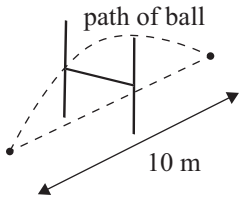
where h metres is the height of the ball when it is x metres from the point from where it is kicked.

If the maximum height of the ball is 2 m, what is the value of a?

(ii) A ball is kicked from the ground and lands at a point 10 m away on the opposite side of a goalpost.

The crossbar of the goalpost is 2 m above the ground.

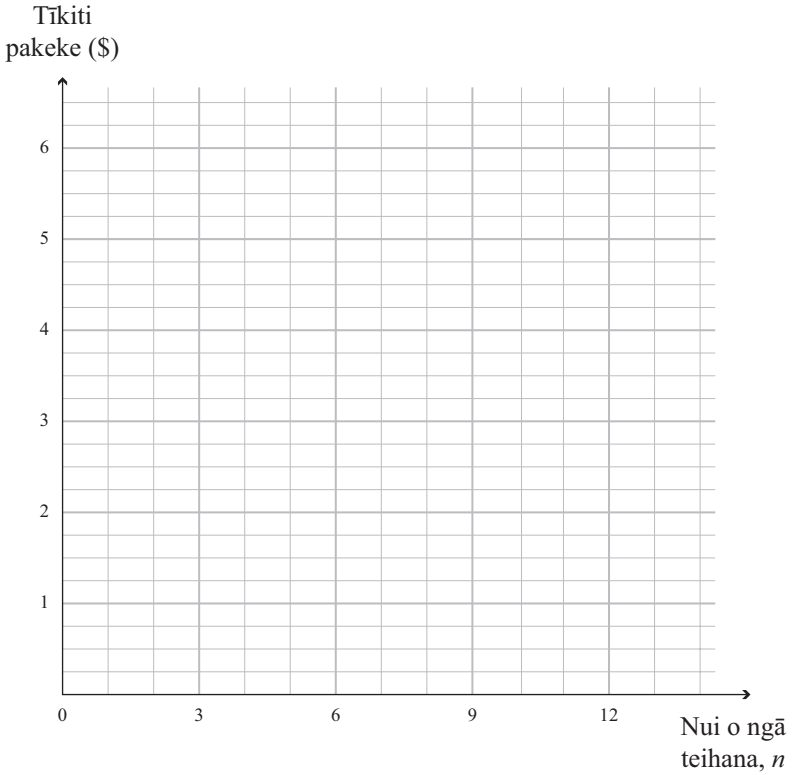
When the ball passes over the crossbar, it is at its maximum height of 2.5 m.



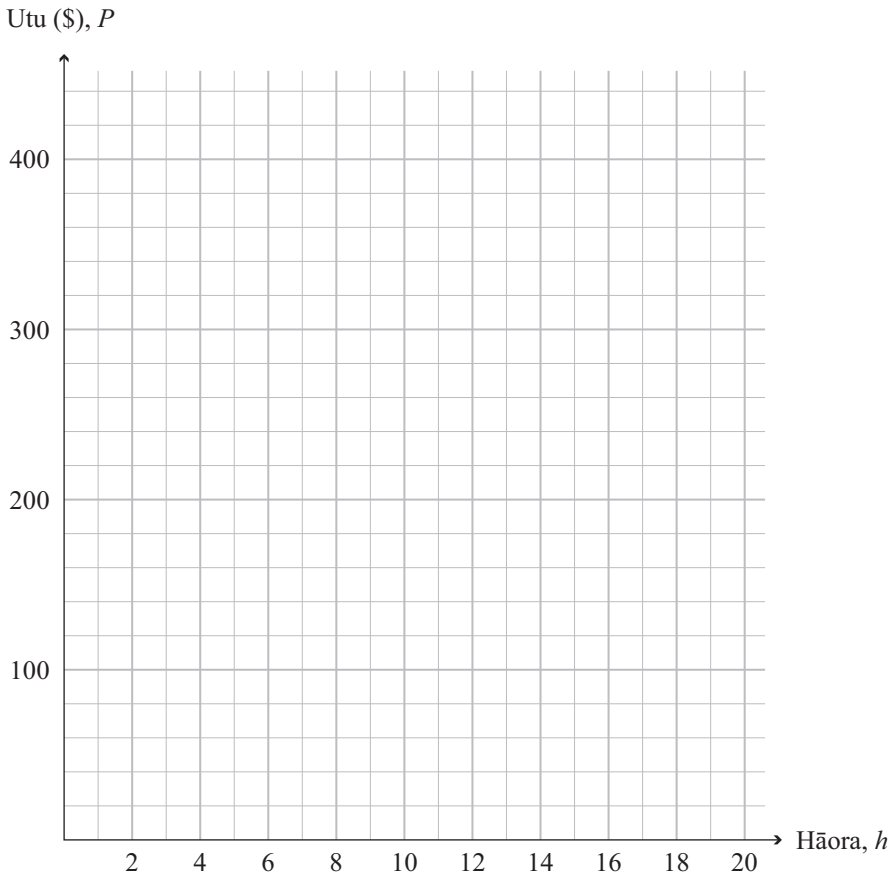
Give the equation for the height, h metres, of the ball above the ground at a distance, x metres, from where it was kicked, if the path of the ball is modelled by a parabola.

MĀ TE KAIMĀKA ANAKE

Ki te hiahia koe ki te tuhi anō i te kauwhata mō te Pātai Tuatahi (a), tuhia ki te tukutuku i raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.

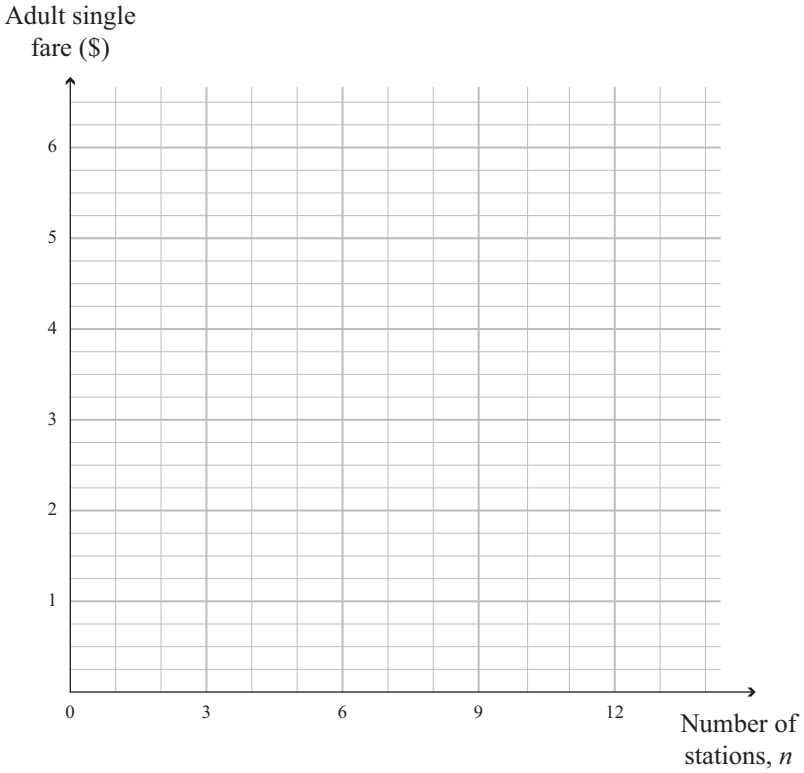


Ki te hiahia koe ki te tuhi anō i te kauwhata mō te Pātai Tuarua (a), tuhia ki te tukutuku i raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.

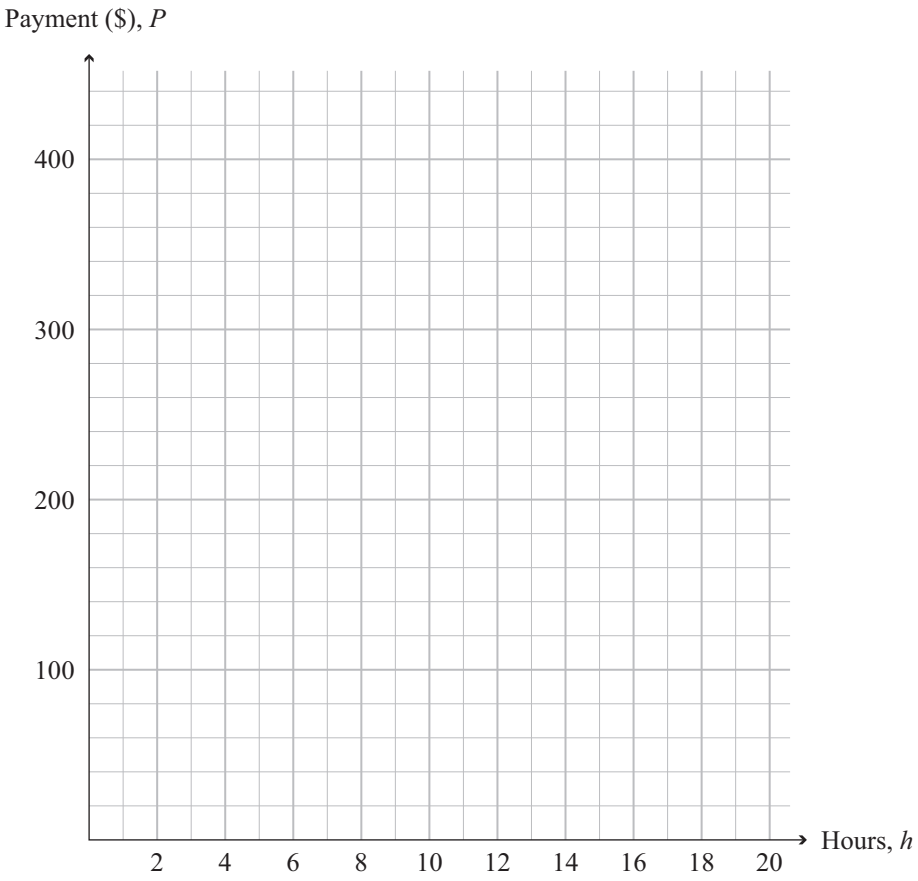


ASSESSOR'S USE ONLY

If you need to redraw the graph from Question One (a), draw it on the grid below. Make sure it is clear which graph you want marked.

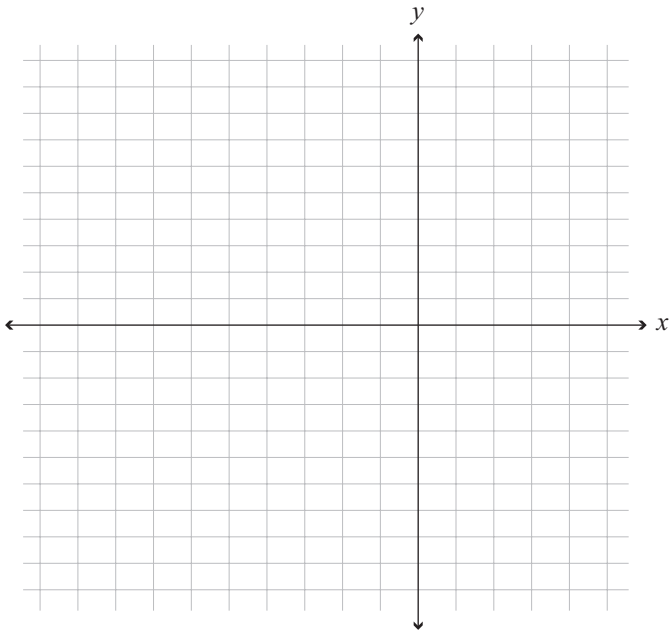


If you need to redraw the graph from Question Two (a), draw it on the grid below. Make sure it is clear which graph you want marked.



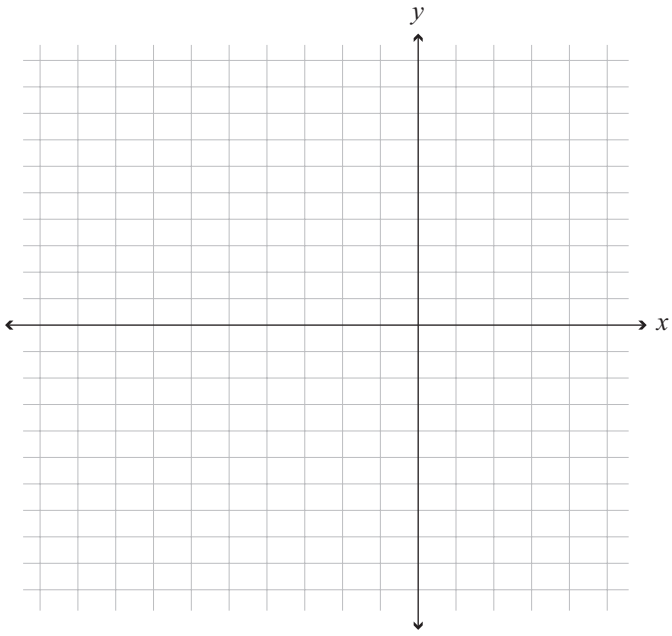
Ki te hiahia koe ki te tuhi anō i te kauwhata mō te Pātai Tuatoru (b), tuhia ki te tukutuku i raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.

MĀ TE KAIMĀKA ANAKE



If you need to redraw the graph from Question Three (b), draw it on the grid below. Make sure it is clear which graph you want marked.

ASSESSOR'S USE ONLY



He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā ka whai wāhi ki konei.

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 1 Mathematics and Statistics, 2011

91028 Investigate relationships between tables, equations and graphs

9.30 am Monday 14 November 2011
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Investigate relationships between tables, equations and graphs.	Investigate relationships between tables, equations and graphs, using relational thinking.	Investigate relationships between tables, equations and graphs, using extended abstract thinking.

91028M

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.

Show ALL working.

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 2–27 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.