NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 1, 2014

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

9.30 i te ata Rātū 18 Whiringa-ā-rangi 2014
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 whaipānga.	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 (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.

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 roto nei ngā whārangi 2–19 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

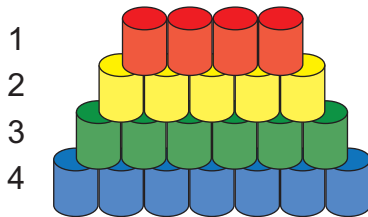**HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.**

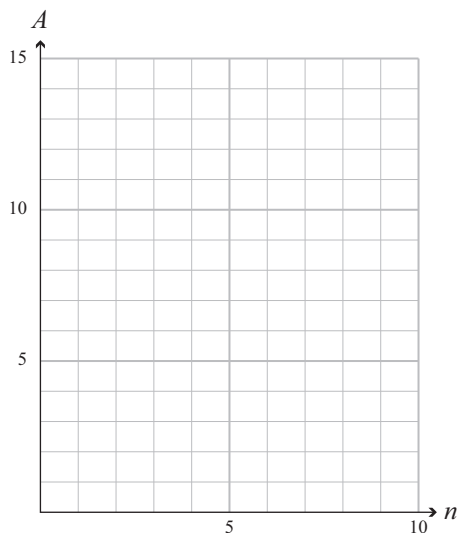**TAPEKE**

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

(a) Kei te tūhurahura a Josie i ngā tauira tau i ngā whakaaturanga hokomaha.

Apa

1
2
3
4

Te maha o ngā apa o ngā kēne, n	Te maha o ngā kēne ki te apa, A
1	4
2	
3	
4	
7	

(i) Whakaotihia te papatau i te taha matau.

(ii) Ki te tukutuku i raro nei, tuhia te kauwhata e whakaatu ana i te maha o ngā kēne i ia apa.

A

15

10

5

5   10 n

> *Ki te hiahia koe ki te tuhi anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 14.*

(iii) E kī ana a Josie kei papahoro mēnā ka whakatūhia pēneihia ngā kēne ki tētahi apa rārangi-tahi, ā, ka whakatau ia ki te tāpiri i ētahi rārangi e rua anō ki muri, kia noho ai e toru ngā rārangi ki ia apa, pēnei i te hoahoa i raro.

Tuhia te whārite mō te tapeke o ngā kēne, A, i tētahi apa, n, o tētahi whakaaturanga, ina hangaia ia apa ki ngā rārangi e 3.

Apa

1
2
3
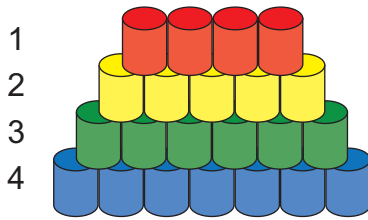4

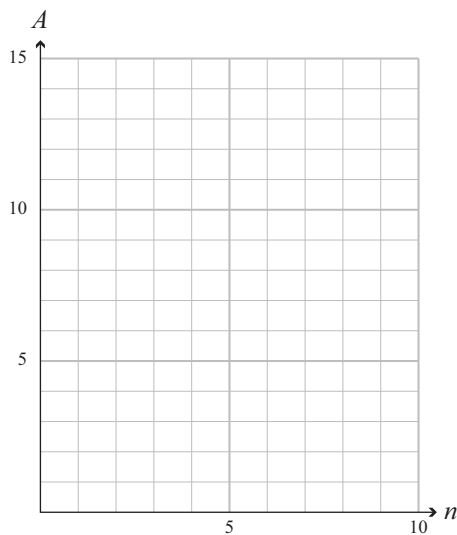$A =$ _____
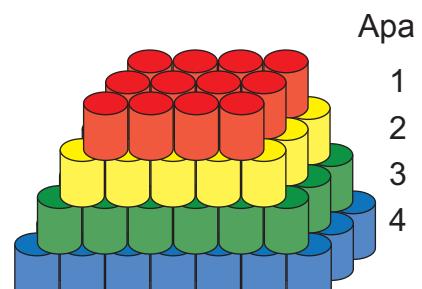
QUESTION ONE

(a)   Josie is investigating number patterns in supermarket displays.

Layer

1
2
3
4

Number of layers of cans, n	Number of cans in layer, A
1	4
2	
3	
4	
7	

(i)   Complete the table on the right.

(ii)   On the grid below plot the graph that shows the number of cans in each layer.

A

If you need to redraw this graph, use the grid on page 15

(iii)   Josie says arranging cans in a single-row layer like this is too unstable and decides to add another 2 rows behind, so there are 3 rows in each layer, as shown below.

Give the equation for the number of cans, *A*, in any layer, *n*, of a display, where each layer is made of 3 rows.
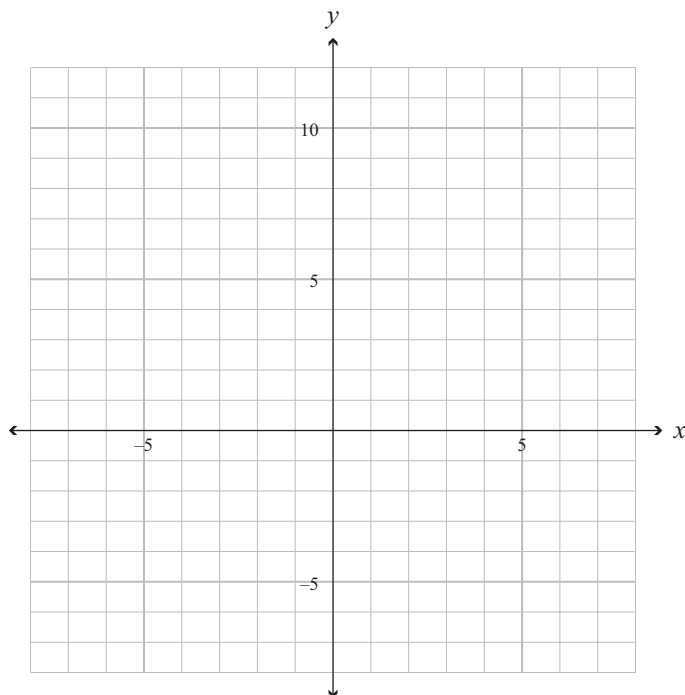
Layer

1
2
3
4

_____

_____

$A =$ _____
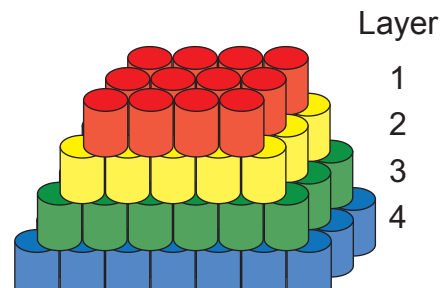
(iv) 15 apa te teitei o tētahi whakaaturanga. E 4 kēne hoki kei ia rārangi o te apa o runga.

Kia hia ngā kēne mō te apa o raro tonu o tēnei whakaaturanga mēnā e 3 ngā rārangi ki ia apa?

Me whakaatu e koe te whakamahinga o tō whārite.

(b) (i) Tuhia te kauwhata o $y = \dfrac{x^2 + 7x}{2}$

Ki te hiahia koe ki te tuhi anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 14.

(ii) Kei te mōhio a Josie ko $T = \dfrac{n^2 + 7n}{2}$ te whārite mō te tapeke o ngā kēne, *T,* i tētahi whakaaturanga me te *n* apa rārangi-tahi.

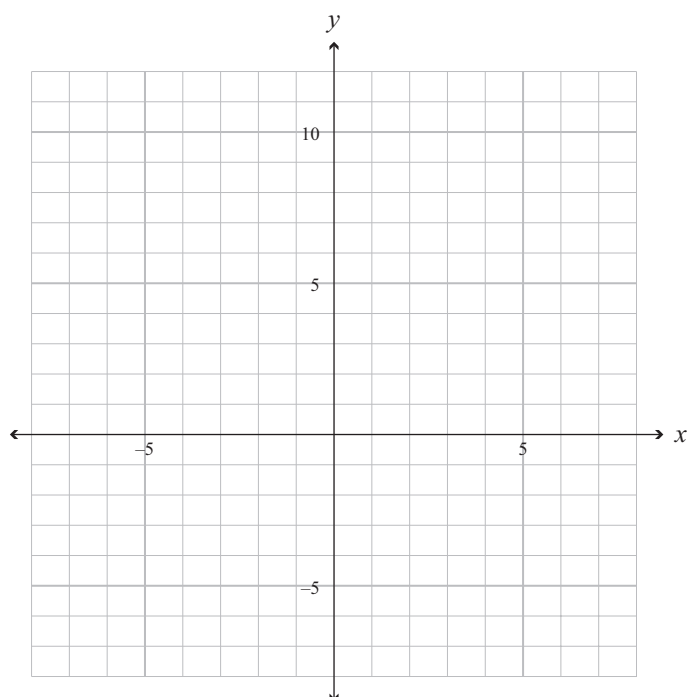Ka pēhea te rerekē o te **kauwhata** o te pānga i waenga i *T* me *n* ki te kauwhata i tuhi koe i (b)(i)?

Homai ētahi take mō tō whakautu.

(iv) A display is 15 layers high. It also has 4 cans in each row of the top layer.

How many cans would she need for the bottom layer of this display if each layer is made of 3 rows?

You must show use of your equation.

(b) (i) Sketch the graph of $y = \dfrac{x^2 + 7x}{2}$

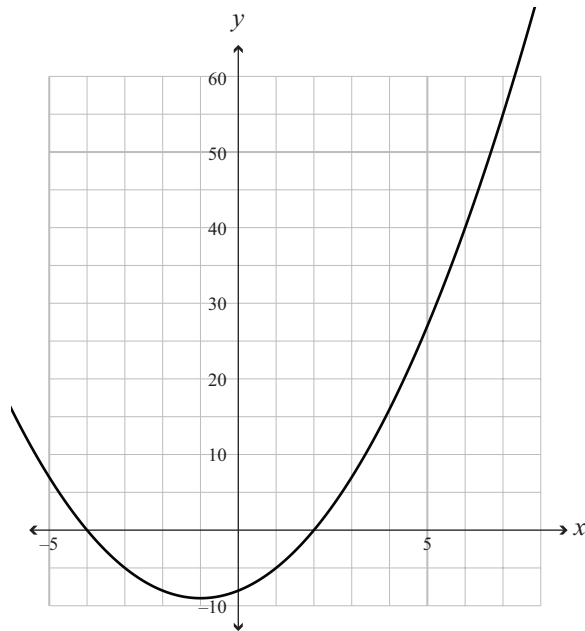> *If you need to redraw this graph, use the grid on page 15*

(ii) Josie knows that $T = \dfrac{n^2 + 7n}{2}$ is the equation for the total number of cans, T, in a display with n single-row layers.

How would the **graph** of the relationship between T and n differ from the graph you drew in (b)(i)?

Give reasons for your answer.

PĀTAI TUARUA

(a) (i) Tuhia te whārite mō te kauwhata e whakaaturia ana i raro nei.

(ii) Mō ēhea uara o te x he tōraro a y?

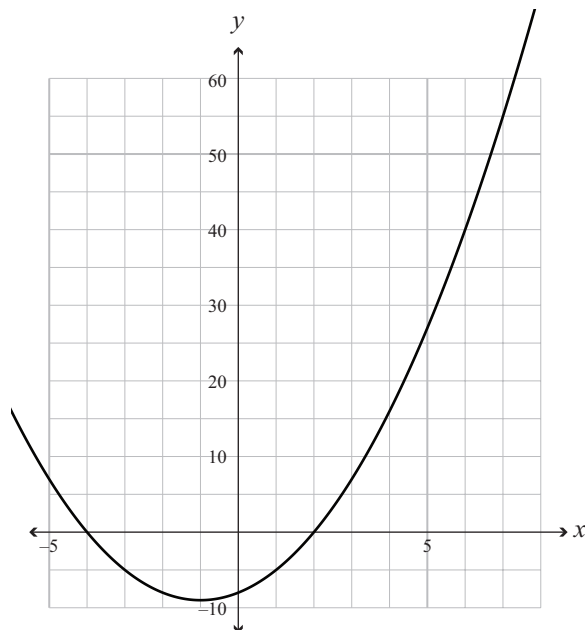(b) Kei te tūhurahura a Raja i ngā raupapa tau o te momo

$$y = x^2 - x + q$$

ina ko q he tau pūmau.

Mēnā ka tāia e ia he kauwhata o tēnei, ka tohu te q i te aha i runga i te kauwhata?

QUESTION TWO

(a) (i) Give the equation of the graph shown below.
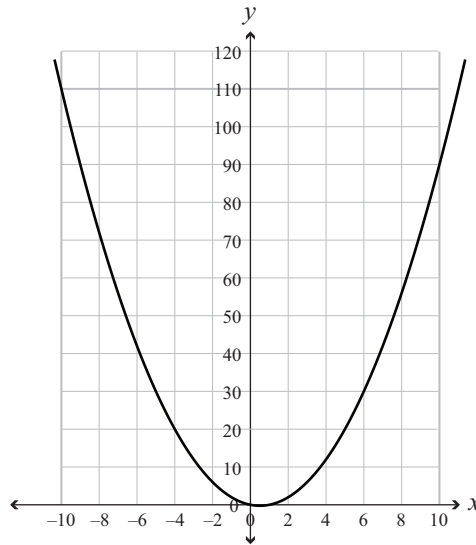

(ii) For what values of x is y negative?

(b) Raja is investigating number sequences of the form

$$y = x^2 - x + q$$

where q is a constant number.

If he drew a graph of this, what would q represent on the graph?

(c)   I whakamahi a Raja i tana tātaitai ki te tuhi i te kauwhata o $y = x^2 - x$ ki ngā tuaka i raro nei.

(i)   He aha ngā taunga[1] o te akitu (te pūwāhi tino hahaka rawa) o te kauwhata o runga?

Me maumahara ki te whakaatu i ō mahinga.

_____

_____

_____

_____

_____

(ii)   Whakaatu ā-tuhituhi, ka pēhea te kauwhata o te $y = -2x^2 + 2x$ e whakatairite ai ki te kauwhata o runga.

_____

_____

_____

(iii) Mēnā ka nekehia te kauwhata i te wāhanga (c)(i) o runga kia 5 ngā waeine whakatematau me te 15 waeine whakarunga, ka aha te whārite hou?

Whakarūnāhia tō whakautu.

_____

¹ takotoranga

(c) Raja used his calculator to draw the graph of $y = x^2 - x$ on the axes below.
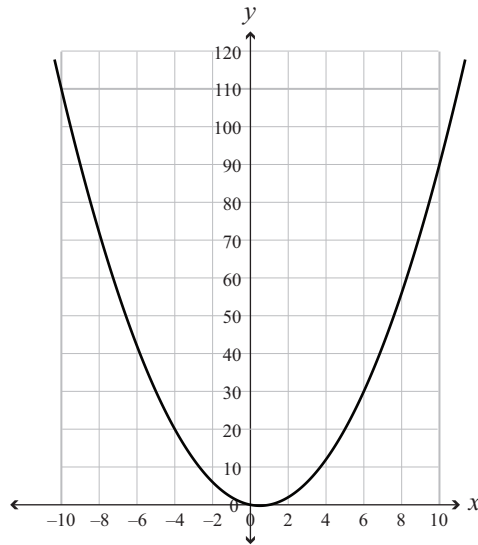
(i) What are the co-ordinates of the vertex (lowest point) of the graph above?

Remember to show your working.

(ii) Describe, in words, how the graph of $y = -2x^2 + 2x$ compares to the graph above.

(iii) If the graph from part (c)(i) above was moved 5 units to the right and 15 units up, what would its new equation be?
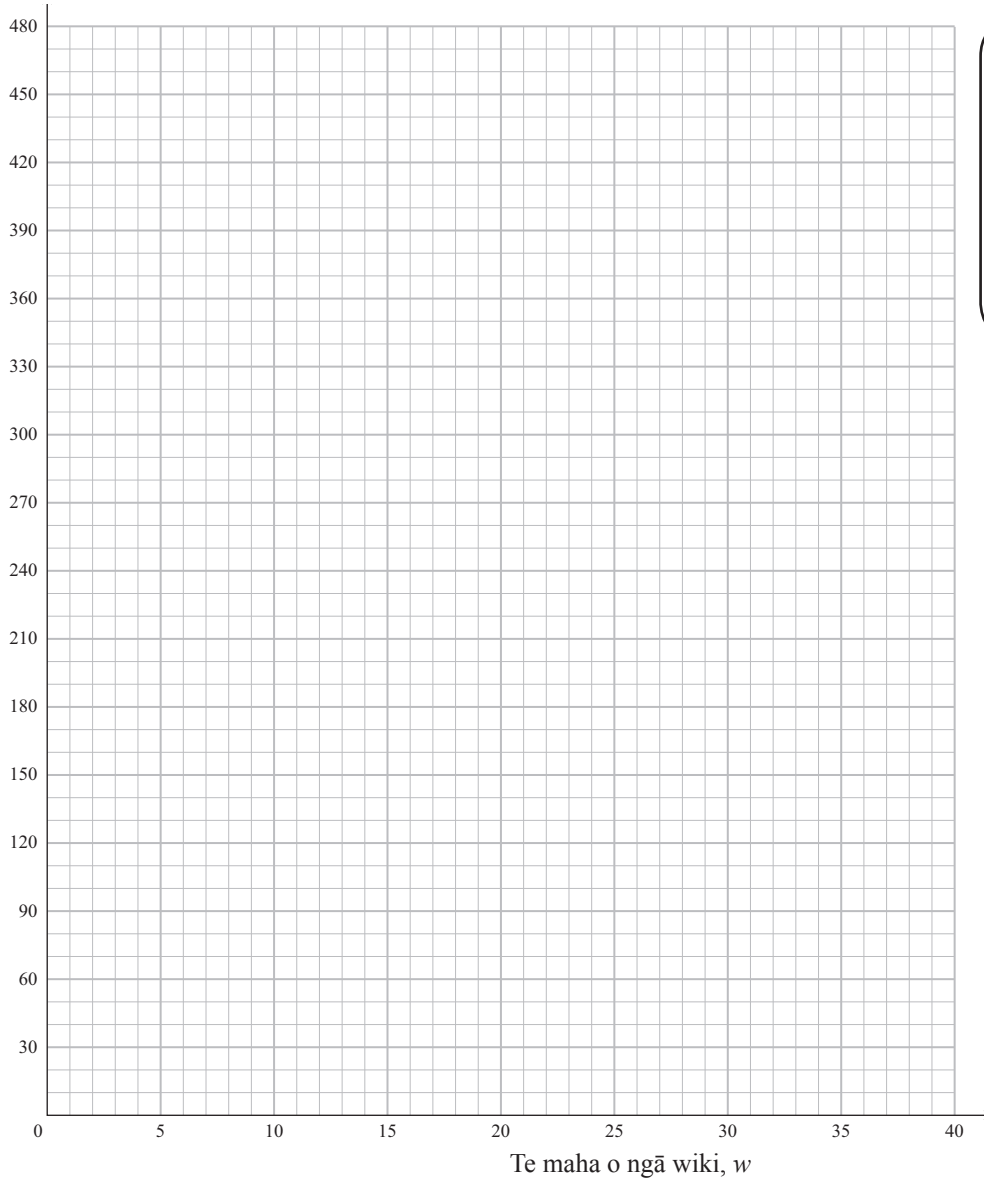
Simplify your answer.

PĀTAI TUATORU

(a)   E \$450 te nama a Arne kei tana pūtea taurewa ākonga.

Kei te utua tana nama mā te \$15 i ia wiki.

(i)   **Mō ngā wiki tuatahi e 5**, tuhia te kauwhata o te **tapeke** me utu tonu e Arne, A, ki te maha o ngā wiki e utu ana ia i te pūtea taurewa, w.

Te tapeke e nama tonu ana, A

Te maha o ngā wiki, w

(ii)   Tuhia te whārite mō te tapeke A e nama tonu ai a Arne i muri i tana utu i te \$15 i ia wiki.
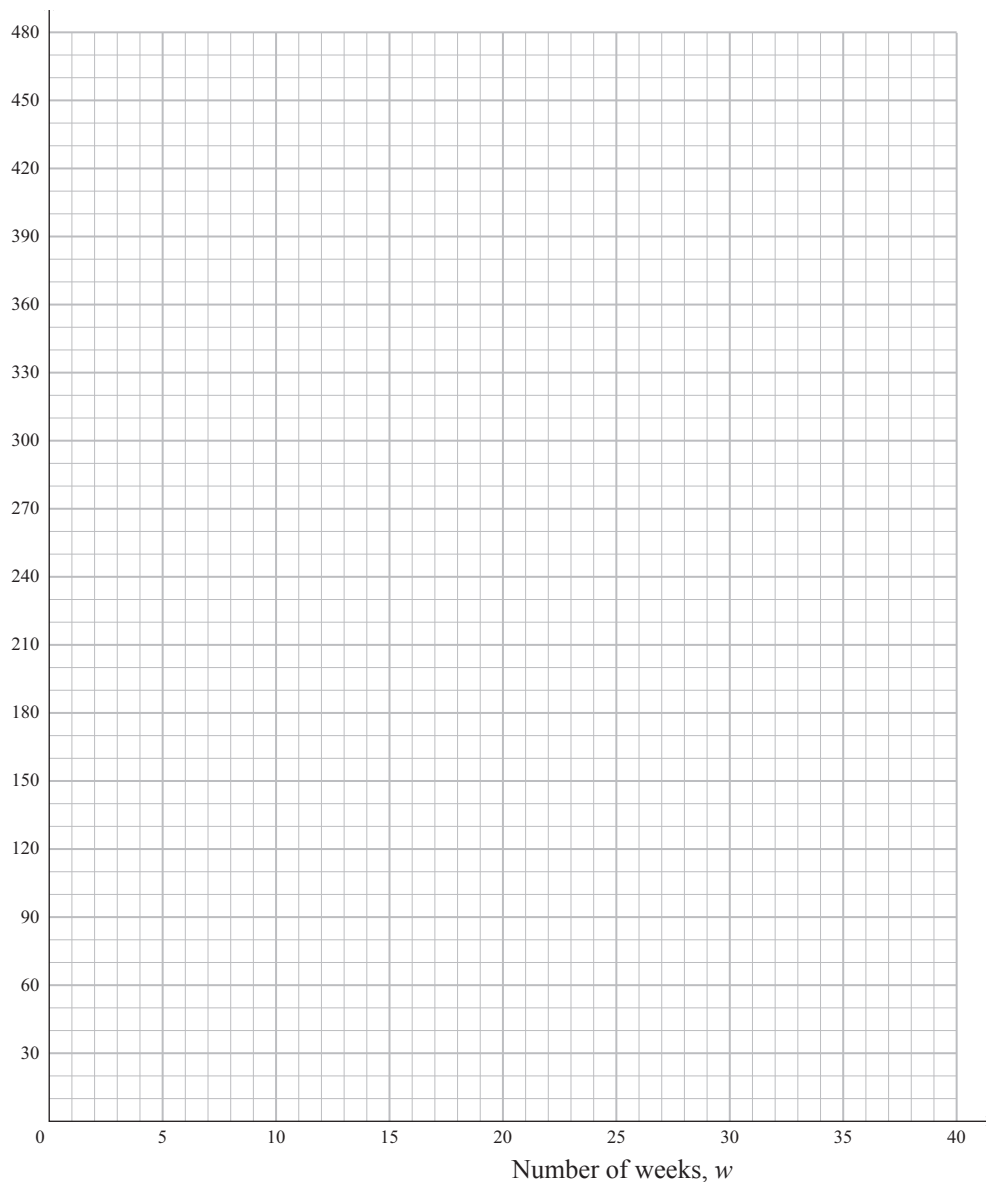
$A =$ _____

QUESTION THREE

(a)   Arne owes $450 on his student loan.

He is paying it off at the rate of $15 each week.

(i)   **For the first 5 weeks**, sketch the graph of the **total** amount Arne still has to pay, A, against the number of weeks he has been paying off the loan, w.

Total still to pay, A

If you need to redraw this graph, use the grid on page 17

Number of weeks, w

(ii)   Give the equation for the amount A that Arne owes after he makes each weekly payment of $15.

_____

$A =$ _____

(iii) Kei te whakatau a Arne e hiahia ana ia kia haere ki tāwāhi hararei ai.

Ko tana hiahia kia oti katoa tana utu i tana pūtea taurewa i te mutunga o te 25 wiki.

Ka titiro ia ki te tapeke e toe tonu ana kia utua me te whakatau ki te utu i te pūtea taurewa katoa i te mutunga tonu o te 25 wiki mēnā ka whakapiki ia i te rahinga e utu ana ia ki te $20 i te wiki.

Tāpiritia tēnei wāhanga ki tō kauwhata.

(iv) E hia ngā wiki ka pau i mua i tana utu i te $20 i te wiki?

_____

_____

(v) Homai te whārite mō te kauwhata e whakaatu ana i ngā utunga **nui ake**.

_____

_____

(b) Homai te whārite mō te kauwhata o raro nei.

_____

_____

_____
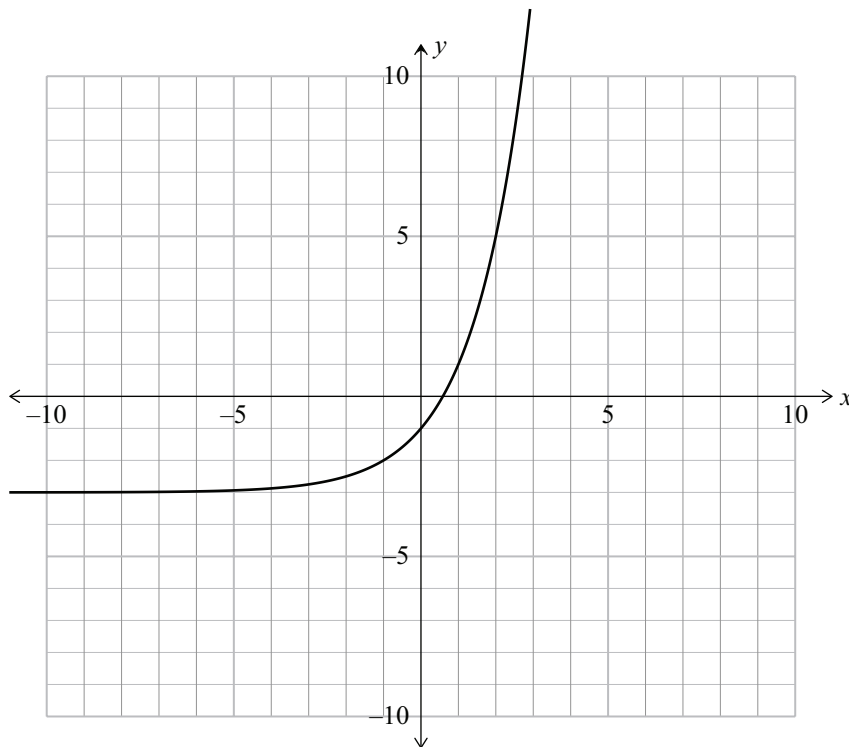
(iii) Arne decides that he wants to go overseas for a holiday.

He wants to finish repaying all of his loan at the end of 25 weeks.

He looks at what he has left to pay and decides he can repay the loan exactly at the end of 25 weeks if he increases the amount he repays to $20 a week.
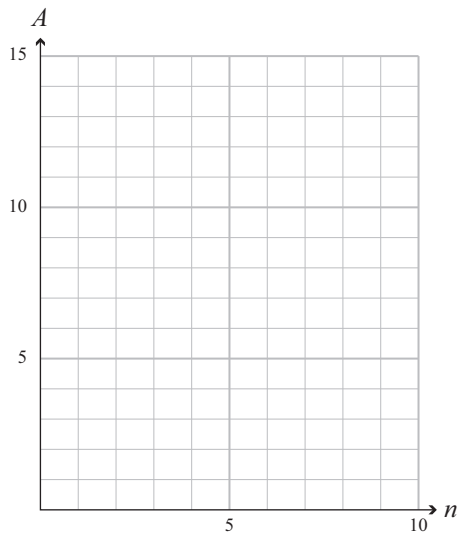
Add this section to your graph.

(iv) After how many weeks did he start paying $20 per week?

(v) Give the equation for the graph representing the **increased** payments.

(b) Give the equation of the graph below.
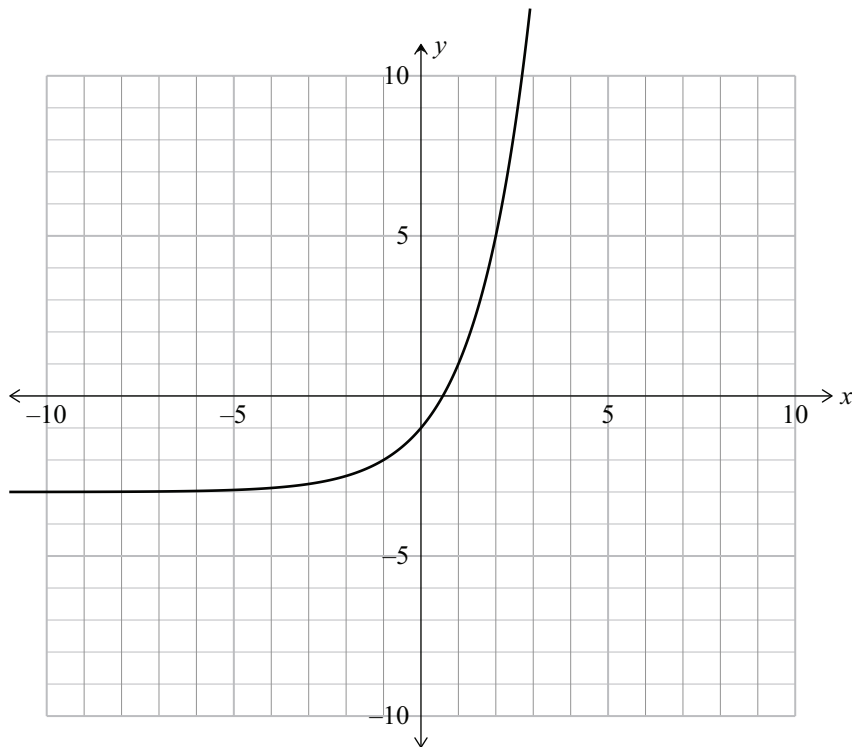
Ki te hiahia koe ki te tuhi anō i tō kauwhata mai i te Pātai Tuatahi (a)(ii), tuhia ki te tukutuku o raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.
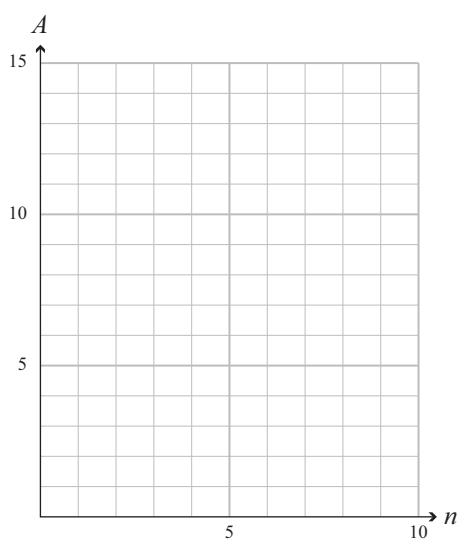
Ki te hiahia koe ki te tuhi anō i tō kauwhata mai i te Pātai Tuatahi (b)(i), tuhia ki te tukutuku o raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.
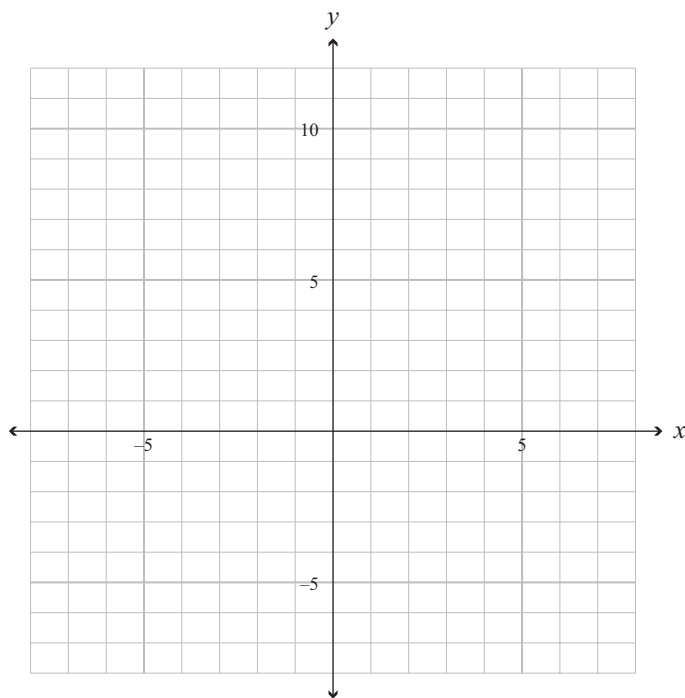
If you need to redraw your graph from Question One (a)(ii), draw it on the grid below. Make sure it is clear which graph you want marked.

If you need to redraw your graph from Question One (b)(i), 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 tō kauwhata mai i te Pātai Tuatoru (a)(i), tuhia ki te tukutuku o raro. Kia mārama te tohu ko tēhea te kauwhata ka hiahia koe kia mākahia.
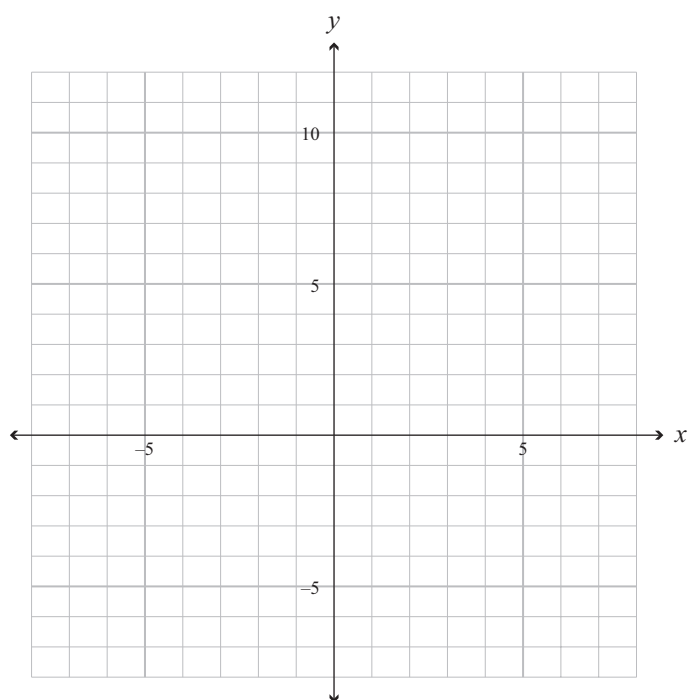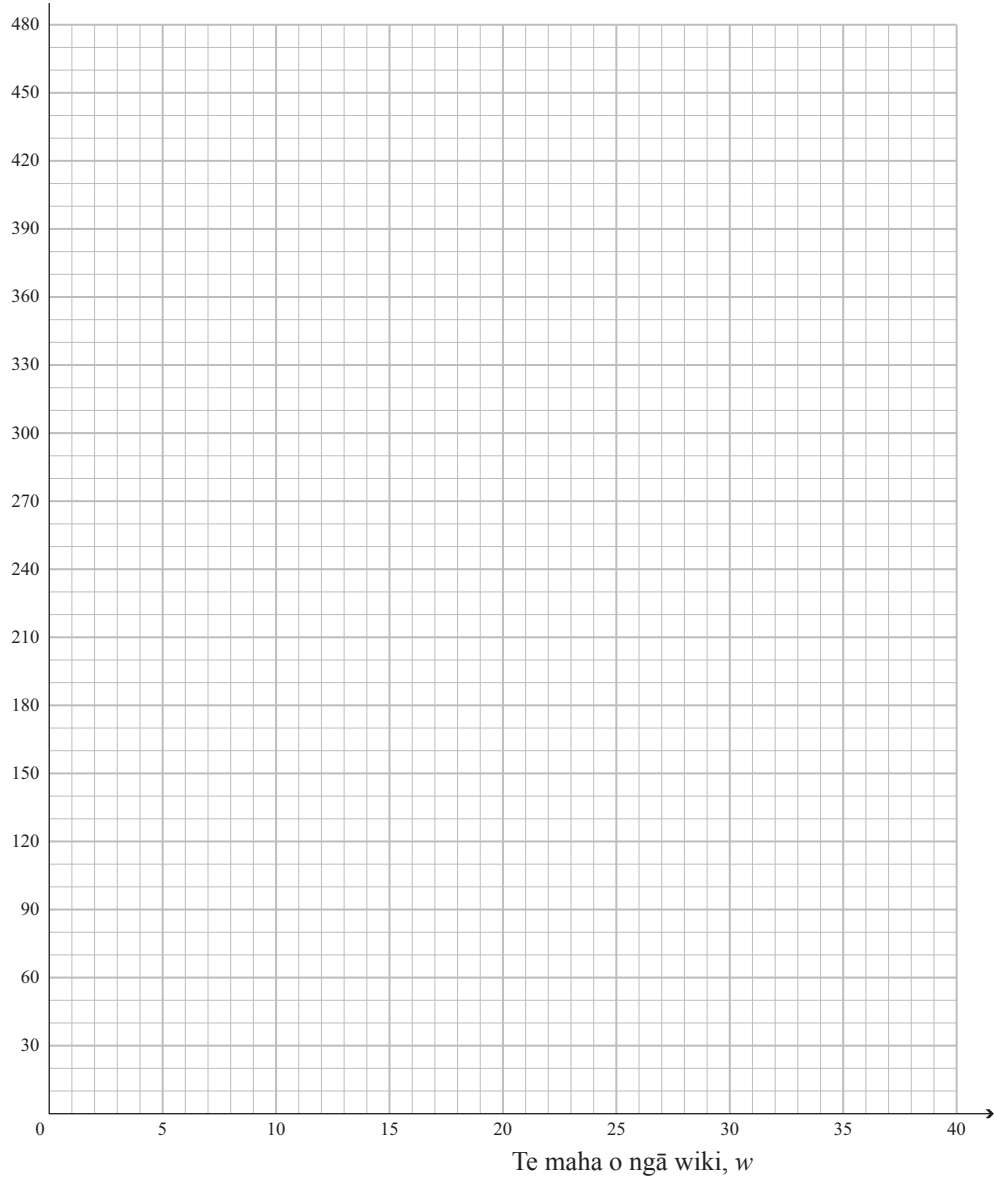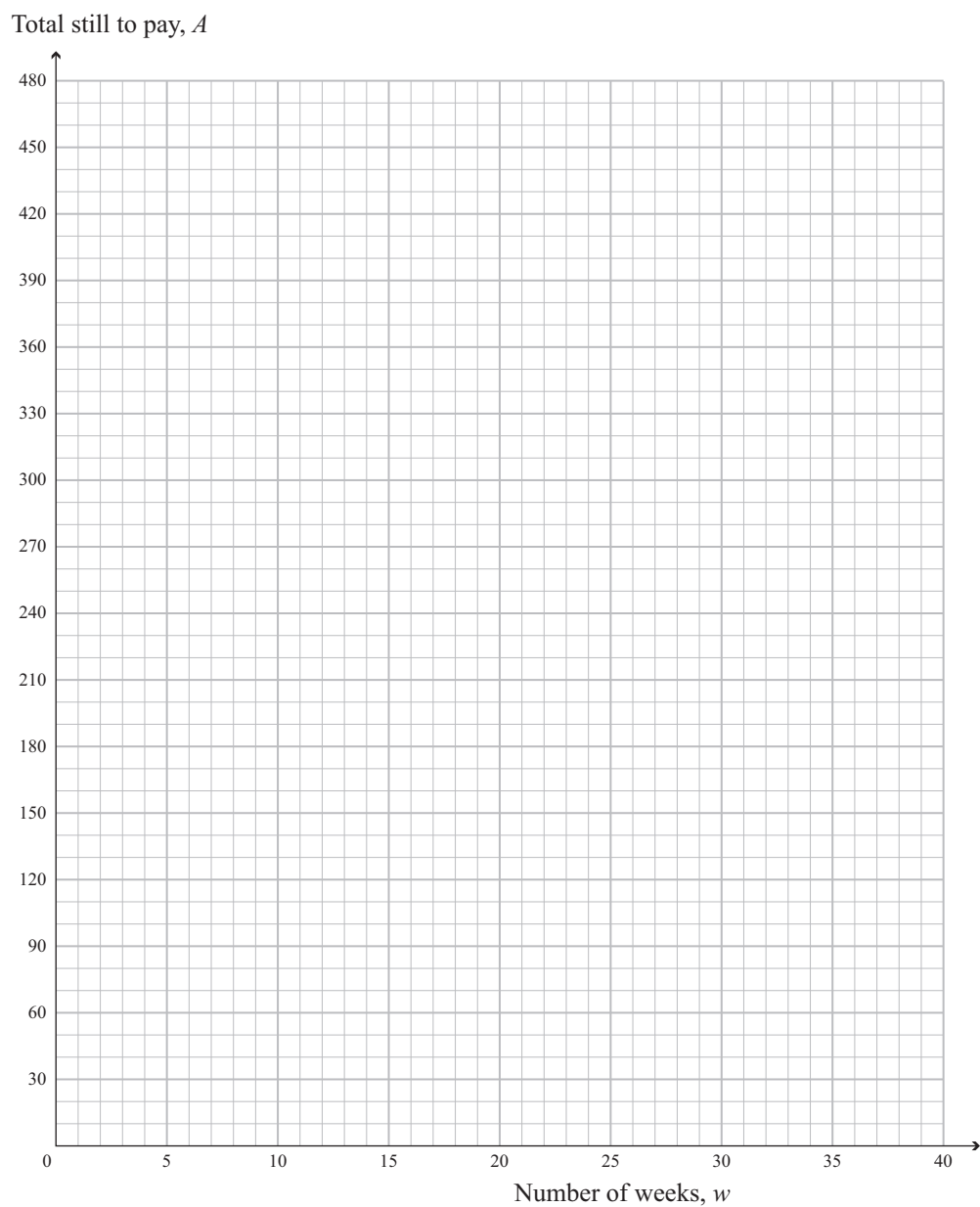
Te tapeke e nama tonu ana, *A*

Te maha o ngā wiki, *w*

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

Total still to pay, *A*

Number of weeks, *w*

He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tāu pātai mēnā e hāngai ana.

QUESTION
NUMBER

QUESTION
NUMBER

Level 1 Mathematics and Statistics, 2014

91028 Investigate relationships between tables, equations and graphs

9.30 am Tuesday 18 November 2014
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.

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 2–19 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.