

91028M



910285



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

Te Pāngarau me te Tauanga, Kaupae 1, 2016

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

9.30 i te ata Rāpare 17 Whiringa-ā-rangi 2016
Whiwhinga: Whā

Paetae	Kaiaka	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 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 KATOĀ kei roto i tēnei pukapuka.

Whakaaturia ngā mahinga KATOĀ.

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 2–27 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.

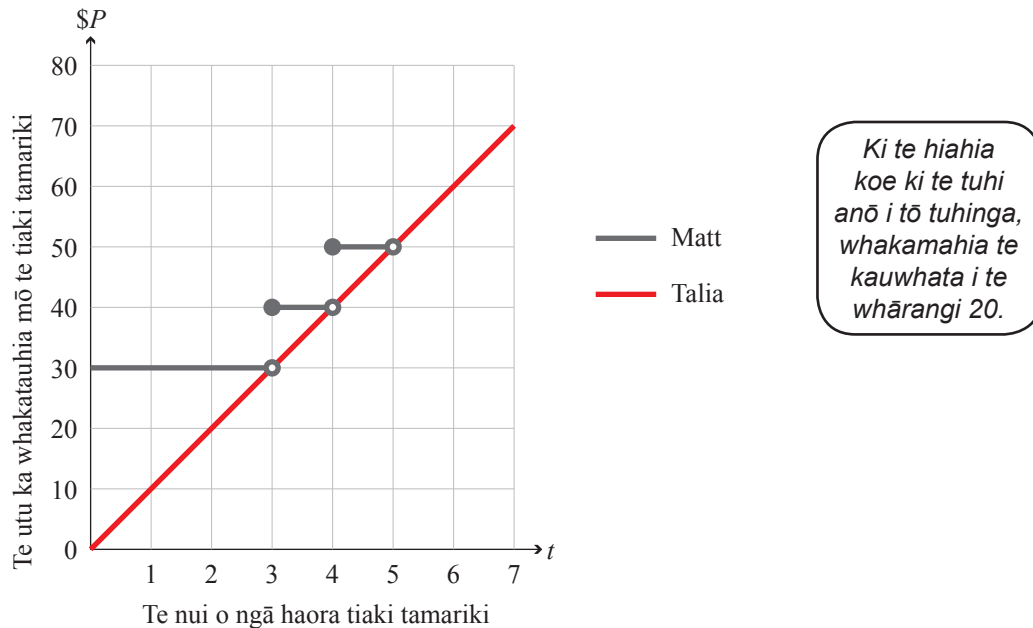
TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

E toru ngā kaitiaki tamariki rerekē hei kōwhiri mā Tama rāua ko Pita mai i a Matt rātou ko Talia ko Sasha.

- (a) E whakaatu ana te kauwhata i raro nei i te utu mō Matt rāua ko Talia.



- (i) E hia te utu ki a Matt mēnā e mahi ana ia mō te 4.5 haora?

- (ii) Ina eke te mahi a Matt ki te 5 haora, neke atu rānei, ka whakapikihia e ia tana utu mō ngā haora tāpiri ki te \$15 i te haora, tētahi wāhanga rānei o te haora ka mahi ia.

Ki te tukutuku i runga ake, whakaaturia mai te rahinga ka whakatauhia e Matt mēnā ka mahi ia mō te 5 haora, neke atu rānei.

- (iii) Kimihia te rahinga toharite ka whakatauhia e Matt mō ia haora mēnā ka mahi ia mō te 6 haora.

- (iv) \$10 i te haora te whakatau utu **toharite** a Talia ahakoa te roa o te wā ka mahi ia.
E whakaaturia ana tēnei ki te kauwhata i runga ake mā te rārangi whero.

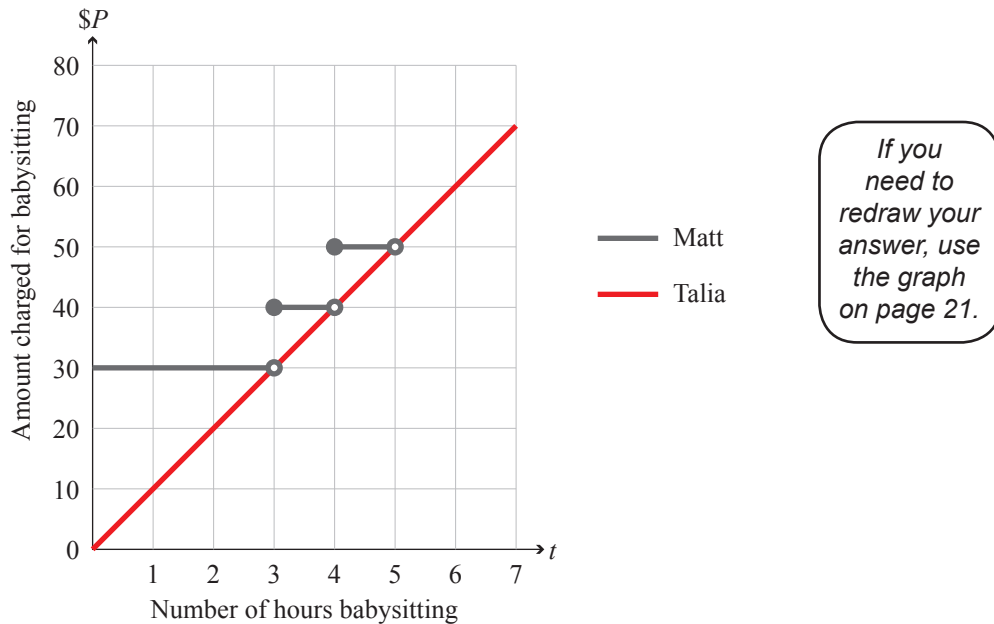
Tuhia te whārite o te kauwhata.

QUESTION ONE

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USE ONLY

Tama and Pita have three different babysitters to choose from: Matt, Talia, and Sasha.

- (a) The graph of the amounts that Matt and Talia charge is shown below.



- (i) How much would Matt be paid if he babysits for 4.5 hours?
-
- (ii) Once Matt has babysat for 5 or more hours, he increases his charge for the additional hours to \$15 an hour or part of an hour that he babysits.

On the grid above, show the amount Matt would charge if he babysits for 5 or more hours.

- (iii) Find the average amount Matt charges per hour if he babysits for 6 hours.
-
-
-

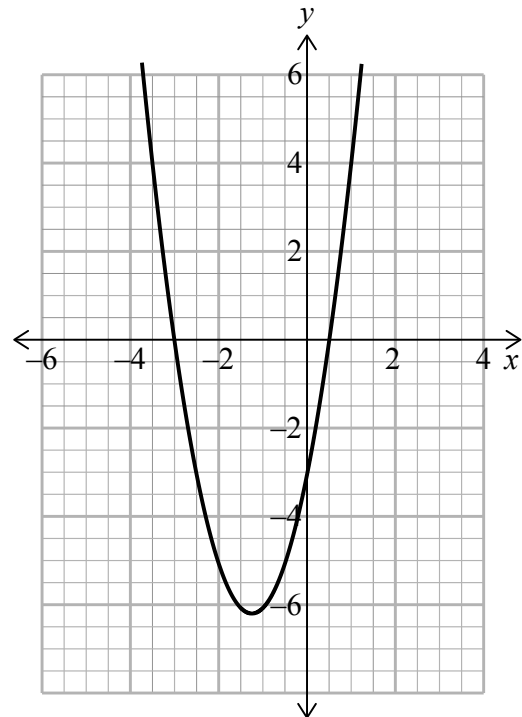
- (iv) Talia charges an **average** of \$10 per hour for any amount of time that she works. This is shown on the graph above with the red line.

Give the equation of the graph.

- (v) Atu ki te 7 haora te mahi a Sasha mō te \$55.

Tukuna he tūtohutanga ko wai te kaitiaki tamariki hei tohu mā Tama rāua Pita, e ai ki te utu e whakatauhia ana e ia kaitiaki tamariki.

- (b) (i) Tuhia te whārite mō te kauwhata e whakaaturia ana i te taha matau.



- (ii) Kātahi ka nekehia te kauwhata kia a wae ki te taha matau, \bar{a} , kia b wae whakarunga.

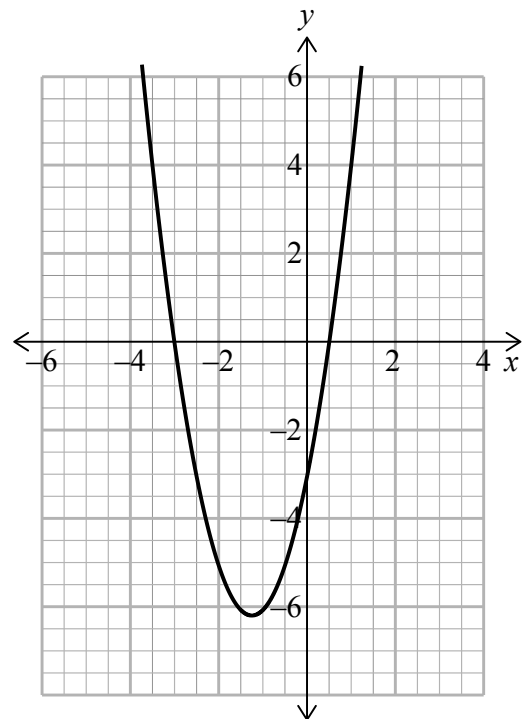
Tuhia:

- te whārite o te kauwhata kua nekehia
- te uara- x i te akitu.

- (v) Sasha will babysit for up to 7 hours for \$55.

Make recommendations on who Tama and Pita should have as their babysitter, based on the amount that each babysitter charges.

- (b) (i) Give the equation of the graph shown on the right.



- (ii) The graph is then translated a units to the right and up b units.

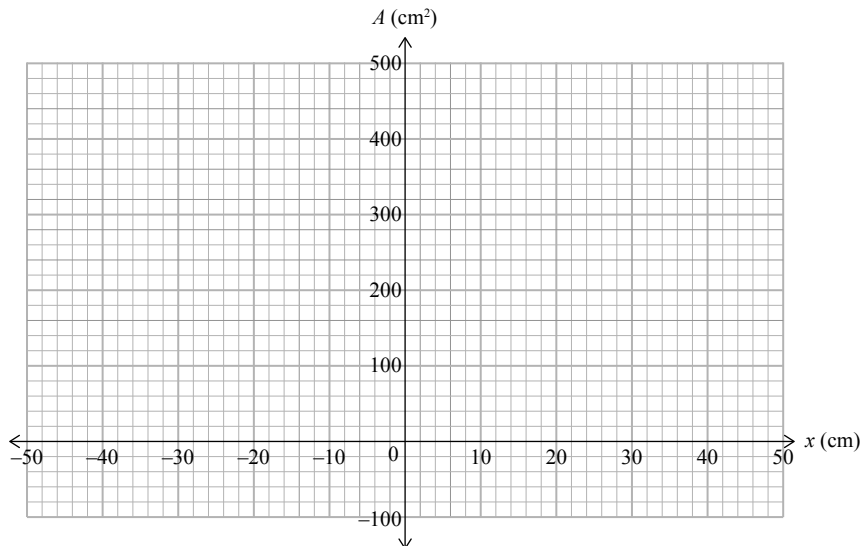
Give:

- the equation of the translated graph
- the x -value at the vertex.

TŪMAHI TUARUA

- (a) (i) Kei te tūhura a Maria i tētahi huinga tapawhā hāngai ko ngā horahanga ka whakatauiratia mā te $A = -(x^2 - 40x)$.

Tātuhia te kauwhata o ngā horahanga rerekē ka tāea mō ngā tapawhā hāngai ina rerekē haere te uara o x .



*Ki te hiahia
koe ki te tuhi
anō i tēnei
kauwhata,
whakamahia
te tukutuku i te
whārangi 20.*

- (ii) He aha te horahanga mōrahi rawa o ngā tapawhā hāngai?

- (iii) Mō ēhea uara o x he iti ake i te 300 cm^2 ngā horahanga?

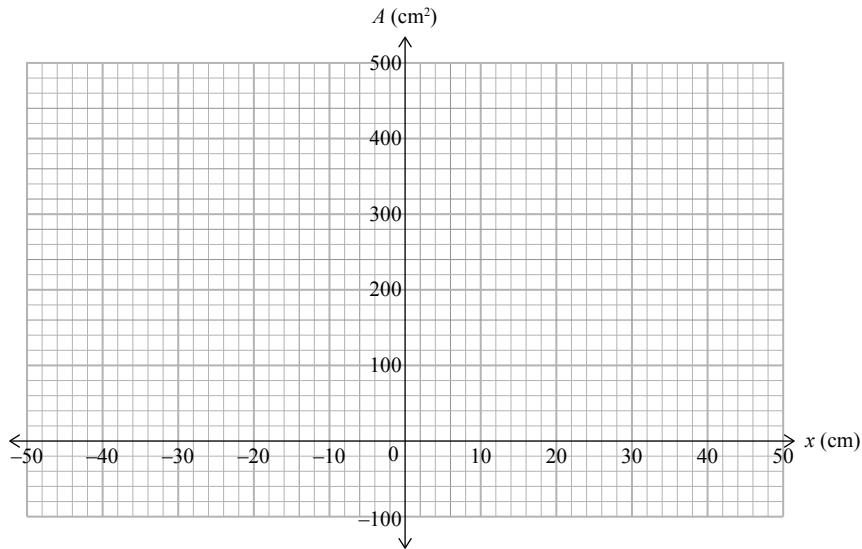
- (iv) He aha te horahanga mōrahi rawa o tētahi atu huinga tapawhā hāngai ko ngā horahanga he $A = -(x^2 - mx)$?

QUESTION TWO

ASSESSOR'S
USE ONLY

- (a) (i) Maria is investigating a set of rectangles that have an area modelled by $A = -(x^2 - 40x)$.

Sketch the graph of the possible range of areas of the rectangles as the value of x changes.



*If you
need to
redraw this
graph, use
the grid on
page 21.*

- (ii) What is the maximum possible area of the rectangles?

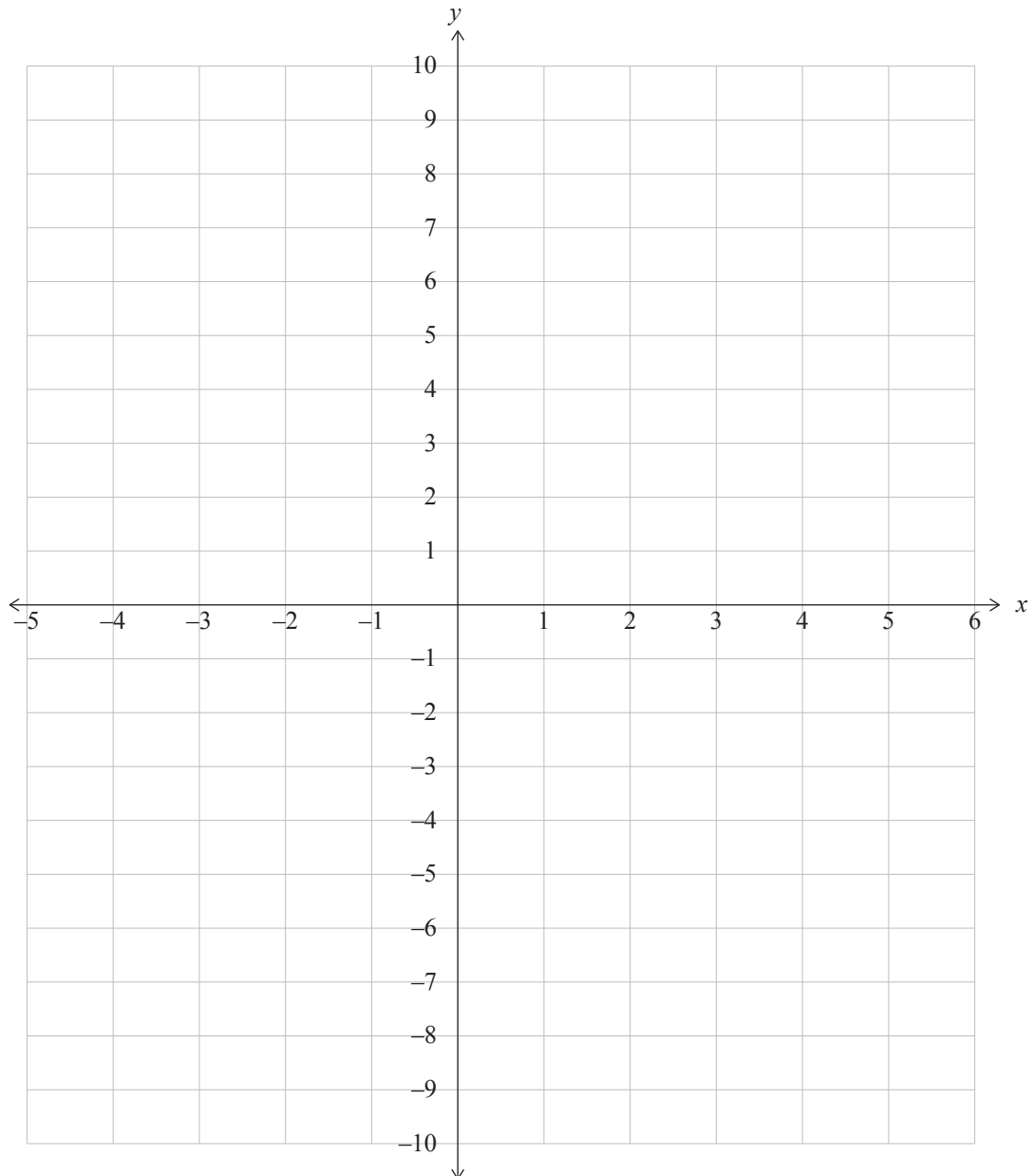
- (iii) For what values of x are the areas less than 300 cm^2 ?

- (iv) What is the maximum area of another set of rectangles that have an area, $A = -(x^2 - mx)$?

(b) Ki tētahi unahi ngā pūwāhi e rārangitia ana i te ripanga i raro nei.

x	y
-2	-6
-1	0
3	4
5	-6

(i) Tātuhia te unahi e whakaaturia ana e aua pūwāhi, ka tuhi hoki i ngā taunga o ngā haukotinga me te akitu.



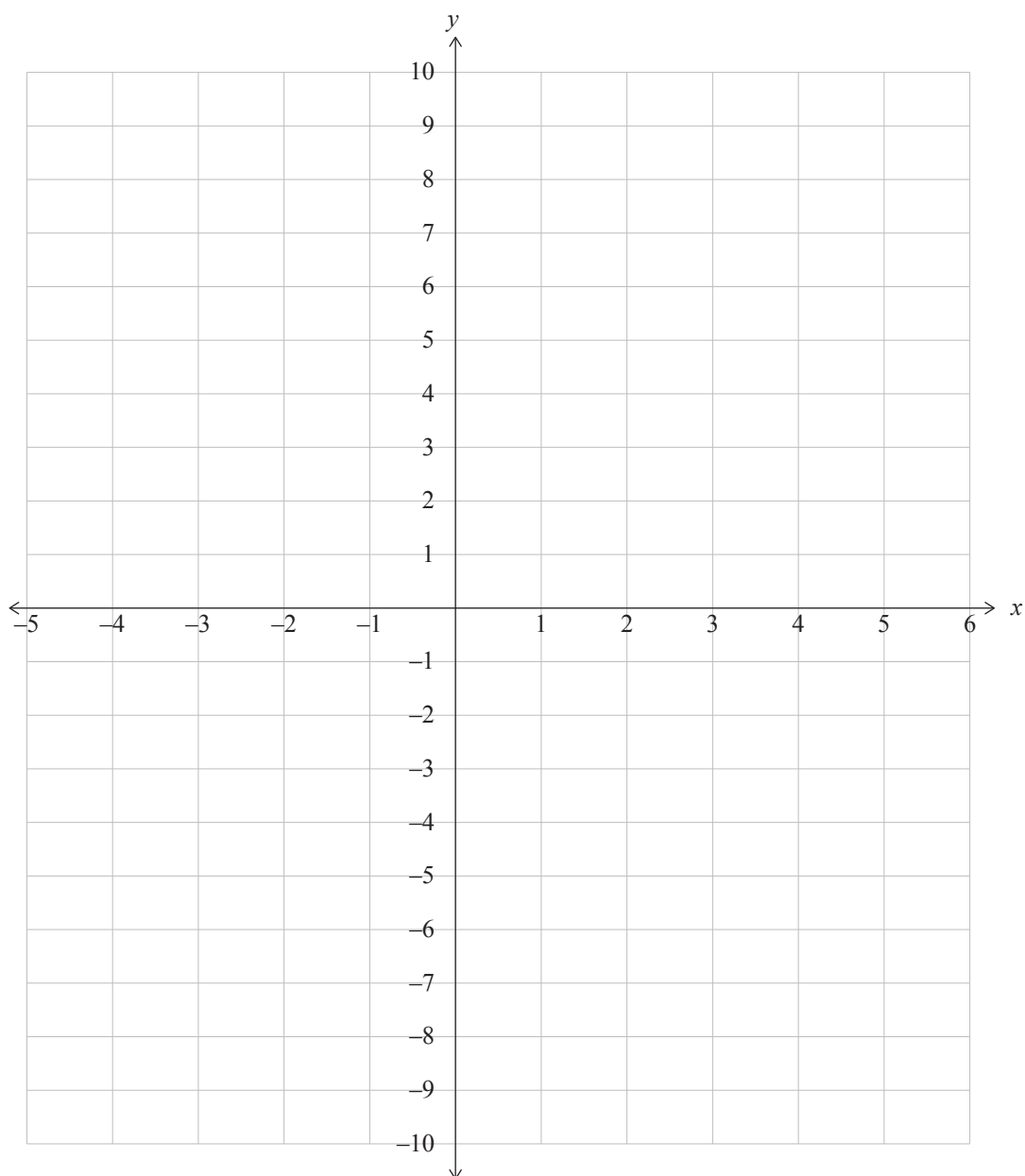
Ki te hiahia
koe ki te tuhi
anō i tēnei
kauwhata,
whakamahia
te tukutuku i te
whārangi 22.

(ii) Tuhia te whārite o te kauwhata.

- (b) The points listed in the table below lie on a parabola.

x	y
-2	-6
-1	0
3	4
5	-6

- (i) Sketch the parabola represented by these points, and give the coordinates of the intercepts and the vertex.



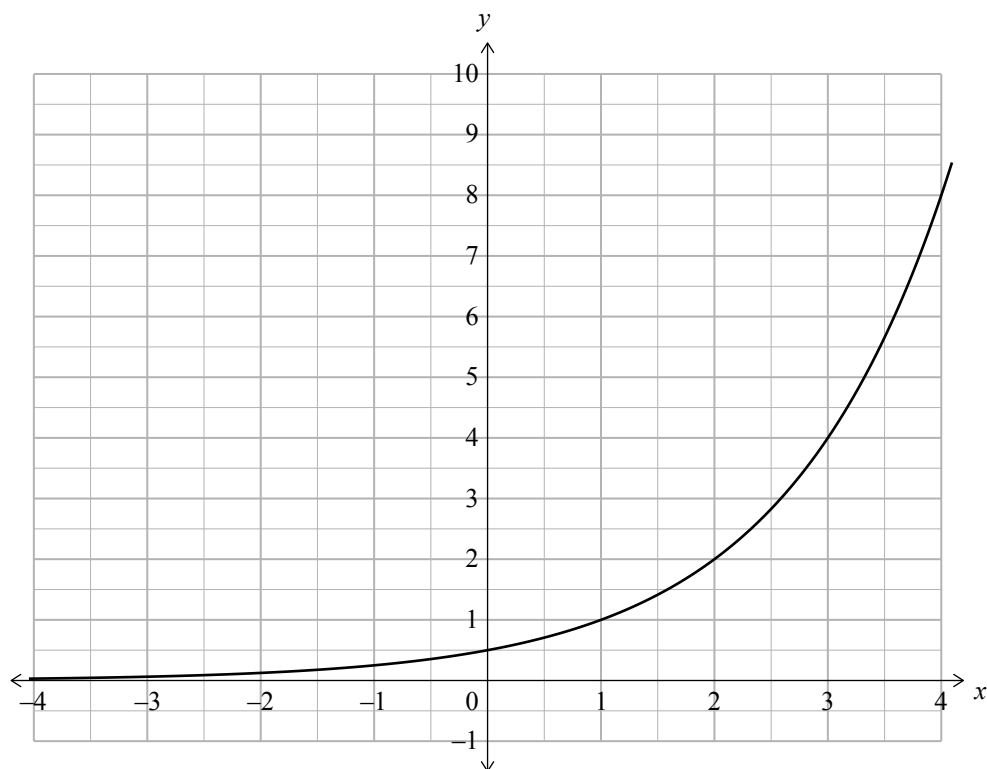
If you
need to
redraw this
graph, use
the grid on
page 23.

- (ii) Give the equation of the graph.

ASSESSOR'S
USE ONLY

TŪMAHI TUATORU

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

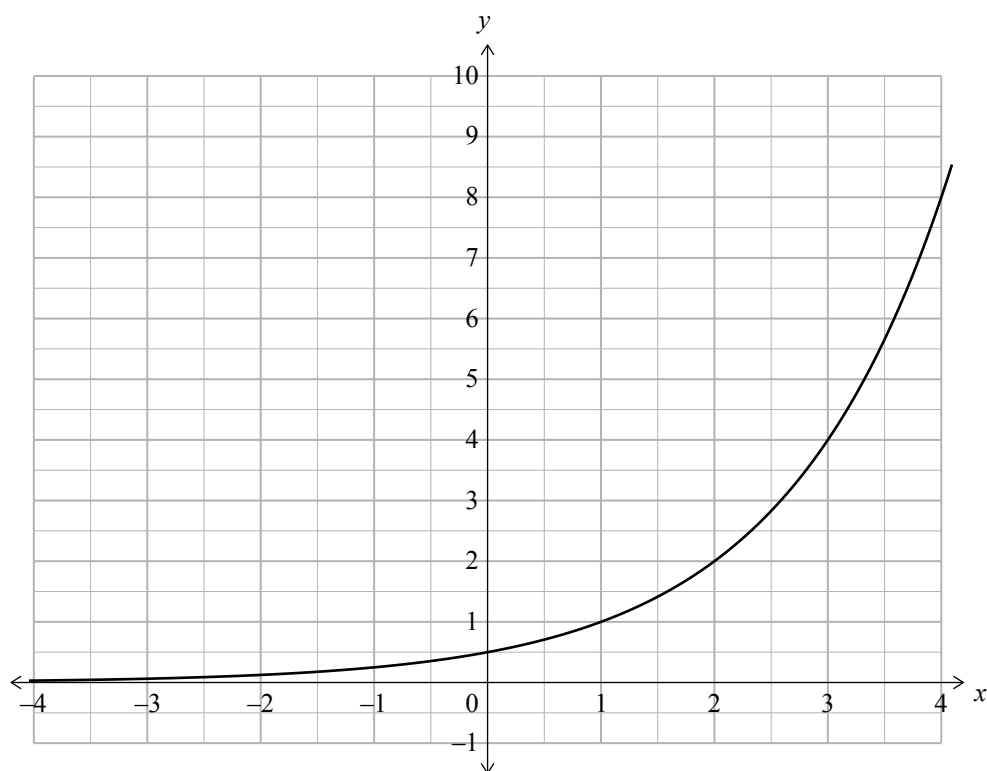


- (ii) Tuhia te whārite o te kauwhata ka puta mēnā ka whakaatahia te kauwhata i runga ake ki te tuaka- y .

$$y = \underline{\hspace{2cm}}$$

QUESTION THREEASSESSOR'S
USE ONLY

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



- (ii) Give the equation of the resulting graph if the graph above is reflected in the y axis.

$y =$ _____

- (b) I tino kaingākauria tētahi papa whakangahau hou i tana whakatuwheratanga. I ngā marama e toru tuatahi, he 4000 te toharite o ngā tāngata i tae ki te papa whakangahau i ia marama.

Whai muri i ngā marama e toru tuatahi, ka tīmata te heke haere o te hunga taetae mai mā te 15% i ia marama mō te iwa marama whai muri mai.

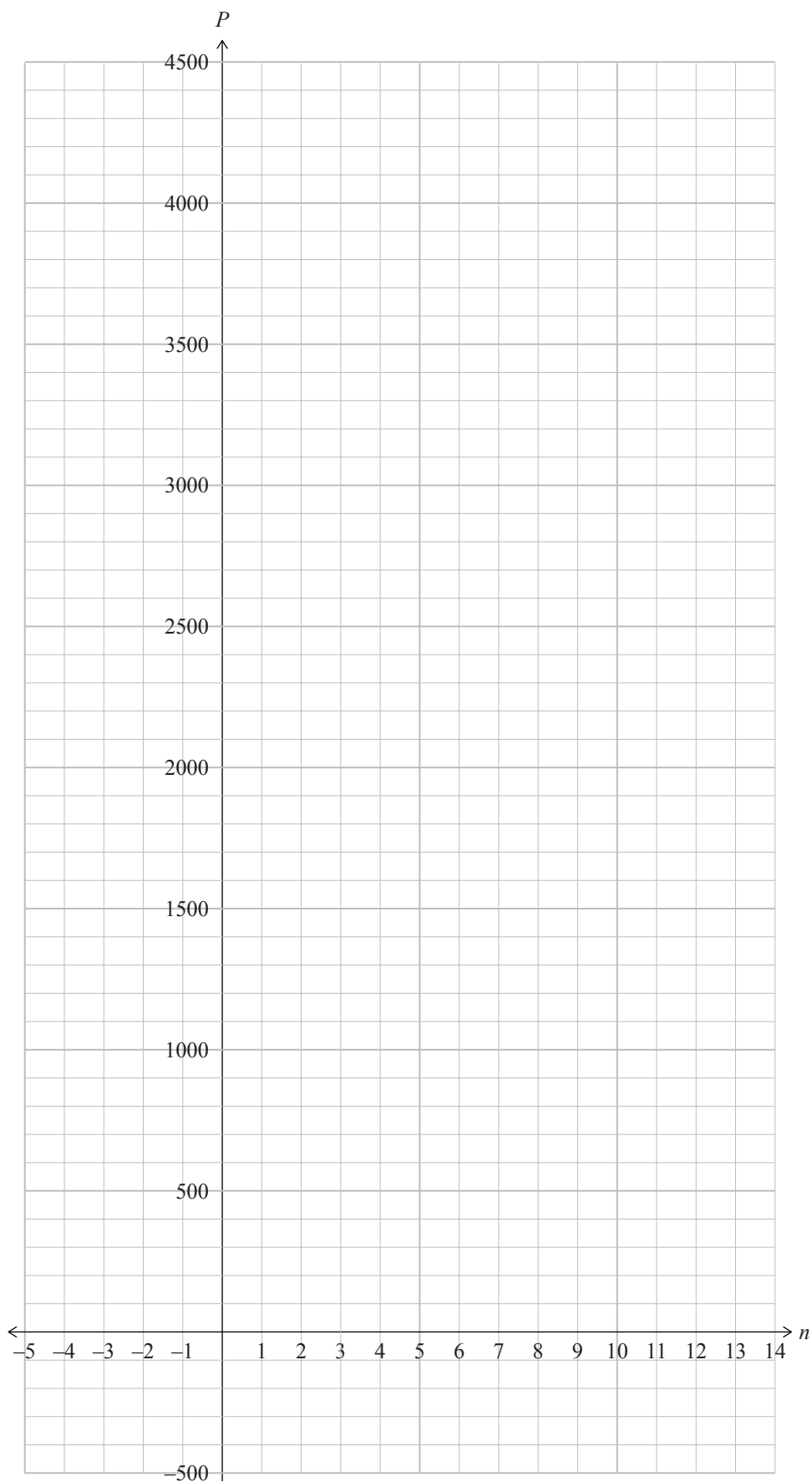
Whai muri i ngā marama e toru tuatahi, ka tāea te tokomaha āwhiwhi o ngā manuhiri ki te papa whakangahau te whakatauirā mā:

$P = 4000 \times 0.85^{n-3}$, ina ko n te rahi o ngā marama atu i te wā i whakatuwherahia te papa whakangahau.

- (i) Whakaotihia te papatau o raro hei whakaatu i te tokomaha āwhiwhi o ngā tāngata i taetae ki te papa whakangahau i ia marama mō te tau tuatahi.

Marama (n)	Tokomaha āwhiwhi o ngā tāngata kua taetae ki te papa whakangahau i te marama nei (P)
1	
2	
3	
4	
5	
6	2457
7	2088
8	1775
9	1509
10	1282
11	1090
12	926

- (ii) Tātuhia he kauwhata hei whakaatu i te tokomaha āwhiwhi o ngā tāngata e taetae ana ki te papa whakangahau i ia marama.



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

- (b) A new fun park was very popular when it opened. In the first three months, an average of 4000 people visited the park each month.

After the first three months, the attendance began to drop by approximately 15% each month for the next nine months.

After the first three months, the approximate number of visitors to the park can be modelled by:

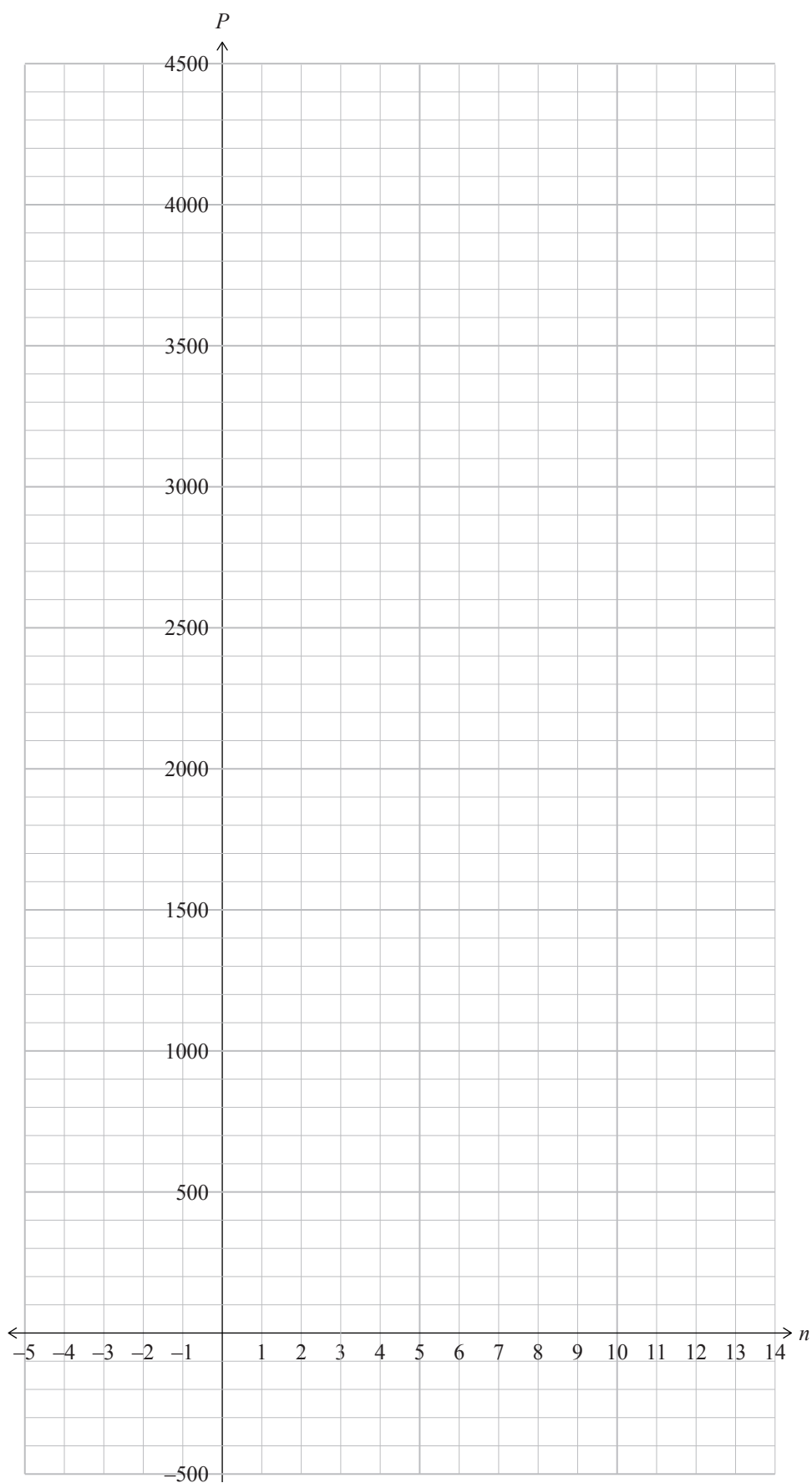
$$P = 4000 \times 0.85^{n-3}, \text{ where } n \text{ is the number of months since the park opened.}$$

- (i) Complete the table below showing the approximate number of people who visited the fun park during each month for the first year.

Month (n)	Approximate number of people visiting park this month (P)
1	
2	
3	
4	
5	
6	2457
7	2088
8	1775
9	1509
10	1282
11	1090
12	926

- (ii) Draw the graph showing the approximate number of people visiting the fun park each month.

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USE ONLY



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

- (iii) I te mutunga o te marama i heke te tokomaha o ngā manuhiri ki raro i te 2000 mō te wā tuatahi, ā, i whakatau te rōpū whakahaere me huaki i ngā mutunga wiki anake.

Tātaihia e hia ngā marama o te tau e tuwhera ana te papa whakangahau i ngā mutunga wiki anake, ā, whakamāramahia hoki ka pēhea te kimi i tēnei mōhiotio **mā te whakamahi i ngā āhuatanga o te kauwhata.**

- (iv) I te tau tuarua, he tokomaha atu ngā tāngata ka taetae mai ki te papa whakangahau i ngā marama e toru tuatahi.

Ka haere ngā marama, ka ōrite te heke haere anō o te haerenga mai o ngā tāngata pērā i te tau tuatahi.

Ko te hiahia o te rōpū whakahaere kia whāiti ki ngā marama e rua i te nui rawa te wā e tuwhera ana te papa whakangahau i ngā mutunga wiki anake.

E hia te tokomaha toharite o ngā tāngata me taetae mai ki te papa whakangahau i ia marama i ngā marama e toru tuatahi kia eke ai ki tēnei?

- (iii) At the end of the month that the number of visitors dropped below 2000 for the first time, the management decided to open only on weekends.

Find how many months of the year the park was open only on the weekends, and explain **by using the features of the graph**, how this information can be found.

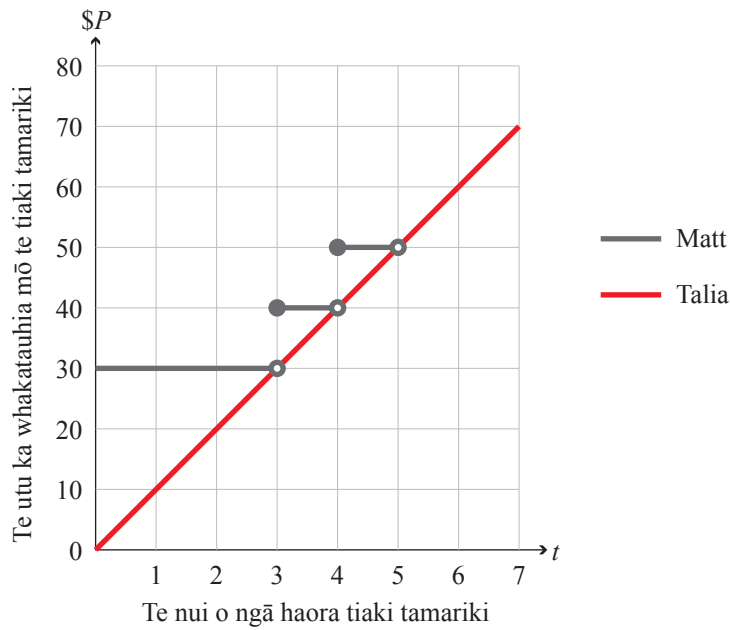
- (iv) In the second year, more people visit the park during the first three months.

As the year progresses, the number of people visiting the park declines at the same rate as it did for the first year.

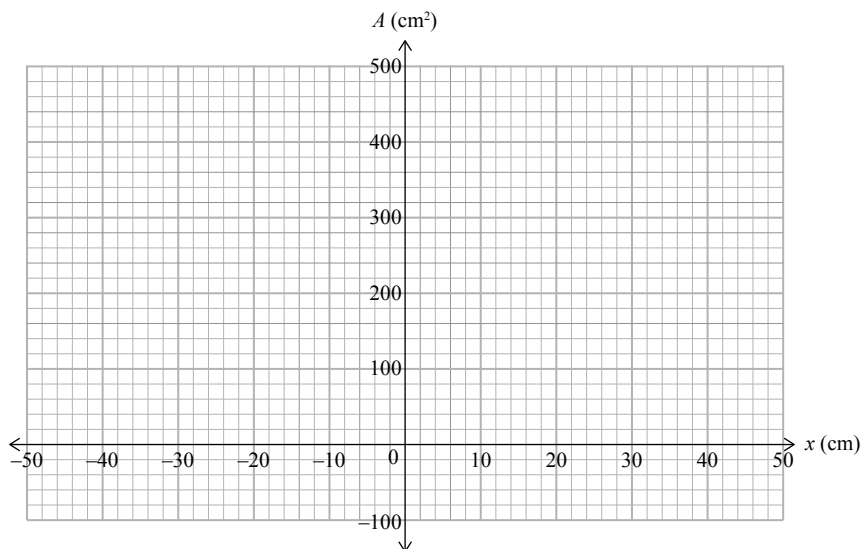
The managers want to limit to a maximum of 2 months, the period when the park is running just on weekends.

What is the average number of people who would need to be visiting the park each month in the first three months if this was to be achieved?

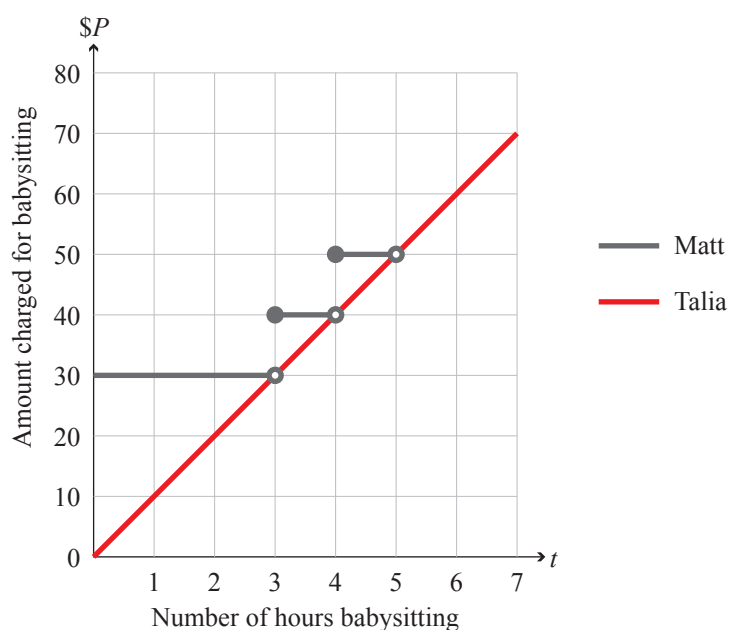
Ki te hiahia koe ki te tuhi anō i tō tuhinga mai i te Tūmahi Tuatahi (a), tuhia ki te kauwhata i raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.



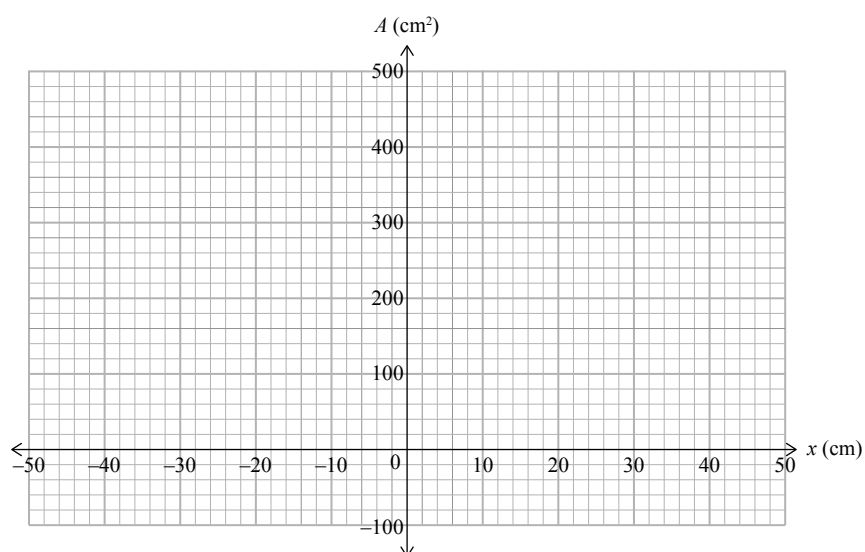
Ki te hiahia koe ki te tuhi anō i tō kauwhata mai i te Tūmahi Tuarua (a)(i), tuhia ki te tukutuku o raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.



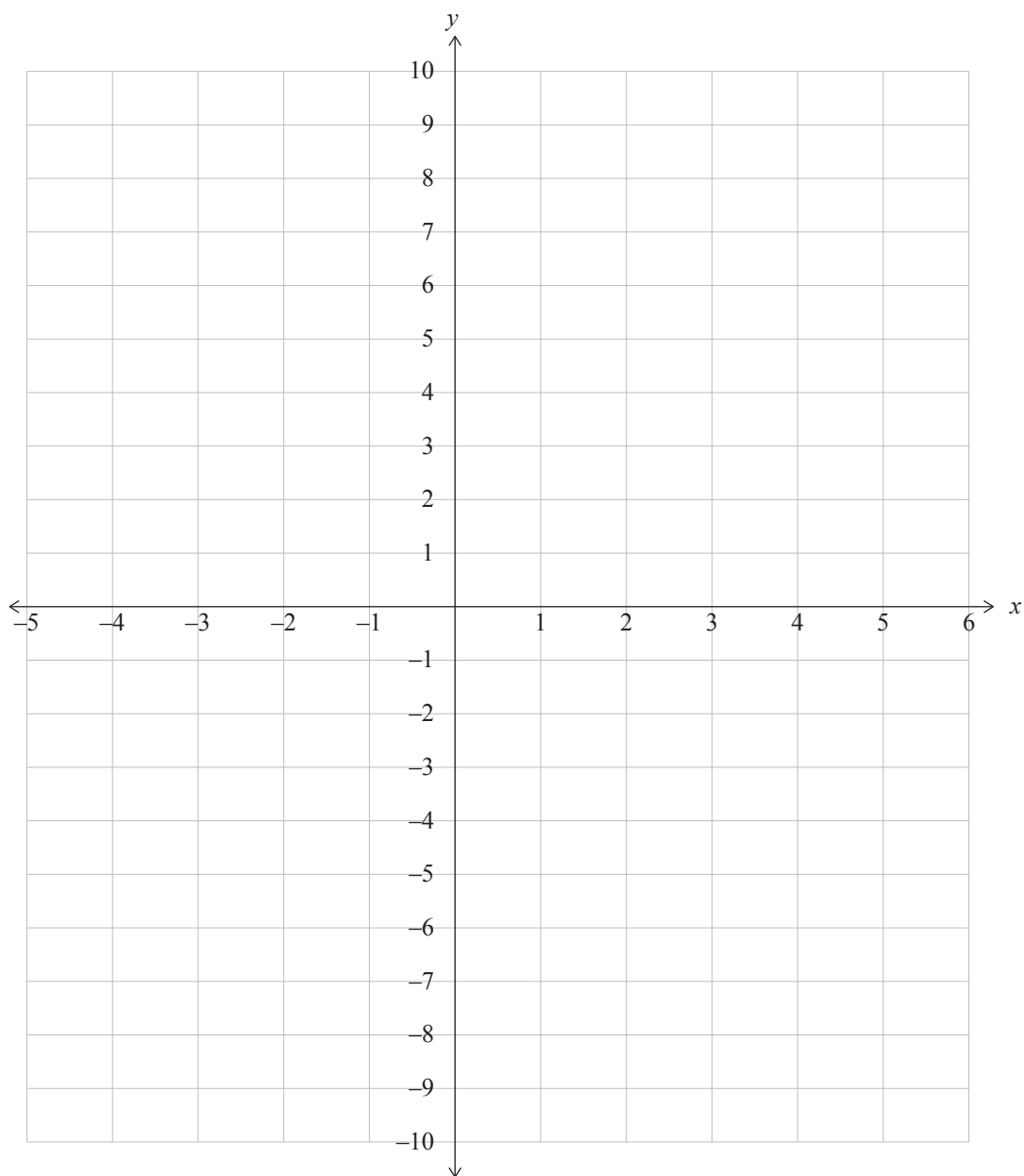
If you need to redraw your answer from Question One (a), draw it on the graph below. Make sure it is clear which graph you want marked.



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

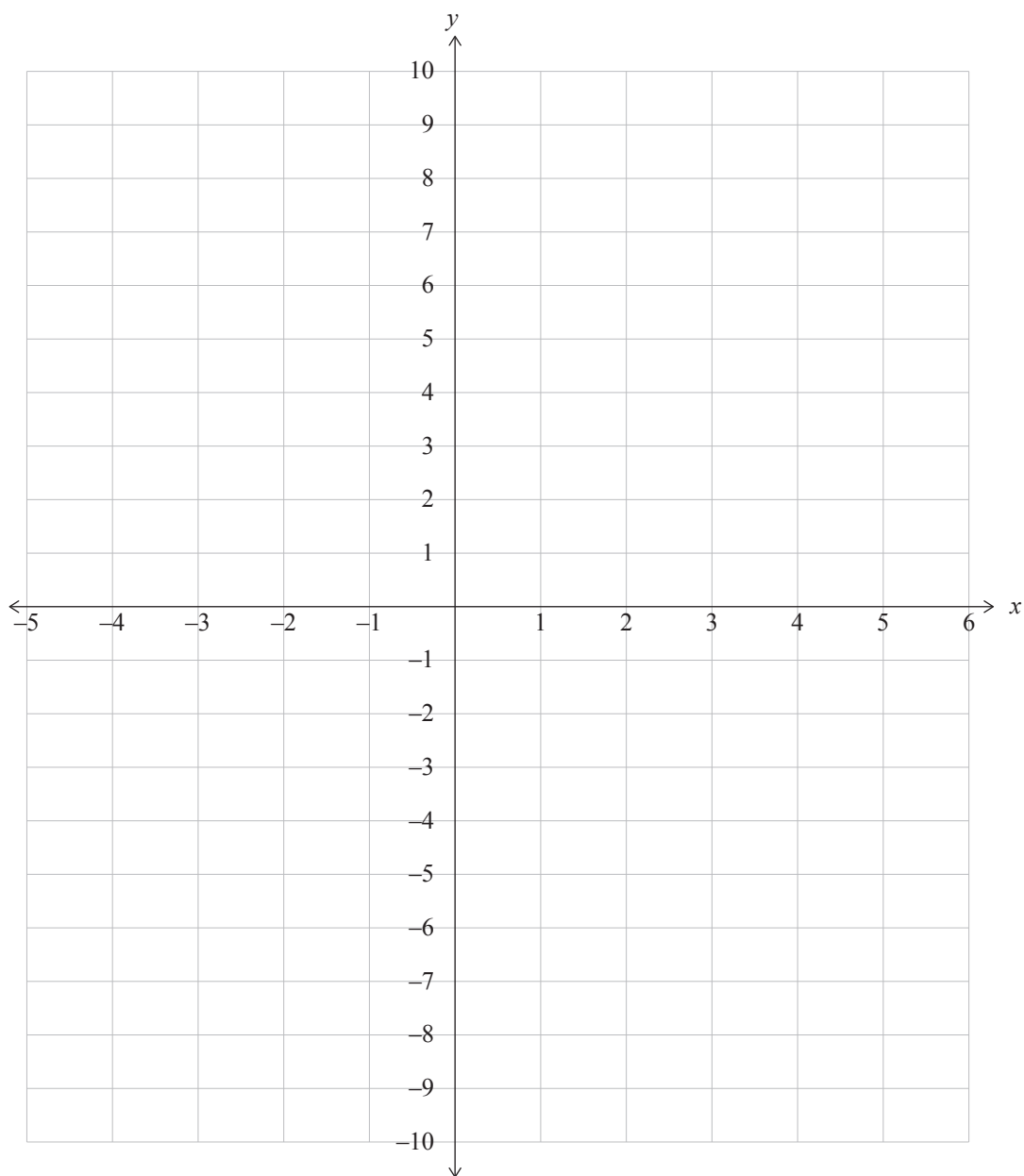


Ki te hiahia koe ki te tuhi anō i tō kauwhata mai i te Tūmahi Tuarua (b)(i), tuhia ki te tukutuku o raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.

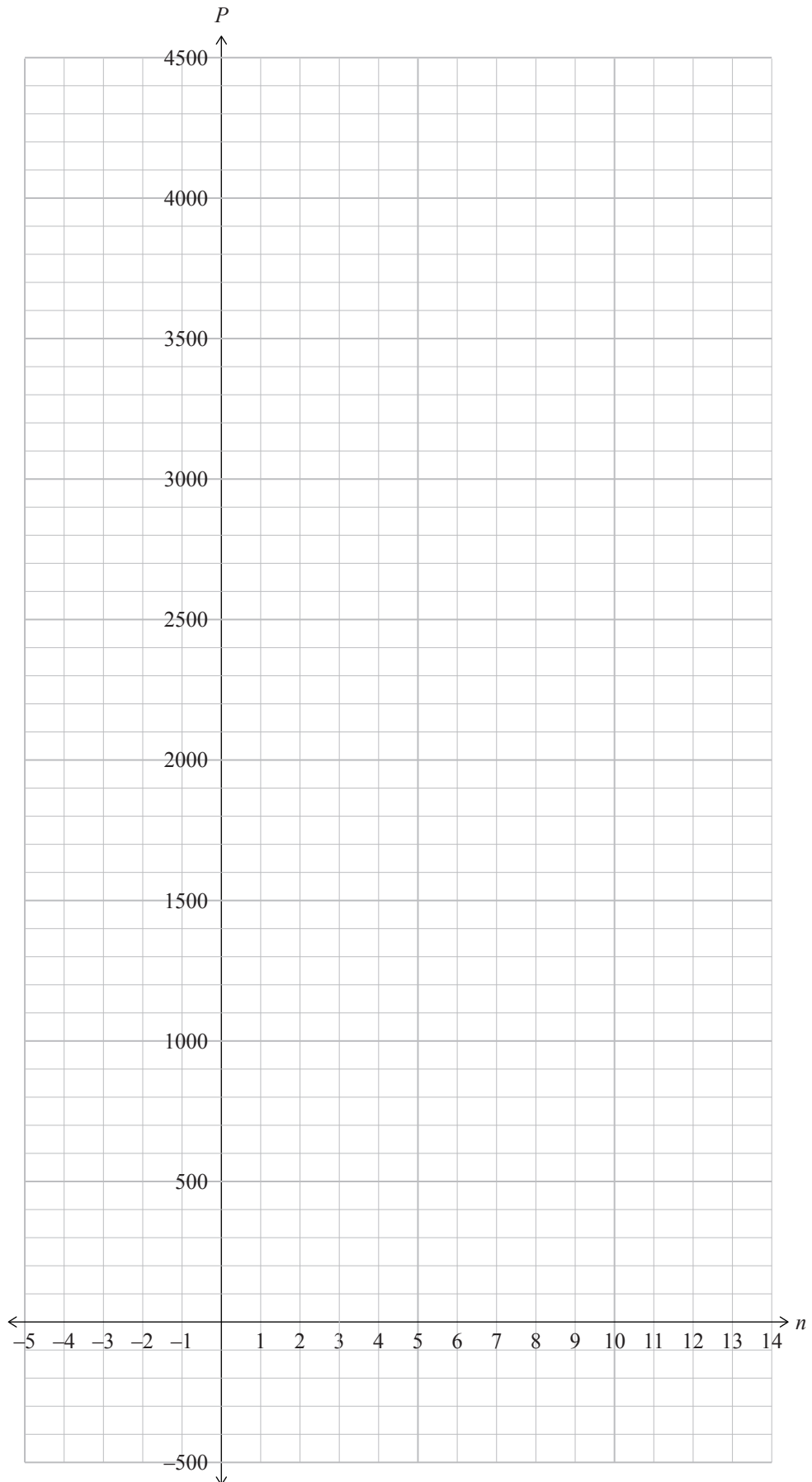


If you need to redraw your graph from Question Two (b)(i), draw it on the grid below.
Make sure it is clear which graph you want marked.

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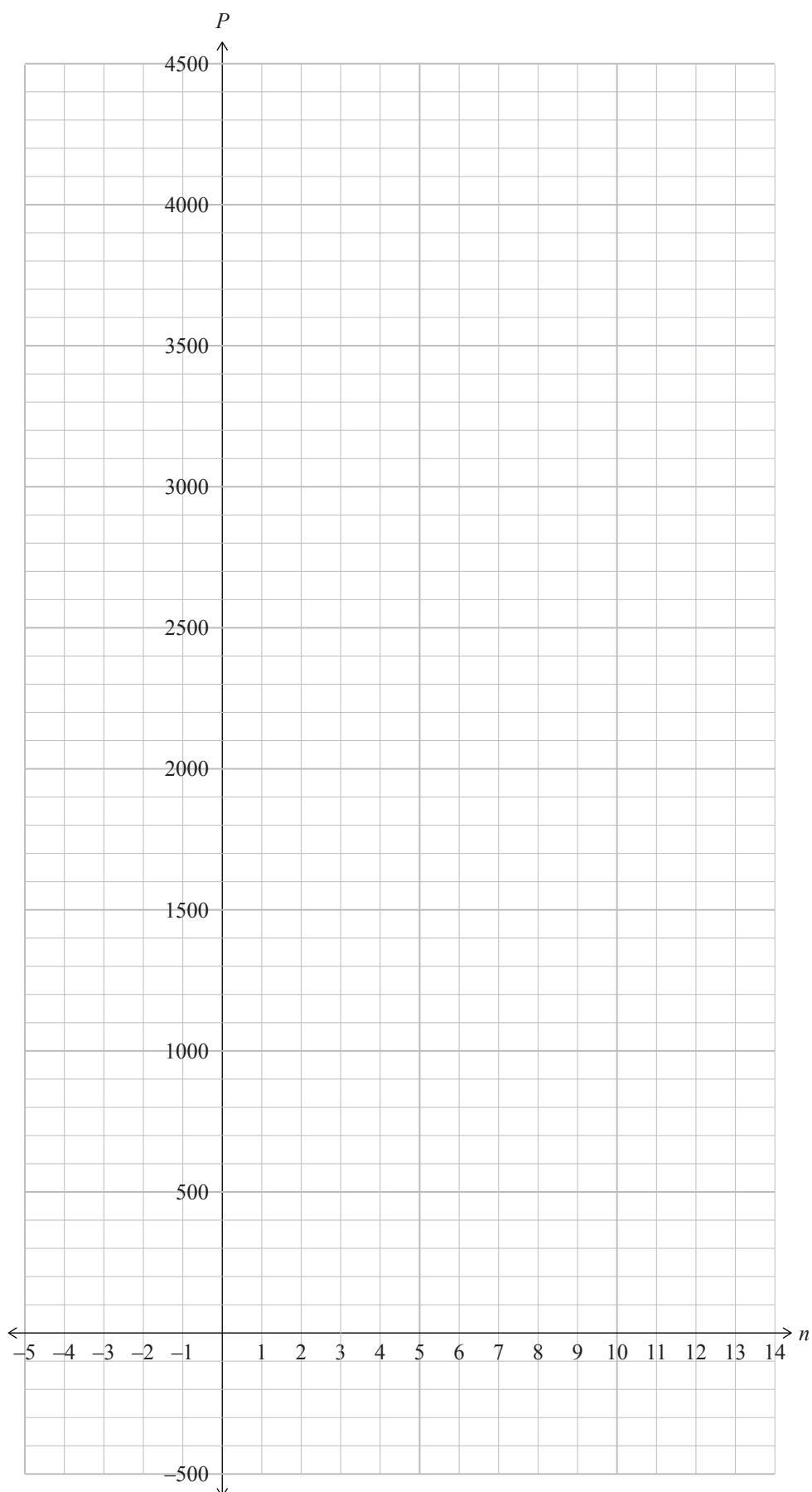


Ki te hiahia koe ki te tuhi anō i te kauwhata mō te Tūmahi Tuatoru (b)(ii), tuhia ki te tukutuku i raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.



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

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**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 1 Mathematics and Statistics, 2016

91028 Investigate relationships between tables, equations and graphs

9.30 a.m. Thursday 17 November 2016
Credits: Four

91028M

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 2–27 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.