

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, 2015

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

9.30 i te ata Rāhina 9 Whiringa-ā-rangi 2015
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 KATO A kei roto i tēnei pukapuka.

Whakaaturia ngā mahinga KATO A.

Mēna ka hiahia whārangi atu anō mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–31 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 tipu ana tētahi tipu i te mata o tētahi hāroto. I kite a Hank i te tipu i te Rā 1. I ngā rā e rua i muri mai i te māharahara a Hank mō te tipu ka tīmata ia ki te ine i te horahanga kua kapi i te tipu.

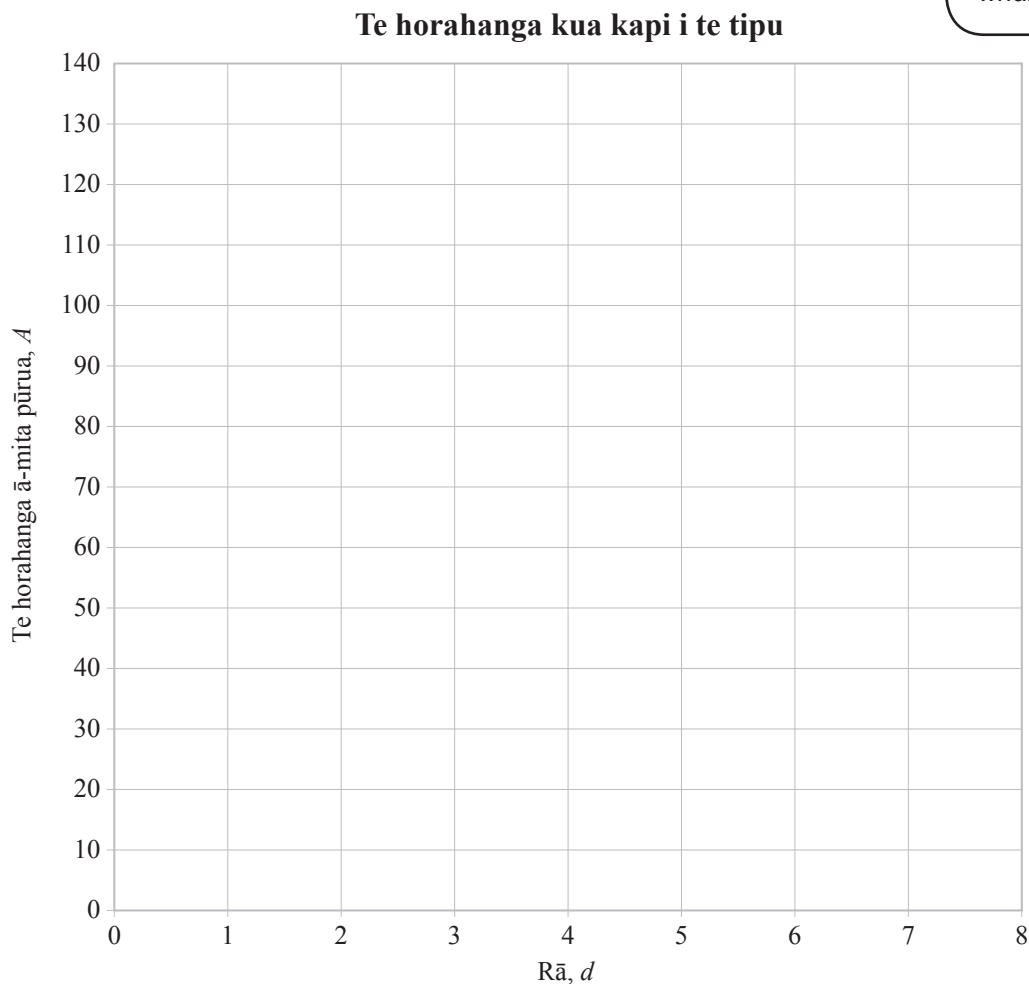
- (a) Ia rā (i te 5 i te ahiahi) ka ine a Hank i te horahanga wai (ki te mita pūrua) kua kapi i te tipu. Kei te tūtohi i raro nei ana inenga.

Rā, d	Te horahanga kua kapi i te tipu, A
1	
2	
3	4
4	8
5	16
6	32
7	64
8	128

Ko d te nui o ngā rā mai i te kitenga tuatahi a Hank i te tipu.

- (i) Whakaaturia he pēhea te huri o te horahanga o te hāroto kua kapi i te tipu i roto i te wā.

Ki te hiahia koe ki te tuhi anō i tēnei kauwhata, whakamahia te tukutuku i te whārangi 26.



- (ii) Ka whai tonu te tipu i te tauira tipu ōrite mai i te wā i kitea tuatahitia.

He aha te horahanga o te hāroto i kapi i te tipu i te wā i kitea tuatahitia?

Whakamāramatia tō tuhinga.

- (iii) Homai te whārite e whakaahua ana i te horahanga o te tipu e kapi ana i te hāroto i muri i ngā rā *d*.

- (iv) Ki te kore he wawaotanga, ko tēhea te rā ka inea tuatahitia e Hank te horahanga o te tipu e nui atu i te 500 mita pūrua?

QUESTION ONE

A plant is growing on the surface of a pond. Hank noticed the plant on Day 1. Two days later Hank was worried about the plant and started measuring the area that the plant covered.

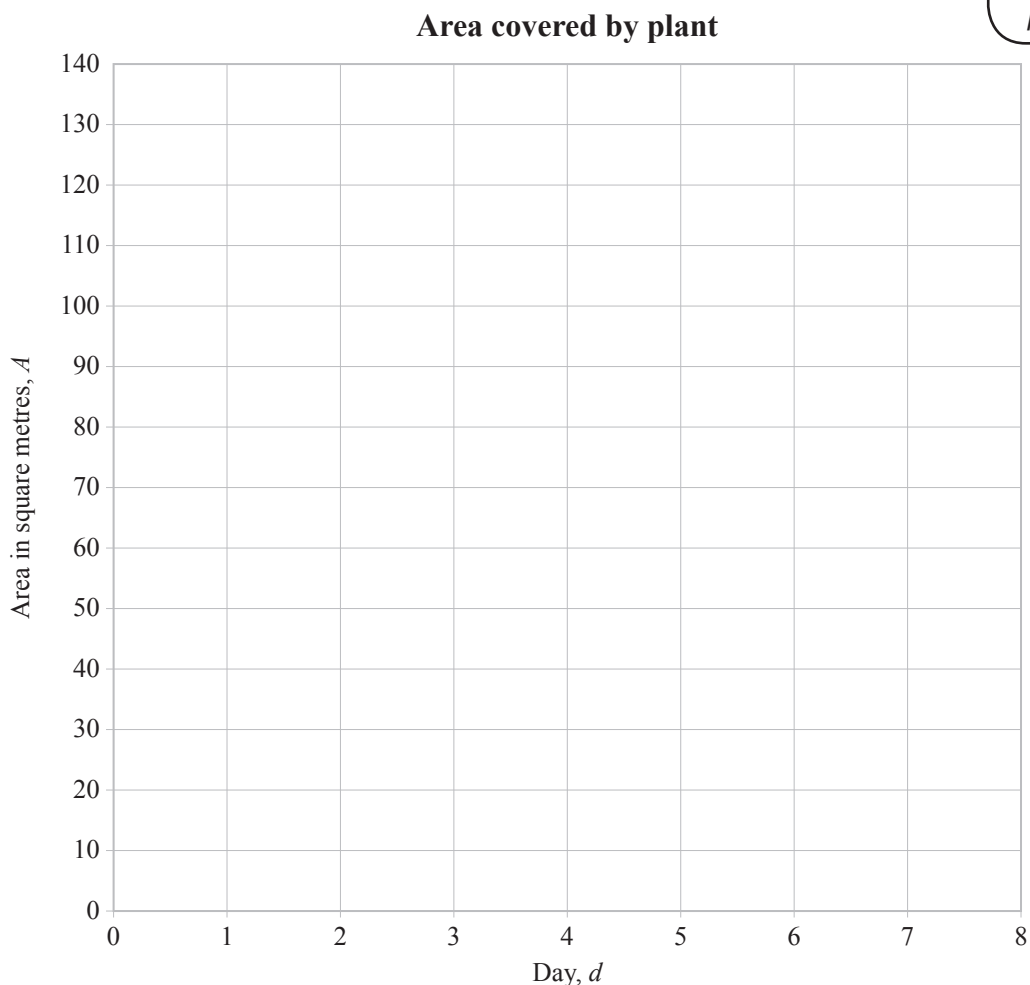
- (a) Each day (at 5 pm) Hank measures the area of water (in square metres) covered by the plant. He records his measurements in the table below.

Day, d	Area covered by plant, A
1	
2	
3	4
4	8
5	16
6	32
7	64
8	128

d is the number of days since Hank first noticed the plant.

- (i) Show how the area of the pond covered by the plant changes with time.

If you need to redraw this graph, use the grid on page 27.



- (ii) The plant followed the same pattern of growth from the time when it was first noticed.

What area of the pond was covered by the plant when it was first noticed?

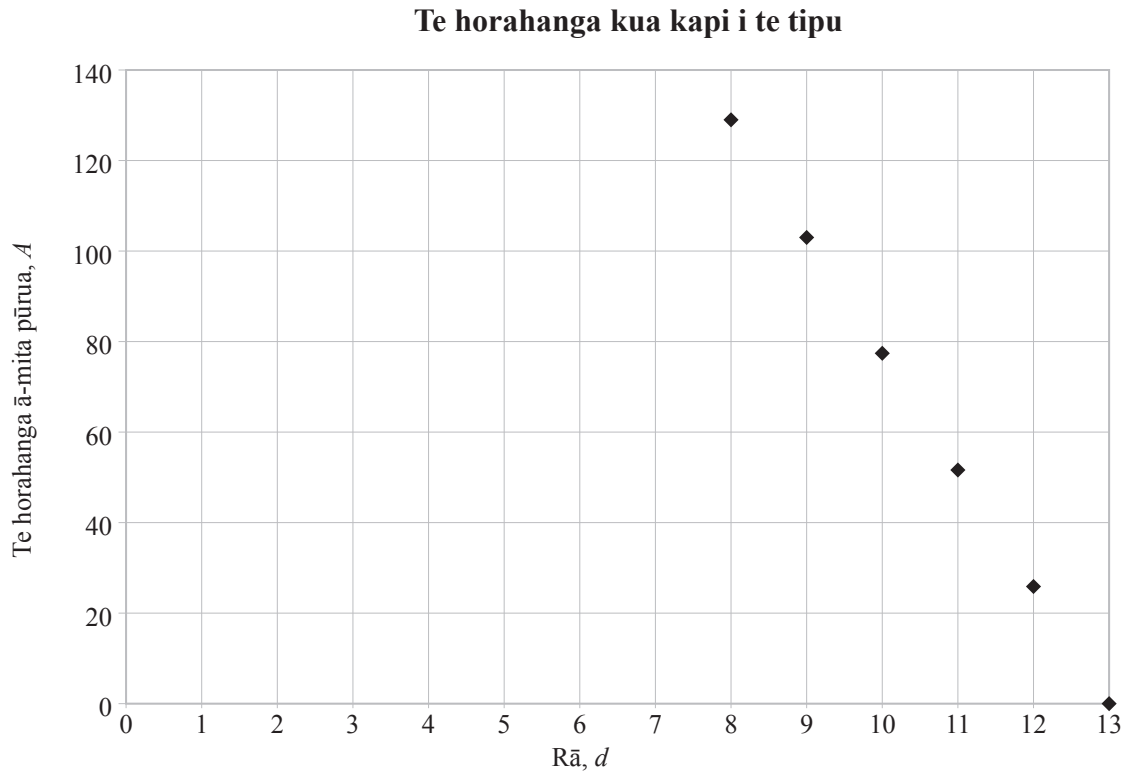
Explain your answer.

- (iii) Give the equation that describes the area of the plant covering the pond after d days.

- (iv) If no intervention takes place, on which day will Hank first measure the area of the plant to be more than 500 square metres?

- (b) Ka tīmata a Hank me ētahi hoa ki te whakawātea i te tipu i te Rā 9.

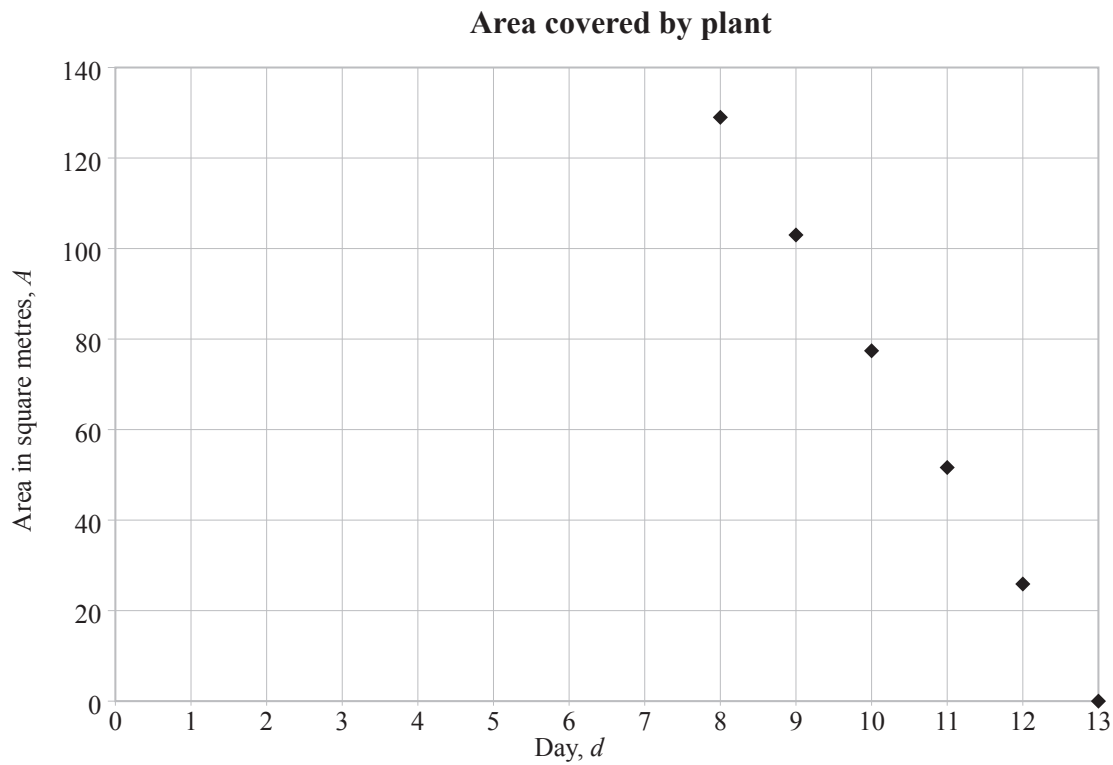
Ko te kauwhata i raro, o te horahanga kua kapi i te tipu mai i te **Rā 8** (ina kapi te 128 mita pūrua), e whakaatu ana i tā Hank e tūmanako ana mō te horahanga o te hāroto ka kapi i te tipu.



- (i) He aha te whārite o te horahanga kua kapi i te tipu e ai ki tēnei kauwhata?

- (b) Hank and some friends start removing the plant on Day 9.

The graph of the area covered by the plant from **Day 8** (when it covers 128 square metres), below, shows what Hank hopes will happen to the area of pond covered by the plant.

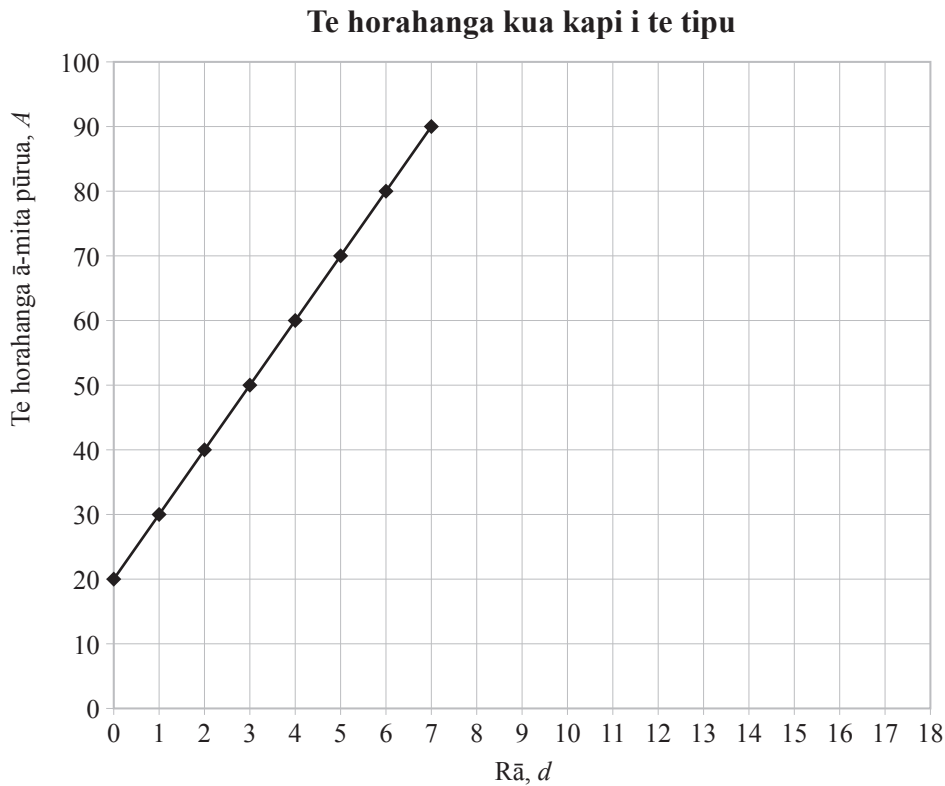


- (i) What is the equation for the area covered by the plant as shown in this graph?

- Write at least TWO comments with justification.

TŪMAHI TUARUA

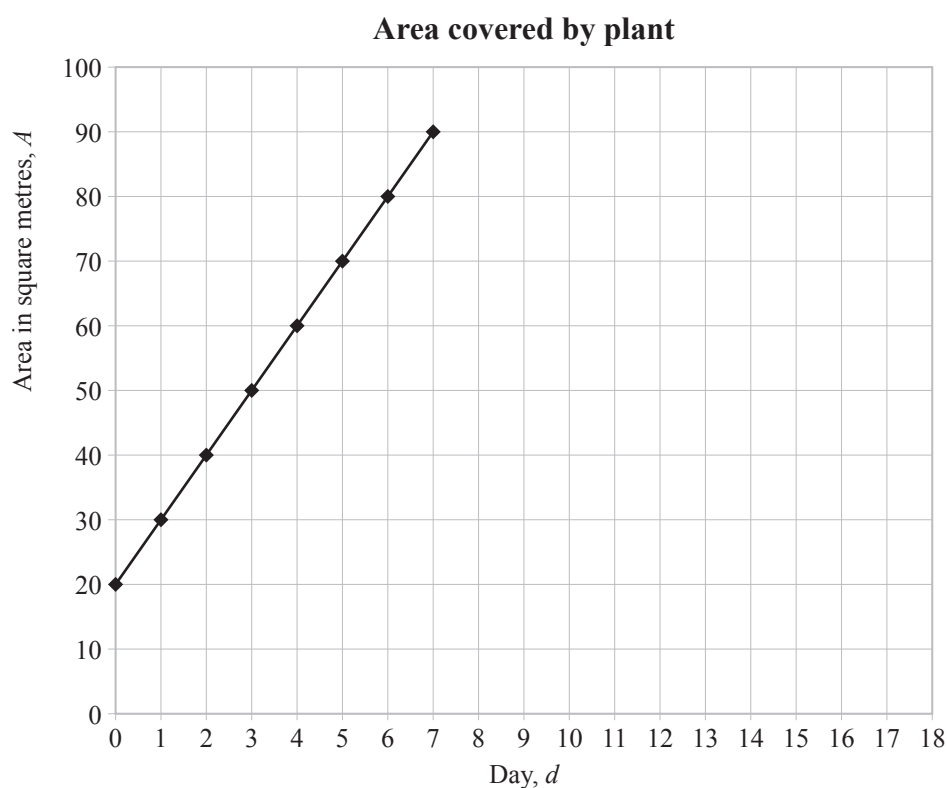
I te tau o muri mai, i te tiputanga mai anō o te tipu, ka ngana a Hank ki te aukati i tana tipu haere tere puta noa i te hāroto. I tana kitenga i te tipu, ka tīmata tonu tana whakawātea haere. E whakaaturia ana i raro ko te kauwhata o te horahanga o te hāroto i kapi i te tipu i taua tau:



- (a) E hia atu anō te nui o te horahanga kua kapi i te tipu i ia rā?
-
- (b) He aha te rā e kapi ai i te tipu te 200 mita pūrua ki te noho ōrite tonu ngā āhuatanga?
Whakaaturia āu mahinga.
-
-
-
-
-

QUESTION TWO

The next year, when the plant begins to grow back, Hank tries to stop it from spreading across the pond so quickly. As soon as he notices the plant, he begins removing it. The graph of the area of pond covered by the plant in this year is shown below:



- (a) How much more area is the plant covering each day?

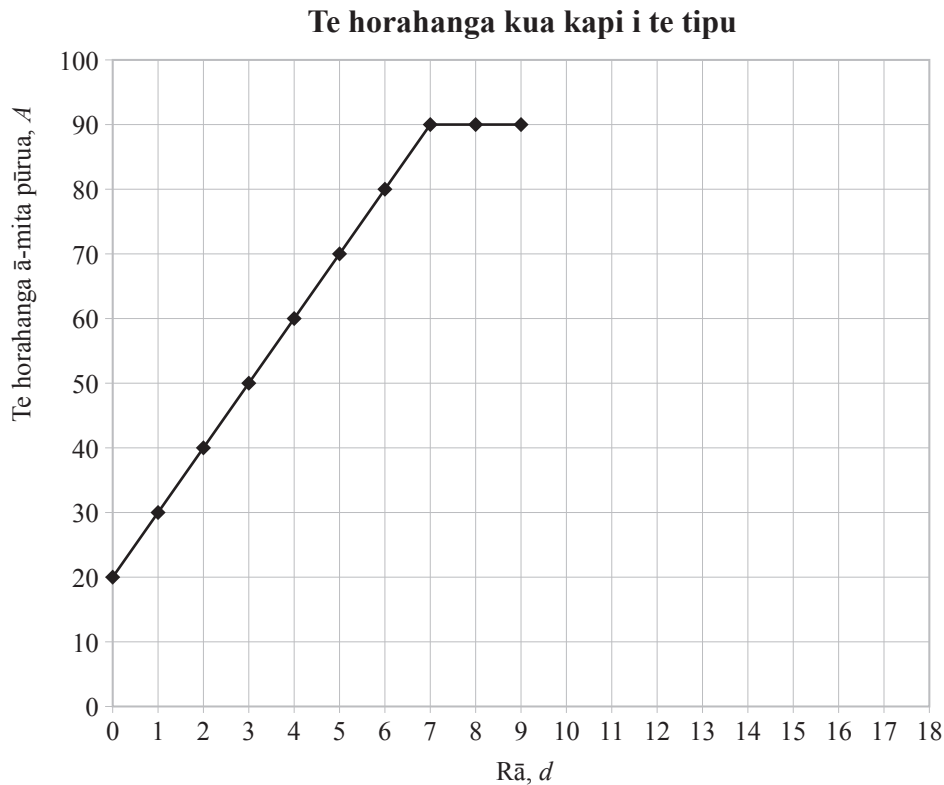
- (b) What day will it be when the plant covers 200 square metres if the conditions remain the same?

Show your working.

I muri i ngā rā e 7 e whakawāteahia ana te tipu e ia anake, ka whakaaro a Hank ki te tiki āwhina.

(c) Ka āwhina tētahi hoa i te Rā 8 me te Rā 9.

Ka noho ōrite tonu te horahanga kua kapi i te tipu mō te Rā 8 me te Rā 9.



*Ki te
hiahia koe
ki te tuhi
anō i tēnei
kauwhata,
whakamahia
te tukutuku i
te whārangi
26.*

(i) He aha te whārite mō tēnei wāhanga hōu o te kauwhata i te Rā 8 me te Rā 9?

(ii) He aha te tikanga o tēnei wāhanga o te kauwhata?

(d) E rua atu anō ngā hoa ka haramai ki te āwhina. Ināianei ka heke haere te horahanga kua kapi i te tipu mā te 15 mita pūrua ia rā tae atu ki te whakakoretanga o te tipu.

(i) Tātuhia he kauwhata ki te tukutuku i runga ake e whakaatu ana i te horahanga o te hāroto kua kapi i te tipu mai i te Rā 10.

(ii) He aha te rā ka kore katoa atu te tipu?

- (e) Ko te whārite o te rārangi mō te Rā 9, haere ake he $A = 225 - 15d$.

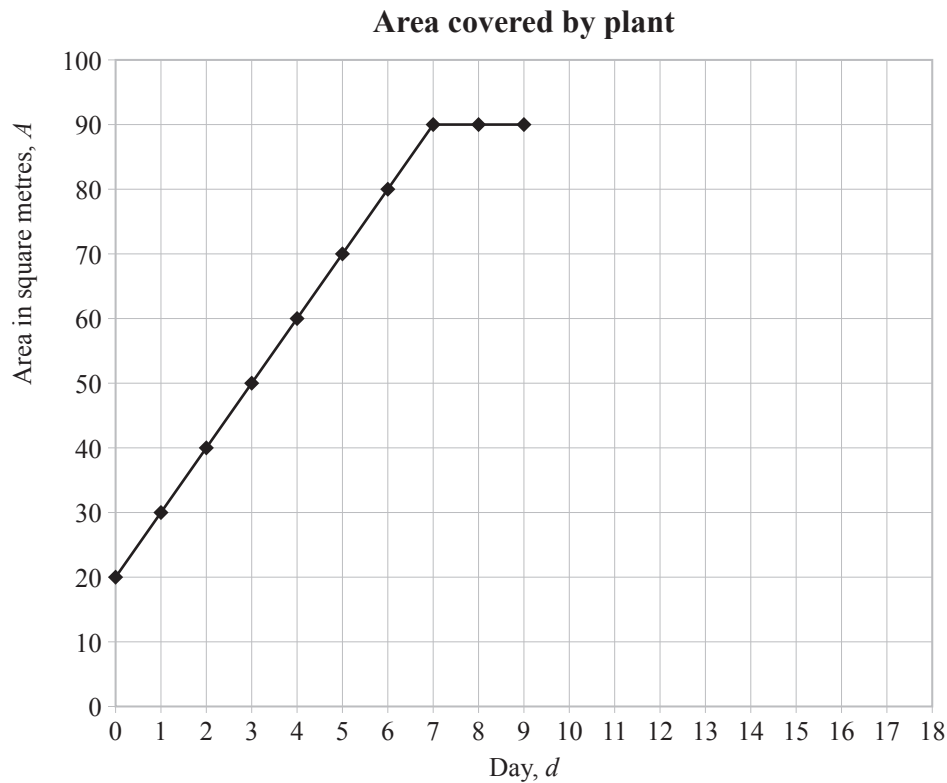
Mēnā i haramai ngā hoa tokorua o Hank i te Rā 8, he aha te whārite mō tēnei rārangi?

Whakamāramahia ō whakaaro whaitake.

After 7 days removing some of the plant by himself, Hank decides to get help.

- (c) One friend helps on Day 8 and Day 9.

The area covered by the plant stays the same for Day 8 and Day 9.



*If you
need to
redraw this
graph, use
the grid on
page 27.*

- (i) What is the equation of this new section of the graph on Day 8 and Day 9?

- (ii) What does this section of the graph mean?

- (d) Two more friends come to help. Now the area covered by the plant decreases by 15 square metres each day until the plant is completely removed.

- (i) Draw a graph on the grid above to show the area of pond covered by the plant from Day 10.

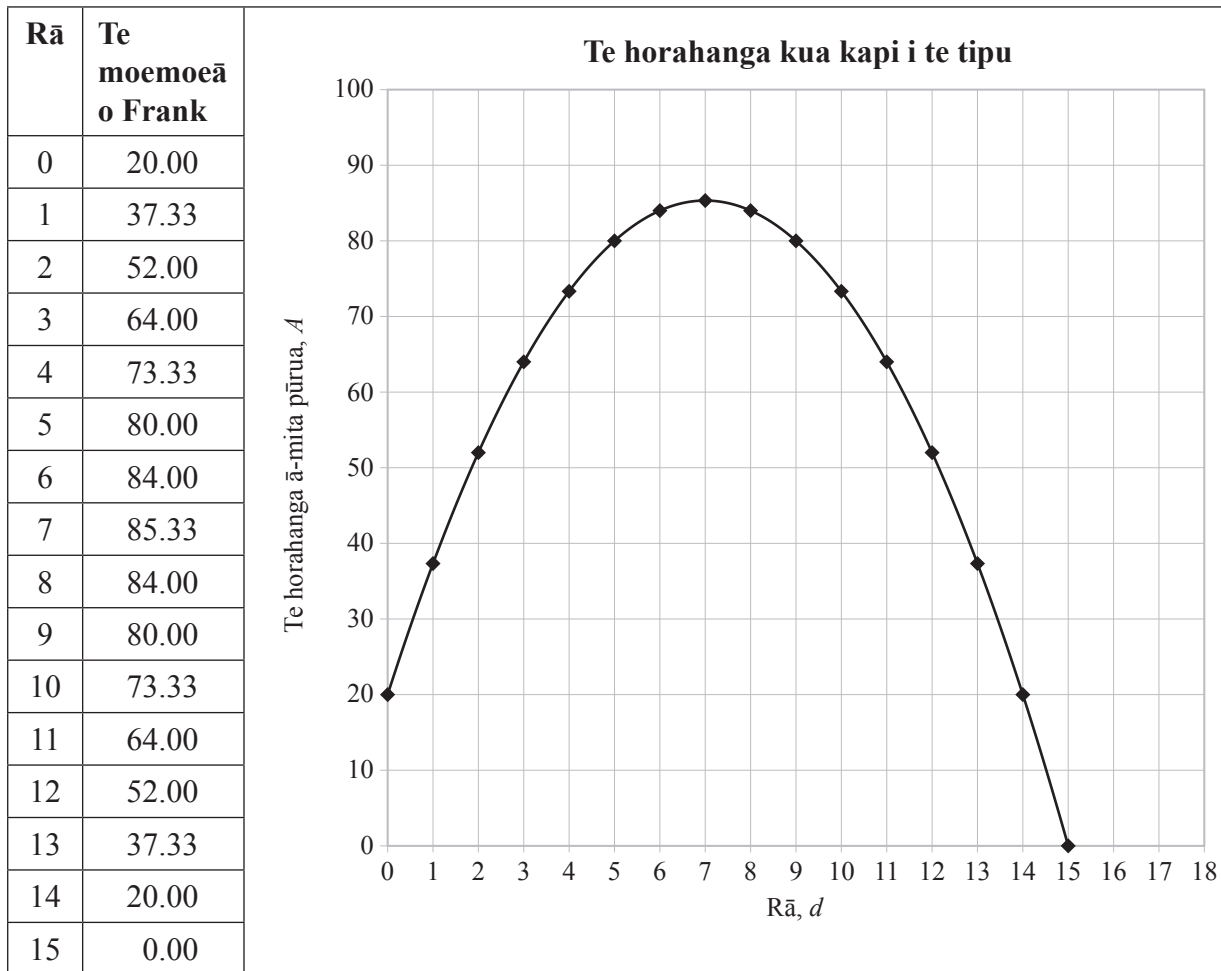
- (ii) On what day will there be no plant left?

- (e) The equation of the line for Day 9 onwards is $A = 225 - 15d$.

If Hank's 2 friends had come on Day 8, what would the equation of this line have been?

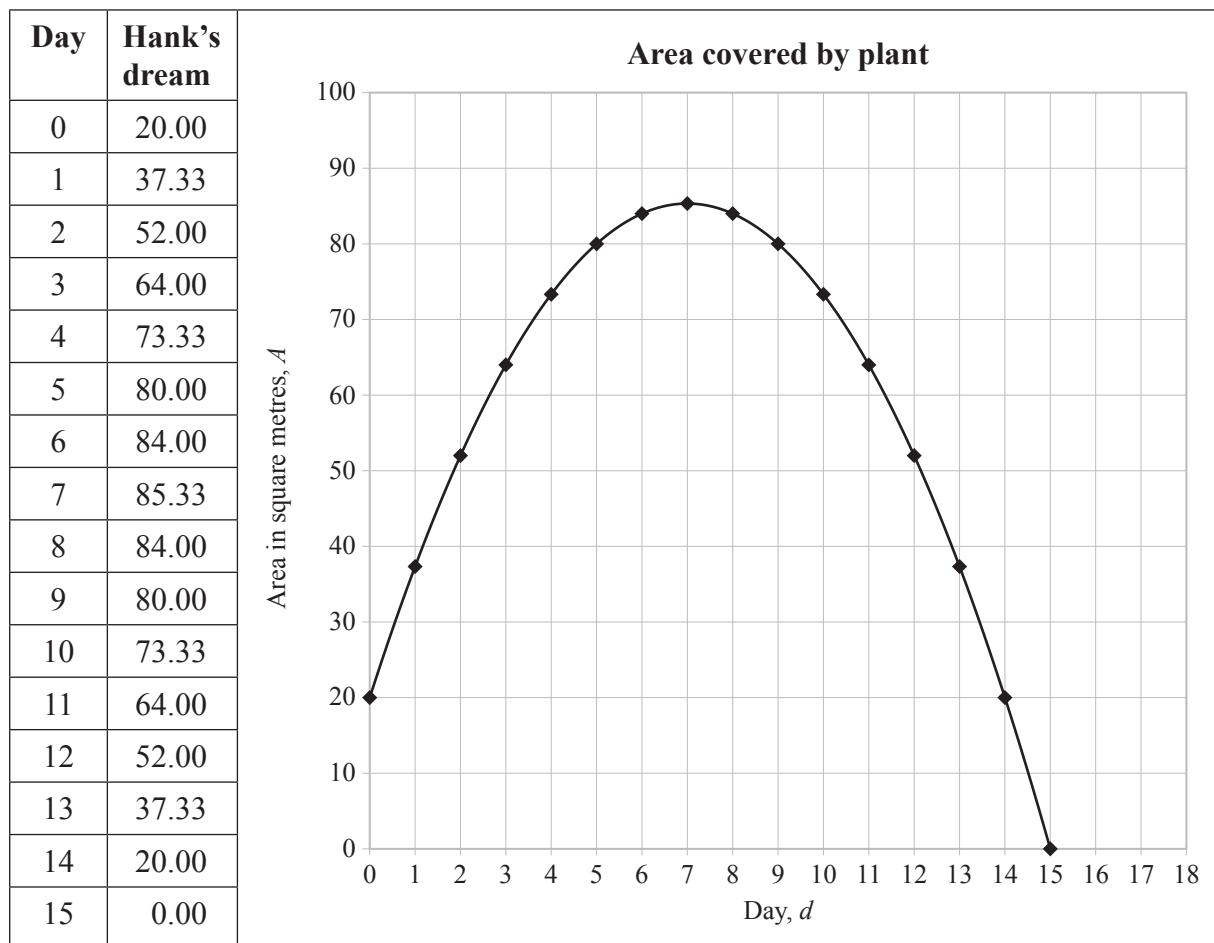
Explain your reasoning.

- (f) I moemoeā a Hank i whakaritea e rātou ko ana hoa i te horahanga o te hāroto kua kapi i te tipu kia whai i te unahi e whakaaturia ana i raro:



He aha te whārite o tēnei kauwhata?

- (f) Hank had a dream that he and his friends made the area of the pond covered by the plant follow the parabola given below:



What is the equation of this graph?

TŪMAHI TUATORU

- (a) Ka whakaritea e Jodie he panga pangarau mā ana hoa. Ka kī ia:

Ka whakaaro au mō tētahi tau tōpū

*Ina tāpiri ahau i te 1 ki taku tau, ka whiwhi ahau i te **A***

*Engari ki te tangohia e ahau te 4, ka whiwhi ahau i te **B***

*Ina whakareatia a **A** mā te **B**, ko taku whakautu he 6.*

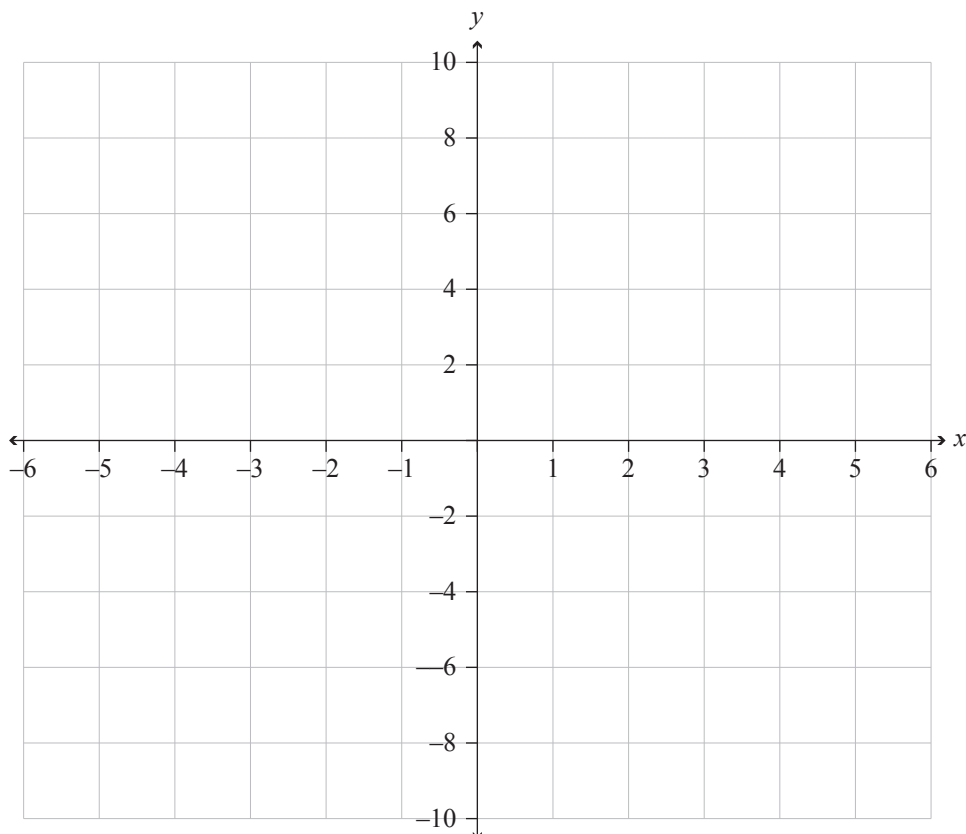
He aha taku tau?

Ka tīmata ana hoa mā te tuhi i tētahi papatau:

x: tau a Jodie	$A = x + 1$	$B = x - 4$	$y = AB$
0	1	-4	-4
1	2	-3	-6
2	3	-2	
3	4		
4			

- (i) Tātuhia te kauwhata o y ki te x .

Whakamahia te huinga tuaka i raro.



Ki te
hiahia koe
ki te tuhi
anō i tēnei
kauwhata,
whakamahia
te tukutuku i
te whārangi
28

- (ii) He aha te whārite o te kauwhata e ōrite ai ki te papatau i runga ake, e ai ki a x ?

$y =$ _____

- (iii) Whakamāramahia mai me pēhea te kimi i te tau a Jodie mai i te kauwhata mēnā he 6 te whakautu.

- (iv) Mēnā i kī a Jodie “*Ka whakareatia a A ki te B he -10* ”.

He aha ngā whakamārama a tō kauwhata mō ngā otinga ki tēnei panga hōu?

QUESTION THREE

- (a) Jodie sets her friends a mathematical problem. She says:

I think of an integer

*When I add 1 to my number, I get **A***

*But if I take 4 off my number, I get **B***

*When **A** is multiplied by **B**, I get an answer of 6.*

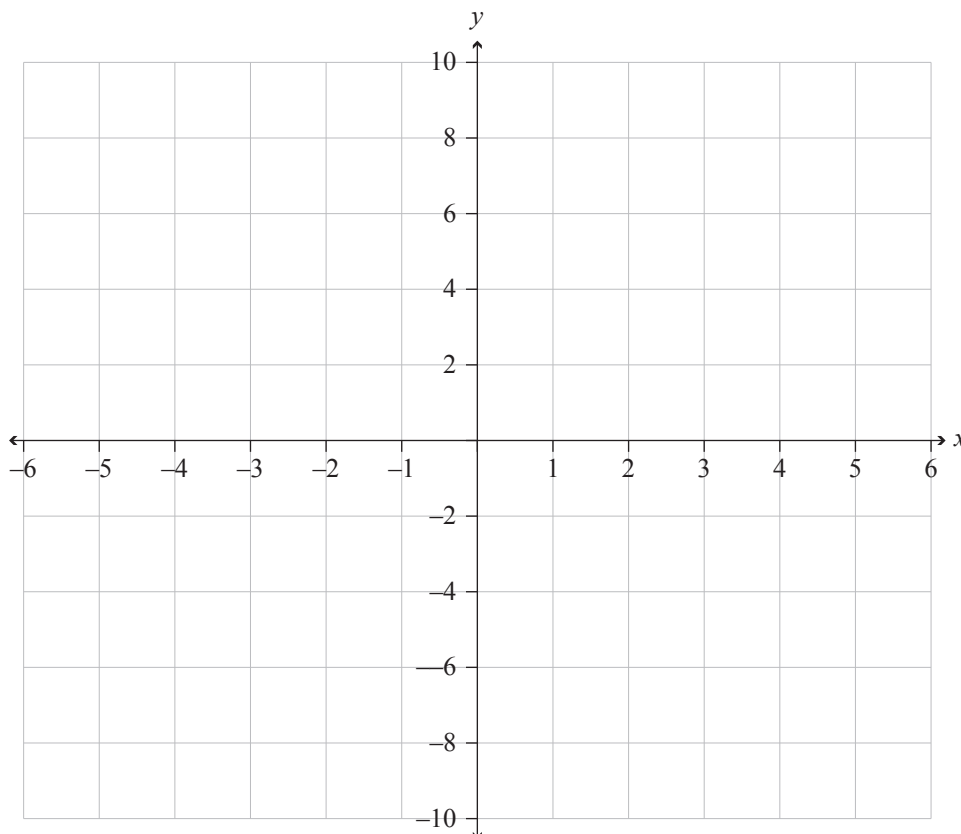
What's my number?

Her friends start by writing a table:

x: Jodie's number	$A = x + 1$	$B = x - 4$	$y = AB$
0	1	-4	-4
1	2	-3	-6
2	3	-2	
3	4		
4			

- (i) Draw the graph of y against x .

Use the set of axes below.



*If you
need to
redraw this
graph, use
the grid on
page 29*

- (ii) What is the equation of the graph that matches the table above, in terms of x ?

$y =$ _____

- (iii) Explain how Jodie's number can be found from the graph if the answer is 6.

- (iv) Suppose Jodie had said "*A multiplied by B gives me -10* ".

What does your graph tell you about the solutions to this new problem?

(b) Ka whakaaro a Tom mō tētahi panga hei whakapātari i a Jodie.

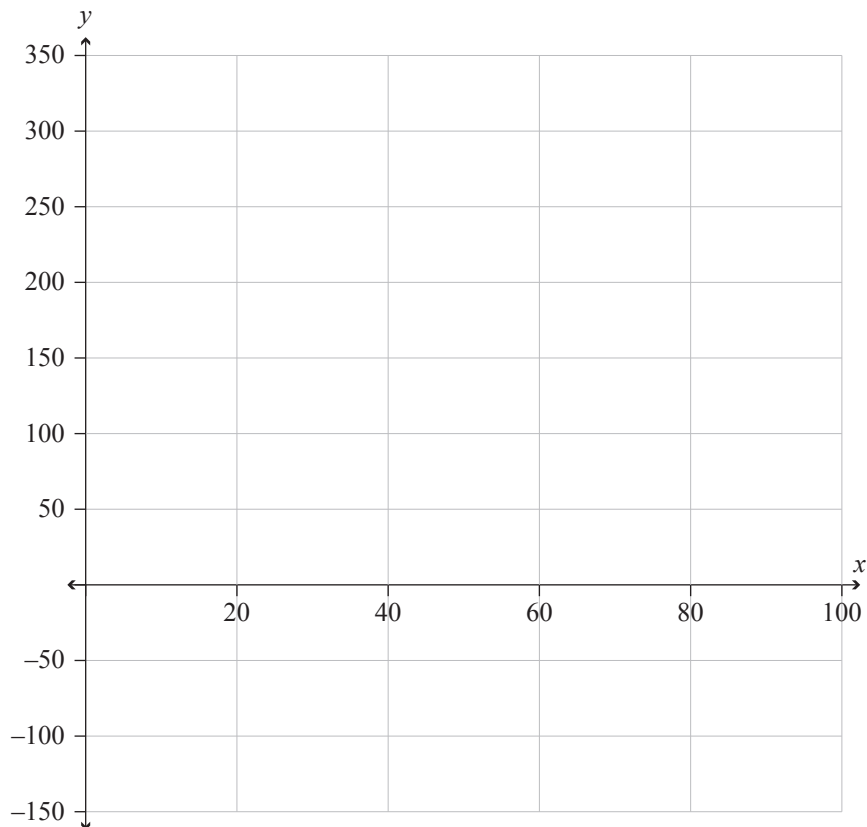
Ka tīmata ia mā te kī:

Whakaarohia tētahi tau e rua ngā mati.

Whakareatia mā te 4 ka tango i te 100 ...

(i) He aha te whārite ka whakamahia e koe hei whakaatu i tēnei pānga?

(ii) Tuhia te kauwhata o tēnei pānga ki ngā tuaka i raro.



*Ki te
hiahia koe
ki te tuhi
anō i tēnei
kauwhata,
whakamahia
te tukutuku i
te whārangi
28*

- (b) Tom thinks of a puzzle to challenge Jodie.

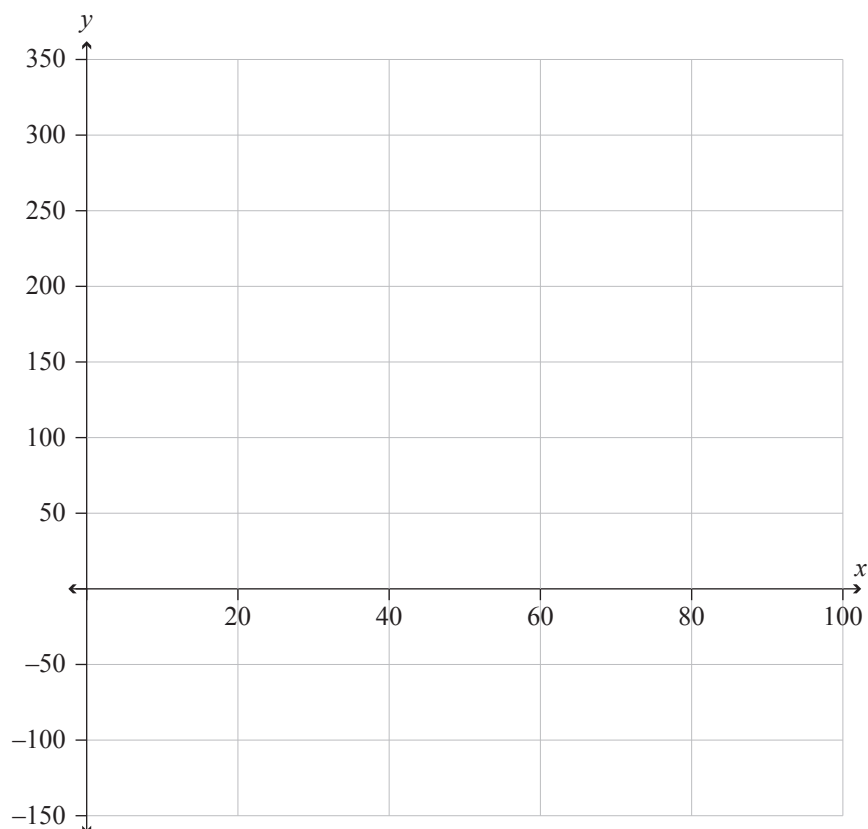
He starts by saying:

I think of a two-digit number.

I multiply it by 4 and take away 100 ...

- (i) What equation would you use to describe this relationship?

- (ii) Draw the graph of this relationship on the axes below.



*If you
need to
redraw this
graph, use
the grid on
page 29*

(iii) Ko te panga katoa a Tom he:

Kimikimihia taku tau e 2 ngā mati:

Ki te whakareatia e ahau ki te 4 ka tango i te 100 ...

*Ka ōrite te riro mai ki tērā e tāpirihia ana e ahau te 47 me te whakarea
i te otinga mā te 1.12*

Whakamāramahia mai he pēhea te kimi i te otinga ki te pātai a Tom, ā, ka homai kia
tōtika rawa atu te otinga.

(iii) Tom's whole puzzle is:

Guess my 2-digit number:

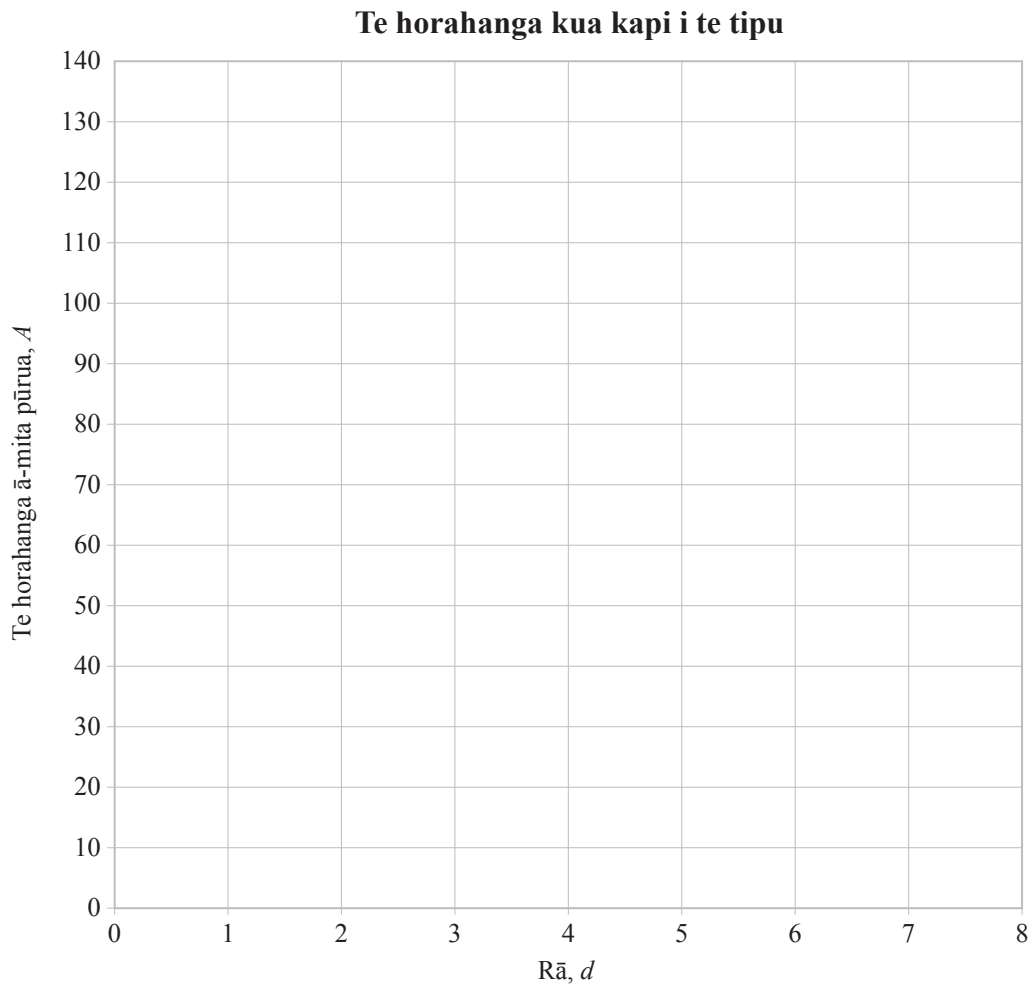
If I multiply it by 4 and take away 100 ...

I get the same as when I add 47 to it and then multiply the result by 1.12

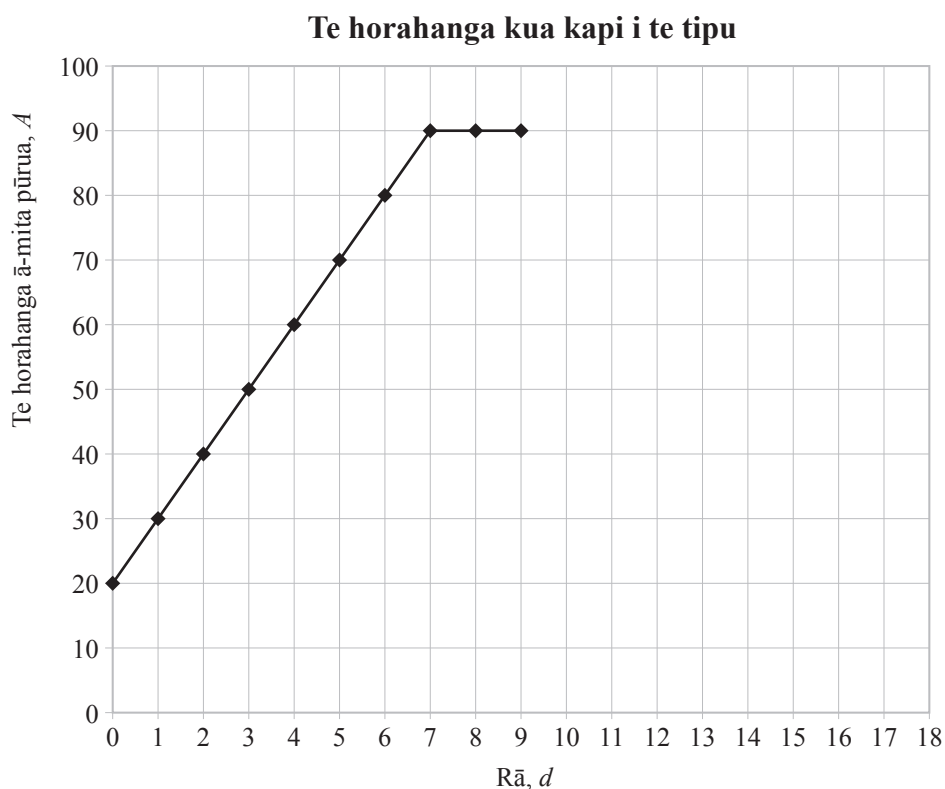
Explain how the solution to Tom's question can be found, and give the solution as accurately as possible.

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

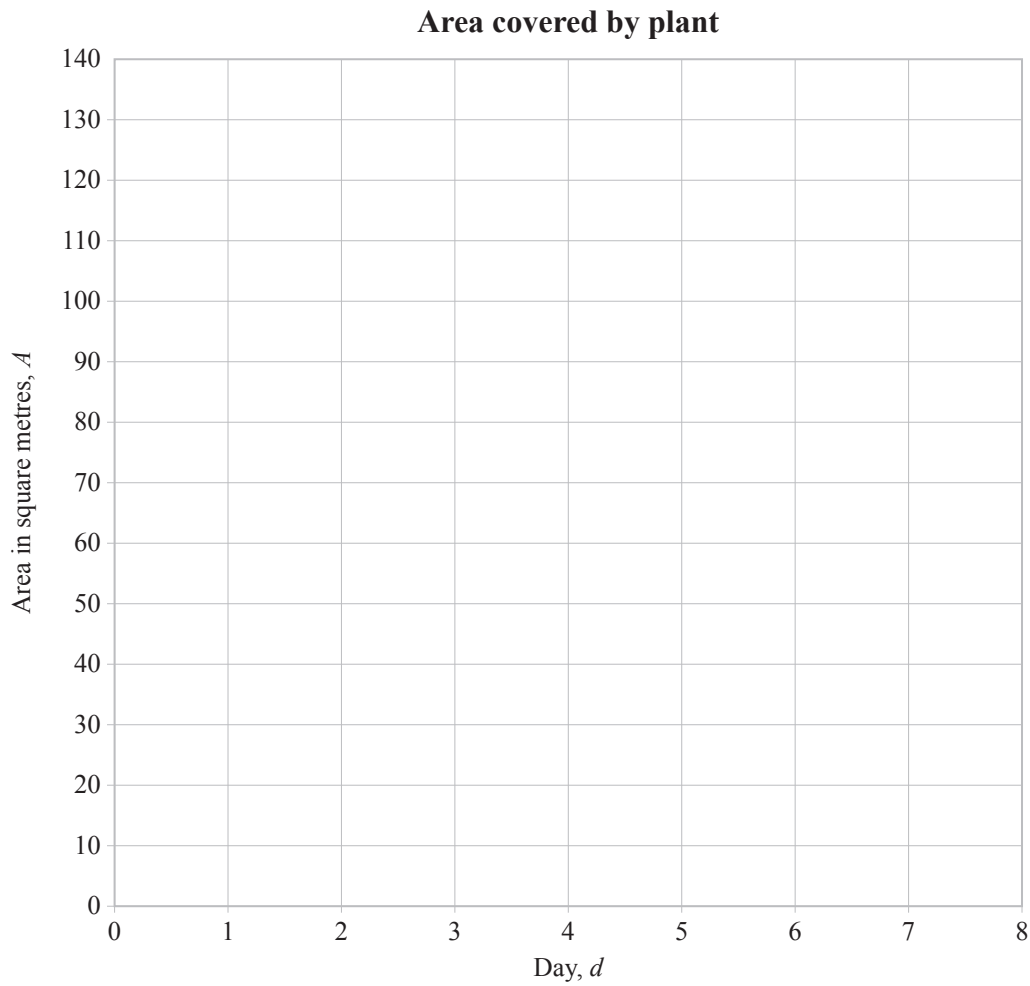


Ki te hiahia koe ki te tuhi anō i te kauwhata, mai i te Tūmahi Tuarua (c), tuhia ki te tukutuku i raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.

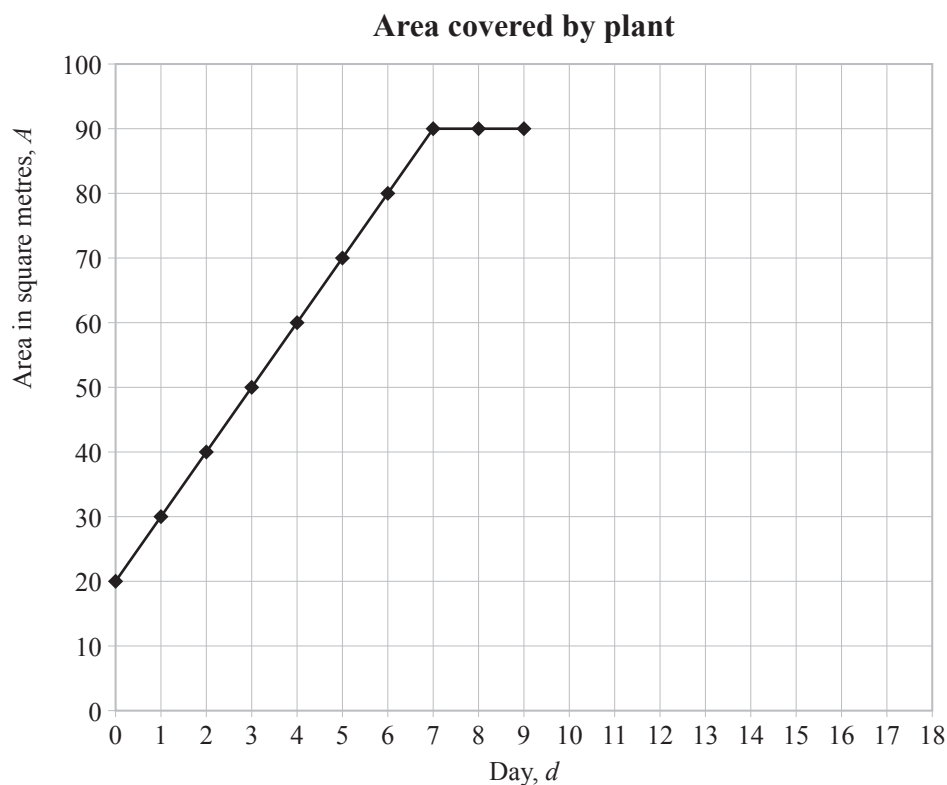


If you need to redraw your graph from Question One (a)(i), draw it on the grid below. Make sure it is clear which graph you want marked.

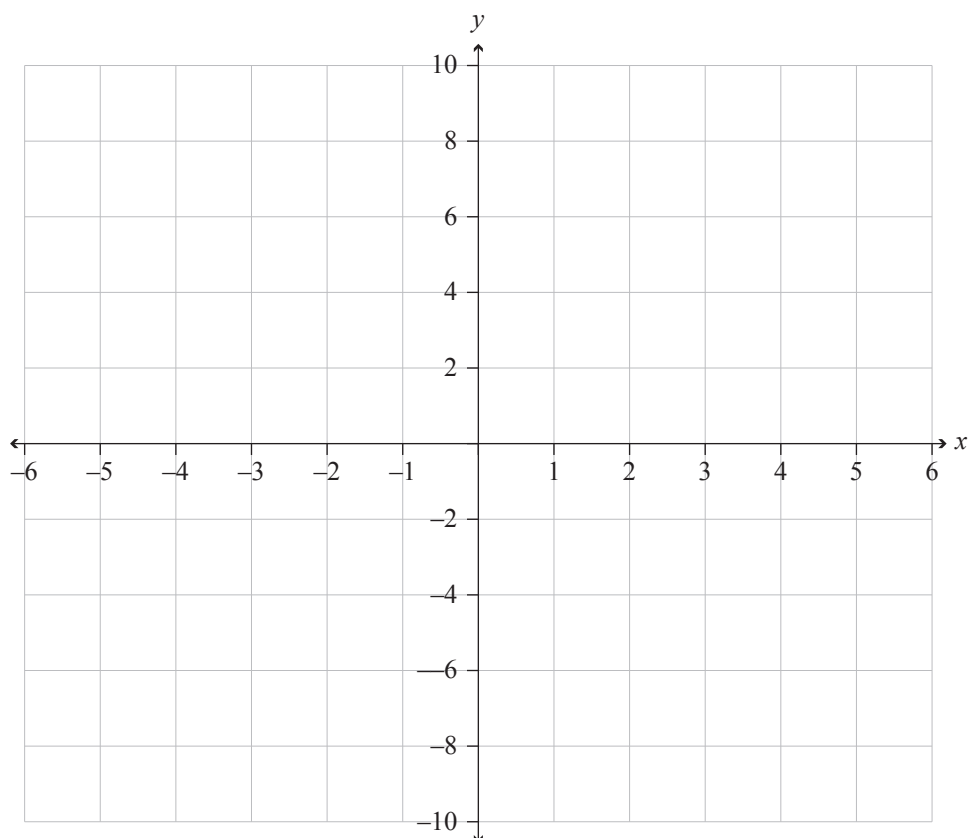
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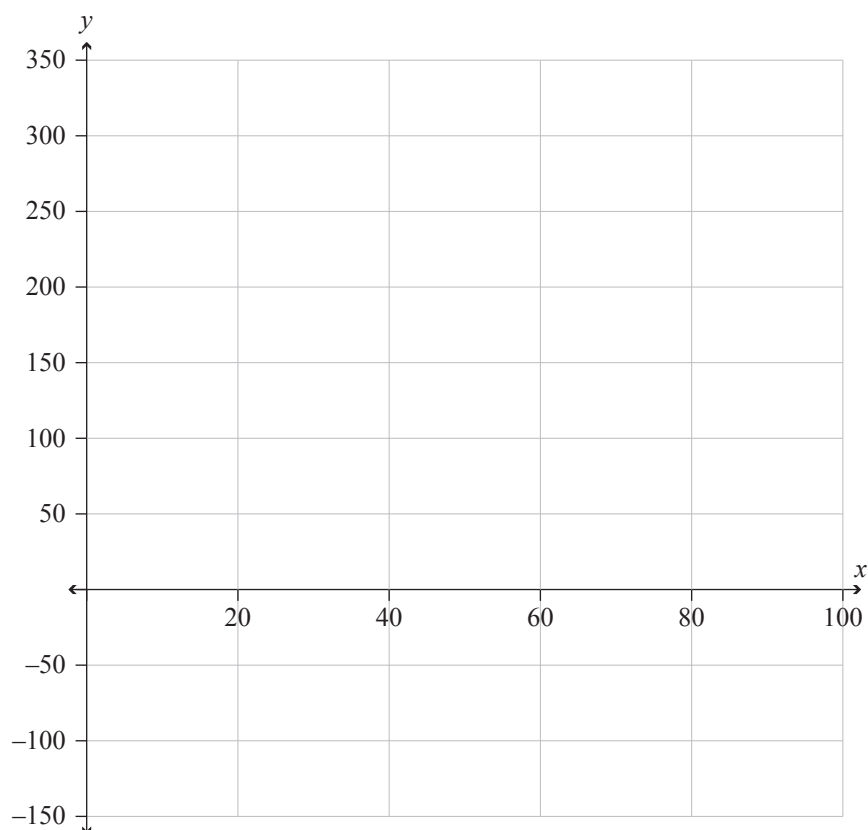
If you need to redraw your graph from Question Two (c), draw it on the grid below. Make sure it is clear which graph you want marked.



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

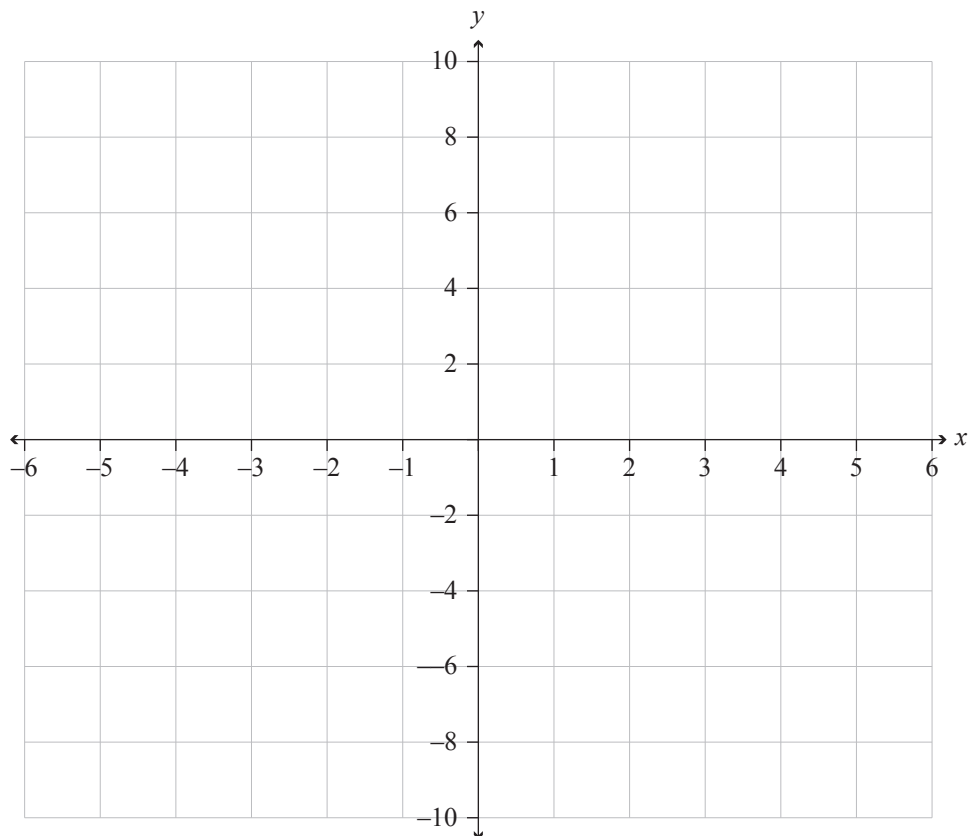


Ki te hiahia koe ki te tuhi anō i te kauwhata mō te Tūmahi Tuatoru (b)(ii), tuhia ki te tukutuku i raro. Me āta tuhi ko tēhea te kauwhata e hiahia ana koe kia mākahia.

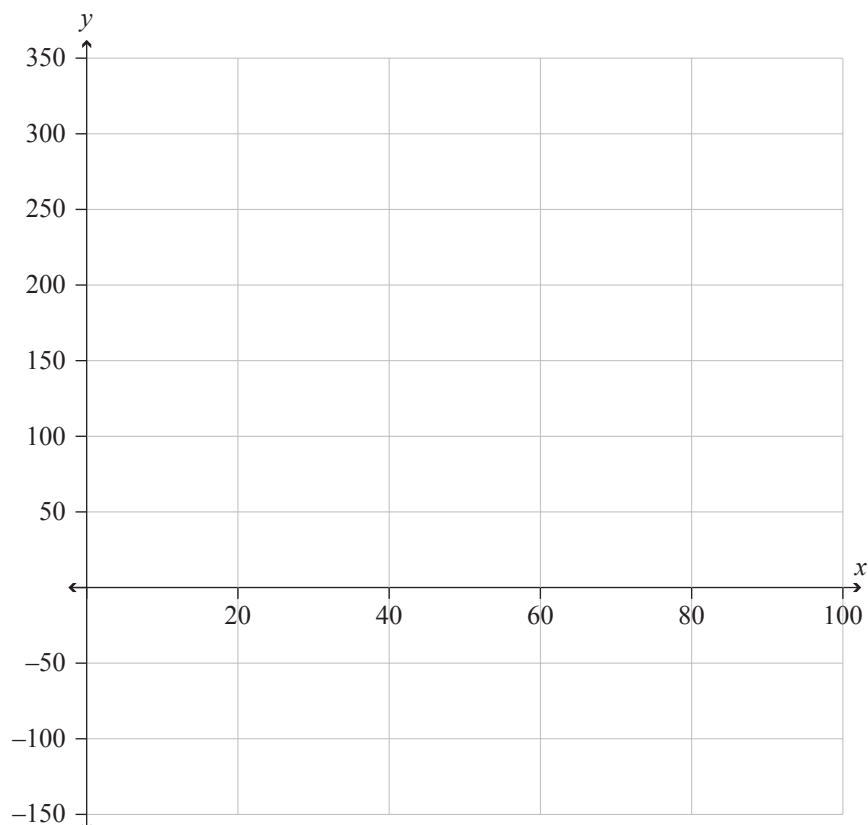


If you need to redraw your graph from Question Three (a)(i), draw it on the grid below. Make sure it is clear which graph you want marked.

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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.



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, 2015

91028 Investigate relationships between tables, equations and graphs

9.30 a.m. Monday 9 November 2015
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 2–31 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.