91028

910280

1

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1 Mathematics and Statistics, 2012

91028 Investigate relationships between tables, equations and graphs

9.30 am Wednesday 14 November 2012
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 2–16 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.

TOTAL

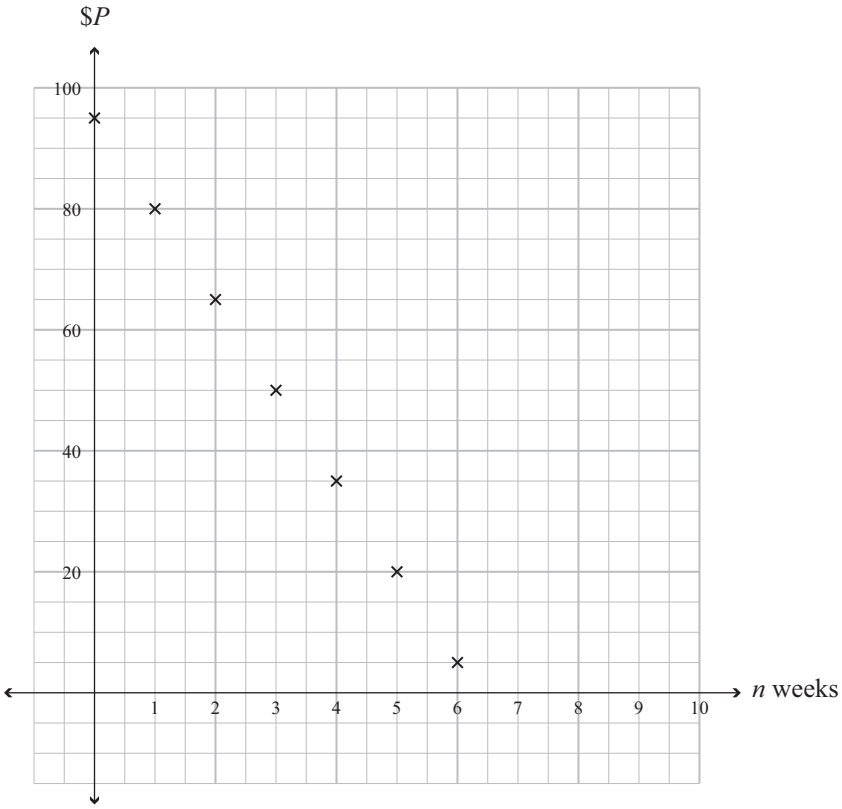
ASSESSOR'S USE ONLY

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

ASSESSOR'S USE ONLY

QUESTION ONE

(a) Jake has borrowed some money, \$$P$, from his father.
He plans to pay him back according to the graph below.



(i) How much does Jake pay his father back each week?

(ii) Give the equation of the line that passes through the points on the graph.

$P =$ _____

ASSESSOR'S USE ONLY

(iii) After three weeks Jake goes on a trip with a friend.
Jake does not pay his father during the fourth week.
He then continues paying him back the next week.

- How does this affect the graph?

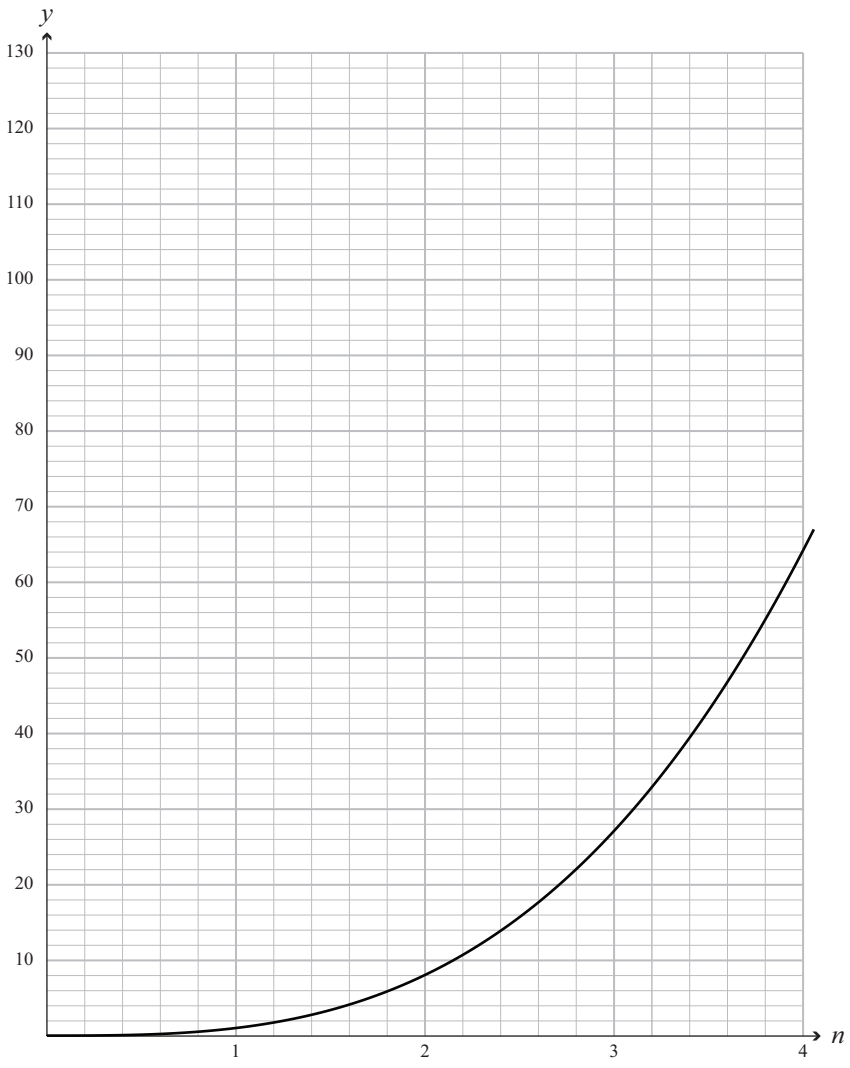
- Give the equation of the graph from the fourth week onwards.

ASSESSOR'S USE ONLY

(b) (i) Complete the table of values below for $n^3 + 3n^2 + 3n + 1$ using each of the values of n below:

n	$(n^3 + 3n^2 + 3n + 1)$
1	
2	
3	
4	

(ii) The graph below shows $y = n^3$



If you need to redraw this graph, use the grid on page 13.

From the table above plot $y = n^3 + 3n^2 + 3n + 1$ on the same grid.

(iii) Compare the graph of $y = n^3$ and the graph of $y = n^3 + 3n^2 + 3n + 1$

ASSESSOR'S USE ONLY

(iv) $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ for all values of a and b.

Find an expression for the difference between the cubes of any two consecutive whole numbers.

How does this result relate to the graph you drew in part (b) (ii)?

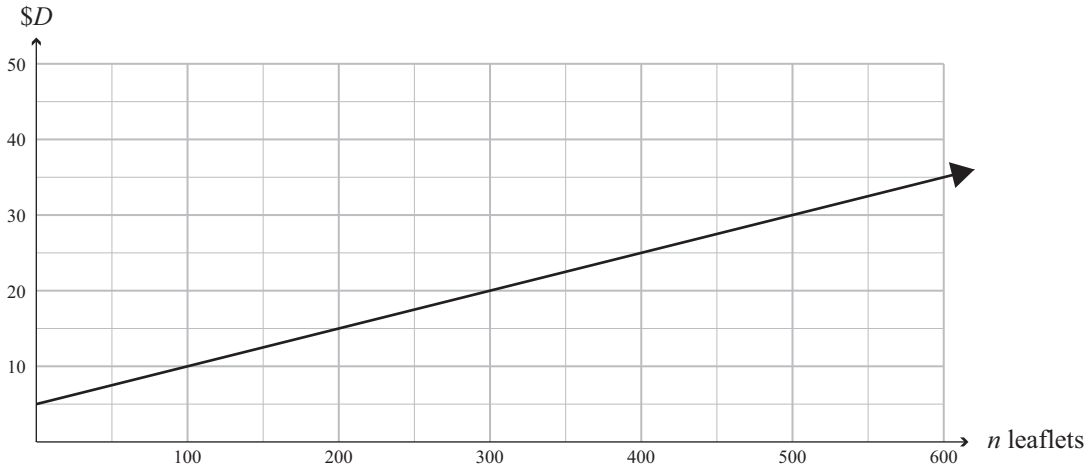
QUESTION TWO

ASSESSOR'S USE ONLY

(a) School students are paid to deliver weekly advertising leaflets to each house.

Leaflets from Us pay students a fixed amount plus an amount for **each leaflet** they deliver.

The graph below shows the amount a student is paid for delivering the leaflets for *Leaflets from Us*.



(i) How much is the student paid for each leaflet they deliver for *Leaflets from Us*?

(ii) Give the equation for the amount, $D, a student would receive, depending on the number of leaflets, n, that they deliver.

ASSESSOR'S USE ONLY

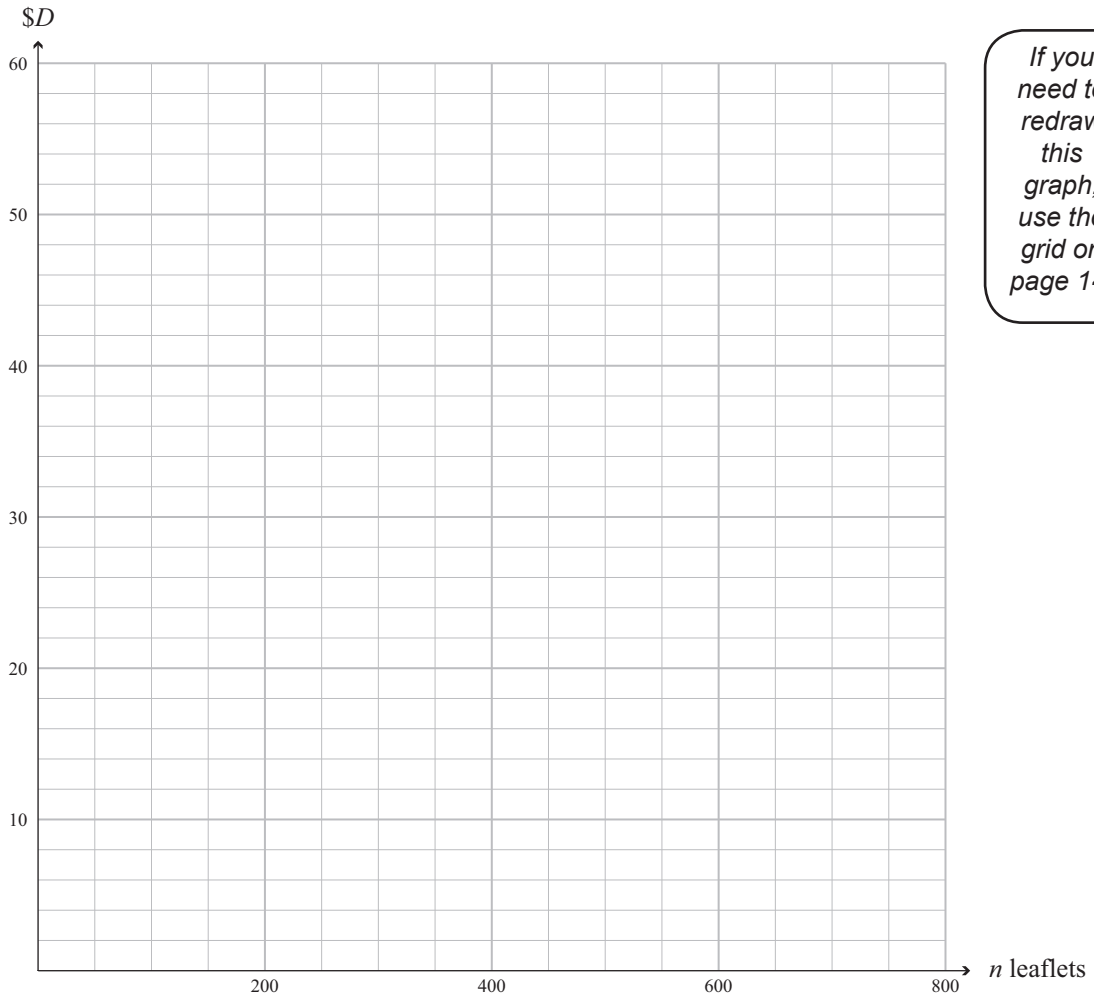
(b) The amount the student is paid by another company *Leaflet Delivery Co* depends on the number of **whole bundles of 50 leaflets** the student delivers.

They are paid a fixed amount plus an amount for **each whole bundle of 50 leaflets** they deliver.

If a student delivers more than 300 leaflets they are paid more per bundle.

Number of leaflets delivered (*n*)	**Amount paid ($*D*)**
1 – 50	$11
51 – 100	$15
101 – 150	$19
151 – 200	$23
201 – 250	$27
251 – 300	$31
301 – 350	$36
351 – 400	$41
401 – 450	$46
451 – 500	$51

(i) On the grid below draw the graph to show the amount a student is paid for delivering *n* leaflets for *Leaflet Delivery Co*.



If you need to redraw this graph, use the grid on page 14.

ASSESSOR'S USE ONLY

(ii) Simone delivers 247 leaflets for *Leaflet Delivery Co*.

How much is she being paid for **each** bundle of 50 leaflets she delivers?

(iii) When Simone delivers her 301st leaflet she works out she is actually paid more per leaflet than when she delivers her 349th leaflet.

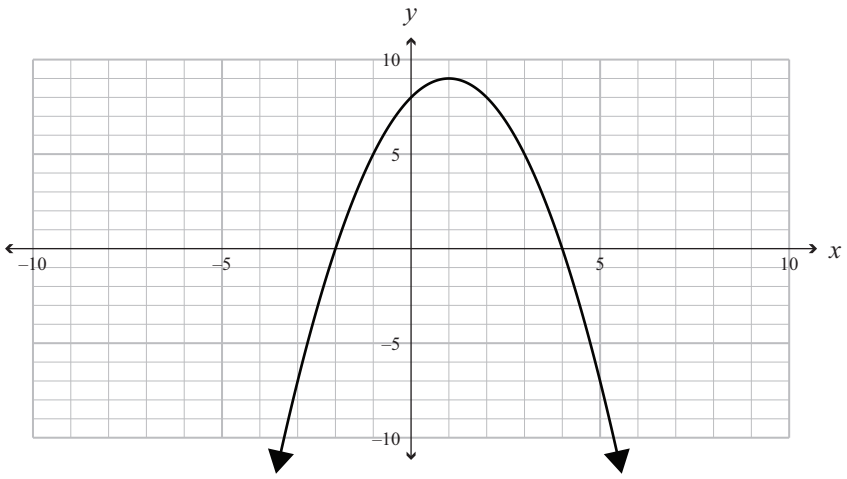
Explain why.

Show calculations to support your answer.

(c) Explain how and why the graph in part (b) is different to the graph in part (a).

(d) Give the equation of the graph shown below.

ASSESSOR'S USE ONLY



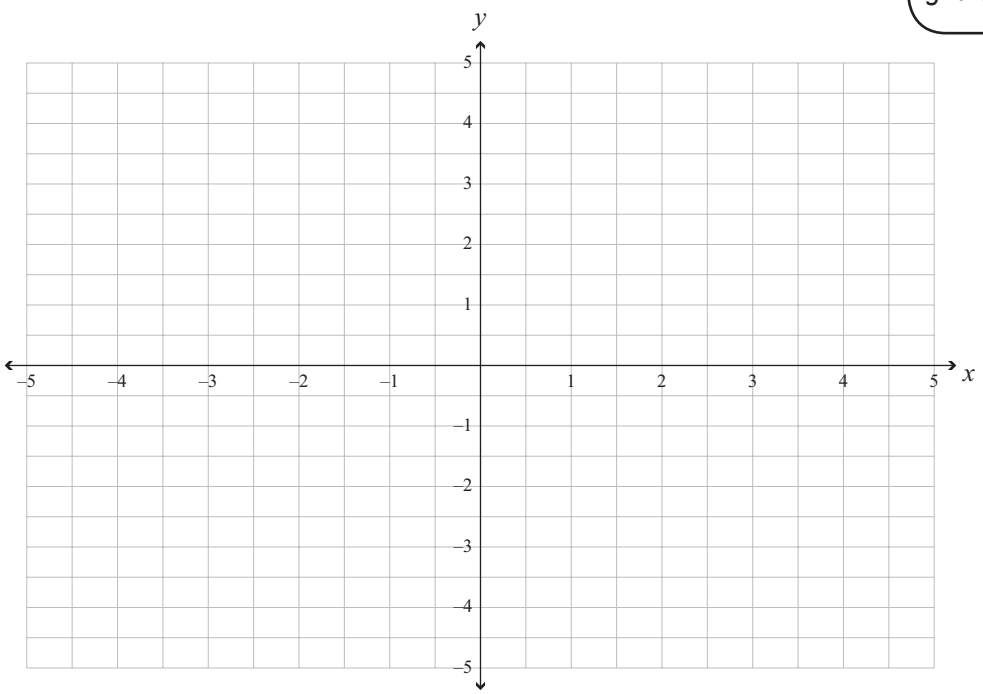
$y =$ _____

QUESTION THREE

ASSESSOR'S USE ONLY

If you need to redraw this graph, use the grid on page 14.

(a) (i) Sketch the graph of $y = x(x + 2)$



(ii) Give the **coordinates** of the x intercepts.

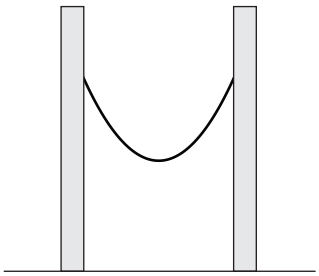
(iii) On the same graph sketch $y = (x – 3)(x – 1) + 4$

(iv) Explain how the graph of $y = x(x + 2)$ is different from the graph of $y = (x – 3)(x – 1) + 4$

(v) How are these differences shown in the equations?

ASSESSOR'S USE ONLY

(b) A rope in a playground is hanging **symmetrically** between 2 poles.



The shape of the rope is modelled by the equation:

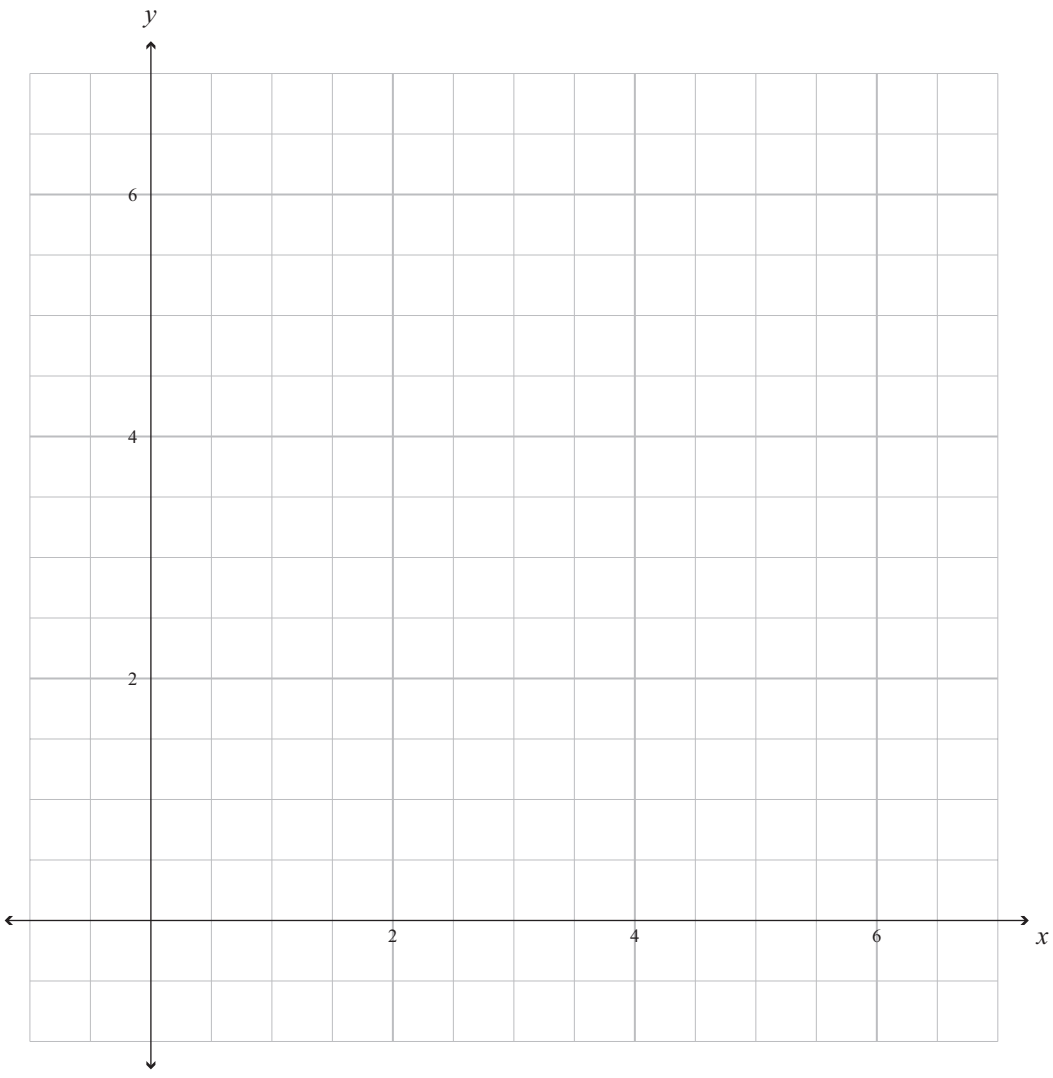
$h = x^2 - 4x + 6$

where h metres is the height of the rope above the ground

and x metres is the distance from the pole on the left side.

(i) How far above the ground are the points where the rope is attached to the poles?

(ii) Sketch the graph of $h = x^2 - 4x + 6$, and show the position of each pole.



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

ASSESSOR'S USE ONLY

(iii) Two other poles are 8 m apart.

Another rope is hanging between them.

The rope is attached to each of the poles at a height of 5 m above the ground.

The lowest point of the rope is 1 m above the ground.

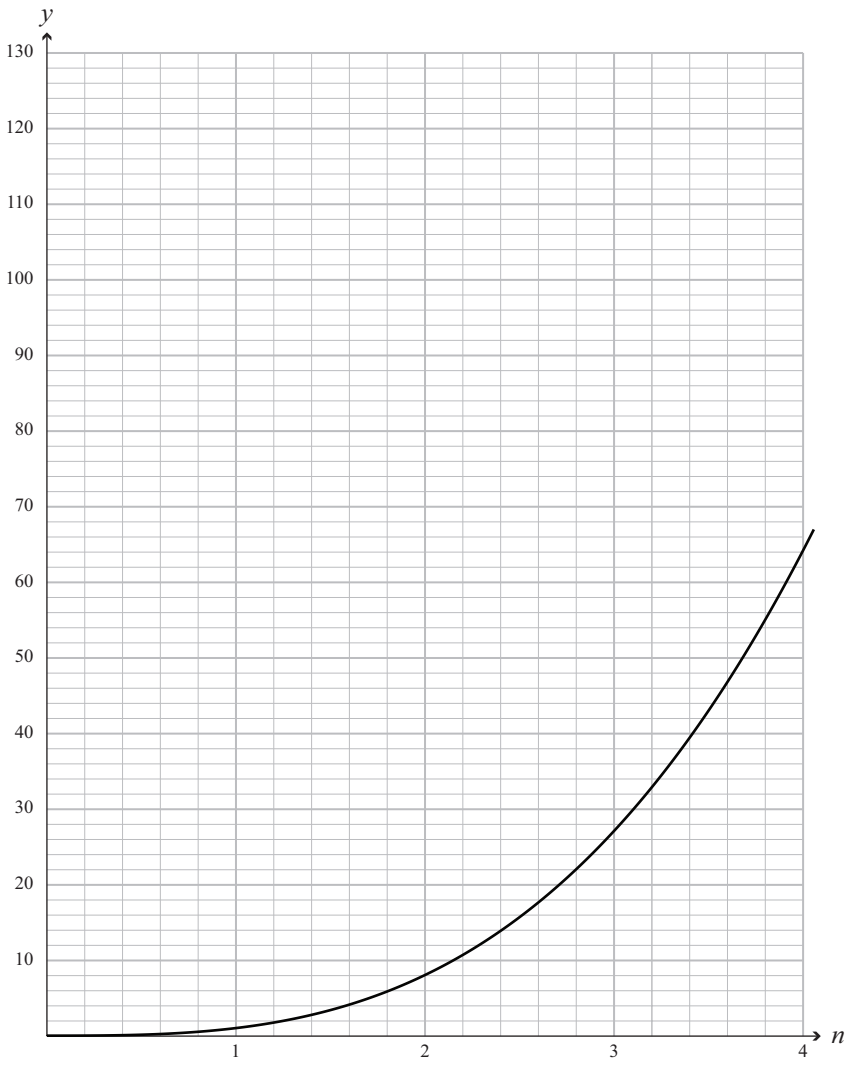
The shape can be modelled by a parabola.

Give the equation of the parabola.

$y =$ _____

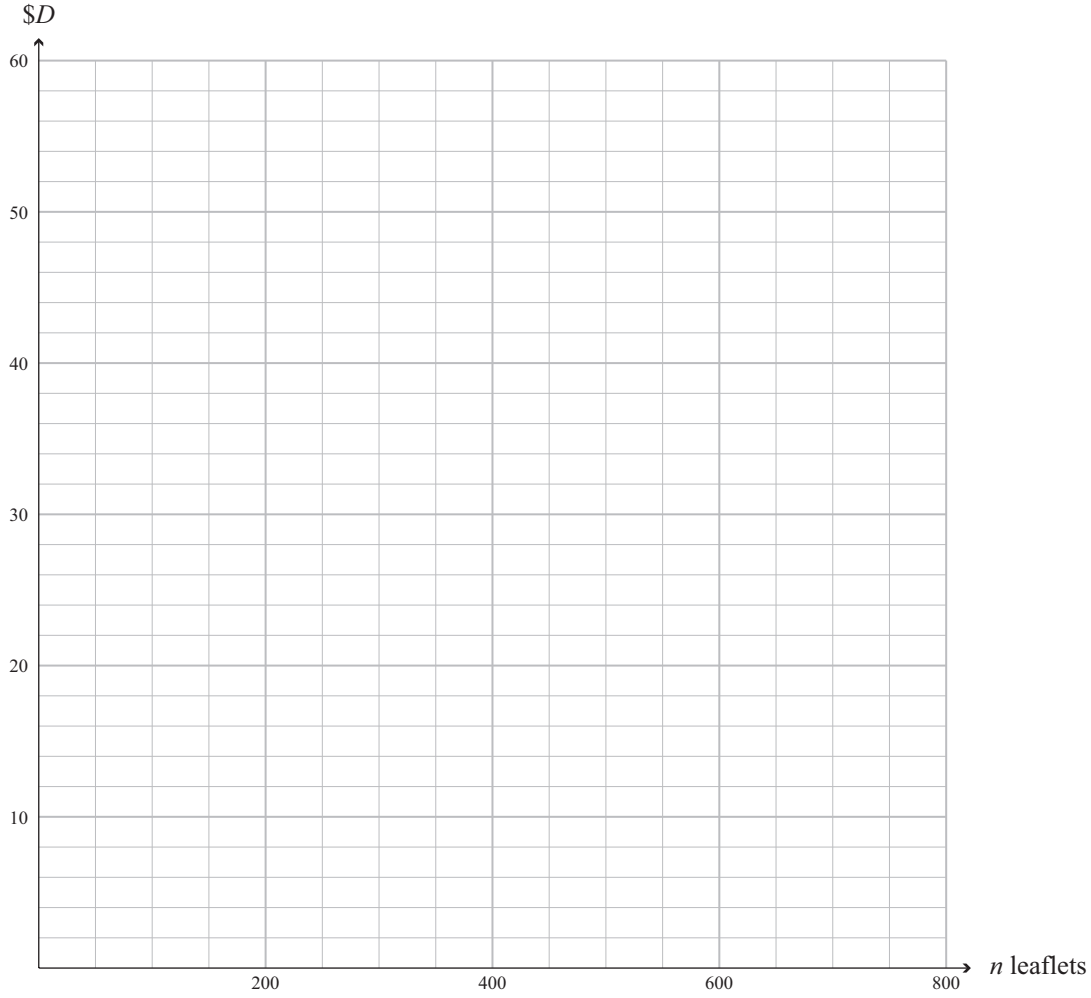
If you need to redraw the graph from Question One (b)(ii), draw it on the grid below. Make sure it is clear which graph you want marked.

ASSESSOR'S USE ONLY

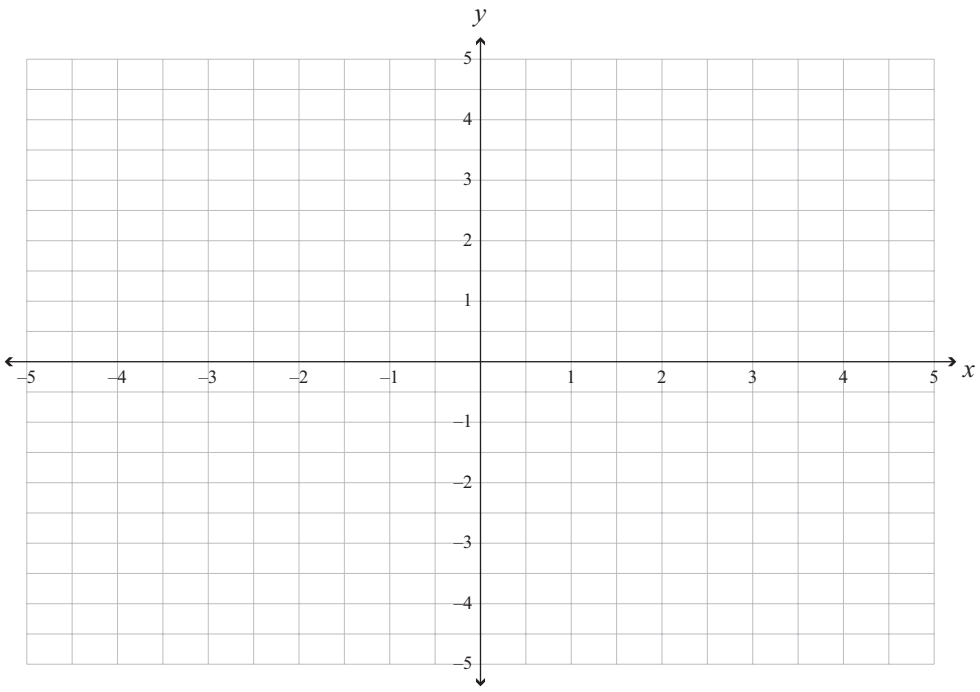


ASSESSOR'S USE ONLY

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

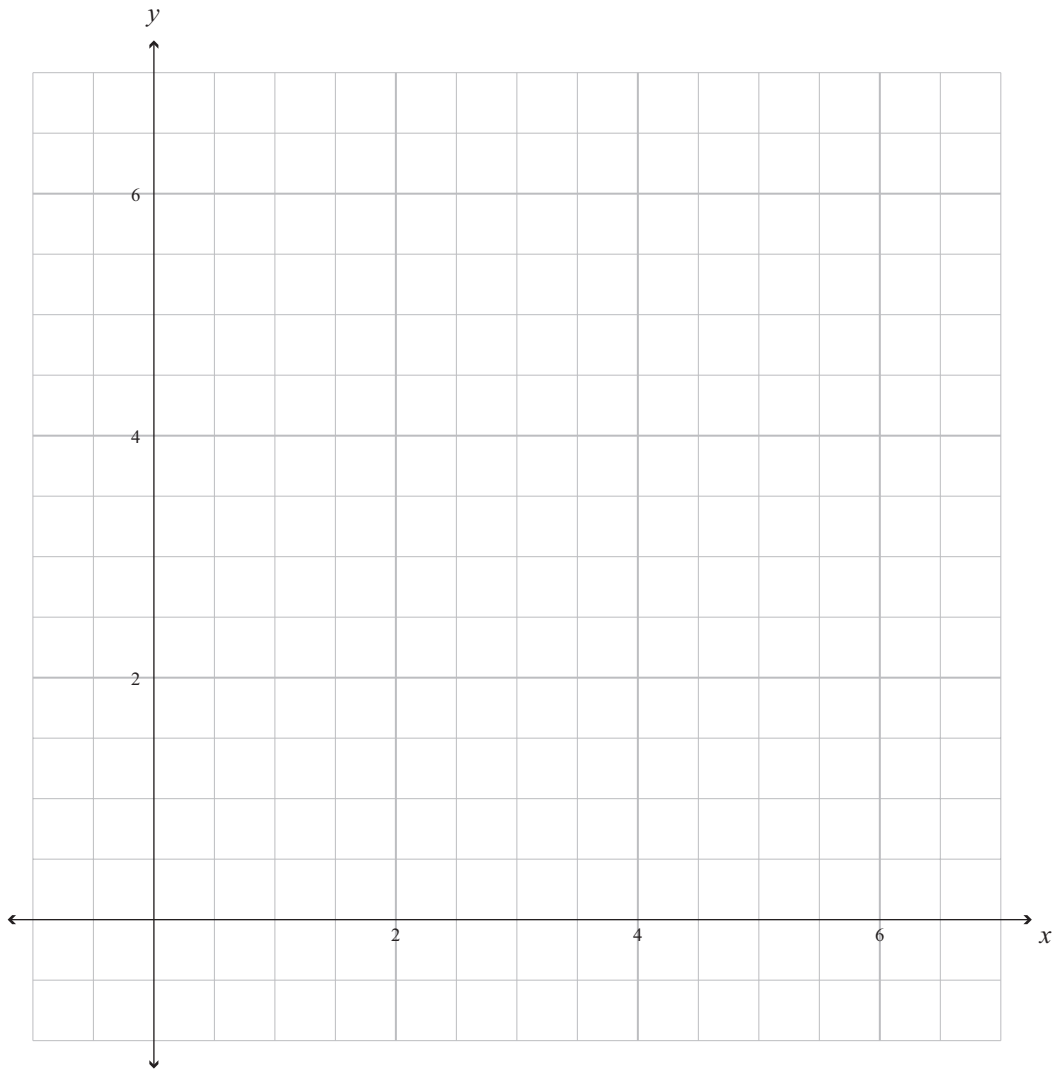


If you need to redraw the graph from Question Three (a)(i), draw it on the grid below. Make sure it is clear which graph you want marked.



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

ASSESSOR'S USE ONLY



Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

ASSESSOR'S USE ONLY

91028