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90148

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

MATHEMATICS, 2002

Level 1

1.2 Sketch and interpret linear or quadratic graphs.

Credits: Three
9.30 am Wednesday 20 November 2002

Check that the Candidate Code Number on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the pages provided at the back of this booklet and clearly number the question. If you make a mistake and need to redraw the graph on page 2 or the graph on page 4, use the copy printed on page 8.

Check that this booklet has pages 2–10 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.

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ACHIEVEMENT CRITERIA

Achievement	Achievement with Merit	Achievement with Excellence
Sketch and interpret features of linear or quadratic graphs. ☐	Sketch graphs of linear and quadratic relations from equations, interpret features of linear and quadratic graphs, and write equations for linear graphs. ☐	Determine and apply an appropriate algebraic model for a graphical situation. ☐
Overall Level of Performance ☐		

You are advised to spend 35 minutes answering the questions in this booklet.

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THE SPORTS DAY

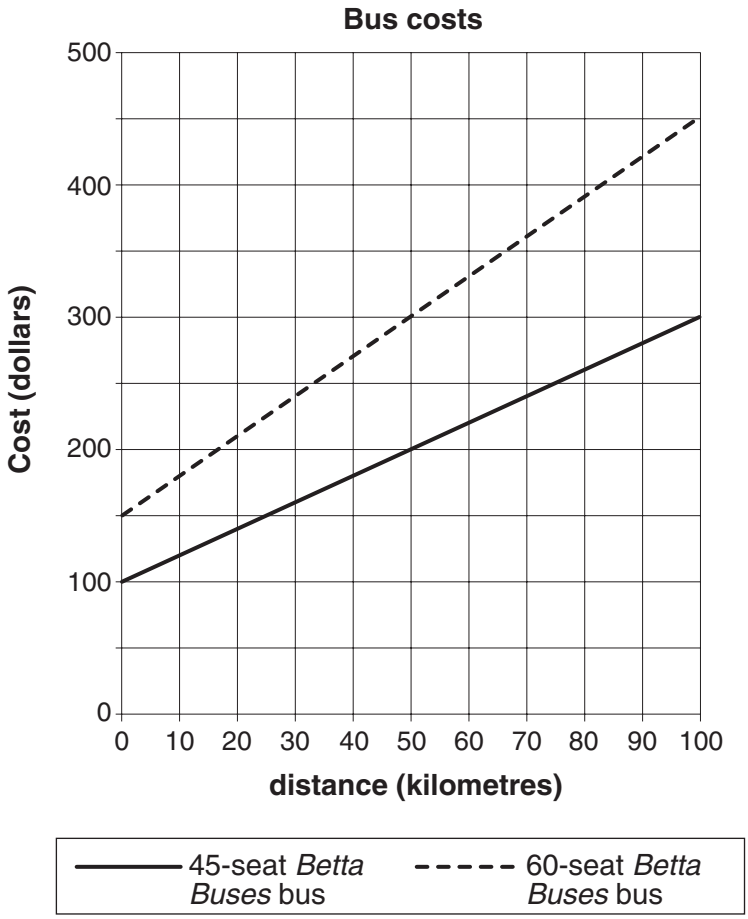
Show **ALL** working.

QUESTION ONE

The teachers at *Valley High* want to know the cost of hiring a bus to travel to the interschool sports day.

Betta Buses has two prices for hiring buses: one for a 45-seat bus and one for a 60-seat bus.

The graph below shows the cost for distances travelled up to 100 kilometres.



(a) Another bus company, *Cheap Coaches*, gives the teachers an equation to work out the cost of their bus:

$$C = 2d + 200$$

where C is the cost to run the bus for a given distance (in dollars)

and d is the distance travelled by the bus (in kilometres).

Draw the graph for the *Cheap Coaches* bus on the axes above.

You should show costs for distances up to 100 kilometres.

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(b) (i) For what distance is it the same price to hire a 60-seat *Betta Buses* bus and a *Cheap Coaches* bus?

(ii) How is this shown by the graphs?

(c) (i) Which TWO buses cost the same to hire per kilometre?

(ii) How is this shown by the graphs?

(d) (i) What is the cost per kilometre to hire the 60-seat *Betta Buses* bus?

(ii) How is this shown by the graph?

(e) (i) Use the graph to write the equation for the 45-seat *Betta Buses* bus.

$C =$ _____

(ii) Use the graph to write the equation for the 60-seat *Betta Buses* bus.

$C =$ _____

QUESTION TWO

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Tom is designing a logo for the *Valley High* sports jacket.

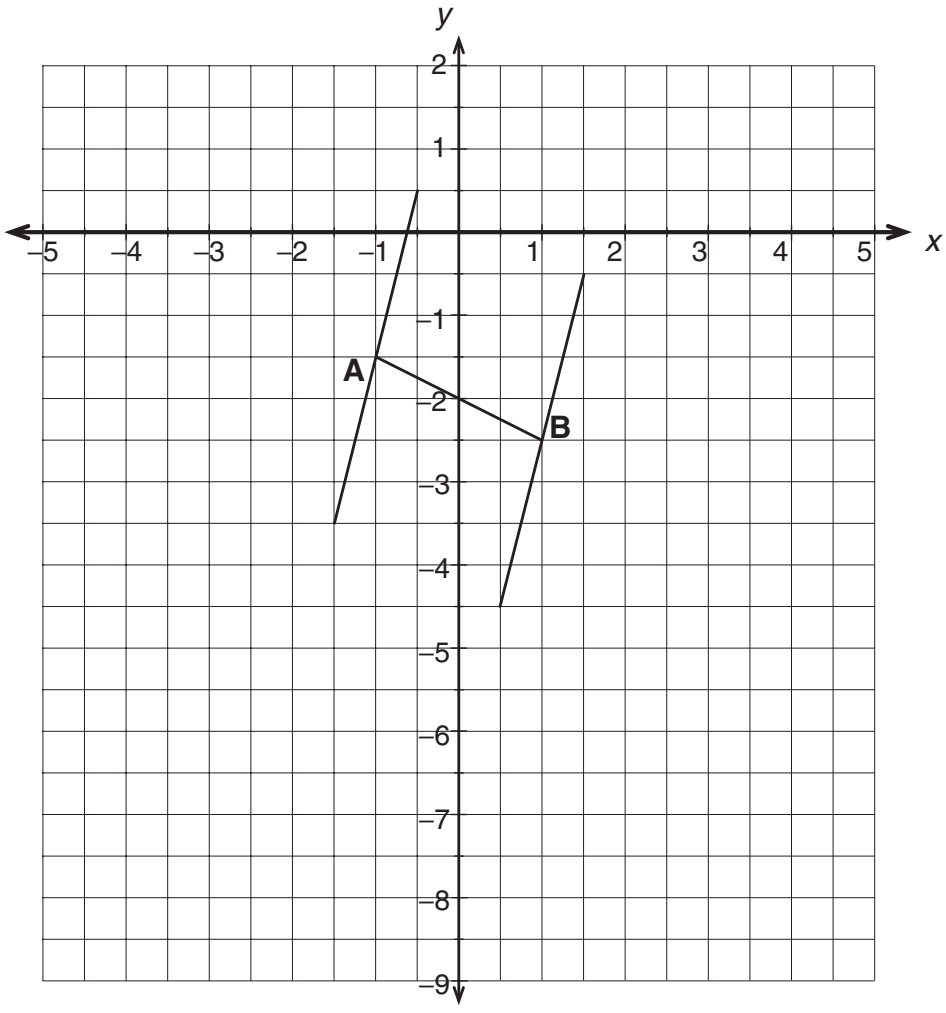
Part of the logo is shown on the axes below.

(a) Write the equation of the line labelled **AB** on the axes below.

_____

_____

$y =$ _____



(b) The logo design also has two parabolas.

(i) On the axes above, draw the graph of $y = (x + 4)(x - 1)$.

(ii) On the axes above, draw the graph of $y = 2x^2 - 8$.

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(c) The part of the graph that is below the x-axis shows the logo for the sports jacket. ***x*** and ***y*** are both measured in centimetres.

(i) What is the height of the logo?

(ii) How is this shown by the graphs?

(iii) What is the width of the logo?

(iv) How is this shown by the graphs?

QUESTION THREE

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Maria won the javelin field event on the sports day.

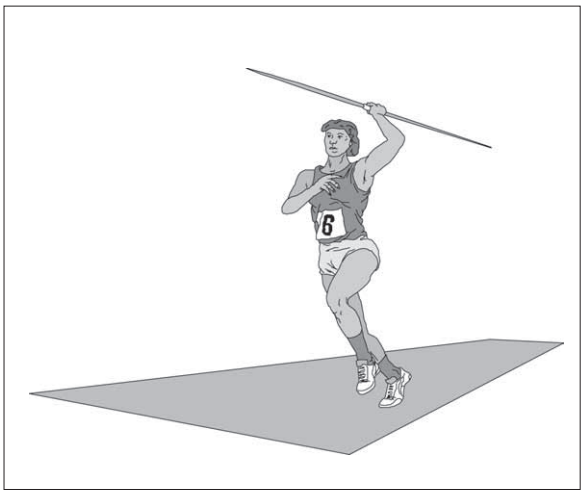
Her coach recorded the heights of the javelin during her winning throw.

The javelin is 2 metres above the ground when it is released.

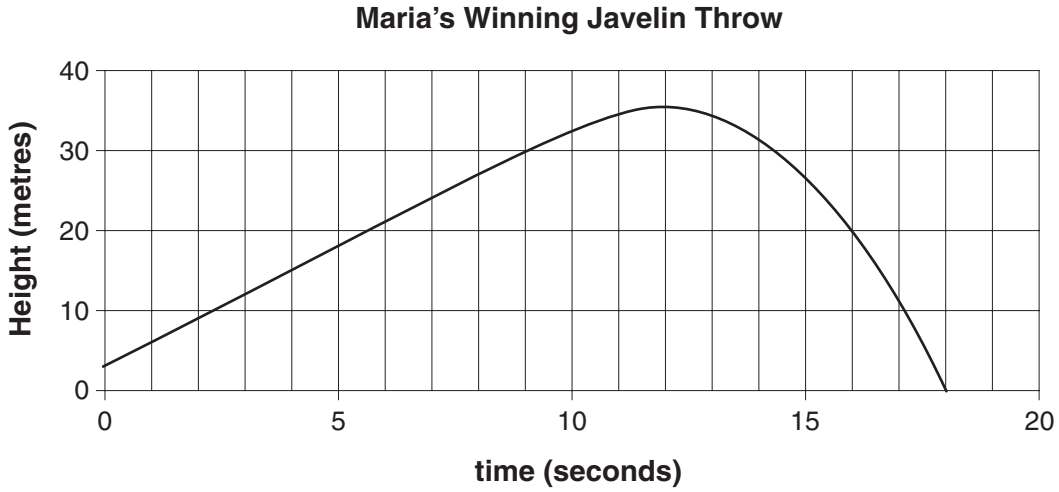
During the first 10 seconds of the javelin's flight, its height increases at a constant rate. The rate is 3 metres per second.

The remainder of the javelin's flight can be modelled by a parabola.

The javelin reaches a maximum height of 36 metres after 12 seconds.



The coach's data is graphed on the set of axes below.



(a) Write TWO equations to model the flight of Maria's winning javelin throw.

(b) Video cameras were placed 27 metres above the ground.

Calculate the **TWO** times when the javelin was level with the video cameras.

Show all working.

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