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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

Level 1 Mathematics, 2003

90148 Sketch and interpret linear or quadratic graphs

Credits: Three
2:00 pm Wednesday 19 November 2003

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 answer ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the pages provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 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 or quadratic graphs, and write equations for linear graphs. ☐	Determine and apply an appropriate algebraic model for a graphical situation. ☐
Overall Level of Performance ☐		

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

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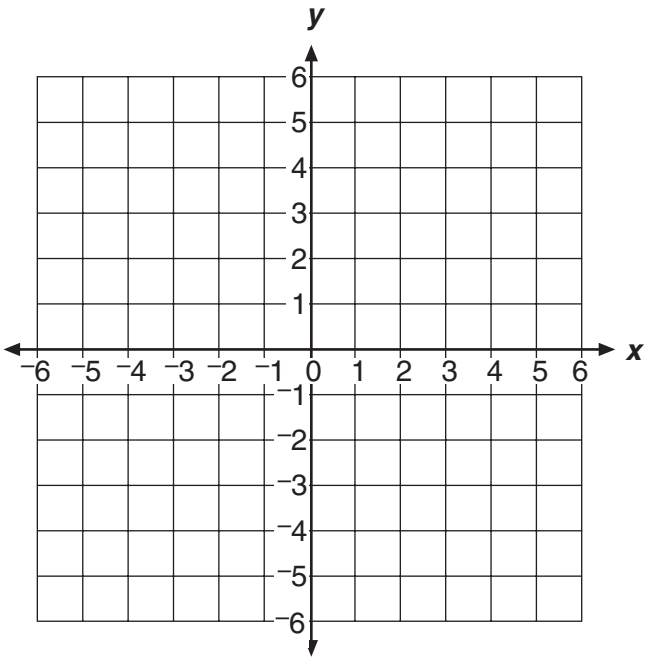
The Olympic Dream

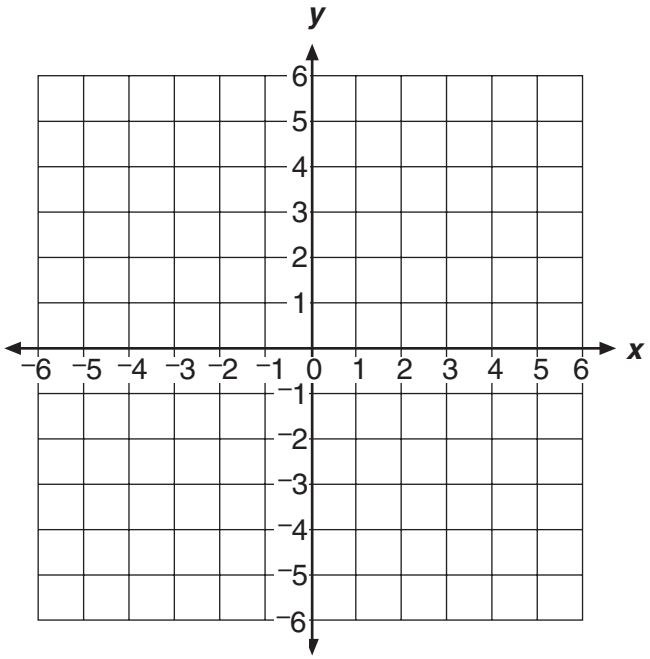
QUESTION ONE

(a) On the axes below, draw the graph of $y = 3x - 2$.



If you need to redraw either of these graphs, use page 10.

(b) On the axes below, draw the graph of $y = x^2 + 1$.



QUESTION TWO

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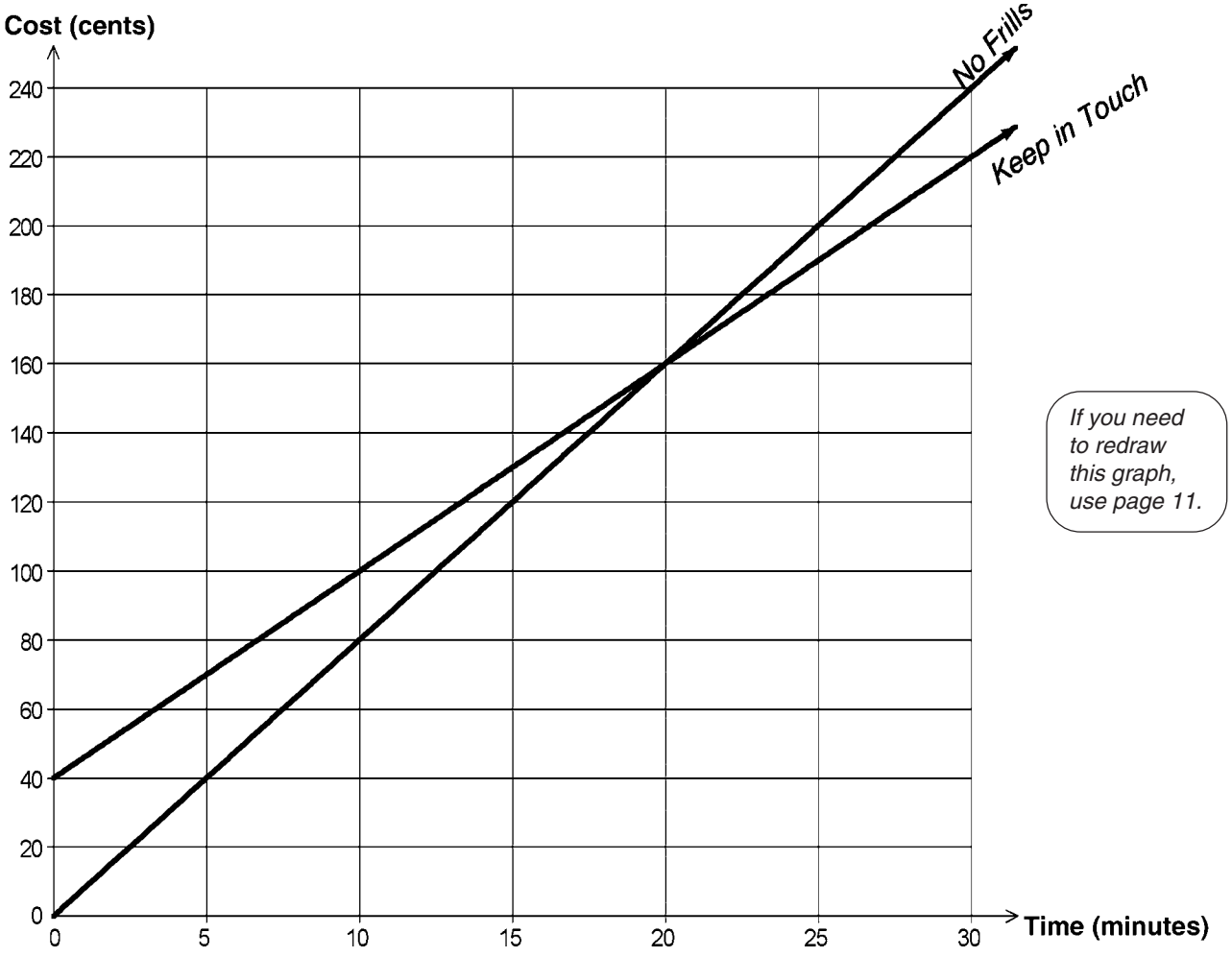
Wendy is overseas competing.

There are three international phone cards that she can buy:

the *No Frills* card, the *Anytime* card and the *Keep in Touch* card.

The graph below shows the call costs for the *No Frills* and *Keep in Touch* cards for up to 30 minutes.



If you need to redraw this graph, use page 11.

The *Anytime* card costs 5 cents per minute plus a 20 cent per call connection fee. The cost per call using the *Anytime* card can be described by the equation:

$$C = 5t + 20$$

where t = time for one call (in minutes)
and C = cost per call (in cents).

(a) On the axes above, draw the graph for the *Anytime* card from $t = 0$ minutes to $t = 30$ minutes.

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(b) (i) Which ONE of the three phone cards has the highest connection fee per call?

_____

(ii) How is this shown by the graphs?

_____

_____

_____

(c) (i) How long is a call that costs the same using the *No Frills* card and the *Keep in Touch* card?

_____

_____

(ii) How is this shown by the graphs?

_____

_____

_____

(d) (i) Use the graph to write the equation for the *No Frills* card.

_____

_____

C = _____

(ii) Use the graph to write the equation for the *Keep in Touch* card.

_____

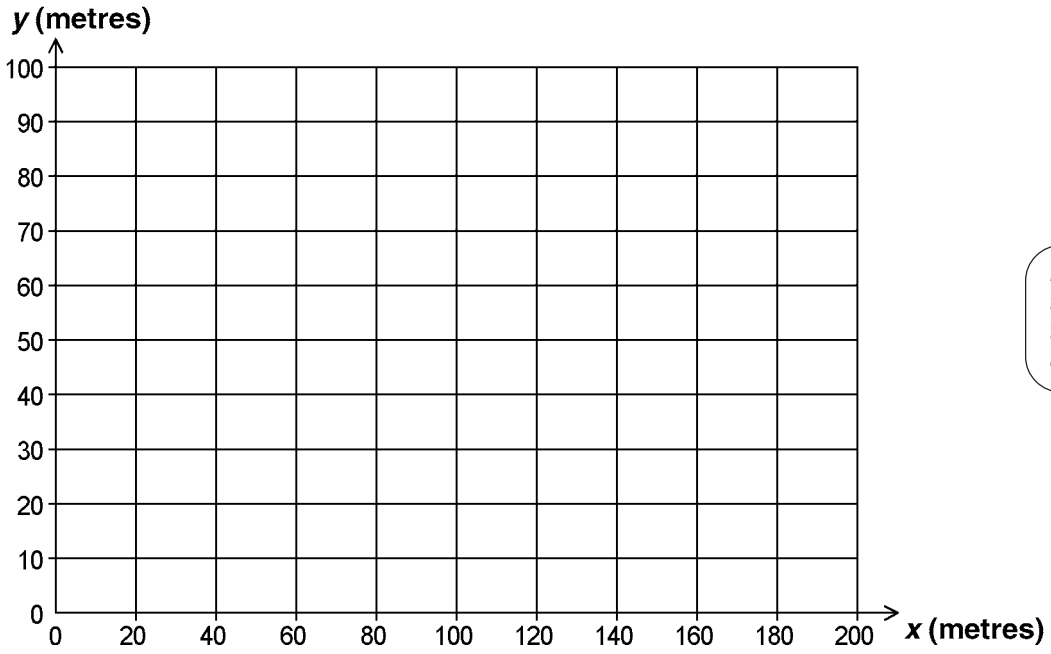
_____

C = _____

QUESTION THREE

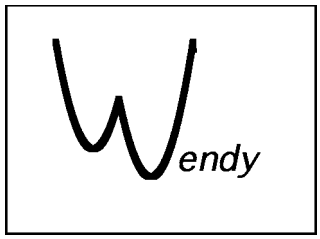
Assessor's use only

(a) The path leading to the pool entrance has the equation $x + 3y = 180$.
On the axes below, draw the graph of the path from $x = 0$ to $x = 180$.



If you need to redraw this graph, use page 11.

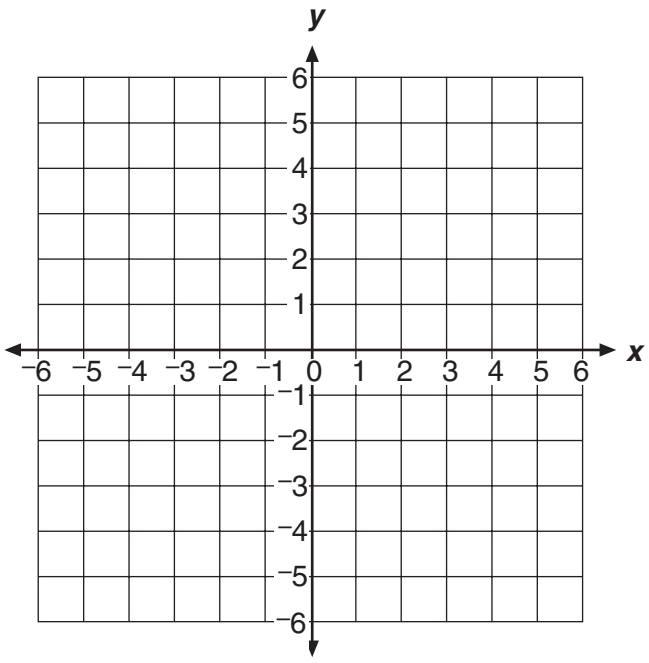
(b) Wendy sketches a logo for her swimsuit:



On the axes below, draw the graph of the 'W' that can be modelled by the equations:

(i) $y = (x - 4)(x - 1)$

(ii) $y = (x + 2)^2$



If you need to redraw this graph, use page 10.

QUESTION FOUR

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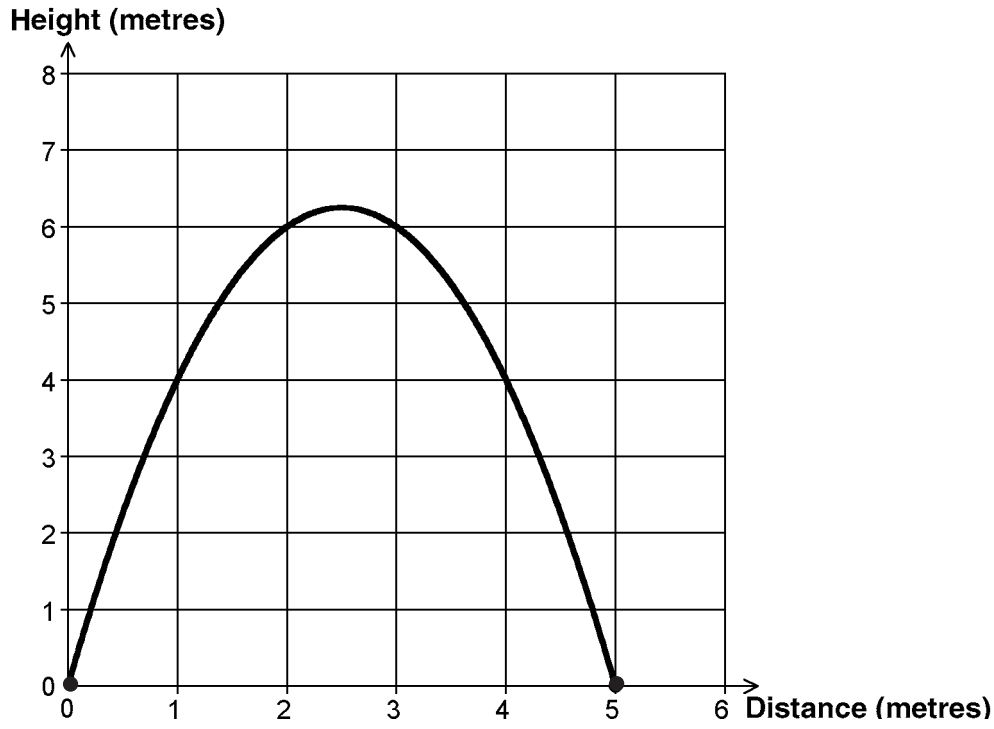
The entrance to the pool is a small tunnel that can be modelled by the quadratic equation:

$$h = d(5 - d)$$

where h = height of the tunnel (in metres)
and d = distance from the left-hand edge of the tunnel (in metres)

The graph for the height of the tunnel is shown below.



(a) (i) What is the maximum width of the tunnel?

_____

_____

(ii) How is this shown on the graph?

_____

_____

(b) (i) What is the maximum height of the tunnel?

_____

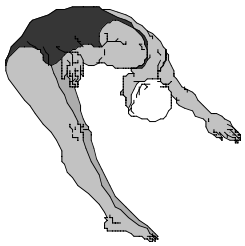
_____

(ii) How is this shown on the graph?

_____

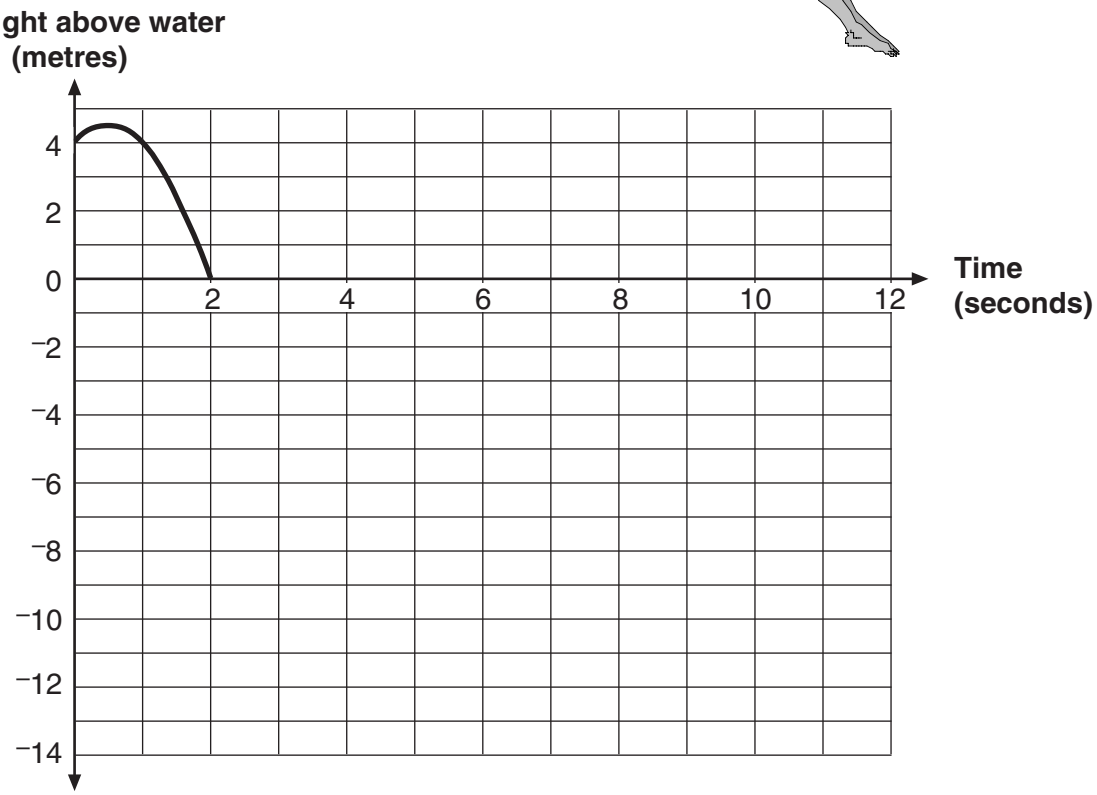
_____

QUESTION FIVE



Wendy is preparing for the 4 metre high diving event.

Part of her dive is shown in the graph below.



(a) From the time she leaves the diving board until she touches the bottom of the pool, her dive is modelled by a parabola.

Write the equation for ***h***, the height above the water, in terms of time, ***t***, that models Wendy's dive until she touches the bottom of the pool.

(b) Once she touches the bottom of the pool, she rises to the surface at a **constant rate** of 2 metres per second. Wendy breaks the surface again 7 seconds after starting her dive.

Write an equation that models her return from the bottom of the pool back to the surface. You may wish to draw on the graph above.

(c) Wendy knows that to achieve a perfect dive, her hands must be within 4 metres of the bottom of the pool 2.5 seconds after starting her dive.

Use your equations from (a) and (b) to find out if Wendy is within 4 metres of the bottom of the pool 2.5 seconds after starting her dive.

Show all working using algebraic techniques. It is NOT sufficient to read values off the graph.

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If you have made a mistake and need to redraw a graph, use the appropriate copy printed here and on page 11.

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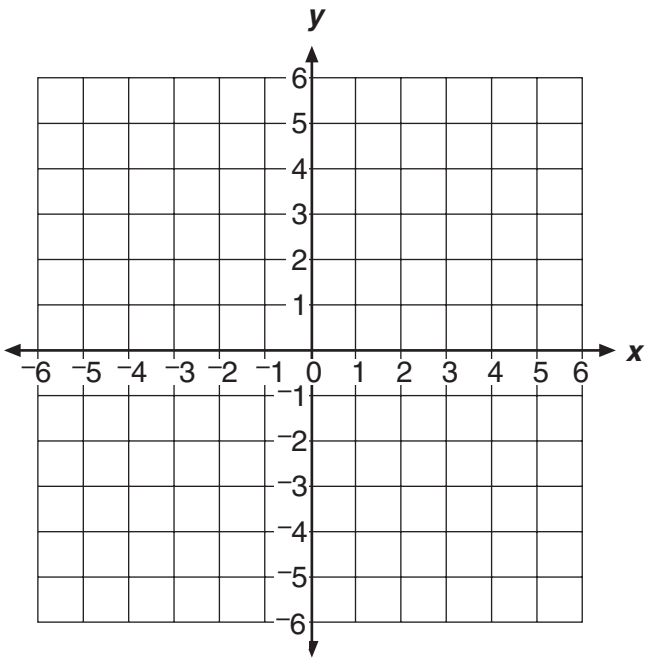

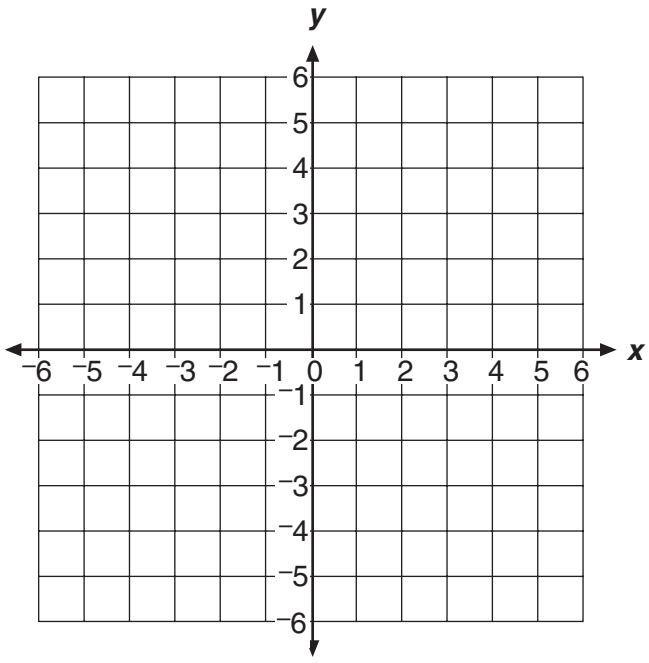

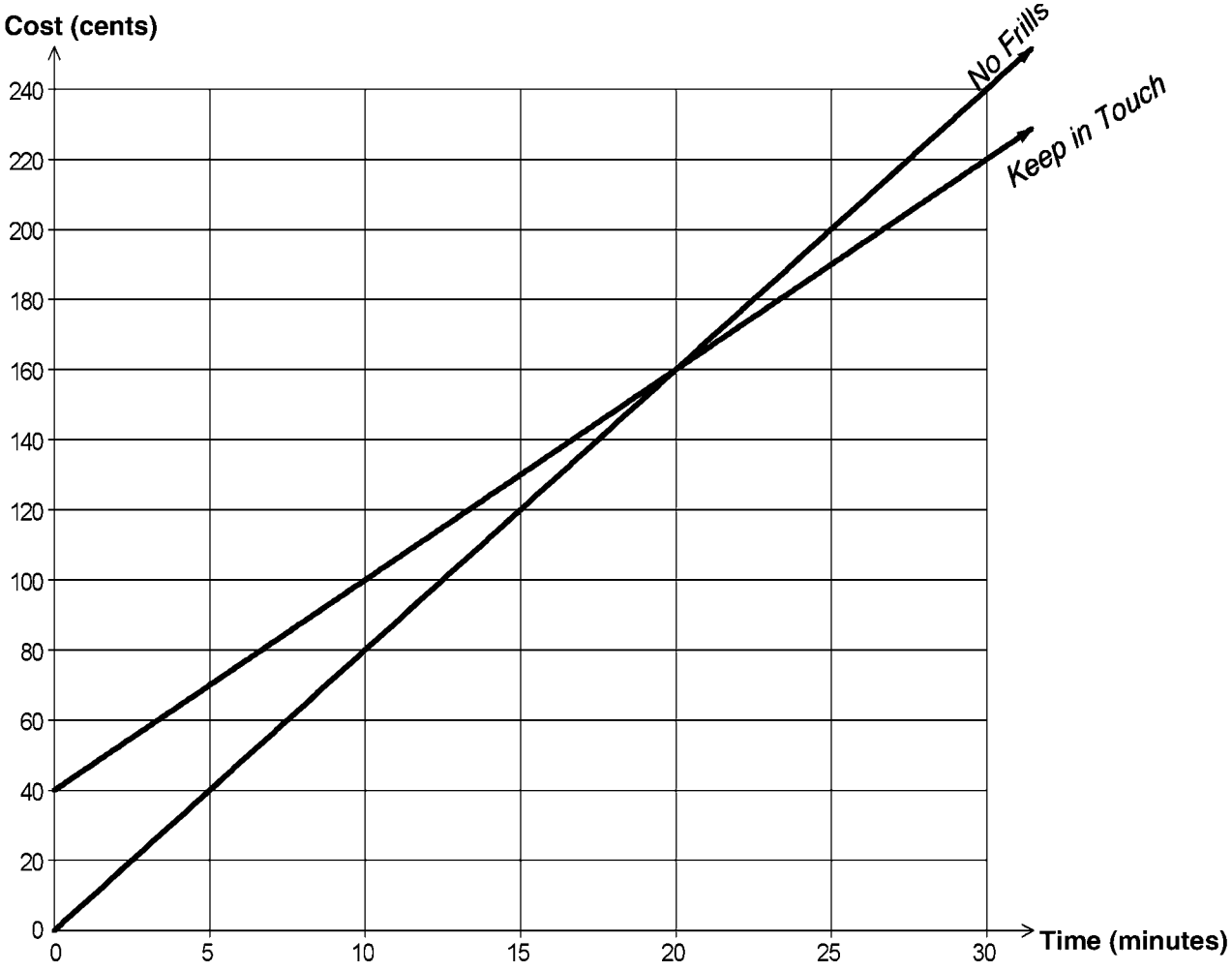

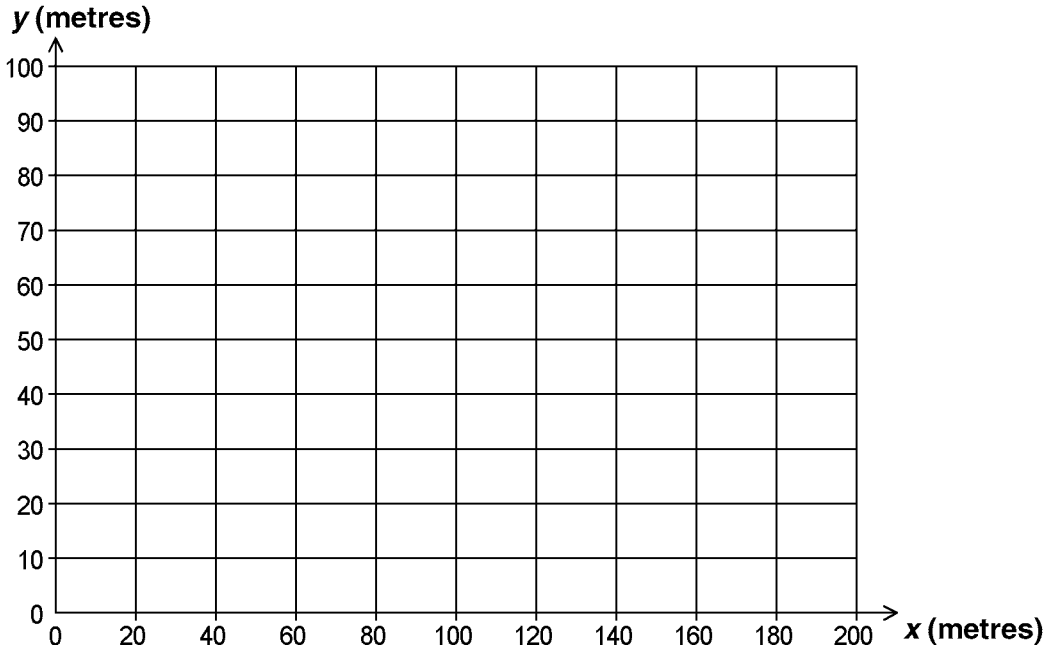

Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question Number