NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2003

Mathematics: Sketch and interpret linear or quadratic graphs (90148)

National Statistics

Assessment Report

Assessment Schedule

Mathematics: Sketch and interpret linear or quadratic graphs (90148)

National Statistics

Number of Results	Percentage achieved			
	Not Achieved	Achieved	Merit	Excellence
38,413	48.5%	28.0%	22.2%	1.3%

Assessment Report

Every candidate for a National Certificate of Educational Achievement examination paper is expected to:
- read the question and do what the question asks
- allow adequate time to complete answers
- be accurate: check and/or proofread
- use appropriate technical terms
- bring the correct equipment
- write and/or draw clearly
- use pen if work is to be eligible for reconsideration.

General Comments

Candidates are required to sketch and interpret linear or quadratic graphs to achieve the standard. An improvement in the Achievement level for many candidates would occur if:

1. all questions were attempted, as it is possible to fulfill the requirements of the standard in later questions to compensate for an error or other deficiency made in the first few questions

2. features of graphs were written in a more precise mathematical way

   Linear graphs may have the following features that will need to be interpreted:

   (i) intercepts on axes

   (ii) gradients

   (iii) points of intersection.

   Quadratic graphs may have the following features that will need to be interpreted:

   (i) intercepts on axes

   (ii) an axis of symmetry

   (iii) a turning point (vertex)

   (iv) a *stretch factor*, for merit or excellence.

3. in sketching of linear graphs their lines must be:

   (i) a straight line, ie not drawn free-hand

   (ii) not a series of dots in a line when the variables are continuous, but a drawn line

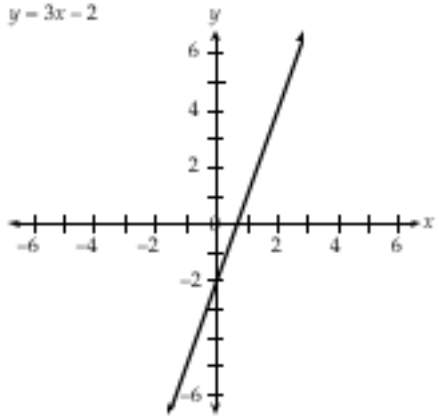
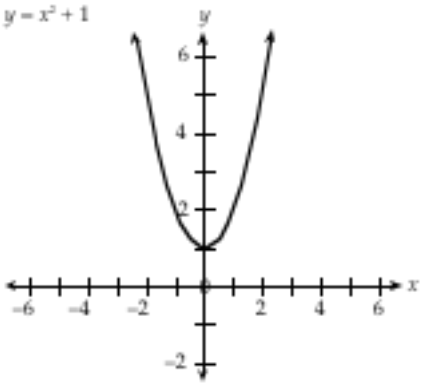
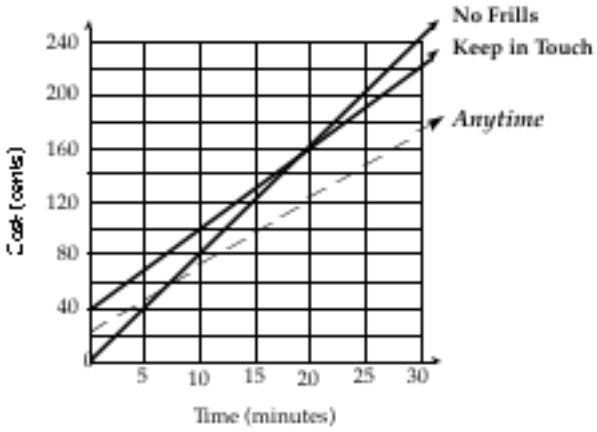
4. in sketching of quadratic graphs their curves must be:
   (i) smooth, especially around the turning point, not V shaped or flat bottoms
   (ii) not just a series of dots when the variables are continuous
   (iii) symmetrical

5. when drawing linear or quadratic graphs, candidates should be expected to do the calculations necessary to locate the important features of the models. Alternatively, candidates could compose a table of coordinates to assist in the sketching of the graphs

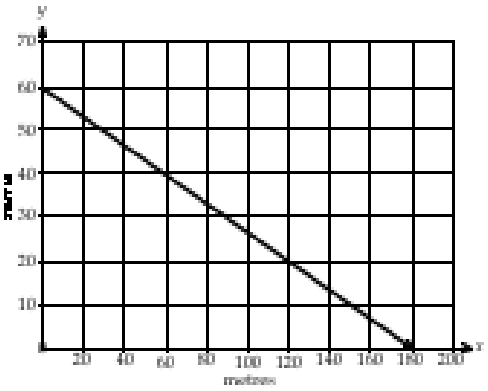
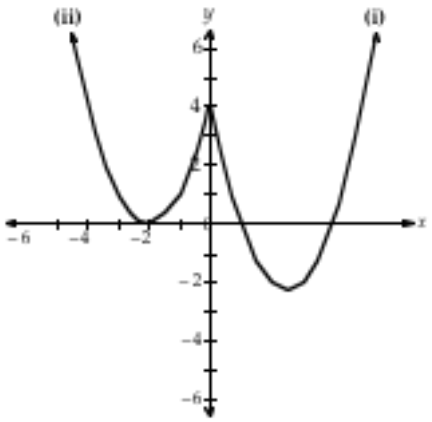
6. more care is taken in reading scales.

Assessment Schedule

Mathematics: Sketch and interpret linear or quadratic graphs (90148)

	Criteria	No.	Code	Evidence	Judgement	Sufficiency
Achievement	Sketch and interpret features of linear or quadratic graphs.	One (a)	L		Units not required in this assessment, including $, c. Must have straight line through (0, –2) and (1, 1) OR through any two correct points.	**Achievement :** **two** L **OR** **two** Q.
		One (b)	Q		Must have a smooth parabola with a vertex at (0,1) passing through (1,2) and (–1,2). Correct shape, ie symmetry. Curve close to other correct points.	**AND**
		Two (a)	L		Must have a straight line through (0,20) and (30,170). Last 10 minutes of line need not be drawn.	
		(b) (i)	F l	*Keep in Touch* card	Or equivalent.	
		(b) (ii)	F l	Highest point on Cost axis (highest *y*-intercept), highest intercept *y*-intercept = 40 cents		
		(c) (i)	F l	*t* = 20 min (160 cents X)	Or equivalent.	**Three** F l.

		Two (c) (ii)	F1	The intersection of the two graphs. Accept words like intercept / interception.		OR
		Four (a) (i)	F q	5	Units not required	**three** of F q
		(a) (ii)	F q	Intercepts on d axis (or x axis), widest horizontal distance of the parabola, graph, curve.	Or equivalent	
		(b) (i)	F q	h = 2.5(5 – 2.5) = 6.25 m **[625 cm, or 610 cm – need units here].**	Accept $6.1 \le h \le 6.4$ Or equivalent	
		(b) (ii)	F q	625 or similar X, as answer a missing decimal point. Vertex of the parabola, maximum point on the graph, y coordinate of the vertex, turning point.		

	Criteria	No.	Code	Evidence	Judgement	Sufficiency
Achievement with Merit	Sketch graphs of linear and quadratic relations from equations, interpret features of linear and quadratic graphs, and write equations for linear graphs.	Three (a)	L		Must have straight line through (0, 60) and (180, 0).	**Merit:** **graphs** of linear and quadratic, **two** of L **AND** **two** of Q **AND**
		(b) (i)	Q			
		(b) (ii)	Q		Must have smooth parabolic curve through (0, 4), (1, 0), (4, 0). Vertex must be below y = –2 and above or equal y = – 3. A smooth parabolic curve through (–3, 1), (–2, 0), (0, 4). Symmetry is important feature on the quadratic graphs.	**three** of F l **AND** **three** F q **AND** **two** W.
		Two (d) (i)	**W**	$C = 8t$ $y = 8x$	Or equivalent.	
		(d) (ii)	**W**	$C = 6t + 40$ $y = 6x + 40$	Or equivalent.	
		Five (b)	**W**	$h = 2t - 14$ $y = 2x - 14$	Or equivalent. They must be equations.	

Achievement with Excellence	Determine and apply an appropriate algebraic model for a graphical situation.	Five (a) (c)	E	$h = 2(2 - t)(t + 1)$ or $h = -2(t^2 - t - 2)$ or $h = -2[(t - {}^1/_2)^2 - 2\,{}^1/_4]$ or $h = -2(t - {}^1/_2)^2 + 4\,{}^1/_2$ or $h = -2t^2 + 2t + 4$ $h(2.5) = -3.5$ using parabola formula substitution Depth of pool = 8 metres, either found algebraically or read off the graph: • if algebraic need to see some working • if off the graph need to see point (3, –8) as the intersection point. Not within 4 m as has **4.5 m** to go to reach the bottom.	Or equivalent using x and y. Must have 1. substitution 2. depth of pool 3. statement including 4.5. Must have reason and algebraic working shown. It is not sufficient to read the value off the graph.	**Excellence:** Merit plus 2E.

Replacement Evidence

For L
Question Five (b) plotting of at least 3 points for the line correctly from (0, –14) to (7, 0) and joining them.
Consistency in

Two (b) (i) and (ii)	eg No Frills X, steepest gradient F_{lc}
	eg No Frills X, highest Cost intercept F_l
Two (c) (i) and (ii)	eg 7.5 min X, intersection point of two lines F_{lc}
Three (b) (i) and(ii)	eg if the graph is a reflection in the y axis then XQ_c
Four (a) (i) and (ii)	eg height of graph X, highest point on graph X
Four (b) (i) and (ii)	eg read with script for meaning as in "Line on Graph" read "Curve on Grid"
Five (a)	correct quadratic equation is replacement evidence for a W

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
*Sketch and interpret features (***FI or Fq***) of linear* **(L***) or quadratic* **(Q***) graphs.* **Judgement Statement** *Two of code* **L** ***or*** *two of code* **Q** *and three of code* **FI** *or three of code* **Fq.**	*Sketch graphs of linear* **(L)** *and quadratic relations* **(Q)** *from equations, interpret features of linear (***FI***) and quadratic graphs* **(Fq***), and write equations* **(W)** *for linear graphs.* **Judgement Statement** *Two of code* **L** ***and*** *two of code* **Q** *and three of code* **FI** ***and*** *three of code* **Fq** *and two of code* **W**	*Determine and apply an appropriate algebraic model for a graphical solution* **(E)**. **Judgement Statement** *Merit plus two of code* **E**

Note: Insufficient evidence to support a judgement above **(X).**