NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2002

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
37,846	41%	46%	10%	3%

Assessment Report

General Comments

There were a lot of blank answer booklets. About 15% of candidates who entered for the standard did not attempt it.

A significant number of candidates attempted only the first two pages. This removed any chance of using supplementary evidence to help achieve the standard. Less able candidates need to concentrate on what is needed to achieve this standard, not just try bits and pieces through the paper.

Many candidates struggled to draw the graphs of the contextual situations where there were different scales on the x– and y-axes.

When graphing linear graphs, candidates should remember that their lines must be:

- straight (use a ruler)
- a single line
- not just a series of dots in a line when the variables are continuous.

When graphing quadratic graphs, candidates should remember that their curves must be:

- smooth, including around the turning point
- a single line
- not just a series of dots when the variables are continuous
- symmetrical

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

- intercepts on axes
- specific gradients
- the same gradient
- intersect with each other

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

- intercepts on axes
- an axis of symmetry
- a turning point
- a stretch factor

Comments on Specific Questions

Question One

Many candidates counted the number of grid squares, rather than using the scales provided on the axes.

A significant number of candidates used the y-intercept and then stepped off the gradient, rather than simply calculating the endpoints on the interval provided.

There was confusion between the words ‘intersect’ and ‘intercept’.

Many candidates did not understand the concept of rates.

The majority of candidates described the calculation, rather than simply stating that the gradient was the feature of the graph being assessed.

Some candidates incorrectly included $ signs in their linear models.

Question Two

Many candidates wrote a quadratic model for the more complicated linear situation.

Candidates need to check whether the gradient of the line on the graph given is positive or negative and adjust their linear model accordingly.

Many candidates drew straight lines for the quadratic situations.

When drawing the graphs of the quadratic functions, candidates are expected to know that they need to do the calculations necessary to locate the important features of the quadratic models. They may wish to draw up a table of coordinates to help.

The quadratic graphs needed to cover the whole domain stated.

Candidates were better at drawing quadratic graphs that were in factor form than those that were in transformation form.

Question Three

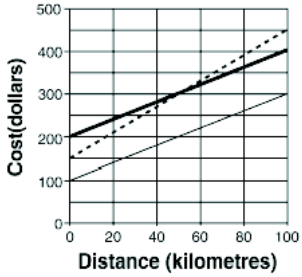
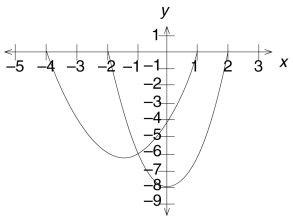
Candidates need to read the information out of the accompanying text rather than trying to read values of the provided graph.

Graphical models require an equation, not just an expression like $3t + 2$.

Solutions to this question required algebraic calculations, rather than just reading values off the provided graph.

Assessment Schedule

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

	Achievement Criteria	No.	Evidence	Code	Judgement	Sufficiency
Evidence contributing to Achievement	Sketch and interpret features of linear or quadratic graphs.	One (a)	Cheap Coaches: Graph of $C = 2, d + 200$ 	**G**	Units not required with any answers in this activity.	ACHIEVEMENT: One of Code **G** **and either** Two of Code **L** **or** Three of Code **Q**
				G	Linear graph from (1, 200) to at least (50, 300).	
				G		
		Two (b)	The Logo: Graph of (i) $y = (x+4)(x-1)$ (ii) $y = 2x^2 - 8$ 		(i) Smooth parabola from at least (–4, 0) to at least (1, 0) through (–1.5, –6.25) and (0, –4) – accept the y-value of turning point in the range $-6.5 \le y \le -6.0$ (ii) Smooth parabola from at least (–2, 0) to at least (2, 0) through (0, –8).	
		One (b)	50 km intersection of the graphs or where the graphs cross.	**L**		
		(c)	The Cheap Coaches and the 45-seat Betta bus same (or equal) slope (or gradient) or parallel lines	**L**	Answers to One (b) and (c) **must be consistent** with their graph.	
		(d)	Cost of \$3 Slope or gradient	**L**		
		Two (c)				
		(i)	8 cm or consistent with **their** graphs	**Q**	$3d$ or $3x$ wrong. Just the calculation shown is wrong. Accept 8.5 cm.	
		(ii)	From the lower turning point up to the x-axis	**Q**		
		(iii)	6 cm or consistent with their graphs	**Q**		
		(iv)	Difference between the outside x-intercepts	**Q**	Their answer must link to the lowest part of the logo	

	Achievement Criteria	No.	Evidence	Code	Judgement	Sufficiency
Evidence contributing to 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.	One (e) (i) (ii) Two (a)	45-seat Betta: $C - 2d + 100$ 60-seat Betta $C - 3d + 100$ $y = -0.5x - 2$	**M** **M** **M**	Or equivalent. Accept use of x or y. Or equivalent. Accept use of x or y. Or equivalent. Accept written as $y = -1/2\,x - 2$.	ACHIEVEMENT WITH MERIT: **Two of Code** G and **Two of Code** L and **Three of Code** Q and **Two of Code** M
Evidence contributing to Achievement With Excellence	Determine and apply an appropriate algebraic model for a graphical situation.	Three (a) (b)	$H = 3t + 2$ $H = -(t-12)^2 + 36$, or $H = -(t-6)(t-18)$ $H = (6-t)(t-18)$ $H = (t-6)(18-t)$ $3t + 2 = 27$ $t = 8\frac{1}{3}$ $-(t-12)^2 + 36 = 27$ $t = 15$ or 9 $t = 15$	**E M** **E M** **E** **E**	Or equivalent. If (0, 3) and (9, 30) is used, $H = 3t + 3$. If (0, 2) and (9, 30) is used then $H = \frac{28}{9}t + 2$ or equivalent. In Three (b) candidate **must show working** and their answers **must be consistent** with their models in Three (a). Final answer must only have $t = 15$. Algebraic guess and check is acceptable as long as values are substituted into the original equations to show that they are correct.	ACHIEVEMENT WITH EXCELLENCE: **Merit** plus **Three of Code** E, including **the Quadratic model.** Replacement evidence: **If an** M **from Three (a) is needed as one of the two code** Ms **for Merit, then the candidate loses the corresponding code** E **for that model.**