



D&D Resources Ltd
Mathematics Exam Preparation Made Easy

External Achievement Standard - 91028

Practice External Assessments 1

RELATIONSHIPS BETWEEN TABLES, EQUATIONS AND GRAPHS

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NCEA 1 Maths

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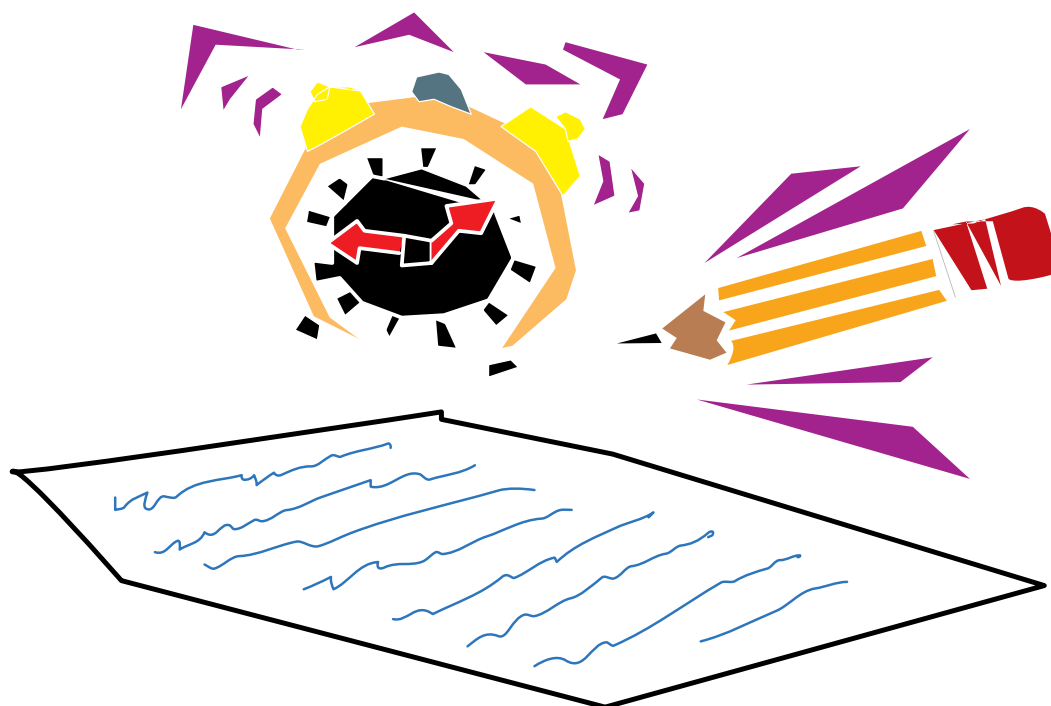
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The questions in the practice assessments are NOT in order of difficulty. Attempt all questions or you may not provide enough evidence to achieve the required standard.

Achievement Standard

91028

Investigate relationships between tables, equations and graphs

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Investigate relationships between tables, equations and graphs. 	<ul style="list-style-type: none"> Investigate relationships between tables, equations and graphs, with relational thinking. 	<ul style="list-style-type: none"> Investigate relationships between tables, equations and graphs with extended abstract thinking.

- ◆ This achievement standard is derived from Level 6 of The New Zealand Curriculum, Learning Media. The following achievement objectives taken from the Patterns and Relationships, Equations and Expressions, and Number Strategies and Knowledge threads of the Mathematics and Statistics learning area are related to this achievement standard:
 - ❖ find optimal solutions, using numerical approaches
 - ❖ solve linear equations and inequations, quadratic and simple exponential equations, and simultaneous equations with two unknowns
 - ❖ relate graphs, tables, and equations to linear, quadratic, and simple exponential relationships found in number and spatial patterns
 - ❖ relate rate of change to the gradient of a graph.
- ◆ Investigate relationships involves:
 - ❖ making links between tables, equations and graphs
 - ❖ demonstrating knowledge of concepts and terms
 - ❖ communicating using appropriate numeric, symbolic or graphical representations.
- ◆ Relational thinking involves one or more of:
 - ❖ selecting and carrying out a logical sequence of steps
 - ❖ connecting different concepts and representations
 - ❖ demonstrating understanding of concepts
 - ❖ forming and using a model;
 and also relating findings to a context, or communicating thinking using appropriate mathematical statements.
- ◆ Extended abstract thinking involves one or more of:
 - ❖ devising a strategy to investigate a situation
 - ❖ identifying relevant concepts in context
 - ❖ developing a chain of logical reasoning, or proof
 - ❖ forming a generalisation;
 and also using correct mathematical statements, or communicating mathematical insight.
- ◆ Relationships include the connections between matching features of tables, equations and graphs, as well as mappings between variables in a set of ordered pairs (relations).

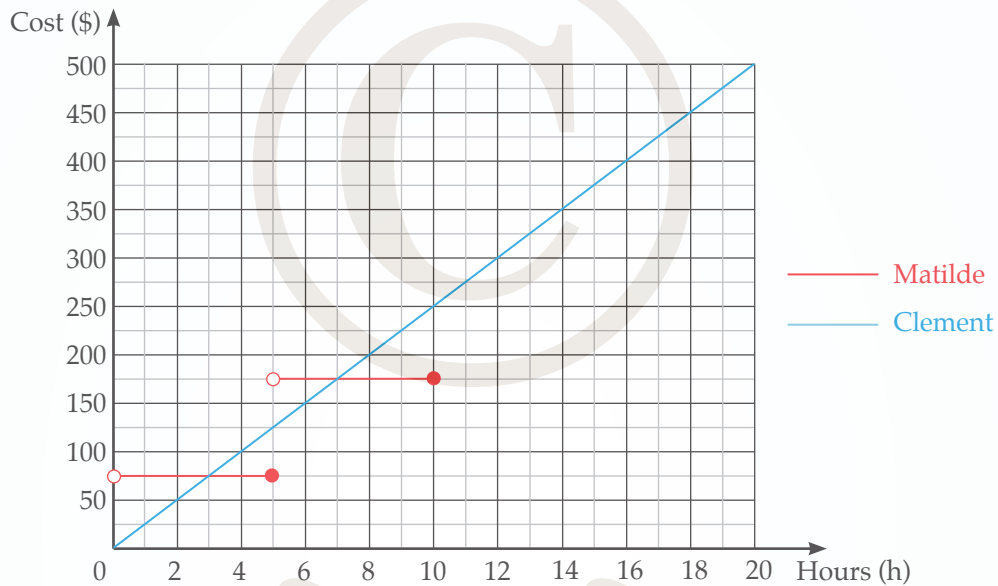
You are advised to spend 60 minutes answering this assessment.

You should show ALL working and answer ALL parts of ALL questions.

QUESTION ONE

Tessa is going to live in France with her host family for a year and before she leaves, she needs to improve her ability to speak French. Two French native speakers have been recommended to tutor her and will offer her a maximum of 20 hourly lessons.

(a) The graph of the amounts that Matilde and Clement will charge is shown below.




(i) What is the average cost per hour for lessons by Matilde if Tessa completes 10 lessons?

(ii) Once Tessa has completed 10 lessons, Matilde will charge \$125 for the next five lessons and \$100 for the five lessons after that.

On the grid above, show the amount that Matilde will charge for more than 10 hours.

(iii) Give the rule that Clement uses to charge for his French lessons.

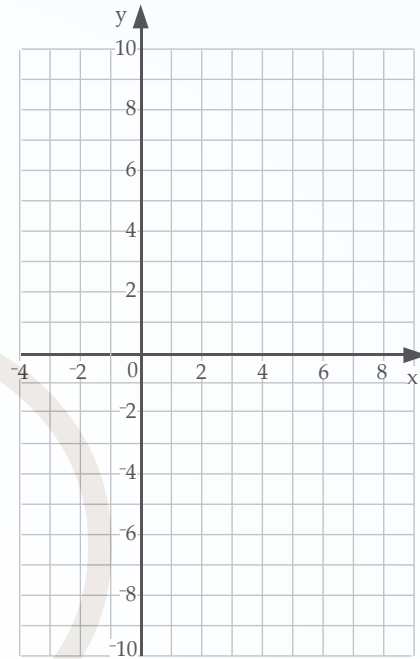


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QUESTION THREE

(a) The points listed in the table below lie on a parabola.

x	y
-2	7
-1	0
4	-5
6	7



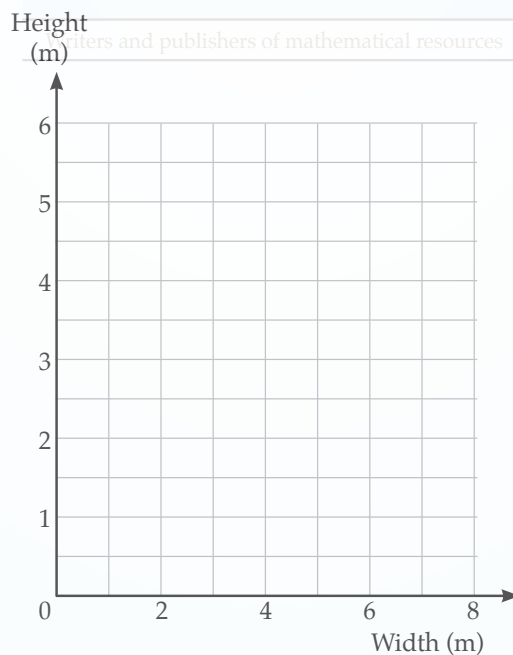
(i) Draw the parabola represented by these points, clearly showing any x intercepts and the vertex.

(ii) Give the equation of the parabola.

(iii) Find the equation of the new curve if the graph above is translated 2 units to the left, 4 units up and reflected across the x-axis.

(b) The cross section of the hayshed can be modelled by the equation $h = \frac{w(8-w)}{3}$, where w is the width in metres and h is the height in metres.

(i) Sketch the graph of $h = \frac{w(8-w)}{3}$.



- (b) In the fitness centre there are a number of medicine balls (weighted ball used for strength training).

Two people with their hands 2.4 metres apart are throwing a medicine ball to one another.

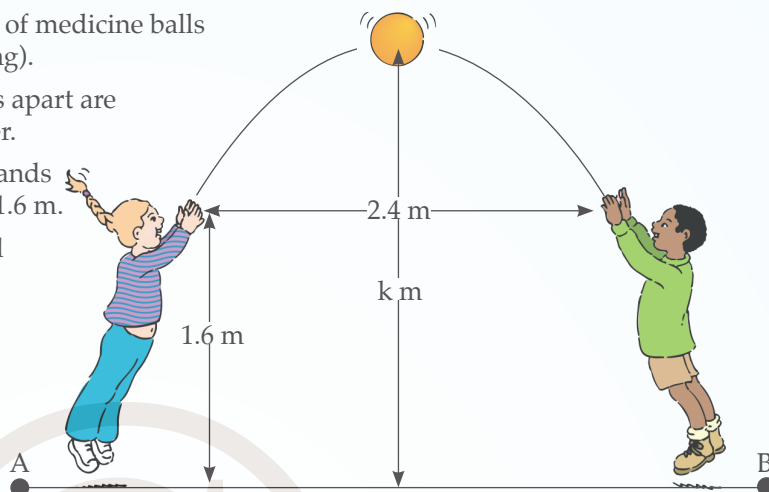
The height, from the ground, to their hands when they release the medicine ball is 1.6 m.

The maximum height the medicine ball reaches above the ground is k m.

The path of the medicine ball can be modelled by

$$y = -\frac{5}{8}(x-2)^2 + k$$

where y is the height of the medicine ball above the ground and x the distance from the point A.

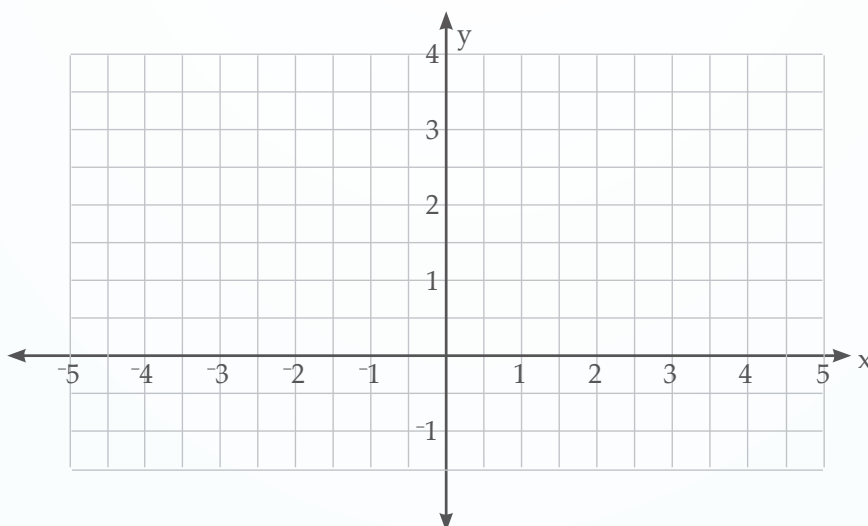


- (i) What is the distance between the points A and B on the ground? Justify your answer.

- (ii) Find the value of k .

- (iii) On the grid below sketch the graph that models the path of the medicine ball until it hits the ground.

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Answers – 91028

PEA 2

Quest.	Evidence	Achievement	Merit	Excellence
		Investigate relationships between tables, equations and graphs.	Investigate relationships between tables, equations and graphs, with relational thinking.	Investigate relationships between tables, equations and graphs with extended abstract thinking.
ONE		TWO of:	TWO of:	ONE of:
(a) (i)	$3p + 1 = 100$ $p = 33$. Pattern number 33.	<ul style="list-style-type: none"> correct answer. 		
(a) (ii)	Each pattern is an array of diamond shaped tiles. Pattern 1 has 1 column x 2 rows, Pattern 2 has 2 columns x 3 rows, Pattern 3 has 3 columns x 4 rows. This generates the rule $T = p(p + 1)$	<ul style="list-style-type: none"> vague description of how rule is generated. 	<ul style="list-style-type: none"> relationship described which links rows with columns. 	
(a) (iii)	$T = p^2 + 3p + 2$ or $(p + 1)(p + 2)$		<ul style="list-style-type: none"> progress towards finding the rule. 	<ul style="list-style-type: none"> equation given.
(a) (iv)	The graph is also a parabola but each point of $T = p(p + 1)$ has been translated to the left by 1, giving $T = (p + 1)(p + 2)$ or $p^2 + 3p + 2$.	<ul style="list-style-type: none"> incomplete description. 	<ul style="list-style-type: none"> clear description of transformation of graph. 	
(a) (v)	For any pattern number p , the difference between the number of tiles, T , for Tiling 3 and Tiling 1 will always be equal to squaring the pattern number and adding one more, that is, $p^2 + 3p + 2 - (3p + 1) = p^2 + 1$		<ul style="list-style-type: none"> progress towards finding a relationship. 	<ul style="list-style-type: none"> relationship and equation correct.
TWO		TWO of:	TWO of:	ONE of:
(a) (i)	$H = 0.8D - 4$	<ul style="list-style-type: none"> correct equation. 		
(a) (ii)	Growth prior to seedling breaking the surface of the topsoil.	<ul style="list-style-type: none"> correct explanation. 		
(a) (iii)	From 15 – 20 days, the graph is steeper. The seedling is growing at a rate of 1.2 cm each day. $H = 1.2D - 10$ From Day 20 – Day 30, the graph is less steep and the seedling is growing at a rate of 0.9 cm each day. It is still growing at a faster rate than in the first 15 days. $H = 0.9D - 4$	<ul style="list-style-type: none"> some aspect correctly described. 	<ul style="list-style-type: none"> partial description and one equation given. 	<ul style="list-style-type: none"> full description and two equations given.
(b) (i)	The sunflower is increasing in height by 60% per week.	<ul style="list-style-type: none"> correct answer. 		