Assessment Schedule – 2022

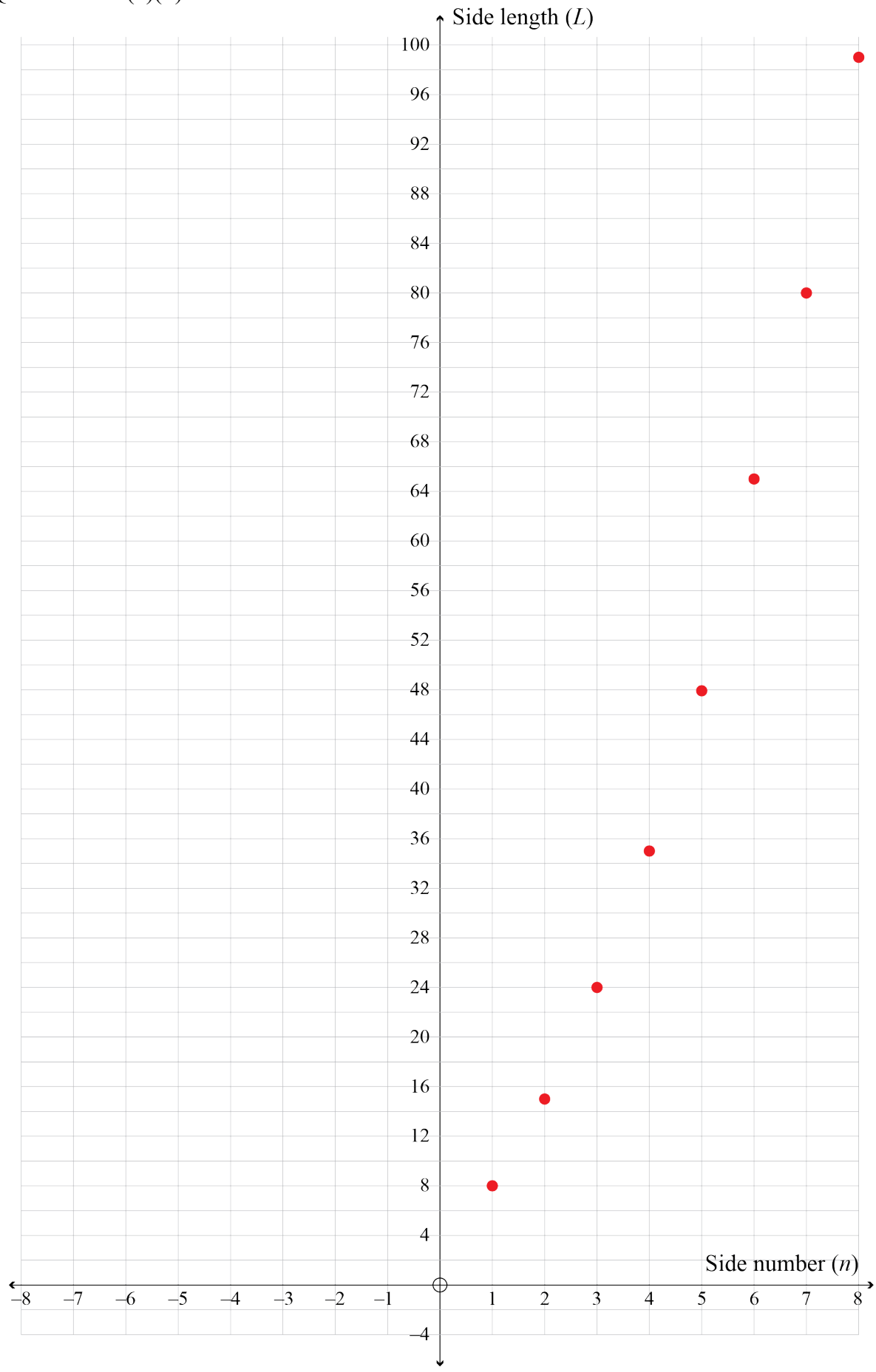
Mathematics and Statistics: Investigate relationships between tables, equations and graphs (91028)

Evidence

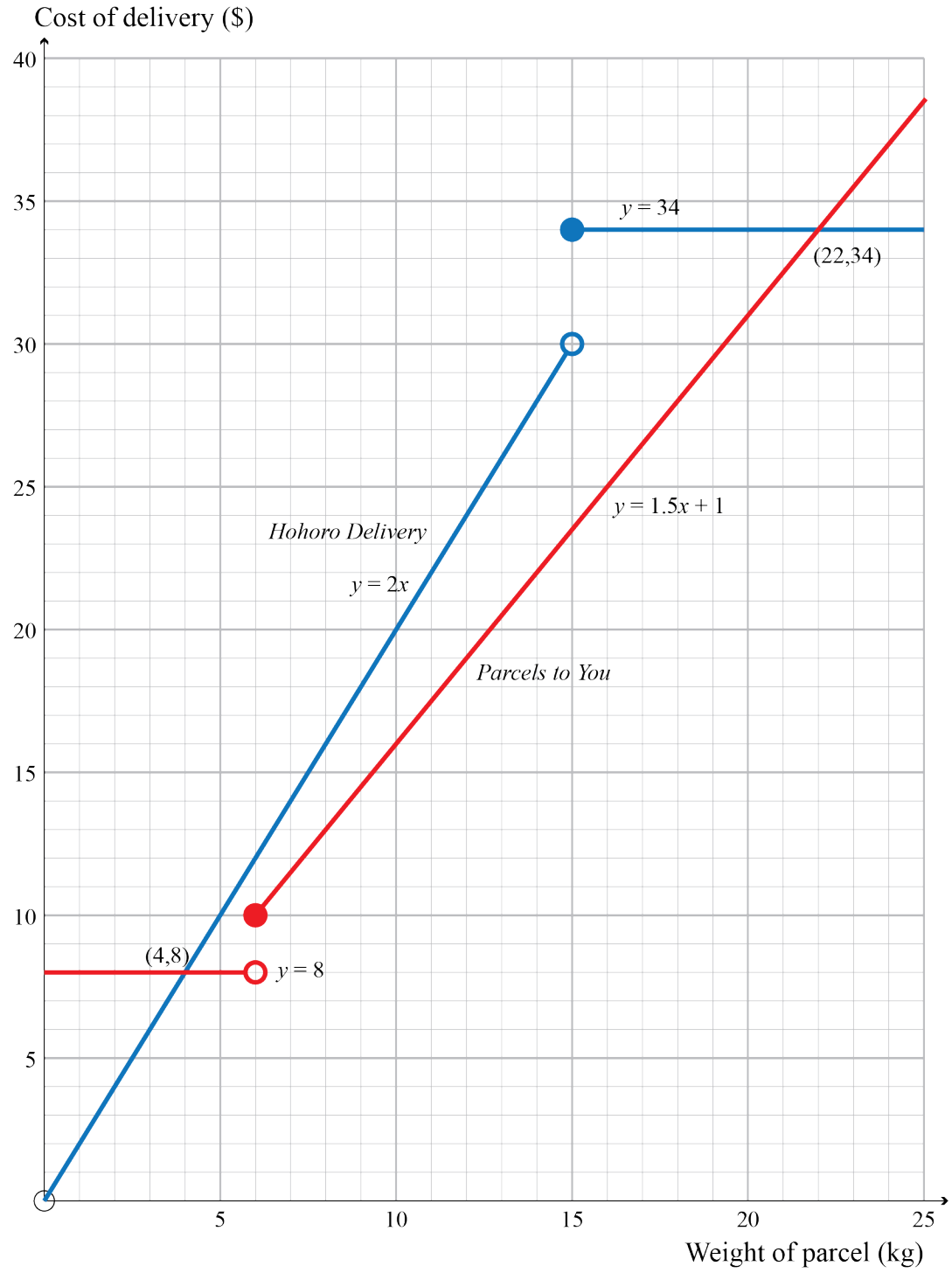
Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$m = 3$ Equation is $y = 3x + c$ (2,–1) gives $–1 = 6 + c$ $c = –7$ Equation is $y = 3x – 7$ OR By working on the graph OR Allow C.A.O.	Correct equation $y = 3x – 7$ • Allow any format.		
(b)(i)	<table><tr><td>6</td><td>63</td></tr><tr><td>7</td><td>80</td></tr><tr><td>8</td><td>99</td></tr></table> $L = n^2 + 4n + 3 = (n + 1)(n + 3)$ OR $L = (n + 2)^2 – 1$ Allow in terms of x and y.	• Correctly filled in table or equivalent on diagram.	• Correct formula.	
(ii)	Graph drawn, with discrete positive values only. (See solution at end of Q1 Schedule).	• Points plotted and joined to form a curve. At least 6 correct values included. No ruler used.	• Discrete points only plotted. At least 6 correct values included. **AND** No negative values plotted. Do not penalise if (0,3) or (0,0) included.	

(c)(i)	Graph for *Parcels to You* drawn, Showing $y = 8$ if $0 \le x < 6$ AND Showing $y = 1.50x + 1$ if $6 \le x < 25$ (See solution at end of Q1 Schedule.)	• Correctly drawn graph of $y = 1.50x + 1$ for $6 \le x < 25$ OR Correctly drawn graph of $y = 8$ $0 \le x < 6$	• Both sections of the graph for Parcels to You are correctly drawn.	• **T1** All sections for both graphs drawn correctly AND Equations for at least two of the four sections of the graph correct AND Identifies correctly when Hohoro and Parcels to You is the best option . (Accept minor error in graphs and omission of intersection points) • **T 2** All sections for both graphs drawn correctly including the closed and empty symbolisation. AND All equations for all sections for both graphs correct AND including the appropriate domains OR correct domains for best options (Intersection points identified by the correct domain or in words) AND • Valid interpretations made which identifies correctly when Hohoro and Parcels to You are the best option
(ii)	*Parcels to You*: Equations are: $y = 8$ if $0 \le x < 6$ AND $y = 1.50x + 1$ if $6 \le x < 25$ *Hohoro Delivery*: Equations are: $y = 2x$ if $0 \le x < 15$ AND $y = 34$ if $15 \le x < 25$ Intersections at (4,8) and (22,34), where both companies' pricing options are the same. If $0 \le x < 4$, best option is *Hohoro Delivery* If $4 < x < 22$, best option is *Parcels to You* If $22 < x < 25$, best option is *Hohoro Delivery.*	• Equations for both sections of *Parcels to You* OR Equations for both sections of *Hohoro Delivery*. OR One section of Hohoro Delivery drawn correctly.	• Correctly drawn graph for both sections of *Hohoro Delivery.* OR Equations for both sections of *Parcels to You.* AND Equations for both sections of *Hohoro Delivery.* OR Error in one part of the equations OR minor error in one part of the graphs. AND Part interpretation of the graphs. OR Correctly identified domains for the best options. (Allow in words.)	
	N1: one question attempted towards a solution N2: 1u	A3: 2 of u A4: 3 of u	M5: 1 of r M6: 2 of r	E7: T 1 E8: T 2

Question One (b)(ii)



Question One (c)(i) and (ii)

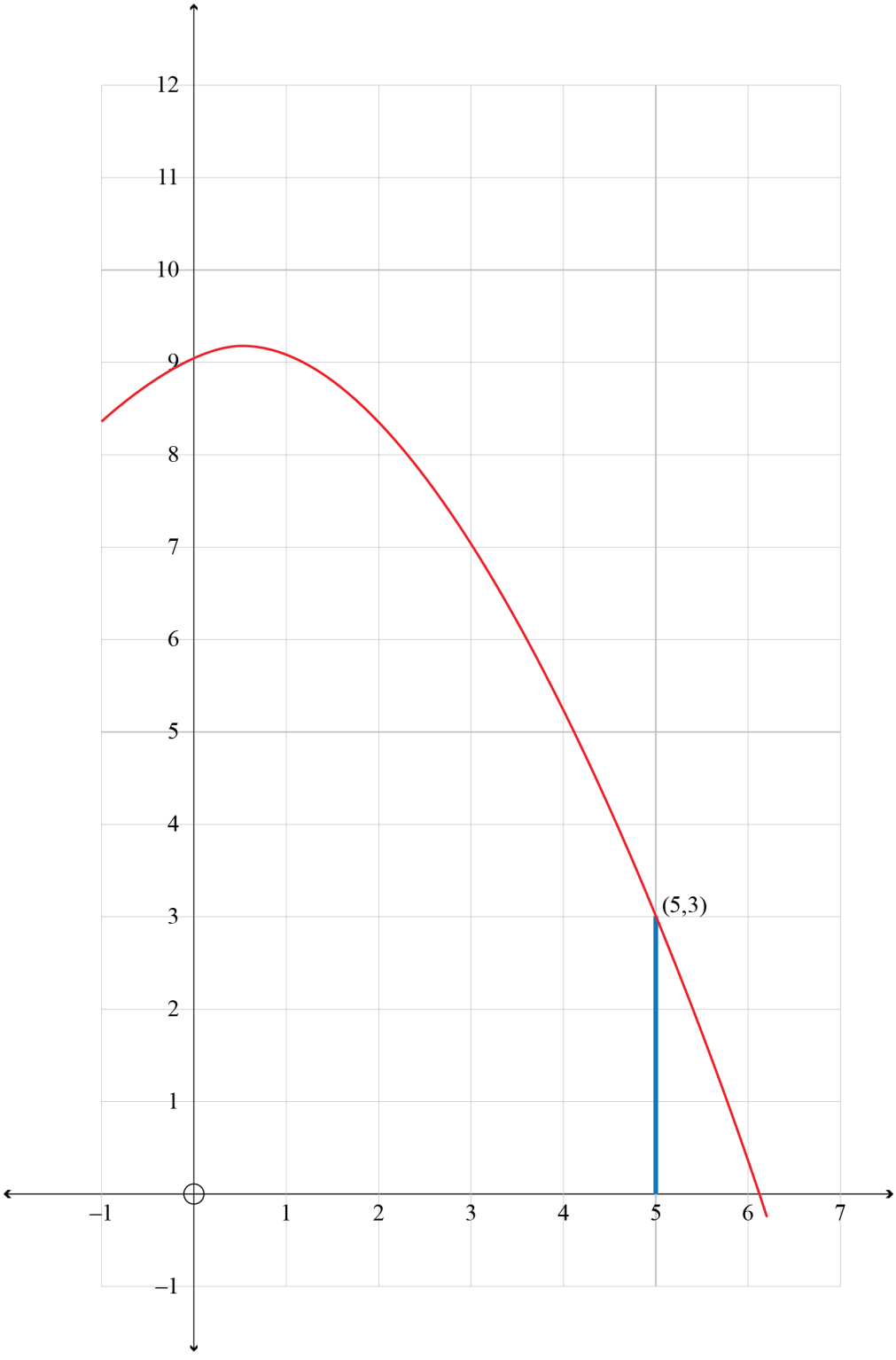


Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i)	$y = (x - 4)^2 - 8$ OR $y = x^2 - 8x + 8$ Allow C.A.O.	• Correct equation.		
(ii)	The new graph has had: • vertical shift upwards of 24 units • horizontal shift of 12 units to the left • new vertex is (-8, 16) • narrowing of the graph's width • new graph will be totally above x-axis.	• Details of ONE of the transformations. OR Partly describe TWO transformations.	• Details of TWO of the transformations with no incorrect details.	
(b)(i)	$q = 9$ Allow C.A.O.	• Correct answer.		
(ii)	$0 = -p \times 4^2 + 9$ $p = \frac{9}{16} = 0.5625$ Allow consistency from (b)(i).	• Correct value of p with some justification.		

(iii)	Using the symmetry property of a parabola, if the graph crosses at (6,0) then it must cross also at (–5,0). Equation is $y = k(x + 5)(x – 6)$ Graph goes through (0,9) gives: $9 = k(0+5)(0-6)$ $9 = –30k$ $k = -\frac{9}{30} = -\frac{3}{10} = –0.3$ So equation is $y = –0.3(x + 5)(x – 6)$ OR $y = –0.3x^2 + 0.3x + 9$ OR $y = –0.3(x – 0.5)^2 + 9.075$ Then maximum height is when $x = 0.5$. Substituting this value into the equation gives maximum height of 9.075 metres.	• Equation of $y = (x + 5)(x – 6)$ OR C.A.O.	Consistent evaluation of the maximum height.	T1 • Showing, that equation is $y = –0.3(x + 5)(x – 6)$ or equivalent. AND Maximum height found. T2 • Correct equation of graph found. AND Position of Dani located and communicated.
(iv)	Using equation of curve found in part (iii). (Allow for consistency.) **Method 1:** Height of ball is 3 metres gives $3 = –0.3(x-0.5)^2 + 9.075$ $3 – 9.075 = –0.3(x-0.5)^2$ $–6.075 = –0.3(x-0.5)^2$ $\frac{–6.075}{–0.3} = (x-0.5)^2$ $20.25 = (x-0.5)^2$ $\sqrt{20.25} = (x-0.5)$ $4.5 = x – 0.5$ $x = 5$ I.e. Dani is 5 metres from the apartment block. **Method 2:** Height of ball is 3 metres gives $3 = –0.3x^2 + 0.3x + 9$ $0 = –0.3x^2 + 0.3x + 6$ $0 = 3x^2 – 3x – 60$ $0 = x^2 – x – 20$ $0 = (x-5)(x+4)$ $x = 5$ or $x = –4$ (ignore) I.e. Dani is 5 metres from the apartment block. **Method 3:** Draw accurate graph, reading off intersection of curve and y = 3. I.e. Dani is 5 metres from the apartment block.	• Attempt at solving equation = 3 OR Appropriate graph drawn. OR C.A.O.	Consistent solving of equation = 3 OR Correct graph of the curve drawn showing the position of Dani.	

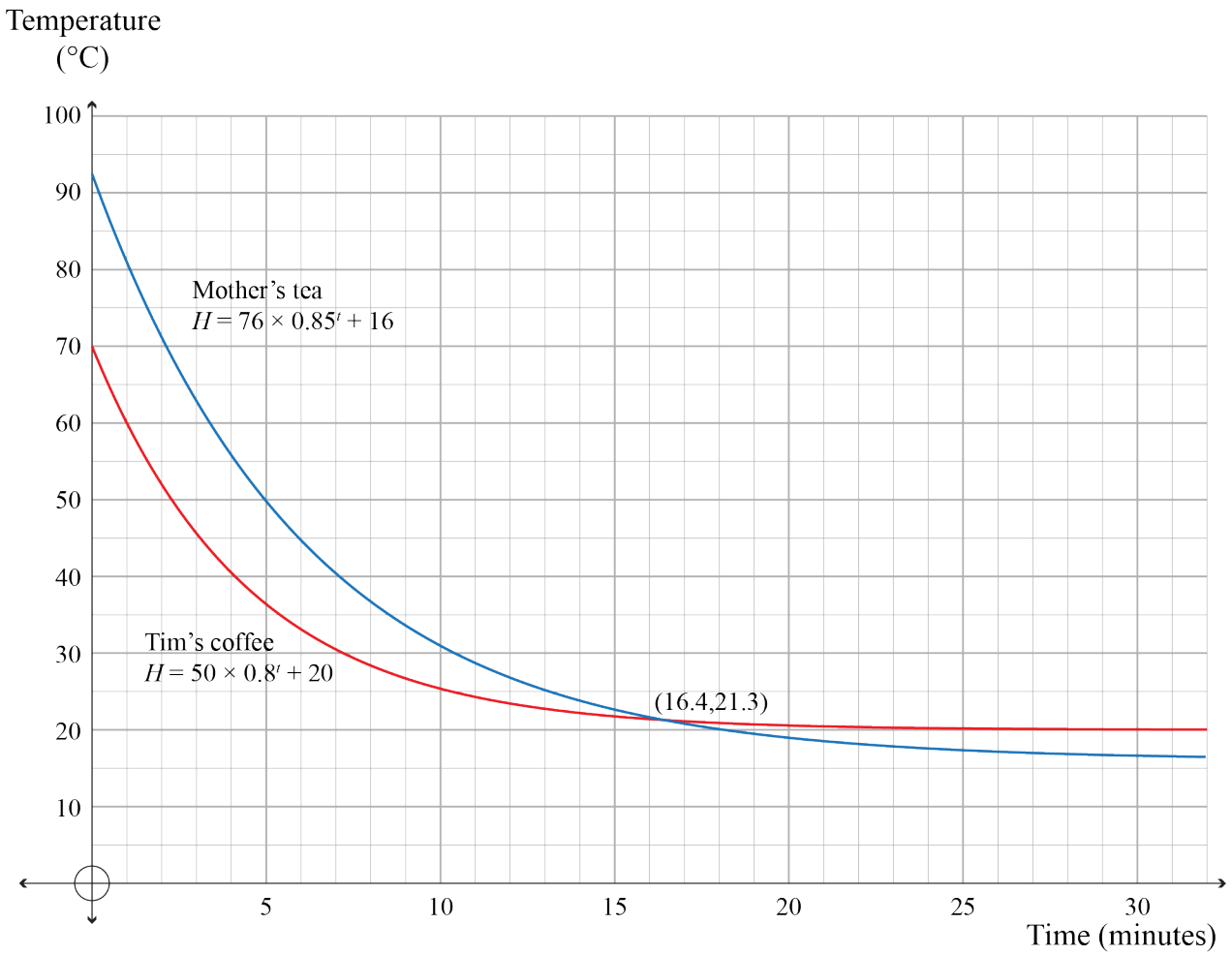
	N1: one question attempted towards a solution N2: 1u	A3: 2 of u A4: 3 of u	M5: 1 of r M6: 2 of r	E7: T 1 E8: T 2

Question Two (b)(iv)



Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	$y = 3^x + 2$ Allow C.A.O.	Correct equation.		
(ii)	Vertical shift gives $y = 3^x + 7$ Reflection gives $y = 3^{-x} + 7$ OR $y = \left(\frac{1}{3}\right)^x + 7$ OR equivalent. Allow consistency from (a)(i) for incorrect exponential equation.	Correct or consistent Equation after ONE of the transformations.	Consistent Equation after BOTH of the transformations.	T1 Correct Equation before and after BOTH of the transformations.
(b)(i)	The room temperature was 20 °C because the asymptote of the graph is at $y = 20$ (or equivalent) Units not required.	Temperature found with some justification.		
(ii)	$60 = 50 \times k^1 + 20$ $40 = 50 \times k$ $k = \frac{40}{50} = 0.8$	Correct k value, with some justification.		
(iii)	Tea graph drawn Tea Equation is $H = 76 \times 0.85^t + 16$ Table of values produced. Conclusion from graphs or table (or equations) or a combination of these that coffee and tea are approximately the same temperature after 16.4 minutes. So tea will be cooler after this time. (Allow for appropriate inaccuracies)	Table of values for coffee found. OR Consistent graph for tea drawn. OR Consistent table of values for tea found. OR Tea equation partly found (76 or 16 identified.	Tea equation found. OR Consistent identification of when the tea equation is less than the coffee equation. OR Used table, equation, or graph to find when tea equation is less than 2.	T1 Graph drawn for comparison OR table for both drinks found. AND point of intersection identified accept from (15 – 18) with clear evidence. AND Interpreted. T 2 : Used table equations or graph for both drinks to identify the value more accurately (accept from 16 – 17). AND Clearly interpreted.
	N1: one question attempted towards a solution N2: 1u	A3: 2 of u A4: 3 of u	M5: 1 of r M6: 2 of r	E7: T1 E8: T2 or (T1 + T1)

Question Three (b)(iii)



Time since making (minutes)	Temperature of Tim's coffee	Temperature of mother's tea
2	52	70.91
4	40.48	55.67
6	33.11	44.66
8	28.39	36.71
10	25.37	30.96
12	23.44	26.81
14	22.20	23.81
16	21.41	21.64
17	21.13	20.80
16.5	21.26	21.20
16.4	21.29	21.29

Cut Scores (Draft)

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24