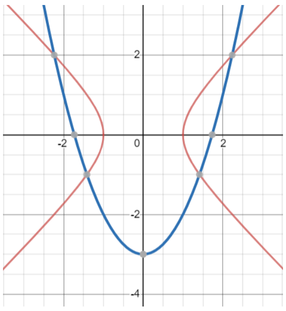
Assessment Schedule – 2021

Mathematics and Statistics: Apply algebraic methods in solving problems (91261)

Evidence

Q ONE	Expected coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	$27y^5$	Correct expression.		
(a)(ii)	$2y^9$	Correct expression.		
(b)	Deduce that $(3x + 2)(x – 4) = 0$ OR $\left(x+\frac{2}{3}\right)(x-4)=0$ so Original equation was $3x^2 – 10x – 8 = 0$	Correct equation but coefficients not whole numbers OR incorrect relevant factorised form but consistent expanded form.	Correct equation.	
(c)	$x^2 – 3kx + 2k^2 = 0$ $(x – k)(x – 2k) = 0$ So solutions are k and 2k, [hence one is twice the other]. OR $x^2 – 3kx + 2k^2 = 0$ $\Delta = (–3k) – 4(1)(2k^2) = k^2$ Hence, $x=\frac{-(-3k)\pm\sqrt{k^2}}{2}$ $=\frac{3k\pm k}{2}$ $=\frac{4k}{2}$ or $\frac{2k}{2}$ i.e. one root is $2k$ and the other is k and hence one is twice the other.	Equation factorised. OR Discriminant evaluated.	Correct conclusion with valid working.	

(d)	Curve Two: $y = (x - 1)(x + 1) - 2$ So $y = x^2 - 3$ Curve One: $x^2 = y^2 + 1$, so substitute into Curve Two to give: $y = y^2 + 1 - 3 = y^2 - 2$ $y^2 - y - 2 = 0$ $(y - 2)(y + 1) = 0$ Either $y = 2$ so $x^2 = 5$ and $x = \pm\sqrt{5}$, so points of intersection are $(\pm\sqrt{5},2) = \pm2.24,2)$ Or $y = -1$ so $x^2 = 2$ and $x = \pm\sqrt{2}$, so points of intersection are $(\pm\sqrt{2},-1) = (\pm1.41,-1)$. FYI: 	Correct expansion and simplification of Curve Two.	Forms one equation in one variable.	T1: Correct identification of two solutions only or of four x values. T2: Complete correct solution with correct mathematical statements.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Part Q correct	1 of u	2 of u	3 of u	1 of r	2 of r	T1	T2

Q TWO	Expected coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)	$\dfrac{(x-4)(x+3)}{4(x+3)} = \dfrac{x-4}{4}$ or equivalent	Correct simplified fraction (not bashed).		
(b)	$\dfrac{5x(x+2)-(x-3)(x-4)}{(x-3)(x+2)}$ $= \dfrac{4x^2+17x-12}{(x-3)(x+2)}$ or equivalent	Line 1 set up, or equivalent.	Obtains correct fraction.	
(c)(i)	D = 11, so $\left(1+\dfrac{R}{100}\right)^{11} = 2$ $\left(1+\dfrac{R}{100}\right) = \sqrt[11]{2} = 1.065$ $R = 6.5(\%)$	Sets up equation and uses the 11th root. OR CAO	Obtains correct solution.	
(c)(ii)	$\left(1+\dfrac{R}{100}\right)^{D} = 2$ $\log\left[\left(1+\dfrac{R}{100}\right)^{D}\right] = \log 2$ $D\log\left(1+\dfrac{R}{100}\right) = \log 2$ $D = \dfrac{\log(2)}{\log\left(1+\dfrac{R}{100}\right)}$	Logs taken of both sides (one of lines 2 or 3 must be shown).	Given expression derived correctly (one of lines 2 or 3 must be shown).	
(c)(iii)	$\dfrac{72}{R} = \dfrac{\log(2)}{\log\left(1+\dfrac{R}{100}\right)}$ $72\log\left(1+\dfrac{R}{100}\right) = R\log(2)$ $\log\left(\left(1+\dfrac{R}{100}\right)^{72}\right) = \log\left(2^{R}\right)$ $\left(1+\dfrac{R}{100}\right)^{72} = 2^{R}$ $2^{R} - \left(1+\dfrac{R}{100}\right)^{72} = 0$	Sets equations equal.	Processes powers (line 3)	T1: Obtains given equation with incorrect mathematical statements. T2: Obtains final given equation with correct mathematical statements. *PL: It may be reqd to make T1 = (c)(ii), T2=(c)(iii)*

N0	**N1**	**N2**	**A3**	**A4**	**M5**	**M6**	**E7**	**E8**
No response; no relevant evidence.	Part Q correct	1 of u	2 of u	3 of u	1 of r	2 of r	T1	T2

Q THREE	Expected coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)	Volume of cuboid = p^3 in simplest form.	Correct answer.		
(b)	$(p-4)(p+5)(p-3)$ $= (p-4)(p^2+2p-15)$ $= p^3 - 2p^2 - 23p + 60$	Correct simplified expression.		
(c)	Volume of cuboid $= p(p+a)(p-a)$ $= p^3 - pa^2$ If this is the same as the volume of the cube, $p^3 - pa^2 = p^3$ so $pa^2 = 0$ Thus $a = 0$ is the only solution (since $p \neq 0$). OR that there are no [non-trivial] solutions. Hence the cuboid never has the same volume as the cube unless you leave the sides unchanged. Or equivalent.	Correct working to the point of equating the two volumes.	Makes correct conclusion with valid working and reasoning.	
(d)(i)	SA of cuboid $= 2[(p-a)(p+a) + 10(p-a) + 10(p+a)]$ $= 2[p^2 - a^2 + 20p]$ Thus $2p^2 - 2a^2 + 40p = 6p^2$ $0 = 4p^2 - 40p + 2a^2$ $0 = 2p^2 - 20p + a^2$	Finds expression for SA of cuboid and expands it (accept no use of factor of 2 for all sides).	Derives given equation clearly.	
(d)(ii)	For there to be solutions, $400 - 8a^2 > 0$ $50 > a^2$ Hence $0 < a < 7.1$. If $a = 7$, we solve $2c^2 - 20c + 49 = 0$ and obtain $p = 5.707$ or $p = 4.293$. However, one of the sides of the cuboid is $p - a$, meaning that it will be negative with either value of p obtained here. If $a = 6$, we solve $2p^2 - 20p + 36 = 0$ and obtain $p = 7.646$ or $p = 2.354$. The larger of these 2 values is a valid solution so the largest possible whole number value of a is 6. The cube has sides of 7.646 cm, and the cuboid is $1.646 \times 13.646 \times 10$ cm.	Evaluates discriminant.	Obtains inequality (or implies one) for a or a^2.	T1: Obtains $a = 7$ and dimensions of 5.707 for the cube but does not go on from there. T2: Obtains correct dimensions for the cube and the cuboid.

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Part Q correct	1 of u	2 of u	3 of u	1 of r	2 of r	T1	T2

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24