Assessment Schedule – 2020

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

Evidence

Q ONE	Evidence	Achievement (u)	Achievement with Merit (r)	Achievement with Excellence (t)
(a)	$(6x - 5)(x + 3)$	Correctly factorised.		
(b)	$f(x) = x^2 + 10x + 22$ $f(x) = (x + 5)^2 - 3$	Square completed correctly.		
(c)(i)	Substitute $x = 4$, $y = 40$: $40 = 4^3 - 12P \times 4 + R$ $40 = 64 - 48P + R$ $48P = 24 + R$ Rearrange to get $P = \frac{24 + R}{48}$	Substitute correctly.	Find an equivalent expression for P in terms of R.	
(c)(ii)	$3x^2 = 12P$ $x^2 = 4P$ $x = \pm\sqrt{4P}$ $x = \pm 2\sqrt{P}$ $x = \pm 2P^{0.5}$ However, point B has a negative x-value, so $x = -2P^{0.5}$	Correctly solves the equation to the point where $x = 2P^{0.5}$ OR $x = 2\sqrt{P}$ OR $x = \pm\sqrt{4P}$ ($\pm$ required)	Finds $x = \pm 2P^{0.5}$	T1: Correct working and mathematical statements including an explanation for only using the negative value.
(c)(iii)	Co-ordinates of B: $y = (-2P^{0.5})^3 - 12P(-2P^{0.5}) + R$ $y = 16P^{1.5} + R$ Orange line length = $(16P^{1.5} + R) - R = 16P^{1.5}$ For three x-intercepts, orange > blue $16P^{1.5} > R$ $\sqrt[2]{P^3} > \frac{R}{16}$ $P^3 > \left(\frac{R}{16}\right)^2$		Length of orange line obtained.	T1: Recognition and statement that $16P^{1.5} > R$ T2: Correct result derived with correct mathematical statements.

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question.	1 of u	2 of u	3 of u	1 of r	2 of r	T1	T2 or two T1

Q TWO	Evidence	Achievement (u)	Achievement with Merit (r)	Achievement with Excellence (t)
(a)	$\log\left(\frac{9y\times4}{3y}\right)=\log(12)$	Correct solution.		
(b)(i)	$x^2 = 36$ $x = 6$	Correct solution.		
(b)(ii)	$\log_5(2x^2)=4$ $2x^2 = 5^4 = 625$ $x^2 = 312.5$ $x = \pm17.68$ (4sf) $x > 0$, so only solution is $x = 17.68$	Combines logs in a valid way.	Finds x.	T1: Correct solution with negative value rejected.
(c)	$\frac{(5x+4)(2x+1)-(3x-4)(x+4)}{(x+4)(2x+1)}=2$ $\frac{10x^2+13x+4-[3x^2+8x-16]}{(x+4)(2x+1)}=2$ $\frac{7x^2+5x+20}{2x^2+9x+4}=2$ $7x^2 + 5x + 20 = 4x^2 + 18x + 8$ $3x^2 - 13x + 12 = 0$ $(3x - 4)(x - 3) = 0$ Either $x=\frac{4}{3}$ or $x = 3$ OR $5x+4-\frac{(x+4)(3x-4)}{2x+1}=2(x+4)$ $(5x + 4)(2x + 1) - (x + 4)(3x - 4) = 2(x + 4)(2x + 1)$ $7x^2 + 5x + 20 = 4x^2 + 18x + 8$ $3x^2 - 13x + 12 = 0$ $(3x - 4)(x - 3) = 0$ Either $x=\frac{4}{3}$ or $x = 3$	Begins to handle denominators in a correct way (adding the fractions using a common denominator or multiplying through by one denominator).	Correct solutions.	
(d)	$ax^2 + bx + c = dx^2 + ex + c$ $(a - d)x^2 + (b - e)x = 0$ $x[(a - d)x + (b - e)] = 0$ so $x = 0$ or $x=\frac{e-b}{a-d}$ One solution will always be on the y-axis, i.e. $x = 0$. The other is $\frac{e-b}{a-d}$. Hence, there will always be one solution, and there will always be a second as long as $a \neq d$ so that this second solution is defined and $b \neq e$, so that the second is distinct from the first. Accept alternative method: use of quadratic formula to derive the same results.	Sets up simultaneous equation.	Solves quadratic correctly but does not draw conclusions from the solutions.	T1: Correct working leading to one of the constraints, clearly expressed. T2: Correct working leading to both of the constraints, clearly expressed.

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Q THREE	Evidence	Achievement (u)	Achievement with Merit (r)	Achievement with Excellence (t)
(a)	$3^{4x} = 30$ $4x\log 3 = \log 30$ $x = \frac{1}{4}\left(\frac{\log 30}{\log 3}\right) = 0.7740\ (4\text{sf})$	Expanded log form.	Correct solution.	
(b)(i)	$x = W^{\frac{5}{2}} - 2 = \sqrt{W^5} - 2$	Correct expression.		
(b)(ii)	$(x+2)^{\frac{2}{5}} < 20$ $x < 20^{2.5} - 2$ $x < 1786.85$ So $x \le 1786$ or $x < 1787$.	Solves equation to find $x = 1786.85$.	Correct solution for x as a whole number.	
(c)(i)	Turnover = $(2d + 5)(101 - 3d) = 445$ $-6d^2 + 187d + 60 = 0$ Either $d = -0.3176$ or $d = 31.48$ (4sf) d needs to be both positive and whole, so neither solution is valid, which means that the turnover is never \$445.	Forms the correct equation for turnover.	Finds the values of d.	T1: Gives a valid explanation as to why the turnover is never \$445.
(c)(ii)	$(2d + 5)(101 - 3d) = k$ $-6d^2 + 187d + (505 - k) = 0$ $d = \frac{-187 \pm \sqrt{187^2 - 4(-6)\times(505-k)}}{2(-6)}$ $d = \frac{187 \pm \sqrt{47089 - 24k}}{12}$ 1. Discriminant needs to be positive (so $k < 1962.04$) 2. d is rational so $47089 - 24k$ must be a square number 3. d is an integer, so $187 \pm \sqrt{47089 - 24k}$ must be divisible by 12 4. d is positive, so $187 \pm \sqrt{47089 - 24k}$ must be positive.	Rearrangement of equation set to 0.	Finds a simplified expression for d.	T1: Makes ONE of the listed conclusions. T2: Makes TWO of the listed conclusions.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24