

Paper 1MA1: 3H			
Question	Working	Answer	Notes
1		171	P1 for process to find one share P1 for process to find total A1 cao
2		plan	C1 a partially correct plan C1 correct plan
3		$t = 3(y + 2a)$	M1 adding $2a$ to both sides or multiplying each term by 3 A1 $t = 3(y + 2a)$ or $t = 3y + 6a$
4		$7.15 \leq x < 7.25$	B1 for 7.15 and 7.25 B1 cao
5 (a)		improvement	C1 appropriate improvement eg do not have axes starting at (0, 0)
(b)		explanation	C1 explanation eg pine cone has a very short width for its length
6 (a)		1.95	M1 method to find one temperature eg $4500 \div 1200$ M1 for complete method A1 cao
(b)		D	B1 cao

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7		complete chain of reasoning	<p>C1 starts chain of reasoning eg finds area of large square and area of triangle or use of Pythagoras for $(x+y)^2 - 4 \times (x \times y \div 2)$ oe or $\sqrt{x^2 + y^2} \times \sqrt{x^2 + y^2}$</p> <p>C1 complete chain of reasoning with correct algebra</p>
8		36.4	<p>P1 start process eg method to find area of trapezium</p> <p>P1 complete process to find volume of tank</p> <p>P1 process to find time eg volume $\times 1000 \div 300$</p> <p>P1 process to find 85% of volume or of time</p> <p>A1 for 36.4 or 36 mins 24 secs</p> <p>C1 explanation eg if the average rate was slower it would take more time, if the average rate was faster it would take less time</p>
9		No with reason	<p>C1 partial explanation, eg 0.96×0.975</p> <p>C1 No with full explanation, eg $0.96 \times 0.975 = 0.936$ so only a 6.4% reduction</p>
		3.15	<p>P1 complete process to find value after 2 years eg $(145000 - '5800') \times 2.5/100$ oe or $145000 \times 0.96 \times 0.975 (= 135720)$</p> <p>P1 $(140000 - '135720') \div '135720' \times 100$ oe</p> <p>A1 for 3.15 – 3.154</p>

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10		1 : 2.53	P1 for substituting values to find surface gravity of either Earth (= 9.805..) or Jupiter (= 24.796..) for complete process P1 A1 for 1 : 2.528 to 2.53
11		$x = 4.5$ $y = -2.5$	M1 for a correct process to eliminate one variable (condone one arithmetic error) A1 cao for either x or y M1 (dep) for substituting found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao
12		12.2	P1 begins process eg $150 \div 19.3$ (= 7.77..) or $150 \div 8.9$ (= 16.85..) complete process to find total volume P1 complete process to find the density of the alloy A1 for answer in range 12.1 to 12.2
13		Triangle (-6, 2), (-6, -1), (-3, -1)	M1 for correct shape and the correct orientation in the wrong position or two vertices correct. A1 cao

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14 (a)		histogram	C1 for 2 correct bars of different widths or at least 3 correct frequency densities C1 all bars in correct proportions or 4 correct bars with axes scaled and labelled C1 fully correct histogram with axes scaled and labelled
(b)	$81 \div 2 = 40.5$ 90 to 105 is 29	108.2	C1 for $81 \div 2 = 40.5$ and $11.5 \div 18 \times 5 (= 3.19..)$ C1 For answer in range 108 to 109
15		shown	C1 for $\frac{a(b+1) - a}{(b+1)^2}$ or $\frac{a(b+1)^2 - a(b+1)}{(b+1)^3}$ oe C1 complete chain of reasoning
16		18.2	M1 for $\frac{260}{360} \times \pi \times 8$ oe or $\frac{100}{360} \times \pi \times 8$ oe A1 for 18.1 to 18.2
17		proof	C1 starts proof eg $n(n+1)$ or $(n-1) \times n$ C1 $n(n+1) + n+1$ or $(n-1) \times n + n$ C1 for convincing proof including $(n+1)^2$ or n^2

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18 (a)	values 0, 2, 5, 9, 15, 24	86	M1 for starting to find area under curve M1 for method to find the area under the curve between $t = 0$ and $t = 10$ (and at least 2 areas) A1
(b)		overestimate with reason	C1 for overestimate and appropriate reason linked to method eg area between trapeziums and curve also included
19		proof leading to $\frac{7}{22}$	M1 for finding two correct recurring decimals that when subtracted would result in a terminating decimal or integer with intention to subtract eg $x = 0.31818\dots$, $100x = 31.81818\dots$ A1 fully correct proof
20		$\frac{1}{4}$	P1 starts process eg $\vec{AB} = 2\mathbf{b} - 2\mathbf{a}$ P1 process to find \vec{AP} or \vec{BP} P1 complete process to find \vec{OP} A1 for $\frac{1}{4}$ oe

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21		10.4	<p>P1 starts process by using cosine rule to find CD eg $(CD)^2 = 4.9^2 + 3.8^2 - 2 \times 4.9 \times 3.8 \times \cos 80$ (= 31.98..)</p> <p>P1 uses sine rule to find angle ACD or angle ADC eg $\frac{\sin C}{3.8} = \frac{\sin 80}{5.655}$ or $\frac{\sin D}{4.9} = \frac{\sin 80}{5.655}$</p> <p>P1 uses sine rule to find BC or BD eg $\frac{BD}{\sin 25} = \frac{5.655}{\sin 33.6}$</p> <p>P1 process to find area eg $1/2 ab \sin C$ A1 for 10.4 to 10.43</p>

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22 (a)		chain of reasoning	C1 for a relevant product eg $\frac{y}{y+5} \times \frac{5}{y+4}$
			C1 for a correct equation eg $2 \times \left(\frac{y}{y+5} \times \frac{5}{y+4} \right) = \frac{6}{11}$
			C1 for method to eliminate fractions from algebraic expression
			C1 complete chain of reasoning
			M1 method to solve equation eg $(ax + b)(cx + d)$ with $ac = 3$ and $bd = \pm 60$
(b)		$\frac{3}{11}$	A1 for selecting $y = 6$
			A1 for $\frac{3}{11}$ oe
23		$2(x+4)^2 + 3$	P1 process to find a , eg $2x^2 + 16x + 35 = 2(x^2 + \dots)$ or $a = 2$
			P1 for $2((x+4)^2 + \dots)$ or $b = 4$
			A1 for $2(x+4)^2 + 3$ or $a = 2, b = 4, c = 3$
			B1 ft from answer of form $a(x+b)^2 + c$
		$(-4, 3)$	