1MA1 Practice papers Set 6: Paper 2H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		$2x + 2(x + 9) < 200$ $2x + 2x + 18 < 200$ $4x + 18 < 200$ $4x < 182$ $x < 45.5$ **OR** $200 \div 4 = 50$ $9 + 9 \div 4 = 4.5$ $50 – 4.5 = 45.5$ OR $200 – 18 = 182$ $182 \div 4 = 45.5$	45	4	B1 for $x + 9$ oe seen (it could just be on a diagram) **or** any rectangle with length 9 cm greater than width M1 for $2x + 2(x + 9)$ oe A1 for 45.5 B1 for answer of 45 **OR** M1 for $200 \div 4$ (=50) M1 for $(9 + 9) \div 4$ (=4.5) A1 for 45.5 B1 for answer of 45
2		$16 \times 7 = 112$ $112 – 87$	25	2	M1 for 6×14.5 (= 87) or 7×16 (=112) or 6×1.5 (= 9) or 7×1.5 (= 10.5) A1 for 25
3			A and 3 B and 2 C and 4 D and 1	2	B2 for all 4 correct (B1 for 2 correct)

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4	(a)		7.5	3	M1 for $4.5^2 + 6^2$ (=5 6.25) M1 for $\sqrt{56.25}$ or $\sqrt{(4.5^2 + 6^2)}$ A1 for 7.5
	(b)		217	4	M1 for use of appropriate trig ratio eg $\tan CAB = \frac{4.5}{6}$ (= 0.75), $\sin CAB = \frac{4.5}{\text{"7.5"}}$ (= 0.6), $\cos CAB = \frac{6}{\text{"7.5"}}$ (= 0.8) M1 for inverse trig shown correctly e.g. $CAB = \tan^{-1}\frac{4.5}{6}$ (= 0.75), $CAB = \sin^{-1}\frac{4.5}{\text{"7.5"}}$ (= 0.6), $CAB = \cos^{-1}\frac{6}{\text{"7.5"}}$ (= 0.8) A1 for 36.8 to 37 (or 53 to 53.2 if identified as *ACB*) B1ft for bearing 180 + "36.8" if "36.8" is not 40–50
5			$9x^2 + 7x - 2$	4	M1 for finding an expression for a missing length eg $4x - 1 - x - x$ (=$2x - 1$) or $x + 2 - 2x$ (= $2 - x$) M1 for a correct expression for one area from the cross-section, eg. $x \times 2x$ or $(4x - 1)(x + 2 - 2x)$ or for one volume of cuboid(s), eg. $x \times 2x \times (x + 1)$ M1 for a complete method to find the volume A1 for $9x^2 + 7x - 2$ or $(9x - 2)(x + 1)$ oe

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6			8	4	M1 for $(2\sqrt{10})^2 - 2^2$ (= 36) A1 for (*CD* =) 6 M1 (dep on M1) for '6' × 4 – $\frac{1}{2}$ × '6' × 2 – $\frac{1}{2}$ × 2 × 2 – $\frac{1}{2}$ × ('6' – 2) × 4 C1 for area of 8 from fully correct working
7			17.7(014…)	3	B1 for 7.75 or7.85 or 5.15 or 5.25 or 62.5 or 63.5 M1 for $\frac{1}{2}$ × 7.75 × 5.15 × sin 62.5 A1 for 17.7(0140994…)
8	(a)		Negative	1	B1 cao
	(b)		117–123	2	M1 for a line of best fit drawn between (9, 130) & (9, 140) and between (13, 100) & (13,110) inc.. A1 for 117 − 123 inclusive

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9		$4x + 3y = 695$ $5x + 2y = 720$ $8x + 6y = 1390$ $15x + 6y = 2160$ $7x = 770$ $x = 110$ $y = 85$	Coffee £1.1(0) Tea 85p	5	M1 for attempt to use variables for cost of cup of tea and cost of a cup of coffee. A1 for correct equations : $4x + 3y = 695$ and $5x + 2y = 720$ oe M1 for correct process to eliminate either x or y (condone one arithmetic error) could be by multiplication of both equations and then addition/subtraction **or** by manipulation of one equation and then substitution into second equation M1 (dep) for substituting found value into either equation A1 for correct answers with units
10		$2 = k^{-1}$	½	2	M1 for reading off and substituting a pair of values from the graph (excluding 0, 1) into the equation, eg $x = -1$, $y = 2$ A1 for ½ oe

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11		US 1 gal costs 20.88÷6=$3.48 1 litre costs $3.48÷3.79 = $0.918... I litre costs 0.918..× 0.77 Euros = 0.707..Euros Russia 1 litre costs 800 ÷25.58 = 31.27... Roubles 1 litre costs 31.27÷40.63 Euros = 0.769... Euros Or 25.58 litres = 25.58 ÷ 3.79 = 6.749.. US gallons 800 roubles = (800÷40.63)÷0.77 = $25.571.. Cost in $ of 1 US gallon in Russia is 25.571..÷6.749... = $3.788.. Cost in $ of 1 US gallon in US = 20.88÷6 = $3.48	Correct conclusion based on correct calculations	5	M1 for a conversion, gallons to litres or litres to gallons M1 for a conversion, roubles to US Dollars or US Dollars to roubles or convert both to Euros M1 for a conversion to common units and common currency A1 for two correct answers in the same currency and for the same unit C1 (dep on at least M1) for correct conclusion ft candidate's figures. eg M1 1 US gal costs 20.88÷6 (=3.48) M1 1 litre costs 3.48 ÷3.79 ..× 0.77 (=0.707..) M1 1 litre in Russia costs 800 ÷25.58 ÷40.63 (=0.769) A1 for 0.707 and 0.769 C1 (dep on at least M1) for correct conclusion ft candidate's figures.

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Question		**Working**	**Answer**	**Mark**	**Notes**
		<u>Cost per litre for US petrol</u> $0.918 or €0.707 or 28.7 rub <u>Cost per gallon for US petrol</u> $3.48 or €2.68 or 109 rub <u>Cost per litre for Russian petrol</u> 31.27 rub or €0.770 or $1 <u>Cost per gallon for Russian petrol</u> 118 rub or €2.92 or $3.79			
12	(a)		0.3 0.3, 0.7, 0.3	2	B1 for 0.3 as first spin oe B1 for 0.3, 0.7, 0.3 in correct positions for second spin oe
	(b)		0.42	3	M1 for '0.3' × '0.7' or 0.7 × '0.3' (=0.21) M1 for '0.3' × '0.7 + 0.7 × '0.3 (OR M2 for $1 - 0.7^2 - 0.3^2$) A1 for 0.42 oe

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13		(A =) $0.5 \times (4 + k) \times \sqrt{3}$ $(= 5\sqrt{6})$ oe $k + 4 = (10\sqrt{6})/\sqrt{3}$ $(k =) 2 \times (5\sqrt{6})/\sqrt{3} - 4$ or $(k =) (5\sqrt{6} - \sqrt{3})/(0.5\sqrt{3})$ oe	$(k =) 10\sqrt{2} - 4$	3	M1 $4\sqrt{3} + 0.5(k - 4) \times \sqrt{3}$ oe M1 correctly isolating k A1 Accept $2(5\sqrt{2} - 2)$ but don't accept $10\sqrt{2} - 4$ followed by $5\sqrt{2} - 2$
14			14.4	3	M1 for $\pi \times 6.5^2 \times 11.5$ (= 1526.42...) M1 (dep) for $\frac{'1526.42...'}{\pi \times 5.8^2}$ A1 for 14.4 - 14.5 **OR** M1 for $\frac{5.8}{6.5}$ or $\frac{6.5}{5.8}$ or 0.89(23…) or 1.12(06896…) M1 for $11.5 \div \left(\frac{5.8}{6.5}\right)^2$ or $11.5 \div \left(\frac{6.5}{5.8}\right)^2$ A1 for 14.4 – 14.5

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15		$(n^2 + 4n + 4) - (n^2 + 2n + 1)$ $\frac{2n+3}{2n^2+3n}$ $\frac{2n+3}{n(2n+3)}$	Proof	4	M1 for correct method to expand $(n + 2)^2$ or $(n + 1)^2$ M1 for correct simplification of numerator M1 for factorisation of $2n^2 + 3n$ **or** for clearing the fractions on both sides correctly C1 for complete and correct proof **OR** M1 for $\{(n+2)-(n+1)\}\{(n+2)+(n+1)\}$ M1 for $1 \times (2n+3)$ M1 for factorisation of $2n^2 + 3n$ **or** for clearing the fractions on both sides correctly C1 for complete and correct proof **OR** M1 for $n\{(n+2)^2-(n+1)^2\} = (2n^2 + 3n) \times 1$ M1 for $n(n+2)^2 - n(n+1)^2$ or for correct expansion of $(n+2)^2-(n+1)^2$ M1 for correct expansion of $n\{(n+2)^2-(n+1)^2\}$ C1 for complete and correct proof (must include statement recognising the equality of LHS and RHS)

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Question		**Working**	**Answer**	**Mark**	**Notes**
16		$p(r-3) = 2r+5$ $pr - 3p = 2r + 5$ $pr - 2r = 3p + 5$ $r(p-2) = 3p + 5$	$\frac{3p+5}{p-2}$	4	M1 for multiplying both sides by $r-3$ eg $p(r-3)$ or $pr-3p$ or $pr-3$ or $p \times r - 3$ M1 for isolating their two terms in r on one side of an equation to get $pr-2r$ or $2r-pr$ M1 (dep on M1) for correctly factorising r from '$pr-2r$' A1 for $\frac{3p+5}{p-2}$ or $\frac{-3p-5}{2-p}$ oe
17	(a)		$y - f(x-5)$	1	B1 cao
	(b)		(4, 3)	2	B2 cao (B1 for one coord. correct (in correct position) or (3,4).)
18	(a)		1.5	3	B1 for tangent drawn at $t = 8$ M1 for height ÷ base for a triangle with the tangent as hypotenuse A1 for 1.25 to 1.75
	(b)		156	3	M1 for attempting to find area under curve M1 for correct method to find the area under the curve between $t = 0$ and $t = 6$ (at least 3 areas) A1 for 150 – 160

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19			$\frac{1}{16}$	4	M1 for $S \propto \frac{1}{t^3}$ or $S = \frac{k}{t^3}$ M1 for $\frac{1}{2} = \frac{k}{4^3}$ oe or $S = \frac{32}{t^3}$ M1 $S = \frac{32}{8^3}$ oe A1 for $\frac{1}{16}$ oe
20		Gradient of N = 3 Gradient of perpendicular to line N = $-\frac{1}{3}$	$y = -\frac{1}{3}x + 1$	3	M1 for complete method to find gradient of line N or for drawing a perpendicular line M1 for method to find the gradient of a perpendicular line A1 $y = -\frac{1}{3}x + 1$ oe
21			$p = 8$, $q = 10$	3	M1 for finding the difference between the x or y coordinates eg $4 - 2$ (= 2) or $17 - 5$ (= 12) M1 for a complete method to find the values of p or q A1 cao

National performance data from Results Plus

	Original source of questions						Mean score of students achieving grade:					
Qn	Spec	Paper	Session YYMM	Qn	Topic	Max score	ALL	A*	A	B	C	D	E
1	5MM2	2F	1106	Q23	Bounds	4	0.38				1.43	0.35	0.16
2	1380	2H	1203	Q02	Mean, median, mode	2	0.71	1.74	1.32	0.89	0.45	0.14	0.07
3	1380	2H	1011	Q11	Distance-time / travel graphs	2	0.89	1.52	1.14	0.92	0.77	0.66	0.57
4	1MA0	2H	1406	Q15	Pythagoras in 2D	7	2.91	5.98	4.72	3.50	2.16	0.88	0.20
5	1MA0	1H	1611	Q22	Volume	4	Data to be added in January 2017						
6	1MA0	1H	1611	Q26	Area	5	Data to be added in January 2017						
7	1MA0	2H	1611	Q20	Bounds	3	Data to be added in January 2017						
8	1380	2H	911	Q11	Scatter diagrams	3	2.46	2.97	2.89	2.72	2.38	1.85	1.28
9	5AM1	1H	1306	Q21	Simultaneous equations	5	3.47	4.98	4.90	4.24	2.15	0.50	0.31
10	1MA0	2H	1611	Q22a	Exponential graphs	2	Data to be added in January 2017						
11	5AM1	1H	1406	Q21	Conversions	5	2.45	4.22	3.52	2.50	1.42	0.70	0.06
12	1MA0	2H	1411	Q19	Probability tree diagrams	5	2.30	4.97	4.81	3.90	2.37	1.62	0.95
13	4MA0	1H	1405	Q18	Surds	3	1.29	2.21	1.06	0.45	0.16	0.05	0.01
14	1MA0	2H	1311	Q24	Volume	3	1.17	2.88	2.56	1.81	0.68	0.09	0.02
15	1MA0	2H	1611	Q24		4	Data to be added in January 2017						
16	5MM2	2H	1211	Q26	Rearranging equations	4	0.93	3.84	2.06	0.61	0.15	0.00	0.00
17	1380	2H	1006	Q27	Transformation of functions	3	0.88	2.22	1.28	0.68	0.46	0.29	0.20
18	5AM2	2H	1306	Q18	Area under a curve	6	1.64	4.83	3.04	0.92	0.12	0.00	0.00
19	5MM2	2H	1411	Q19	Direct and indirect proportion	4	1.09	3.63	2.25	0.84	0.31	0.05	0.00
20	1MA0	2H	1506	Q17	Gradients	3	0.51	2.35	1.29	0.45	0.10	0.02	0.00
21	1MA0	2H	1506	Q12	Coordinates in 2D	3	0.41	1.84	0.84	0.32	0.15	0.11	0.08
						80							