

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 $6 \times 14.5 (= 87)$ or $7 \times 16 (=112)$ or $6 \times 1.5 (= 9)$ or $7 \times 1.5 (= 10.5)$ 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 $4.5^2 + 6^2 (=56.25)$ 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 $\tan CAB = \frac{4.5}{6} (=0.75)$, $\sin CAB = \frac{4.5}{7.5} (=0.6)$, $\cos CAB = \frac{6}{7.5} (=0.8)$ M1 for inverse trig shown correctly e.g. $CAB = \tan^{-1} \frac{4.5}{6} (=0.75)$, $CAB = \sin^{-1} \frac{4.5}{7.5} (=0.6)$, $CAB = \cos^{-1} \frac{6}{7.5} (=0.8)$ A1 for 36.8 to 37 (or 53 to 53.2 if identified as <i>ACB</i>) 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 $'6' \times 4 - \frac{1}{2} \times '6' \times 2 - \frac{1}{2} \times 2 \times 2 - \frac{1}{2} \times ('6' - 2) \times 4$ C1 for area of 8 from fully correct working
7		17.7(014...)	3	B1 for 7.75 or 7.85 or 5.15 or 5.25 or 62.5 or 63.5 M1 for $\frac{1}{2} \times 7.75 \times 5.15 \times \sin 62.5$ A1 for 17.7(0140994...)
8	(a) (b)	Negative 117–123	1 2	B1 cao 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	$2 = k^{-1}$	$\frac{1}{2}$	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 $\frac{1}{2}$ oe

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

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		<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	2	B1 for 0.3 as first spin oe
			0.3, 0.7, 0.3		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	$(A \Rightarrow) 0.5 \cdot (4 + k) \cdot \sqrt{3}$ $(= 5\sqrt{6})$ oe $k + 4 = (10\sqrt{6})/\sqrt{3}$ $(k \Rightarrow) 2 \times (5\sqrt{6})/\sqrt{3} - 4$ or $(k \Rightarrow) (5\sqrt{6} - \sqrt{3})/(0.5\sqrt{3})$ oe	$(k \Rightarrow) 10\sqrt{2} - 4$	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 $\frac{1526.42\dots}{\pi \times 5.8^2}$ 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 $11.5 \mid \left(\frac{5.8}{6.5}\right)^2$ or $11.5 \mid \left(\frac{6.5}{5.8}\right)^2$ 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	<p>M1 for correct method to expand $(n + 2)^2$ or $(n + 1)^2$</p> <p>M1 for correct simplification of numerator</p> <p>M1 for factorisation of $2n^2 + 3n$ or for clearing the fractions on both sides correctly</p> <p>C1 for complete and correct proof</p> <p>OR</p> <p>M1 for $\{(n + 2) - (n + 1)\} \{(n + 2) + (n + 1)\}$</p> <p>M1 for $1 \times (2n + 3)$</p> <p>M1 for factorisation of $2n^2 + 3n$ or for clearing the fractions on both sides correctly</p> <p>C1 for complete and correct proof</p> <p>OR</p> <p>M1 for $n\{(n + 2)^2 - (n + 1)^2\} = (2n^2 + 3n) \times 1$</p> <p>M1 for $n(n + 2)^2 - n(n + 1)^2$ or for correct expansion of $(n + 2)^2 - (n + 1)^2$</p> <p>M1 for correct expansion of $n\{(n + 2)^2 - (n + 1)^2\}$</p> <p>C1 for complete and correct proof (must include statement recognising the equality of LHS and RHS)</p>

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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 \div 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					Max score	Mean score of students achieving grade:							
Qn	Spec	Paper	Session YYMM	Qn		Topic	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							