

1MA1 Practice papers Set 2: Paper 3H (Regular) mark scheme – Version 1.0

Question		Working	Answer	Mark	Notes
1.	(a)		76	3	M1 for $89\% = 68$ M1 for $68 \div 0.89$ (or equivalent) A1 for 76 – 76.41
	(b)		11.8	2	M1 for $(68 - 60) \div 68 \times 100$ (or equivalent) A1for 11.7 – 12
2.		12 are red. $\frac{1}{3}$ are red $12 \times 3 =$ 2 blue for 1 red 24 blue for 12 red $24 + 12 =$	36	3	M1 for $P(\text{red}) = \frac{1}{3}$ M1 for $\frac{1}{3} \times 36 = 12$ red or 12×3 A1 for 36 cao OR M1 for 2 blue for 1 red M1 for 24 blue for 12 red or $24 + 12$ A1 for 36 cao

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3.		No with reason	1	C1 No and e.g, the area of B will be $2^2 = 4$ times greater than the area of A or may use values to give a counter example
4.	$\frac{15}{2} - \frac{14}{3} = \frac{45a}{6a} - \frac{28a}{6a}$	shown	3	M1 Complete improper fractions M1 Correct fractions with common denominator a multiple of 6 A1 dep on M2. Improper fraction required, e.g. $\frac{17}{6}$, $\frac{34}{12}$
5.		$t = \frac{7+5g}{3}$	3	M1 expands bracket, e.g.. $5t - 5g = 2t + 7$ or divides all terms by 5 as a first step M1 isolates terms in t , e.g.. $5t - 2t = 7 + 5g$ A1

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6.	$180 \times 365 = 65700$ $65700 \div 1000 = 65.7$ $65.7 \times 91.22 = 5993.154$ $5993.154 \div 100 + 28.20 = 88.13\dots$ <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>D</th> <th>U</th> <th>C</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>366</td> <td>65880</td> <td>6010</td> <td>88.30</td> </tr> <tr> <td>365</td> <td>65700</td> <td>5993</td> <td>88.13</td> </tr> <tr> <td></td> <td>65000</td> <td>5929</td> <td>87.49</td> </tr> <tr> <td></td> <td>66000</td> <td>6020</td> <td>88.40</td> </tr> <tr> <td>364</td> <td>65520</td> <td>5976</td> <td>87.96</td> </tr> <tr> <td>360</td> <td>64800</td> <td>5911</td> <td>87.31</td> </tr> <tr> <td>336</td> <td>60480</td> <td>5517</td> <td>83.37</td> </tr> </tbody> </table>	D	U	C	T	366	65880	6010	88.30	365	65700	5993	88.13		65000	5929	87.49		66000	6020	88.40	364	65520	5976	87.96	360	64800	5911	87.31	336	60480	5517	83.37	Decision (should have a water meter installed)	5	<p>Per year</p> <p>M1 for $180 \times '365'$ (= 65700) M1 for $'65700' \div 1000$ (= 65.7 or 65 or 66) M1 for $'65.7' \times 91.22$ (= 5993...) A1 for answer in range (£)87 to (£)89 C1 (dep on at least M1) for conclusion following from working seen</p> <p>OR (per day)</p> <p>M1 for $107 \div '365'$ (= 0.293...) M1 for $180 \div 1000 \times 91.22$ (= 16.4196) M1 for $28.2 \div '365' + '0.164196'$ (units must be consistent) A1 for 29 – 30(p) and 24 – 24.3(p) (or equivalent) C1 (dep on at least M1) for conclusion following from working seen</p> <p>OR</p> <p>M1 for $(107 - 28.20) \div 0.9122$ (= 86.384..) M1 for $'86.384..' \times 1000$ (= 86384.5...) M1 for $'365' \times 180$ (= 65700) A1 for 65700 and 86384.5... C1 (dep on at least M1) for conclusion following from working seen</p> <p>NB : Allow 365 or 366 or 52×7 (=364) or 12×30 (=360) or $365\frac{1}{4}$ for number of days</p>
D	U	C	T																																	
366	65880	6010	88.30																																	
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7.	$36 \times 4 (=144)$ $176 + 103 + '144' (= 423)$ $15 \times 28 = 420$ Or $'423' \div 28 = 15.107\dots$	No with correct working	4	M1 for $36 \times 4 (= 144)$ M1 for $176 + 103 + '144' (= 423)$ M1 for 28×15 C1 (dep on at least M2 awarded) for 420 and 423 and 'No she won't have enough' Or M1 for $36 \times 4 (=144)$ M1 for $176 + 103 + '144' (=423)$ M1 for $423 \div 28$ C1 (dep on at least M2 awarded) for 15.10 or 15.11 or 15.107... and 'No she won't have enough'
8.	(a)	$7n - 4$	2	B2 for $7n - 4$ (B1 for $7n + d$ where d is an integer)
	(b)	explanation	2	M1 for ' $7n - 4' = 150$ or any other valid method, e.g. counting on 7s (to get 150) A1 for a complete explanation eg. the 22nd term is 150 or $n = 22$ from solution of equation or a clear demonstration based on 22 or complete sequence

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9.	(a)		6	3	M1 13 or 12.75 (LQ) 19 or 18.25 (UQ) identified from ordered list OR attempt to find IQR eg. 3(rd) and 9(th) seen or 2.75(th) and 8.25(th) seen M1 Identify 13 or 12.75 (LQ), AND 19 or 18.25 (UQ) A1 (accept 5.5)
	(b)		James and reason using IQR	1	B1 ft from (a) James: he has a lower IQR (or equivalent) (IQR must be part of the statement)
	(c)		no change with reason	1	B1 no change box ticked with reason, e.g. 2 new scores above median and 2 new scores below median or median of 4 numbers is 17

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10.	(a) $\frac{1}{2}(3x + 1 + 5x + 3)(2x + 3) =$ $\frac{1}{2}(8x + 4)(2x + 3)$ So, $(4x + 2)(2x + 3) - 46 = 0$ $8x^2 + 16x + 6 - 46 = 0$ $8x^2 + 16x - 40 = 0$ $x^2 + 2x - 5 = 0$	Proof	3	M1 for correct method to find area of trapezium M1 (dep) for expanding all brackets to get a correct expression for the area C1 for complete correct proof
	(b) $x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2 \times 1}$ $= \frac{-2 \pm \sqrt{24}}{2}$ OR $(x + 1)^2 - 1^2 - 5$ $= (x + 1)^2 - 6$ $x + 1 = \pm \sqrt{6}$	1.45, -3.45	3	M1 for $\frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2 \times 1}$ condone one sign error in substitution M1 for $\frac{-2 \pm \sqrt{24}}{2}$ A1 for 1.44 to 1.45 (and -3.44 to -3.45) OR M1 for $(x + 1)^2 - 1^2 - 5$ (or equivalent) M1 for $x + 1 = (\pm)\sqrt{6}$ A1 for 1.44 to 1.45 (and -3.44 to -3.45)

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11.	$\sqrt{45^2 + 20^2} = \sqrt{2425} = 49.24\dots$ $\sqrt{30^2 + 20^2} = \sqrt{1300} = 36.05\dots$ $\sqrt{45^2 + 30^2} = \sqrt{2925} = 54.08\dots$ $\sqrt{45^2 + 20^2 + 30^2} = \sqrt{3325}$ $= 57.66281297$ <p>OR</p> $30^2 + 20^2 + 45^2$ $= 900 + 400 + 2025 = 3325$ $\sqrt{3325} = 57.66281297$	No with working	4	M1 for $45^2 + 20^2$ or $20^2 + 30^2$ or $45^2 + 30^2$ M1 for $\sqrt{45^2 + 20^2}$ or $\sqrt{20^2 + 30^2}$ or $\sqrt{45^2 + 30^2}$ M1 for $\sqrt{45^2 + 20^2 + 30^2}$ ($= \sqrt{3325}$) C1 for No AND $57.6 - 57.7 < 60$ (or equivalent) OR M2 for $30^2 + 20^2 + 45^2$ ($= 900 + 400 + 2025 = 3325$) M1 for $\sqrt{3325}$ C1 for No AND $57.6 - 57.7 < 60$ (or equivalent)
12	$(6.21795 \times 10^{10}) \div$ $510\,072\,000$ $= 121.9(03378\dots)$	1.22×10^2	3	M1 for SA Jupiter \div SA Earth e.g. $(6.21795 \times 10^{10}) \div 510\,072\,000$ (or equivalent), e.g. $62000 \div 51$ or digits 121 or digits 122 A1 for 121 – 122

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				A1 for $1.21 \times 10^2 - 1.22 \times 10^2$
13.		Yes with appropriate reason	4	M1 for writing $l \propto \frac{1}{d^2}$ or $l = \frac{k}{d^2}$ M1 for substituting to find value of k ($k = 2500$) M1 for substituting 5.4 to get $l = \frac{2500}{5.4^2}$ or substituting 85 to get $85 = \frac{2500}{d^2}$ C1 (Dep on M1 for yes and the number of decibels is 85.7(3...) which is more than 85 or distance is 5.42 m which is more than 5.4 m
14.	73 – 26	47	3	M1 for a complete method A1 B1 Alternate segment theorem
15.	$12 \times 20 + 10.8 \times 10 + 7 \times 15 + 5 \times 15 + 1.8 \times 30 + 0.6 \times 30$ $= 240 + 108 + 105 + 75 + 54 + 18$ $= 528 + 72 = 600$	12%	3	M1 for attempt to work out total area (e.g. = 600) or area greater than 60 (e.g. =72) by using fd or counting squares M1 (dep) for $\frac{72}{600} \times 100$ (or equivalent) (= 12) A1 cao (must have % otherwise 2 marks)

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16.	$2^{\frac{n}{2}} = \frac{2^x}{(2^3)^y}$ $2^{\frac{n}{2}} = 2^{x-3y}$	$n = 2x - 6y$	3	M1 for writing 8 as 2^3 or $2^{\frac{n}{2}}$ M1 for 2^{x-3y} or $\frac{1}{2}n = x - 3y$ A1 for $n = 2(x - 3y)$ or $n = (x - 3y) \div 0.5$
17.	(a) (b) $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $\overrightarrow{AP} = \frac{3}{4} \times (\mathbf{b} - \mathbf{a})$ $\overrightarrow{OP} = \mathbf{a} + \frac{3}{4} \times (\mathbf{b} - \mathbf{a})$ OR $\overrightarrow{OP} = \overrightarrow{OB} + \overrightarrow{BP}$ $\overrightarrow{BP} = \frac{1}{4} \times (\mathbf{a} - \mathbf{b})$ $\overrightarrow{OP} = \mathbf{b} + \frac{1}{4} \times (\mathbf{a} - \mathbf{b})$	$\mathbf{b} - \mathbf{a}$ $\frac{1}{4}(\mathbf{a} + 3\mathbf{b})$	1 3	B1 for $\mathbf{b} - \mathbf{a}$ or $-\mathbf{a} + \mathbf{b}$ B1 for $\frac{3}{4} \times '(\mathbf{b} - \mathbf{a})'$ M1 for $(\overrightarrow{OP} =) \overrightarrow{OA} + \overrightarrow{AP}$ or $(\overrightarrow{OP} =) \overrightarrow{OA} + \frac{3}{4}\overrightarrow{AB}$ or $\mathbf{a} \pm \frac{3}{4} \times '(\mathbf{b} - \mathbf{a})'$ A1 for $\frac{1}{4}(\mathbf{a} + 3\mathbf{b})$ or $\frac{1}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$ OR B1 for $\frac{1}{4} \times '(\mathbf{a} - \mathbf{b})'$ M1 for $(\overrightarrow{OP} =) \overrightarrow{OB} + \overrightarrow{BP}$ or $(\overrightarrow{OP} =) \overrightarrow{OB} + \frac{1}{4}\overrightarrow{BA}$ or $\mathbf{b} \pm \frac{1}{4} \times '(\mathbf{a} - \mathbf{b})'$ A1 for $\frac{1}{4}(\mathbf{a} + 3\mathbf{b})$ or $\frac{1}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$

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18.	$7 = ka^1 ; 175 = ka^3$ $k = \frac{7}{a} , 175 = \frac{7a^3}{a} ,$ $175 = 7a^2$ $a^2 = 25, \text{ so } a = 5, k = 1.4$ <p>Or</p> $7^3 = k^3 a^3, \quad 175 = ka^3$ $k^2 = \frac{7^3}{175}, \quad k = 1.4, \quad a = 5$	$k = 1.4$ $a = 5$	3	<p>M1 either $a^2 = 25$ or $7 = ka$ (or $7 = ka^1$) and $175 = ka^3$</p> <p>A1 $k = 1.4$ (or equivalent)</p> <p>A1 $a = 5$</p> <p>SC Either $a = 5$ or $k = 1.4$ (or equivalent) gets B2</p>

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19.		Yes with explanation	3	<p>M1 For Line A: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4</p> <p>OR for Line B: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$</p> <p>M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made e.g. gradients, equations or points.</p> <p>C1 for gradients 1.5 and 2 and Yes with explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations</p> <p>OR</p> <p>M1 for a diagram that shows both lines drawn and intersecting at (0,4)</p> <p>M1 for a diagram that shows both lines and their intersection point identified as (0,4)</p> <p>C1 for Yes and states the intersection point as (0,4)</p>

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20.	$\frac{\sin A}{36} = \frac{\sin 48}{57}$ $A = \sin^{-1} \left(\frac{\sin 48}{57} \times 36 \right) \text{ or}$ <p>A in range 27.9 – 28</p> $\frac{1}{2} \times 57 \times$ $36 \sin (180 - 48 - "28")$ <p>(= 995.49...)</p>		4	<p>M1 or $\frac{36}{\sin A} = \frac{57}{\sin 48}$</p> <p>M1 dep</p> <p>M1 dep on the first M1</p> <p>A1</p> <p>or $\frac{1}{2} \times 57 \times 36 \sin (48)$ with AC in range 74 – 74.5</p> <p>or AC from a correct method</p>

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21.	<p>(a) $l^2 = 12^2 + 4^2$</p> <p>$\pi \times 4 \times \sqrt{(12^2 - 4^2)}$ or</p> <p>$\pi \times 4 \times \sqrt{160}$</p> <p>$\pi \times 4 \times 12.6(4911\dots)$ or</p> <p>50.56π or</p> <p>$\frac{1264}{25}\pi$</p> <p>(b) $\frac{12-h}{r} = \frac{12}{4}$ or $4(12-h) = 12r$</p> <p>or $\frac{h}{12} = \frac{4-r}{4}$ or $4:12 = r : 12-h$</p>	159	3	<p>M1 for $l^2 = 12^2 + 4^2$</p> <p>M1 for a correct expression of the curved surface area</p> <p>A1 (accept in range 158 – 159)</p>
		$V = 12\pi r^2 - 3\pi r^3$	3	M1
			A1	M1 $h = 3r$
			A1	cso

National performance data from Results Plus

Qu No	Source of questions				Topic	Max score	Mean % all	Mean score of students achieving grade:						
	Spec	Paper	Session	Qu				ALL	A*	A	B	C	D	E
1	1MA0	2H	1511	Q14	Percentages	5	14	0.69	3.66	2.79	1.91	0.84	0.38	0.13
2	5AM2	2F	1211	Q22	Probability	3	28	0.83				1.66	0.78	0.36
3				NEW	Algebraic proof	1		No data available						
4	4MA0(R)	1F	1501	Q19	Fractions	3	53	1.59				2.09	1.46	0.00
5				NEW	Rearranging equations	3		No data available						
6	5AM2	2H	1411	Q12	Solve inequalities	5	66	3.30	5.00	4.50	4.25	2.71	1.79	0.00
7	5AM1	1H	1506	Q12	Compound interest	5	59	2.96	4.60	3.72	3.04	1.99	0.85	0.43
8	1MA0	2H	1311	Q08	Number sequences	4	58	2.30	3.84	3.46	2.87	2.03	1.28	0.82
9	4MA0	1H	1601	Q13	Mean, median, mode	5	39	1.94	3.47	2.03	1.21	0.74	0.41	0.24
10	5MM2	2H	1406	Q26	Solve quadratic equations	6	42	2.54	5.73	4.65	2.27	0.63	0.12	0.03
11	5AM2	2H	1211	Q20	Pythagoras in 3D	4	36	1.42	3.80	2.89	1.68	0.61	0.02	0.00
12	1380	2H	1106	Q19	Standard form	3	31	0.94	2.66	1.72	0.75	0.23	0.06	0.03
13	5AM2	2H	1506	Q19	Direct and indirect proportion	4	31	1.25	3.19	2.13	0.82	0.11	0.02	0.00
14	4MA0	1H	1601	Q17b	Circle theorems	3	37	1.12	2.22	1.21	0.57	0.17	0.04	0.03
15	1MA0	2H	1311	Q27	Histograms and grouped frequency	3	23	0.68	2.42	1.75	0.90	0.21	0.06	0.05
16	4MA0	2H	1405	Q24	Solve linear equations	3	18	0.55	1.08	0.30	0.13	0.05	0.02	0.01
17	1MA0	2H	1206	Q26	Vectors	4	18	0.73	3.16	1.62	0.57	0.12	0.02	0.01
18	2540	2H	806	Q25	Graphs of exponential functions	3	12	0.36	1.81	0.57	0.10	0.03	0.01	0.02
19	1MA0	2H	1311	Q25	Gradients	3	10	0.29	1.86	0.83	0.21	0.02	0.00	0.00
20	4MA0	1H	1601	Q20	Sine and cosine rule	4	43	1.73	3.42	2.20	0.70	0.10	0.01	0.00
21	4MA0(R)	1H	1601	Q15ab	Volume and surface area	6	64	2.90	3.81	2.43	1.75	1.17	0.14	0.60
						80								