1MA1 Practice papers Set 3: Paper 2H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
1.			29.1	3	M1 use of cos M1 cos ("x") = (= 0.87…) or ("x" =) cos – 1 ( ) **OR** or M2 for sin and following correct Pythagoras or M2 for tan and following correct Pythagoras or correct Pythagoras and then correct use of sine or cosine rule with "21.36" A1 for ans rounding to 29.1 (29.1103…)
2.		$2000 \times 1.05^2 =$ 2000×1.1025 **OR** $2000 \times 1.05 = 2100$ $2100 \times 1.05 = 2205$	£2205	3	M2 2000×1.05^2 (M1 2000×1.05^n, $n \neq 2$) A1 cao **OR** M1 $\frac{5}{100} \times 2000$ (oe) or 100 or 200 or 2100 or 2200 seen M1 (dep) $\frac{5}{100} \times$ (2000 + "100") A1 cao SC B2 for £2315.25 seen (3 yrs)

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3.		Angle *ACB* = 67º *x* = 180 – (67 + 67)	46° with reasons	4	B1 for angle *ACB* = 67º, could be marked on the diagram M1 for 180 – (‘67’ + ‘67’) A1 for *x* = 46° C1 for vertically opposite angles (or vertically opposite angles) **and** base angles of an isosceles triangle are equal **OR** B1 for angle *ACB* = 67º, could be marked on the diagram M1 for 180 – (‘67’ + ‘67’) A1 for *x* = 46° C1 for “angles on a straight line add up to 180º **and** base angles of an isosceles triangle are equal

<table>
<tr><th colspan="4">1MA1 Practice papers Set 3: Paper 2H (Regular) mark scheme – Version 1.0</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>4.</td><td></td><td>$\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$
$1-\frac{1}{36}$

OR
$\frac{1}{6}\times\frac{5}{6}+\frac{5}{6}\times\frac{1}{6}+\frac{5}{6}\times\frac{5}{6}$
$=\frac{5+5+25}{36}$

OR
<table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>1,1</td><td>1,2</td><td>1,3</td><td>1,4</td><td>1,5</td><td>1,6</td></tr><tr><td>2</td><td>2,1</td><td>2,2</td><td>2,3</td><td>2,4</td><td>2,5</td><td>2,6</td></tr><tr><td>3</td><td>3,1</td><td>3,2</td><td>3,3</td><td>3,4</td><td>3,5</td><td>3,6</td></tr><tr><td>4</td><td>4,1</td><td>4,2</td><td>4,3</td><td>4,4</td><td>4,5</td><td>4,6</td></tr><tr><td>5</td><td>5,1</td><td>5,2</td><td>5,3</td><td>5,4</td><td>5,5</td><td>5,6</td></tr><tr><td>6</td><td>6,1</td><td>6,2</td><td>6,3</td><td>6,4</td><td>6,5</td><td>6,6</td></tr></table></td><td>$\frac{35}{36}$</td><td>3</td><td>M1 for $\frac{1}{6}\times\frac{1}{6}$ oe
M1 for $1-$, $\frac{1}{6}\times\frac{1}{6}$, oe
A1 for $\frac{35}{36}$ or 0.97(2222...) oe
OR
M1 for $\frac{1}{6}\times\frac{5}{6}$ or $\frac{5}{6}\times\frac{1}{6}$ or $\frac{5}{6}\times\frac{5}{6}$ oe
M1 for $'\frac{1}{6}\times\frac{5}{6}'+'\frac{5}{6}\times\frac{1}{6}'+'\frac{5}{6}\times\frac{5}{6}'$ oe
A1 for $\frac{35}{36}$ or 0.97(2222...) oe
OR
M1 for probability space oe that can lead to the answer
M1 for $1-\frac{'\text{numberof }6,6'}{36}$ or $\frac{'\text{numberof non}6,6'}{36}$
A1 for $\frac{35}{36}$ or 0.97(2222...) oe</td></tr>
</table>

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Question		**Working**	**Answer**	**Mark**	**Notes**
5.		$P = kr^2$ $36 = k \times 20^2$ $P = 0.09\ r^2$ **OR** $\frac{20^2}{r^2} = \frac{36}{p}$ $P = \frac{36}{20^2} r^2$	$P = 0.09\ r^2$	3	M1 for $P = kr^2$ (accept any $k \neq 0$ or 1) M1 (dep) for $36 = k \times 20^2$ A1 for $P = 0.09\ r^2$ oe **OR** M2 for $\frac{20^2}{r^2} = \frac{36}{p}$ oe, e.g. $20^2 : r^2 = 36 : P$ A1 for $P = \frac{36}{20^2} r^2$ oe

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Question		**Working**	**Answer**	**Mark**	**Notes**
6.		$2x + 2(x \pm 9) < 200$ $2x + 2x \pm 18 < 200$ $4x \pm 18 < 200$ $4x < 182$ (or 218) $x < 45.5$ ($x < 54.5$, so width < 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 $x \pm 9$ oe seen (it could just be on a diagram) or a rectangle with length 9 cm greater than the width M1 for $2x + 2(x \pm 9)$ 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 **OR** M1 for $200 – 18$ (= 182) M1 for $182 \div 4$ A1 for 45.5 B1 for answer of 45 [SC: B3 for 45.5 seen from any method]

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Question		**Working**	**Answer**	**Mark**	**Notes**
7.		$\sqrt{45^2 + 20^2} = \sqrt{2425}$ = 49.24... $\sqrt{30^2 + 20^2} = \sqrt{1300}$ = 36.05... $\sqrt{45^2 + 30^2} = \sqrt{2925}$ = 54.08... $\sqrt{45^2 + 20^2 + 30^2}$ $= \sqrt{3325}$ = 57.66281297 **OR** $30^2 + 20^2 + 45^2$ = 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 oe **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 oe
8.				2	B2 for correct locus within guidelines (overlay) (B1 for a line drawn parallel to either given line OR a line passing through the angle outside of the guidelines OR a line drawn within the guidelines but not passing through angle)

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9.			116	3	M1 for 80% or 0.8 seen oe or $\frac{464}{0.8}$ (= 580) M1 for $\frac{464}{0.8} - 464$ A1 cao **OR** M1 for 80% or 0.8 seen oe M1 for 464 ÷ 4 or 464 ÷ (80÷20) A1 cao
10.		(6.21795×10^{10}) ÷ 510 072 000 = 121.9(03378…)	1.22×10^2	3	M1 for SA Jupiter ÷ SA Earth e.g. (6.21795×10^{10}) ÷ 510 072 000 oe, e.g. 62000 ÷ 51 or digits 121 …. or digits 122 A1 for 121 – 122 A1 for $1.21 \times 10^2 – 1.22 \times 10^2$
11.			75.5	3	M1 for 25 × 67.8 (= 1695) or 55 × 72.0 (= 3960) M1 (dep) for (“3960” − “1695”) ÷ 30 A1 cao
12.			Rotation, 90° clockwise centre (1,4)	3	B1 for rotation B1 for 90° clockwise or 270° anticlockwise B1 for (1,4) NB Award B0 if more than one transformation given

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13.	(*a*)		25.5	2	M1 for 3000 × 8.5 A1 cao
	(*b*)		2.187×10^6	3	M1 for $\left(\frac{225}{0.25}\right)^3$ or 900^3 oe or $\left(\frac{225}{25}\right)^3$ or 9^3 M1 for correct conversion of units (cm^3 to m^3) A1 cao
14.			12	5	M1 for writing a correct expression for the perimeter of the square or the rectangle e.g. $4(x + 6)$ or $10x + 20$ or for the semi-perimeter M1 for equating the two (semi) perimeters correctly M1 for resolving the fraction e.g. $20x + 120 = 30x + 60$ or for rearranging the equation to the form. $a = bx + c$ M1 for $10x + 60 = 120$ or $24 = 2x + 12$ or $x = 6$ A1 cao
15.	(*a*)		$2x^3 + 3x^2 - 28x - 15$	3	M1 Correct expansion of any 2 brackets (condone 1 error) M1 Correct expansion of previos product by remaining bracket (condone 1 error) A1
	(*b*)		$r = \frac{am - 1}{5 - a}$	3	M1 for $5r - ar = am - 1$ oe (terms in r isolated) M1 for $r(5 - a) = am - 1$ A1

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16.			49	3	M1 for 180 – 56 – 75 A1 for 49 C1 for alternate segment theorem and angles on a straight line add up to 180^o OR alternate segment theorem and angles in a triangle add up to 180^o Appropriate to methods shown
17.			6.2	5	M1 for a method to find an angle *RAB* = 70, *ABR* = 50, *BRA* = 60 or *TAR* = 20 M1 for substitution into sine formula $\frac{AR}{\sin"50"} = \frac{12}{\sin"60"}$ M1 for use of sine rule to find *AR*, $AR = \frac{12}{\sin"60"} \times \sin"50"$ (= 10.61) M1 for substitution into cosine formula $TR^2 = 5^2 + "10.61"^2 - 2 \times 5 \times "10.61" \times \cos 20$ (= 37.92) A1 for 6.15 – 6.2
18.	(*a*) (i)(ii) (*b*)		(2, 0) and (6, 0) (0, 4) Drawn curve	2 2	B1 for (2, 0) and (6, 0) B1 for (0, 4) M1 for a translation in the positive *y*-direction A1 for curve passing through (2, 0), (0, 2) and (4, 2)

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19.	(*a*)		11	3	M1 for tangent drawn at $t = 2$ M1 (dep) for $\frac{diff.\ y}{diff.\ x}$ ft from tangent A1 for 9 – 14
	(*b*)		66.5	3	M1 for splitting the area into 4 strips and a method of finding the area of one shape under the graph, e.g. ½ × 1 × (26 + 62) (= 44) M1 for complete process to find the area under the graph, e.g. '44' + ½ × 1 × (8 + 26) (= 17) + ½ × 1 × (1.5 + 8) (= 4.75) + + ½ × 1 × (0 + 1.5) (= 0.75) [= 66.5] A1 NB Allow for ± 1 when reading the values of the diagram
20.			1847 – 1848	5	M1 for correct method to establish week 6 population as $1200 \times x$ oe M1 for forming equation $1200\ x^2 = 900$ M1 for method to solve equation to establish $x = \frac{\sqrt{3}}{2}$ M1 for correct method for week 2 population e.g. $1200 \div \left(\frac{\sqrt{3}}{2}\right)^3$ oe A1 for 1847 – 1848 given as answer dependent on working seen

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					OR M1 for realising that population is $\frac{3}{4}$ in 2 weeks M1 for forming the equation $\frac{3}{4} = x^2$ M1 for method to solve equation to establish $x = \frac{\sqrt{3}}{2}$ M1 for correct method for week 2 population e.g. $1200 \div \left(\frac{\sqrt{3}}{2}\right)^3$ oe A1 for 1847 – 1848 given as answer dependent on working seen **OR** M1 for establishing population is of form $N = Ab^t$ oe M1 for substituting $t = 5$, $N = 1200$ gives $1200 = Ax^5$ M1 for substituting $t = 7$, $N = 900$ gives $900 = Ax^7$ or $900 = 1200x^2$ and $x^2 = \frac{3}{4}$ so $x = \frac{\sqrt{3}}{2}$ M1 for correct method for week 2 population e.g. $1200 \div \left(\frac{\sqrt{3}}{2}\right)^3$ oe A1 for 1847 – 1848 given as answer dependent on working seen

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21.		$(A =)$ $0.5\times(4+k)\times\sqrt{3}\left(=5\sqrt{6}\right)$ $k+4=\dfrac{10\sqrt{6}}{\sqrt{3}}$ $(k =)\ 2\times\dfrac{5\sqrt{6}}{\sqrt{3}-4}$ or $(k =)\ \dfrac{5\sqrt{6}-2\sqrt{3}}{0.5\sqrt{3}}$ 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 $2\left(5\sqrt{2}-2\right)$ but don't accept $10\sqrt{2}-4$ followed by $5\sqrt{2}-2$

National performance data from Results Plus

Qu No	Spec	Paper	Session	Qu	Topic	Max score	Mean % all	ALL	A*	A	B	C	D	E
1	4MA0	1F	1305	Q21	Trigonometry	3	46	1.37				2.21	1.19	0.69
2	1387	6H	711	Q07	Compound interest	3	77	2.32	2.95	2.74	2.30	1.46		
3	5AM1	1F	1211	Q19	Angles	4	41	1.64				3.07	2.17	1.09
4	5AM2	2H	1211	Q13	Probability	3	54	1.61	2.90	2.32	1.84	1.20	0.67	0.43
5	5AM2	2H	1111	Q17	Direct and indirect proportion	3	23	0.70	2.25	2.29	0.90	0.00	0.00	0.00
6	5MM2	2H	1106	Q09	Bounds	4	48	1.93	3.56	3.03	2.18	1.70	0.73	0.00
7	5AM2	2H	1211	Q20	Pythagoras in 3D	4	36	1.42	3.80	2.89	1.68	0.61	0.02	0.00
8	1380	2H	1006	Q16	Loci	2	50	0.99	1.85	1.42	0.95	0.58	0.34	0.21
9	1MA0	2H	1311	Q20	Reverse percentages	3	29	0.88	2.30	1.84	1.22	0.54	0.16	0.06
10	1380	2H	1106	Q19	Standard form	3	31	0.94	2.66	1.72	0.75	0.23	0.06	0.03
11	1MA0	2H	1406	Q20	Mean, median, mode	3	22	0.65	2.39	1.56	0.72	0.17	0.02	0.01
12	2MB0	3H	1506	Q10	Properties of 2D shapes	3	70	2.11	2.93	2.69	2.40	1.90	1.12	0.55
13	5AM2	2H	1411	Q17	Compound measures	5	34	1.70	3.45	3.00	2.04	1.04	0.64	1.33
14	5AM1	1F	1411	Q16	Solve linear equations	5	10	0.49	4.00	3.00	2.00	1.00	0.42	0.33
15	NEW QUESTION				Expand double /change subject of formula	6	No data available							
16	2MB0	3H	1506	Q14	Circle Theory	3	36	1.09	2.32	1.80	1.04	0.54	0.37	0.47
17	2MB0	3H	1506	Q22	Trigonometry	5	33	1.67	4.37	3.02	1.60	0.48	0.23	0.09
18	5MM2	2H	1506	Q22	Transformation of functions	4	39	1.54	3.47	2.38	1.07	0.49	0.20	0.27
19a	5AM2	2H	1111	Q23	Gradients as rate of change	3	14	0.43	3.00	1.14	0.30	0.00	0.00	0.00
19b	NEW QUESTION				Area under the graph	3	No data available							
20	5AM2	2H	1506	Q22	Proportional change	5	26	1.28	3.96	1.88	0.67	0.13	0.05	0.00
21	4MA0	1H	1405	Q18	Surds	3	43	1.29	2.21	1.06	0.45	0.16	0.05	0.01
						80								