

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0					
Question		Working	Answer	Mark	Notes
1			$\frac{39}{80}$	4	M1 for a correct method to find $\frac{2}{5}$ of 40; eg. $40 \div 5 \times 2 (= 16)$ or for a correct method to find $\frac{5}{8}$ of 40; eg. $40 \div 8 \times 5 (= 25)$ M1 for a correct method to find $\frac{2}{5}$ of 40 and $\frac{5}{8}$ of 40 M1 (dep on M1) for $80 - "16" - "25" (= 39)$ or $\frac{"16" + "25"}{80} (= \frac{41}{80})$ A1 $\frac{39}{80}$ oe OR M1 for $1 - \frac{2}{5} (= \frac{3}{5})$ and $1 - \frac{5}{8} (= \frac{3}{8})$ M1 for a correct method to find $\frac{3}{5}$ of 40; eg. $40 \div 5 \times 3 (= 24)$ or for a correct method to find $\frac{3}{8}$ of 40; eg. $40 \div 8 \times 3 (= 15)$ M1 (dep on M1) for $"24" + "15" (= 39)$ A1 $\frac{39}{80}$ oe
	2		$w = 2P + 3$	2	M1 for a clear intention to multiply both sides by 2 or add $\frac{3}{2}$ to both sides as a first step A1 for $w = 2P + 3$ oe

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3	$25 \div 50 = 0.5 \text{ h} = 30 \text{ min}$ $25 \div 60 = 0.416\text{h} = 25 \text{ min}$	5	3	M1 for $25 \div 50$ or $\frac{60}{50} \times 25$ or 30 (min) or 0.5(h) or $25 \div 60$ or $\frac{60}{60} \times 25$ or 25 (min) or 0.41(6)(h) M1(dep) ‘0.5’ – ‘0.41(6)’ or ‘30’ – ‘25’ A1 cao OR M1 for $60 \div 25 (= 2.4)$ and $60 \div \text{“2.4”}$ or $50 \div 25 (= 2)$ and $60 \div \text{“2”}$ M1(dep) for ‘30’ – ‘25’ A1 cao

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4	$12x + 9y = -21$ $\underline{12x - 16y = 104}$ $25y = -125$ $y = -5$ $4x + 3 \times -5 = -7$ OR $16x + 12y = -28$ $\underline{9x - 12y = 78}$ $25x = 50$ $x = 2$ $4 \times 2 + 3y = -7$	$x = 2$ $y = -5$	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either $x = 2$ or $y = -5$ M1 (dep on 1 st M1) for correct substitution of their found value or (indep) for correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both $x = 2$ and $y = -5$ SC: B1 for $x = 2$ or $y = -5$ if M0 scored

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5	(a)	4500×1.04^2	4867.20	3	M1 for $4500 \cdot 1.04$ or for $4500 + 0.04 \cdot 4500$ or for 4680 or 180 or 360 or 4860 M1 (dep) ‘4680’ $\cdot 1.04$ or for ‘4680’ $+ 0.04 \cdot$ ‘4680’ A1 for 4867.2(0) cao (If correct answer seen then ignore any extra years) Alternative method M2 for 4500×1.04^2 or $4500 \cdot 1.04^3$ A1 for 4867.2(0) cao [SC: 367.2(0) seen B2]
	(b)	2400×1.075^n 2580 2773.5 2981.5125 3205.12... 3445.51...	5	2	M1 for an attempt to evaluate 2400×1.075^n for at least one value of n (not equal to 1) or $3445.51 \div 1.075^n$ ($n \geq 2$) or $\frac{3445.51}{2400}$ (=1.4356...) and 1.075^n evaluated, $n \geq 2$ A1 for 5 cao

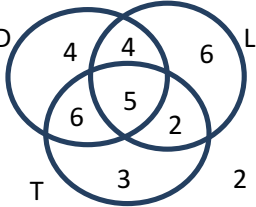
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Question	Working	Answer	Mark	Notes
6	$2 \times 10 \cos 70$ OR $BC^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos 40$ $BC = \sqrt{46.79(1....)}$	6.84	4	M1 for $180 - 2 \times 70$ M1 for $\frac{10}{\sin 70} = \frac{BC}{\sin(180 - 2 \times 70)}$ M1 for $BC = \frac{\sin(180 - 2 \times 70) \times 10}{\sin 70}$ A1 for 6.84(0...) OR M1 for $180 - 2 \times 70$ M1 for $10^2 + 10^2 - 2 \times 10 \times 10 \times \cos(180 - 2 \times 70)$ M1 for $\sqrt{46.79(1....)}$ A1 for 6.84(0...) M1 for perpendicular from A to BC, may be implied by correct working M1 for $10 \times \cos 70$ or $10 \times \sin 20$ or correct attempt to use sin or cos M1 for $2 \times '10 \times \cos 70'$ A1 for 6.84(0...)

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7	(i) $\frac{1}{2} \times (x+6+3x-4) \times (x-1)$ or $(x+6)(x-1)$ or $(x-1)(3x-4)$ or $\frac{1}{2} \times (x-1)(3x-4-(x+6))$ $\frac{1}{2} \times (4x^2 - 2x - 2) = 119$ (ii) $(2x \pm 15)(x \pm 8) (= 0)$ or $\frac{- -1 \pm \sqrt{(-1)^2 - 4 \times 2 \times -120}}{2 \times 2}$ or $\left(x - \frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^2 - 60 = 0$ $(2x+15)(x-8) (=0)$ or $\frac{1 \pm \sqrt{1+960}}{4}$ or $x = \frac{1}{4} \pm \sqrt{\left(\frac{1}{4}\right)^2 + 60}$ or -7.5 and 8 given as solutions	shown 8	3 3	M1 correct algebraic expression for any relevant area M1 for correct equation with at least one pair of brackets expanded correctly A1 for completion to given equation M1 Start to solve quadratic condone one sign error in substitution if quadratic formula used; allow -1^2 or 1^2 or 1 in place of $(-1)^2$ M1 ft from an incorrect 3 term quadratic equation A1 dep ft method from an incorrect 3 term quadratic equation Award all 3 marks if first M1 awarded and 8 alone given as final answer

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8	(a)		$x \geq -1$	1	B1 cao
	(b)		$-4, -3, -2$	2	B2 for all 3 values and no extras (ignore repeats) (B1 for 2 correct values and no extras or all 3 correct values and -5)
	(c)		$y < 4$	2	M1 for clear intention to add 2 onto each side of an inequality (or equation) or clear intention to divide all terms by 5 as a first step or $(y =) 4$ A1 cao

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9	$\text{eg. } \frac{3}{9} \times \frac{2}{8} \times \frac{1}{7} \left(= \frac{6}{504} = \frac{1}{84} \right)$ $\text{eg. } \frac{2}{9} \times \frac{3}{8} \times \frac{4}{7} \left(= \frac{24}{504} = \frac{1}{21} \right)$ $6 \times \frac{24}{504} \left(= \frac{144}{504} = \frac{6}{21} = \frac{2}{7} \right)$ $6 \times \frac{2}{9} \times \frac{3}{8} \times \frac{4}{7} + \frac{3}{9} \times \frac{2}{8} \times \frac{1}{7} \left(= \frac{6}{21} + \frac{1}{84} \right)$	$\frac{150}{504}$	5	M1 (probabilities from selecting 2, 2, 2) allow $\frac{3}{9} \times \frac{2}{9} \times \frac{1}{9} \left(= \frac{6}{729} \right)$ or $\frac{3}{9} \times \frac{3}{9} \times \frac{3}{9} \left(= \frac{27}{729} \right)$ M1 (probabilities from selecting 1, 2, 3) allow $\frac{2}{9} \times \frac{3}{9} \times \frac{4}{9} \left(= \frac{24}{729} \right)$ M1 (probabilities for all combinations of 1, 2, 3) allow $6 \times \frac{24}{729} \left(= \frac{144}{729} \right)$ M1 complete correct method A1 oe eg. $\frac{25}{84}$, 0.298, 0.297619...

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10	$20 = 2, 2, 5$ $140 = 2, 2, 5, 7$ $420 = 2, 2, 3, 5, 7$	60	2	M1 for identifying the prime factors for 2 of the 3 numbers 20,140,420 (can be implied by a factor tree, repeated division or Venn diagram) or For a complete Venn diagram for x and 140 with 20 in the intersection or $x = 20 \times 3$ or $20 \times 7 \times y = 420$ or $\frac{420}{20 \times 7}$ or At least the 1st 3 multiples of 20 or $140x = 420 \times 20$ oe A1 (Allow $2 \times 2 \times 3 \times 5$)	
11		380	3	M1 for $1 - 0.15$ (= 0.85) or $100 - 15$ (= 85) M1 for $323 \div 0.85$ oe or $323 \div 85 \times 100$ oe A1 cao	
12		 5/9		M1 for 5 in the middle and 1 from $4(D \cap L \cap T')$ or $2(L \cap T \cap D')$ or $6(D \cap T \cap L')$ M1 for any 4 correct entries A1 for all correct including 2 outside the circles inside the rectangle B1 ft from incorrect diagram	

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13	(a)		1	1	B1
	(b)	$y = (x - 6) / 2$			
		$2y = x - 6$			M1 or for a correct flowchart including inverse
		$2y + 6 = x$	$2x + 6$	2	A1

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14	$PQ(ML) = 20 \sin 30^\circ$ $(=10)$ or $MR = \sqrt{12^2 + 20^2} = \sqrt{544}$ $= 4\sqrt{34} = 23.32..)$ $LR = \sqrt{12^2 + (RQ)^2} =$ $\sqrt{12^2 + (10\sqrt{3})^2} = \sqrt{444} = 2\sqrt{111}$ $\sin MRL = \frac{10}{4\sqrt{34}} \left(\frac{ML}{MR} \right)$ or $\cos MRL = \frac{2\sqrt{111}}{4\sqrt{34}}$ $\left(\frac{LR}{MR} \right)$ or $\tan MRL = \frac{10}{2\sqrt{111}} \left(\frac{ML}{LR} \right)$	25.4	5	B1 Recognition of angle LRM as required angle either drawn on diagram or from working M2 for a correct method to calculate $PQ(ML)$ & MR or MR & LR or $PQ(ML)$ & LR (NB: LR requires use of $RQ = \sqrt{20^2 - 10^2}$ or $20 \cos 30 = \sqrt{300} = 10\sqrt{3} = 17.32..)$ Or M1 for a correct method to calculate one of the sides PQ or MR or LR M1 (Dep on M2) Use of a correct trig ratio to find angle MRL A1 25.38 – 25.5

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Question	Working	Answer	Mark	Notes
15		21 or 22	5	M1 for $160r^2 = 90$ or $\frac{90}{160}$ M1 for $(r=) \sqrt{\frac{90}{160}}$ oe M1 (dep M2) for $160 \times \left(\sqrt{\frac{90}{160}}\right)^7$ oe A1 for 21.3... A1 for 21 or 22 or M1 for $160 \times r^2 = 90$ or $\frac{90}{160}$ M1 for $160 \times \frac{100-n}{100} \times \frac{100-n}{100} = 90$ M1 (dep M2) for 160×0.75^7 A1 for 21.3... A1 for 21 or 22

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16	$AC^2 = 11.8^2 + 7.4^2$ $- 2 \times 11.8 \times 7.4 \times \cos 132$ $AC = 17.63\dots$ $\frac{1}{2} \times 8.2 \times "17.63\dots"$ $(= 72.28\dots)$ $+ \frac{1}{2} \times 11.8 \times 7.4 \times \sin 132$ $(= 32.445\dots)$	105	6	M1 for $AC^2 = 11.8^2 + 7.4^2 - 2 \times 11.8 \times 7.4 \times \cos 132$ M1 for correct order of operations or 310.85... A1 for $AC = 17.63\dots$ M1 for Area of $ABC = \frac{1}{2} \times 8.2 \times "17.63\dots"$ or Area of $ADC = \frac{1}{2} \times 11.8 \times 7.4 \times \sin 132$ M1 for $"\frac{1}{2} \times 8.2 \times "17.63\dots" + \frac{1}{2} \times 11.8 \times 7.4 \times \sin 132"$ A1 for an answer in the range 104.7 – 105

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17	$\sqrt{t} = \frac{x}{2a}$ or $x^2 = (2a\sqrt{t})^2$ or $x^4 = (2a\sqrt{t})^4$ oe $t = \left(\frac{x}{2a}\right)^2$ oe or $t^2 = \frac{x^4}{16a^4}$ oe $y = a\left[\left(\frac{x}{2a}\right)^2\right]^2 - 2a\left(\frac{x}{2a}\right)^2$ oe	$y = \frac{x^4}{16a^3} - \frac{x^2}{2a}$	4	M1 Correct rearrangement for $\sqrt{t}$ or correct expression for x^2 or x^4 M1 Correct expressions for t or t^2 or for at^2 or $2at$ in terms of x and a M1 for correct substitution of t and t^2 into expression for y A1 Fully correct answer in required form

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18	Area ($1 < l < 6$) $= (0.12 \times 1) +$ $(0.32 \times 1) + (0.38 \times 1) +$ $(0.52 \times 1) + (0.16 \times 1)$ $= 1.50$ Total Area = $(0.12 \times 2) +$ $(0.32 \times 1) + (0.38 \times 1) +$ $(0.52 \times 1) + (0.16 \times 2)$ $= 1.78$ Proportion = $\frac{1.50}{1.78}$	0.84 or $\frac{75}{89}$	4	M1 for attempt to use frequency density $\times$ width e.g. 0.12×2 or 0.24 M1 for $(0.12 \times 2) + (0.32 \times 1) + (0.38 \times 1) + (0.52 \times 1) + (0.16 \times 2)$ or 1.78 seen M1 for $((0.12 \times 1) + (0.32 \times 1) + (0.38 \times 1) + (0.52 \times 1) + (0.16 \times 1)) \times 1.78$ A1 for answer which rounds to 0.84 or 84% or $\frac{75}{89}$ or equivalent vulgar fraction OR M1 for attempt to use area e.g. sight of any one of 4.8, 6.4, 7.6, 10.4 or 6.4 (cm²) oe M1 for $4.8 + 6.4 + 7.6 + 10.4 + 6.4$ or 35.6 (cm²) oe seen M1 for $(2.4 + 6.4 + 7.6 + 10.4 + 3.2)$ “35.6” oe A1 for answer which rounds to 0.843 or 84.3%% or $\frac{75}{89}$ or equivalent vulgar fraction

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Question		Working	Answer	Mark	Notes
19			congruency proved	3	M1 for correct statement with correct reason M1 for a second correct statement with correct reason C1 for complete proof justifying congruency, eg SAS or AAS Eg $DAE = BCF$ (opposite angles of parallelogram are equal) $AE = FC$ (E and F are midpoints of lines of equal length) $AD = BC$ (opposite sides of parallelogram are equal) $AED \equiv CFB$ (SAS)
			explains why $DE = FB$	1	C1 for relevant statement using congruency Eg DE and FB are corresponding sides of congruent triangles

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	2H	1411	Q07	Fractions	4	1.98	3.50	2.97	2.44	1.18	0.76	0.10
2	5MM2	2F	1506	Q20	Rearranging equations	2	0.14				0.51	0.15	0.03
3	1MA0	2F	1211	Q23	Compound measures	3	0.59				1.35	0.70	0.35
4	5MM2	2H	1211	Q18	Simultaneous equations	4	2.07	4.00	3.41	2.37	1.38	0.17	0.00
5	1380	2H	0906	Q19	Compound interest	5	3.41	4.93	4.59	3.68	2.25	0.94	0.35
6	5MM2	2H	1111	Q17	Trigonometry	4	1.62	3.93	3.28	1.63	0.55	0.45	0.00
7	4MA0	3H	1606	Q17	Solving quadratic equations	6	3.21	5.22	3.03	1.13	0.32	0.13	0.02
8	5MM2	2H	1406	Q10	Solve inequalities	5	3.77	4.81	4.52	3.98	3.18	2.25	0.82
9	4MA0	3H	1606	Q21	Probability	5	1.70	2.88	1.45	0.57	0.14	0.04	0.02
10	4MA0	4H	1606	Q10	LCM and HCF	2	1.26	1.78	1.20	0.76	0.40	0.23	0.16
11	5MM2	2H	1306	Q12	Reverse percentages	3	1.90	2.98	2.76	2.18	1.06	0.35	0.14
12	4MA0	4H	1606	Q21	Venn diagrams	4	2.04	3.15	1.80	0.94	0.4	0.15	0.05
13	4MA0	2H	1305	Q17	Functions	5	3.03	4.26	3.09	1.78	0.95	0.45	0.18
14	4MA0(R)	4H	1606	Q17	Trigonometry	5	2.33	4.36	2.96	1.36	0.47	0.14	0.02
15	5AM2	2H	1311	Q25	Proportional change	5	1.33	4.58	2.62	1.07	0.28	0.00	0.00
16	5MM2	2H	1106	Q24	Sine and cosine rule	6	1.30	5.46	3.05	0.73	0.23	0.02	0.00
17	4MA0(R)	4H	1606	Q21	Rearranging equations	4	1.00	2.72	0.66	0.11	0.01	0.01	0.00
18	5AM1	1H	1111	Q22	Histograms and grouped data	4	0.72	1.67	0.86	0.50	0.09	0.14	0.00
19	5MM2	2H	1311	Q26	Geometric proof	4	0.26	1.41	0.42	0.11	0.03	0.00	0.00
						80							