

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

Question	Working	Answer	Mark	Notes
1		$\frac{39}{80}$	4	<p>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. $40 \div 8 \times 5 (= 25)$</p> <p>M1 for a correct method to find $\frac{2}{5}$ of 40 and $\frac{5}{8}$ of 40</p> <p>M1 (dep on M1) for $80 - "16" - "25" (= 39)$ or $\frac{"16"+"25"}{80} (= \frac{41}{80})$</p> <p>A1 $\frac{39}{80}$ oe</p> <p>OR</p> <p>M1 for $1 - \frac{2}{5} (= \frac{3}{5})$ and $1 - \frac{5}{8} (= \frac{3}{8})$</p> <p>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. $40 \div 8 \times 3 (= 15)$</p> <p>M1 (dep on M1) for $"24" + "15" (= 39)$</p> <p>A1 $\frac{39}{80}$ oe</p>
2		$w = 2P + 3$	2	<p>M1 for a clear intention to multiply both sides by 2 or add $\frac{3}{2}$ to both sides as a first step</p> <p>A1 for $w = 2P + 3$ oe</p>

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

Question		Working	Answer	Mark	Notes
5	(a)	4500×1.04^2	4867.20	3	<p>M1 for 4500×1.04 or for $4500 + 0.04 \times 4500$ or for 4680 or 180 or 360 or 4860</p> <p>M1 (dep) '4680' $\times 1.04$ or for '4680' $+ 0.04 \times$ '4680'</p> <p>A1 for 4867.2(0) cao</p> <p>(If correct answer seen then ignore any extra years)</p> <p>Alternative method</p> <p>M2 for 4500×1.04^2 or 4500×1.04^3</p> <p>A1 for 4867.2(0) cao</p> <p>[SC: 367.2(0) seen B2]</p>
	(b)	2400×1.075^n 2580 2773.5 2981.5125 3205.12... 3445.51...	5	2	<p>M1 for an attempt to evaluate 2400×1.075^n for at least one value of n (not equal to 1) or $3445.51 \div 1.075^n$ ($n \geq 2$)</p> <p>or $\frac{34451}{2400}$ (=1.4356...) and 1.075^n evaluated, $n \geq 2$</p> <p>A1 for 5 cao</p>

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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6	$2 \times 10 \cos 70$ OR $BC^2 = 10^2 + 10^2 -$ $2 \times 10 \times 10 \times \cos 40$ $BC = \sqrt{4679(1....)}$	6.84	4	<p>M1 for $180 - 2 \times 70$</p> <p>M1 for $\frac{10}{\sin 70} = \frac{BC}{\sin(180 - 2 \times 70)}$</p> <p>M1 for $BC = \frac{\sin(180 - 2 \times 70) \times 10}{\sin 70}$</p> <p>A1 for 6.84(0...)</p> <p>OR</p> <p>M1 for $180 - 2 \times 70$</p> <p>M1 for $10^2 + 10^2 - 2 \times 10 \times 10 \times \cos(180 - 2 \times 70)$</p> <p>M1 for $\sqrt{4679(1....)}$</p> <p>A1 for 6.84(0...)</p> <p>M1 for perpendicular from A to BC, may be implied by correct working</p> <p>M1 for $10 \times \cos 70$ or $10 \times \sin 20$ or correct attempt to use sin or cos</p> <p>M1 for $2 \times '10 \times \cos 70'$</p> <p>A1 for 6.84(0...)</p>

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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7	<p>(i) $\frac{1}{2} \times (x+6+3x-4) \times (x-1)$ or $(x+6)(x-1)$ or $(x-1)(3x-4)$ or $\frac{1}{2} \times (x-1)(3x-4-(x+6))$ $\frac{1}{2} \times (4x^2 - 2x - 2) = 119$</p> <p>(ii) $(2x+15)(x+8) (=0)$ 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</p>	<p>shown</p> <p>8</p>	<p>3</p> <p>3</p>	<p>M1 correct algebraic expression for any relevant area</p> <p>M1 for correct equation with at least one pair of brackets expanded correctly</p> <p>A1 for completion to given equation</p> <p>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 $(-1)^2$</p> <p>M1 ft from an incorrect 3 term quadratic equation</p> <p>A1 dep</p> <p>ft method from an incorrect 3 term quadratic equation</p> <p>Award all 3 marks if first M1 awarded and 8 alone given as final answer</p>

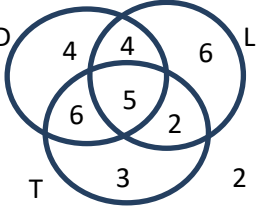
1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

Question		Working	Answer	Mark	Notes
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

IMA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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9	eg. $\frac{3}{9} \times \frac{2}{8} \times \frac{1}{7} \left(= \frac{6}{504} = \frac{1}{84} \right)$ 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...

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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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 1 st 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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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14	$PQ(ML) = 20\sin 30^\circ$ (=10) or $MR = \sqrt{12^2 + 20^2} = \sqrt{544}$ = $4\sqrt{34} = 23.32\dots$ $LR = \sqrt{12^2 + (RQ)^2} =$ $\sqrt{12^2 + (10\sqrt{3})^2} = \sqrt{444} = 2\sqrt{111} = 21.07\dots$ $\sin MRL = \frac{10}{4\sqrt{34}} \left(\frac{ML}{MR} \right)$ 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 $20\cos 30 = \sqrt{300} = 10\sqrt{3} = 17.32\dots$) 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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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16	$AC^2 = 11.8^2 + 7.4^2$ $- 2 \times 11.8 \times 7.4 \times \cos 132$ $AC = 17.63\dots$ $\frac{1}{2} \times 8.2 \times "17.63\dots"$ $(\text{= } 72.28\dots)$ $+ \frac{1}{2} \times 11.8 \times 7.4 \times \sin 132$ $(\text{= } 32.445\dots)$	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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

1MA1 Practice papers Set 6: Paper 3H (Regular) mark scheme – Version 1.0

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

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							