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Mark Scheme (Results)

June 2011

International GCSE
Mathematics (4MA0) Paper 3H

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Question Number	Working	Answer	Mark	Notes
1. (a)	$\frac{24.1}{0.6} - 38.44 = 40.166\ldots - 38.44$		2	M1 for 0.6 or $\frac{3}{5}$ or 40.166… (4 figures correct rounded or truncated) or $40\frac{1}{6}$ or 38.44 or $38\frac{11}{25}$
		1.726666667		A1 Accept if first 4 figures correct (rounded or truncated) Also accept 1.726 & or $\frac{259}{150}$ or $1\frac{109}{150}$
(b)		1.73	1	B1 ft from (a) if answer to (a) is a decimal with more than 3 sf
				Total 3 marks

Question Number	Working	Answer	Mark	Notes	(alternative method)
2 .	(5 − 2) × 180 or 3 × 180 or (2 × 5 − 4) × 90 or 6 × 90 or 360 + 180		4	M1	360−(83+66+53+96) Condone 1 incorrect ext angle
	540			A1 540 seen scores M1A1	62
	"540" − (97 + 114 + 127 + 84)			M1 dep on first M1	180 − "62"
		118		A1 cao	
					Total 4 marks

Question Number	Working	Answer	Mark	Notes
3. (a)		$w(w - 9)$	2	B2 Award B2 also for $(w \pm 0)(w - 9)$ B1 for factors which, when expanded & simplified, give two terms, one of which is correct except B0 for $(w + 3)(w - 3)$ SC B1 for $w(w - 9w)$
(b)	$3x = -6$ or $3x = 1 - 7$ or $5x - 2x = -6$ oe		3	M2 for correct rearrangement with x terms on one side and numbers on the other AND correct collection of terms on at least one side M1 for $5x - 2x = 1 - 7$ oe ie correct rearrangement with x terms on one side and numbers on the other
		-2		A1 cao dep on M2
(c)	$y^2 + 3y - 7y - 21$		2	M1 for 3 correct terms out of 4 or for 4 correct terms ignoring signs or for $y^2 - 4y + n$ for any non-zero value of n
		$y^2 - 4y - 21$		A1 cao
				Total 7 marks

Question Number	Working	Answer	Mark	Notes
4. (a)	1 − (0.6 + 0.3)		2	M1
		0.1		A1 Also accept $\frac{1}{10}$ or 10%
(b)	30 × 0.6		2	M1
		18		A1 cao Do not accept $\frac{18}{30}$
				Total 4 marks

Question Number	Working	Answer	Mark	Notes	
5.	$\frac{10}{12}$ and $\frac{9}{12}$ eg $\frac{10-9}{12}$, $\frac{10}{12}-\frac{9}{12}$		2	B2	B1 for $\frac{10}{12}$ or $\frac{9}{12}$ Also accept $\frac{5\times2}{6\times2}$ or $\frac{3\times3}{4\times3}$
					Alternative method B1 for both fractions correctly expressed as equivalent fractions with denominators that are common multiples of 6 and 4 eg $\frac{20}{24}$ and $\frac{18}{24}$ or $\frac{5\times4}{6\times4}$ and $\frac{3\times6}{4\times6}$ B1 (dep on first B1) for evaluation as a correct fraction which is equivalent to $\frac{1}{12}$ eg $\frac{2}{24}$
					SC B1 for multiplying both sides by 12 ie 10 – 9 = 1
				Total 2 marks	

Question Number	Working	Answer	Mark	Notes	
6. (a)		Rotation	3	B1 Accept 'rotate', 'rotated' etc	These marks are independent but award no marks if the answer is not a single transformation
		90° clockwise		B1 Also accept quarter turn clockwise, −90° or 270°	
		(0, 0)		B1 Also accept origin, *O*	
(b)	vertices (4,4), (4,2), (5,2)	**R** correct	2	B2 Condone omission of label B1 for 2 correct vertices	
					Total 5 marks

Question Number	Working	Answer	Mark	Notes
7.	3+5+7 or 15		3	M1 15 may be denominator of fraction or coefficient in an equation such as $15x = 90$
	90 ÷ (3+5+7) or 90 ÷ "15" or 6 or $\frac{7}{15}$ oe			M1 dep
		42		A1 Also award for 18 : 30 : 42
				Total 3 marks

Question Number	Working	Answer	Mark	Notes	
8. (i)		3, 5, 7, 11	2	B1 cao	Brackets not necessary
(ii)		2, 3, 5, 7, 9, 11		B1 cao (B0 if 3 or 5 or 7 or 11 repeated)	
					Total 2 marks

Question Number	Working		Answer	Mark	Notes		
9.	eg $\frac{5}{100}\times 8000 = 400$	OR		3		M1 for eg $\frac{5}{100}\times 8000$ or 400	OR M2 for 8000×1.05^3 (M1 for 8000×1.05 or 8400 or 8000×1.05^2 or 8000×1.05^4)
	$\frac{5}{100}\times(8000+"400")$ = 420 $\frac{5}{100}\times(8000+"400"+"420")$ = 441 8000+"400"+"420"+"441"	8000×1.05^3				M1 for completing method	
						Accept (1 + 0.05) as equivalent to 1.05 throughout.	
						SC If no other marks gained, award M1 for 8000×1.15 oe or 9200	
			9261		A1	Cao	
							Total 3 marks

Question Number	Working	Answer	Mark	Notes
10.		$C = \frac{3d+7}{2}$ oe	3	B3 $\frac{3d+7}{2}$ oe B2 for $C = 3d + 7 \div 2$ oe B1 for $3d + 7 \div 2$ B1 for C = linear expression in d
				Total 3 marks

Question Number	Working	Answer	Mark	Notes
11. (a)	$1 \times 8 + 3 \times 14 + 5 \times 26 + 7 \times 17 + 9 \times 10 + 11 \times 5$ or $8 + 42 + 130 + 119 + 90 + 55$		3	M1 for finding at least four products $f \times x$ consistently within intervals (inc end points) and summing them
				M1 (dep) for use of halfway values
		444		A1 Cao
(b)		8 22 48 65 75 80	1	B1 Cao
(c)		Points correct	2	B1 $\pm$ ½ sq ft from sensible table
		Curve or line segments		B1 ft from points if 4 or 5 correct or if points are plotted consistently within each interval at the correct heights Accept curve which is not joined to the origin
(d)	5.2 indicated on cf graph		2	M1 for 5.2 indicated on cf graph
		approx 36-40 from correct graph		A1 If M1 scored, ft from cf graph If M1 not scored, ft only from correct curve & if answer is correct ($\pm$ ½ sq tolerance), award M1 A1
				Total 8 marks

Question Number	Working	Answer	Mark	Notes
12. (a)	$\frac{BC}{5.2}=\frac{9}{6}$ oe		2	M1 for correct, relevant proportionality statement with 3 values substituted
		7.8		A1 cao
(b)	$\frac{CE}{7.2}=\frac{6}{9}$ oe or $\frac{CE}{6}=\frac{7.2}{9}$ oe or $\frac{CE}{7.2}=\frac{5.2}{"7.8"}$ oe or $\frac{CE}{5.2}=\frac{7.2}{"7.8"}$ oe		2	M1 for correct, relevant proportionality statement with 3 values substituted
		4.8		A1 cao
				Total 4 marks

Question Number	Working	Answer	Mark	Notes
13.	$\frac{20(2x-1)}{4}+\frac{20(x-1)}{5}=2\times20$ or $5(2x-1)+4(x-1)=40$ or $\frac{5(2x-1)+4(x-1)}{20}=2$ or $\frac{5(2x-1)}{20}+\frac{4(x-1)}{20}=2$		4	M1 for clear intention to multiply both sides by 20 or a multiple of 20 or to express LHS as a single fraction with a denominator of 20 or a multiple of 20 or to express LHS as the sum of two fractions with denominators of 20 or a multiple of 20 May be implied by first B1
	$10x - 5 + 4x - 4 = 40$ or $\frac{10x-5+4x-4}{20}=2$ or $\frac{10x-5}{20}+\frac{4x-4}{20}=2$			B1 expanding brackets (dep on M1)
	$14x = 49$ or $14x - 9 = 40$ or $10x + 4x - 9 = 40$ or $14x - 49 = 0$			B1 dep on both preceding marks ie for a correct rearrangement of a correct equation
		3.5		A1 dep on all preceding marks
				Total 4 marks

Question Number	Working	Answer	Mark	Notes
14.	1.75 seen		2	M1
		8		A1
				Total 2 marks

Question Number	Working	Answer	Mark	Notes
15. (a)	Splits shape into rectangle & semicircle		4	M1 May be implied by working
	$\frac{\pi \times 2.7^2}{2}$ or value rounding to 11.4 or 11.5			M1 $\pi \rightarrow 11.451105\ldots$ $3.14 \rightarrow 11.4453$ $3.142 \rightarrow 11.45259$ Also award for equivalent multiple of π eg 3.645π, $\frac{729\pi}{200}$
	$2 \times 2.7 \times 7.1$ or 38.34			M1 Also accept 38.3
		49.8		A1 for 49.8 or for answer rounding to 49.78 or 49.79
(b)	$P - 2L = \pi r + 2r$ oe		3	M1 for rearranging with both r terms on one side
	$P - 2L = (\pi + 2)r$ oe			M1 for factorising a correct expression (does not depend on a correct rearrangement)
		$\frac{P-2L}{\pi+2}$ oe		A1
				Total 7 marks

Question Number	Working	Answer	Mark	Notes
16. (a)(i)		114	2	B1 cao
(ii)	eg angle at the centre = 2 × angle at circumference			B1 Three key points must be mentioned 1. Angle at centre/middle/*O*/origin 2. Twice, double, 2× or half/$\frac{1}{2}$ as appropriate 3. angle at circumference/edge/perimeter (NOT e.g. angle *D*, angle *ADB*, angle at top, angle at outside)
(b)		74	1	B1 cao
				Total 3 marks

Question Number	Working	Answer	Mark	Notes	
17. (i)	$\frac{1}{7}\times\frac{2}{6}$ and no other terms		2	M1	
		$\frac{2}{42}$ or $\frac{1}{21}$ oe		A1	Also accept 0.05, 0.04, 0.047, 0.048 etc Sample space method – award 2 marks for a correct answer; otherwise no marks
(ii)	$\frac{1}{7}\times\frac{1}{6}$ or $\frac{2}{7}\times\frac{3}{6}$		3	M1	SC M1 for $\frac{1}{7}\times\frac{1}{7}$ or $\frac{2}{7}\times\frac{3}{7}$
	$\frac{1}{7}\times\frac{1}{6}+\frac{2}{7}\times\frac{3}{6}$			M1	M1 for $\frac{1}{7}\times\frac{1}{7}+\frac{2}{7}\times\frac{3}{7}$
		$\frac{7}{42}$ or $\frac{1}{6}$ oe		A1	Also accept $0.16\dot{6}$, 0.16, 0.17, 0.166, 0.167 etc but not 0.2 Sample space method – award 3 marks for a correct answer; otherwise no marks
					Total 5 marks

Question Number	Working	Answer	Mark	Notes
18.	$(BC =)\ 47 \sin 32^\circ$		5	M1 or for $(CD =)\dfrac{47\sin 32^\circ}{\sin 129^\circ}$
	24.906… at least 3 sf (may be implied by correct *BD*)			A1 or for *CD* = 32.048… at least 2 sf (may be implied by correct *BD*)
	$\tan 51^\circ = \dfrac{"24.906..."}{BD}$ or $\tan 39^\circ = \dfrac{BD}{"24.906..."}$			M1 or for $\cos 51^\circ = \dfrac{BD}{"32.048..."}$
	$(BD =)\dfrac{"24.906..."}{\tan 51^\circ}$ or $"24.906..." \tan 39^\circ$			M1 or for $(BD =)"32.048..." \cos 51^\circ$
		20.2		A1 for answer rounding to 20.2 (20.1686…)
				Total 5 marks

Question Number	Working	Answer	Mark	Notes
19. (a)	$P = kQ^3$		3	M1 for $P = kQ^3$ but not for $P = Q^3$
	$1350 = k \times 3375$			M1 for $1350 = k \times 3375$ Also award for $1350 = k \times 15^3$
		$P = 0.4Q^3$ oe		A1 $P = 0.4Q^3$ oe Award 3 marks if answer is $P = kQ^3$ oe but k is evaluated as 0.4 in part (a) or part (b)
(b)		3200	1	B1 ft from "0.4" × 8000 except for k = 1, if at least M1 scored in (a) (at least 1 d.p. accuracy in follow through)
				Total 4 marks

Question Number	Working	Answer	Mark	Notes	
20.	$a^2 \times 10^{2n}$		3	M1	
		$\frac{a^2}{10} \times 10^{2n+1}$		A1 for $\frac{a^2}{10}$ oe A1 for $\times 10^{2n+1}$ oe	Award M1 A1 A1 for $\frac{a^2}{10} \times 10^{2n+1}$ even if M1 not awarded. Award M1 A1 A0 if $\frac{a^2}{10}$ oe seen. Award M1 A0 A1 if $\times 10^{2n+1}$ oe seen.
					Total 3 marks

Question Number	Working	Answer	Mark	Notes
21. (a)	Use of areas to obtain a correct expression for A, which must be correctly punctuated. For example $(A =) 80 - 2\times\frac{1}{2}x(10-x) - 2\times\frac{1}{2}x(8-x)$ or $10\times 8 - \frac{1}{2}x(10-x) - \frac{1}{2}x(10-x) - \frac{1}{2}x(8-x) - \frac{1}{2}x(8-x)$ or $80 - x(10-x) - x(8-x)$ or $80 - 2\left(\frac{10x-x^2}{2}\right) - 2\left(\frac{8x-x^2}{2}\right)$		3	B2 B1 for expression for area of triangle or pair of congruent triangles, for example $\frac{1}{2}x(10-x)$ or $\frac{1}{2}x(8-x)$ or $x(10-x)$ or $x(8-x)$ Condone omission of brackets for award of B1
	Correct simplification of a correct expression for A to obtain an expression which is equivalent to $2x^2 - 18x + 80$ For example $(A =)\ 80 - 10x + x^2 - 8x + x^2$ or $80 - (10x - x^2) - (8x - x^2)$ or $80 - (5x - \frac{1}{2}x^2) - (5x - \frac{1}{2}x^2) - (4x - \frac{1}{2}x^2) - (4x - \frac{1}{2}x^2)$			B1 dep on B2
(b)(i)		$4x - 18$	5	B2 B1 for 2 of 3 terms differentiated correctly
(ii)	"$4x - 18$" = 0			M1
		4.5 oe		A1 cao
(iii)	eg positive coefficient of x^2 or U shape or $\frac{d^2A}{dx^2} = 4$ which > 0			B1
				Total 8 marks

Question Number	Working	Answer	Mark	Notes
22.	$x^2 + (2x-3)^2 = 2$		6	M1 for correct substitution
	$x^2 + 4x^2 - 6x - 6x + 9 = 2$ or $x^2 + 4x^2 - 12x + 9 = 2$			B1 (indep) for correct expansion of $(2x-3)^2$ even if unsimplified
	$5x^2 - 12x + 7 (= 0)$			B1 for correct simplification Condone omission of '= 0'
	$(5x-7)(x-1)(=0)$ or $\frac{12 \pm \sqrt{4}}{10}$ or $\frac{12}{10} \pm \frac{\sqrt{4}}{10}$ or $\frac{6}{5} \pm \frac{1}{5}$			B1 for correct factorisation or for correct substitution into quadratic formula and correct evaluation of '$b^2 - 4ac$' or for using square completion correctly as far as indicated
	$x = 1$ or $x = 1\frac{2}{5}$			A1 for both values of x dep on all preceding marks
		$x = 1$, $y = -1$ $x = 1\frac{2}{5}$, $y = -\frac{1}{5}$		A1 for complete, correct solutions (need not be paired) dep on all preceding marks No marks for $x = 1$, $y = -1$ with no working
				Total 6 marks

Question Number	Working	Answer	Mark	Notes
23.	$\frac{2\pi r^2 + 2\pi rh}{4\pi r^2} = 2$		5	M1 Also award for $\frac{\pi r^2 + 2\pi rh}{4\pi r^2} = 2$
	$2\pi r^2 + 2\pi rh = 2 \times 4\pi r^2$ oe			M1 for $2\pi r^2 + 2\pi rh = 2 \times 4\pi r^2$ oe or $\frac{2\pi r(r+h)}{4\pi r^2} = 2$ If first M1 awarded for $\frac{\pi r^2 + 2\pi rh}{4\pi r^2} = 2$ award this second M1 also for $\pi r^2 + 2\pi rh = 2 \times 4\pi r^2$ oe
	$h = 3r$ oe			A1 If first M1 awarded for $\frac{\pi r^2 + 2\pi rh}{4\pi r^2} = 2$ and second M1 for $\pi r^2 + 2\pi rh = 2 \times 4\pi r^2$ oe Award this A1 also for $h = 3.5r$ oe
	$\frac{\pi r^2 \times "3r"}{\frac{4}{3}\pi r^3}$ oe			M1 dep on first two M1s h must be of the form kr
		$\frac{9}{4}$ oe		A1
				Total 5 marks

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