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Mark Scheme (Results)

January 2012

International GCSE Mathematics (4MA0) Paper 4H

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Apart from Questions 3, 13(b) and 17(f) (where the mark scheme states otherwise), the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1.	$\frac{4.2}{1.12}$		2	M1 for 4.2 or 1.12 or 0.6 or $\frac{15}{4}$
		3.75		A1
				Total 2 marks

2.	$\frac{135}{180}$		3	M1
	0.75 oe			A1
		45		A1 cao
				Total 3 marks

3.	$4x = 7$ or $4x = 2 + 5$ or $7x - 3x = 7$ oe or $4x - 7 = 0$ oe		3	M2	for correct rearrangement with x terms on one side and numbers on the other AND collection of terms on at least one side or for $4x - 7 = 0$ oe M1 for $7x - 3x = 2 + 5$ oe ie correct rearrangement with x terms on one side and numbers on the other
		$1\frac{3}{4}$ oe		A1	Award full marks for a correct answer if at least 1 method mark scored
					Total 3 marks

4.	1 7 7		3	B2	for 1 7 7 in any order B1 for three positive whole numbers with either a median of 7 or a sum of 15 *SC* Award B1 for 0 7 8
		6		B1	cao
					Total 3 marks

5.	One correct point plotted or stated		4	B1	May appear in table
	2nd correct point plotted or stated			B1	May appear in table
	Correct line between $x = -2$ and $x = 4$			B2	B1 for a line joining two correct, plotted points
					Total 4 marks

6.	(a)	1 + 7 or 8		2	M1	8 may be denominator of fraction or coefficient in an equation such as $8x = 32$	*SC* If M0 A0, award B1 for 4 : 28
			28		A1	cao	
	(b)	32 × 45 or 1440 or 14.4(0)m		3	M1		
		$\frac{"1440"}{72}$			M1	dep	
			20		A1	cao	
						Total 5 marks	

7.	Fully correct factor tree or repeated division or 2, 2, 2, 5, 5 or 2 × 2 × 2 × 5 × 5		3	M2	M1 for factor tree or repeated division with 2 and 5 as factors
		$2^3 \times 5^2$		A1	Also accept $2^3.5^2$
					Total 3 marks

8.	$y^{3+n-1} = y^6$ oe or $y^{3+n} = y^7$ oe or $3 + n - 1 = 6$ oe or $y^n = \frac{y^7}{y^3}$ or $y^n = \frac{y^6}{y^2}$ or $y^n = y^4$		2	M1		*SC* if M0, award B1 for an answer of y^4
		4		A1	cao	
					Total 2 marks	

9.	(a)	Complete, correct expression which, if correctly evaluated, gives 48 eg $4\times\frac{1}{2}\times6\times4$, $2\times\frac{1}{2}\times12\times4$, $\frac{1}{2}\times12\times8$		3	M2	M1 for correct expression for area of one relevant triangle eg $\frac{1}{2}\times6\times4$, $\frac{1}{2}\times6\times4\sin90°$, $\frac{1}{2}\times8\times6$, $\frac{1}{2}\times12\times4$
			48		A1	cao
	(b)	$4^2+6^2 = 16+36 = 52$		3	M1	for squaring and adding
		$\sqrt{4^2+6^2}$			M1	(dep) for square root
			7.21		A1	for answer which rounds to 7.21 (7.211102…)
						Total 6 marks

10.	(i)		$-1\frac{1}{2} < x \leq 2$	4	B2	Also accept $-\frac{3}{2} < x \leq 2$ or answer expressed as two separate inequalities B1 for $-1\frac{1}{2} < x$ or $-\frac{3}{2} < x$ or $x \leq 2$ (these may be as part of a double-ended inequality) or $-\frac{6}{4} < x \leq \frac{8}{4}$
	(ii)		−1 0 1 2		B2	B1 for 4 correct and 1 wrong or for 3 correct and 0 wrong
						Total 4 marks

11.	(a)	$75 = 3 \times 5^2$ and $90 = 2 \times 3^2 \times 5$ or 1,3,5,15,25,75 and 1,2,3,5,6,9,10,15,18,30,45,90 or 3×5		2	M1	Need not be products of powers; accept products or lists ie 3,5,5 and 2,3,3,5 Prime factors may be shown as factor trees or repeated division
			15		A1	
	(b)	$2 \times 3^2 \times 5^2$ oe eg $6 \times 3 \times 5^2$ or 75,150,225,300,375,450 and 90,180,270,360,450		2	M1	Also award for $\frac{75 \times 90}{15}$
			450		A1	
						Total 4 marks

12.	(a)		Rotation	3	B1		These marks are independent but award no marks if the answer is not a single transformation
			90°		B1	Also accept quarter turn or −270° (B0 for 90° clockwise)	
			(0, 0)		B1	Also accept origin, *O*	
	(b)		**R** correct	1	B1		
	(c)		Rotation 90°	2	B1	Accept quarter turn or −270° instead of 90°	As for (a)
			(3, 1)		B1	ft from their **R** if it is a translation of the correct **R**	
							Total 6 marks

13. (a)	$4y = 10 - 3x$ or $-4y = 3x - 10$		3	M1	May be implied by second M1 or by $y = -\frac{3}{4}x + c$ even if value of c is incorrect. or finds coordinates of 2 points on the line eg (0, 2.5), $x = 2$, $y = 1$, table, diagram.
	$y = \frac{5}{2} - \frac{3}{4}x$ oe or $y = \frac{10}{4} - \frac{3}{4}x$ oe or $y = \frac{10 - 3x}{4}$ oe			M1	or for clear attempt to evaluate $\frac{\text{vert diff}}{\text{horiz diff}}$ for their pts
		$-\frac{3}{4}$		A1	Award 3 marks for correct answer if either first M1scored or no working shown. *SC* If M0, award B1 for $-\frac{3}{4}x$

13 (b)	eg $9x+12y=30$ $10x-12y=46$	eg $15x+20y=50$ $15x-18y=69$		5	M1	for coefficients of x or y the same or for correct rearrangement of one equation followed by correct substitution in the other eg $5x-6\left(\frac{10-3x}{4}\right)=23$
	$x=4$	$y=-\frac{1}{2}$			A1	cao dep on M1
					M1	(dep on 1st M1) for substituting for other variable
			$x=4,\ \ y=-\frac{1}{2}$		A1	Award 4 marks for correct values if at least first M1 scored
			$(4,\ -\frac{1}{2})$		B1	Award 5 marks for correct answer if at least first M1 scored ft from their values of x and y
						Total 8 marks

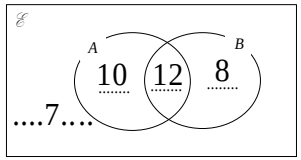
14. (a)		55 115 155 177 190 200	1	B1	cao
(b)		Points correct	2	B1	$\pm$ ½ sq ft from sensible table ie clear attempt to add frequencies
		Curve or line segments		B1	ft from points if 4 or 5 correct or ft correctly from sensible table or if points are plotted consistently within each interval at the correct heights Accept curve which is not joined to the origin
(c)	26 indicated on cf graph		2	M1	for 26 indicated on cf graph – accept 26-27 inc
		approx 60 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 5 marks

15.		$-4 < x < 4$	2	B2	B1 for $x < 4$ or $x > -4$ or $x < \pm 4$ or $x < \sqrt{16}$ *SC* B1 for $-4 \leq x \leq 4$
					Total 2 marks

16. (a)	$\frac{3}{8} + \frac{2}{8}$ oe		2	M1		
		$\frac{5}{8}$		A1		
(b)(i)	$\frac{2}{8} \times \frac{1}{7}$ appearing once only		5	M1		Sample space method – award 2 marks for correct answer; otherwise no marks
		$\frac{2}{56}$ or $\frac{1}{28}$		A1	for $\frac{2}{56}$ or $\frac{1}{28}$ or for 0.036 or for answer rounding to 0.036	
(ii)	$\frac{2}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{2}{7}$ or $2 \times \frac{2}{8} \times \frac{3}{7}$ oe			M1 for one correct product M1 for completely correct expression		
		$\frac{12}{56}$		A1 for $\frac{12}{56}$ oe inc $\frac{3}{14}$ or for 0.21 or for answer rounding to 0.21		
				Note for (b)(ii): sample space method – award 3 marks for correct answer; otherwise no marks *SC* M1 for $\frac{2}{8} \times \frac{3}{8}$ or $\frac{3}{8} \times \frac{2}{8}$ M1 (dep) for $\frac{2}{8} \times \frac{3}{8} + \frac{3}{8} \times \frac{2}{8}$ oe *SC* Sample space method – award 2 marks for $\frac{12}{64}$ oe; otherwise no marks	
						Total 7 marks

17.	(a)		2	1	B1	cao
	(b)		$x < 6$	2	B2	cao B1 for eg $x \leq 6$ or … −2, −1, 0, 1, 2, 3, 4, 5 *SC* B1 for $x \geq 6$
	(c)		7	1	B1	cao
	(d)	g(0) = 15		2	M1	for 15 seen
			3		A1	cao If M0, award B1 for ± 3 oe
	(e)	$k = 12$		3	M1	May be stated or indicated on diagram. May be implied by one correct solution.
			−0.7 or −0.8 3.8		A2	A1 for solution rounding to −0.7 or −0.8 A1 for solution rounding to 3.8
	(f)	tan drawn at $x = 3.5$		3	M1	tan or tan produced passes between points $(3, 3 \leq y \leq 6)$ and $(4, 11 \leq y \leq 14)$
		$\frac{\text{vertical difference}}{\text{horizontal difference}}$			M1	finds their $\frac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on tan or finds their $\frac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on curve, where one of the points has an x-coordinate between 3 and 3.5 inc and the other point has an x-coordinate between 3.5 and 4 inc
			6.5 – 11 inc		A1	dep on both M marks
						Total 12 marks

18.	$(\cos x^\circ =) \dfrac{4^2 + 6^2 - 8^2}{2 \times 4 \times 6}$ or $8^2 = 4^2 + 6^2 - 2 \times 4 \times 6 \cos x^\circ$		3	M1	for correct substitution in Cosine Rule
	$(\cos x^\circ =) -0.25$ oe			A1	
		104.5		A1	for value rounding to 104.5 (104.4775…)
					Total 3 marks

19. (a)			2	B2	for all correct B1 for 2 or 3 correct
(b)(i)		10	2	B1	cao
(ii)		25		B1	cao
					Total 4 marks

20.	$\pi \times r \times 9 = 100$ oe		5	M1	
	(r =) 3.53677…			A1	for 3.53 or for value rounding to 3.54 (3.14 → 3.53857…)
	$\sqrt{9^2 - "3.53..."^2}$			M1	
	(h =) 8.2759…			A1	for 8.27 or for value rounding to 8.28
		108		A1	for answer rounding to 108 (π → 108.40… 3.14 → 108.45…) If both M1s scored , award 5 marks for an answer which rounds to 108
					Total 5 marks

21.	(a)		$8y^6$	2	B2	B1 for 8 B1 for y^6
	(b)	$2^p \times (2^3)^q = 2^p \times 2^{3q} = 2^{p+3q}$	$p + 3q$	2	B2	B1 for 2^{3q} seen
						Total 4 marks

22.	(a)(i)		3**a** + 3**b** oe	3	B1	
	(ii)		2**a** + 2**b** oe		B1	Accept eg $\frac{2}{3}(3\mathbf{a} + 3\mathbf{b})$
	(iii)		**a** + 2**b** oe		B1	Accept eg 2**a** + 2**b** − **a**
	(b)	$\overrightarrow{DF} = 2\mathbf{a} + 4\mathbf{b}$ oe		2	M1	Also award for $\overrightarrow{EF} = \mathbf{a} + 2\mathbf{b}$ oe
			$\overrightarrow{DF} = 2\overrightarrow{DE}$ oe eg $\overrightarrow{DE} = \overrightarrow{EF}$		A1	Also award A1 for an acceptable explanation in words.
						Total 5 marks

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