Mark Scheme (Results)

January 2015

Pearson Edexcel International GCSE Mathematics A (4MA0) Paper 3HR

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working
  - SC - special case
  - oe – or equivalent (and appropriate)
  - dep – dependent
  - indep – independent
  - eeoo – each error or omission

- **No working**
  If no working is shown then correct answers normally score full marks
  If no working is shown then incorrect (even though nearly correct) answers score no marks.
- **With working**
  If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
  If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.
  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
  If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
  If there is no answer on the answer line then check the working for an obvious answer.
- **Ignoring subsequent work**
  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
  It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.
- **Parts of questions**
  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

Apart from Questions 4c, 9 and 24 (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	640 ÷ (7 + 9) × 9 or 40 × 9		2	M1
		360		A1 SCB1 for 280
				Total 2 marks

Question	Working	Answer	Mark	Notes
2 (a)	$15625 + \frac{173}{2.5}$	15694.2	2	B2 B1 for 15625 or 69.2 or $\frac{346}{5}$ or $\frac{78471}{5}$
(b)		15700	1	B1 ft from (b) if non-trivial
				Total 3 marks

Question	Working	Answer	Mark	Notes
3	0×5 + 1×8 + 2×2 + 3×3 + 4×2 or 0 + 8 + 4 + 9 + 8		2	M1 condone one error in products (products need not be evaluated and we need not see 0 or 0×5)
		29		A1 SC : B1 for an answer of 34 or 1.45 with no working
				Total 2 marks

Question	Working	Answer	Mark	Notes
4 (a)		$3(2w + 5)$	1	B1
(b)	$x^2 + 4x + 7x + 28$		2	M1 for 3 correct terms out of 4 or for 4 correct terms ignoring signs or for $x^2 + 11x + c$ for any non-zero value of c or for ... + $11x$ + 28
		$x^2 + 11x + 28$		A1
(c)	$3(x – 5) = 3x – 15$		3	M1 For correct expansion of bracket (seen anywhere)
	$3x – 15 = 7x + 12$ $-15-12 = 7x – 3x$ *or* $3x - 7x = 12 + 15$ oe			M1 correct rearrangement with x terms on one side and numbers on the other side $-15 - 12 = 7x - 3x$ or $3x - 7x = 12 + 15$ or better
		-6.75		A1 Award 3 marks if M1 scored and answer correct, accept -6.75 oe
				Total 6 marks

Question	Working	Answer	Mark	Notes
5	(−2,−4)(−1,−1)(0, 2)(1, 5)(2, 8) (3, 11)(4, 14)	Correct line between $x = -2$ and $x = 4$	4	B4 For a correct line between $x = -2$ and $x = 4$ B3 For a correct line through at least 3 of (−2,−4)(−1,−1)(0, 2)(1, 5)(2, 8)(3, 11)(4, 14) **OR** for all of (−2,−4)(−1,−1)(0, 2)(1, 5)(2, 8)(3, 11)(4, 14) plotted but not joined B2 For at least 2 correct points plotted **OR** for a line drawn with a positive gradient through (0, 2) and a clear attempt to use a gradient of 3 B1 For at least 2 correct points stated (may be in a table) **OR** For a line drawn with a positive gradient through (0, 2) **OR** for a line with the correct gradient. **NB** a line joining (0, 2) to (3, 0) scores B0
				Total 4 marks

Question	Working	Answer	Mark	Notes
6	$\frac{4+1}{2}$ or $\frac{1+9}{2}$	(2.5, 5)	2	M1 or x coordinate of 2.5 or y coordinate of 5 A1 (2.5oe, 5)
				Total 2 marks

Question	Working	Answer	Mark	Notes
7		Translation 4 right and 6 up	2	B2 B1 for translation B1 for 4 right and 6 up or $\begin{pmatrix}4\\6\end{pmatrix}$
				Total 2 marks

Question	Working	Answer	Mark	Notes
8 (a)	$\frac{12}{100}\times 45$ (=5.4) 45 − "5.4"	39.6(0)	3	M1 or M2 for 45 × 0.88 oe eg 45 ×(1− 0.12) (**NB** 45 ×(1−12%) scores zero unless accompanied by a correct answer) M1 Dep on correct method for 12% A1
(b)	546 − 525 (=21) $\frac{'21'}{525}$ × 100	4	3	M1 546/525(=1.04) M1 Dep (("1.04" – 1)×100) or 546/525 × 100 − 100 A1
				Total 6 marks

Question	Working	Answer	Mark	Notes
9	$\frac{15}{2}-\frac{14}{3}=\frac{45a}{6a}-\frac{28a}{6a}$	shown	3	M1 Correct improper fractions M1 Correct fractions with a common denominator a multiple of 6 A1 dep on M2 Improper fraction required eg $\frac{17}{6}$, $\frac{34}{12}$
				Alt method M1 $(7)\frac{3}{6}-(4)\frac{4}{6}$ (ie can ignore integer parts) M1 $-\frac{1}{6}$ A1 Improper fraction required eg $\frac{17}{6}$, $\frac{34}{12}$ **or** $3-\frac{1}{6}$ Answer dep on M2
				Alt method M1 $7\frac{3}{6}-4\frac{4}{6}$ M1 $6\frac{9}{6}-4\frac{4}{6}$ A1 $2\frac{5}{6}$ required before final answer Answer dep on M2
				NB: Follow one strand that gives most marks
				Total 3 marks

Question	Working	Answer	Mark	Notes
10 (a)	$\pi \times 11^2$ $(121\pi)(=380.1...)$ or $2\times\pi\times11^2$ $(242\pi)(=760.2..)$oe		4	M1
	$2\times\pi\times11\times30(660\pi)$ $(=2073.4...)$			M1 ind
	2×"380" + "2073" or "760.2" + "2073" $(242\pi + 660\pi$ or $902\pi)$			M1 dep on M2
		2800		A1 2833.71... awrt 2800 SC : B3 for 2453.59...or awrt 2500
(b) (i)		29.5	1	B1
(b) (ii)		30.5 or 30.49 rec	1	B1
				Total 6 marks

Question	Working	Answer	Mark	Notes
11	$\tan A = \frac{80}{35}$ or $\tan B = \frac{35}{80}$		4	M1
	$(A =) \tan^{-1}\left(\frac{80}{35}\right)$ or $(B =) \tan^{-1}\left(\frac{35}{80}\right)$			M1
	$(A =)$ 66.37... or $(B =)$ 23.62...			A1 Accept answers that round to 66 or 24 (allow answers without labels)
		204		B1 Allow answers in range 203.6 - 204 ft for correct conversion to bearing
				Total 4 marks

Question	Working	Answer	Mark	Notes
12 (a)	18 − 10	8	2	M1 A1
(b)			1	B1 ft from (a)Eg. No as the range and/or iqr for the boys is greater than the same measure for the girls
				Total 3 marks

Question	Working	Answer	Mark	Notes
13	$2^3 \times 3^2$		2	M1 for identifying 2^3 **or** 3^2 **or** for 24, 48, 72 **and** 36, 72 **or** for an answer of 144 **or** 216
		72		A1 accept $2^3 \times 3^2$
				Total 2 marks

Question	Working	Answer	Mark	Notes
14	180 − 140 or 40		5	M1 or 180 × (n − 2) ÷ n = 140 oe
	360 ÷ "40"			M1 or 40n = 360
	n = 9			A1
	180 − 360÷(2×"9")			M1 or (180 × (2×"9" − 2)) ÷ 2×"9" or (90 × (2 × 2 × "9" − 4)) ÷ 2×"9" (2880÷18)
		160		A1
				Total 5 marks
	Alternative scheme			
	180 − 140 or 40		5	M1 or 180 × (n − 2) ÷ n = 140 oe
	"40" ÷ 2			M1
	20			A1
	180 − "20"			M1
		160		A1

Question	Working	Answer	Mark	Notes
15		$16x^6y^4$	2	B2 B1 for two of 16, x^6, y^4 in a product with three terms. Terms must be simplified.
				Total 2 marks

Question	Working	Answer	Mark	Notes
16 (a)		8, 25, 50, 90, 112, 120	1	B1 cao
(b)	Plotting points from table at ends of interval Points joined with curve or line segments		2	B1 $\pm$ ½ sq ft from sensible table ie clear attempt to add frequencies B1 ft from points if 4 or 5 correct or if all points are plotted consistently within each interval at the correct heights Accept cf graph which is not joined to the origin **NB** A bar chart, unless it has a curve going consistently through a point in each bar, scores no points.
(c)	60 (or 60.5) indicated on cf graph or stated	approx 33	2	M1 for 60 (or 60.5) indicated on cf axis or stated A1 If M1 scored, ft from cf graph If no indication of method, ft only from correct curve & if answer is correct ($\pm$ ½ sq tolerance) award M1 A1
				Total 5 marks

Question	Working	Answer	Mark	Notes
17 (a)	$8x + 4y = 112$		3	M1 correct equation linking x and y
	$y = \frac{112-8x}{4}$ oe $V = x^2 \times \frac{112-8x}{4}$	proof		M1 expression y in terms of x A1 Conclusion with full working shown
(b)	$56x - 6x^2$		2	B2 B1 for $56x$; B1 for $-6x^2$
(c)	$56x - 6x^2 = 0$ $x = \frac{28}{3}$ oe		3 813	M1 ft for equating differential to 0 A1 Correct value for x A1 for answer that rounds to 813
				Total 8 marks

Question	Working	Answer	Mark	Notes
18	$\frac{4}{3} \times \pi \times \left(\frac{18.6}{2}\right)^3$ or 3369(.282...) "3369(.282...)"÷ 2	 1680	3	M1 M1 dep A1 for ans which rounds to 1680
				Total 3 marks

Question	Working	Answer	Mark	Notes
19	$8x = 6 \times 6.5$	 4.875	2	M1 A1 4.875 oe allow 4.88 or 4.9
				Total 2 marks

Question	Working	Answer	Mark	Notes
20 (a)	$R = \frac{k}{c^2}$		3 M1	for $R = \frac{k}{c^2}$ but not for $R = \frac{1}{c^2}$ Also award for correct equation in R, c^2 and a constant or for R = numerical value ÷ c^2
	$30 = \frac{k}{4^2}$ or $k = 480$ oe		M1	for $30 = \frac{k}{4^2}$ or for correct substitution into an equation which scores the first method mark (may be implied by correct evaluation of the constant)
		$R = \frac{480}{c^2}$ oe	A1	Award 3 marks if answer is $R = \frac{k}{c^2}$ but k is evaluated in part (b). SCB2 for correct formula for c in terms of R.
(b)	$c^2 = \frac{480}{1920}$ or $c^2 = \frac{30}{1920} \times 4^2$		2 M1	M1ft for substitution and rearrangement into form $c^2 = \frac{k}{1920}$ with their value of k substituted except for $k = 1$
		0.5oe	A1	accept ±0.5
				Total 5 marks

Question	Working	Answer	Mark	Notes
21 (a)		$-\frac{1}{3}$	1	B1
(b)		2.5 oe	1	B1
(c)	$\frac{x+4}{2(x+4)-5}$	$\frac{x+4}{2x+3}$	2	M1 A1
(d)	$y(2x-5)=x$ $2xy-x=5y$	$\frac{5x}{2x-1}$	3	M1 or $2xy-5y=x$ or $x(2y-5)=y$ oe M1 or $x(2y-1)=5y$ or $2xy-y=5x$ oe A1 $\frac{5y}{2y-1}$ is M2 only
				Total 7 marks

Question	Working	Answer	Mark	Notes
22 (a)	$\frac{2}{7}\times\frac{1}{6}$ or $\frac{3}{7}\times\frac{2}{6}$ $\frac{2}{7}\times\frac{1}{6}+\frac{3}{7}\times\frac{2}{6}$	$\frac{8}{42}$	3	M1 Replacement - $\frac{2}{7}\times\frac{2}{7}$ or $\frac{3}{7}\times\frac{3}{7}$ M1 Replacement - $\frac{2}{7}\times\frac{2}{7}+\frac{3}{7}\times\frac{3}{7}$ A1 $\frac{8}{42}$ oe
(b)	$\frac{2}{7}\times\frac{3}{6}$ or $\frac{3}{7}\times\frac{2}{6}$ or $\frac{1}{7}\times\frac{1}{6}$ $\frac{2}{7}\times\frac{3}{6}+\frac{3}{7}\times\frac{2}{6}+\frac{1}{7}\times\frac{1}{6}+\frac{1}{7}\times\frac{1}{6}$	$\frac{14}{42}$	3	M1 Replacement – $\frac{2}{7}\times\frac{3}{7}$ or $\frac{3}{7}\times\frac{2}{7}$ or $\frac{1}{7}\times\frac{1}{7}$ M1 Replacement - $\frac{2}{7}\times\frac{3}{7}+\frac{3}{7}\times\frac{2}{7}+\frac{1}{7}\times\frac{1}{7}+\frac{1}{7}\times\frac{1}{7}$ A1 $\frac{14}{42}$ oe
				Total 6 marks

Question	Working	Answer	Mark	Notes
23	$\frac{\sin 47}{13.8} = \frac{\sin MLN}{8.5}$		6	M1 Or method using a right angled triangle to find length *MX* (*MX* is perpendicular to *LN*) Sin 47 = $\frac{MX}{8.5}$
	$MLN = \sin^{-1}\left(\frac{\sin 47 \times 8.5}{13.8}\right)$			M1 Or $\cos^{-1}$ ($\frac{8.5 \sin 47}{13.8}$)
	MLN = 26.7(73...)			A1 *LMX*= 63.232..
	LMN = 180 − 47 − "26.7..." or 106(.2260622…)			M1 *LMN* = 63.232 + (180 –(90+47)… or 106(.2260622…)
	$\frac{1}{2} \times 8.5 \times 13.8 \times \sin("106")$			M1
		56.3		A1 Accept an answer that rounds to 56.3 or 56.4 unless clearly obtained from incorrect working.
				Total 6 marks

Question	Working	Answer	Mark	Notes
24	$x^2 + (2x - 3)^2 = 41$		6	M1 $\left(\frac{y+3}{2}\right)^2 + y^2 = 41$
	$x^2 + 4x^2 - 6x - 6x + 9 = 41$ or $x^2 + 4x^2 - 12x + 9 = 41$			$\left(\frac{y^2+6y+9}{4}\right) + y^2 = 41$ or $\left(\frac{y^2+3y+3y+9}{4}\right) + y^2 = 41$
				M1 (indep) for correct expansion of $(2x - 3)^2$ or $\left(\frac{y+3}{2}\right)^2$ even if unsimplified
	$5x^2 - 12x - 32$ (= 0)			A1 $5y^2 + 6y - 155$ (=0)
	$(5x + 8)(x - 4)$ (= 0) or $5x(x - 4) + 8(x - 4)$ (= 0) or $x(5x + 8) - 4(5x + 8)$ or $\frac{--12 \pm \sqrt{(-12)^2 - 4\times5\times-32}}{2\times5}$ (may be partially evaluated condone lack of brackets around negative numbers) eg $\frac{12 \pm \sqrt{144+640}}{10}$ or $\frac{12\pm28}{10}$			M1 $(5y + 31)(y - 5)$ (=0) oe or $5y(y - 5) + 31(y - 5)$ (=0) or $y(5y + 31) - 5(5y + 31)$ (=0) or $\frac{-6 \pm \sqrt{6^2 - 4\times5\times-155}}{2\times5}$ or better Condone omission of '=0'
	$x = -\frac{8}{5}$ or $x = 4$			A1 $y = -\frac{31}{5}$ or $y = 5$ — dep on all preceding method marks
		$x = -\frac{8}{5}$, $y = -\frac{31}{5}$ $x = 4$, $y = 5$		A1
				Total 6 marks

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