Mark Scheme (Results)

January 2018

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

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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.
- 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  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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.

International GCSE Maths					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$1\,400\,000 \div 125\,000$ oe **or** $14 \div 125\,000$ **or** $14 \times 1000 \times 100 (= 1\,400\,000)$ **or** $125\,000 \div 1000 \div 100 (= 1.25)$	11.2	2	M1 for a first step; can be implied by an answer with digits 112 A1
	(b)	$(4.8 \times 1000 \times 100) \div 19.2$ oe **or** $4.8 \div (19.2 \div 1000 \div 100)$ oe	25 000	2	M1 for division by 19.2; can be implied by an answer with digits 25 A1
2	(a)		2.2587(80006..)	2	M1 for 11.245 **or** 2.204 **or** 5.102087.. **or** 2.2587... rounded or truncated to 2 or more decimal places A1
	(b)		2.3	1	B1ft ft from (a) as long as from at least 3sf
3	(a)	$(-7)^2 + 7 \times 5$ **or** $-7 \times -7 + 7 \times 5$ oe **or** 49	84	2	M1 for correct substitution **or** correct evaluation of $(-7)^2$ NB: accept 7(5) in place of 7 × 5 A1
	(b)	$100 = 11^2 + 7q$ oe **or** $A - p^2 = 7q$ $100 = 11^2 + 7q$ oe **or** $-7 = 11^2 - 100$ oe	−3	3	M1 for correct substitution **or** rearrangement M1 isolating $7q$ in a correct equation A1 cao

Question	Working	Answer	Mark	Notes
4 (a)	$(80+1)\div 2\left(=40.5\left(\text{th}\right)\right)$ **or** $80\div 2\left(=40\left(\text{th}\right)\right)$	4	2	M1 **or** listing numbers and attempt to find median A1
(b)	$1\times 5,\ 2\times 12,\ 3\times 16,\ 4\times 32,\ 5\times 15$ **or** $5,\ 24,\ 48,\ 128,\ 75$ **or** 280 "280"÷80	3.5 oe	3	M1 for at least 4 correct products – may be seen by side of table (products may not be evaluated); M1 dep Allow division by their $\sum f$ provided addition or total under column seen A1 condone rounding to 4 if 3.5 **or** 280 ÷ 80 is present
(c)	$\frac{32}{80}+\frac{12}{80}$ **or** $\frac{32+12}{80}$	$\frac{44}{80}$	2	M1 or for $\frac{44}{n}$ where $n > 44$ **or** $\frac{m}{80}$ where $m < 80$ A1 for $\frac{44}{80}$ oe **or** 0.55 **or** 55%
5 (a)	$3-6y=2y-7$ **or** $1-2y=\frac{2y}{3}-\frac{7}{3}$ e.g. $-6y-2y=-7-3$ **or** $3+7=2y+6y$ **or** $-8y=-10$ **or** $8y=10$	1.25 oe	3	M1 for multiplying out brackets in a correct equation **or** dividing all terms by 3 M1 for isolating the terms in y ft from $3-2y=2y-7$ **or** $1-6y=2y-7$ A1 dep on M1 awarded

Question	Working	Answer	Mark	Notes
5 (b)		$-3 < x \leqslant 4$	2	B2 also accept $x > -3$ and $x \leqslant 4$ or $4 \geqslant x > -3$ If not B2 then award B1 for a double-ended inequality which is correct at one end (ignore the other end) eg. $-3 < x < 4$, $-3 \leqslant x \leqslant 4$, $-3 < x > 4$ **or** for an answer of $x > -3$ oe or $x \leqslant 4$ oe **or** the wrong variable in an otherwise correct inequality eg. $-3 < y \leqslant 4$ **SC :** Award B1 for $-3 \leqslant x < 4$
(c)	e.g. $2m \geqslant 8 - 13$	$m \geqslant -2.5$ oe	2	M1 for isolating terms in m (in an equation or inequality) e.g. $2m \geqslant -5$ **or** -2.5 oe A1 must be an inequality

Question	Working	Answer	Mark	Notes
6 (a)	$(QR^2 =)10.6^2 - 5.9^2 (= 77.55)$ $(QR =)\sqrt{10.6^2 - 5.9^2}$ **or** $\sqrt{"77.55"}$	8.81	3	M1 for squaring and subtracting. M1 dep A1 for 8.806 – 8.81
(b)	E.g. $\sin R = \frac{5.9}{10.6}$ **or** $\cos R = \frac{'8.81'}{10.6}$ **or** $\tan R = \frac{5.9}{'8.81'}$ E.g. $\sin^{-1}\left(\frac{5.9}{10.6}\right)$ **or** $\cos^{-1}\left(\frac{'8.81'}{10.6}\right)$ **or** $\tan^{-1}\left(\frac{5.9}{'8.81'}\right)$	33.8	3	M1 correct trig statement for angle *PRQ* **or** for angle *QPR* M1 complete method to find angle *PRQ* A1 for 33.8 – 33.82125
(c)		12.45	1	B1 12.45 or $12.44\dot{9}$

Question	Working	Answer	Mark	Notes
7	(−2, 11)(−1, 8)(0, 5)(1, 2) (2, −1)(3, −4)	Correct line between $x = -2$ and $x = 3$	3	B3 for a correct line between $x = -2$ and $x = 3$ If not B3 then award B2 for a correct line through at least 3 of (−2, 11) (−1, 8) (0, 5) (1, 2) (2, −1) (3, −4) **OR** for all of (−2, 11) (−1, 8) (0, 5) (1, 2) (2, −1) (3, −4) plotted, not joined If not B2 then award B1 for for at least 2 correct points stated or calculated (may be in a table) **OR** for a line with a gradient of −3 **OR** for a line drawn with a negative gradient through (0, 5) **NB: No mark should be awarded for a line through (0, 5) and (3, 0)**
8	arc centre B cutting BA and BC at (say) P and Q **AND** arcs centres P and Q of equal radii which intersect at R (R must fall within guidelines) bisector drawn with all necessary arcs		2	M1 A1 dep SC: B1 for bisector within guidelines with no arcs

Question	Working	Answer	Mark	Notes
9	$4x + 28 + x - 13 = 180$ $x = 33$ $360 \div$ ("33" $-$ 13) oe	18	4	M1 for a correct equation in x A1 for the correct value of x M1 (dep on M1) for a correct calculation to find n ft "33" A1
10	$m = -4$ **or** $2y + 8x = k$ $(k \neq 5)$ $3 =$ "-4" $\times 2 + c$ **or** $y - 3 =$ "-4"$(x - 2)$ **or** $c = 11$	$y = -4x + 11$	3	M1 for recognising gradient $= -4$ e.g. an answer of $y = -4x + c$ with $c \neq 2.5$ M1 (indep) for correct method to find c using their gradient or $2 \times 3 + 8 \times 2 = k$ A1 oe eg $y - 3 = -4 \times (x - 2)$, $2y + 8x = 22$ NB $L = -4x + 11$ oe scores M1 M1 A0

Question	Working	Answer	Mark	Notes
11	eg $\frac{23}{100} \times 330$ oe (=75.9) $\frac{23}{100} \times (330 - \text{“}75.9\text{”})$ (= 58.443) $\frac{23}{100} \times (330 - \text{“}75.9\text{”} - \text{“}58.443\text{”})$ (= 45.00....) 330 – “75.9” – “58.443” – “45.00..”	151	3	M1 for $\frac{23}{100} \times 330$ oe or 75.9 M1 for a complete method (condone 4 years rather than 3) M2 for 330×0.77^3 **or** 330×0.77^4 (=116.00..)) If not M2 then award M1 for 330×0.77 (=254.1(0)) **or** 330×0.77^2 (=195.65(7)) accept (1 – 0.23) as equivalent to 0.77 throughout A1 for 150.6 – 151 **SC** If no other marks gained, award B1 for 330 × 0.69 oe (=227.7) **or** 330× 0.31 oe (=102.3) **or** an answer of 102 (.3...)
12	e.g. $\frac{4(x+4)}{12} + \frac{3(2x+3)}{12} (= 7)$ **OR** $\frac{4(x+4)+3(2x+3)}{12} (= 7)$ **OR** $4(x + 4) + 3(2x + 3) = 7 \times 3 \times 4$ e.g. $4x + 16 + 6x + 9 = 7 \times 12$ **OR** $10x + 25 = 7 \times 12$	5.9 oe	3	M1 for dealing with fractions e.g. express LHS as the sum of 2 fractions with denominator of 12 or a multiple of 12 (if brackets expanded, condone 1 error) **or** express LHS as a single fraction with denominator of 12 or a multiple of 12 (if brackets expanded, condone 1 error) **or** multiplying both sides by 12 or a multiple of 12 (if brackets expanded, condone 1 error)) M1 for dealing with fraction(s) **and** expanding brackets (condone 1 error in expansion of brackets) A1 dep on M1 gained

Question	Working	Answer	Mark	Notes
13 (a)		35 700 000	1	B1
(b)	$(3.57 \times 10^7) \div (1.35 \times 10^4)$ (= 2644(.44...)) **or** 35 700 000 ÷ 13 500 oe	2.6×10^3	2	M1 **or** for $2600 - 2644.\dot{4}$ A1 must be in standard form **and** in the range $2.6 \times 10^3 - 2.6\dot{4} \times 10^3$
14	11 – 3	8	2	M1 for identifying 3 and 11 as LQ and UQ may be circled in list A1
15	E.g. $AOC = 360 - 2 \times 90 - 76$ (=104) **or** $AOC = 180 - 76$ (=104) oe "104" ÷ 2	52	3	M1 for a method to find angle AOC M1 (dep) for complete method to find angle ABC A1

Question	Working	Answer	Mark	Notes
16	eg $100x = 34.5\dot{4}\dot{5}$ and $x = 0.3\dot{4}\dot{5}$ $100x - x = 34.5\dot{4}\dot{5} - 0.3\dot{4}\dot{5}$ **Alternative scheme** eg $10x = 0.\dot{4}\dot{5}$ $1000x = 45.\dot{4}\dot{5}$ $1000x - 10x = 45.\dot{4}\dot{5} - 0.\dot{4}\dot{5}$ $990x = 45$ $\boldsymbol{x} = \frac{45}{990}$ $0.3\dot{4}\dot{5} = \frac{3}{10} + \frac{45}{990}$	Shown by an algebraic method Shown by an algebraic method	2	M1 for two decimals that, when subtracted will leave a non-recurring value, **and** intention to subtract (must show recurring dots or at least 2 of 54 or 45) A1 must see a correct fraction prior to $\frac{19}{55}$ **or** division must be clearly shown M1 for two decimals that, when subtracted will leave a non-recurring value, **and** intention to subtract A1 for a complete method
17	$x^2 = \frac{2b-a}{7-am}$ $x^2(7 - am) = 2b - a$ $7x^2 - 2b = amx^2 - a$ **or** $a - amx^2 = 2b - 7x^2$	$a = \frac{7x^2 - 2b}{mx^2 - 1}$ oe	4	M1 for squaring both sides M1 for multiplying by $7 - am$ in a correct equation allow $x^2 \times 7 - am = 2b - a$ $7 - am \times x^2 = 2b - a$ M1 for isolating terms in a in a correct equation A1 or for $a = \frac{2b - 7x^2}{1 - mx^2}$ oe with a as the subject

Question	Working	Answer	Mark	Notes
18 (a)	$\frac{7}{\sqrt{132}} = \frac{h}{\sqrt{297}}$ oe **or** $7 \times \frac{\sqrt{297}}{\sqrt{132}}$ oe **or** $7 \div \frac{\sqrt{132}}{\sqrt{297}}$ oe	10.5 oe	2	M1 for a correct linear scale factor $\frac{\sqrt{297}}{\sqrt{132}}$ oe **or** $\frac{\sqrt{132}}{\sqrt{297}}$ oe A1
(b)	e.g. $567 \div \left("\frac{3}{2}"\right)^3$ or $567 \times \left("\frac{2}{3}"\right)^3$	168	2	M1 for a fully correct method NB: scale factor may not be simplified and could be ft from (a) dep on M1 scored in (a) A1
19 (a)	33 ÷ 10 (=3.3) , 39 ÷ 15 (=2.6), 36 ÷ 20 (=1.8),12 ÷ 15 (=0.8)		3	M1 for use of area e.g. correct method for any 2 frequency densities **or** any 2 correct bars of different widths
	fd 3.3, 2.6, 1.8, 0.8			M1 for at least 3 correct fd **or** at least 3 correct bars
		A fully correct histogram		A1 for a correct histogram, with a linear scale on fd axis **or** a key
(b)	0.75 × 36 + 12 (=39)		2	M1 for a fully correct method to find number of people who travelled more than 30 km
		$\frac{39}{120}$		A1 for $\frac{39}{120}$ oe e.g. 0.325, 32.5%
	Alternative method E.g. "3.3" × 2 + "2.6" × 3 + "1.8" × 4 + "0.8" × 3 (= 24) **and** "1.8" × 3 + "0.8" × 3 (= 7.8)	$\frac{39}{120}$		M1 dep on at least M1 in (a) ft from their graph using area A1 for $\frac{39}{120}$ oe e.g. 0.325, 32.5%

Question	Working	Answer	Mark	Notes
20 (a)	$\sqrt{25\times2}+\sqrt{64\times2}-\sqrt{100\times2}$ **or** $5\sqrt{2}+8\sqrt{2}-10\sqrt{2}$ **or** $3\sqrt{2}$	3	2	M1 for at least 2 out of 3 correct products from those shown **or** for $3\sqrt{2}$ A1
(b)	E.g. $\frac{5\sqrt{a}+a}{10\sqrt{a}}\times\frac{\sqrt{a}}{\sqrt{a}}$ **or** $\frac{5\sqrt{a}}{10\sqrt{a}}+\frac{a}{10\sqrt{a}}$ **or** $\frac{\sqrt{a}(5+\sqrt{a})}{10\sqrt{a}}$	$\frac{1}{2}+\frac{1}{10}\sqrt{a}$	2	M1 $\sqrt{a}$ for multiplying numerator and denominator by $\sqrt{a}$ (or a multiple of $\sqrt{a}$) **or** splitting fraction into 2 parts **or** taking out $\sqrt{a}$ as a common factor A1 from correct working NB. individual fractions need not be in their simplest form
21	$((10a-b)+(2a-5b))((10a-b)-(2a-5b))$ **Or** $(10a-b+2a-5b)(10a-b-2a+5b)$ $(12a-6b)(8a+4b)$	$24(2a-b)(2a+b)$	3	M1 first stage in using difference of 2 squares allow $-2a-5b$ in place of $-(2a-5b)$ M1 simplifying 2 correct brackets A1 fully factorised expression from correct working
	Alternative $(100a^2-10ab-10ab+b^2)$ **or** $4a^2-10ab-10ab+25b^2$ **or** $-4a^2+10ab+10ab-25b^2$ $96a^2-24b^2$	$24(2a-b)(2a+b)$	3	M1 expanding one bracket correctly M1 simplifying 2 correct expansions A1 fully factorised expression from correct working

Question	Working	Answer	Mark	Notes
22	$\sqrt[5]{\frac{32}{3125}}\left(=\frac{2}{5}\text{oe}\right)$ $\left("\frac{2}{5}"\right)^4\times\left(1-"\frac{2}{5}"\right)\text{oe}\left(=\frac{48}{3125}\text{oe}\right)$	$\frac{240}{3125}$	3	M1 a correct method to find probability of getting one head M1 (dep) for the probability of getting one combination of 4 heads and 1 tail A1 oe eg $\frac{48}{625}$, 0.0768
23 (a)	$(f(-4)=)\ \frac{3\times-4}{-4-2}\ (=2)$ **or** $\left(gf(x)=\right)\frac{4\left(\frac{3x}{x-2}\right)}{5}$ oe **or** $\frac{4\left(\frac{3\times-4}{-4-2}\right)}{5}$	1.6	2	M1 A1 oe
(b)	$\frac{3\times\frac{4x}{5}}{\frac{4x}{5}-2}$ E.g. $\frac{12x}{4x-10}$ oe	$\frac{6x}{2x-5}$	3	M1 for a correct first expression for fg(x) M1 for a correct unsimplified fraction of the form $\frac{ax}{bx-c}$ where a, b and c are integers A1 cao SC : Award B2 for $\frac{3x}{x-2.5}$

Question	Working	Answer	Mark	Notes
(c)	$y = \frac{3x}{x-2}$ $y(x-2) = 3x$ $xy - 3x = 2y$ or $x(y-3) = 2y$ $x = \frac{3y}{y-2}$ $x(y-2) = 3y$ $xy - 3y = 2x$ or $y(x-3) = 2x$	$\frac{2x}{x-3}$	3	M1 for writing function in the form $y = \frac{3x}{x-2}$ or $x = \frac{3y}{y-2}$ **and** multiplying both sides by the denominator M1 isolating terms in x (or y) A1 oe must be in terms of x
24	$\overrightarrow{BX} = \frac{3}{2} \times 4\mathbf{a} = (6\mathbf{a})$ **or** $\overrightarrow{CX} = \frac{5}{2} \times 4\mathbf{a} = (10\mathbf{a})$ **or** $\overrightarrow{AX} = \frac{3}{2} \times 4\mathbf{a} + 3\mathbf{c} = (6\mathbf{a} + 3\mathbf{c})$ **or** $\overrightarrow{OY} = \overrightarrow{OC} + \overrightarrow{CY}$ **or** $\overrightarrow{OY} = \overrightarrow{OC} + 2\overrightarrow{AX}$ $\overrightarrow{CY}$ (or $2\overrightarrow{AX}$) = $2(-4\mathbf{a} + 3\mathbf{c} + 4\mathbf{a} + 6\mathbf{a})$ **(** $= 6\mathbf{c} + 12\mathbf{a}$)	$9\mathbf{c} + 12\mathbf{a}$	3	M1 correct vector, in terms of **a** and/or **c** for $\overrightarrow{BX}$ or $\overrightarrow{CX}$ or $\overrightarrow{AX}$ (need not be simplified) **or** $\overrightarrow{OY} = \overrightarrow{OC} + \overrightarrow{CY}$ **or** $\overrightarrow{OY} = \overrightarrow{OC} + 2\overrightarrow{AX}$ (accept 3**c** in place of $\overrightarrow{OC}$ and their $\overrightarrow{CY}$ and their $\overrightarrow{AX}$ if clearly stated in terms of **a** and **c**) M1 correct vector for $\overrightarrow{CY}$ (or $2\overrightarrow{AX}$) (need not be simplified) implies the award of both method marks A1 for $9\mathbf{c} + 12\mathbf{a}$ **or** $3(3\mathbf{c} + 4\mathbf{a})$

Question	Working	Answer	Mark	Notes
25	e.g. angle $AOB = 360 \div 5$ (=72) **or** angle $ABC = 108$ **or** angle $OBC = 54$ **or** angle $COM = 36$	63.1	5	M1 for correct use of angles in a pentagon
	e.g. $AO = \frac{4}{\cos(54)}$ (= 6.8(05...)) oe			M1 for a method to find AO (or BO etc) or OM
	$OM = 4\tan(54)$ (= 5.5(055...))oe			
	e.g. $\tan APO = \frac{"6.8..."}{10}$ (angle APO = 34(.2...)			M1 for a method to find angle APO or angle OPM **OR**
	e.g. $\tan OPM = \frac{"5.5..."}{10}$ (angle OPM = 28.8... **or** 29)			for a method to find angle PAO(55.8...) **AND** angle PMO (61.1...)
	"34.2" + "28.8" **OR** 180 – "55.8" – "61.1"			M1 for a complete method
				A1 for answer in the range 62.9 – 63.2
	Alternative	63.1	5	
	e.g. angle $AOB = 360 \div 5$ (=72) **or** angle $ABC = 108$ **or** angle $OBC = 54$ **or** angle $COM = 36$			M1 for correct use of angles in a pentagon
	e.g. $AO = \frac{4}{\cos(54)}$ (= 6.8(05...)) oe			M1 f for a method to find AO (or BO etc) or OM
	$OM = 4\tan(54)$ (= 5.5(055...))oe			
	e.g. $AP = \sqrt{10^2 + 6.8..^2}$ **AND** $MP = \sqrt{10^2 + 5.5..^2}$			M1 for a method to find AP (or BP etc) **AND** MP
	(= 12.(09...) (= 11.(415...)			
	e.g. $\cos APM = \frac{12.09..^2 + 11.415..^2 - 12.31..^2}{2 \times 12.09.. \times 11.415..}$			M1 for a complete method
				A1 for answer in the range 62.9 – 63.2