Mark Scheme (Results)

January 2018

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

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January 2018
Publications Code 4MA0_4H_1801_MS

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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 4MA_4H				
Question	**Working**	**Answer**	**Mark**	**Notes**
1		$T = 24c + 37r$	3	B3 for a correct final answer (award B2 if $T = 24c + 37r$ is incorrectly simplified) If not B3 then B2 for $T = 24c + kr$ **or** $T = kc + 37r$ (k may be 0) **or** $24c + 37r$ B1 for $24c$ **or** $37r$ **or** T = (linear expression in c and r eg $T = c + r$ but not $T = cr$)
2	$165 \div 50 (= 3.3)$ $'0.3' \times 60 (= 18)$ **or** $'3.3' \times 60 (= 198)$	3 hours 18 minutes	3	M1 M1 A1
3 (a)	$\frac{2}{7} \times \frac{5}{4}$ $\frac{2}{7} \times \frac{5}{4} = \frac{10}{28} = \frac{5}{14}$ **or** show cancelling giving $\frac{1}{7} \times \frac{5}{2} = \frac{5}{14}$ **Alternative method** $\frac{10}{35} \div \frac{28}{35}$ oe $\frac{10}{28} = \frac{5}{14}$ oe $\frac{2}{4} = 0.5$ $\frac{7}{5} = 1.4$ $\frac{0.5}{1.4} = \frac{5}{14}$	$\frac{5}{14}$ $\frac{5}{14}$	2 2	M1 A1 answer from correct working with $\frac{10}{28}$ oe seen or $\frac{5}{14}$ from correct cancelling M1 A1 answer from correct working with $\frac{10}{28}$ oe seen or from use of decimals with $\frac{0.5}{1.4}$ seen.

Question	Working	Answer	Mark	Notes
(b)	eg $\frac{19}{6}-\frac{5}{3}$ eg $\frac{19}{6}-\frac{10}{6}$ eg $\frac{9}{6}=1\frac{3}{6}=1\frac{1}{2}$ (2) $\frac{1}{6}-\frac{4}{6}$ $2-\frac{3}{6}$ $1\frac{3}{6}=1\frac{1}{2}$ $3\frac{1}{6}-1\frac{4}{6}$ $2-\frac{3}{6}$ $1\frac{3}{6}=1\frac{1}{2}$ $\frac{7}{6}-\frac{4}{6}$ $1\frac{7}{6}-\frac{4}{6}$ $1\frac{3}{6}=1\frac{1}{2}$	$1\frac{1}{2}$	3	M1 common denominator used for subtraction **or** improper fractions M1 Method which would lead to $\frac{9}{6}$ oe or $1\frac{3}{6}$ oe dep on first M1 A1 answer from correct working with all steps seen
4	$110\div 20\left(=5.5\right)$ Point marked on bearing of 220° from *C*	*D* marked	3	M1 may be implied by a line of length 5.5 cm or a circle of radius 5.5 cm; allow ±2 mm [or *D* marked 5.5 cm from *B*] M1 allow ±2° A1 *D* marked in correct position (overlay)
5	$\pi\times 18$ **or** $2\times\pi\times\left(18\div 2\right)$	56.5	2	M1 A1 56.5 – 56.6
6		(1, 1) (2, 1) (4, −2) (1, −2)	2	B2 If not B2 then B1 for 3 correct points plotted or shape in correct orientation or for a correct rotation 90° anticlockwise [(−5, 0)(−8, 0)(−5, −3)(−6, −3)]

Question	Working	Answer	Mark	Notes
7	e.g. $1-\frac{1}{12}\left(=\frac{11}{12}\right)$ **or** $\frac{1}{12}+x+3x=1$ $"\frac{11}{12}"\div 4$ **or** $\left(1-\frac{1}{12}\right)\div 4$ **or** $1-\frac{33}{48}$	$\frac{11}{48}$ oe	3	M1 or two fractions that add to $\frac{11}{12}$ eg $\frac{3}{12}, \frac{8}{12}$ **or** 2.75 **or** an answer of $\frac{8.25}{12}$ M1 complete method or an answer of $\frac{33}{48}\left(=\frac{11}{16}\right)$ **or** $\frac{2.75}{12}$ A1 or 0.229(16…) or 22.9(16…)%
8 (a)	$0.145\times 62\left(=8.99\right)$ oe $\left(0.145\times 62\ 000\ 000\left(=8\ 990\ 000\right)\right)$ oe 62 – "8.99" $\left(62\ 000\ 000-"8\ 990\ 000"\right)$ Allow 53 010 000	53.01	3	M1 M1 for 1 – 0.145 (=0.855)oe M1 dep M1 dep for "0.855" × 62 ("0.855" × 62 000 000) A1 accept 53 million (53 000 000) if working seen SCB2 if M0 scored then award B2 for digits 5301
(b)	$1656-1404\left(=252\right)$ **or** $\frac{1404}{1656}\left(=0.848\right)$ **or** for 84.8 $\frac{"252"}{1656}\times 100$ **or** (1 − "0.848") × 100 **or** 100 – "84.8"	15.2	3	M1 M1 dep A1 15.2 – 15.22 allow −15.2

Question	Working	Answer	Mark	Notes
(c)	$5\times3+15\times16+25\times6+35\times4+45(\times1)$ **or** $15+240+150+140+45$	590	3	M2 For the addition of 5 products (at least 4 correct) if not M2 then award M1 for multiplication of midpoints (at least 4 correct) by frequencies (without addition) **or** for the addition of 5 products (at least 4 correct) not using the mid-value where the value is consistently within the interval (including either end) A1 SCB2 for (19.6(6...))
9 (a)		2, 4, 6, 7, 8, 10, 11, 12	1	B1
(b)		No with reason	1	B1 e.g. 20 is not in the universal set set *A* only goes up to 12 etc
(c)		e.g. 1, 3, 7	2	B2 For 7 and any two of 1, 3, 5, 9 if not B2 then award B1 for three values of which two are correct **or** for 7 **and** three or four correct values, none incorrect
10 (a)		$5(5m+6n)$	1	B1
(b)		$2p^2-3p$	1	B1
(c)	$\frac{y^{13}}{y^4}$ **or** $y^{(1)}\times y^8$ **or** $y^5\times y^4$ **or** y^{5+8-4}	y^9	2	M1 A1
(d)	$x^2+7x-3x-21$	$x^2+4x-21$	2	M1 3 terms correct with signs **or** 4 terms correct ignoring signs **or** $x^2 + 4x \pm \ldots$. **or** $\ldots. + 4x - 21$ A1

Question	Working	Answer	Mark	Notes
(e)		$9p^3m(4m + 3p^2)$	2	B2 B1 for any correct partial factorisation with at least 2 letters or one letter and one number outside the bracket eg. $3m(12p^3m + 9p^5)$ or correct highest common factor with a 2 term expression in m and p inside the bracket
11	$8.5^2 - 4^2$ (=56.25) $\sqrt{8.5^2 - 4^2}$ **or** $\sqrt{56.25}$ **or** 7.5 $\frac{1}{2}(13+(13+"7.5")\times 4$ **or** 13 × 4 + 0.5 × (7.5 × 4) oe	67	4	M1 M1 M1 A correct method to find area dep on correct use of Pythagoras' Theorem A1
12 (a)	80 – "33"	47	2	M1 for indication of correct reading from 150 cm and subtraction from 80 or a non-integer value in the range 46 - 47 A1 46 or 47
(b)		156	2	M1 for using 40 or 40.5 on cumulative frequency axis eg indicated by horizontal line or dot on curve at correct place A1 155 - 157
13 (a)	24, 48, 72, 96, 120…. **and** 30, 60, 90, 120… **or** 2, 2, 2, 3 **and** 2, 3, 5	120	2	M1 Multiples of 24 and 30 to 120 or correct prime factors of 24 and 30 could be on completed factor trees or 'ladder' diagrams A1 or for 2 × 2 × 2 × 3 × 5 oe
(b)		2×3^2	1	B1oe or for 18

Question	Working	Answer	Mark	Notes
14 (a)		41.5, 13	1	B1
(b)		correct curve	2	M1 at least 6 points plotted correctly ft from their table A1 A fully correct curve through all 8 correct points
(c)	$y = 30$ drawn on graph	1.8	2	M1 A1 1.75 – 1.85 or ft from reciprocal curve
15	$P = \frac{k}{d^2}$ $25.6 = \frac{k}{\left(\frac{1}{8}\right)^2}$ oe **or** $k = 0.4$ oe	$P = \frac{2}{5d^2}$	3	M1 M1 implies previous M1 A1 oe eg. $P = \frac{0.4}{d^2}$ allow $P = \frac{k}{d^2}$ if $k = 0.4$ oe stated
16 (a)	$\frac{1}{2} \times 10.5 \times 17.6 \times \sin(109^\circ)$	87.4	2	M1 A1 87.36 – 87.4
(b)	$10.5^2 + 17.6^2 - 2 \times 10.5 \times 17.6 \times \cos(109^o)$ e.g. 540 **or** $10.5^2 + 17.6^2 \pm 120$ **or** 420.0..± a single number oe	23.2	3	M1 M1 correct order of operations A1 for 23.2 – 23.25

Question	Working	Answer	Mark	Notes
17 (a)		$6x^2 - 18x$	2	B2 B1 for $3\times 2x^2$ (= $6x^2$) or $-9\times 2x$ (= $-18x$)
(b)	$6x^2 - 18x = -\frac{27}{2}$ oe e.g.$(2x \pm 3)(2x \pm 3)$ (= 0) **or** correct substitution into quadratic formula (condone one sign error) x = 1.5 oe	(1.5, −6.5) oe	4	M1 ft from (a) M1 method to solve correct quadratic equation (terms may not all be 'on the same side') ($12x^2 - 36x = -27$ **or** $4x^2 - 12x + 9$ (=0) **or** $6x^2 - 18x + 13.5$ (=0) oe) by factorising or correct substitution into formula M1 dep on M1 for correct value of x A1 dep on correct quadratic equation
18 (a)	$\begin{pmatrix}5\\6\end{pmatrix}+\begin{pmatrix}-3\\8\end{pmatrix}$ **or** $\begin{pmatrix}5\\6\end{pmatrix}-\begin{pmatrix}3\\-8\end{pmatrix}$	$\begin{pmatrix}2\\14\end{pmatrix}$	2	M1 or $\overrightarrow{DA}=\overrightarrow{DC}+\overrightarrow{CA}$ oe or (2, 14) or for $\begin{pmatrix}a\\14\end{pmatrix}$ **or** $\begin{pmatrix}2\\b\end{pmatrix}$ or correct vector values written without brackets A1
(b)	$\begin{pmatrix}2\\5\end{pmatrix}+2\begin{pmatrix}3\\-8\end{pmatrix}$ **or** $\begin{pmatrix}8\\-11\end{pmatrix}$	(8, −11)	2	M1 for a correct sum of vectors or the correct values in a column vector or for (8, y) or (x, −11) A1

Question	Working	Answer	Mark	Notes
19 (a)		0.68 0.32, 0.68, 0.32, 0.68	2	B2 for all correct probabilities (B1 for 0.68 for Naveed wins)
(b)	0.32 × 0.68 (=0.2176) 2 × "0.2176" oe	0.4352	3	M1 ft from tree diagram (allow 0.218) M1 ft from tree diagram A1 [Allow 0.435 from correct working] oe eg. $\frac{272}{625}$ 43.5(2)%
(c)	$\frac{3}{10}\times\frac{2}{9}$ **or** $\frac{5}{10}\times\frac{4}{9}$ **or** $\frac{2}{10}\times\frac{1}{9}$ $\frac{3}{10}\times\frac{2}{9} + \frac{5}{10}\times\frac{4}{9} + \frac{2}{10}\times\frac{1}{9}$	$\frac{28}{90}$ oe	3	M1 M1 A1 eg $\frac{14}{45}$ or 0.311(1…..) **Method with replacement (maximum 2 marks)** M1 $\frac{3}{10}\times\frac{3}{10}$ **or** $\frac{5}{10}\times\frac{5}{10}$ **or** $\frac{2}{10}\times\frac{2}{10}$ M1 $\frac{3}{10}\times\frac{3}{10}+\frac{5}{10}\times\frac{5}{10}+\frac{2}{10}\times\frac{2}{10}\left(=\frac{38}{100}\right)$

Question	Working	Answer	Mark	Notes
20 (a)	eg $\left(\frac{27f^3}{125e^{12}}\right)^{\frac{2}{3}}$ **or** $\frac{1}{\left(\frac{125e^{12}}{27f^3}\right)^{\frac{2}{3}}}$ **or** $\left(\frac{15625e^{24}}{729f^6}\right)^{-\frac{1}{3}}$ **or** $\left(\frac{5e^4}{3f}\right)^{-2}$	$\frac{9f^2}{25e^8}$	3	M1 For dealing with either negative index **or** cube root **or** square **or** an expression including $\frac{9}{25}$ **or** $\left(\frac{25}{9}\right)^{-1}$ **or** $\frac{f^2}{e^8}$ **or** $\frac{e^{-8}}{f^{-2}}$ (oe)
	eg $\left(\frac{3f}{5e^4}\right)^2$ **or** $\frac{1}{\left(\frac{15625e^{24}}{729f^6}\right)^{\frac{1}{3}}}$ **or** $\left(\frac{25e^8}{9f^2}\right)^{-1}$ **or** $\frac{1}{\left(\frac{5e^4}{3f}\right)^2}$ **or** $\left(\frac{729f^6}{15625e^{24}}\right)^{\frac{1}{3}}$			M1 For dealing with two elements **or** a correct expression not simplified eg $\frac{\frac{1}{25}e^{-8}}{\frac{1}{9}f^{-2}}$, $\frac{0.04e^{-8}}{0.1\dot{f}^{-2}}$
				A1 allow $\frac{9e^{-8}}{25f^{-2}}$, $0.36\frac{f^2}{e^8}$, $\frac{9}{25}e^{-8}f^2$
(b)	$8^x=(2^3)^x$ *or* 2^{3x} $4^n=(2^2)^n$ *or* 2^{2n} $2^{\frac{1}{2}}\times 2^{\frac{n}{3}}=2^{\frac{1}{2}+\frac{n}{3}}$ eg $\frac{3+2n}{6}=3x-2n$ **or** $\frac{1}{2}+\frac{n}{3}+2n=3x$ oe Eg $x=\frac{1}{6}+\frac{n}{9}+\frac{2n}{3}$, $x=\frac{1}{6}+\frac{7n}{9}$ oe	$x=\frac{14n+3}{18}$	4	M2 For all of: 8^x written as a power or 2 4^n written as a power of 2 LHS written as a single 2 with a power M1 for 2 of these 3 M1 A correct equation using only the powers A1 oe

Question	Working	Answer	Mark	Notes
21	6.75 **or** 6.85 **or** 9.15 **or** 9.25 **or** 3.425 **or** 3.375 $\pi \times (6.75 \div 2)^2 + \pi \times (6.75 \div 2) \times 9.15$	42.3	3	B1 M1 or $(k =)\ (6.75 \div 2)^2 + (6.75 \div 2) \times 9.15$ A1 42.27(1875) dep on correct working
22	$x^2 + (3 - 2x)^2 = 18$ $9 - 6x - 6x + 4x^2$ $5x^2 - 12x - 9\ (= 0)$ $(5x + 3)(x - 3)\ (= 0)$ **or** $\frac{--12 \pm \sqrt{(-12)^2 - 4 \times 5 \times -9}}{2 \times 5}$ $x = 3$ **and** $x = -0.6$	$x = 3$, $y = -3$ **and** $x = -0.6$, $y = 4.2$	6	M1 for elimination of one variable e.g. $y^2 + \left(\frac{3-y}{2}\right)^2 = 18$ M1 indep for correct expansion e.g. $\frac{y^2 - 3y - 3y + 9}{4}$ A1 for correct simplified quadratic equation (terms may not all be 'on the same side') e.g. $5y^2 - 6y - 63\ (= 0)$ NB dep on first M1 M1 ft if first M1 awarded and equation is a 3 term quadratic for correct factorisation or correct substitution into formula e.g. $(5y - 21)(y + 3) = 0$ **or** $\frac{--6 \pm \sqrt{(-6)^2 - 4 \times 5 \times -63}}{2 \times 5}$ A1 **or** $y = -3$ **and** $y = 4.2$ correct x or y values implies previous M1 dep on first A1 awarded A1 Values for x and y must be correctly paired dep on first A1 awarded