



Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE
In Mathematics A (4MA1) Higher Tier
Paper 2H

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January 2019

Publications Code 4MA1_2H_1901_MS

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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.

If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review. 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.

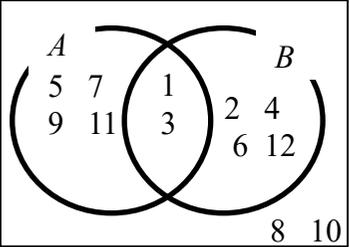
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

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

Question	Working	Answer	Mark	Notes
1	$73 \div 200 (=0.365)$ or $73 \times 100 (= 7300)$ or $1 \text{ cm} = 2 \text{ m}$ oe $"0.365" \times 100$ or $"7300" \div 200$ $73 \div 2$	36.5	3	M1 M1 Allow their incorrectly converted $73 \text{ m} \div 200$ A1 M2 for $100 \div \frac{200}{73}$ oe
2		$4n + 3$	2	B2 oe e.g. $7 + 4(n - 1)$ or $4n + (7 - 4)$ etc allow $T_n = 4n + 3$ or $x = 4n + 3$ etc If not B2 then award B1 for answer of $4n + k$ ($k \neq 3$) or $n = 4n + 3$
3	$90 \div (2 + 13) (= 6)$ or $\frac{12 + x}{90 + x} = \frac{1}{3}$ $"6" \times 2 (=12)$ or $"6" \times 13 (=78)$ or $3(12 + x) = 90 + x$ $("78" \div 2) - "12"$ or $2x = 54$ or $"78" \times 3/2 - "78" - "12"$ oe	27	4	M1 M1 M2 for $\frac{2}{15} \times 90 (= 12)$ or $\frac{13}{15} \times 90 (= 78)$ M1 dep on a correct method for "78" and "12" A1

Question	Working	Answer	Mark	Notes
4		Fully correct Venn diagram	4	B4 fully correct Venn diagram with labels <i>A</i> and <i>B</i> (If not B4 then B3 for 3 correct regions, B2 for 2 correct regions, B1 for 1 correct region)
5	$123 - 67 (=56)$ or $2x = 123 - 67$ or $2x + y = 67$ or $4x + y = 123$ oe $(x = \text{length of tile, } y = \text{width of tile})$ e.g. $"56" \div 2 (=28)$ $67 - 56 (=11)$ or $67 - 2 \times "28" (=11)$ or $123 - 4 \times "28" (=11)$ $(67 - 2 \times "11") \times (123 - 2 \times "11")$ (45×101) or $123 \times 67 - 12 \times "28" \times "11"$ $(8241 - 3696)$	4545	5	M1 M1 for method to find length or width M1 for method to find other dimension M1 dep on M2 A1

Question	Working	Answer	Mark	Notes																								
6 (a)	$2 \times 2 \times 2 \times 2 \times 2 \times 3$ or $2 \times 2 \times 2 \times 3 \times 5$ e.g. <table border="1" style="margin-left: 20px;"> <tr><td>2</td><td>96</td><td>120</td></tr> <tr><td>2</td><td>48</td><td>60</td></tr> <tr><td>2</td><td>24</td><td>30</td></tr> <tr><td>3</td><td>12</td><td>15</td></tr> <tr><td></td><td>4</td><td>5</td></tr> </table> <table border="1" style="margin-left: 20px;"> <tr><td>6</td><td>96</td><td>120</td></tr> <tr><td>4</td><td>16</td><td>20</td></tr> <tr><td></td><td>4</td><td>5</td></tr> </table>	2	96	120	2	48	60	2	24	30	3	12	15		4	5	6	96	120	4	16	20		4	5			M1 for one number written as product of prime factors number may be at the end of factor trees or on 'ladder' diagrams or Use of table method (allow 1 error), 2 examples shown but could have 2, 3, 4, 6, 12, 24 along the side or at least 2 factors for each (excluding 1, 96, 120)
2	96	120																										
2	48	60																										
2	24	30																										
3	12	15																										
	4	5																										
6	96	120																										
4	16	20																										
	4	5																										
(b)		24	2	A1 or $2^3 \times 3$ oe M1 for $2^m \times 3^n \times 5^p \times 7^q \times 11^r$ with at least two of $m = 4, n = 1, p = 2, q = 2, r = 1$ (or omission of one with others fully correct) NB: e.g. 2^4 could be 2×2^3 or prime numbers may be seen in a Venn diagram – if so must be correctly placed																								
		646 800	2	A1 or $2^4 \times 3 \times 5^2 \times 7^2 \times 11$ oe																								

Question	Working	Answer	Mark	Notes	
7	(a) $8500 \times 0.023 (=195.5)$ or $8500 \times 1.023 (=8695.5)$ $((8500 + "195.5") \times 1.023) \times 1.023$	9100	3	M1	M2 for 8500×1.023^3 (M1 for 8500×1.023^n)
	(b) $687\,700 \div 0.92 (=747\,500)$ or $687\,700 \div 1.15 (=598\,000)$ or $1.15 \times 0.92 (=1.058)$ $687\,7000 \div (0.92 \times 1.15)$			M1 A1 M1	
		650 000	3	M1 A1	Dep on M1 for completely correct method

Question	Working	Answer	Mark	Notes
8	(a)	5.38	3	M1
	(b)			M1
	$0.65 = \frac{3.5}{V}$ $(V =) \frac{3.5}{0.65}$			A1 for answer in range 5.38 – 5.385 SCB1 for a “correct” equation involving V with digits 65 and 35 where units have been converted eg $V = \frac{3500}{0.65}$
	$630 \times 1000 (=630\,000)$ $60 \times 60 (=3600)$ eg $630 \div 60 (=10.5)$ $630\,000 \div 60 (=10\,500)$ $1000 \div 60 (=16.66\dots)$ $1000 \div (60 \times 60) (=0.277\dots)$ $1 \div (60 \times 60) (= 0.000277\dots)$ $\frac{630 \times 1000}{60 \times 60} \text{ oe}$	175	3	M1 for converting 630 km to m or 1 hour to seconds or for correct operation(s) using at least 2 of the numbers 630, 1000, 60, 60 M1 Fully correct method (M2 for $630 \div 3.6$) A1

Question	Working	Answer	Mark	Notes
9	<p>e.g. $4x + 5y = 4$ $4x - 2y = 18$ with the operation of subtraction</p> <p>$4x + 5y = 4$ $10x - 5y = 45$ With the operation of adding</p> <p>$y = 2x - 9$ and $4x + 5(2x - 9) = 4$</p>	$x = 3.5$ oe, $y = -2$	3	<p>M1 for correct method to eliminate one variable – multiplying one or both equations so the coefficient of x or y is the same in both with the intention to add or subtract to eliminate one variable (condone one arithmetic error) or isolating x or y in one equation and substituting into the other equation</p> <p>M1 (dep) for substitution of found variable into one equation or correct method to eliminate second variable</p> <p>A1 Dep on M1</p>
10	<p>$3 \div 2 (=1.5)$ or eg $\frac{4-1}{2(-0)}$ or $c = 1$</p> <p>$y = "1.5"x + c$ or $y = mx + 1$ or eg $y - 4 = m(x - 2)$</p>	$y = 1.5x + 1$ oe	3	<p>M1 for correct method to find gradient – may see this on grid. For $c = 1$, could be $(L =) mx + 1$ oe or for $1.5x + c$</p> <p>M1 for use of $y = mx + c$ with either m or c or for $(L =) 1.5x + 1$</p> <p>A1 oe eg $y - 4 = \frac{3}{2}(x - 2)$</p>

Question	Working	Answer	Mark	Notes
11	<p>Basic comparisons from information: eg The median is greater for Science/less for Maths The IQR (or range) is higher for Science/less for Maths The median is 2.5 marks higher for Science The IQR (or range) is 7 marks more for Science</p> <p>Comparisons in context: eg On the whole students have higher marks in Science The spread of results is greater for Science Results are more consistent for Maths</p>	Two comparisons one for IQR and one for median	2	<p>B2 For 2 comparisons in context or 1 basic comparison and 1 comparison in context</p> <p>(B1 for 1 or 2 basic statements or for 1 statement in context)</p> <p>NB; any numbers used must be correct for the award of the mark</p>

Question	Working	Answer	Mark	Notes
12	(a)	1	1	B1
	(b)	$27x^6y^{15}$	2	B2 If not B2 then B1 for any two correct terms in a product
	(c)	$2(e^2 - 9)$ or $(2e - 6)(e + 3)$ or $(e - 3)(2e + 6)$	$2(e - 3)(e + 3)$	2 M1 A1 M1
	(d)	$m^2 = \frac{6a + r}{5r}$ $m^2 \times 5r = 6a + r$ $5rm^2 - r = 6a$	$r = \frac{6a}{5m^2 - 1}$	4 M1 M1 A1 or for $r = \frac{-6a}{1 - 5m^2}$ oe NB: to award A1 we must see $r = \frac{6a}{5m^2 - 1}$ in working if $\frac{6a}{5m^2 - 1}$ alone is given as answer

Question	Working	Answer	Mark	Notes
13	$4 \times 5 + 13 \times 6 + 16 \times 7 + 8x + 6 \times 9$ $(20 + 78 + 112 + 8x + 54)$ or $264 + 8x$ $(4 + 13 + 16 + 6 + x) \times 7 (=7(39 + x) = 273 + 7x)$ or $(4 + 13 + 16 + 6) \times 7 (=273)$ oe or $\frac{"264 + 8x"}{"39 + x"}$ $\frac{"264 + 8x"}{"39 + x"} = 7$ oe eg $"264 + 8x" = "(39 + x)" \times 7$ or $"273" - "264"$	9	4	M1 at least 3 products correct with intention to add M1 for use of mean M1 A1

Question	Working	Answer	Mark	Notes	
14	(a)	0.65 0.35, 0.65 0.35, 0.65	2	B2oe	for all correct If not B2 then award B1 for 0.65 in any of the 3 possible positions NB all values may be given as fractions
	(b)	0.35 × 0.35 or 0.35 × 0.65 or 0.65 × 0.35 or 0.65 × 0.65 0.35 × 0.35 + 0.35 × 0.65 + 0.65 × 0.35 or 1 - 0.65 × 0.65	0.5775	3	M1 ft from (a) M1 ft from (a) A1 oe e.g. $\frac{231}{400}$, 0.58 or 58% or better

Question	Working	Answer	Mark	Notes
15 (a)	e.g. $\frac{1}{2} \times (x + 5 + 3x - 2) \times (2x - 3)$ or $0.5(4x + 3)(2x - 3)$ oe eg. $\frac{1}{2} \times (8x^2 - 12x + 6x - 9) = 133$ or $8x^2 - 12x + 6x - 9 = 266$	shown	3	M1 correct algebraic expression for area M1 for correct equation with brackets expanded A1 for completion to given equation dep on M2
(b)	$\frac{- -6 \pm \sqrt{36 - -8800}}{2 \times 8} \text{ or } \frac{6 \pm \sqrt{36 + 8800}}{16} \text{ or } \frac{6 \pm \sqrt{8836}}{16}$ or $(4x - 25)(2x + 11) (=0)$			M2 If not M2 then award M1 for $\frac{- -6 \pm \sqrt{(-6)^2 - 4 \times 8 \times -275}}{2 \times 8}$ Condone one sign error in substitution; allow evaluation of individual terms e.g. 36 in place of $(-6)^2$ [allow -6^2 or 6^2 in place of $(-6)^2$, throughout allow + rather than \pm] or $(4x \pm 25)(2x \pm 11) (=0)$ (if student gains M1 and shows both answers the 2 nd M1 can be awarded) ft from an incorrect 3 term quadratic equation

Question	Working	Answer	Mark	Notes
16	e.g. $\sqrt[3]{\frac{960}{405}} \left(= \frac{4}{3} \right)$ (=1.3...) or $\sqrt[3]{\frac{405}{960}} \left(= \frac{3}{4} \right)$ (=0.75) $\left(\frac{3}{4} \right)^2 \times 928$ or $928 \div \left(\frac{4}{3} \right)^2$ oe	522	3	M1 for a correct linear scale factor M1 for a complete method A1
17 (a) (b) (c)	$g(-1.5) = 1 \div (1 - 2 \times -1.5)$ (=0.25) or $fg(x) = 4 - 3 \times \left(\frac{1}{1-2x} \right)$ oe	-11 0.5 oe	1 1	B1 B1 M1 $g(-1.5)$ must be the correct calculation alone.
18	7.5 or 8.5 or 4.65 or 4.55 25 or 15 $\frac{4.55}{25-7.5}$	3.25 oe	2	A1
		0.26 oe	4	M1 M1 M1 for $\frac{LB_1}{UB - LB_2}$ with $4.55 \leq LB_1 < 4.6$ and $20 < UB \leq 25$ and $7.5 \leq LB_2 < 8$ A1 for 0.26 from correct working

Question	Working	Answer	Mark	Notes
19	<p>At least 2 of: $2.5 \times 2 (=5)$ or $4 \times 3 (=12)$ or $3.4 \times 5 (=17)$ or $2.2 \times 5 (=11)$ or $(1 \times) 15$ or $(1 \times) 10 (=10)$ or e.g. at least 2 of 100, 240, 340, 220, 300 or 200</p> <p>$2.5 \times 2 + 4 \times 3 + 3.4 \times 5 + 2.2 \times 5 + (1 \times) 15$ or $5 + 12 + 17 + 11 + 15 (=60)$ or e.g. $100 + 240 + 340 + 220 + 300 (=1200)$</p>	$\frac{1}{6}$ oe	3	<p>M1 for working with area of at least 2 bars could be using freq density \times mins or use of counting squares or blocks</p> <p>M1 for method to find total number of people (allow one error) or total number of squares/blocks for method used (allow one error)</p> <p>A1 for $\frac{1}{6}$ or $16.\dot{6}\%$ or $0.1\dot{6}$ or 1 in 6 (percentages or decimal rounded or truncated to 3 or more sig figs)</p>

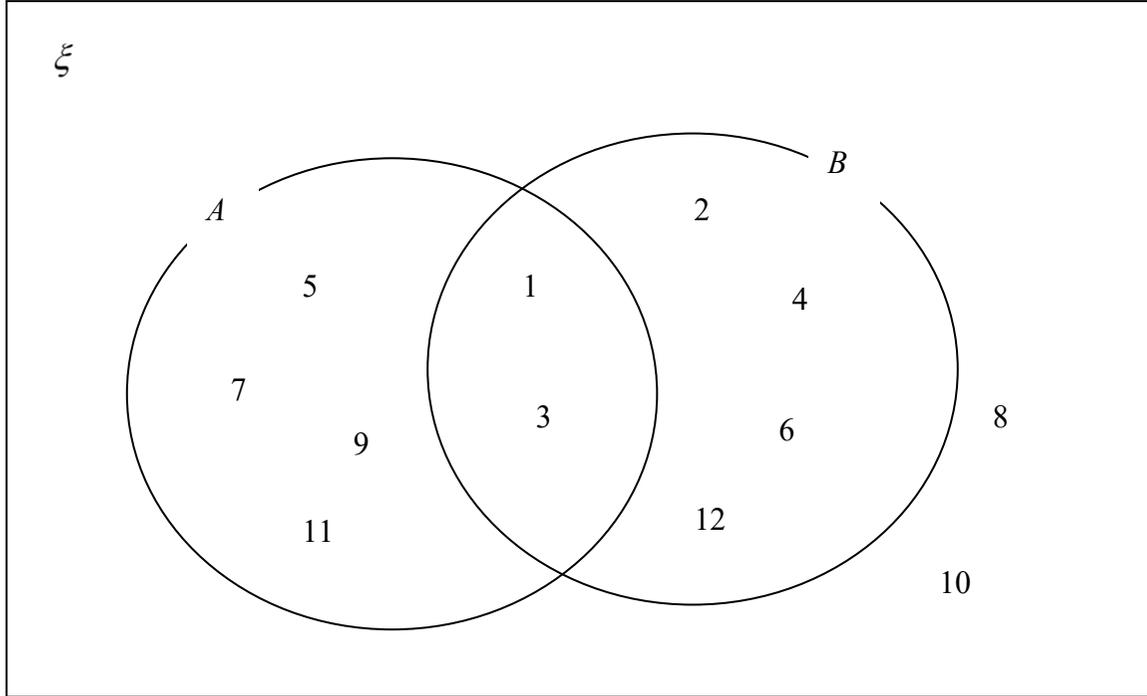
Question	Working	Answer	Mark	Notes
20	angle $CDB = x$ or angle $CAB = x$ angle $CBA = 180 - 2x$ angle $CDA = 180 - (180 - 2x) = 2x$	proof with reasons	5	M1 M1 M1 B1 dep on M1 for any one appropriate circle theorem reason A1 for complete proof with full reasons <u>alternate segment theorem</u> , angles in a <u>triangle</u> sum to <u>180°</u> , <u>isosceles triangle</u> , <u>opposite angles of a cyclic quadrilateral</u> sum to <u>180°</u>
	Alternative method angle $CDB = x$ or angle $CAB = x$ angle $ACB = x$ angle $ACQ = 2x$ and angle $CDA = 2x$			M1 M1 M1
	Alternative method angle $OCB = 90 - x$ angle $BOC = 180 - 2(90 - x) (=2x)$ angle $AOB = 2x$ and angle $CDA = 2x$	proof with reasons	5	B1 dep on M1 for any one appropriate circle theorem reason A1 for complete proof with full reasons <u>alternate segment theorem</u> , <u>isosceles triangle</u>
		proof with reasons	5	M1 M1 M1 B1 dep for any one appropriate circle theorem reason A1 for complete proof with full reasons angle between <u>tangent and radius is 90°</u> oe, angles in a <u>triangle</u> sum to <u>180°</u> , <u>isosceles triangle</u> , angle at <u>centre is twice</u> angle at <u>circumference</u> oe

Q20 contd	Alternative method where students assume $CDA = 2x$ and must work to show that $BCQ = x$			
	eg angle $ABC = 180 - 2x$ Angle $CAB = \text{angle } ACB =$ $[180 - (180 - 2x)] \div 2 = x$ $BCQ = CAB = x$			M1 M1 M1 B1 Dep on M1 for any one appropriate circle theorem reason A1 For complete proof with reasons e.g. <u>opposite angles of cyclic quadrilateral</u> sum to 180° angles in <u>triangle</u> sum to <u>180°</u> <u>isosceles triangle</u> <u>alternate segment theorem</u>
21	$y = \frac{6}{4}x(+33)$ or (gradient =) $\frac{6}{4}$ oe $m \times \frac{6}{4} = -1$ or (gradient of M =) $-\frac{2}{3}$ oe $\frac{k-6}{-4-5} = -\frac{2}{3}$	12	4	M1 M1 M1 or complete method to find equation of line ($3y = -2x + 28$) dep and then substitution of $x = -4$ A1

Question	Working	Answer	Mark	Notes
22	$\frac{\pi r^2}{\pi r^2 + \pi r l} = \frac{3}{8} \text{ or } \pi r^2 : \pi r^2 + \pi r l = 3 : 8 \text{ or}$ $\pi r^2 : \pi r l = 3 : 5 \text{ or } \pi r^2 = 3 \text{ and } \pi r l = 5$ $8\pi r^2 = 3(\pi r^2 + \pi r l) \text{ or } 5\pi r^2 = 3\pi r l \text{ or}$ $\left[r = \sqrt{\frac{3}{\pi}} (= 0.9772\dots) \text{ and } l = \frac{5}{\pi r} \right]$ $\frac{r}{l} = \frac{3}{5} \text{ oe or } l = \frac{5}{\pi \sqrt{\frac{3}{\pi}}} (= 1.62\dots)$ $\text{e.g. } \sin\left(\frac{AVB}{2}\right) = \frac{3}{5} \text{ oe eg } \sin\left(\frac{AVB}{2}\right) = \frac{\sqrt{\frac{3}{\pi}}}{\frac{5}{\pi \sqrt{\frac{3}{\pi}}}}$ $2 \times \sin^{-1}\left(\frac{3}{5}\right) \text{ oe}$	73.7	6	M1 M1 M1 M1 M1 A1 awrt $\sin^{-1}\left(\frac{3}{5}\right) = 36.86\dots$

Question	Working	Answer	Mark	Notes
23	e.g. $\overrightarrow{AB} = \overrightarrow{AD} + \overrightarrow{DB}$ or $\begin{pmatrix} 2 \\ -3 \end{pmatrix} + \begin{pmatrix} -1 \\ 7 \end{pmatrix}$ $\overrightarrow{AB} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ $\overrightarrow{DC} = 3 \times \begin{pmatrix} 1 \\ 4 \end{pmatrix} = \begin{pmatrix} 3 \\ 12 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} 1 \\ -7 \end{pmatrix} + \begin{pmatrix} 3 \\ 12 \end{pmatrix} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ oe or $\overrightarrow{BC} = \begin{pmatrix} -1 \\ -4 \end{pmatrix} + \begin{pmatrix} 2 \\ -3 \end{pmatrix} + \begin{pmatrix} 3 \\ 12 \end{pmatrix} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ oe			M1 for a correct vector equation for \overrightarrow{AB} A1 M1 M1 A1 No isw
		$\sqrt{41}$ cao	5	

4



6b

