

EDEXCEL • GCSE MATHEMATICS 1MA1

Higher Tier — Paper 1

Non-Calculator

November 2023 exam series

MARK SCHEME

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Mark Scheme (Results)

November 2023

Pearson Edexcel GCSE
In Mathematics (1MA1)
Higher (Non-Calculator) Paper 1H

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General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- 1** All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.
- 2** All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no 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.

Questions where working is not required: In general, the correct answer should be given full marks.

Questions that specifically require working: In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

- 3** **Crossed out work**
This should be marked **unless** the candidate has replaced it with an alternative response.
- 4** **Choice of method**
If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.
If no answer appears on the answer line, mark both methods **then award the lower number of marks.**
- 5** **Incorrect method**
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review for your Team Leader to check.
- 6** **Follow through marks**
Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 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 or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

8 Probability

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9 Linear equations

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

10 Range of answers

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range

11 Number in brackets after a calculation

Where there is a number in brackets after a calculation eg $2 \times 6 (=12)$ then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

12 Use of inverted commas

Some numbers in the mark scheme will appear inside inverted commas eg “12” $\times 50$; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

13 Word in square brackets

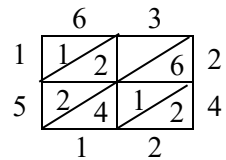
Where a word is used in square brackets eg [area] $\times 1.5$: the value used for [area] does **not** have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

14 Misread

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

Guidance on the use of abbreviations within this mark scheme

M	method mark awarded for a correct method or partial method
P	process mark awarded for a correct process as part of a problem solving question
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper: 1MA1/1H													
Question	Answer	Mark	Mark scheme	Additional guidance									
1	15.12	M1	for a complete method with relative place value correct including an intention to add all the appropriate elements of the calculation	252 1260 1512  <table border="1" data-bbox="1581 612 1868 724"><tr><td></td><td>60</td><td>3</td></tr><tr><td>20</td><td>1200</td><td>60</td></tr><tr><td>4</td><td>240</td><td>12</td></tr></table> 1200 + 60 + 240 + 12 = 1512		60	3	20	1200	60	4	240	12
	60	3											
20	1200	60											
4	240	12											
		A1	for digits 1512										
		A1	(dep on M1) for correct placement of the decimal point into their final answer										
2	(a)(i)	1	B1	cao									
	(ii)	$\frac{1}{25}$	B1	oe									
	(b)	2^6	M1	for a correct first step using a rule of indices, eg $2^{5+4} (= 2^9)$ or $2^{5-3} (= 2^2)$ or $2^{4-3} (= 2^1)$ or for $2 \times 2 \times 2 \times 2 \times 2 \times 2$ or 64									
		A1	for 2^6	Accept $n = 6$									

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
3	$2^2 \times 3 \times 13$	M1	for a complete method to find prime factors; could be shown in a complete factor tree with no more than one error or by division by prime factors with no more than one error or for 2, 2, 3, 13 (1)	Condone the inclusion of 1 for this mark
		A1	$2^2 \times 3 \times 13$ or $2 \times 2 \times 3 \times 13$ oe	
	26	M1	for a correct factor tree for 130 (or 156 if not credited in part (a)) with no more than one arithmetic error or for listing factors of 156 or 130, at least 4 correct for either (with no more than 1 incorrect in either list), could be in factor pairs or for the prime factors of 130 (2, 5, 13) (or 156 if not credited in part (a)) or identifies a common factor other than 1 (2 or 13)	Condone the inclusion of 1 for this mark 1, 2, 3, 4, 6, 12, 13, 26, 39, 52, 78, 156 1, 2, 5, 10, 13, 26, 65, 130
		A1	cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
4 (a)	3.5	P1	for a process to find the total length of the 5 sticks, eg $4.2 \times 5 (= 21)$ or for forming an equation, eg $\frac{7 + 4x}{5} = 4.2$	If figures are given as part of the answer they must be correct, but can allow ft
(b)	Explanation	P1 A1 C1	for complete process to find the mean eg $(“21” - 7) \div 4$ oe for explanation Acceptable examples it reduced the mean my answer will be less the answer will be 1 it will be 2.5 less Not acceptable examples the mean will be more my answer will change it would decrease the lengths of the other sticks	
5	Angle constructed	C2 (C1)	for fully correct construction with all arcs drawn for line drawn within guidelines with no (or incorrect) construction arcs or correct arcs drawn and no line seen	Full marks cannot be awarded if no construction lines are seen

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	144	P1 P1 P1 A1	for using the ratio, eg $x = 2y$ or $2y + 2y + y (= 180)$ or $2 + 2 + 1 (= 5 \text{ (parts)})$ for using angle facts to give an equation, eg $x + x + y = 180$ or $2y + 2y + y = 180$ or $y + w = 180$ or $5x \div 2 = 180$ oe or $w = 2x$ or for $180 \div 5 (= 36)$ for a complete process, eg $180 - (180 \div 5)$ cao	The first two marks may be awarded in either order Award P2 for $x = 72$ or $y = 36$
7	2400	P1 P1 P1 P1 A1	for setting up an equation in x, eg $x + (3x + 1) + (2x - 5) = 44$ or $6x - 4 = 44$ or $x = 48 \div 6 (= 8)$ for substituting “8” into either $(3x + 1)$ or $(2x - 5)$ eg $3 \times “8” + 1 (= 25)$ or $2 \times “8” - 5 (= 11)$ for finding the mass of one book, eg $7500 \div “25” (= 300)$ for finding the mass of the books on shelf A, eg $“300” \times “8”$ cao	
8	1100	M1 A1	for a complete method to find the original cost, eg $660 \div (100 - 40) \times 100$ or $660 \div 0.6$ oe cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	Graph drawn	B2	for a correct line drawn	Accept answers in the form $\frac{a}{b}$ where a and b are integers If figures are given as part of the answer they must be correct, but can allow ft
		(B1)	for stating or plotting at least 2 points on the line eg (0, 0) and (4, 5) or (4, 5) and (8, 10) or giving the equation of the line eg $y = \frac{5}{4}x$	
(b)(i)	1.25	B1	oe or ft their line in part (a)	
(ii)	Explanation	C1	for explanation Acceptable examples the number of cups of water per cup of rice every cup of rice has 1.25 cups of water for every 4 cups of rice there are 5 cups of water Not acceptable examples cups of water $\div$ cups of rice the gradient represents the steepness of the line the number of cups of rice for each cup of water	
10	$\frac{25}{\pi}$	P1	for showing $\pi d = 10$ or $2\pi r = 10$ or $r = \frac{10}{2\pi}$ or $d = \frac{10}{\pi}$	Need not be simplified but needs to show a single value of π
		P1	(dep P1) for using $r = \frac{5}{\pi}$ or $r = \frac{10}{2\pi}$ or $d = \frac{10}{\pi}$ in πr^2 eg $\pi \times \left(\frac{10}{2\pi}\right)^2$	
		A1	oe	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
11 (a)(i)	Box plot	B2	for fully correct box plot	Accept ends that are marked (eg line, cross, dot) or defined by the end of the whiskers if clear
		(B1	for median plotted at 900 or whiskers plotted finishing at 300 and 1300)	
(ii)	780 and 1200	B1	for 780 and 1200 correctly placed in the table	
(b)	60	M1	for a complete method eg $\frac{3}{4} \times 80$ oe	
		A1	cao	
12	$y = -\frac{2}{3}x - 1$	M1	for a method to find gradient of perpendicular line, eg $y = \frac{3}{2}x(-\frac{7}{2})$ and $\frac{3}{2} \times m = -1$ or gradient of perpendicular shown as $-\frac{2}{3}$	
		M1	for a method to find the value of c , eg $-5 = "-\frac{2}{3}" \times 6 + c$ or $y - -5 = "-\frac{2}{3}"(x - 6)$ oe	
		A1	for $y = -\frac{2}{3}x - 1$ oe eg $2x + 3y + 3 = 0$ or $y + 5 = -\frac{2}{3}(x - 6)$ SC B1 for $y = -\frac{1}{3}x - 3$ oe if M0 scored	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	187.5	M1 M1 A1	for $\left(\frac{5}{2}\right)^3$ or $\left(\frac{2}{5}\right)^3$ or 2.5^3 or $\left(\frac{1}{2.5}\right)^3$ or $2^3 : 5^3$ for a complete method, eg $12 \div 8 \times 125$ or 12×2.5^3 oe	Accept $\frac{375}{2}$
14	17	M1 M1 A1	for $27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2$ or 3^2 or $\sqrt[3]{27^2}$ or $\sqrt[3]{729}$ or $\left(\frac{1}{2}\right)^{-3} = \frac{1}{\left(\frac{1}{2}\right)^3}$ or 2^3 for a full method eg “3” ² + “2” ³ or for correctly evaluating $27^{\frac{2}{3}}$ or $\left(\frac{1}{2}\right)^{-3}$ eg 9 or 8 seen cao	
15	25	M1 M1 A1	for a tangent drawn at $t = 3$ for a complete method to find the gradient from tangent eg $50 \div (4 - 2)$ for answer in the range 22 to 28 or ft acceptable tangent	A tangent must be seen to award any marks This mark can be awarded if the tangent is drawn at $t \neq 3$ Award 0 marks for a correct answer (in the range) with no (or incorrect) supportive working

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	4.5	P1	for initial use of formula, eg $6 = 8k$	If figures are given as part of the answer they must be correct, but can allow ft
		P1	for a full process to find P_3 eg $\frac{6}{8} \times 6$	
		A1	oe	
(b)	Explanation	C1	for explanation Acceptable examples Yes, the population will increase as k is over 1 She is correct because $1.05 > 1$ Yes, each year the population will increase by 5% Yes, because $0.75 + 0.3 = 1.05$ Yes, a 0.3 increase is greater than the current 0.25 decrease Not acceptable examples Yes, the population will increase each year Yes, because there is an increase in k No because 0.3 is less than 0.75	
17 (a)	$(2x + 1)(3x - 4)$	M1	for $(2x \pm 1)(3x \pm 4)$ oe or for brackets which when expanded give 2 out of 3 terms correct	
		A1	cao	
(b)	$-\frac{1}{2} < x < \frac{4}{3}$	M1	for two critical values with at least one correct, $-\frac{1}{2}$ or $\frac{4}{3}$ or ft their critical values from (a)	
		A1	for $-\frac{1}{2} < x < \frac{4}{3}$ oe eg $x < \frac{4}{3}, x > -\frac{1}{2}$	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	$\frac{1}{3}$	P1 P1 P1 A1	for start of process to find the probability of spinner B landing on red eg $\frac{1}{4}x = \frac{1}{24}$ oe or $\frac{1}{24} \div \frac{1}{4}$ or $x = \frac{1}{6}$ for process to find probability of one red and one not red eg $\frac{1}{4} \times (1 - \frac{1}{6}) (= \frac{5}{24})$ or $(1 - \frac{1}{4}) \times \frac{1}{6} (= \frac{3}{24})$ or process to find probability of both not red, eg $(1 - \frac{1}{4}) \times (1 - \frac{1}{6}) (= \frac{15}{24})$ for a complete process to find the required probability eg $\frac{5}{24} + \frac{3}{24}$ or $1 - \frac{1}{24} - \frac{15}{24}$ oe	
19 (a)	18 and 162	M1 A1	for a correct method, eg line drawn at 0.3 to sine curve or point(s) marked on sine curve or for one correct value for answers in the range 15 to 18 and 162 to 165 and no incorrect values	
(b)	-20 or 160	B1	cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	120	P1 P1 P1 A1	for using the cosine rule for any angle, eg $(5\sqrt{7})^2 = 10^2 + 5^2 - 2 \times 10 \times 5 \times \cos B$ for a complete process to find $\cos B$ eg $(\cos B =) \frac{10^2 + 5^2 - (5\sqrt{7})^2}{2 \times 10 \times 5}$ oe for $\cos^{-1}(\frac{1}{2}) = 60$ or $\cos B = -0.5$ cao	May be any angle; check diagram for working. A correct answer with no supportive working gets 0 marks
21 (a)	Circle drawn	B2	for drawing a circle centre (0,0) and radius 13	Circle could be drawn freehand as long as it closely approximates to a circle For both A marks accept answers in the ranges $x = 7.0$ to 7.4 , $y = 10.6$ to 11.0 $x = -7.0$ to -7.4 , $y = -10.6$ to -11.0 Accept values given as coordinates Check graph for answers
		(B1	for drawing a circle centre (0,0) with radius $\neq 13$ or a circle of radius 13 with a centre not (0,0) or an incomplete correct circle drawn)	
(b)	$x = 7.2$, $y = 10.8$ and $x = -7.2$, $y = -10.8$	M1	for drawing the line $2y = 3x$	
		A1	for both x values correct or both y values correct or one pair of x and y values correct ft from (a) dep on B1	
		A1	for both correct pairs of values correctly matched ft from (a) dep on B1	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	$3 + \sqrt{2}$	P1	for start of process to find the common ratio, eg writes $\frac{13+9\sqrt{2}}{3+2\sqrt{2}}$	Award P1 for process to rationalise the denominator of $\frac{3+2\sqrt{2}}{13+9\sqrt{2}}$
		P1	for process to rationalise the denominator, eg $\frac{13+9\sqrt{2}}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$	
		P1	(dep P2) for expanding terms, condone one error in expansion of numerator or denominator, eg $\frac{39+27\sqrt{2}-18\sqrt{2}\sqrt{2}-26\sqrt{2}}{9+6\sqrt{2}-6\sqrt{2}-4\sqrt{2}\sqrt{2}}$ or $\frac{39+27\sqrt{2}-26\sqrt{2}-36}{9-8}$ oe	
		A1	cao	A correct answer with no supportive working gets 0 marks.

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 1H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme. Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

PAPER: 1MA1_1H		
Question	Modification	Mark scheme notes
5	Wording added 'Look at the diagram for Question 5 in the Diagram Booklet. It shows'. Wording removed 'The'. Wording removed 'lies'. Diagram enlarged. Cross changed to a dot.	Standard mark scheme
6	Wording added 'Look at the diagram for Question 6 in the Diagram Booklet. It'. Wording removed 'The diagram'. Diagram enlarged. Diagram rotated such that ABC is horizontal. Angles moved outside of the angle arcs and angle arcs made smaller. Wording added 'Angle DAB = x° Angle DBA = y° Angle DBC = w° '	Standard mark scheme
7	Letter 'x' changed to 'y'.	Standard mark scheme but note change of letter
9	Wording added 'Look at the diagram for Question 9 in the Diagram Booklet. It shows a grid.' Wording added 'on the grid in the Diagram Booklet'. Diagram enlarged. Axis labels moved to the top of the vertical axis and to the left of the horizontal axis. x and y labels moved to the top of the vertical axis and to the right of the horizontal axis. Small squares removed. Right axis labelled. Open headed arrows.	Standard mark scheme
11	Wording added 'Look at the diagram for Question 11 in the Diagram Booklet. It shows an incomplete box plot diagram.' Wording added 'below'. Wording added 'in the Diagram Booklet'. Table enlarged and left aligned. Diagram enlarged. Label moved to the left. Lower quartile changed from 780 to 700. For Braille i & ii added to table and answer. In (a)(ii) wording added 'There are two spaces to fill.'	Standard mark scheme but note change of 780 to 700 for the LQ.
15	Wording added 'Look at the diagram for Question 15 in the Diagram Booklet.' Wording 'Here is' removed and replaced with 'The diagram shows'. Diagram enlarged. Axis labels moved to the top of the vertical axis and to the left of the horizontal axis. d and t labels moved to the top of the vertical axis and to the right of the horizontal axis. Small squares removed. Label right axis. Open headed arrows	Standard mark scheme

PAPER: 1MA1_1H		
Question	Modification	Mark scheme notes
19	Wording added 'Look at the diagram for Question 19 in the Diagram Booklet. It'. Wording removed 'Here is'. Diagram enlarged. Axis labels moved to the top of the vertical axis and to the right of the horizontal axis. Open headed arrows. Value '0.3' changed to '0.75'	(a) M1 line drawn at 0.75 to sine curve or one correct value A1 for answer in the range 45 to 59 and 121 to 135 (b) Standard mark scheme
20	Wording added 'Look at the diagram for Question 20 in the Diagram Booklet. It shows'. Wording removed 'Here is'. Wording added 'BC = 5 cm BA = 10 cm AC = 5 $\sqrt{7}$' Diagram enlarged.	Standard mark scheme
21	(a) Wording added 'Look at the diagram for Question 21 in the Diagram Booklet. It shows a grid.' Value '169' changed to '36', to reduce the size of the circle the candidate draws, and such that the grid fits in the Diagram Booklet. Diagram enlarged. Diagram cut at $y=9$, $y=-9$, $x=9$, and $x=-9$. Small squares removed. Axis labels moved to the top of the vertical axis and to the right of the horizontal axis.	Standard mark scheme but note the radius is now 6
21	(b) Value '169' changed to '36'.	Standard mark scheme but note the solutions are now as follows: $x = 3.4, y = 5.0$ $x = -3.4, y = -5.0$