

GCSE Mathematics (1MA1) – Aiming for 7 Paper 3H

Summer 2022 student-friendly mark scheme

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme

M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.

A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 2 marks) 1

Part	Working or answer an examiner might expect to see	Mark	Notes
(b)	$8.5^2 - 4^2 = 72.25 - 16 = 56.25$ $\sqrt{56.25} =$	M1	This mark is given for a method to use Pythagoras' theorem to find x
	7.5	A1	This mark is given for the correct answer only

Question 2 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{20}{5} = 4$	M1	This mark is given for a method to find a ratio of the lengths of the triangles
	$4 \times 4 = 16$	A1	This mark is given for the correct answer only
(b)	$\frac{22}{4}$	M1	This mark is given for a method to find the length of AB
	5.5	A1	This mark is given for the correct answer only

Question 3 (Total 4 marks) 3

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{15}{3} \times 36 = \text{£}180$	P1	This mark is given for a process to find the cost of 15 rolls from Chic Decor
	$70 \times (15 \div 5) \times 0.12 = \text{£}25.20$	P1	This mark is given for a process to find the discount available at Style Papers
	$(3 \times 70) - 25.20 = \text{£}184.80$	P1	This mark is given for a process to find the cost of 15 rolls from Style Papers
	Jo should buy the wallpaper from Chic Decor	C1	This mark is given for a valid statement supported by correct working

Question 4 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$R = n, S = 2n, T = 2n - 6$	P1	This mark is given for a process to develop three algebraic expressions (with at least two correct)
	$n + 2n + 2n - 6 = 54$	P1	This mark is given for a process to sum the three algebraic expressions to 54
	$5n - 6 = 54$ $n = 12$	P1	This mark is given for a process to solve the linear equation
	Ratio = 12: $(2 \times 12 - 6) = 12 : 18$	P1	This mark is given for a process to find the ratio of the number of counters Rick and Tony have
	$p = 1.5$	A1	This mark is given for the correct answer only

Question 5 (Total 4 marks) 5

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$4 \times (-3)^2 - 11$ $= 36 - 11$	M1	This mark is given for a method to substitute -3 into the equation
	25	A1	This mark is given for the correct answer only
(b)	$d - 4 = 3p$ or $\frac{d}{3} - \frac{4}{3} = p$	M1	This mark is given for a first step to make p the subject of the formula
	$p = \frac{d - 4}{3}$	A1	This mark is given for the correct answer only

Question 6 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$16 \times 5 \times 3$	M1	This mark is given for a method to work out how many outfits Rayheem can choose
	240	A1	This mark is given for the correct answer only

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		B1	This mark is given for 0.7 on the first branch
		B1	This mark is given for 0.65 and 0.65 on the second branches
(b)	0.3×0.35	M1	This mark is given for a method to find the probability of winning both quizzes
	0.105	A1	This mark is given for the correct answer only

Question 8 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$AC = 8$ or $AC = 8 \times \tan 45^\circ = 8$	M1	This mark is given for a method to find the distance AC
	$\sin 20^\circ = \frac{8}{AB}$	A1	This mark is given for a method to find the length AB
	$AB = \frac{8}{\sin 20^\circ} = \frac{8}{0.342...} = 23.4$	A1	This mark is given for a correct answer in the range 23.3 to 23.4

Question 9 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	0.000675	B1	This mark is given for the correct answer only
(b)	$\frac{(2.56 \times 4.12) \times (10^6 \times 10^{-3})}{1.6 \times 10^{-2}} = \frac{10.5472 \times 10^3}{1.6 \times 10^{-2}}$ $\frac{10.5472}{1.6} \times 10^{3-(-2)}$	M1	This mark is given for 10.5472×10^3 seen or 6.592×10^n where $n \neq 5$ seen
	6.592×10^5	A1	This mark is given for the correct answer only

Question 10 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$p + 9 = 3a$	M1	This mark is given for a first step at a method to rearrange the formula
	$a = \frac{p+9}{3}$	A1	This mark is given for the correct answer only

Question 11 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$7 \times 5 = 35$ $13 \times 5 = 65$ $7 \times 13 \times 5 = 455$	M1	This mark is given for a method to find at least one product
	$35 + 65 + 455 = 555$	C1	This mark is given for a full explanation

Question 12 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes																				
	<table border="1"> <thead> <tr> <th></th> <th>F</th> <th>S</th> <th>G</th> <th>Total</th> </tr> </thead> <tbody> <tr> <th>Girls</th> <td></td> <td></td> <td>18</td> <td>110</td> </tr> <tr> <th>Boys</th> <td>60</td> <td></td> <td></td> <td>90</td> </tr> <tr> <th>Total</th> <td>104</td> <td>70</td> <td></td> <td>200</td> </tr> </tbody> </table>		F	S	G	Total	Girls			18	110	Boys	60			90	Total	104	70		200	P1	This mark is given for a process to add the information given into a two-way table
	F	S	G	Total																			
Girls			18	110																			
Boys	60			90																			
Total	104	70		200																			
	<table border="1"> <thead> <tr> <th></th> <th>F</th> <th>S</th> <th>G</th> <th>Total</th> </tr> </thead> <tbody> <tr> <th>Girls</th> <td></td> <td></td> <td>18</td> <td>110</td> </tr> <tr> <th>Boys</th> <td>60</td> <td>22</td> <td>8</td> <td>90</td> </tr> <tr> <th>Total</th> <td>104</td> <td>70</td> <td>26</td> <td>200</td> </tr> </tbody> </table> $200 - 104 - 70 = 26$ $26 - 18 = 8$		F	S	G	Total	Girls			18	110	Boys	60	22	8	90	Total	104	70	26	200	P1	This mark is given for a process to use the information in the table to find out how many students chose German
	F	S	G	Total																			
Girls			18	110																			
Boys	60	22	8	90																			
Total	104	70	26	200																			
	$90 - 60 - 8 = 22$	A1	This mark is given for the correct answer only																				

Question 13 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$81x^{20}y^{24}$	B2	These marks are given for a fully correct answer (B1 is given for any two of 81, x^{20} or y^{24} seen)
(b)	$(x + 2)(x - 3) = x^2 - x - 6$ or $(x + 2)(x + 4) = x^2 + 6x + 8$ or $(x - 3)(x + 4) = x^2 + x - 12$	M1	This mark is given for a method to find the product of any two linear expressions
	$(x^2 - x - 6)(x + 4) =$ $x^3 - x^2 - 6x + 4x^2 - 4x - 24$ or $(x^2 + 6x + 8)(x - 3) =$ $x^3 + 6x^2 + 8x - 3x^2 - 18x - 24$ or $(x^2 + x - 12)(x + 2) =$ $x^3 + x^2 - 12x + 2x^2 + 2x - 24$	M1	This mark is given for a method to find the full expansion of the three terms
	$x^3 + 3x^2 - 10x - 24$	A1	This mark is given for the correct answer only

Question 14 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$6 \times \frac{15}{60} = 1.5$ $9 \times \frac{40}{60} = 6$	P1	This mark is given for a process to find the distance of either of the two parts of Jessica's journey
	$1.5 + 6 = 7.5$	P1	This mark is given for a process to find the total distance of Jessica's journey
	$45 \text{ minutes} = 0.75 \text{ hours}$ $\frac{75}{7.5} =$	P1	This mark is given for a process to find Amy's average speed
	10	A1	This mark is given for the correct answer only

Question 15 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example: Rob should have divided by 8	A1	This mark is given for a valid description of the error in Rob's working

Question 16 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$A = \frac{1}{2}h(a + b)$ where $h = 4x$, $a = 5$ and $b = (3x + 5) - 2x = x + 5$	M1	This mark is given for a method to find an algebraic representation of the lengths used to work out the area of the trapezium <i>QUVR</i>
	$A = \frac{1}{2} \times 4x \times (5 + x + 5)$	M1	This mark is given for a method to find an algebraic representation of the area of the trapezium <i>QUVR</i>
	$A = 2x(x + 10) = 2x^2 + 20x$	C1	This mark is given for the correct expansion of brackets seen and simplification to the given answer

Question 17 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$3\mathbf{a} = \begin{pmatrix} 3 \times 2 \\ 3 \times -3 \end{pmatrix} = \begin{pmatrix} 6 \\ -9 \end{pmatrix}$	M1	This mark is given for a method to find a column vector for $3\mathbf{a}$
	$2\mathbf{b} = \begin{pmatrix} 6 \\ -9 \end{pmatrix} - \begin{pmatrix} 8 \\ -17 \end{pmatrix} = \begin{pmatrix} -2 \\ 8 \end{pmatrix}$	M1	This mark is given for a method to find a column vector for $2\mathbf{b}$
	$\mathbf{b} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$	A1	This mark is given for the correct answer only

Question 18 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$6.75 < e \leq 6.85$ $0.045 < f \leq 0.055$	B1	This mark is given for stating any correct upper or lower bound
	$p = \sqrt{\frac{2 \times 6.85}{0.045}} = \sqrt{\frac{13.7}{0.045}} = \sqrt{304.444\dots}$	M1	This mark is given for using the upper bound of e and the lower bound of f to work out the upper bound for p
	17.4 (to 3 significant figures)	A1	This mark is given for a correct answer in the range 17.4 to 17.5

Question 19 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	x could be 4, 5, 6, 7 y could be 5, 6, 7, 8, 9	B1	This mark is given for the identification of possible values of x and y
	5, 6, 7	A1	This mark is given for the correct answers only

Question 20 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$4(p^2 - 9)$ or $(4p - 12)(p + 3)$ or $(p - 3)(4p + 12)$ or $(2p - 6)(2p + 6)$	P1	This mark is given for a method to find a partial factorisation
	$4(p - 3)(p + 3)$	A1	This mark is given for a correct answer only (allow $2(p - 3)2(p + 3)$)
(b)	For example: $6m^2 + 2m - 15m - 5$ or $2m^2 + 8m - 5m - 20$ or $3m^2 + 12m + m + 4$	M1	This mark is given for a method to find the product of at least two linear expressions
	$6m^3 + 2m^2 - 15m^2 + 24m^2 + 8m - 60m - 5m - 20$	M1	This mark is given for a complete method to find all the terms
	$6m^3 + 11m^2 - 57m - 20$	A1	This mark is given for a correct answer only

Question 21 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$50 \times 167.6 = 8380$ $20 \times 182 = 3640$	P1	This mark is given for a process to find the total heights of all 50 people or the total height of the 20 men
	$\frac{8380 - 3640}{30}$	P1	This mark is given for a process to find the mean height of the 30 women
	158	A1	This mark is given for the correct answer only

Question 22 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example: Peter should have added the terms $2x$ and 4 rather than subtracted them The answer should be $5x + 9$	P1	This mark is given for a valid explanation

Question 23 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For example: $10^{150} \times 10^{90} = 10^{240}$ or $10^{360} \div 10^{150} = 10^{210}$ or $10^{360} \div 10^{90} = 10^{270}$ or $\sqrt{10^{360}} = 10^{180}$	M1	This mark is given for a correct first step using the rules of indices
	$\frac{10^{180}}{10^{120}}$ or $\sqrt{10^{120}}$	P1	This mark is given for a method to use the rules of indices to simplify
	10^{60}	A1	This mark is given for the correct answer only
(b)	For example: Liam should multiply the powers of 12 to get 50×2 rather than 50^2	C1	This mark is given for a correct explanation

Question 24 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\pi \times 40^2 \times 160 = 804\,247\dots \text{ cm}^3$	P1	This mark is given for a process to find the volume of one tank
	$4 \times 804\,247\dots = 3\,216\,990.2\dots \text{ cm}^3$	P1	This mark is given for a process to find the volume of all four tanks
	32 litres = 32 000 cm ³ Amount of mixture = 101 × 32 000 = 3 232 000 cm ³	P1	This mark is given for a process to find how much of the mixture 32 litres will make
	32 320 000 cm ² > 3 216 990 cm ³ Yes, Karina has enough fertiliser for the four tanks	C1	This mark is given for a valid answer supported by correct working

Question 25 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{8000}{100 \times 100 \times 100} = 0.008$	B1	This mark is given for the correct answer only
(b)	180 km = 180 000 m 1 hour = 3600 seconds	M1	This mark is given for a method to convert km to m or hours to seconds
	$\frac{180000}{3600}$	M1	This mark is given for a method to find the speed in metres per second
	50	A1	This mark is given for the correct answer only

Aiming for 7 Paper 3H (Set 3)					Edexcel averages: mean scores of students who achieved grade								
Qn	Skill tested	Mean score	Max score	Mean %	ALL	9	8	7	6	5	4	3	U
1	Understand, recall and use Pythagoras' theorem in 2-D, then in 3-D problems	1.76	2	88	1.76	1.99	1.98	1.96	1.88	1.57	0.90	0.35	0.10
2	Congruent and similar shapes	2.98	4	75	2.98	4.00	3.96	3.91	3.85	3.59	2.83	1.49	0.47
3	Use percentages to solve problems	3.74	4	94	3.74	3.98	3.93	3.86	3.76	3.62	3.31	2.52	1.55
4	Set up simple equations	4.26	5	85	4.26	4.94	4.84	4.71	4.43	3.74	2.56	1.12	0.50
5	Change the subject of a formula including cases where the subject is on both sides of the original formula, or where a power of the subject appears	3.40	4	85	3.40	3.96	3.89	3.76	3.50	2.98	2.10	1.14	0.56
6	Solve word problems	1.74	2	87	1.74	1.96	1.92	1.87	1.77	1.58	1.25	0.64	0.29
7	Enumerate sets and combinations of sets systematically; two-way tables, Venn diagrams and tree diagrams	2.79	4	70	2.79	3.97	3.96	3.74	3.59	3.18	2.43	1.72	0.81
8	Use the trigonometric ratios to solve 2-D and 3-D problems	2.09	3	70	2.09	2.95	2.88	2.70	2.17	1.21	0.43	0.13	0.04
9	Standard form	2.06	3	69	2.06	2.91	2.64	2.69	2.49	2.27	2.02	1.30	0.70
10	Rearrange formulae to change the subject	1.23	2	62	1.23	1.91	1.89	1.79	1.81	1.62	0.98	0.28	0.07
11	Listing strategies/Product rule for counting	1.04	2	52	1.04	1.97	1.77	1.79	1.59	1.34	0.64	0.29	0.07
12	Two way tables	2.26	3	75	2.26	2.91	2.79	2.63	2.52	2.51	2.13	1.79	1.34
13	Expand expressions	2.63	5	53	2.63	4.97	4.77	4.38	3.91	3.02	1.95	0.71	0.33
14	Understand and use compound measures, including speed and density	2.98	4	75	2.98	3.91	3.73	3.43	2.98	2.32	1.43	0.56	0.28
15	Ratio in real context	0.76	1	76	0.76	0.88	0.89	0.83	0.87	0.85	0.75	0.59	0.46
16	Use algebraic manipulation to solve problems	1.82	3	61	1.82	2.97	2.83	2.44	1.69	0.83	0.27	0.07	0.03
17	Understand and use vector notation	2.00	3	67	2.00	2.88	2.67	2.38	1.95	1.39	0.78	0.28	0.09
18	Calculate the upper and lower bounds of calculations, particularly when working with measurements	1.75	3	58	1.75	2.89	2.70	2.34	1.64	0.78	0.25	0.07	0.03
19	Solve linear inequalities	1.07	2	54	1.07	1.88	1.57	1.51	1.45	1.35	0.87	0.45	0.12
20	Use algebraic manipulation to solve problems	3.17	5	63	3.17	4.26	3.95	3.70	3.28	2.38	1.25	0.44	0.12
21	Measures of central tendency (median, mean, mode and modal class)	0.96	3	32	0.96	2.94	2.61	2.17	1.57	1.03	0.34	0.10	0.04
22	Simplify and manipulate algebraic expressions and fractions	0.24	1	24	0.24	0.91	0.83	0.67	0.37	0.18	0.08	0.02	0.01
23	Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer, fractional and negative powers, and powers of a power	2.33	4	58	2.33	3.73	3.18	2.66	2.15	1.58	0.94	0.46	0.19
24	Volume cuboids and other right prisms (including cylinders)	1.10	4	28	1.10	3.58	2.99	2.65	1.81	1.14	0.36	0.12	0.05
25	Change between standard units and compound units	1.36	4	34	1.36	3.79	3.18	2.39	2.10	1.56	0.79	0.29	0.09
		51.52	80	64	51.52	77.04	72.35	66.96	59.13	47.62	31.64	16.93	8.34

Suggested grade boundaries

Grade	9	8	7	6	5	4	3
Mark	75	70	63	53	40	24	13