

GCSE Mathematics (1MA1) – Higher Tier Shadow Paper 2H (Set 1)

Summer 2023 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 3 marks)

Part	Working or answer examiner might expect to see	Mark	Notes
(a)	$\sqrt{1577} - 32 = 39.711\dots - 32 = 7.711\dots$ $2.3^2 - 5 = 5.29 - 5 = 0.29$	M1	This mark is given for 7.711... or 0.29 seen
	$\frac{7.711\dots}{0.29} = 26.591237\dots$	A1	This mark is given for at least three decimal places given, correctly rounded or truncated
(b)	$\frac{1}{0.8} = 1.25$	B1	This mark is given for a correct answer only

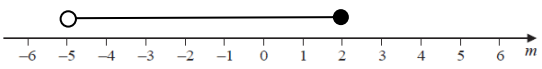
Question 2 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example $84 = 2 \times 42$ $42 = 2 \times 21$ $21 = 3 \times 7$	M1	This mark is given for a complete method to find the prime factors
	$2 \times 2 \times 3 \times 7$	A1	This mark is given for the correct answer only

Question 3 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example: Hermione is wrong; she should have said “there are 12 red counters because 1 is a quarter of 4 and a quarter of 48 is 12”	C1	This mark is given for a correct explanation

Question 4 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	7	B1	This mark is given for the correct answer only
(b)		B2	These marks are given for a fully correct diagram (B1 is given for a line from -5 to 2 but with incorrect endpoint notation)
(c)	$\frac{4}{5}h < 16$	M1	This mark is given for a method to add 6 to both sides of the inequality
	$4h < 80$	M1	This mark is given for a method to multiply both sides of the inequality by 5
	$h < 20$	A1	This mark is given for the correct answer only

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Area of triangle = $\frac{1}{2} \times 7 \times 5x$ Area of rectangle = $4(3x + 1)$	P1	This mark is given for a process to find an expression for the area of one of the shapes
		P1	This mark is given for a process to find an expression for the area of both of the shapes
	$\frac{1}{2} \times 7 \times 5x = 4(3x + 1) + 18$ $17.5x = 12x + 4 + 18$ $5.5x = 22$	P1	This mark is given for a process to write and solve an equation in x
	$(x =) 4$	A1	This mark is given for a correct answer only

Question 6 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$900 \times \frac{65}{100} = 585$	P1	This mark is given for a process to find the weight of turnips and parsnips sold
	$\frac{585}{(9+4)} = 45$	P1	This mark is given for a process to find the weight of parsnips sold
	$45 \times 4 = 180$	A1	This mark is given for the correct answer only

Question 7 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2.725 \leq d < 2.735$	B1	This mark is given for a 2.725 in the correct position
		B1	This mark is given for a 2.735 in the correct position

Question 8 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Ronnie's house: $280\,000 \times 1.025 \times 1.025$ Tom's house: $260\,000 \times 1.06 \times 1.06$	P1	This mark is given a for a first step of a process to find the value of at least one house after two years
		P1	This mark is given a for a first step of a process to find the value of both houses after two years
	Ronnie's house: $280\,000 \times (1.025)^2 = 294\,175$ Tom's house: $260\,000 \times (1.06)^2 = 292\,136$	P1	This mark is given a for a full process to find the value of both houses after two years
	Ronnie's house has the greatest value	C1	This mark is given for a correct conclusion supported by correct working

Question 9 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		M1	This mark is given for 4 or 5 points plotted correctly from the cumulative frequency table
		A1	This mark is given for a fully correct graph drawn through the points (30, 18), (40, 36), (50, 57), (60, 72), (70, 78)
(b)	41	B1	This mark is given for a correct answer in the range 39-43...

Question 10 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{24}{80}$	P1	This mark is given for a process to use relative frequency
	$\frac{24}{80} \times \frac{24}{80}$	P1	This mark is given for a process to estimate the probability
	$\frac{576}{6400} = \frac{9}{100}$	A1	This mark is given for a correct answer only (accept 0.09 or 9%)
(b)	For example: n should be greater than 80 $n > 80$	C1	This mark is given for a correct answer only

Question 11 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$4x + 12y = 2$ $15x - 12y = 93$	M1	This mark is given for a method to eliminate y
	$19x = 95$ $x = 5$	A1	This mark is given for finding the value of x
	$10 + 6y = 1$ or $25 - 4y = 31$ $6y = -9$ or $-4y = 6$	M1	This mark is given for a method to substitute to find the value of y
	$y = -1.5$	A1	This mark is given for finding the value of y

Question 12 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Diameter = $\sqrt{10^2 + 12^2}$ or Radius = $\frac{\sqrt{10^2 + 12^2}}{2}$	P1	This mark is given for a process to find the diameter or radius of the circle
	Diameter = $\sqrt{244} = 15.6\dots$ or Radius = $\frac{\sqrt{244}}{2} = 7.8\dots$	P1	This mark is given for a complete process to find the diameter or radius of the circle
	Circumference = $\pi d = 15.6\dots \times \pi$ or Circumference = $2\pi r = 7.8\dots \times \pi$	P1	This mark is given for a process to find the circumference of the circle
	49.1	A1	This mark is given for a correct answer (to three significant figures)

Question 13 (Total 4 marks)

Part	Working or an answer examiner might expect to see	Mark	Notes
	$\frac{19}{\sin 72} = \frac{16}{\sin BCA}$	P1	This mark is given for a the start of a process to use the sine rule to find angle BCA
	$\sin BCA = \frac{16 \sin 72}{19} = 0.800\dots$ $BCA = 53.2\dots$	P1	This mark is given for a process to rearrange to find angle BCA
	$BAC = 180 - 72 - 53.2 =$	P1	This mark is given for a process to find angle BAC
	54.8	A1	This mark is given for a correct answer to 1 decimal place in the range 54.8–54.9

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x^2 - x - 12 = (x + 3)(x - 4)$	M1	This mark is given for a method to factorise one expression
	$2x^2 + 5x - 3 = (x + 3)(2x - 1)$	P1	This mark is given for a method to factorise another expression
	$\frac{(x + 3)(x - 4)}{(x + 3)(2x - 1)} = \frac{(x - 4)}{(2x - 1)}$	A1	This mark is given for the correct answer in the form required

Question 15 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\begin{array}{cccc} 2 & 3 & 6 & 11 \\ & 1 & 3 & 5 \\ & & 2 & 2 \end{array}$	M1	This mark is given for a method to find a coefficient for n^2 (half of the second difference)
	$n^2 - 2, n^2 - 4, n^2 - 6, n^2 - 8$	A1	This mark is given for a method to find a coefficient for n (difference of 2)
	$n^2 - 2n + 3$		This mark is given for the correct answer only

Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	<p>Bar height of 2.4 cm drawn for the interval 40–60 hours)</p>		This mark is given for a method to use area to represent frequency: for example, 11.2 cm ² represents 7 nurses or for the correct scale on the Frequency density axis, 4 cm = 1 unit
		A1	This mark is given for a fully complete histogram
(b)	16 + 18 + 14 + 12	M1	This mark is given for a method to find the total area under the histogram
	60	A1	This mark is given for the correct answer only

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$x^4 = 2x^2 + 2$ $x = \sqrt[4]{2x^2 + 2}$	C1	This mark is given for a rearrangement of the equation shown
(b)	$x_1 = \sqrt[4]{2 \times (1.5)^2 + 2} = 1.5967\dots$	M1	This mark is given for a substitution to find the value of x_1
	$x_2 = \sqrt[4]{2 \times (1.5967\dots)^2 + 2} = 1.6322\dots$	M1	This mark is given for a substitution to find the value of x_2
	$x_3 = \sqrt[4]{2 \times (1.6322\dots)^2 + 2} = 1.6453\dots$	A1	This mark is given for a correct answer in the range 1.64 to 1.65

Question 18 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$a : c = 4 : 9$ or $b : c = 25 : 9$ or $45a : 35c = 60 : 105$ and $21b : 35c = 175 : 105$	M1	This mark is given for a method to find a ratio connecting two of a , b and c
	$45a : 21b : 35c = 60 : 175 : 105$ $a : b : c = 4 : 25 : 9$	M1	This mark is given for a method to find a ratio connecting a , b and c
	$a + b = 29, b + c = 34$ $a + b : b + c = 29 : 34$	A1	This mark is given for showing $a + b : b + c = 29 : 34$

Question 19 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$13.75 \leq AC \leq 13.85$ $10.55 \leq BC \leq 10.65$	P1	This mark is given for stating at least one upper or lower bound
	Lower bound for $\cos x = \frac{10.55}{13.85} = 0.761\dots$	P1	This mark is given for a method to use the lower bound and upper bound
	Upper bound for $x = 40.38\dots$	A1	This mark is given for a correct answer in the range 40 to 41 supported by correct working

Question 20 (Total 4 marks)

Part	Working or an answer examiner might expect to see	Mark	Notes
	$\overrightarrow{OM} = \frac{2}{5} \overrightarrow{OR}$ $\overrightarrow{MR} = \frac{3}{5} \overrightarrow{OR}$	P1	This mark is given for a process to find an expression for \overrightarrow{OM} or \overrightarrow{MR}
	$\overrightarrow{MT} = \overrightarrow{MO} + \overrightarrow{OT}$ or $\overrightarrow{MT} = \overrightarrow{MR} + \overrightarrow{RT}$	P1	This mark is given for a process to find an expression for \overrightarrow{MT}
	$\overrightarrow{MT} = -\frac{3}{7}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ or $\frac{4}{7}(\mathbf{a} - \mathbf{b}) + \mathbf{b}$	P1	This mark is given for a complete process to find \overrightarrow{MT} in terms of \mathbf{a} and \mathbf{b}
	$\frac{4}{7}\mathbf{a} + \frac{3}{7}\mathbf{b}$ or $\frac{1}{7}(4\mathbf{a} + 3\mathbf{b})$	A1	This mark is given for a correct answer only

Question 21 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		B1	This mark is given for a correct sketch with a line through the points $(-3, 3)$, $(-2, 4)$, $(-1, 4)$ and $(0, 3)$
(b)		B1	This mark is given for a correct sketch with a line through the points $(0, 0)$, $(-1, -1)$, $(-2, -1)$ and $(-3, 0)$

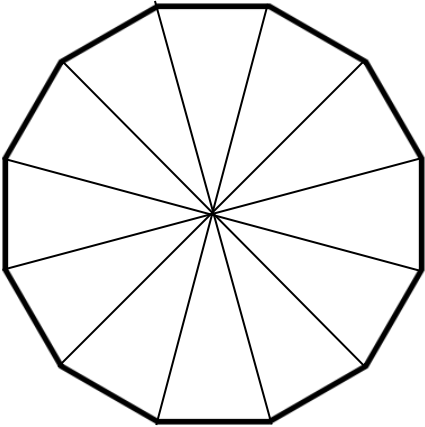
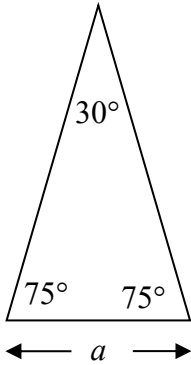
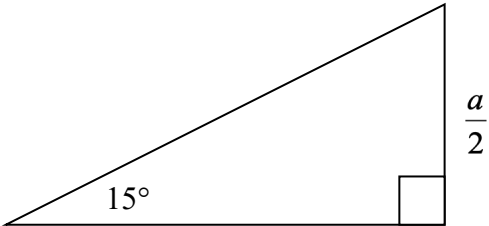
Question 22 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$P(\text{at least one white and one brown}) = 1 - P(\text{all white}) - P(\text{all brown})$	P1	This mark is given for a start to a process to find a correct expression
	$1 - \left(\frac{3}{4}\right)^n - \left(\frac{1}{4}\right)^n$	A1	This mark is given for a correct expression

Question 23 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$1 : 1 + 3 : 1 + 3 + 5 = 1 : 4 : 9$	M1	This mark is given for a start to a process to find a use ratio
	$1^2 : 4^2 : 9^2 = 1 : 16 : 81$	M1	This mark is given for a process to write down the ratio of the areas of the triangles
	$1 : (16 - 1) : (81 - 16) = 1 : 15 : 65$	A1	This mark is given for correct working leading to the ratio shown

***Question 24 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		P1	This mark is given for a process to treat the dodecagon as twelve equal triangles
		P1	This mark is given for a process to find the internal angles of one of the twelve triangles
	 $h = \frac{a}{2 \tan 15^\circ}$	P1	This mark is given for a process to find the height of one of the twelve triangles
	$\text{Area} = \frac{1}{2} \times a \times \frac{a}{2 \tan 15^\circ} = \frac{a^2}{4 \tan 15^\circ}$	P1	This mark is given for a process to find the area of one of the twelve triangles
	$12 \times \frac{a^2}{4 \tan 15^\circ} = \frac{3a^2}{\tan 15^\circ}$	A1	This mark is given for a correct answer only