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

November 2021 shadow student-friendly mark scheme (Set 1)

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

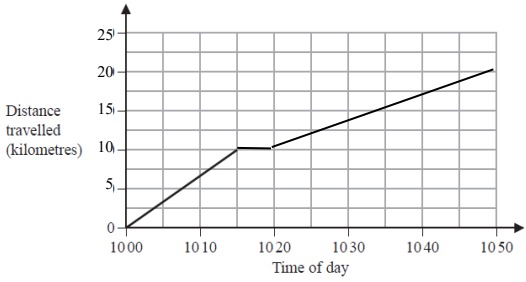| Guidance on the use of codes within this mark scheme |
| --- |
| M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

 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)

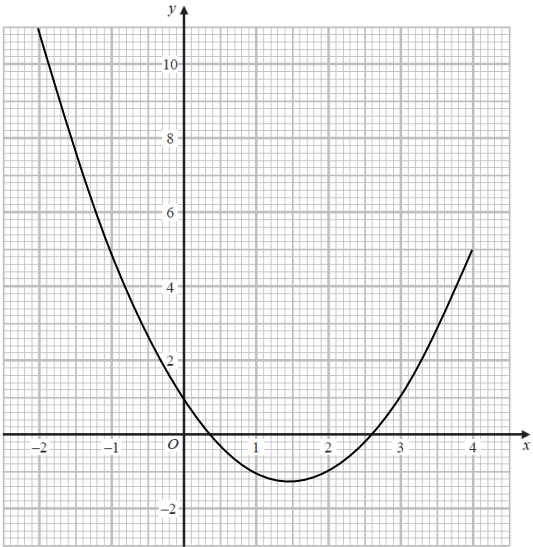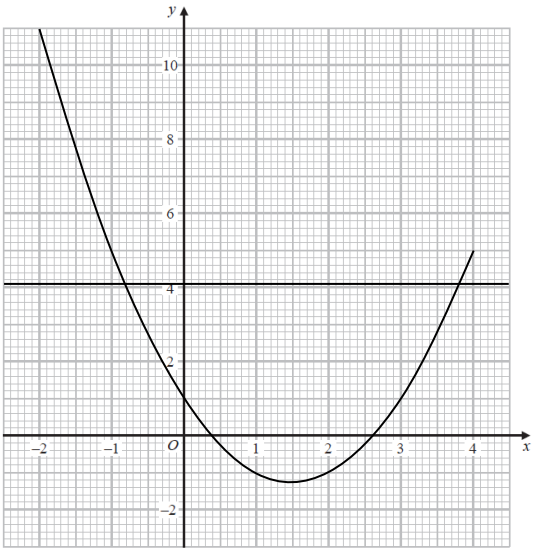| Part	Working or answer an examiner might expect to see	Mark	Notes
	$x \geq -2$	B1	This mark is given for the correct answer only
		C2	These marks are given for a fully correct diagram (C1 is given for an open circle at –4 or a closed circle at 0)

Question 2 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For example: $72 = 2 \times 2 \times 2 \times 3 \times 3$ $108 = 2 \times 2 \times 3 \times 3 \times 3$ **or** Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 36, 72 Factors of 108: 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108	M1	This mark is given for a method to find the highest common factor (HCF)
	HCF = $2 \times 2 \times 3 \times 3 = 36$ **or** 36 identified from both lists	A1	This mark is given for a correct answer only
(b)	For example: $36 = 2 \times 2 \times 3 \times 3$ $60 = 2 \times 2 \times 3 \times 5$ **or** Multiples of 36: 36, 72, 108, 144, 180, 216, … Multiples of 60: 60, 120, 180, 240, 300, …	M1	This mark is given for a method to find the lowest common multiple (LCM)
	LCM = $2 \times 2 \times 3 \times 3 \times 5 = 180$ **or** 180 identified from both lists	A1	This mark is given for a correct answer only

Question 3 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\dfrac{10 \times 60}{15}$	M1	This mark is given for a method to find Kieran's speed
	40	A1	This mark is given for a correct answer only
(b)	$\dfrac{30 \times 20}{60} = 10$	M1	This mark is given for a method to find the distance travelled in the final 20 minutes
		C2	This mark is given for a fully correct travel graph (C1 is given for one correct line added to the graph)

Question 4 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	5, –1, –1, 1	B2	These marks are given for all 4 values correct (B1 is given for 2 or 3 values correct)
(b)		M1	This mark is given for at least 5 marks plotted correctly
		A1	This mark is given for a fully correct curve drawn
(c)		M1	This mark is given for $y = 4$ drawn **or** intersections with $y = 4$ drawn **or** $x^2 – 3x + 1 = 4$ drawn
	3.8, –0.8	A1	This mark is given for answers in the ranges 3.7 to 3.9 and –0.7 to –0.9

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$12^2 + 10^2 = 244$	P1	This mark is given for a process to find the length of the hypotenuse of the triangle
	$\sqrt{244} = 15.6\ldots$	P1	This mark is given for finding the length of the hypotenuse of the triangle
	$10 + 10 + 15.6 + (15.6 - 12) + 12$	P1	This mark is given for a process to find the length of the perimeter of the shape
	51.2	A1	This mark is given for an answer in the range 51 to 52

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$BC = 14 \times \tan 51° = 14 \times 1.234\ldots$	M1	This mark is given for a method to find the length BC
	17.3	A1	This mark is given for an answer in the range 17.2 to 17.3
(b)	$\cos x = \dfrac{14}{19}$	M1	This mark is given for a method to find the size of angle x
	42.5	A1	This mark is given for an answer in the range 42.3 to 42.6

Question 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(2.6 \times 90) + (1.7 \times 60) = 192$	P1	This mark is given for a process to find the total mass of liquids **A** and **B**
	$336 \div 150$	P1	This mark is given for a process to find the density of liquid **C**
	2.24	A1	This mark is given for the correct answer only

Question 8 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	All inequalities should start with zero	C1	This mark is given for an error correctly identified

Question 9 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	upper quartile = 188 lower quartile = 50	M1	This mark is given for a method to find the interquartile range
	188 – 50 = 138	A1	This mark is given for the correct answer only
(b)	No, less than 50% of the taxi drivers waited for at least two hours No, 50% of taxi drivers waited at least 140 minutes (the median waiting time)	C1	This mark is given for a correct explanation
(c)	For example: The median is lower on Tuesday (higher on Monday) The upper quartile is lower on Tuesday (higher on Monday) We don't know how many people were waiting for each time	C1	This mark is given for a correct explanation

Question 10 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$1.035^3 = 1.1087179\ldots$	P1	This mark is given for a process to find Lola's initial investment
	$\dfrac{310441}{1.035^3} = 280\,000$	P1	This mark is given for a complete process to find Lola's initial investment
	$280\,000 \times 1.025^2 \times 1.03^2$	P1	This mark is given for a process to find the value of Suha's investment
	$312\,090.26$	A1	This mark is given for the correct answer in the range 312 090 to 312 091

Question 11 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	x-coordinate = 12 × 3 = 36 y-coordinate = 4 × 4 = 16	M1	This mark is given for a method to find the x-coordinate **or** the y-coordinate of R
	(36, 16)	A1	This mark is given for the correct answer only
(b)	4 ÷ 12 = 0.333…	P1	This mark is given for a process to find the gradient of the line **L**
	$-\dfrac{1}{\frac{1}{3}} = -3$	P1	This mark is given for a process to find the gradient of the perpendicular to **L**
	$y = -3x + 4$	A1	This mark is given for the correct answer only

Question 12 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(x + 3)(2x - 4)$ or $(2x - 4)(3x - 1)$	M1	This mark is given for a method to find the product of two linear expressions
	$(2x^2 + 2x - 12)(3x - 1)$ or $(x + 3)(6x^2 - 14x + 4)$	M1	This mark is given for a method to multiply out the remaining products
	$6x^3 + 4x^2 - 38x + 12$	A1	This mark is given for the correct answer only

Question 13 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	25 × 130 × 120	M1	This mark is given for a method to find the number of combinations
	390 000	A1	This mark is given for the correct answer only

Question 14 (Total 4 marks)

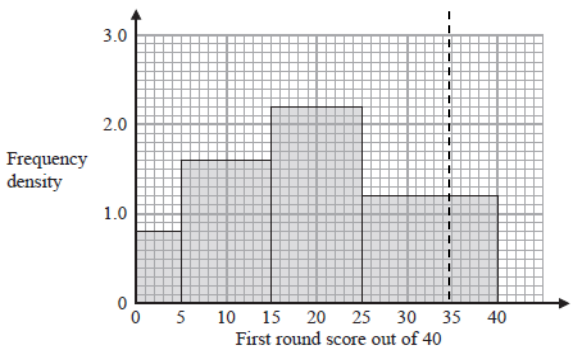| Part	Working or answer an examiner might expect to see	Mark	Notes
	Angle $BCD = \dfrac{180}{(3+2)} = 36$ Opposite angles of a cyclic quadrilateral add up to 180	M1	This mark is given for a method to find the size of angle BCD with a reason
	Angle $BDA = 180 - 40 - (180 - 72) = 32$ Angles in a triangle add up to 180	M1	This mark is given for a method to find the size of angle BDA
	Angle $SBA = BDA = 32$	A1	This mark is given for the correct answer only
	Alternate segment theorem	C1	This mark is given for a correct reason

Question 15 (Total 5 marks)

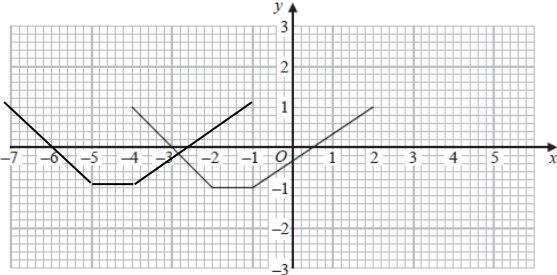| Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$PQ^2 = 12^2 + 17^2 - (2 \times 12 \times 17 \times \cos 82°)$	M1	This mark is given for a method to use the cosine rule to find the length PQ
	$PQ = \sqrt{(144 + 289 - 56.78\ldots)}$	M1	This mark is given for a method to use the correct order of operations
	19.4	A1	This mark is given for an answer in the range 19.3 to 19.4
(b)	$0.5 \times \sin 82° \times 12 \times 17$	M1	This mark is given for a method to use area $= \frac{1}{2} ab \sin C$ to find the area
	101	A1	This mark is given for a correct answer in the range 101 to 101.01

Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\sqrt[3]{7-3\times1} = \sqrt[3]{4} = 1.587\ldots$	M1	This mark is given for a method to substitute $x = 2$ in the original equation
	$\sqrt[3]{7-3\times1.587} = 1.307\ldots$ $\sqrt[3]{7-3\times1.307} = 1.454\ldots$	M1	This mark is given for a method to substitute to find x_2 and x_3
	$x_1 = 1.587\ldots$ $x_2 = 1.307\ldots$ $x_3 = 1.454$	A1	This mark is given for three correct answers
(b)	$x^3 = 7 - 3x$ $x^3 + 3x - 7$ $a = 3, b = -7$	C1	This mark is given for a correct answer only

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$0.8 \times 5 = 4$ $1.6 \times 10 = 16$ $2.2 \times 10 = 22$ $1.2 \times 15 = 18$	P1	This mark is given for a process to find the frequencies
	$4 + 16 + 22 + 18 = 60$	P1	This mark is given for a process to find the number of people who sat the written test
	$60 \times 0.1 = 6$	P1	This mark is given for a process to find the number of people who qualified for a second interview
	  35	A1	This mark is given for a correct answer only

Question 18 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	24, 156, (360 + 24) = 384, (360 + 156) = 516	M1	This mark is given for any two angles found in the ranges 20 to 30, 150 to 160, 380 to 390 and 510 to 520
		A1	This mark is given for all four angles found in the ranges 20 to 30, 150 to 160, 380 to 390 and 510 to 520
(b)	$y = -\cos x°$	B1	This mark is given for the correct equation (or any equivalent)
(c)		A1	This mark is given for a graph translated by 3 in the negative x-direction

Question 19 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$\sqrt[3]{27} : \sqrt[3]{8}$ $= 3 : 2$	P1	This mark is given for a process to find the ratio of the radius of sphere **A** to the radius of sphere **B**
	$(3 \times 1) : (4 \times 2)$ $= 3 : 8$	P1	This mark is given for a process to find the ratio of the radius of sphere **A** to the radius of sphere **C**
	$3^2 : 8^2$ $= 9 : 64$	A1	This mark is given for the correct answer only

Question 20 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	D–D = $0.8 \times 0.7 = 0.56$ D–ND = $0.8 \times 0.3 = 0.24$ ND–D = $0.2 \times 0.9 = 0.18$ ND–ND = $0.2 \times 0.1 = 0.02$	P1	This mark is given for a process to find at least one of the four correct probabilities for two consecutive days (D = delivery, ND = no delivery)
	$0.56 \times 0.7 = 0.392$ $0.24 \times 0.9 = 0.216$ $0.18 \times 0.7 = 0.126$ $0.02 \times 0.9 = 0.018$	P1	This mark is given for a process to find at least one of the correct probabilities for a postal delivery on Wednesday
	$0.392 + 0.216 + 0.126 + 0.018$	P1	This mark is given for a complete process to find the probability of a postal delivery on Wednesday
	0.752	A1	This mark is given for the correct answer only

Question 21 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$42.45 \leq l \leq 42.55$ $9.805 \leq g \leq 9.815$	B1	This mark is given for stating an upper or lower bound for l or g
	upper bound = $2\pi\sqrt{\dfrac{42.55}{9.805}}$	P1	This mark is given for a process to find an upper bound for T
	lower bound = $2\pi\sqrt{\dfrac{42.45}{9.815}}$	P1	This mark is given for a process to find a lower bound for T
	upper bound = 13.0906… lower bound = 13.0686…	A1	This mark is given for two correct answers (rounded or truncated to 2 decimal places)