

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

November 2021 student-friendly mark scheme

Please note that this mark scheme is not the one used by examiners for marking 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.

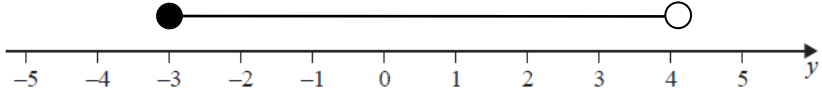
A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

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).

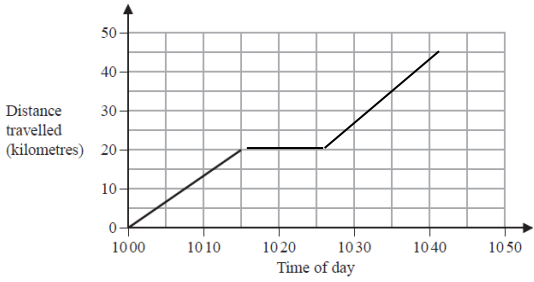
Question 1 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$x > -1$	B1	This mark is given for the correct answer only
(b)		C2	These marks are given for a fully correct diagram (C1 is given for an open circle at 4 or a closed circle at -3)

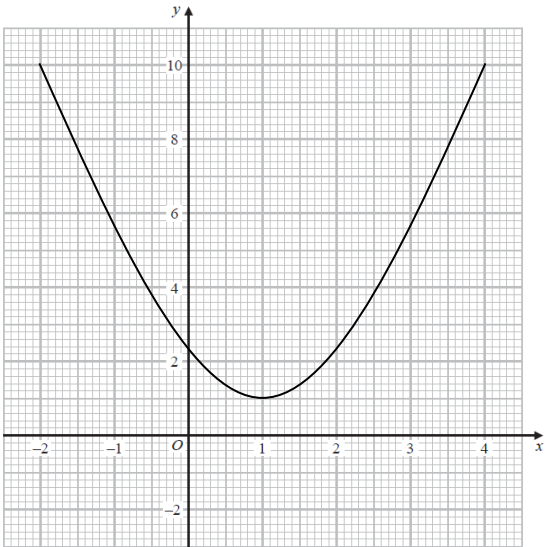
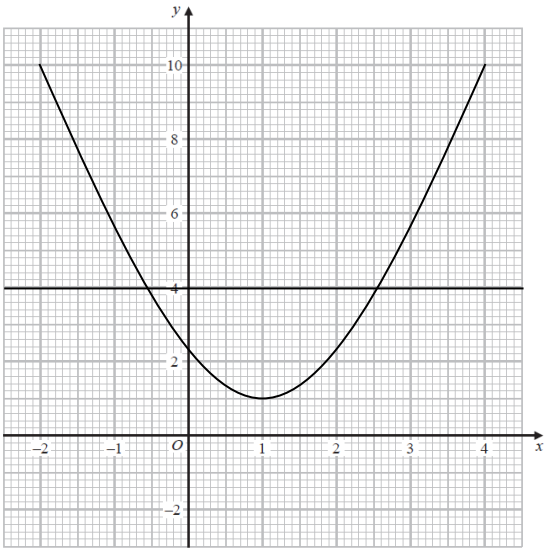
Question 2 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For example: $60 = 2 \times 2 \times 3 \times 5$ $84 = 2 \times 2 \times 3 \times 7$	M1	This mark is given for a method to find the highest common factor (HCF)
	$HCF = 2 \times 2 \times 3 = 12$	A1	This mark is given for a correct answer only
(b)	For example: $24 = 2 \times 2 \times 2 \times 3$ $40 = 2 \times 2 \times 2 \times 5$	M1	This mark is given for a method to find the lowest common multiple (LCM)
	$LCM = 2 \times 2 \times 2 \times 3 \times 5 = 120$	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)	$\frac{20 \times 60}{15}$	M1	This mark is given for a method to find Sam's speed
	80	A1	This mark is given for a correct answer only
(b)	$\frac{75 \times 20}{60} = 25$	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, 2, 10	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 $y = x^2 - 2x - 2$ drawn
	2.7, -0.7	A1	This mark is given for answers in the ranges 2.65 to 2.8 and -0.65 to -0.8

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$8^2 + 10^2 = 164$	P1	This mark is given for a process to find the length of the hypotenuse of the triangle
	$\sqrt{164} = 12.8\dots$	P1	This mark is given for finding the length of the hypotenuse of the triangle
	$8 + 8 + 12.8 + (12.8 - 10) + 10$	P1	This mark is given for a process to find the length of the perimeter of the shape
	41.6	A1	This mark is given for an answer in the range 41 to 42

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$BC = 12 \times \tan 56^\circ = 12 \times 1.482\dots$	M1	This mark is given for a method to find the length BC
	17.8	A1	This mark is given for an answer in the range 17.7 to 17.8
(b)	$\cos x = \frac{15}{18}$	M1	This mark is given for a method to find the size of angle x
	33.6	A1	This mark is given for an answer in the range 33.5 to 33.6

Question 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(1.8 \times 80) + (1.2 \times 40) = 192$	P1	This mark is given for a process to find the total mass of liquids A and B
	$192 \div 120$	P1	This mark is given for a process to find the density of liquid C
	1.6	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)	Yes, because the median waiting time is 2 hours (120 minutes)	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) There may just have been one person waiting for 210 minutes 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
	$1.025^3 = 1.07689\dots$	P1	This mark is given for a process to find Louise's initial investment
	$\frac{344\,065}{1.025^3} = 320\,000$	P1	This mark is given for a complete process to find Louise's initial investment
	$320\,000 \times 1.02^2 \times 1.035$	P1	This mark is given for a process to find the value of Sadiq's investment
	344 580.48	A1	This mark is given for the correct answer in the range 344 580 to 344 581

Question 11 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$x\text{-coordinate} = 6 \times \frac{3}{2} = 9$ $y\text{-coordinate} = 3 \times \frac{2}{5} = 7.5$	M1	This mark is given for a method to find the x -coordinate or the y -coordinate
	(9, 7.5)	A1	This mark is given for the correct answer only
(b)	$3 \div 6 = 0.5$	P1	This mark is given for a process to find the gradient of the line L
	$-\frac{1}{0.5} = -2$	P1	This mark is given for a process to find the gradient of the perpendicular to L
	$y = -2x + 3$	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
	$(x - 2)(3x + 2) = 3x^2 - 4x - 4$ or $(3x + 2)(2x + 3) = 6x^2 + 13x + 6$	M1	This mark is given for a method to find the product of two linear expressions
	$(3x^2 - 4x - 4)(2x + 3)$ or $(x - 2)(6x^2 + 13x + 6)$	M1	This mark is given for a method to multiply out the remaining products
	$6x^3 + x^2 - 20x - 12$	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
	$16 \times 120 \times 100$	M1	This mark is given for a method to find the number of combinations
	192 000	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
	$\text{Angle } BCD = \frac{180}{(3+1)} = 45$ <p>Opposite angles of a cyclic quadrilateral add up to 180</p>	M1	This mark is given for a method to find the size of angle BCD with a reason
	$\text{Angle } BDA = 180 - 20 - (180 - 45) = 25$ <p>Angles in a triangle add up to 180</p>	M1	This mark is given for a method to find the size of angle BDA
	$\text{Angle } SBA = BDA = 25$	A1	This mark is given for the correct answer only
	Alternate segment theorem	C1	This mark is given for a correct reason

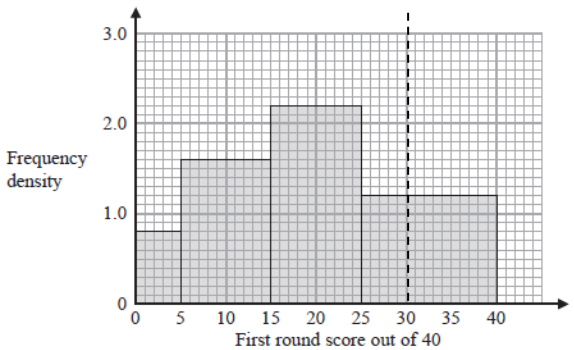
Question 15 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$BC^2 = 8^2 + 11^2 - (2 \times 8 \times 11 \times \cos 72^\circ)$	M1	This mark is given for a method to use the cosine rule to find the length BC
	$BC = \sqrt{(64 + 121 - 54.38\dots)}$	M1	This mark is given for a method to use the correct order of operations
	11.4	A1	This mark is given for an answer in the range 11.4 to 11.5
(b)	$0.5 \times \sin 72^\circ \times 8 \times 11$	M1	This mark is given for a method to use $\text{area} = \frac{1}{2} ab \sin C$ to find the area
	41.8	A1	This mark is given for an answer in the range 41.5 to 41.9

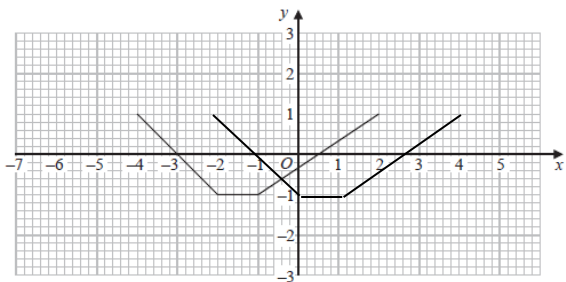
Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\sqrt[3]{10 - 2 \times 2} = \sqrt[3]{6} = 1.817$	M1	This mark is given for a method to substitute $x = 2$ in the original equation
	$\sqrt[3]{10 - 2 \times 1.817} = 1.853$ $\sqrt[3]{10 - 2 \times 1.853} = 1.846$	M1	This mark is given for a method to substitute to find x_2 and x_3
	$x_1 = 1.817$ $x_2 = 1.853$ $x_3 = 1.846$	A1	This mark is given for three correct answers
(b)	$x^3 = 10 - 2x$ $x^3 + 2x - 10$ $a = 2, b = -10$	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 in the competition
	$60 \times 0.2 = 12$	P1	This mark is given for a process to find the number of people who qualified for the next round
	 <p>30</p>	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)	37, 143, (360 + 37) = 397, (360 + 143) = 503	M1	This mark is given for any two angles found in the ranges 35 to 40, 140 to 145, 395 to 400 and 500 to 505
		A1	This mark is given for all four angles found in the ranges 35 to 40, 140 to 145, 395 to 400 and 500 to 505
(b)	$y = -\sin x^\circ$	B1	This mark is given for the correct equation (or any equivalent)
(c)		A1	This mark is given for a graph translated by 2 in the positive x -direction

Question 19 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$\sqrt[3]{125} : \sqrt[3]{27}$ $= 5 : 3$	P1	This mark is given for a process to find the ratio of the radius of sphere A to the radius of sphere B
	$(5 \times 1) : (3 \times 2)$ $= 5 : 6$	P1	This mark is given for a process to find the ratio of the radius of sphere B to the radius of sphere C
	$5^2 : 6^2$ $= 25 : 36$	A1	This mark is given for the correct answer in the form $\frac{a + \sqrt{3}}{b}$

Question 20 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$RR = 0.7 \times 0.8 = 0.56$ $R-NR = 0.7 \times 0.2 = 0.14$ $NR-R = 0.3 \times 0.6 = 0.18$ $NR-NR = 0.3 \times 0.4 = 0.12$	P1	This mark is given for a process to find the correct probability for two consecutive days (R = rain, NR = not rain)
	$0.56 \times 0.8 = 0.448$ $0.14 \times 0.6 = 0.084$ $0.18 \times 0.8 = 0.144$ $0.12 \times 0.6 = 0.072$	P1	This mark is given for a process to find the correct probability for rain on Wednesday
	$0.448 + 0.084 + 0.144 + 0.072$	P1	This mark is given for a complete process to find the probability of rain on Wednesday
	0.748	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
	$51.95 \leq l \leq 52.05$ $1.445 \leq T \leq 1.455$	B1	This mark is given for stating an upper or lower bound for l or T
	$g = \frac{4\pi^2 l}{T^2}$	P1	This mark is given for a process to rearrange the formula to give g as the subject
	upper bound = $\frac{4\pi^2 \times 52.05}{1.445^2}$ lower bound = $\frac{4\pi^2 \times 51.95}{1.455^2}$	P1	This mark is given for a process to find an upper or lower bound for g
	upper bound = 984.11... lower bound = 968.76...	A1	This mark is given for two correct answers (rounded or truncated to 2 decimal places)