

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

Summer 2023 shadow paper 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 an or answer examiner might expect to see	Mark	Notes
	For example: $462 \div 12$ or $4.62 \div 0.12 = 3\dots$	M1	This mark is given for a method to calculate the division or 3 identified as the first digit
	Digits 385 seen (for example, 3.85 or 0.385 or 385)	A1	This mark is given for a the digits 385 seen
	38.5	A1	This mark is given for the correct answer only

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$5 - 3 + \frac{3}{10} - \frac{2}{5} = 2 - \frac{1}{10}$ or $\frac{53}{10} - \frac{34}{10} = \frac{19}{10}$	M2	These marks are given for a fully correct method (M1 is given for two fractions with a correct common denominator or for converting both to improper fractions)
	$1\frac{9}{10}$	A1	This mark is given for the correct answer only

Question 3 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sqrt[3]{64} = 4$	P1	This mark is given for a process to find the length of one side of the cube
	$4 \times 4 = 16$	P1	This mark is given for a process to find the area of one square side of the cube
	6×16	P1	This mark is given for a process to find the total surface area of the cube
	96	A1	This mark is given for a correct answer only

Question 4 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B2	<p>These marks are given for a fully correct polygon with points plotted at the midpoints (2.5, 2), (7.5, 22), (12.5, 17), (17.5, 14), (22.5, 9)</p> <p>(B1 is given for points plotted correctly but not joined by straight lines)</p> <p>or points joined at correct heights within intervals, including plotting at end values</p> <p>or a correct polygon with one point incorrect</p> <p>or a correct polygon with first and last points joined directly)</p>

Question 5 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		M1	This mark is given for correct numbers in one region
		M1	This mark is given for correct numbers in a second region
		A1	This mark is given for a fully correct Venn diagram
(b)	$\frac{5}{10}$	M1	This mark is given for $\frac{a}{10}$, $0 < a < 10$, or $\frac{5}{b}$, where b is an integer and $b > 5$
		A1	This mark is given for the correct answer only

Question 6 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For example: as age increases, weight increases	C1	This mark is given for a valid description of the relationship between age and weight
(b)		M1	This mark is given for a suitable line of best fit drawn or a point marked on the grid at $(x, 8.4)$ where $7 < x < 9$ or a horizontal line drawn from 5.8 across to $(x, 8.4)$ where $7 < x < 9$
	7.8	A1	This mark is given for an answer in the range 7 to 9

Question 7 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$375 \div \frac{15}{100}$ or $375 \div 0.15$	M1	This mark is given for a method to find the price of the computer before the increase
	2500	B1	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
	$\text{area} = \frac{1500}{50} = 30$	P1	This mark is given a for a process to find the area of the base of the cylinder
	$\text{pressure} = \frac{120}{30}$	P1	This mark is given a for a process to find the pressure
	4	A1	This mark is given for the correct answer only

Question 9 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x = 6, y = -2$	B1	This mark is given for the correct answer only

Question 10 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$180 \times (5 - 2) = 540$	P1	This mark is given for a process to find the sum of the interior angles of a pentagon
	$540 - 115 - 128 - 125 = 172$	P1	This mark is given for a process to find the sizes of angles AED and ABC
	$\frac{172}{(3+1)} = 43$	P1	This mark is given for a process to find the size of angle ABC
	$3 \times 43 = 129$	A1	This mark is given for the correct answer only

Question 11 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$100x^{12}y^8$ or $20x^3y$	P1	This mark is given for a method to find a partial evaluation
	$100x^{12}y^8$ and $20x^3y$	P1	This mark is given for a method to evaluate the numerator and denominator
	$5x^9y^7$	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
	$\frac{1}{6} \times \frac{2}{7}$ or $\frac{1}{6} \times \frac{5}{7}$ or $\frac{5}{6} \times \frac{2}{7}$	M1	This mark is given for a method to find one correct product
	$\frac{1}{6} \times \frac{2}{7} + \frac{1}{6} \times \frac{5}{7} + \frac{5}{6} \times \frac{2}{7} =$ $\frac{2}{42} + \frac{5}{42} + \frac{10}{42}$	M1	This mark is given for a full method to find the probability
	$\frac{17}{42}$	A1	This mark is given for a correct answer (or equivalent fraction)

Question 13 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = kx$ or $36 = k \times 1.2$ or $k = 30$	M1	This mark is given for a method to set up an equation with a constant term
	$y = 30 \times 4$	M1	This mark is given for a method to substitute when $x = 4$
	$y = 120$	C1	This mark is given for a correct answer only

Question 14 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	3^{-4}	B1	This mark is given for a correct answer only
(b)	$27^{\frac{4}{3}} = (\sqrt[3]{27})^4$ and $16^{\frac{3}{2}} = (\sqrt{16})^3$	M1	This mark is given for a method to evaluate the terms in the expression
	$3^4 = 81$ and $4^3 = 64$	M1	This mark is given for correctly evaluating the terms in the expression
	$81 - 64 = 17$	A1	This mark is given for a correct answer only

Question 15 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Equation of L_2 : $4y = 20 - kx$ or $y = 5 - \frac{k}{4}x$	P1	This mark is given for a process to write the equation of the line L_2 in terms of y
	Gradient of $L_1 = 3$ so gradient of $L_2 = -\frac{1}{3}$	P1	This mark is given for a process to find the gradient of L_2 as perpendicular to L_1
	$-\frac{k}{4} = -\frac{1}{3}$ $k = \frac{4}{3}$	A1	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
	$\frac{375\pi}{5} \times 8 = 600\pi$	P1	This mark is given for a process to find the total surface area of the sphere
	$600\pi = 4\pi r^2$	P1	This mark is given for a process to substitute into the surface area formula
	$r = \sqrt{\frac{600\pi}{4\pi}} = \sqrt{150}$	P1	This mark is given for a process to find the radius of the sphere
	$5\sqrt{6}$	A1	This mark is given for the correct answer only in the form $a\sqrt{b}$

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y(7x + 4) = 5(3x - 2)$ or $7xy + 4y = 15x - 10$	M1	This mark is given for a method to find an equation without a fraction
	$4y + 10 = 15x - 7xy$	M1	This mark is given for rearranging to isolate x terms in a correct equation
	$4y + 10 = x(15 - 7y)$	M1	This mark is given for a method to factorise
	$x = \frac{4y + 10}{15 - 7y}$	A1	This mark is given for the correct answer only

Question 18 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$8a + 3r = 28$ or $a : r = 1 : 2$	P1	This mark is given for a process to associate algebraic expressions with the correct ratios
	$\frac{a}{r} = \frac{1}{2}$ or $2a = r$ or $2a - r = 0$	P1	This mark is given for a process to set up an equation
	$8a + 6a = 28$ $14a = 28$	P1	This mark is given for a process to eliminate r
	$a = \frac{28}{14} = 2, r = \frac{28 - (8 \times 2)}{3} = 4$	A1	This mark is given for the correct answer only

Question 19 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x = \frac{231}{7 \times 3}$	P1	This mark is given for a process to use the product rule to find the number of shirts
	$x = 11$	A1	This mark is given for the correct answer only

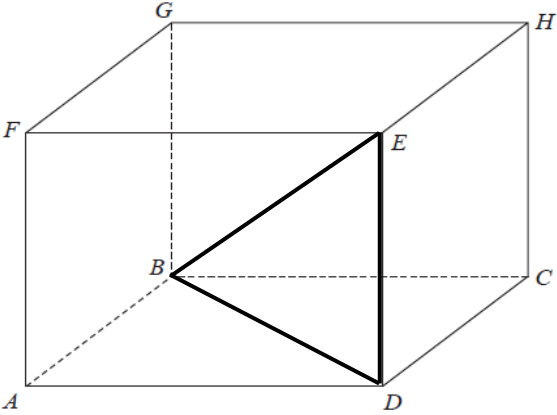
Question 20 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\text{Let } g(x) = y: 3(y - 7) = 2\sqrt{x}$ $= \frac{3(y - 7)}{2} = \sqrt{x}$	M1	This mark is given for a method to change the subject
	$g^{-1}(x) = \left(\frac{3(y - 7)}{2} \right)^2$	A1	This mark is given for the correct answer only
(b)	$gf(x) = \frac{2(\sqrt{2x - 6})}{3} + 7 = 15$	M1	This mark is given for a method to find $gf(x)$
	$\frac{2(\sqrt{2x - 6})}{3} = 8$ $\sqrt{2x - 6} = 12$ $2x - 6 = 144$ $2x = 150$	M1	This mark is given for a method to evaluate x
	$x = 75$	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
	$BAD = 62 \div 2 = 31$ (The angle at the centre of a circle is twice the angle at the circumference)	M1	This mark is given for a method to find a missing angle with a reason given
	$ADO = 180 - 62 - (180 - 55 - 31) = 24$	M1	This mark is given for a method to find a second missing angle
	$ADC = 90 - 24 = 66$ (The tangent of a circle is perpendicular to the radius of the circle)	A1	This mark is given for a complete method to find the size of the angle ADC
	Circle theorems stated appropriately, as above	C1	This mark is given for correctly stating both of the circle theorems used

Question 22 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	 $\sin EBD = \frac{5.9}{11.8} = 0.5$	P1	This mark is given for process to find the size of angle ACF
	$EBD = 30^\circ$	A1	This mark is given for the correct answer only

Question 23 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$\frac{3\sqrt{5}}{4-\sqrt{5}} \times \frac{4+\sqrt{5}}{4+\sqrt{5}} = \frac{12\sqrt{5}+15}{16-5} = \frac{12\sqrt{3}+15}{11}$	M1	This mark is given for a method to rationalise one of the fractions in the expression
	$\frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$	M1	This mark is given for a method to rationalise the other fraction in the expression
	$\frac{12\sqrt{3}+15}{11} - \frac{2\sqrt{5}}{5} = \frac{60\sqrt{5}+75}{55} - \frac{22\sqrt{5}}{55}$	M1	This mark is given for a method to simplify by finding the common denominator
	$\frac{38\sqrt{5}+75}{55}$	A1	This mark is given for the correct answer in the form $\frac{a\sqrt{5}+b}{c}$

Question 24 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(3x+6)(3x-6) < 0$ $-2 < x < 2$	M1	This mark is given for a method to solve the first quadratic inequality
	$(5-3x)(x+4)$ or $\frac{7 \pm \sqrt{(-7)^2 - 4 \times (-3) \times 20}}{2 \times (-3)}$ $-4 < x < \frac{5}{3}$	M1	This mark is given for a method to solve the second quadratic inequality
	$x > -2, x < 2, x > -4, x < \frac{5}{3}$	M1	The mark is given for a method to find at least two of the set of four possible critical values
	$-2 < x < \frac{5}{3}$	M1	This mark is given for a method to identifying at least one of the critical values satisfying both inequalities
		A1	This mark is given for a fully correct answer only