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

Spring 2017 mock paper (Set 2); Student-friendly 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. In some cases full marks can be given for a question or part of questions where no working is seen. However, it is wise to show working for one small slip could lead to all marks being lost if no working is shown. Some questions (such as QWC) 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).

Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners are prepared to award zero marks if the student's response is not worthy of credit according to the mark scheme.

Question 1 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$280 \div (2 + 5) = 40$	M1	This mark is given for a method to find the amount of money represented by one part
	$40 \times 2 = 80$ (Ali); $40 \times 5 = 200$ (Beth)	A1	This mark is given for the correct answer only

Question 2 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$ABE = 180° – 142° = 38°$	M1	This mark is given for a method to find one angle
	Angles on a straight line add up to 180°	C1	This communication mark is given for a correct statement allied to the calculation made
	$BAE = 71°$	M1	This mark is given for a method to find further angle(s)
	Base angles of an isosceles triangle are equal Angles in a triangle add up to 180°	C1	This communication mark is given for a correct statement allied to the calculation made
	$BAE = AED = x = 71°$ Alternate angles are equal	A1	This mark is given for the correct answer only with a correct supporting statement

NB: There are other ways to arrive at the solution for this question.

Question 3 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$2x + 3 + 5x – 2 + 5x + 3 =$	P1	This mark is given for stating the perimeter algebraically
	$\frac{12x + 4}{4} =$	P1	This mark is given for a process to simplify to $12x + 4$ and divide by 4
	$3x + 1$	A1	This mark is given for the correct answer only

Question 4 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(\frac{1}{2} \times 2 \times 5) + (1 \times 15) = 20$ (m^2)	P1	This mark is given for a process to find the volume by finding the complete cross-sectional area
	20 (m^2) × 10 (m) = 200 m^3	P1	This mark is given for a process to find the volume of the pool
	200 m^3 = 200 000 litres	P1	This mark is given for a process to convert between m^3 and litres.
	$\frac{200\ 000}{5}$ = 40 000 seconds	A1	This accuracy mark is given for finding out the time taken to fill the pool
	10 hours = 36 000 seconds 10 hours is not enough time to fill the pool	C1	This communication mark is given for a correct statement with correct supporting figures

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{12}{3} \times 5 =$	M1	This mark is given for a method to find proportion statement
	20	A1	This mark is given for the correct answer only
(b) (i)	The work rate of each man is the same; The work rate of each man does not change over time	C1	This communication mark is given for a correct statement
(ii)	If the work rate slower it takes longer; If the work rate faster takes less time	C1	This communication mark is given for a correct statement

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{1}{6}$ and $\frac{5}{6}$ on left hand branches	B1	This mark is given for the correct answers only,
	$\frac{1}{8}$, $\frac{7}{8}$, $\frac{1}{8}$ and $\frac{7}{8}$ on right hand branches	B1	This mark is given for the correct answers only
(b)	$\frac{5}{6} \times \frac{7}{8} =$	M1	This mark is given for a method to find the probability that neither dice will land on 6
	$\frac{35}{48}$	A1	This mark is given for the correct answer only

Question 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	3 6 11 18 27 38 51 3 5 7 9 11 13 2 2 2 2 2	M1	This mark is given for a method to find 2nd differences
	$n^2 + 2$	A1	This mark is given for the correct answer only
(b)	$50^2 + 2 = 2502$	B1	This mark is given for the correct answer only

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2\frac{3}{4} = \frac{11}{4}$, $3\frac{1}{5} = \frac{16}{5}$	M1	This mark is given for a method to write the numbers as improper fractions
	$\frac{11}{4} \times \frac{16}{5} = 8\frac{4}{5}$	A1	This mark is given for the correct answer or an equivalent fraction

Question 9 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$3p + 7q$ or 15 : 35	P1	This mark is given for a process to use algebra using information, or to divide 50 in the ratio 3: 7
	$(3p + 7q) \div (3 + 7)$	P1	This mark is given for a process to find mass of 1 litre of R
	$5(3p + 7q)$	A1	This mark is given for the correct answer only

Question 10 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Area of B = 1.1 × Area of A	P1	This mark is given for a using a multiple of 1.1
	Area of C = 1.1 × Area of B = 1.1 × 1.1 × Area of A	P1	This mark is given for a for complete process to derive of 1.21
	Area of C = 1.21 × Area of A, a 21% increase	A1	This mark is given for the correct answer only

Question 11 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		B1	This mark is given for at least 5 of the points plotted correctly
	6 points plotted consistently within each interval on graph	B1	This mark is given for a fully correct cumulative frequency graph
(b)	0.25 × 80 = 20	M1	This mark is given for a method to find 25% of the total days
		M1	This mark is given for reading from the graph from 60
	Answer in the range 37 – 39	A1	This mark is given for a correct estimate in the range 37 to 39 (which agrees with the graph drawn)

Question 12 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$30 \times 14 = 420$ $18 \times 10 = 180$	C1	This mark is given for a method to find total number of counters in all bags and boxes and the total number of counters in the bags
	$420 - 180 = 240$	C1	This mark is given for a method to find the total number of counters in the boxes
	The mean number of counters per box is $240 \div 12 = 20$, so Mark is wrong	C1	This mark is given for a complete solution

Question 13 (Total 2 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$100 \times 0.4\dot{3} = 43.\dot{3}$ $10 \times 0.4\dot{3} = 4.\dot{3}$ So subtracting, $90 \times 0.4\dot{3} = 39$	M1	This mark is given for a fully complete method for finding two correct decimals that, when subtracted, give an integer
	Thus $0.4\dot{3} = \frac{39}{90} = \frac{13}{30}$	A1	This mark is given for correct working leading to a correct conclusion

Question 14 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{4}{3} \times 3 \times 2_3 = 32$	P1	This mark is given for to estimate the volume of a sphere
	$\frac{1500}{32}$ or $\frac{1500}{30}$	P1	This mark is given for a complete process to estimate the number of spheres that can be made
	An estimate in the range 46 – 50	A1	This mark is given for an estimate supported by calculations
(b)	The number of spheres would be less because most divisors have been rounded down	C1	This communication mark is given for a correct statement

Question 15 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\sqrt[4]{27\times 3} = 3$ and $\sqrt[4]{10^8} = 10^2 = 100$	B1	This mark is given for the correct use of index rules
	$3 \times 100 = 300$	B1	This mark is given for the correct answer only (as 300 or 3×10^2)
(b)	$\left(\frac{216}{1000}\right)^{-\frac{2}{3}} = \left(\frac{1000}{216}\right)^{\frac{2}{3}} = \left(\frac{10}{6}\right)^2 =$	M1	This mark is given for working out at least one step (reciprocal or cube root to both numbers)
	$\frac{100}{36} = \frac{25}{9}$	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
	$k(t-3) = \frac{2(t+3)(t-3)}{t-3}$ $k(t-3) = 2(t+3)$	M1	This mark is given for multiplying both sides by $t-3$ as the first step
	$kt - 2t = 6 + 3k$	M1	This mark is given for isolating terms in t
	$(k-2)t = 6 + 3k$	M1	This mark is given for factorising for t
	$t = \frac{6+3k}{k-2}$	A1	This mark is given for the correct answer only

Question 17 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(3(x-y)-2)(x-y)$	M1	This mark is given for identifying $(x-y)$ as a common factor
	$(3x-3y-2)(x-y)$	A1	This mark is given for the correct answer only
(b)	$2x^2 + x - 15 = (2x-5)(x+3)$ $3x^2 + 9x = 3x(x+3)$	M1	This mark is given for factorising the denominators of the fractions
	$\frac{1}{(2x-5)(x+3)} \times \frac{3x(x+3)}{1}$	M1	This mark is given for inverting one fraction and multiplying
	$\frac{3x}{2x-5}$ $(a = 3, b = 2, c = -5)$	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
	$\frac{4\sqrt{3}}{1+\sqrt{3}\sqrt{3}}$	C1	This mark is given for multiplying both top and bottom of the fraction by $\sqrt{3}$.
	$\frac{4\sqrt{3}}{1+3} = \frac{4\sqrt{3}}{4}$	C1	This mark is given for simplifying the denominator
	$\sqrt{3}$	C1	This mark is given for a correct conclusion

Question 19 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(2n + 1)^2 + (2n + 3)^2 + (2n + 5)^2 =$ $(4n^2 + 4n + 1) + (4n^2 + 12n + 9)$ $+ (4n^2 + 20n + 25)$	C1	This mark is given for the expansion of the squares of any three consecutive numbers shown algebraically
	$12n^2 + 36n + 35$	C1	This mark is given for simplifying
	$12(n^2 + 3n + 2) + 11$	C1	This mark is given for arriving at a multiple of 12 added to 11

Question 20 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\overrightarrow{OC} = \mathbf{a} + \mathbf{b}$ $\overrightarrow{CD} = -\mathbf{a} + \mathbf{b}$ $\overrightarrow{MD} = \frac{1}{2}(-\mathbf{a} + \mathbf{b})$	M1	This mark is given for finding a vector expression for the line *MD*
	$\overrightarrow{BM} = \overrightarrow{BD} + \overrightarrow{DM} = \mathbf{b} - \frac{1}{2}(-\mathbf{a} + \mathbf{b})$ $= \frac{1}{2}(\mathbf{a} + \mathbf{b})$	M1	This mark is given for finding a vector expression for the line *BM*
	$\overrightarrow{BM} = \frac{1}{2}(\mathbf{a} + \mathbf{b}) = \frac{1}{2}\overrightarrow{OC}$ $k = \frac{1}{2}$ or 0.5	A1	This mark is given for a correct answer supported by a vector method

Question 21 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$x^2 = xy + 66$	P1	This mark is given for establishing a relationship between the areas of the rectangle and the square
	$(3y + 4)^2 = y(3y + 4) + 66$	P1	This mark is given for a process to form an equation in one variable
	$= 6y^2 + 20y - 50 = 0$ so $2(3y^2 + 10y - 25) = 0$	P1	This mark is given for a process to form an equation to be solved
	$2(3y - 5)(y + 5) = 0$	P1	This mark is given for a process to solve
	$y = \frac{5}{3}$	P1	This mark is given for a selection of a positive number as the only solution, and substituting to find other variable
	width = $1\frac{2}{3}$ (cm), length = 9 (cm)	A1	This mark is given for a completely correct solution

Question 22 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	If YG is the height of AYB and XH is the height of AXB then $YG = XH$ since the areas are the same	C1	This mark is given for a correct first step in the proof
	XH (= h) and GY (= H) $XMH = GMY$ (opposite angles) $XHM = YGM$ (both 90°)	C1	This mark is given for a correct second step in the proof
	Triangles MHX and YGM are congruent ($\sin x = h/XM$ and $\sin x = H/YM$)	C1	This mark is given for a correct third step in the proof
	Conclusion and statement that $XM = MY$	C1	This mark is given for a completely correct proof and conclusion