GCSE Mathematics (1MA1) – Higher Tier Paper 3H

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 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{d-10}{5-2}=4$	P1	This mark is given for a process to process to use the gradient
	$\frac{d-10}{3}=4$ so $d-10=12$	P1	This mark is given for a process to for a complete process to rearrange equation formed to isolate d
	$d=22$	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
	$100 \div 1.38$ (= £72.46) or 222×1.38 (= €306.36)	P1	This mark is given for a process to use the currency conversion rate
	$\frac{72.46}{222+72.46}=0.2461$ or $\frac{100}{306.36+100}=0.2461$	P1	This mark is given for a complete process to find the percentage required
	24.6%	A1	This mark is given for an answer in the range 24.6 – 24.61

Question 3 (Total 7 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$95 \times 18 = 1710$ $80 \times 18 = 1440$ $95 \times 80 = 7600$	P1	This mark is given for a process to for process to find the surface area of at least two different faces
	$(1710 + 1440 + 7600) \times 2 = 21500$	P1	This mark is given for a complete process to find the surface area of one cushion
	$4\ m^2 = 40\ 000\ cm^2$	P1	This mark is given for a process to convert units
	$\frac{21500 \times 6}{40000}$ (= 3.225)	P1	
	4 cans	A1	This mark is given for the correct answer only (whole number of cans)
(b)	$\frac{21500 \times 6}{44000}$ = 2.93	P1	This mark is given for a process to find the number of cans needed (the surface area of 6 cushions divided by the new area covered by one spray can)
	The number of tins required will be reduced to three	C1	This mark is given for a correct statement supported by correct working

Question 4 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)(i)	$\begin{pmatrix} 1+3 \\ 4+2 \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$	B1	This mark is given for the correct answer only
(a)(ii)	$2\mathbf{a} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ or $3\mathbf{b} = \begin{pmatrix} 9 \\ 6 \end{pmatrix}$	M1	This mark is given for a method to use either $\begin{pmatrix} 2 \\ 8 \end{pmatrix}$ or $\begin{pmatrix} 9 \\ 6 \end{pmatrix}$
	$\begin{pmatrix} 2+9 \\ 8+6 \end{pmatrix} = \begin{pmatrix} 11 \\ 14 \end{pmatrix}$	A1	This mark is given for the correct answer only
(b)	Correct line from *P* drawn on diagram	B1	This mark is given for a correct vector drawn

Question 5 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Graph drawn	M1	This mark is given for a method to draw a line of gradient $\frac{16}{9}$ drawn, with at least two correct points plotted
	Fully correct graph	C1	This mark is given for a fully correct graph drawn
	48 – 52	B1	This mark is given for answer in the range 48 –52

Question 6 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sin 30° = \frac{x}{18}$ or $x = 18 \times \sin 30°$	M1	This mark is given for a method to find out a value for x
	$\sin 30° = 0.5$, so $x = 9$	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
	11 28 – 08 40 = 2 hrs 48 mins (= 2.8 hrs)	P1	This mark is given for a process to find the journey time
	$2.8 \times 183 =$	P1	This mark is given for a complete process to find the distance travelled
	512.4	A1	This mark is given for the correct answer only

Question 8 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\pi r^2 \times 6r$	P1	This mark is given for a process to find volume of cylinder
	$\frac{3 \times \frac{4}{3}\pi r^3}{\pi r^2 \times 6r} = \frac{2}{3}$	P1	This mark is given for complete process to find the volume of 3 spheres divided by the volume of the cylinder
	$\frac{1}{3}$	A1	This mark is given for the correct answer only (the proportion **not** filled)
(b)	Proportion between number of spheres and relevant height cylinder remains constant	C1	This mark is given for a correct statement

Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	8600 ÷ 15	P1	This mark is given for process to use density and mass
	1 m^3 of A has mass 8600 ÷ 15 × 13 (= 573.33)	P1	This mark is given for process to use ratio to find the density of A
	5 m^3 of A has mass 573.33 × 5 (= 37266.67)	P1	This mark is given for a full process to find mass of alloy A
	3 m^3 of C has mass $3 \times \frac{21}{15} \times 8600$ (= 36120)	P1	This mark is given for a full process to find mass of alloy C
	37266.67 – 36120 = 1146.67	A1	This mark is given for the correct answer in the range 1146 – 1150

Question 10 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$0.045 \times 10^3 = 4.5 \times 10^1$ $4.5 \times 10^{-3} = 4.5 \times 10^{-3}$ $450 = 4.5 \times 10^2$ $0.45 \times 10^{-1} = 4.5 \times 10^{-2}$	M1	This mark is given for conversion to same format or three expressions in the correct order
	4.5×10^{-3}, 0.45×10^{-1}, 0.045×10^3, 450	A1	This mark is given for the correct order only

Question 11 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	AB = 8 cm, Map has scale 1 cm = 7 km	M1	This mark is given measuring the length AB and finding the scale factor
	35 km = 5 cm on the map	M1	This mark is given for a complete method to find the correct scaled length for 35 km
	Arc from A of circle with radius 5 cm	M1	This mark is given for drawing an arc from A of circle with radius 5 cm
	A line with a bearing of 300° from B	M1	This mark is given for drawing a line with a bearing of 300° from B
	× marked	A1	This mark is given for a clearly indicated intersection as required point

Question 12 (Total 2 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	24 × 12 =	M1	This mark is given for a method to produce a solution
	288	A1	This mark is given for the correct answer only

Question 13 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(x + 2)(2x – 3) = 2x^2 + 4x – 3x – 6$	M1	This mark is given for multiplying out two brackets with at least three terms out of four correct
	$(2x^2 + x – 6)(3x + 1) =$ $6x^3 + 2x^2 + 3x^2 + x – 18x – 6$	M1	This mark is given for a complete method to multiply all three brackets
	$6x^3 + 5x^2 – 17x – 6$	A1	This mark is given for the correct answer only
(b)	$n^4 \div n^{\frac{1}{2}} = n^{4-\frac{1}{2}}$ $= n^{\frac{7}{2}}$ or $n^{3\frac{1}{2}}$	B1	This mark is given for the correct answer only

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sqrt{(9 \times 7)} + \sqrt{(9c)}$	M1	This mark is given for a valid first step
	$3(\sqrt{7} + \sqrt{c})$	M1	This mark is given for a complete method to show a multiplicative relationship
	1:3	A1	This mark is given for the correct answer only

Question 15 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$960 \div 120 \ (= 8)$	M1	This mark is given for method to find the volume scale factor
	$(\sqrt[3]{8})^2$	M1	This mark is given for a complete process to find the surface area
	1:4	A1	This mark is given for the correct answer only

Question 16 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{1}{8} \times \frac{2}{7}$ or $\frac{2}{8} \times \frac{3}{7}$	P1	This mark is given for process to start to find a solution
	$\left(\frac{1}{8} \times \frac{2}{7}\right) + \left(\frac{2}{8} \times \frac{3}{7}\right) = \frac{2}{56} + \frac{6}{56}$	P1	This mark is given for complete process to find the probability
	$\frac{8}{56}$	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)	$N = 100a + 10b + c$ $K = 100c + 10b + a$	M1	This mark is given for forming algebraic expressions for N and K
	$N - K = 99a - 99c$	M1	This mark is given for finding the difference for their expressions
	$= 99(a - c)$, so a multiple of 99	C1	This mark is given for a concluding statement using the term $99(a - c)$
(b)	Yes, it has no effect since the b terms cancel	C1	This mark is given for a correct statement

Question 18 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(7\frac{1}{2}$ squares – 4 squares) represent 7 fish; so each square represents 2 fish	M1	This mark is given for working with frequency density
	10, 8, 12, 15, 15, 8	M1	This mark is given for finding at least 4 of 10, 8, 12, 15, 15, 8
	10 + 8 + 12 + 15 + 15 + 8 = 68	A1	This mark is given for the correct answer only
(b)(i)		M1	This mark is given for a complete correct method to divide the area of the histogram into two equal parts or for a complete correct method to interpolate for the 34.5th value
	412 – 417	A1	This mark is given for the correct answer only answer within the range 412 – 417
(b)(ii)	Only an estimate because it is dependent on a distribution within the interval	C1	This mark is given for a correct statement.

Question 19 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2x^2 - 5x - 12 = (2x + 3)(x - 4)$	M1	This mark is given for factorising the quadratic
	$x = -\frac{3}{2}$ and $x = 4$	A1	This mark is given for critical values of $-\frac{3}{2}$ and 4
	$x < -\frac{3}{2}$ and $x > 4$	A1	This mark is given for the correct inequalities

Question 20 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$0.11 \div 0.55$ (= 0.2)	P1	This mark is given for a process to start to find a solution
	$0.2 \times (1 - 0.55) =$	P1	This mark is given for complete process to find a probability
	0.09	A1	This mark is given for the correct answer only

Question 21 (Total 8 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	$\frac{1}{7} + \frac{1}{2}$	M1	This mark is given for correct substitution into the function
	$\frac{9}{14}$	A1	This mark is given for the correct answer only
(b)	– 2 or 3	B1	This mark is given for the correct answer only
(c)	$f(x) = \frac{2x-1}{(x+2)(x-3)} = 4$	M1	This mark is given for representing the equation as a single fraction
	$\frac{2x-1}{x^2-x-6} = 4$ $\frac{2x-1}{4(x^2-x-6)} = 1$ $2x - 1 = 4x^2 - 4x - 24$	M1	This mark is given for simplifying and rearranging to a quadratic equal to zero
	$4x^2 - 6x - 23 = 0$	A1	This mark is given for the correct answer only
	$a = 4, b = 6, c = -23$	M1	This mark is given for a complete method to solve using the quadratic formula
	$\frac{3 \pm \sqrt{101}}{4}$	A1	This mark is given for the correct answer only