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

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
	<table><tr><td></td><td>G</td><td>R</td><td>C</td><td>Total</td></tr><tr><td>M</td><td></td><td></td><td>9</td><td></td></tr><tr><td>F</td><td>30</td><td></td><td></td><td>45</td></tr><tr><td>Total</td><td>52</td><td>35</td><td></td><td>100</td></tr></table>	P1	This mark is given for a process to arrange the given information in a two-way table
	100 – 52 –35 = **13** 13 – 9 = **4** <table><tr><td></td><td>G</td><td>R</td><td>C</td><td>Total</td></tr><tr><td>M</td><td></td><td></td><td>9</td><td></td></tr><tr><td>F</td><td>30</td><td></td><td>**4**</td><td>45</td></tr><tr><td>Total</td><td>52</td><td>35</td><td>**13**</td><td>100</td></tr></table>	P1	This mark is given for a process to find total number of adults cycling (13) or the number of females cycling (4)
	45 – 30 – 4 = **11** <table><tr><td></td><td>G</td><td>R</td><td>C</td><td>Total</td></tr><tr><td>M</td><td></td><td></td><td>9</td><td></td></tr><tr><td>F</td><td>30</td><td>**11**</td><td>4</td><td>45</td></tr><tr><td>Total</td><td>52</td><td>35</td><td>13</td><td>100</td></tr></table>	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
	$\frac{15}{16}$	P1	This mark is given for process to find the proportion of group that are students
	$\frac{15}{16} \times \frac{5}{12} = \frac{75}{192}$	P1	This mark is given for complete process to find the proportion of the students that are girls
	39%	A1	This mark is given for correctly converting the fraction to a percentage

Question 3 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B1	This mark is given for a pair of intersecting arcs centred on *A* and *B*
	Correct construction	B1	This mark is given for a fully correct construction

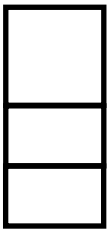
Question 4 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		B1	This mark is given for one root correct
	– 1.2 and 3.2	B1	This mark is given for a second root correct
(b)	(1, – 5)	B1	This mark is given for the correct answer only

Question 5 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\pi \times 54$ (= 169.6460033) or ($\pi \times 54$) ÷ 2 (= 84.82300165)	P1	This mark is given for process to find the distance around one or both ends of the track
	40 × 2 + 169.6460033 (= 249.6460033)	P1	This mark is given for complete process to find the total length of the track
	e.g. $\pi \times 590$ (= 1853.539666 mm) or $\pi \times 0.59$ (= 1.8539666 m)	P1	This mark is given for process to find the circumference of wheel
	249.64… ÷ 1.85… or unrounded answer of 134.6860863	P1	This mark is given for complete process to find the number of revolutions in consistent units
	135	A1	This mark is given for the correct answer only

Question 6 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Rectangle 4 high by 2 wide	B1	This mark is given for a correct rectangle
	Elevation 	B1	This mark is given for fully correct side elevation

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(1.496 \times 10^{11}) \div (3 \times 10^{8})$ (= 498.666…)	M1	This mark is given for a method to find the number of seconds taken for light to reach the earth
	498.666… ÷ (60 × 60)	A1	This mark is given for converting the number of seconds into hours
	0.1385185185 = 0.139 to 3 significant figures	A1	This mark is given for showing the answer to be 0.139 hours as required
(b)	For example, Danesh has multiplied the indices rather than adding them	C1	This mark is given for a correct explanation

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Line drawn with gradient 3 passing through *A*	M1	This mark is given for a line drawn with gradient 3 passing through *A*
	$y = 3x - 1$	A1	This mark is given for the correct answer only

Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	N: 13995×0.88 **or** L: 14495×0.87	P1	This mark is given for a process to find the value of one car at the end of one year
	N: $13995 \times (0.88)^3$ **or** L: $14495 \times (0.87)^3$	P1	This mark is given for a process to find the value of one car at the end of 3 years
	N: $13995 \times (0.88)^3$ (= 9537.2006) L: $14495 \times (0.87)^3$ (= 9545.0005)	P1	This mark is given for a complete process to find the value of both cars at the end of 3 years
	N: £9537.20 L: £9545.00 Lauren's car will have the greater value	C1	This mark is given for a correct conclusion supported by working shown
(b)	Natasha's car will be worth less	C1	This mark is given for an appropriate explanation

Question 10 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for a single line segment with a positive gradient that could be used as a line of best fit or a horizontal line from 740 or a point plotted at (x, 740) where x is in the range 72 – 80
	72 – 80 (cm)	A1	This mark is given for an answer in range 72 – 80
	110 cm is outside of the range of the data, the line of best fit cannot be extended that far	B1	This mark is given for a correct explanation

Question 11 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	4.7805×10^7	B1	This mark is given for the correct answer only

Question 12 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(x + 11)(x – 11)$	B1	This mark is given for the correct answer only

Question 13 (Total 2 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	Median plotted incorrectly	B1	This mark is given for a correct reason
	Range plotted rather than maximum or maximum nor plotted	B1	This mark is given for a correct reason

Question 14 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$20x + 30y = 25$ $42x + 30y = –63$ or $28x + 42y = 35$ $28x + 20y = –42$	M1	This mark is given for a process to eliminate one variable or a rearrangement of one equation leading to substitution
	$–22x = 88$, $x = – 4$ or $22y = 77$, $y = 3.5$	A1	This mark is given for finding a correct value of x or a correct value of y
	$x = –4$, so $–16\ x + 6y = 5$ or $y = 3.5$, so $4x + 21 = 5$	M1	This mark is given for x to find y or of a correct substitution of y to find x
	$x = – 4$ $y = 3.5$	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
	$(n + 1)^2 - n^2 = n^2 + 2n + 1 - n^2$ or $(n + 1)^2 - n^2 = (n + 1 + n)(n + 1 - n)$	M1	This mark is given for a correct expansion or a factorisation of a suitable expression for 2 consecutive integers
	$2n + 1$ or $2n + 3$	A1	This mark is given for an expansion or factorisation correctly simplified
	$2n + 1$ or $2n + 3$ are odd for all values of n	C1	This mark is given for a correct conclusion drawn from fully correct working

Question 16 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Enlargement, scale factor –2, centre (4, 6)	B2	These two marks are given for a full description of the transformation (B1 is given for two correct aspects)

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	69.5, 70.5, 39.5, 40.5, 121.5, 122.5, 13.5, 14.5	P1	This mark is given for one correct bound seen
	120.5 × 40.5 × 70.5 (= 344057.625)	P1	This mark is given for a complete process to find the upper bound for the volume of the tank
	13.5 litres = 13500 cm^3 344057.625 ÷ 13500 (= 25.485703) 13.5 × 1000 × 25 (= 337500)	P1	This mark is given for a complete process to find the upper bound for the number of buckets (upper bound for volume of tank ÷ lower bound for volume of bucket) **OR** correct process to compare the lower bound for 25 buckets of water with the upper bound for the volume of the tank,
	25 buckets of water will not definitely fill the tank	C1	This mark is given for a correct conclusion based on correct calculations

Question 18 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$T = \frac{k}{u^3}$ so $0.0096 = \frac{k}{5^3}$, $T = \frac{1.2}{u^3}$	M1	This mark is given for a method to use the constant k and substitute values for u and T.
	$u = \sqrt[3]{\frac{1.2}{0.15}}$	M1	This mark is given for a method to find a value for u
	2	A1	This mark is given for the correct answer only

Question 19 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(x + 5)^2 = x^2 + 10x + 25$	M1	This mark is given for a method to start to complete the square
	$x^2 + 10x + 18 = (x + 5)^2 - 7$	M1	This mark is given for a method to complete the square
	$(-5, -7)$	A1	This mark is given for the correct answer only

Question 20 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$ACD = 54°$ or $ADC = 66°$	M1	This mark is given for finding the size of angle ACD or ADC
	Alternate segment theorem or Opposite angles of a cyclic quadrilateral add up to 180	C1	This mark is given for a correct reason given for the angle found
	$CAD = 60°$	A1	This mark is given for finding the size of angle $CAD = 60°$
	Angles in a triangle add up to 180	C1	This mark is given for a correct reason given for the angle found

Question 21 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$gf(x) = \frac{1}{3x^2 - 2}$ or $f(4) = 48$	M1	This mark is given for finding an expression for $gf(x)$ or the value of $f(4)$.
	$gf(x) = \frac{1}{(3\times16) - 2} = \frac{1}{46}$ or $gf(4) = g(f(4)) = g(48) = \frac{1}{46}$	A1	This mark is given for the correct answer only

Question 22 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(a + \sqrt{8})^2 = a^2 + 2a\sqrt{8} + 8$	P1	This mark is given for a process to expand $(a + \sqrt{8})^2$, with at least 3 terms correct
	$c = a^2 + 8$	A1	This mark is given for finding a correct expression for c
	$2a\sqrt{8} = 2a \times 2\sqrt{2} = 4a\sqrt{2}$, so $d = 4a$	A1	This mark is given for finding a correct expression for d

Question 23 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2x^3 + 4x - 3 = 0$ and f(0) = –3, f(1) = 3 or f(0) = 0 and f(1) = 6	M1	This mark is given for a method to find at least one root in [0, 1]
	Since there is a change in sign, there must be at least one root in $0 < x < 1$ (since f is continuous) or 0 and 6 are either side of 3	C1	This mark is given for a correct explanation
(b)	$4x = 3 - 2x^3$ $x = \frac{3 - 2x^3}{4}$ $x = \frac{3}{4} - \frac{x^3}{2}$	B1	This mark is given for correct steps leading to rearranged equation
(c)	$x_1 = 0.75$	M1	This mark is given for one correct iteration
	$x_2 = 0.5390625$ $x_3 =$	M1	This mark is given for two further iterations
	0.671677351	A1	This mark is given for the correct answer only (examiners will accept 0.671)

Question 24 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$0.5 \times 7 \times BC \times \sin 70° = 42$	P1	This mark is given for a process to make a correct substitution into $\frac{1}{2}ab\sin C$
	$BC = \frac{84}{0.5 \times 7 \times \sin 70}$ (= 12.77013327)	P1	This mark is given for a process to rearrange to find the length BC
	$AB^2 = BC^2 + 7^2 - (2 \times BC \times 7 \times \cos 70°)$	P1	This mark is given for a process to us the cosine rule to find the length AB
	$AB^2 =$ $163.0763 + 49 - (14 \times 12.770 \times 0.342) =$ 150.9	P1	This mark is given for a process to find a value for AB^2
	$AB = \sqrt{150.9} = 12.3$	A1	This mark is given for an answer in the range 12.28 – 12.3

Question 25 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{7}{x+7}$ or $\frac{x}{x+6}$	P1	This mark is given for a process to start to solve problem
	$\frac{7}{x+7} \times \frac{x}{x+6} = \frac{21}{80}$	P1	This mark is given for a process to find the correct product
	$\frac{7x}{x^2+13x+42} = \frac{21}{80}$ $21x^2 + 273x + 882 = 560x$ $21x^2 - 287x + 882 = 0$	P1	This mark is given for a process to rearrange and arrive at correct quadratic equation = 0
	$\frac{287 \pm 91}{42}$ or $7(3x - 14)(x - 9) = 0$	P1	This mark is given for a correct substitution into the quadratic formula or factorisation of the quadratic expression
	= 4.6667 and 9, so 9 counters	A1	This mark is given for the correct answer only