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

October 2016 mock paper 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 a for 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.

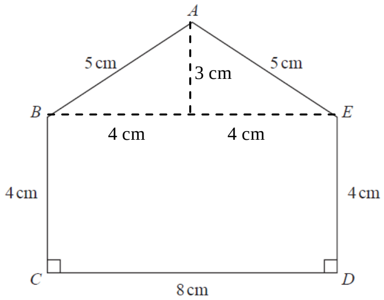
Question 1 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{13}{5} - \frac{11}{6}$	M1	This method mark is given for converting both expressions to improper fractions
	$\frac{78}{30} - \frac{55}{30}$	M1	This method mark is given for a correct method to find a common denominator
	$\frac{23}{30}$	A1	This accuracy mark is given for the correct answer (or an equivalent fraction)

Question 2 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)(i)	The starting price **or** a fixed charge	C1	This communication mark is given for correct interpretation
(a)(ii)	The cost per minute **or** how much the price increases every minute	C1	This communication mark is given for correct interpretation
(b)	7.5 ÷ 5 **or** the y-intercept = 0.5	M1	This method mark is given for an attempt to calculate the gradient, with 2 correct values used or for finding the y-intercept
	$1.5x + 0.5$	M1	This method mark is given for a gradient given as a coefficient of x in an equation
	$y = 1.5x + 0.5$	A1	This accuracy mark is given for the fully correct equation for the gradient

Question 3 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sqrt{5^2 - 4^2} = 3$ 	P2	Two process marks are given for dividing the shape into a rectangle and a triangle and finding the perpendicular height of the triangle (One process mark is given for the expression $5^2 - 4^2$ being used)
	$4 \times 8 = 32$ **or** $\frac{1}{2}(3 \times 8) = 12$ or $2 \times \frac{1}{2}(3 \times 4) = 12$	P1	This process mark is given for process to find the area of one of the two shapes formed
	32 + 12	P1	This process mark is given for a complete process to find the total area of the shape *ABCDE*
	44 (cm^2)	A1	This accuracy mark is given for the correct answer only

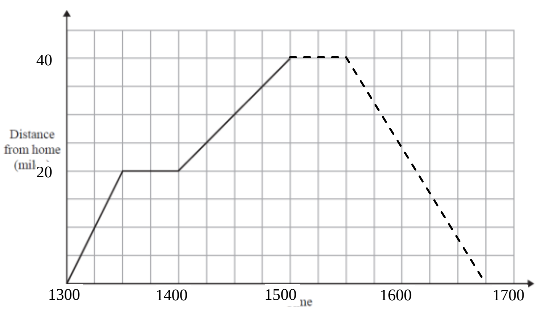
Question 4 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	0835 to 1105 = 2.5 hours 2.5 × 110 = 275 miles	P1	This process mark is given for a process to find distance from Manchester to London
	0835 to 1135 = 3 hours 275 + 37 = 312 miles 312 ÷ 3 = 104 mph	P1	This process mark is given for a process to find speed for Gill's journey from Manchester to London
	110 mph – 104 mph	P1	This process mark is given for a complete process to find difference in speeds
	6 (mph)	A1	This accuracy mark is given for the correct answer only

Question 5 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	600 ÷ 60 = 10, 180 ÷ 30 = 6 or 6 × 1.8 = 10.8, 0.6 × 0.3 = 0.18	P1	This process mark is given for a process to start to solve the problem
	10 × 6 = 60 or 10.8 ÷ 0.18 = 60	P1	This process mark is given for a complete process to find the total number of tiles
	$\frac{3}{5} \times 60$ (= 36)	P1	This process mark is given for a process to find out how many white tiles are needed
	(60 – 36) = 24 tiles 24 tiles in ratio 1:3 is 6:18	P1	This process mark is given for a process to find out how many green and blue tiles are needed
	White = 36, Green = 6, Blue = 18	A1	This accuracy mark is given for the correct answer only
(b)	Fewer tiles will be needed	C1	This communication mark is given for a correct conclusion.

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	40 mph × 0.5 hour (= 20 miles) **or** *x*-axis scaled correctly	M1	This method mark is given for a method to find the distance to the hospital
	40 miles **or** *y*-axis scaled correctly	M1	This method mark is given for finding a total distance from home to the hospital
	40 miles at 32 mph takes 1.25 hours or a completed travel graph 	A1	This accuracy mark is given for finding the time of the journey home from the hospital or for a fully a complete travel graph
	Ria arrives home at 16 45	C1	This communication mark is given for a correct conclusion

Question 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{40 \times \sqrt{100}}{0.2}$	B1	This mark is given for correctly rounding two of the three values (40, 100, 0.2)
	(40 × 10) ÷ 0.2 or 400 ÷ 0.2	M1	This method mark is given for partially completing the calculation
	2000	A1	This accuracy 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
	Translation	B1	This mark is given for stating the transformation is a translation
	$\begin{pmatrix} 4 \\ -7 \end{pmatrix} + \begin{pmatrix} -3 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 \\ -9 \end{pmatrix}$	B1	This mark is given for the correct vector $\begin{pmatrix} 1 \\ -9 \end{pmatrix}$

Question 9 (Total 3 marks) *********not finished yet

Part	Working or answer an examiner might expect to see	Mark	Notes
	8 × 5 (= 40) machine days **and** 40 – (4 × 2) (= 32) machine days left **or** $\frac{1}{5}$ complete **or** $\frac{4}{5}$ left	P1	This process mark is given for a process to start to solve the problem
	32 ÷ 8 (= 4) and 2 + 4 or $\frac{4}{5} \times 5$	P1	This process mark is given for a complete process to solve the problem
	6 (days)	A1	This accuracy mark is given for the correct answer only

Question 10 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$64^{-\frac{2}{3}} = \frac{1}{64^{\frac{2}{3}}} = \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2} = \frac{1}{16}$	B1	This mark is given for the correct answer only

Question 11 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	A & **Y**, **B** & **X**, **C** & **Z**, **D** & **W**	B2	Two marks are given for all four correct pairs (B1 is given for two or three correct pairs)

Question 12 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	52.00 – 41.60 (= 10.40)	M1	This method mark is given for finding the total amount of the reduction
	10.40 ÷ 52 × 100	M1	This method mark is given for a method to find the amount of the reduction as a fraction of the original price
	20 (%)	A1	This accuracy mark is given for the correct answer only

Question 13 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$2n + 1$ and $2m + 1$	M1	This method mark is given for expressions to represent any two different odd numbers
	$(2n + 1) – (2m + 1) = 2n + 2m = 2(n + m)$	M1	This method mark is given for method to subtract and factorise.
	Any number of the form $2(n + m)$ must be even	C1	This communication mark is given for a correct conclusion

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$0.6\dot{2}\dot{4} \times \frac{99}{100} = 0.618$, $0.6\dot{2}\dot{4} = \frac{618}{990}$	M1	This method mark is given for method to find two multiples of $0.6\dot{2}\dot{4}$ that can be used to eliminate the decimals
	$\frac{618}{990} = \frac{206}{330} =$	M1	This method mark is given for complete method to find a fraction in its simplest form
	$\frac{103}{165}$	A1	This accuracy mark is given for the correct answer only

Question 15 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{1}{10}x^2 - 3x = 0$	P1	This process mark is given for a process to find the points where the curve meets the x-axis
	$x = 0$ and $x = 30$	P1	This process mark is given for finding the points where the curve meets the x-axis
	$\frac{1}{10}x^2 - 3x$ when $x = 15$	P1	This process mark is given for finding the x-coordinate for the deepest point on the curve ($x = 15$) and substituting
	22.5 (cm)	A1	This accuracy mark is given for the correct answer only

Question 15 (Total 4 marks) – alternative mark scheme

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = \frac{1}{10}(x^2 - 30x)$	P1	This process mark is given for rearranging $y = \frac{x^2}{10} - 3x$
	$y = \frac{1}{10}((x - 15)^2 - 225)$	P1	This process mark is given for process to rearrange the equation and complete the square
	$\frac{1}{10}((x - 15)^2 - 225)$ when $x = 15$	P1	This process mark is given for finding the x-coordinate for the deepest point on the curve ($x = 15$) and substituting
	22.5 (cm)	A1	This accuracy mark is given for the correct answer only

Question 16 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	Charlie should have used $\frac{1}{3}$ instead of $\frac{1}{2}$	C1	This communication mark is given for correct evaluation of method seen
(b)	The constant term should be −6 not +6	C1	This communication mark is given for correct evaluation of result shown

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	OAB = 57° Alternate segment theorem	M1	This method mark is given for method to find *OAB*
	OBA = 57° Base angles of an isosceles triangle are equal *AOB* = 66° Angles in a triangle add up to 180°	M1	This method mark is given for complete method to find *AOB*
	66°	C2	These two communication marks are given for an answer of 66° with all reasons appropriate for their method (C1 (dep on M1) for one appropriate circle theorem reason for their method)

Question 17 (Total 4 marks) – alternative mark scheme

Part	Working or answer an examiner might expect to see	Mark	Notes
	ODB = 90° – 57° = 33° The tangent to a circle is perpendicular (90°) to the radius (diameter)	M1	This method mark is given for method to find *ODB*
	OBD = 33° Base angles of an isosceles triangle are equal *DOB* = 114° Angles in a triangle add up to 180° *AOB* = 66° Angles on a straight line add up to 180°	M1	This method mark is given for complete method to find *AOB*
	66°	C2	These two communication marks are given for an answer of 66° with all reasons appropriate for their method (C1 (dep on M1) for one appropriate circle theorem reason for their method)

Question 17 (Total 4 marks) – alternative mark scheme

Part	Working or answer an examiner might expect to see	Mark	Notes
	ODB = 90° – 57° = 33° The tangent to a circle is perpendicular (90°) to the radius (diameter)	M1	This method mark is given for method to find *ODB*
	OBD = 33° Base angles of an isosceles triangle are equal *AOB* = 66° The exterior angle of a triangle is equal to the sum of the interior opposite angles	M1	This method mark is given for complete method to find *AOB*
	66°	C2	These two communication marks are given for an answer of 66° with all reasons appropriate for their method (C1 (dep on M1) for one appropriate circle theorem reason for their method)

Question 18 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	1.5 3 5.5 9 13.5 1.5 2.5 3.5 4.5 1 1 1	P1	This process mark is given for process to find common second differences
	$\frac{1}{2}n^2$	P1	This process mark is given for $\frac{1}{2}n^2$ as part of an algebraic expression
	$\frac{1}{2}n^2 + 1$	A1	This accuracy mark is given for the correct answer only (or an equivalent expression)

Question 19 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	CAD = *ACB* = 90° (given)	C1	This communication mark is given for one correct relevant statement
	ABC = *ABD* (common) *ADC* = 180 – 90 – *ABD* = 180 – 90 – *ABC* = *BAC*	C1	This communication mark is given for all correct relevant statements
	∴ Δ *ABD* is similar to Δ *CBA* (AAA)	C1	This communication mark is given for correct conclusion (with reasons)

Question 20 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$(2y-3)^2 + y^2 = 18$	M1	This method mark is given for rearranging $x-2y=-3$ to find an expression for x and substituting
	$4y^2 - 6y - 6y + 9$	M1	This method mark is given for the expansion of the expression $(2y-3)^2$
	$5y^2 - 12y - 9 = 0$	M1	This method mark is given for rearranging to find a quadratic equation to be solved
	$(5y+3)(y-3) = 0$	M1	This method mark is given for factorising the quadratic equation
	$x = 3$, $y = 3$; $x = -4.2$, $y = -0.6$	A1	This accuracy mark is given for the correct pair of solutions only

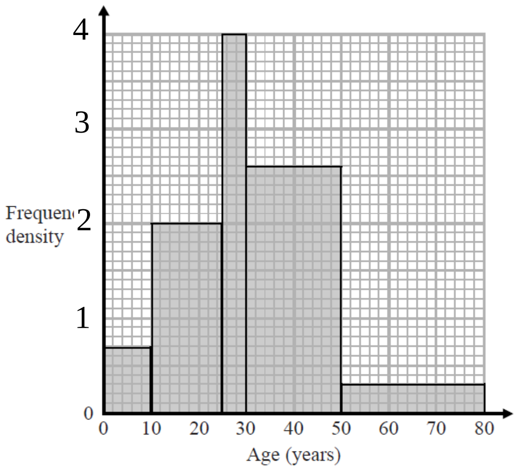
Question 21 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{(3+\sqrt{2})}{(5+\sqrt{8})} \times \frac{(5-\sqrt{8})}{(5-\sqrt{8})}$	M1	This method mark is given for intention to multiply numerator and denominator by $(5-\sqrt{8})$
	$(3+\sqrt{2})(5-\sqrt{8}) = 15 + 5\sqrt{2} - 3\sqrt{8} - 4$ or $(5+\sqrt{8})(5-\sqrt{8}) = 25 + 5\sqrt{8} - 5\sqrt{8} - 8$	M1	This method mark is given for correct expansion of either $(3+\sqrt{2})(5-\sqrt{8})$ or $(5+\sqrt{8})(5-\sqrt{8})$, at least 3 terms correct or 4 correct terms ignoring signs
	$\frac{15+5\sqrt{2}-3\sqrt{8}-4}{25+5\sqrt{8}-5\sqrt{8}-8} = \frac{11+5\sqrt{2}-6\sqrt{2}}{17}$ $= \frac{11-\sqrt{2}}{17}$	A1	This accuracy mark is given for fully correct working leading to the answer shown

Question 22 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = \mathrm{f}(-x)$	B1	This mark is given for the correct answer only
	$y = \mathrm{g}(x) + 1$	B1	This mark is given for the correct answer only
	$(180, -1)$	B1	This mark is given for the correct answer only

Question 23 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		P1	This process mark is given for 20 ÷ 5 or correct scale on the frequency density axis or use of area
	0–10: 10 × 0.7 = 7 10–25: 15 × 2.0 = 30 25–30: 5 × 4.0 = 20 30–50: 20 × 2.6 = 52 50–80: 30 × 0.3 = 9	P1	This process mark is given a correct method to find the area of the remaining bars (allow one error)
	$\dfrac{52+9}{7+30+20+52+9} = \dfrac{61}{118}$	A1	This accuracy mark is given for the correct answer only (or an equivalent fraction)

Question 24 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{6}{10}\times\frac{8}{11}$ or $\frac{4}{10}\times\frac{7}{11}$	P1	This process mark is given for finding an expression to represent a black counter being drawn from bag **A** followed by a black counter being drawn from bag **B** or for finding an expression to represent a white counter being drawn from bag **A** followed by a black counter being drawn from bag **B**
	$\left(\frac{6}{10}\times\frac{8}{11}\right)+\left(\frac{4}{10}\times\frac{7}{11}\right)$	P1	This process mark is given for adding the two expressions to find the probability that there are now more black counters than white counters in bag **C**
	$\frac{76}{110}$	A1	This accuracy mark is given for the correct answer only (or an equivalent fraction)