

Mark Scheme (Results)

Summer 2013

GCSE Mathematics (Linear) 1MA0
Higher (Non-Calculator) Paper 1H

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NOTES ON MARKING PRINCIPLES

- 1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- 2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- 3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- 4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- 5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- 6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.
 - ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
 - iii) *organise information clearly and coherently, using specialist vocabulary when appropriate.*
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme

M1 – method mark
A1 – accuracy mark
B1 – Working mark
C1 – communication mark
QWC – quality of written communication
oe – or equivalent
cao – correct answer only
ft – follow through
sc – special case
dep – dependent (on a previous mark or conclusion)
indep – independent
isw – ignore subsequent working

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
1	(a)		331.705	1	B1 cao
	(b)		179300	1	B1 cao
2			24	4	<p>M1 for $0.15 \times 240 (= 36)$ oe M1 for $\frac{3}{4} \times 240 (= 180)$ oe M1 (dep on both prev M1) for $240 - "180" - "36"$ A1 cao</p> <p>OR</p> <p>M1 for $15(\%) + 75(\%) (= 90(\%))$ M1 for $100(\%) - "90(\%)" (= 10(\%))$ M1 (dep on both prev M1) for $"\frac{10}{100}" \times 240$ oe A1 cao</p> <p>OR</p> <p>M1 for $0.15 + 0.75(= 0.9)$ oe M1 for $"0.9" \times 240(= 216)$ oe M1 (dep on both prev M1) for $240 \square "216"$ A1 cao</p> <p>OR</p> <p>M1 for $0.15 + 0.75(= 0.9)$ oe M1 for $1 - "0.9"(= 0.1)$ oe M1 (dep on both prev M1) for $"0.1" \times 240$ oe A1 cao</p>

PAPER: 1MA0_1H					
Question	Working	Answer	Mark	Notes	
3		2 4 7 8 3 0 3 3 5 7 8 8 4 1 1 2 4 4 5 Key, eg 4 1 is 4.1(kg)	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required)	
4	(a)		6 + 3t	1	B1 for 6 + 3t
	(b)		$6x^2 + 15x$	2	B2 for $6x^2 + 15x$ (B1 for $6x^2$ or $15x$)
	(c)	$m^2 + 10m + 3m + 30$	$m^2 + 13m + 30$	2	M1 for all 4 terms (and no additional terms) correct with or without signs or 3 out of no more than four terms correct with signs A1 for $m^2 + 13m + 30$
5		5 525 5 105 3 21 7	$3 \times 5 \times 5 \times 7$	3	M1 for continual prime factorisation (at least first 2 steps correct) or first two stages of a factor tree correct M1 for fully correct factor tree or list 3, 5, 5, 7 A1 $3 \times 5 \times 5 \times 7$ or $3 \times 5^2 \times 7$

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
6		7	3	M1 for 4×10 or 40 or $\frac{12+6+15+x}{4}$ or a correct equation M1 for a complete and correct method A1 cao
7	(a) (4,0) (3, 0) (3, -1) (2, -1) (2, 2) (4, 2) (b)	Correct position Rotation 180° (0,1)	2 3	B2 for correct shape in correct position (B1 for any incorrect translation of correct shape) B1 for rotation B1 for 180° (ignore direction) B1 for (0, 1) OR B1 for enlargement B1 for scale factor -1 B1 for (0, 1) (NB: a combination of transformations gets B0)

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
8	$\frac{20 \times 300}{0.5}$	12000	3	<p>B1 for 20 or 300 used M1 for “20” × “300” or $\frac{20}{0.5}$ or $\frac{300}{0.5}$, values do not need to be rounded A1 for answer in the range 11200 –13200</p> <p>SC B3 for 12000 with or without working</p>
9	<p>LCM (80, 50) = 400</p> <p>Matt $400 \div 50 = 8$ Dan $400 \div 80 = 5$</p> <p>OR</p> <p>$50 = 2 \times 5 (\times 5)$ $80 = 2 \times 5 (\times 2 \times 2 \times 2)$</p>	<p>Matt 8 Dan 5</p>	3	<p>M1 lists multiples of both 80 (seconds) and 50 (seconds) (at least 3 of each but condone errors if intention is clear, can be in minutes and seconds) or use of 400 seconds oe. M1 (dep on M1) for a division of "LCM" by 80 or 50 or counts up “multiples” (implied if one answer is correct or answers reversed) A1 Matt 8 and Dan 5</p> <p>SC B1 for Matt 7, Dan 4</p> <p>OR</p> <p>M1 for expansion of both 80 and 50 into prime factors. M1 demonstrates that both expansions include 10 oe A1 Matt 8 and Dan 5</p> <p>SC B1 for Matt 7, Dan 4</p>

PAPER: 1MA0 1H				
Question	Working	Answer	Mark	Notes
10		1.5	4	<p>M1 for correct expression for perimeter eg. $4 + 3x + x + 6 + 4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 + 4 + 3x + x + 6 = 32$ oe M1 for $8x = 12$ or $12 \div 8$ A1 for 1.5 oe</p> <p>OR</p> <p>M1 for correct expression for semi-perimeter eg. $4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 = 16$ oe M1 for $4x = 6$ or $6 \div 4$ A1 for 1.5 oe</p>

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
*11 QWC	$\frac{30}{24} \times 60 = 75$	Debbie + explanation	4	<p>M1 for reading 24 (mins) and 30 (km) or a pair of other values for Debbie M1 for correct method to calculate speed eg. $30 \div 24$ oe A1 for 74 – 76 or for 1.2 – 1.3 and 1.1 C1 (dep on M2) for correct conclusion, eg Debbie is fastest from comparison of “74 – 76” with 66 (kph) or “1.2 – 1.3” and 1.1 (km per minute)</p> <p>OR</p> <p>M1 for using an appropriate pair of values for Ian’s speed eg 66 and 60, 33 and 30, 11 and 10 M1 for pair of values plotted on graph A1 for correct line drawn C1 (dep on M2) for Debbie is fastest from comparison of gradients.</p> <p>OR</p> <p>M1 for reading 24 (mins) and 30 (km) or a pair other values for Debbie M1 for Ian’s time for same distance or Ian’s distance for same time. A1 for a pair of comparable values. C1 (dep on M2) for Debbie is fastest from comparison of comparable values.</p>

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
12	x -2 -1 0 1 2 3 4 y 4 4.5 5 5.5 6 6.5 7	$y = \frac{1}{2}x + 5$ drawn	3	<p>(Table of values/calculation of values) M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be plotted correctly) A1 for correct line between $x = -2$ and $x = 4$</p> <p>(No table of values) M1 for at least 2 correct points with no more than 2 incorrect points M1 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = \frac{1}{2}x + 5$ drawn A1 for correct line between $x = -2$ and $x = 4$</p> <p>(Use of $y=mx+c$) M1 for line drawn with gradient 0.5 OR line drawn with y intercept at 5 M1 for line drawn with gradient 0.5 AND line drawn with y intercept at 5 A1 For correct line between $x = -2$ and $x = 4$</p> <p>SC B2 for a correct line from $x = 0$ to $x = 4$</p>
*13 QWC		Yes with explanation	3	<p>M1 for bearing $\pm 2^\circ$ within overlay M1 for use of scale to show arc within overlay or line drawn from C to ship's course with measurement C1(dep M1) for comparison leading to a suitable conclusion from a correct method</p>

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
14	(a)	Line joins an empty circle at -2 to a solid circle at 3	diagram	2	B2 cao (B1 for line from -2 to 3)
	(b)	$2x \geq 7$	$x \geq 3.5$	2	M1 for correct method to isolate variable and number terms (condone use of $=$, $>$, \leq , or $<$) or $(x =) 3.5$ A1 for $x \geq 3.5$ oe as final answer
*Q15 QWC			No + explanation	3	M1 for $500 \times 9 \times 10^{-3}$ oe A1 for 4.5 C1 (dep M1) for correct decision based on comparison of their paper height with 4 OR M1 for $4 \div 500$ oe A1 for 0.008 C1 (dep M1) for correct decision based on comparison of their paper thickness with 0.009 OR M1 for $4 \div (9 \times 10^{-3})$ oe A1 for 444(4...) C1 (dep M1) for correct decision based on comparison of their number of sheets of paper with 500
16			£500	3	M1 for $70\% = 350$ or $\frac{350}{70}$ M1 for $\frac{350}{70} \times 100$ oe A1 cao

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
17		1 hour 45 mins	6	<p>M1 for method to find volume of pond, eg $\frac{1}{2}(1.3 + 0.5) \times 2 \times 1 (= 1.8)$</p> <p>M1 for method to find the volume of water emptied in 30 minutes, eg $1 \times 2 \times 0.2 (= 0.4)$, $100 \times 200 \times 20 (= 400000)$</p> <p>A1 for correct rate, eg $0.8 \text{ m}^3/\text{hr}$, 0.4 m^3 in 30 minutes</p> <p>M1 for correct method to find total time taken to empty the pond, eg “1.8” \div “0.8”</p> <p>M1 for method to find extra time, eg 2 hrs 15 minutes – 30 minutes</p> <p>A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins</p> <p>OR</p> <p>M1 for method to find volume of water emptied in 30 minutes, eg. $1 \times 2 \times 0.2 (= 0.4)$, $100 \times 200 \times 20 (= 400000)$</p> <p>M1 for method to work out rate of water loss eg. “0.4” $\times 2$</p> <p>A1 for correct rate, eg $0.8 \text{ m}^3/\text{hr}$</p> <p>M1 for correct method to work out remaining volume of water eg. $\frac{1}{2}(1.1 + 0.3) \times 2 \times 1 (= 1.4)$</p> <p>M1 for method to work out time, eg “1.4” \div “0.8”</p> <p>A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins</p> <p>NB working could be in 3D or in 2D and in metres or cm throughout</p>

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
18	$12x + 21y = 3$ $12x + 40y = 60$ $19y = 57$ $y = 3$ $3x + 10 \times 3 = 15$ $3x = -15$ Alternative method $x = \left(\frac{1-7y}{4}\right)$ $3\left(\frac{1-7y}{4}\right) + 10y = 15$ $3 - 21y + 40y = 60$ $19y = 57$ $x = \left(\frac{1-7 \times 3}{4}\right)$	$x = -5, y = 3$	4	M1 for a correct process to eliminate either x or y or rearrangement of one equation leading to substitution (condone one arithmetic error) A1 for either $x = -5$ or $y = 3$ M1 (dep) for correct substitution of their found value A1 cao
19	$-5, 0.2, 0.5, 1$	$-5, 5^{-1}, 0.5, 5^0$	2	M1 for either 5^{-1} or 5^0 evaluated correctly A1 for a fully correct list from correct working, accept original numbers or evaluated (SC B1 for one error in position or correct list in reverse order)

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
20		$5x^2$	4	<p>M1 for $4x \times 4x$ M1 for $(2x \times 4x)/2$ or $(2x \times x)/2$ or $(3x \times 4x)/2$ M1(dep M2) for “$16x^2$” – “$4x^2$” – “x^2” – “$6x^2$” A1 for $5x^2$</p> <p>OR</p> <p>M1 for $\sqrt{(2x)^2 + (4x)^2} (= \sqrt{20x^2} = \sqrt{20}x)$ M1 for $\sqrt{(x)^2 + (2x)^2} (= \sqrt{5x^2} = \sqrt{5}x)$ M1(dep M2) for $\frac{\sqrt{5}x \times \sqrt{20}x}{2} (= \frac{\sqrt{100}}{2}x^2)$ A1 for $5x^2$</p>
21	(a) Cf table: 4, 9, 25, 52, 57, 60 cf graph	Correct Cf graph	3	<p>B1 Correct cumulative frequencies (may be implied by correct heights on the grid) M1 for at least 5 of “6 points” plotted consistently within each interval A1 for a fully correct CF graph</p>
	(b)(i)	172	3	<p>B1 for 172 or read off at cf = 30 or 30.5 from a cf graph, ft provided M1 is awarded in (a)</p>
	(ii) IQR = UQ – LQ	12 - 14		<p>M1 for readings from graph at cf = 15 or 15.25 and cf = 45 or 45.75 from a cf graph with at least one of LQ or UQ correct from graph ($\pm \frac{1}{2}$ square). A1ft provided M1 is awarded in (a)</p>

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
22		1200 cm ³	4	<p>M1 for $10 \times 2 \times 2$ and 15×2 M1 for “40” \times “30” A1 for 1200 B1 (indep) for cm³</p> <p>OR</p> <p>M1 for 10×15 or 2^3 or 8 indicated as scale factor M1 for $10 \times 15 \times 2 \times 2 \times 2$ A1 for 1200 B1 (indep) for cm³</p> <p>SC B2 for 600 cm³ (B1 for 600)</p>
23	$\frac{4(x+5)}{(x+5)(x-3)}$	$\frac{4}{x-3}$	2	<p>M1 for $(x \pm 5)(x \pm 3)$ A1 for $\frac{4}{x-3}$</p>
24	$12 \div 10 = 1.2$ $15 \div 5 = 3$ $13 \div 5 = 2.6$ $18 \div 10 = 1.8$ $3 \div 15 = 0.2$	Histogram	3	<p>B3 for fully correct histogram (B2 for 4 correct blocks) (B1 for 3 correct blocks)</p> <p>(If B0, SC B1 for correct key eg $1\text{cm}^2 = 2$ (calls) Or frequency \div class interval for at least 3 frequencies)</p> <p>NB Apply the same mark scheme if a different frequency density is used.</p>

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
25	(a)		$a = 4, b = 5$	3	M1 for sight of $(x - 4)^2$ M1 for $(x - 4)^2 - 16 + 21$ A1 for $a = 4, b = 5$ OR M1 for $x^2 - 2ax + a^2 + b$ M1 for $-2a = -8$ and $a^2 + b = 21$ A1 for $a = 4, b = 5$
	(b)		(4, 5)	1	B1 ft
26		$\begin{array}{r} 50 \ 1 \ 1 \\ 1 \ 50 \ 1 \\ 1 \ 1 \ 50 \end{array}$	$\frac{126}{720}$	4	M1 for 3 fractions $\frac{a}{10}, \frac{b}{9}, \frac{c}{8}$ where $a < 10, b < 9$ and $c < 8$ M1 for $\frac{7}{10} \times \frac{3}{9} \times \frac{2}{8}$ or $\frac{3}{10} \times \frac{7}{9} \times \frac{2}{8}$ or $\frac{3}{10} \times \frac{2}{9} \times \frac{7}{8}$ ($= \frac{42}{720}$) M1 for $\frac{7}{10} \times \frac{3}{9} \times \frac{2}{8} + \frac{3}{10} \times \frac{7}{9} \times \frac{2}{8} + \frac{3}{10} \times \frac{2}{9} \times \frac{7}{8}$ or $3 \times \frac{3}{10} \times \frac{2}{9} \times \frac{7}{8}$ A1 for $\frac{126}{720}$ oe. eg. $\frac{7}{40}$ Alternative Scheme for With Replacement M1 for $\frac{7}{10} \times \frac{3}{10} \times \frac{3}{10}$ ($= \frac{63}{1000}$) M1 for $\frac{7}{10} \times \frac{3}{10} \times \frac{3}{10} \times 3$ ($= \frac{189}{1000}$) M0 A0 No further marks

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
27	(a)		$\mathbf{a} - \mathbf{b}$	1	B1 for $\mathbf{a} - \mathbf{b}$ oe
	(b)		$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$	3	M1 for a correct vector statement for \overrightarrow{NR} eg. $(\overrightarrow{NR} =) \overrightarrow{NQ} + \overrightarrow{QR}$ or $(\overrightarrow{NR} =) \overrightarrow{NS} + \overrightarrow{SR}$ M1 for $\frac{2}{5}SQ (+ QR)$ or $\frac{3}{5}QS (+ SR)$ (SQ, QR, QS, SR may be written in terms of \mathbf{a} and \mathbf{b}) A1 for $\frac{2}{5}(\mathbf{a} - \mathbf{b}) + \mathbf{b}$ oe or $\frac{3}{5}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ oe
28	(a)		(90, 0)	1	B1 for (90, 0) (condone $(\frac{\pi}{2}, 0)$)
	(b)		Correct graph	1	B1 for graph through (0, 2) (90, 0) (180, -2) (270, 0) (360, 2) professional judgement

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

PAPER: 1MA0_1H			
Question		Modification	Notes
3		Stem and leaf diagram: Additional horizontal line was inserted in the diagram.	Standard mark scheme
4	(b)	MLP only: x changed to y .	Standard mark scheme
7	(a)	2cm grid – shape P moved up two squares.	Note that the original shape P is in a different position
	(b)	2cm grid. No shading of shapes – x axis -2 and -4 removed as they would obscure shape	Standard mark scheme
10		Braille and MLP x changed to y .	Standard mark scheme
11		2 cm for 5 on both axes.	Change of scale
12		1.5 cm grid.	Standard mark scheme

PAPER: 1MA0_1H		
Question	Modification	Notes
13	N line increased to 9 cm. Shading removed. 'Land' and 'Sea' labelled. 037 degrees was changed to 040 degrees.	037° changed to 040°
14	2 cm spaces between numbers.	Standard mark scheme
17	(b) Model as well as diagram provided. Braille only: 90 degrees written on diagram instead of the right angle sign.	Standard mark scheme
21	Frequency table: numbers changed to 5, 5, 10, 25, 10 and 5. Grid: 1.5 cm for 5 on both axes. Right axis labelled.	Frequency numbers changed to 5, 5, 10, 25, 10, 5 (a) Cumulative frequencies 5, 10, 20, 45, 55, 60 (b) Greater tolerance needed. Median and IQR will be different to those in standard scheme.
22	(b) Models as well as diagram provided.	Standard mark scheme
24	2cm grid both axes. In the table, the number of calls is changed to 12 14 13 20 6	Number of calls changed to 12, 14, 13, 20, 6 So frequency density will be 1.2, 2.8, 2.6, 2, 0.4
27	vectors 'a' and 'b' in larger font size	Standard mark scheme
28	Size of diagram enlarged. Cross at A changed to a filled-in circle	Standard mark scheme

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