

Mark Scheme (Results)

Summer 2013

GCSE Mathematics (2MB01) Higher
5MB3H (Calculator) Paper 01

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

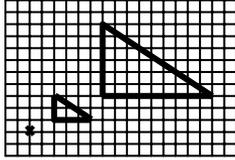
sc – special case

dep – dependent (on a previous mark or conclusion)

indep – independent

isw – ignore subsequent working

PAPER: 5MB3H_01

Question		Working	Answer	Mark	Notes
1			13	2	M1 for $7.8(0) \div 6 \times 10$ or $7.8(0) \div 6$ or $7.8(0) \times 10$ or $\frac{10}{6}$ oe or $\frac{6}{10}$ oe A1 cao
2				3	B3 for fully correct triangle (B2 for 2 vertices correct or enlargement scale factor 3 in wrong position or enlargement, centre A , with different scale factor) (B1 for 1 vertex correct or enlargement, not from A , different scale factor)
3			1.3852..	2	M1 for 6.4 or 4.62 or $\frac{320}{231}$ A1 for 1.3852(81385)
*4			4 rolls	4	M1 for $\pi \times 2.4$ M1 for $(\pi \times 2.4) \div 2$ or 7.5 to 7.541 M1 for or 3.75 or 3.76... or 3.77... or (2, 4,) 6, 8 C1 for a clear statement that 4 (rolls) are needed

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Question		Working	Answer	Mark	Notes
5	(a)	$3 \times -2 + 5$	-1	2	M1 for substitution of -2 into $3e + 5$ e.g. $3 \times -2 + 5$ A1 cao
	(b)	$4y - 2y = 14 - 3$ $2y = 11$ $y = \frac{11}{2}$	$\frac{11}{2}$	2	M1 for clear attempt to subtract 2y or 3 from both sides A1 for $\frac{11}{2}$ oe
	(c)	$3x - 15 = 21$ $3x = 36$ $x = 12$	12	2	M1 for $3 \times x - 3 \times 5$ or intention to divide both sides of equation by 3 as a first step A1 cao
	(d)		-2, -1, 0, 1, 2, 3	2	B2 for all 6 correct values; ignore repeats, any order (B1 for 5 correct and no incorrect values e.g. -2, -1, 1, 2, 3 or 6 correct and one incorrect value e.g. -2, -1, 0, 1, 2, 3, 4)
6			Correct position of T	3	M1 for line drawn or point marked within guidelines from B M1 for line drawn or point marked within guidelines from C A1 for T within region on overlay

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Question	Working	Answer	Mark	Notes
7		550	5	<p>M1 for a correct method to find 20% of an amount e.g. 3500×0.2 oe (= 700) M1 for a correct method to increase an amount by 20% e.g. 3500×1.2 oe (= 4200) M1 for subtracting 900 M1 for division by 6 A1 for 550</p> <p>NB Operations may occur in any order as long as they could lead to the correct answer. Award marks until a breakdown in method occurs.</p>
8	$x + 2x + 15 = 63$ $3x = 48$	16	3	<p>M1 for $x + 2x + 15 = 63$ M1 for attempt to subtract 15 from each side of their equation A1 cao</p> <p>OR</p> <p>M1 for $63 - 15 (= 48)$ M1 for '48' $\div 3$ A1 cao</p> <p>OR</p> <p>M2 for 16 and 32 seen (M1 for a strategy using at least two pairs with the ratio 1 : 2) A1 cao</p>

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Question	Working	Answer	Mark	Notes
9	$342 \div 88 = 3.886\dots$ $570 \div 195 = 2.923\dots$ $1500 \div 399 = 3.759\dots$ OR $88 \div 342 = 0.257\dots$ $195 \div 570 = 0.342\dots$ $399 \div 1500 = 0.266$	Small bottle with correct calculations	4	<p>M1 for one of $342 \div 88 (= 3.886\dots)$, $570 \div 195 (= 2.923\dots)$, $1500 \div 399 (= 3.759\dots)$ OR one of $88 \div 342 (= 0.257\dots)$, $195 \div 570 (= 0.342\dots)$, $399 \div 1500 (= 0.266)$ OR any other calculation that could lead to a comparative figure</p> <p>M1 for calculations that could lead to comparative figures for 2 bottles</p> <p>M1 for calculations that could lead to comparative figures for 3 bottles, e.g. all three from the above lists</p> <p>C1 for correct comparative figures for all 3 bottles leading to a correctly stated comparison: small or 342g best value</p>

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Question		Working	Answer	Mark	Notes
10	(a)	$24.5^2 + 10.6^2 (= 712.61)$ $\sqrt{712.61}$	26.7	3	M1 for $(GJ^2 =) 24.5^2 + 10.6^2$ or $600.25 + 112.36$ or 712.61 M1 for $\sqrt{24.5^2 + 10.6^2}$ or $\sqrt{712.61}$ A1 for answer in the range $26.69 - 26.7$
	(b)	$\cos x = \frac{7}{18}$ $x = \cos^{-1}\left(\frac{7}{18}\right)$	67.1	3	M1 for $\cos(x) = \frac{7}{18}$ oe M1 for $(x =) \cos^{-1}\left(\frac{7}{18}\right)$ or $\cos^{-1}(0.388\dots)$ or $\cos^{-1}(0.38)$ A1 for answer in the range $67.1 - 67.17$ SC: B2 for an answer of $1.1(713\dots)$ or 1.2 or $74.5(717\dots)$ or 74.6

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Question		Working		Answer	Mark	Notes
11		4	40	4.8	4	B2 for a trial between 4 and 5 exclusive (B1 for a trial at 4 or 5) B1 for a different trial of $4.8 < x \leq 4.85$ B1 (dep on at least one previous B1) for 4.8 Trials should be evaluated to at least 2 sf truncated or rounded for values of x correct to 1 decimal place. Trials should be evaluated to at least 1 dp truncated or rounded for values of x correct to 2 dp. (For trial at 4.82, accept 83, for trial at 4.85 accept 85) NB no working scores no marks even if the answer is correct
		4.1	44.(321)			
		4.2	48.(888)			
		4.3	53.(707)			
		4.4	58.(784)			
		4.5	64.(125)			
		4.6	69.(736)			
		4.7	75.(623)			
		4.8	81.(792)			
		4.9	88.(249)			
		5	95			
		4.81	82.4(2464)			
		4.82	83.0(6017)			
4.83	83.6(9859)					
4.84	84.3(399)					
4.85	84.9(8412)					
12	(a)			-13, -1, 2	2	B2 for all values correct (B1 for any one value correct)
	(b)			Graph drawn	2	M1 fit for at least 4 points plotted correctly from their table A1 cao for correct curve drawn from (-2, -13) to (2, 11)

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Question	Working	Answer	Mark	Notes
13	$3x + 10y = 7$ $3x - 12y = 18$ $22y = -11$ $y = -0.5$ $3x + 10 \times -0.5 = 7$ $x = 4$	$x = 4,$ $y = -0.5$	3	M1 for a full method to eliminate x or y , allow one error in calculation M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 for 4 and -0.5
14	B at (3, -1), (5, -1), (5, -4) C at (-1, -1), (-3, -1), (-3, -4)	Rotation of 180° about (1,0)	3	M1 for showing C correctly on the grid without showing B or for showing B and C correctly on the grid A1 for rotation of 180° A1 for (centre) (1,0) OR M1 for showing C correctly on the grid without showing B or for showing B and C correctly on the grid A1 for enlargement scale factor -1 A1 for (centre) (1,0) NB Award no marks for any correct answer from an incorrect diagram and no A marks if more than one transformation is given

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Question	Working	Answer	Mark	Notes
15	Northway Bank: $6000 \times 0.038 = 228$ $6000 + 228 = 6228$ $6228 \times 0.038 = 236.664$ $6228 + 236.664$ $= 6464.664$ Portland Bank: $6000 \times 0.05 = 300$ $6000 + 300 = 6300$ $6300 \times 0.032 = 201.6$ $6300 + 201.6$ $= 6501.6$	Portland Bank with values	4	M1 for a correct method to calculate 3.8% or 5% of 6000 M1 for a correct method to calculate using a compound interest method, eg 1.038^2 oe or 1.05 followed by 1.032 oe A1 for 1.077444 or 1.0836 or for 6464.66(4) or 464.66(4) or for 6501.6(0) or 501.6(0) C1 for a correct decision in a statement with two correct comparable values e.g. for 7.7(444)% and 8.36%, or for 6464.66(4) and 6501.6(0), or for 464.66(4) and 501.6(0) NB all final money values can be rounded or truncated to nearest integer or left unrounded
16		2.52×10^{15}	2	M1 for 4.032×10^9 or 4 032 000 000 or sight of figures 252 A1 for 2.52×10^{15}
17		40960	3	M1 for $T \propto \frac{1}{d^2}$ or $T = \frac{k}{d^2}$ or $k = Td^2$ M1 for $k = 160 \times 8^2 (= 10240)$ A1 for 40960

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Question	Working	Answer	Mark	Notes
18		0.27 and -1.47	3	M1 for $\frac{-6 \pm \sqrt{6^2 - 4 \times 5 \times -2}}{2 \times 5}$, allow substitution of 2 or -2 for c M1 for $\frac{-6 \pm \sqrt{76}}{10}$ A1 for 0.27(17797...) and -1.47(17797...)
19		12.7	6	M1 for $0.5 \times 12.3 \times AB \times \sin 73 = 50$ M1 for $(AB =) 50 \div (0.5 \times 12.3 \times \sin 73)$ A1 for 8.5 – 8.502 M1 for $(AC^2 =) 12.3^2 + '8.50'^2 - 2 \times 12.3 \times '8.50' \times \cos 73$ M1 (dep) for correct order of evaluation or 162.42... A1 for answer in the range 12.7 – 12.8 OR (with perpendicular from A meeting BC at a point X) M1 for $0.5 \times 12.3 \times AX = 50$ M1 for $(AB =) \frac{50 \div (0.5 \times 12.3)}{\sin 73}$ A1 for 8.5 – 8.502 M1 for $(BX =) '8.5' \times \cos 73 (= 2.485...)$ M1 for $(AC =) \sqrt{8.13^2 + (12.3 - 2.485)^2}$ A1 for answer in the range 12.7 – 12.8

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Question		Working	Answer	Mark	Notes
20	(a)		$4\mathbf{b} - 2\mathbf{a}$	1	B1 for $4\mathbf{b} - 2\mathbf{a}$ oe
	(b)	$\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN},$ $2\mathbf{a} + \frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$ $2\mathbf{a} + 3\mathbf{b} - 1.5\mathbf{a}$	$3\mathbf{b} + 0.5\mathbf{a}$	3	M1 for a correct vector for \overrightarrow{ON} , e.g. ($\overrightarrow{ON} =$) $\overrightarrow{OA} + \overrightarrow{AN}$, may be written in terms of \mathbf{a} and \mathbf{b} e.g. ($\overrightarrow{ON} =$) $2\mathbf{a} + \frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$ M1 for ($\overrightarrow{AN} =$) $\frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$ oe or ($\overrightarrow{NB} =$) $\frac{1}{4}(4\mathbf{b} - 2\mathbf{a})$ oe or ($\overrightarrow{NA} =$) $\frac{3}{4}(2\mathbf{a} - 4\mathbf{b})$ oe or ($\overrightarrow{BN} =$) $\frac{1}{4}(2\mathbf{a} - 4\mathbf{b})$ oe A1 for $3\mathbf{b} + 0.5\mathbf{a}$
21	(a)		35.55	1	B1 cao
	(b)	$\sqrt{\frac{2 \times 35.55}{9.85}}$	2.68668..	3	B1 for 9.85 M1 for $\sqrt{\frac{2 \times '35.55'}{'9.85'}}$ where '35.55' is ft from (a) and $9.8 < '9.85' \leq 9.85$ A1 (dep on M1) for 2.68668... (can be rounded or truncated to at least 3 sf) supported by correct working

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

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Question	Modification	Notes
2	Given triangle named Shape P. Enlargement given on diagram (Shape Q). Candidates asked to: 'Describe fully the single transformation that maps Shape P onto Shape Q.'	B1 for "enlargement"; B1 for "scale factor 3"; B1 for reference to point A as the centre of enlargement.
6	Diagram size not altered, but North lines extended to 9 cm.	Standard mark scheme
9	No pictures, just the information given.	Standard mark scheme
10	Braille only: Information given about the diagrams	Standard mark scheme
12	2 cm grid. Leeway needed.	Standard mark scheme
14	2 cm grid. 1 row removed at top and bottom.	Standard mark scheme
20	Vectors a and b in a larger font than other letters.	Standard mark scheme

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