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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

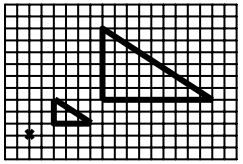
**12 Parts of questions**

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

| PAPER: 5MB3H_01 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | | 13 | 2 | M1 for 7.8(0) ÷ 6 × 10 or 7.8(0) ÷ 6 or 7.8(0) × 10 or $\frac{10}{6}$ oe or $\frac{6}{10}$ oe<br>A1 cao |
| 2 | | |  | 3 | B3 for fully correct triangle<br>(B2 for 2 vertices correct or enlargement scale factor 3 in wrong position or enlargement, centre *A*, with different scale factor)<br>(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 $\frac{320}{231}$<br>A1 for 1.3852(81385) |
| *4 | | | 4 rolls | 4 | M1 for $\pi \times 2.4$<br>M1 for $(\pi \times 2.4) \div 2$ or 7.5 to 7.541<br>M1 for or 3.75 or 3.76... or 3.77... or (2, 4,) 6 , 8<br>C1 for a clear statement that 4 (rolls) are needed |

| PAPER: 5MB3H_01 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 5 | (a) | $3 \times -2 + 5$ | $-1$ | 2 | M1 for substitution of $-2$ into $3e + 5$ e.g. $3 \times -2 + 5$<br>A1 cao |
| | (b) | $4y - 2y = 14 - 3$<br>$2y = 11$<br>$y = \frac{11}{2}$ | $\frac{11}{2}$ | 2 | M1 for clear attempt to subtract $2y$ or 3 from both sides<br>A1 for $\frac{11}{2}$ oe |
| | (c) | $3x - 15 = 21$<br>$3x = 36$<br>$x = 12$ | 12 | 2 | M1 for $3 \times x - 3 \times 5$ or intention to divide both sides of equation by 3 as a first step<br>A1 cao |
| | (d) | | $-2, -1, 0, 1, 2, 3$ | 2 | B2 for all 6 correct values; ignore repeats, any order<br>(B1 for 5 correct and no incorrect values<br>e.g. $-2, -1, 1, 2, 3$ or 6 correct and one incorrect value<br>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 $B$<br>M1 for line drawn or point marked within guidelines from $C$<br>A1 for $T$ within region on overlay |

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 7 | | | 550 | 5 | M1 for a correct method to find 20% of an amount e.g. 3500 × 0.2 oe (= 700)<br>M1 for a correct method to increase an amount by 20% e.g. 3500 × 1.2 oe (= 4200)<br>M1 for subtracting 900<br>M1 for division by 6<br>A1 for 550<br><br>**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. |
| 8 | | $x + 2x + 15 = 63$<br>$3x = 48$ | 16 | 3 | M1 for $x + 2x + 15 = 63$<br>M1 for attempt to subtract 15 from each side of their equation<br>A1 cao<br><br>OR<br>M1 for 63 – 15 (= 48)<br>M1 for '48' ÷ 3<br>A1 cao<br><br>OR<br>M2 for 16 and 32 seen<br>(M1 for a strategy using at least two pairs with the ratio 1 : 2)<br>A1 cao |

| PAPER: 5MB3H_01 | | | | | |
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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 9 | | 342 ÷ 88 = 3.886…<br>570 ÷ 195 = 2.923…<br>1500 ÷ 399 = 3.759…<br><br>OR<br><br>88 ÷ 342 = 0.257…<br>195 ÷ 570 = 0.342…<br>399 ÷ 1500 = 0.266 | Small bottle with correct calculations | 4 | M1 for one of 342 ÷ 88 (= 3.886…),<br>570 ÷ 195 (= 2.923…), 1500 ÷ 399 (= 3.759…)<br>OR one of 88 ÷ 342 (= 0.257…),<br>195 ÷ 570 (= 0.342…), 399 ÷ 1500 (= 0.266)<br>OR any other calculation that could lead to a comparative figure<br><br>M1 for calculations that could lead to comparative figures for 2 bottles<br><br>M1 for calculations that could lead to comparative figures for 3 bottles, e.g. all three from the above lists<br><br>C1 for correct comparative figures for all 3 bottles leading to a correctly stated comparison: small or 342g best value |

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

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

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 13 | | $3x + 10y = 7$<br>$3x - 12y = 18$<br><br>$22y = -11$<br>$y = -0.5$<br>$3x + 10 \times -0.5 = 7$<br>$x = 4$ | $x = 4$,<br>$y = -0.5$ | 3 | M1 for a full method to eliminate $x$ or $y$, allow one error in calculation<br>M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again<br>A1 for 4 and –0.5 |
| 14 | | **B** at (3, –1), (5, –1), (5, –4)<br>**C** at (–1, –1), (–3, –1), (–3, –4) | Rotation of $180^o$ 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<br>A1 for rotation of $180^o$<br>A1 for (centre) (1,0)<br><br>OR<br><br>M1 for showing **C** correctly on the grid without showing **B** or for showing **B** and **C** correctly on the grid<br>A1 for enlargement scale factor –1<br>A1 for (centre) (1,0)<br><br>**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:<br>6000 × 0.038 = 228<br>6000 + 228 = 6228<br>6228 × 0.038 = 236.664<br>6228 + 236.664<br>= 6464.664<br><br>Portland Bank:<br>6000 × 0.05 = 300<br>6000 + 300 = 6300<br>6300 × 0.032 = 201.6<br>6300 + 201.6<br>= 6501.6 | Portland Bank with values | 4 | M1 for a correct method to calculate 3.8% or 5% of 6000<br>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<br>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)<br>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)<br><br>**NB** all final money values can be rounded or truncated to nearest integer or left unrounded |
| 16 | | | $2.52\times10^{15}$ | 2 | M1 for $4.032\times10^9$ or 4 032 000 000 or sight of figures 252<br>A1 for $2.52\times10^{15}$ |
| 17 | | | 40960 | 3 | M1 for $T \propto \frac{1}{d^2}$ or $T = \frac{k}{d^2}$ or $k = Td^2$<br>M1 for $k = 160 \times 8^2$ (= 10240)<br>A1 for 40960 |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 18 | | | 0.27 and –1.47 | 3 | M1 for $\frac{-6\pm\sqrt{6^2-4\times5\times-2}}{2\times5}$, allow substitution of 2 or –2 for $c$<br>M1 for $\frac{-6\pm\sqrt{76}}{10}$<br>A1 for 0.27(17797…) and –1.47(17797…) |
| 19 | | | 12.7 | 6 | M1 for $0.5 \times 12.3 \times AB \times \sin 73 = 50$<br>M1 for $(AB =)\ 50 \div (0.5 \times 12.3 \times \sin 73)$<br>A1 for 8.5 – 8.502<br>M1 for $(AC^2 =)\ 12.3^2 + \text{'8.50'}^2 - 2\times12.3\times\text{'8.50'}\times\cos 73$<br>M1 (dep) for correct order of evaluation or 162.42…<br>A1 for answer in the range 12.7 – 12.8<br><br>OR<br><br>(with perpendicular from $A$ meeting $BC$ at a point $X$)<br>M1 for $0.5 \times 12.3 \times AX = 50$<br>M1 for $(AB =)\ \frac{50\div(0.5\times12.3)}{\sin 73}$<br>A1 for 8.5 – 8.502<br>M1 for $(BX =)$ '8.5' × cos73 (= 2.485…)<br>M1 for $(AC =)\ \sqrt{\text{'8.13'}^2+(12.3-\text{'2.485'})^2}$<br>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) | $\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$,<br>$2\mathbf{a} + \frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$<br>$2\mathbf{a} + 3\mathbf{b} - 1.5\mathbf{a}$ | $3\mathbf{b} + 0.5\mathbf{a}$ | 3 | M1 for a correct vector for $\overrightarrow{ON}$,<br>e.g. $(\overrightarrow{ON} =)\ \overrightarrow{OA} + \overrightarrow{AN}$,<br>may be written in terms of **a** and **b**<br>e.g. $(\overrightarrow{ON} =)\ 2\mathbf{a} + \frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$<br>M1 for $(\overrightarrow{AN} =)\ \frac{3}{4}(4\mathbf{b} - 2\mathbf{a})$ oe or $(\overrightarrow{NB} =)\ \frac{1}{4}(4\mathbf{b} - 2\mathbf{a})$<br>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<br>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<br>M1 for $\sqrt{\frac{2\times'35.55'}{'9.85'}}$ where '35.55' is ft from (a) and<br>$9.8 <$ '9.85' $\leq 9.85$<br>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: ±5º
Measurements of length: ±5 mm

| **PAPER: 5MB3H_01** | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| 2 | | Given triangle named Shape P. Enlargement given on diagram (Shape Q).<br>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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