



# Mark Scheme (Results)

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5MB3H_01				
Question	Working	Answer	Mark	Notes
*1		small and correct answers	3	<p>M1 for <math>4.2 \div 1.75</math> (=2.4(0)) <b>or</b> <math>8.68 \div 3.5</math> (=2.48)  M1 for <math>4.2 \div 1.75</math> (=2.4(0)) <b>and</b> <math>8.68 \div 3.5</math> (=2.48)  C1 (dep on at least M1) for small and (£)2.4(0) and (£)2.48</p> <p><b>OR</b></p> <p>M1 for <math>1.75 \div 4.2</math> (=0.41(6)) <b>or</b> <math>3.5 \div 8.68</math> (=0.40(3))  M1 for <math>1.75 \div 4.2</math> (=0.41(6)) <b>and</b> <math>3.5 \div 8.68</math> (=0.40(3))  C1 (dep on at least M1) for small and 0.41(6)(kg) and 0.40(3)(kg)</p> <p><b>OR</b></p> <p>M1 for <math>4.2 \div 1.75</math> (=2.4(0)) <b>or</b> <math>8.68 \div 3.5</math> (=2.48)  M1 for <math>(4.2 \div 1.75) \times 3.5</math> (=8.4(0)) <b>or</b> <math>(8.68 \div 3.5) \times 1.75</math> (=4.34)  C1 (dep on at least M1) for small and (£)8.4(0) <b>or</b> for small and (£)4.34</p> <p><b>OR</b></p> <p>M1 for <math>1.75 \div 4.2</math> (=0.41(6)) <b>or</b> <math>3.5 \div 8.68</math> (=0.40(3))  M1 for <math>(1.75 \div 4.2) \times 8.68</math> (=3.61(6)) <b>or</b> <math>(3.5 \div 8.68) \times 4.2</math> (=1.69(3))  C1 (dep on at least M1) for small and 3.61(6)(kg) <b>or</b> 1.69(3)(kg)</p> <p><b>OR</b></p> <p>M2 for <math>8.68 \div 2</math> (=4.34) <b>or</b> <math>4.20 \times 2</math> (=8.40)  C1 (dep on at least M1) for small and (£)4.34 <b>or</b> (£8.40)</p> <p><b>OR</b></p> <p>Any other method considered equivalent. Figures may be truncated or rounded as long as their method is clear.</p>

5MB3H_01				
Question	Working	Answer	Mark	Notes
2	$7 \times 8^2 + 320 = 448 + 320$ $768p = 7.68$	£7.68	3	M1 for $7 \times 8^2$ or 448 seen A1 for 768 B1 for correct monetary answer written correctly eg £7.68 or 768p
3		correct shaded region	2	B1 for arc of circle, centre oak tree, radius 4cm( $\pm 2$ mm) B1 for shaded region where the tree can be planted, bounded by sides of garden and arc of circle centre oak tree
4	(a)	-3, -2, -1, 0, 1	2	B2 for all 5 values and no others (B1 for 4 correct values and no others or -4, -3, -2, -1, 0, 1 or -3, -2, -1, 0, 1, 2
	(b)	$-2 \leq x < 4$	2	B2 for $-2 \leq x < 4$ (B1 for $-2 \leq x$ or $x < 4$ or $-2 < x \leq 4$ ) [Note: accept the use of any letter other than $x$ throughout and ignore any attempt to list integer values]
5		25.1-25.2	2	M1 for $2 \times 3.142 \times 4$ or $8\pi$ oe A1 for 25.1 – 25. 2
6	(a)	5, -4, -3	2	B2 for 5, -4 and -3 (B1 for 5 or -4 or -3)
	(b)	correct curve	2	B2 for fully correct curve (B1 ft for at least 5 points plotted correctly)



5MB3H_01					
Question	Working	Answer	Mark	Notes	
7		enlargement, scale factor 2, centre (6, -5)	3	B1 for enlargement B1 for (scale) factor 2 or $\times 2$ or sf 2 B1 for (6, -5) NB: award 0 marks for an explanation that includes reference to more than one transformation.	
*8	<p>Cost of wages, rent and other expenses last year  <math>92\,000 + 10\,800 + 7\,000 = 109\,800</math></p> <p>Cost of wages, rent and other expenses this year  <math>1.075 \times 92\,000 + \frac{7}{9} \times 10\,800 + 7\,000 \div 2 = 110\,800</math></p> <p>Costs are more this year, so she cannot increase the amount she spends on goods</p>	no, with working and reason	4	<p>M1 for an attempt to calculate using 7.5% and 92000 (eg 7.5% of 92000 or increase of 7.5%) eg <math>92\,000 + 6\,900</math> or 98900</p> <p>M1 for an attempt to find a fractional amount of 10800 (eg <math>\frac{7}{9} \times 10\,800</math> or 8400 or <math>\frac{2}{9} \times 10\,800</math> or 2400)</p> <p>M1 for complete method of increasing 92000 by 7.5%, finding <math>\frac{7}{9}</math> of 10800, and halving 7000, with at least all of these three added together.</p> <p>C1 for statement eg “no” with both 110800 &amp; 109800 seen, OR “no” with “1000 more” OR “no” and compares 110800 with 109800, oe.</p>	
9	(a)	$\sqrt{30} = 5.4772255 \dots$ $2.5^2 = 6.25$ $5.4772255 \dots \div 6.25 =$	0.876	2	M1 for $\sqrt{30} \div 6.25$ or $5.4(7\dots) \div 2.5^2$ A1 for any answer in the range 0.876 to 0.877
	(b)	$4.5 \times 1000 \times 1000$	4 500 000	2	M1 for complete method equivalent to $4.5 \times 1000 \times 1000$ A1 for 4 500 000 oe

5MB3H_01				
Question	Working	Answer	Mark	Notes
10	$3 \rightarrow 21$ $4 \rightarrow 56$ $3.1 \rightarrow 23.5(9)$ $3.2 \rightarrow 26.3(6)$ $3.3 \rightarrow 29.3(3)$ $3.4 \rightarrow 32.5(0)$ $3.5 \rightarrow 35.8(7)$ $3.6 \rightarrow 39.4(5)$ $3.7 \rightarrow 43.2(5)$ $3.8 \rightarrow 47.2(7)$ $3.9 \rightarrow 51.5$ $3.35 \rightarrow 30.8(9)$	3.3	4	B2 for a trial between 3.3 and 3.4 inclusive (B1 for a trial between 3 and 4 inclusive) B1 for a different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3  NB trials should be evaluated to at least 1dp truncated or rounded
11		45	3	M1 for $60000 \times 0.75$ or $\div 1000$ or digits 45 or the numbers 60 or 0.00075) M1 for the complete method $60\,000 \times 0.75 \div 1000$ oe A1 cao
12	(a)	-7	2	M1 for an attempt to get $xs$ on one side or number terms on one side A1 cao
	(b)	8.5	2	M1 for an attempt to divide each side by 4 or an attempt to expand the bracket eg $4 \times x - 4 \times 5$ A1 for 8.5 oe

5MB3H_01				
Question	Working	Answer	Mark	Notes
*13	$2500 \times 0.04 \times 2 = \text{£}200$ $2500 \times (1.039)^2 = \text{£}2698.80$ $\text{£}2698.80 - \text{£}2500 = \text{£}198.80$ Scheme A gives £1.20 more	statement	4	M1 for a correct method to find 4% of 2500 or 3.9% of 2500 A1 for a correctly calculated amount 2700 or 2698.8(0) or 200 or 198.8(0); or percentage rate calculated over the 2 years for comparison: 3.93% or 3.976% oe M1 for a correct compound interest method using 3.9% and 2500 over 2 years C1 for statement of scheme A, with two correct comparable figures.
14	$3x - 2y = 7$ $7x + 2y = 13$ $10x = 20 \quad x = 2$ $3 \times 2 - 2y = 7 \quad -2y = 1$ $y = -0.5$	2, -0.5	3	M1 for a correct process to eliminate either $x$ or $y$ (allow one arithmetic error) M1 (dep) for correct substitution of their found variable or an otherwise correct method to eliminate the other variable A1 for 2 and -0.5 oe
15	(a) (b) (c) $500 \div 250\,000 [= 0.002]$ OR $(5 \times 10^2) \div (2.5 \times 10^5) [= (5 \div 2.5) \times 10^{2-5}]$ OR $\frac{500}{250} \times \frac{1}{10^3} [= 2 \times 10^{-3}]$ OR $\frac{500 \div 100}{250\,000 \div 100} = \frac{5}{2500}$ $[= 0.002]$	$3.7 \times 10^{-3}$  49000  $2 \times 10^{-3}$	1  1  2	B1 cao  B1 cao  M1 for an attempt to divide using two numbers that are in consistent form eg following an attempt to convert to ordinary numbers, or standard form numbers.  A1 for $2 \times 10^{-3}$

5MB3H_01				
Question	Working	Answer	Mark	Notes
16		12.7	3	M1 for $3.142 \times 5 \times 5$ oe or $3.142 \times 5 \times 5 \times 'h'$ ( $=78.5 - 78.55$ ) M1 for $1000 \div (3.142 \times 5 \times 5)$ A1 for 12.7 – 12.8 NB: multiples of $\pi$ acceptable for M marks
17	$4x - 3 = 2x + 2y$ $2x - 3 = 2y$ $2x = 2y + 3$ $x = y + 1.5$	$x = y + 1.5$	3	M1 for attempt to expand brackets eg $2 \times x + 2 \times y$ or divide through by 2 (each term). M1 for attempt to get $x$ on one side of equation. A1 for $(x =) y + 1.5$ , $\frac{2y + 3}{2}$ , oe
18		(11, 21)	3	M1 for $5 - 2$ or $9 - 3$ OR 3 or 6 as long as these are not related to the 3 from A or multiple 3 or 9,18  M1 for $2 + 3 \times "3"$ and $3 + 3 \times "6"$ OR for $5 + 2 \times "3"$ and $9 + 2 \times "6"$ OR for $2 + 3 \times "3"$ ( $=11$ ) and $(y =) 2 \times '11' - 1$  A1 cao  SC: B1 if no method shown and answer shows $x$ coordinate as 11 or $y$ coordinate as 21.

5MB3H_01				
Question	Working	Answer	Mark	Notes
19		4.6	5	<p>M1 for <math>AC = \sqrt{3^2 + 4^2}</math> (=5) or <math>DA = \sqrt{5^2 + 2^2}</math>  M1 for <math>\tan BAC = 0.75</math> oe or (<math>BAC =</math>) 36.8(6) or 36.9  M1 for <math>\tan DAC = 0.4</math> oe or (<math>DAC =</math>) 21.8(0)  M1 for <math>\sqrt{5^2 + 2^2} \times \sin("36.8(6)" + "21.8(0)")</math> or <math>5.385 \times \sin 58.7</math>  A1 for 4.59 – 4.61</p> <p>OR</p> <p>M1 for <math>AC = \sqrt{3^2 + 4^2}</math> (= 5) or <math>DP = \sqrt{(29 - AP^2)}</math>  M1 for <math>\cos BAC = 0.8</math> oe or (<math>BAC =</math>) 36.8(6) oe  M1 for <math>\text{angle } CDP = \text{angle } BAC</math>  M1 for (<math>DP =</math>) <math>3 + 2 \times \cos CDP</math> or (<math>AP =</math>) <math>4 - 2 \times \sin CDP</math>  A1 for 4.59 – 4.61</p>
20		0.5, -3	3	<p>M1 for <math>(2x \pm 1)(x \pm 3)</math>  M1 for <math>(2x - 1)(x + 3)</math>  A1 cao</p> <p>OR</p> <p>M1 for <math>\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -3}}{2 \times 2}</math> allow sub. of <math>c = \pm 3</math>  M1 for <math>\frac{-5 \pm \sqrt{49}}{4}</math>  A1 cao</p> <p>NB: any other method put in review.</p>

5MB3H_01				
Question	Working	Answer	Mark	Notes
21	$1180.5 \div \frac{4}{3}\pi(6.15)^3$	1.21	4	M1 for $1180 \pm 0.5$ or $6.2 \pm 0.05$ M1 for 'max. mass' $\div$ 'min. volume' where "min volume" is defined as any expression involving 6.15 M1 for $1180.5 \div \frac{4}{3}\pi(6.15)^3$ A1 for 1.21 – 1.22
22		proof	3	B1 for $AD = AB$ and $AE = AG$ B1 for angle $EAB = \text{angle } DAG$ ( $= 90 + \text{angle } DAE$ ) B1 (dep on previous B marks) for 2 sides and included angle (SAS) oe
23	(a)	$3\mathbf{a} + \mathbf{b}$	1	B1 oe
	(b)	$3\mathbf{c}$	4	M1 for writing $QB$ as a combination of vectors eg $\frac{1}{2}('3\mathbf{a} + \mathbf{b}') + \mathbf{b}$ or $3\mathbf{a} + 2\mathbf{b} - \frac{1}{2}('3\mathbf{a} + \mathbf{b}')$ or $2\mathbf{a} + 2\mathbf{b} - \mathbf{c}$ oe M1 for equating $\mathbf{a} + \mathbf{b} = 2\mathbf{c}$ or writing $PQ$ in terms of vectors $\mathbf{a}$ and $\mathbf{b}$ eg $-\mathbf{a} + \frac{1}{2}('3\mathbf{a} + \mathbf{b}')$ or $2\mathbf{a} + \mathbf{b} - \frac{1}{2}('3\mathbf{a} + \mathbf{b}')$ A1 for $(PQ=) \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$ or $(QB=) \frac{3}{2}\mathbf{a} + \frac{3}{2}\mathbf{b}$ or $(QB=) 2\mathbf{c} - \mathbf{a} + \mathbf{a} + \mathbf{c}$ A1 cao NB: accept equivalent expressions throughout



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