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Mark Scheme (Results)

March 2012

GCSE Mathematics (2MB01) Higher
5MB2H (Non-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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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 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

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		30 ÷ 12 = 2.5 220 × 2.5 40 × 2.5 150 × 2.5 2 × 2.5	550 100 375 5	3	M2 for any one of 220 + 220 + 110 or 40 + 40 + 20 or 150 + 150 + 75 or 2 + 2 + 1 or 550 or 100 or 375 or 5 A1 for all 4 correct values OR M1 for 30 ÷ 12 oe or sight of 2.5 M1(dep) for 220 × '2.5' or 40 × '2.5' or 150 × '2.5' or 2 × '2.5' oe or 550 or 100 or 375 or 5 A1 for all 4 correct values OR M1 for 220 ÷ 12 or 40 ÷ 12 or 150 ÷ 12 or 2 ÷ 12 or $18\frac{1}{3}$ or $3\frac{1}{3}$ or 12.5 or $\frac{1}{6}$ seen M1(dep) for '$18\frac{1}{3}$' × 30 or '$3\frac{1}{3}$' × 30 or '12.5' × 30 or '$\frac{1}{6}$' × 30 or 550 or 100 or 375 or 5 A1 for all 4 correct values **Continued on next page**

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
					OR M1 for M1 for 220 ÷ 2 or 40 ÷ 2 or 150 ÷ 2 or 2 ÷ 2 or 110 or 20 or 75 or 1 seen M1(dep) for '110' × 5 or '20' × 5 or '75' × 5 or '1' × 5 or 550 or 100 or 375 or 5 seen A1 for all 4 correct values (SC: B2 for 275, 50, 187.5 and 2.5 or B1 for 275 or 50 or 187.5 or 2.5, if M0 scored)
2	(a)		Terms must end in 2 or 7	1	B1 for any correct reason; eg terms must end in 2 or 7
	(b)		$5n - 3$	2	B2 for $5n - 3$ (oe, including unsimplified) (B1 for $5n + k$, $k \neq -3$ or k is absent, or $n = 5n - 3$)
3		$\left(\frac{1+4}{2}, \frac{2+0}{2}\right)$	(2.5, 1)	2	M1 for $\frac{1+4}{2}$ and $\frac{2+0}{2}$ or for either the x coordinate correct or the y coordinate correct A1 for (2.5, 1) oe SC: B1for an answer of (1, 2.5) if M0 scored

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4*		500 × 1000 × 400 = 200 000 000 20 × 50 × 40 = 40 000 200 000 000 ÷ 40 000 = 5000 OR (500 ÷ 20) × (1000 ÷ 50) × (400 ÷ 40) = 25 × 20 × 10 = 5000	Proof	4	B1 for a correct unit conversion, could be seen on the diagram or in working M1 for 500 × 1000 × 400 or 200 000 000 or 20 × 50 × 40 or 40 000 or 5 × 10 × 4 or 200 or 0.2 × 0.5 × 0.4 or 0.04 M1(dep) for '200 000 000' ÷ '40 000' C1 for fully correct working leading to final answer of 5000 OR B1 for a correct unit conversion, could be seen on the diagram or in working M1 for (500 ÷ 20) or (1000 ÷ 50) or (400 ÷ 40) or at least two of 25, 20, 10 seen M1(dep) for '25' × '20' × '10' C1 for fully correct working leading to final answer of 5000

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		$8e - 5f$	2	B2 for $8e - 5f$ oe (B1 for $8e$ or $-5f$)
	(b)		$2(2t + 5)$	1	B1 cao
	(c)	$3 + 2p - 2$	$1 + 2p$	2	M1 for $2 \times p$ and 2×-1 oe within at most 3 terms seen A1 cao
	(d)	$x(a + b) + y(a + b)$	$(a + b)(x + y)$	2	M1 for $x(a + b)$ or $y(a + b)$ or $a(x + y)$ or $b(x + y)$ seen A1 for $(a + b)(x + y)$ oe 2-bracketed expression

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		30000 × 20 ÷ 100 = 6000 30000 – 6000 = 24000 24000 ÷ 12 OR 30000 ÷ 12 = 2500 2500 × 20 ÷ 100 = 500 2500 – 500 OR 100 – 20 = 80 30000 × 80 ÷ 100 = 24000 24000 ÷ 12 OR 30000 ÷ 12 = 2500 2500 × 80 ÷ 100	2000	3	M1 for 30000 × 20 ÷ 100 oe (= 6000) M1 for (30000 – '6000') ÷ 12 A1 cao OR M1 for 30000 ÷ 12 (= 2500) M1 for '2500' – '2500' × 20 ÷ 100 oe A1 cao OR M1 for 100 – 20 (= 80) M1 for 30000 × 80 ÷ 100 oe and dividing by 12 A1 cao OR M1 for 30000 ÷ 12 (= 2500) M1 for '2500' × 80 ÷ 100 oe A1 cao

<table>
<tr><th colspan="5">5MB2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>7</td><td></td><td>10 × 8/5 = 16
60 – 16

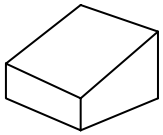
OR
60 × 5/8 = 37.5
37.5 – 10</td><td>44 km or
27.5 miles</td><td>3</td><td>B1 for 5 miles = 8 km or equivalent statement or use of conversion factor 8/5 or 5/8
M1 for 10 × ‘8/5’ (= 16) or 60 × ‘5/8’ (= 37.5)
A1 for 44 km or 27.5 miles, accept76 km or 47.5 miles (units must be quoted)</td></tr>
<tr><td>8</td><td></td><td><table><tr><td>x</td><td>–2</td><td>–1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>–10</td><td>–6</td><td>–2</td><td>2</td><td>6</td><td>10</td></tr></table>
OR

Using $y = mx + c$

gradient = 4
y intercept = –2</td><td>Straight line from
(–2, –10) to (3, 10)</td><td>3</td><td>(Table of values)
M1 for at least 2 correct attempts to find points by substituting values of x
M1 (dep) ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted)
A1 for correct line between $x = -2$ and $x = 3$

(No table of values)
M2 for at least 2 correct points and no incorrect points plotted OR line segment of $y = 4x - 2$ drawn (ignore any additional incorrect segments)
(M1 for at least 3 correct points with no more than 2 incorrect points)
A1 for correct line between $x = -2$ and $x = 3$

(Use of $y = mx + c$)
M2 line segment of $y = 4x - 2$ drawn (ignore any additional incorrect segments)
(M1 for line drawn with gradient of 4 OR line drawn with y intercept of –2 and a positive gradient)
A1 for correct line between $x = -2$ and $x = 3$</td></tr>
</table>

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		6 by 4 rectangle drawn	2	B2 for a 6 by 4 rectangle drawn (B1 for a rectangle drawn with one correct dimension)
	(b)		3-D sketch 	2	M1 for an attempt at a 3-D sketch with a trapezoidal face A1 for a correct 3-D sketch

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10*		Angle *ABE* = 40 (vertically opposite angles are equal) Angle *BAE* = angle *BEA* = (180 – 40)/2 = 70 (base angles of an isos triangle are equal) *x* = 70 (alternate angles on parallel lines are equal) OR Angle *ABE* = 40 (vertically opposite angles are equal) Angle *BAE* = angle *BEA* = (180 – 40)/2 = 70 (base angles of an isosceles triangle are equal) Angle *BEF* = 40 (corresponding angles are equal) *x* = 180 – 70 – 40 = 70 (angles as a straight line add up to 180°)	70	5	B1 for angle *ABE* = 40, could be marked on the diagram M1 for (180 – '40')/2 (= 70) A1 for 70^o identified as the angle x^o C2 for fully correct reasons: 'vertically opposite angles are equal' or 'vertically opposite angles are equal' 'base angles of an isosceles triangle are equal' 'alternate angles on parallel lines are equal' (C1 for just one correct reason quoted) OR B1 for angle *ABE* = 40 or angle *BEF* = 40, could be marked on the diagram M1 for (180 – '40')/2 (= 70) A1 for 70^o identified as the angle x^o C2 for fully correct reasons: 'vertically opposite angles are equal' or 'vertically opposite angles are equal' 'base angles of an isosceles triangle are equal' 'corresponding angles on parallel lines are equal' 'angles on a straight line add up to 180' (C1 for just one correct reason quoted)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		1	1	B1 cao
	(b)		3	1	B1 cao
	(c)		$\frac{1}{8}$	1	B1 for $\frac{1}{8}$ oe
12		Angle *PTO* = angle *PSO* = 90 Angle *TPS* = 24 × 2 = 48 360 – 90 – 90 – 48 OR Angle *PTO* = 90 Angle *TOP* = 180 – 90 – 24 = 66 66 × 2	132	3	M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 360 – 90 – 90 – (24 × 2) A1 cao OR M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 2 × (180 – 90 – 24) A1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13*		Rectangle – unshaded triangle $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $=3x^2 + 18x – 5x – 30 – (3x^2 – 5x)$ $=3x^2 + 18x – 5x – 30 – 3x^2 + 5x$ QED OR $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $= (x + 6)(3x – 5) – x(3x – 5)$ $= (3x – 5)(x + 6 – x)$ $= 6(3x – 5) = 18x – 30$ QED OR Shaded trapezium + shaded triangle $½(x + 6 – 2x + x + 6)(3x – 5)$ $=6(3x – 5) = 18x – 30$ QED	Proof	4	M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for $3x^2 + 18x – 5x – 30$ or $½×(6x^2 – 10x)$ or $3x^2 – 5x$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for factorising process with $(3x – 5)$ as the common factor C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for $x + 6 – 2x$ $(= 6 − x)$ M2 for $½(x + 6 – 2x + x + 6)(3x – 5)$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		. 0.25 = 0.2555… 0.25555…×10 = 2.5555… 0.25555…×100 = 25.5555… 25.5555…– 2.5555… = 23 **Alternative Method** x = 0.25555 … 10x = 2.5555 … 100x = 25.5555… 90x = 23	$\frac{23}{90}$	3	M1 for 0.25555... or 0.2 + 0.05555… M1 for two correct recurring decimals that, when subtracted, would result a terminating decimal, and attempting the subtraction or $\frac{2.3}{9}$ or $\frac{253}{990}$ A1 cao **Alternative Method** M1 for x = 0.25555… M1 for two correct recurring decimals that, when subtracted, would result a terminating decimal, e.g. 10x = 2.5555..., 100x = 25.5555… and attempting the subtraction or 9x = 2.3 or 90x = 23 or 900x = 230 or $\frac{2.3}{9}$ or $\frac{253}{990}$ A1 cao SC: B1 for fraction with denominator 90 if M0
15		Grad = $\frac{1}{3}$ 3 = 6 × $\frac{1}{3}$ + c c = 1	$y = \frac{1}{3}x + 1$	3	M1 for –3 × m = –1 oe or $\frac{1}{3}$ seen M1 for 3 = 6 × ‘$\frac{1}{3}$’ + c or y – 3 = ‘$\frac{1}{3}$’(x – 6) A1 for $y = \frac{1}{3}x + 1$ oe

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	$3\sqrt{5}$	2	M1 for $\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ A1 for $\frac{15\sqrt{5}}{5}$ or better
	(b)	$(1 + \sqrt{3})(1 + \sqrt{3})$ $= 1 + \sqrt{3} + \sqrt{3} + 3$ $= 4 + 2\sqrt{3}$	4, 2	2	M1 for $1\times1 + 1\times\sqrt{3} + 1\times\sqrt{3} + \sqrt{3}\times\sqrt{3}$ oe A1 cao
17		$\frac{3(a-b)+2b}{b(a-b)}$ $\frac{3a-3b+2b}{b(a-b)}$	$\frac{3a-b}{b(a-b)}$	3	M1 for a common denominator of $b(a-b)$ oe M1 for $\frac{3(a-b)+2b}{'b(a-b)'}$ or $\frac{3(a-b)}{'b(a-b)'} + \frac{2b}{'b(a-b)'}$ A1 for $\frac{3a-b}{b(a-b)}$ or $\frac{3a-b}{ba-b^2}$

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