

Mark Scheme (Results)

November 2011

Modular Mathematics (GCSE)
Unit 2: 5MB2H_01 (Higher)

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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Question		Working	Answer	Mark	Notes									
1		$\frac{1}{5} + \frac{3}{7} = \frac{7}{35} + \frac{15}{35}$ Or <table border="1"><tr><td></td><td>3</td><td>7</td></tr><tr><td>1</td><td></td><td>7</td></tr><tr><td>5</td><td>15</td><td>35</td></tr></table> Or 0.2+0.42(857...)		3	7	1		7	5	15	35	$\frac{22}{35}$ oe	2	M1 for attempt to put over a common denominator with at least one fraction correctly done ie $\frac{7}{35}$ oe or $\frac{15}{35}$ oe Or M1 for table structure shown with all cells correct Or M1 attempt to use decimals, must use at least 2 decimal places for $\frac{3}{7}$ A1 $\frac{22}{35}$ oe
	3	7												
1		7												
5	15	35												
2	(a)		$20fg$	1	B1 in any acceptable order									
	(b)	$9a + 3(8 - 2a)$ $= 9a + 24 - 6a$	$3a + 24$	2	M1 for 3×8 and $\pm 3 \times 2a$ oe within at most 4 terms seen A1 cao									
	(c)		c^8	1	B1 cao									
	(d)		x^{15}	1	B1 cao									
	(e)		$7(y + 3)$	1	B1 cao									

5MB2H 01					
Question		Working	Answer	Mark	Notes
3		<div><div><div>135</div><div>48</div><div>1080</div><div>5400</div><div>6480</div></div><div>Or</div><div><div><div><div>1</div><div>3</div><div>5</div></div><div><div><div>4</div><div>2</div><div>0</div></div><div>4</div></div><div><div><div>6</div><div>2</div><div>4</div></div><div>8</div></div><div><div><div>8</div><div>4</div><div>0</div></div><div>0</div></div></div></div><div>Or</div><div><div><div>100</div><div>30</div><div>5</div></div><div><div><div>40</div><div>8</div></div><div><div>4000</div><div>1200</div><div>200</div></div><div><div>800</div><div>240</div><div>40</div></div></div></div><div>4000 + 1200 + 200 + 800 + 240 + 40 = 6480</div><div>Or</div><div>48x1=48</div><div>48x0.30=14.4(0)</div><div>48x.05=2.4(0)</div><div>Or</div><div>48x1=48</div><div>48x0.35=16.8(0)</div></div>	55.08	6	<div>M1 for a complete method with relative place value correct</div> <div>Condone 1 multiplication error, addition not necessary.</div> <div>Or</div> <div>M1 for a complete grid.</div> <div>Condone 1 multiplication error, addition not necessary.</div> <div>Or</div> <div>M1 for sight of a complete partitioning method.</div> <div>Condone 1 multiplication error, addition not necessary.</div> <div>Or</div> <div>M1 for sight of a complete partitioning method which partitions the money only and uses consistent units</div> <div>Condone 1 multiplication error, addition not necessary.</div> <div>A1 (dep on M1) for digits 648 seen</div> <div>M1 for 15 ÷ 100 × ‘64.8’ oe eg 10% = 6.48</div> <div>5% = 3.24 (done in pence or £) (= £9.72 oe)</div> <div>M1 for ‘64.8’ – 15 ÷ 100 × ‘64.8’ oe (done in pence or £)</div> <div>(or M2 for 85 ÷ 100 × ‘64.8’ oe (done in pence or £))</div> <div>A1 for digits 5508 seen</div> <div>A1 cao</div>

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Question	Working		Answer	Mark	Notes																								
	<p>11475 <u>48</u> 91800 <u>459000</u> 550800</p> <p> <div> <div>1</div> <div>1</div> <div>4</div> <div>7</div> <div>5</div> </div> <div> <div>4</div> <div>4</div> <div>6</div> <div>8</div> <div>0</div> </div> <div> <div>8</div> <div>8</div> <div>2</div> <div>6</div> <div>0</div> </div> <div> <div>5</div> <div>5</div> <div>0</div> <div>8</div> <div>0</div> <div>0</div> </div> </p> <table border="1"> <tr> <td></td><td>10000</td><td>1000</td><td>400</td><td>70</td><td>5</td></tr> <tr> <td>4</td><td>400000</td><td>40000</td><td>16000</td><td>2800</td><td>200</td></tr> <tr> <td>8</td><td>80000</td><td>8000</td><td>3200</td><td>560</td><td>40</td></tr> <tr> <td></td><td>480000</td><td>48000</td><td>19200</td><td>3360</td><td>240</td></tr> </table> <p>480000+48000+19200+3360+240= 550800</p>			10000	1000	400	70	5	4	400000	40000	16000	2800	200	8	80000	8000	3200	560	40		480000	48000	19200	3360	240			<p>OR</p> <p>M1 for $15 \div 100 \times 135$ oe eg $10\% = 13.5$ $5\% = 6.75$ (done in pence or £) (= 20.25p oe) M1 for $135 - '15 \div 100 \times 135'$ oe (done in pence or £) (or M2 for $85 \div 100 \times 135$ oe (done in pence or £)) A1 for digits 11475 seen</p> <p>M1 for a complete method with relative place value correct Condone 1 multiplication error, addition not necessary. Or M1 for a complete grid. Condone 1 multiplication error, addition not necessary. Or M1 for sight of a complete partitioning method. Condone 1 multiplication error, addition not necessary. Or M1 for sight of a complete partitioning method which partitions the money only and uses consistent units Condone 1 multiplication error, addition not necessary.</p> <p>A1 digits 5508 seen A1 cao</p>
	10000	1000	400	70	5																								
4	400000	40000	16000	2800	200																								
8	80000	8000	3200	560	40																								
	480000	48000	19200	3360	240																								

5MB2H 01				
Question	Working	Answer	Mark	Notes
4	<p>Big area = 144 Small area = 64 Area frame = 144 – 64 = 80 80 ÷ 4 Or Area one piece is a trapezium $\frac{1}{2} (12+8) \times (12-8) \div 2$ $\frac{1}{2} \times 20 \times 2 = 20$ Or Area of rectangle and 2 triangles $8 \times 2 + 2 \times (\frac{1}{2} \times 2 \times 2)$ 16 + 4 Or Area of rectangle – 2 triangles $12 \times 2 - 2 \times (\frac{1}{2} \times 2 \times 2)$ 24 - 4</p>	20	4	<p>M1 for 12×12 or 8×8 or 144 seen or 64 seen as areas M1 for $12 \times 12 - 8 \times 8$ or '144' – '64' or 80 seen as areas M1 for $(12 \times 12 - 8 \times 8) \div 4$ or '(144 – 64)' ÷ 4 or '80' ÷ 4 seen as areas A1 for 20 cao Or M1 for 12 – 8 or 4 seen as difference in lengths M1 for height of trapezium = $(12 - 8) \div 2$ or '4' ÷ 2 or 2 M1 for area trapezium = $\frac{1}{2} (12 + 8) \times '2'$ oe A1 for 20 cao Or M1 for $\frac{1}{2} \times (12 - 8)$ or 2 for width of frame M1 for $8 \times 2 = 16$ for rectangle M1 for $2 \times (\frac{1}{2} \times 2 \times 2)$ or 4 for 2 triangles A1 for 20 cao Or M1 for $\frac{1}{2} \times (12 - 8)$ or 2 for width of frame M1 for $12 \times 2 = 24$ for rectangle M1 for $2 \times (\frac{1}{2} \times 2 \times 2)$ or 4 for 2 triangles A1 for 20 cao</p> <p>NB Marks can be awarded for correct measurements indicated on the diagram Note If 80 is seen on the answer line following a correct calculation of one piece of card, full marks can be earned.</p>

5MB2H 01					
Question		Working	Answer	Mark	Notes
5	(a)		64	1	B1 cao
	(b)		$6n + 4$	2	B2 for $6n + 4$ (oe, including unsimplified) (B1 for $6n + k$, $k \neq 4$ or k is absent, $n=6n+4$)
6		$96 \div 2^2$ $= 96 \div 4$ $= 24$	No + calculations	3	M1 for $96 \div 2^2$ oe A1 for 24 C1 dep on M1 for “No” with a calculation to support their conclusion SC C1 $96 \div 2$ and correct conclusion from ‘ $96 \div 2$ ’ NB 24 with no working and No gets no marks
7		$\frac{1}{2} (4 \times 3) \times 7$ $= 6 \times 7$	42 cm^3	4	M2 for $\frac{1}{2} \times 4 \times 3 \times 7$ oe (M1 for $\frac{1}{2} (4 \times 3)$ or $4 \times 3 \times 7$ or 6 seen as an area or $7 \times$ ‘cross sectional area’ or 84 seen) A1 for 42 B1 (indep) for cm^3

5MB2H 01					
Question		Working	Answer	Mark	Notes
8	(a)		3.5, 4.5, 5	2	B2 for 3.5, 4.5, 5 oe (B1 for 1 correct)
	(b)		Single line from (-2, 3) to (2, 5)	2	B2 cao for correct single line between $x = -2$ and $x = 2$ (B1 ft for plotting at least 4 points correctly or for a line with gradient $\frac{1}{2}$ or for a single straight line passing through (0, 4))
	(c)(i)	(1, 2) to (0, 4)	Correct line	3	B1 ft for a perpendicular line through (0, 4) for at least $x = -1$ to $x = 1$
	(ii)		$y = -2x + 4$		B2 correct answer or f.t. correct equation for their line (B1 $y = -2x + k$ or $-2x+4$ or ft correct expression for their line with no $y =$)

5MB2H 01				
Question	Working	Answer	Mark	Notes
9	<p>Lisa = $4\frac{1}{2}$ miles in 30 min = 9 mph Martin = $16 \times 5 \div 8 = 10$ mph Or Lisa = $9 \times 8 \div 5 = 14.4$ km/h Martin = 16 km/h Or For 5 miles Lisa took 33 minutes 10 miles is 66 minutes Martin = $16 \times 5 \div 8 = 10$ miles in 1 hour Or Martin 16 km/h = 10 mph = 5 miles in 30 minutes Draw travel graph for Martin Martin's graph steeper (or Lisa = 4.5 miles in 30 minutes)</p>	<p>Martin faster + calculation or graph</p>	4	<p>M1 for Lisa's speed or distance $\times 8 \div 5$ or Martin's $16 \times 5 \div 8$ A1 for one correct conversion from metric to imperial or imperial to metric for their speed or distance (units should be seen) M1 for using the same time period or same distance C1 (dep on M2) concluding statement + both answers correct with units OR M1 for plotting (30, 5) on the graph A1 for a correct line to show Martin's speed M1 for converting 16 km/h to 10 mph oe C1(dep on M2) for concluding statement fully supported by working ie Martin is faster because his graph is steeper oe</p>
10	<p>$66 \div 2 = 33 \pm (6 \div 2)$ $P = 30$ and $T = 36$ Ages = $30 : 36 = 5 : 6$ $770 \div 11 = 70$ each part $5 \times 70 = \text{£}350$ $6 \times 70 = \text{£}420$</p>	<p>350 420</p>	5	<p>M1 $66 \div 2 = 33 \pm (6 \div 2)$ or $(66-6) \div 2$ or for at least 3 trials with a total of 66 or a difference of 6 or for $x + x + 6 = 66$ or $x + x - 6 = 66$ oe A1 for 30 and 36 seen or 5 and 6 oe M1 for $770 \div '11'$ or $770 \div 66$ M1 for '$770 \div 66 \times '30'$', where '30' is a ft from their previous answer or '$770 \div 66 \times '36'$', where '36' is a ft from their previous answer or '$770 \div 11 \times 5$ or '$770 \div 11 \times 6$ oe A1 for $P = 350$ and $T = 420$</p>

5MB2H 01					
Question		Working	Answer	Mark	Notes
11	(a)		6.08×10^7	1	B1 cao
	(b)		0.00017	1	B1 cao
12	(a)		$(e + 10)$	1	B1 cao
	(b)		$(e - 10)$ $(x - 5)$ $(2x + 3)$	2	M1 for $(2x \pm 3)(x \pm 5)$ A1 cao
	(c)		$(g - 7)^6$	1	B1 cao
13		$\frac{3}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$	$\frac{3\sqrt{7}}{7}$	2	M1 for $\times \frac{\sqrt{7}}{\sqrt{7}}$ A1 cao
14		Angle $ORT = 90^\circ$ Angle between the tangent and the radius is 90° Angle $AST = 90^\circ$ Corresponding angles with angle ORT as AS is parallel to OR	Proof	3	B1 for angle ORT (or angle ORS) = 90° C1 for angle between the <u>tangent</u> and the <u>radius</u> is <u>90°/right angle</u> C1 for angle $AST = 90^\circ$ and angle $AST =$ angle ORT because <u>corresponding</u> angles are equal oe or for angle $ASR = 90^\circ$ because of <u>allied /co-interior</u> angles, so angle $AST = 90^\circ$ because <u>angles</u> on a straight <u>line</u> add up to <u>180°</u>

5MB2H 01					
Question		Working	Answer	Mark	Notes
15	(a)	$(x+2)(x+1) + x(2x+2)$ $= x^2 + 3x + 2 + 2x^2 + 2x$ Or $(x+2)(x+1) + x[2x+2 - (x+2)] + (x+2)(x)$ $= x^2 + x + 2x + 2 + x^2 + x^2 + 2x$ Or $(2x+2)(x+x+1) - (x+1)[2x+2 - (x+2)]$ $= (2x+2)(2x+1) - (x+1)x$ $= 4x^2 + 6x + 2 - x^2 - x$ Or $(x+2)(2x+1) + xx = 2x^2 + x + 4x + 2 + x^2$	$3x^2 + 5x + 2$	4	M1 for area of 1 rectangle Eg $(x+2) \times (x+1)$ oe or $x \times (2x+2)$ oe or $(2x+2)(x+x+1)$ oe or $x \times (x+1)$ oe or $(x+2)(2x+1)$ oe or xx oe A1 for correct simplification of this area Eg $x^2 + x + 2x + 2$ (or better) or $2x^2 + 2x$ (or better) or $4x^2 + 4x + 2x + 2$ (or better) or $x^2 + x$ (or better) or $2x^2 + x + 4x + 2$ (or better) or x^2 M1 (dep on M1) for a complete method to find the area using at least two quadratic expressions Eg ' $(x+2)(x+1)$ ' + ' $x(2x+2)$ ' A1 cao for $3x^2 + 5x + 2$
	(b)	$3x^2 + 5x + 2$ $= (3x+2)(x+1)$		1	B1 cao $(x+1)$

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