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Mark Scheme (Results)

November 2010

GCSE

GCSE Mathematics (Modular) 5MB2H
Unit 2 - 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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 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		$140 \div (3+4) (= 20)$ "20"×4	80	2	M1 for $140 \div (3+4)$ or 20 or $\frac{4}{7} \times 140$ A1 cao
2	(a)		$8bc$	1	B1 cao
	(b)		$6w - 15t$	2	M1 for $3 \times 2w - 3 \times 5t$ or 6w or -15t A1 cao
	(c)	$x^2 + -2x + 7x - 14$	$x^2 + 5x - 14$	2	M1 for all 4 terms correct with or without signs **or** 3 out of no more than four terms correct with signs **or** $x(x-2) + 7(x-2)$ *or* $x(x+7) - 2(x+7)$ A1 cao
3		$80 \div 100 \times 15$	12	2	M1 for $80 \div 100 \times 15$ **or** 8 and 4 seen **or** correct method to find 10% and 5% of 80 eg $80 \div 100 \times 10$ and $80 \div 100 \times 5$ oe A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
4	$BFD = 42°$ *HFB* = 110° $110 - 42$	68	3	M1 for $EDC = 42$ or $DHF = 180 - 110$ M1 for $180 - 42 - 70$ A1 cao **or** M1 for $BFD = 42°$ or $HFB = 110°$ M1 for $110 - 42$ A1 cao **or** M1 for $AFH = 180 - 110 = 70$ M1 for $180 - 70 - 42 = 68$ A1 cao
5		24	2	M1 for list of at least 3 multiples of 8 **and** 2 multiples of 12 **or** correct method to write **either** 8 **or** 12 as product of prime factors A1 cao
6	$180 - 140 (= 40)$ $360 \div "40"$	9	3	M1 for $180 - 140 (= 40)$ M1 (dep) for $360 \div "40"$ A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
7 (a)		68	2	M1 for $\frac{9}{5}\times 20+32$ A1 cao
(b)	Table of values 10 20 30 40 50 50 68 86 104 122 **or** Use $y=mx+c$ With $m=\frac{9}{5}$, $c=32$	Single line from (0, 32) to (50, 122)	3	B3 for correct single straight line from (0, 32) to (50, 122) [B2 for at least 3 points correctly plotted (ft from (a)) and joined with line segments **or** 3 correct points plotted two of which must be the extremes with no joining **or** a single line of gradient $\frac{9}{5}$ passing through (0,32) B1 for 2 correctly plotted points ft from (a) **or** a single line of gradient $\frac{9}{5}$ **or** a single line with positive gradient passing through (0,32) **or** 2 correct pairs of values, may include (20,68) from (a) if correct]
(c)		37.8	1	B1 for answer in range 36 - 39 **or** ft from line drawn (± 2mm) *NB : Whole question needs to be clipped together*

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
8	$12\times 7=84$ $84-\frac{1}{2}(3\times 6)$ $75\div 32$	3	4	M1 for $12\times 7\,(=84)$ M1 for $"84"-\frac{1}{2}(3\times 6)\ \ (=75)$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks) **or** M1 for $12\times 4\ \ (=48)$ M1 for $"48"+\frac{1}{2}(12+6)\times 3$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks) M1 for $6\times 3+\frac{1}{2}(3\times 6)\ (=27)$ M1 for $"27"+12\times 4$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks)

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
9	$3600\times 4=14400$ $\frac{2}{5}=40\%$ $\frac{1}{4}=25$ $30+40+25=95\%$ Saved 5% 10% of $14400=1440$ 5% 0f $14400=1440\div 2$	£720	5	M1 $3600\times 4\ (=14400)$ B1 for $\frac{2}{5}=40\%$ **or** $\frac{1}{4}=25$ M1 for $30+40+25$ or 95 or 5 M1 for complete method to find 5% of 14400 A1 cao **or** M1 for $3600\times 4\ (=14400)$ B1 for $30\%=\frac{3}{10}$ oe M1 $\frac{3}{10}+\frac{2}{5}+\frac{1}{4}$ or $\frac{19}{20}$ or $\frac{1}{20}$ M1 for complete method to find $\frac{1}{20}$ of 14400 A1 cao **or** M1 $3600\times 4\ (=14400)$ M1 for 0.3×14400 oe $(=4320)$ M1 for $\frac{2}{5}\times 14400$ oe $(=5760)$ M1 $14400-3600-4320-5760$ A1 cao SC if no other marks awarded M1 for $0.3\times 3600\ (=1080)$ M1 for $\frac{2}{5}\times 3600\ (=14400)$

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		$4wy(5w+6y^2)$	2	M1 for a correct factor taken outside the brackets Or 4*wy*(a 2 term expression in w and y, with just one error) A1 cao
	(b)		$(m + 8)(m - 5)$	2	M1 for $(m \pm 8)(m \pm 5)$ A1 cao
11		45	200 minutes	6	M1 for $120\times 20\times 30(=72000)$ M1 for $"72000"\div 120$ A1 for $600\,\text{cm}^3$ min oe M1 for $\frac{1}{2}\times(120+80)\times 40\times 30\,(=120000)$ M1 for $"120000"\div"600"$ A1 for 200 minutes or 3 hours 20 mins oe SC B1 for 4 hours
12	(a)		1	1	B1 cao
	(b)		$8x^{18}y^{-3}$	2	M1 for $2^3x^{3\times6}y^{3\times-1}$ **or** $8x^{18}y^k$ (k ≠ 0) **Or** $8x^k y^{-3}$ (k ≠ 0) **or** $kx^{18}y^{-3}$ (k ≠ 0, k ≠ 1) **or** $2x^6y^{-1} \times 2x^6y^{-1} \times 2x^6y^{-1}$ A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
13	0.5×10^6	5×10^5	2	M1 for 0.5×10^6 or 500000 or $2.5\div0.5\times10^6$ or $0.5\times10^{9-3}$ Or $2500000000\div5000$ A1 cao
14*	$(2x-2)(2x+1)$ $+\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ $4x^2 - 2x - 2$ $+ x^2 + 4x - x - 4$ $= 5x^2 + x - 6$ Or $(2x-2)(3x+5)$ $-\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ $= 6x^2 - 6x + 10x - 10$ $- x^2 - 4x + x + 4$ $= 5x^2 + x - 6$	Show	4	M1 for correct expression for a single rectangle area $(2x-2)(2x+1)$ or $(2x-2)(3x+5)$ M1 for correct expression for triangle area $\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ M1 for all 4 terms correct with or without signs or 3 out of no more than four terms correct with signs in expansion of any two linear expressions. C1 for $5x^2+x-6$ and all steps clearly shown in a logical progression **QWC: All steps need to be clearly laid out showing a logical progression**

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
15	$\frac{2x}{x-1}-\frac{7x-3}{x^2-1}$ $=\frac{2x(x+1)}{x^2-1}-\frac{7x-3}{x^2-1}$ $=\frac{2x^2+2x-7x+3}{x^2-1}$ $=\frac{2x^2-5x+3}{x^2-1}$ $=\frac{(2x-3)(x-1)}{(x+1)(x-1)}$ $=\frac{2x-3}{x+1}$	$\frac{2x-3}{x+1}$	4	B1 for $x^2-1=(x+1)(x-1)$ M1 for correct process to obtain any common denominator M1 for correct expansion and simplification of numerator A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
15	Alternative method $\frac{2x}{x-1}-\frac{7x-3}{x^2-1}$ $=\frac{2x\left(x^2-1\right)}{(x-1)(x^2-1)}-\frac{(7x-3)(x-1)}{(x-1)(x^2-1)}$ $=\frac{2x(x^2-1)-(7x+3)(x-1)}{(x-1)(x^2-1)}$ $=\frac{2x^3-2x-7x^2+7+3x-3}{(x-1)(x^2-1)}$ $=\frac{2x^3-7x^2+8x-3}{(x-1)(x^2-1)}$ $=\frac{(2x-3)(x-1)^2}{(x+1)(x-1)^2}$ $=\frac{2x-3}{x+1}$	$\frac{2x-3}{x+1}$	4	Alternative Method M1 for correct process to obtain any common denominator B1 for $2x^3-2x-7x^2+7+3x-3$ M1 (dep on first M1) for correct expansion and simplification of numerator A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16*	$AOT = 90 - x$ (Angle between tangent and radius is 90°) $AOC = 90 + x$ (Tangents from an external point are equal) $ACB = 2(180 - (90 + x)) \div 2 = 90 - x$ Or Obtuse angle $BOA = 180 - 2x$ (Angle between tangent and radius is 90°) Reflex angle $BOA = 180 + 2x$ (Tangents from an external point are equal) $ACB = (360 - (180 + 2x)) \div 2 - 90 - x$		5	B1 for $AOT = 90 - x$ or OAT = 90° or OBT= 90° (may be shown on diagram) B1 for $AOC = 90 + x$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Tangents from an external point are equal. **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Tangents from an external point are equal, **QWC: proof should be clearly laid out with technical language correct**] **OR** B1 for obtuse angle $BOA = 180 - 2x$ or OAT = 90° or OBT= 90° (may be shown on diagram) B1 for reflex angle $BOA = 180 + 2x$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Tangents from an external point are equal. **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Tangents from an external point are equal, **QWC: proof should be clearly laid out with technical language correct**]

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16*	Alternative method $AOB = 360 - 2x - 90 - 90 = 180 - 2x$ (Angle between tangent and radius is 90^o) $ACB = (180 - 2x)/2$ (Angle at the circumference is half angle at the centre)			Alternative method B1 for $AOB = 360 - 2x - 90 - 90$ B1 for $ACB = (180 - 2x)/2$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Angle at the circumference is half angle at the centre **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Angle at the circumference is half angle at the centre **QWC: proof should be clearly laid out with technical language correct**] B3 maybe awarded for a fully correct alternative method.

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