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Mark Scheme (Results)

March 2011

GCSE

GCSE Mathematics (Modular) – 5MB2H

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		21	1	B1 cao
	(b)		$4n + 1$	2	M1 for $4n + k$ $(k \neq 1)$ A1 oe NB $n = 4n+1$ gets M1 only
2		$300 \div (2 + 3 + 5) \times 5$ $= 300 \div 10 \times 5$ $= 30 \times 5$	150	2	M1 for $300 \div (2 + 3 + 5)$ or $\times 5$ or 30 seen or 60 : 90 : 150 A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
3	$y = 2x + 3$ x: –3, –2, –1, 0, 1 y: –3, –1, 1, 3, 5	Line	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 ft for plotting at least 2 of their points (any points plotted from their table must be correct) A1 for correct line between –3 and 1 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x + 3$ 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 –3 and 1 **(Use of $y = mx + c$)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x + 3$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of 2 OR line drawn with a y intercept of 3 and a positive gradient A1 for correct line between –3 and 1

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
4	LCM (40, 24) = 120 Rolls 120 ÷ 40 = Sausages 120 ÷ 24 = OR Rolls 40 is 2×2×2 (×5) Sausages 24 is 2×2×2 (×3)	Rolls (packs) 3 Sausages (trays) 5 Hot dogs 120	5	M1 attempts multiples of either 40 or 24 (at least 3 but condone errors if intention is clear) M1 attempts multiples of both 40 and 24 (at least 3 but condone errors if intention is clear) M1 (dep on M1) for a division of 40 or 24 or counts up ‘multiples’ (implied if one answer is correct or answers reversed) A1 rolls (packs) 3, sausages (trays) 5 OR any multiple of 3,5 A1 hot dogs 120 or ft on both of their packs or ft ‘common multiple’ OR M1 expansion of either number into factors M1 demonstrates one of the expansions that includes 8 oe M1 demonstrates a 2nd expansion that includes 8 oe A1 cao for rolls (packs) 3, sausages (trays) 5 A1 hot dogs 120

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
5	Triangular face: ½ × 5 × 12 = 30 Rectangular faces: (13×10), (12×10),(5×10) Area: 30 + 30 + 130 + 120 + 50 =	360 cm^2	4	M1 for ½ × 5 × 12 (= 30) oe M1 for 2 + of (13×10) and (12×10) and (5×10) oe A1 cao NB: No marks awarded for calculating volume B1 (indep) units stated (cm^2)
6 (i)	180° – 160° =	20	3	B1 cao
(ii)	Exterior angles sum to 360° So 360 ÷ '20' =	18		M1 for 360 ÷ "20" A1 cao
7	½ × 6(10 + 8) – ½ × 3(7 + 5) = 54 – 18	36	3	M1 for ½ × 6(10 + 8) or ½ × 3(7 + 5) oe M1(dep) for ½ × 6(10 + 8) – ½ × 3(7 + 5) oe A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
8	**Park Palace**: 810 + 80 + 80 = £970 per adult 1/5 of 970 = 194 970 – 194 = £776 per child 970 + 970 + 776 + 776 = **£3492** **Dubai Grand**: 854 + 53 + 53 = £960 per adult 10% + 5% of 960 = 96 + 48 = 144 960 – 144 = £816 per child 960 + 960 + 816 + 816 = **£3552**	Park Palace £3492	6	M1 for identifying correct week for holiday (eg use of 854 for DG, eg circle correct row) M1 for using 7 nights for at least one hotel M2 for complete correct method for **reduction** of 1/5 **and** 15% for at least 5 nights (M1 for correct method to get 1/5 or 15% or 4/5 or 85% of a total for at least 5 nights) A1 for one correct total (3492 or 3552) A1 for 34 92 and 3552, with Park Palace (or 3492) indicated as the best choice.
9	8 km per 30 seconds = 16 km per minute = 16 × 60 = 960 km per hour 960 km/hr × 5 ÷ 8 = 600 miles per hour	600	3	M1 convert to km/h by × 2 × 60 or 960 seen or use of speed = distance ÷ time M1 convert distance to miles by × 5 ÷ 8 oe or sight of 5 miles A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
10	(2, 5, 6) to (–1, – 4, 2) is (– 3, – 9, – 4) (–1 –3, –4 – 9, 2 – 4) or $\frac{2+x}{2} = -1$, $\frac{5+y}{2} = -4$, $\frac{6+z}{2} = 2$	(– 4, –13, – 2)	2	M1 for a complete correct method for at least 1 coordinate (could be implied by 2 out of 3 coordinates correct) A1 cao
11 (a)		$3x + 6$	2	M1 for attempted expansion of the bracket eg $3\times x$ and 3×2 seen or $3x + k$ or $kx + 6$ A1 for $3x + 6$
(b)		$6xy(2x^2 – 3y)$	2	M1 or $6xy$ (two terms involving x and/or y) or correct partial factorisation by taking out two from 6 (or 3 or 2) or x or y A1 cao
(c)	$2x^2 + 8x – 3x –12$	$2x^2 + 5x – 12$	2	M1 for 3 out of 4 correct terms with correct signs, or all 4 terms ignoring signs A1 cao
(d)		$10\,x^7 y^5$	2	B2 for $10\,x^7 y^5$ (B1 for product of two of 5×2 oe, x^{4+3}, y^{3+2} ignore × signs)

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Question		**Working**	**Answer**	**Mark**	**Notes**
12	(i)		1	3	B1 cao
	(ii)		$\frac{1}{5}$		B1 for $\frac{1}{5}$ or 0.2
	(iii)		3		B1 cao (accept ± 3)
13	(a)		$y = 5x + c$	1	B1 for $y = 5x + c$ oe $c \neq 6$
	(b)	gradient = $-\frac{1}{m} = -\frac{1}{5}$ $y = -\frac{1}{5} + c$ $x = -2, y = 5$ $5 = \frac{2}{5} + c$ $c = 5 - \frac{2}{5} = 4\frac{3}{5}$ $y = -\frac{1}{5}x + 4\frac{3}{5}$	$y = -\frac{1}{5}x + 4\frac{3}{5}$	3	M1 recognition that gradient = $-\frac{1}{m} = -\frac{1}{5}$ oe M1 substitution of $x = -2$, $y = 5$ in $y = mx + c$ where $m = -\frac{1}{5}$, $\frac{1}{5}$ or -5 A1 $y = -\frac{1}{5}x + 4\frac{3}{5}$ oe

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Question	**Working**	**Answer**	**Mark**	**Notes**
14	$\frac{x^2-2x-15}{x^2-4x-21}=\frac{(x-5)(x+3)}{(x-7)(x+3)}$	$\frac{x-5}{x-7}$	3	M1 attempt to factorise numerator (at least one bracket correct) or $(x \pm 5)(x \pm 3)$ M1 attempt to factorise denominator (at least one bracket correct) or $(x \pm 7)(x \pm 3)$ A1 oe
15	Unknown length = $x + 3 – x – x$ = $3 – x$ **Cross-sectional area** $= (x + 3)(x –1) + (x + 3)(x –1) + (3 – x)(2x)$ $= x^2 +2x – 3 + x^2 + 2x – 3 + 6x – 2x^2$ $= 4x – 6 + 6x$ $= 10x – 6$ **Volume** $=(10x – 6)(x + 3)$ $= 10x^2 + 24x – 18$ **OR** Unknown length = $x + 3 – x – x$ = $3 – x$ **Volume** $= (x + 3)(x + 3)(x –1) + (x + 3)(x + 3)(x –1) + (2x)(3 – x)(x + 3)$ $= (10x – 6)(x + 3)$ $= 10x^2 + 24x –18$	$10x^2 + 24x– 18$	4	B1 for $x + 3 – x – x$ oe or $3 – x$ seen or $x – 1 + 2x + x – 1$ oe or $4x – 2$ seen M1 for correct expression for 1 area from cross-section or for 1 volume of cuboid(s) (brackets not needed) M1 for correct method for total cross-sectional area OR at least 2 volumes added OR volume of surrounding cuboid – at least 1 vol (brackets needed) A1 for $10x^2 + 24x – 18$ oe

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Question	Working	Answer	Mark	Notes
15 cont..	**OR** Unknown length = $(2x - 2) + 2x = 4x - 2$ **Surrounding area** $= (4x - 2)(x + 3) = 4x^2 + 10x - 6$ So A = $4x^2 + 10x - 6 - 4x^2 = 10x - 6$ So V = $(10x - 6)(x + 3) = 10x^2 + 24x - 18$ **OR** Unknown length = $(2x - 2) + 2x = 4x - 2$ **Surrounding volume** $= (4x - 2)(x + 3)(x + 3)$ $V = (4x - 2)(x + 3)(x + 3) - 2x(2x)(x + 3)$			

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16	*DE* = *AE*, and *AE* = *EB* (tangents from an external point are equal in length) so *DE* = *EB* *AE* = *EC* (given) Therefore *AE* = *DE* = *EB* = *EC* So *DB* = *AC* If the diagonals are equal and bisect each other then the quadrilateral is a rectangle. OR If *AE* = *DE* = *EB* = *EC* then there are four isosceles triangles *ADE*, *AEB*, *BEC*, *DEC* in which the angles *DAB*, *ABC*, *BCD*, *CDA* are all the same. Since *ABCD* is a quadrilateral this makes all four angles 90°, and *ABCD* must therefore be a rectangle.	Proof	4	B1 for *DE* = *AE* or *AE* = *EB* (can be implied by triangle *AED* is isosceles or triangle *AEB* is isosceles or indication on the diagram) OR <u>tangents</u> from an external <u>point</u> are <u>equal</u> in length B1 for *AE* = *DE* = *EB* = *EC* B1 for *DB* = *AC*, (dep on B2) OR consideration of 4 isosceles triangles in *ABCD* C1 fully correct proof. Proof should be clearly laid out with technical language correct and fully correct reasons

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