Mark Scheme (Results)

November 2011

GCSE Mathematics (5MM2H)
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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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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5MM2H_01					
Question		Working	Answer	Mark	Notes
1	(a)	$\dfrac{1}{0.625}$	1.6	1	B1 for 1.6 or $\frac{8}{5}$ or $1\frac{3}{5}$
	(b)	$\sqrt{15.625-3}=\sqrt{12.625}$	3.55	2	M1 for 15.625 – 3 or 12.625 or $\sqrt{\dfrac{200}{4}}$ A1 for 3.55(3…)
2	(a)	$\frac{1161}{9}=129,\;\;129\times5=645$	645	2	M1 for $\frac{1161}{9}$ or 1161 × 5 or sight of 129 or 5805 A1 cao
	(b)	$\dfrac{(13\times5)}{(20\times5)}$	65	2	M1 for $\frac{(13\times5)}{(20\times5)}$ or $\frac{13}{20}\times100$ or $13\times\frac{100}{20}$ A1 cao
3		$2\times(6\times5)\;+\;2\times(5\times12)\;+\;2\times(6\times12)$ $=60+120+144$ $=324$	324 cm^2	4	M1 for 5×6(=30) **or** 12×5(=60) **or** 6×12(=72) M1 for adding the areas of 5 or 6 faces, at least 4 of which must be correct A1 cao C1 (indep) for cm^2
4	(a)(i)		53	2	B1 cao
	(ii)		corresponding angles are equal		B1 for corresponding (angles) are equal or fully correct alternative reasons.
	(b)	$108+y=180$	72	2	B1 cao B1 for co-interior (or allied) or supplementary angles add to 180° Or Angles on a straight line add to 180° **and a**lternate angles **and** angles in a quadrilateral add to 360° Or fully correct alternative reasons.

5MM2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
5		$T = 5x + 7y$	3	B3 cao $T = 5x + 7y$ $T = 5×x + 7×y$ (B2 for $5 × x + 7×y$ seen Or $T = $ k $+ 7y$ where k $≠ 5x$ or $T = $ k $+ 7y$ where k $≠ 7y$ and k is algebraic or numerical B1 for $5 × x$ or $7 × y$ seen or $T = $ a linear expression in x and/or y)
6	$\frac{3}{4} × 120 = 90$, $\frac{1}{4} × 120 = 30$ $\frac{2}{3} × 90 = 60$, $\frac{20}{100} × 30 = 6$ 60 : 6	10 : 1	5	M1 for $\frac{3}{4} × 120$ oe or 90 or $\frac{1}{4} × $ 120 oe or 30 M2 (indep) for $(1 - × \frac{1}{3}) × $'90' oe (or 60) AND $\frac{(100-80)}{100 ×'30'}$ oe (or 6) (M1 (indep) for $1 - \frac{1}{3} × $'90' oe or 60 OR $\frac{(100-80)}{100 ×'30'}$ oe or 6 OR both $\frac{1}{3} × 90$ (=30) and $\frac{80}{100} × 30$ (=24) M1 (dep on at least M2) for '60' : '6' or 1 to 10 or 6 to 60 oe or reversed ratio 6:60 A1 10:1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)	$2 \times m - 3$	$2m - 3$	2	M1 for $2 \times m$ **or** $m - 3$ **or** $b \times m - 3$ A1 for $2m - 3$ oe **NB:** If additional variable is introduced as subject then ignore. If $2m - 3 = k$ where k is a number then ignore k
	(b)	$(n + 3) \div 2$	$\dfrac{n + 3}{2}$	2	M1 for $n + 3$ **or** $\dfrac{n \pm 3}{2}$ oe **or** $n + 3 \div 2$ **or** $\dfrac{n}{2} \pm 3$ or for a reverse flow chart with at least one correct inverse process identified A1 for $\dfrac{n + 3}{2}$ oe NB If additional variable is introduced as subject then ignore. If $\dfrac{n + 3}{2} = k$ where k is a number then ignore k
8	(a)		$-3, -2, -1, 0, 1$	2	B2 for all 5 correct values and no extras; ignore repeats, any order (-1 for each omission or additional value)
	(b)		$3 < x \le 5$	2	B2 for $3 < x \le 5$ **or** just >3 **and** ≤ 5 (B1 for $3 < x$ **or** $x \le 5$ **or** $5 \ge x$ **or** >3 **or** ≤ 5 **or** $3 \le x < 5$) **NB**: Accept the use of any letter other than x throughout and ignore any attempts to list integer values
	(c)	$4x \le 18 - 3$ $x \le \dfrac{15}{4}$	$x \le \dfrac{15}{4}$	2	M1 for intention to subtract 3 from both sides or divide each term by 4 **or** $(x =) \dfrac{15}{4}$ oe A1 for $x \le \dfrac{15}{4}$ oe

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		Area of cross-section 5×2 + 2×2 = 14 or 5×4 − 3×2 = 14 Volume of prism = 14×6 = 84 **or** 5 × 2 × 6 + 2 × 2 × 6 =60 + 24 =84 **or** 5 × 4 × 6 = 120 3 × 2 × 6 = 36 120 − 36 = 84	84	4	M1 for splitting cross-section into at least two rectangles **or** completing the enclosing rectangle M1 (dep) for a complete area, correct product for at least one rectangle M1 (dep) for 'area' × 6 A1 cao **or** M1 for splitting cuboid into at least two cuboids or completing the enclosing cuboid M1 (dep) for correct product for volume of at least one cuboid M1 (dep) for complete volume of prism (at least one product must be correct) A1 cao
10	(a)	$\dfrac{360}{5}$	72	2	M1 for a complete correct method to find exterior angle eg $\dfrac{360}{5}$ A1 cao
	(b)	180 − 72	108	2	M1 ft for 180 − '72' **or** ((5 − 2)×180)÷5 A1cao SC : If no marks scored in (a) or (b) then award 1 mark in (a) for sight of $\dfrac{360}{5}$ seen anywhere.

5MM2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
11	e.g. 70% = 17920 $1\% = \frac{17920}{70} (=256)$ $100\% = \frac{17920}{70} \times 100$	25600	3	M1 100%–30%, or 70% or 1 – 0.3 or 0.7 M1 for $\frac{17920}{70} \times 100$ or $\frac{17920}{0.7}$ A1 cao
12	$\dfrac{\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2}{2} = 12.5\pi$	39.3	5	M1 for $\pi \times 5^2$ (=78.5(39…)) **or** $\pi \times 10^2$ (=314(.159…)) **or** 100π **or** 25π M1 for $\frac{1}{2} \times \pi \times 10^2$ (=157(.07…)) **or** 50π M1 (dep on at least one of the previous Ms) for $\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2$ M1 (dep on previous M) for $(\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2) \div 2$ or $\dfrac{'157.07...'-'78.53....'}{2}$ or $25\pi/2$ A1 for answer in range 39.2 – 39.3 **or** M1 for $\pi \times 5^2$ (=78.5(39…)) **or** $\pi \times 10^2$ (=314(.159…)) **or** 100π **or** 25π M1 for $\frac{1}{4} \times \pi \times 10^2$ (=78.5(398…)) **or** 25π M1 for $\frac{1}{2} \times \pi \times 5^2$ (=39.2(69…)) **or** 12.5π M1(dep on 2 previous Ms) for '78.5' – '39.2' A1 for answer in range 39.2 – 39.3

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		1, –3, 6	2	B2 for all 3 correct (B1 for 1 or 2 correct)
	(b)		Graph	2	B2 for a fully correct graph **or** B1 ft for all their points plotted correctly ±2mm B1 for a smooth curve drawn through their points provided B1 awarded in (a)
	(c)		1.7, −1.7	2	B1 for −1.6 to −1.8 or ft from their graph B1 for 1.6 to 1.8 or ft from their graph
14		$(AC=) \sqrt{(8^2 - 5^2)} = 6.244(9...)$ $(BPC=) 0.5×π×8 = 12.56(6...)$ $5 + 6.244(9...) + 12.56(6...)$	23.8	5	M1 for $8^2 - 5^2$ or $AC^2 + 5^2 = 8^2$ M1 for $\sqrt{(8^2 - 5^2)}$ (=6.24(4..)) with least one of 8^2 or 5^2 correctly evaluated. M1 for $8π$ (=25.13 to 25.13(2...)) or $8π/2$ or $4π$ (=12.56(6...)) using π=3.14 or better M1 for 5 + their AC + their arc PBC A1 for 23.7 – 23.9
15	(i)		B	3	B1 cao
	(ii)		G		B1 cao
	(iii)		E		B1 cao

5MM2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16	e.g. $x + 1 : 3 : x - 1$ $(\times 10)\ 10x + 10 : 30 : 10x - 10$ $10x + 10 + 30 + 10x - 10 = 60$ $20x = 30$ $x = 1.5$	1.5	5	M2 for $10\times (x{+}1)$ and $10\times (x{-}1)$ (M1 for $x + 1 + 3 + x - 1$ or $2x + 3$ oe or $x + 1 + x - 1 = 30$ or $x = 15$) M1 for '$10x{+}10$'$+30+$'$10x{-}10$' $= 60$ or '$10x{+}10$' $+$'$10x{-}10$' $= 30$ oe M1 for an attempt to reduce the form $ax = b$ (condone one error) A1 cao
17	$2 \times 10\cos70$ OR $BC^2 = 10^2 + 10^2 -$ $2\times10\times10\times\cos40$ $BC = \sqrt{46.79(1....)}$	6.84	4	M1 for $180 - 2\times70$ M1 for $\dfrac{10}{\sin 70} = \dfrac{BC}{\sin(180 - 2\times70)}$ M1 for $BC = \dfrac{\sin(180 - 2\times70)\times10}{\sin 70}$ A1 for 6.84(0…) OR M1 for $180 - 2\times70$ M1 for $10^2 + 10^2 - 2\times10\times10\times\cos(180 - 2\times70)$ M1 for $\sqrt{'46.79(1....)'}$ A1 for 6.84(0…) M1 for perpendicular from A to BC, may be implied by correct working M1 for $10\times\cos70$ or $10\times\sin20$ or correct attempt to use sin or cos M1 for $2\times$ '$10\times\cos70$' A1 for 6.84(0...)

5MM2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
17	$2 \times 10\cos70$ OR $BC^2 = 10^2 + 10^2 - 2\times10\times10\times\cos40$ $BC = \sqrt{46.79(1....)}$	6.84	4	M1 for $180 - 2\times70$ M1 for $\dfrac{10}{\sin 70} = \dfrac{BC}{\sin(180 - 2\times70)}$ M1 for $BC = \dfrac{\sin(180 - 2\times70)\times10}{\sin 70}$ A1 for 6.84(0…) OR M1 for $180 - 2\times70$ M1 for $10^2 + 10^2 - 2\times10\times10\times\cos(180 - 2\times70)$ M1 for $\sqrt{'46.79(1....)'}$ A1 for 6.84(0…) M1 for perpendicular from A to BC, may be implied by correct working M1 for 10×cos70 or 10×sin20 or correct attempt to use sin or cos M1 for 2× '10×cos70' A1 for 6.84(0...)

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$(1 + 0.05) \times 1500 = 1575$ $(1 + 0.05) \times 1575 = 1653.75$ $1.1 \times 1500 = 1650$ OR $1.05 \times 1.05 = 1.1025$	No + reason	4	M1 for $(1 + 0.05) \times 1500$ oe or 1575 M1 (dep) for $(1 + 0.05) \times$ '1575' (=1653.75) OR M2 for $(1 + 0.05) \times (1 + 0.05) \times 1500$ (=1653.75) Or 1.1025×1500 (=1653.75) M1 for 1.1×1500 or 1650 C1 for No with justification comparing 2 correct values, $1653.75 > 1650$ oe <u>Alternative</u> M1 for 1.05 M2 for $(1.05)^2$ M1 for 1.1 C1 for No with justification comparing 2 correct values $1.1 < 1.1025$ oe, $0.1 < 0.1025$ oe, $10\% < 10.25\%$ oe or
19	(a)	$\dfrac{9}{6} \times 1.5$ or $\dfrac{7.5}{6} \times 9 - 9$	2.25	2	M1 for $\dfrac{6}{1.5}, \dfrac{1.5}{6}, \dfrac{9}{6}, \dfrac{6}{9}, \dfrac{7.5}{6}$ or $\dfrac{6}{7.5}$ oe used as scale factor A1 cao
	(b)	$0.5 \times 6 \times 9 \times \sin 30$	13.5	2	M1 for attempt to use $0.5 \times 6 \times 9 \times \sin 30$ or any other complete correct method. A1 cao

Question		Working	Answer	Mark	Notes
20	(a)	$2 \times (2.5 \times 10^{-3}) \times (1.8 \times 10^{-3}) =$ 9×10^{-6} $(2.5 \times 10^{-3}) - (1.8 \times 10^{-3}) = 7 \times 10^{-4}$ $\dfrac{9 \times 10^{-6}}{7 \times 10^{-4}} = 1.29 \times 10^{-2}$	1.29×10^{-2}	3	M1 for $2 \times (2.5 \times 10^{-3}) \times (1.8 \times 10^{-3})$ OR 9×10^{-6} or 0.000009 oe seen OR $(2.5 \times 10^{-3}) - (1.8 \times 10^{-3})$ or 7×10^{-4} oe seen M1 for $\dfrac{"9 \times 10^{-6}"}{"7 \times 10^{-4}"}$ (= 0.0128 to 0.0129) with at least one of numerator or denominator correct. A1 for 1.28×10^{-2} to 1.29×10^{-2}
	(b)	$x \times (y - a) = 2ay$ $xy - xa = 2ay$ $xy - 2ay = xa$ $y(x - 2a) = xa$ $y = \dfrac{xa}{x - 2a}$	$(y =) \dfrac{xa}{x - 2a}$	4	M1 for $x \times (y - a)$ or $xy \pm xa$ or $xy \pm a$ M1 for $xy \pm 2ay = \ldots$ M1 for $y(x \pm 2a) = \ldots$ A1 for $y (=) \dfrac{xa}{(x - 2a)}$ oe
21		Gradient $= \dfrac{-1}{(2)}$ $y = -0.5x + c$ $2 = -0.5(-1) + c$ $c = 1.5$	$y = -0.5x + 1.5$	3	M1 for a clear attempt to use $\dfrac{-1}{m}$ or $\dfrac{-1}{2m}$ or -0.5 seen M1 for an attempt to use their gradient with $(-1, 2)$ in a correct equation, e.g. $2 = '-0.5'(-1) + c$ or $y - 2 = '-0.5'(x - (-1))$ A1 for $y = -0.5x + 1.5$ oe

Question		Working	Answer	Mark	Notes
22		$6x - 9y = 36$ $6x + 10y = -2$ $19y = -38$ $2x - 3 \times -2 = 12$ OR $10x - 15y = 60$ $9x + 15y = -3$ $19x = 57$ $2 \times 3 - 3y = 12$ OR $x = \dfrac{(12 + 3y)}{2}$ $\dfrac{3(12 + 3y)}{2} + 5y = -1$ $36 + 9y + 10y = -2$ $19y = -38$ $x = \dfrac{(12 + 3 \times -2)}{2}$	$x = 3, y = -2$	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either $x = 3$ or $y = -2$ M1 (dep) for correct substitution of their found variable OR M1 for correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both $x = 3$, $y = -2$ [SC B1 for $x = 3$ or $y = -2$ if M0 scored]
23		$P = k/x^2$ $6 = k/5^2$ $(k = 150)$ $P = \dfrac{150}{8^2}$	2.34	3	M1 for $P = k/x^2$ or $P \propto k/x^2$ M1 for $6 = k/5^2$ or $(k =)$ 150 seen or $6 \times 5^2 = P \times 8^2$ A1 2.34
24	(i)		$(-2, 1)$	3	B1 cao
	(ii)		$(-1, 3)$		B1 cao
	(iii)		$(2, 3)$		B1 cao