

Mark Scheme (Results)

November 2011

GCSE Mathematics (5MM1H)
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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5MM1H_01					
Question		Working	Answer	Mark	Notes
4	(a)		4	1	B1 cao
	(b)	$14 - 4 - 8 = 2$	2	3	M1 for $4 \times 2 (=8)$ blue counters M1 for $14 - "8" - 4$ or $10 - "8"$ A1 cao or M1 for $P(B) = 2 \times \frac{4}{14}$ oe ($= \frac{8}{14}$ oe) M1 for $1 - \frac{"8"}{14} - \frac{4}{14}$ oe or $P(Y) = \frac{2}{14}$ oe or $\frac{2}{14} \times 14$ oe A1 cao
5	(a)		Triangle at (2,2),(6,2) and (2,10)	2	B2 fully correct answer (B1 correct enlargement incorrect centre)
	(b)		A rotation about (0,0) clockwise through 90	3	B1 Rotation B1 90° clockwise or 270° (anticlockwise) B1 for (0,0) or <i>O</i> or origin NB: a combination of transformations gets B0
	(c)		Triangle at (-2,3), (2,3) and (-2,1)	2	B2 fully correct answer (B1 for any translation)

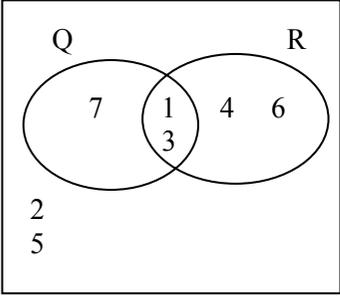
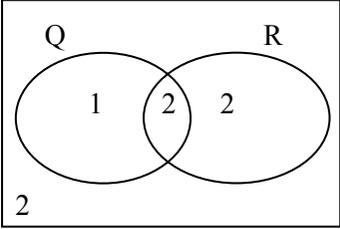
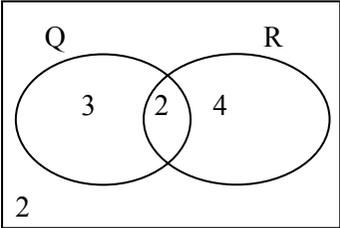
5MM1H_01

Question		Working							Answer	Mark	Notes	
6	(i)	+	1	2	3	4	5	6	$\frac{2}{36}$	$\frac{1}{18}$	6	M1 for listing / identifying the 2 outcomes (5,6) and (6,5) or $(\frac{1}{6} \times \frac{1}{6}) + (\frac{1}{6} \times \frac{1}{6})$ A1 for $\frac{2}{36}$ oe
		1	2	3	4	5	6	7				
		2	3	4	5	6	7	8				
		3	4	5	6	7	8	9				
		4	5	6	7	8	9	10				
		5	6	7	8	9	10	11				
		6	7	8	9	10	11	12				
	(ii)									Incorrect and reason		M1 for identifying there are 36 outcomes, eg 36 seen or outcomes listed or shown in a table (can be earned in (i)) M1 for attempt to list or find the number of outcomes giving a total of 5 or more (allow one error, omission or extra outcome), eg 30 (or 29 or 31) seen or outcomes listed or identified in table. A1 $\frac{30}{36}$ oe C1 (dep M2) for conclusion that Savio is incorrect with supportive evidence (including clear reference to their probability for a total of 5 or more). Alternative M1 for identifying there are 36 outcomes, eg 36 seen or outcomes listed or shown in a table (can be earned in (i)) M1 for outcomes giving a total of <u>less</u> than 5 eg 6 total outcomes, outcomes listed or identified in table A1 $\frac{30}{36}$ oe C1 (dep M2) for conclusion that Savio is incorrect with supportive evidence (including clear reference to their P(5 or more) or comparison of P(less than 5) with $\frac{1}{4}$ oe).

5MM1H_01					
Question		Working	Answer	Mark	Notes
7	(a)	$7 \times 4 \div 2$	14	2	M1 for $7 \times 4 \div 2$ A1 cao
	(b)		Pair of numbers with product 4 eg 1,14 or 2,7	2	ft B2 correct pair (B1 one correct dimension seen unless clearly working with perimeter not area)
8	(i)		$\frac{8}{40}$	1	B1 $\frac{8}{40}$ oe
	(ii)	$\frac{1}{40} + \frac{9}{40}$ $\frac{10}{40}$	$\frac{10}{40}$	3	M1 for $\frac{1}{40}$ or $\frac{9}{40}$ M1 for $\frac{1}{40} + \frac{9}{40}$ or $1 + 9 (=10)$ A1 $\frac{10}{40}$ oe Note: Award 0 marks for $\frac{2}{8}$ without working in (ii) if $\frac{2}{8}$ seen in (i)

5MM1H_01				
Question	Working	Answer	Mark	Notes
9	(a) 2 -1 0 1 2 3 4 1 3 5 7 9 11 13 Or Using $y = mx + c$, gradient =2, y intercept = 5		3	<p>(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 correct) A1 for correct line between -2 and 4</p> <p>(No table of values) M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y - 2x = 5$ 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 -2 and 4</p> <p>(Use of $y=mx+c$) M2 line segment of $y - 2x = 5$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of 2 OR line drawn with a y intercept of 5 and a positive gradient) A1 for correct line between -2 and 4</p>
	(b)(i)	4		B1 Allow 3.8 to 4.2 inclusive either by substitution or ft from a straight line segment ($\pm 2\text{mm}$)
	(ii)	1.6		B1 Allow 1.4 to 1.8 inclusive either by substitution or ft from a straight line segment ($\pm 2\text{mm}$) Note: Condone alternative or additional value - 1.4 to - 1.8 inclusive ft from straight line segments

5MM1H_01					
Question		Working	Answer	Mark	Notes
10	(a)		4	1	B1 cao
	(b)		7 or (0,7)	1	B1 cao
11		$180 - x$	$\frac{180 - x}{2}$ Or $90 - \frac{x}{2}$	2	M1 for $180 - x$ seen (eg $180 - x \div 2$) A1 correct expression
12	(a)		$3x(x-2)$	2	B2 $3x(x-2)$ (or B1 for partial factorisation $3(x^2-2x)$ or $x(3x-6)$)
	(b)	$6y + 21 + 4y - 20 = 10y + 1$	$10y + 1$	2	M1 $3 \times 2y + 3 \times 7$ or $4 \times y - 4 \times 5$ or $10y$ A1 cao
	(c)	$12 = 5x - 10$	4.4 or $4\frac{2}{5}$ or $\frac{22}{5}$	3	M1 one correct manipulation either $5x - 10$ or $\frac{12}{5}$ M1 for intention to add 10 to both sides Or intention to add 2 to both sides eg $12 + 10 = 5x$ or $\frac{12}{5} + 2 = x$ A1 4.4 or $\frac{22}{5}$ oe

5MM1H_01				
Question	Working	Answer	Mark	Notes
13			4	<p>M1 for an attempt at classification, eg by writing Q in an appropriate shape or writing an appropriate shape number next to set Q</p> <p>M1 for correct placement of any shape number in the Venn diagram.</p> <p>A1 for all shape numbers in sets Q and R correctly placed</p> <p>A1 for 2 and 5 outside of Q and R</p> <p>SC B2 for giving total number of elements in each part of Venn diagram:</p>  <p>SC B1 for:</p> 

5MM1H_01				
Question	Working	Answer	Mark	Notes
14	(a) 4 by 8	32	1	B1 cao
	(b)	$2n^2$	2	M1 for quadratic expression in n A1 for $2n^2$ oe
	(c) $200 \div 2 = 100, \sqrt{100} = 10$	Yes and reason	2	B2 for yes and $10 \times 20 = 200$ or $2 \times 10^2 = 200$ or $\sqrt{200} \div 2 = 10$ or completes sequence up to and including 200 (B1 for using $2n^2$ oe or 50 and 72 seen or statement that 200 is 10 th term)
15	(a) $30+70+80=180$ Angles are the same	Yes and reason	2	M1 sight of 30,70,80 (from angles in triangle add to 180) A1 (dep on award of M1) Angles are the same
	(b) – –	13.5	2	M1 6/4 oe scale factor seen or 4/6 oe scale factor seen A1 cao
16	47000, 4700, 0.407, 47 0.407, 47, 4700, 47000 407×10^{-3} , 0.47×10^2 , 4700, 4.7×10^4	407×10^{-3} , 0.47×10^2 , 4700, 4.7×10^4	2	M1 Converting all to same form A1 Fully correct ordering of numbers in standard form (SC B1 if one incorrectly placed or all 4 in reverse order)
17	$\frac{(x-3)(x+3)}{(x-3)(x+4)}$	$\frac{(x+3)}{(x+4)}$	3	B1 $(x-3)(x+3)$ B1 $(x-3)(x+4)$ B1 $\frac{(x+3)}{(x+4)}$

5MM1H_01				
Question	Working	Answer	Mark	Notes
18	(a) 180-90-34=56 90-56=34	$x=34^\circ$ Reason	2	B1 34° B1 for <u>Alternate segment theorem</u> Or B1 34° B1 for all reasons: <u>Angles</u> in a <u>semicircle</u> are <u>90°</u> <u>Angles</u> in a <u>triangle</u> add up to <u>180°</u> The <u>tangent</u> to a circle is <u>perpendicular</u> (90°) to the <u>radius</u> (diameter)
	(b) 130/2=65 90-65=25°	25° Reasons	4	M1 for 90 - 130/2 A1 cao C2 for both reasons The <u>angle</u> at the <u>centre</u> of a circle is <u>twice the angle</u> at the <u>circumference</u> . <u>Angles</u> in a <u>semicircle</u> are <u>90°</u> (C1 for one reason)
19	(a)	1	1	B1cao
	(b)	$\frac{1}{14}$	1	B1cao
	(c)	9	2	M1 for 3 ² or ($\sqrt[3]{27}$) ² or $\sqrt[3]{27^2}$ A1 cao

5MM1H_01				
Question	Working	Answer	Mark	Notes
20		Proof shown	3	<p>M1 For expressing a general pair of two odd numbers algebraically eg $2n+1, 2m+1$ or $2n-1, 2m-1$ or $2n-1, 2m+1$ or</p> <p>For expressing a pair of two consecutive or identical odd numbers algebraically eg $2m+1, 2m+3$ or $2n-1, 2n+1$ or $2n+1, 2n+1$</p> <p>M1 (dep) for showing addition of 2 algebraic expressions which are a general pair of 2 odd numbers , not a consecutive pair eg $2n+1 + 2m+1$s</p> <p>A1 Simplified expression for sum eg $2n + 2m + 2$ and correct reasoning that it is divisible by 2 eg $2n+2m+2$ is divisible by 2 or 2 is a factor of $2n+2m+2$ or $2(n + m + 1)$</p> <p>SC B1 for using 2 different variables (eg m and n) which are defined as even and then used to form expressions for 2 general odd numbers eg $n+1$ and $m+1$</p>

5MM1H_01				
Question	Working	Answer	Mark	Notes
21	(a)	$1 - \frac{2}{9}$	1	B1 $\frac{7}{9}$ oe
	(b)(i)	Tree diagram or $\frac{5}{9} \times \frac{1}{9} + \frac{1}{9} \times \frac{5}{9}$	5	<p>B1 for $\frac{5}{9}$ or $\frac{1}{9}$ seen</p> <p>M1 Indication of correct 2 branches from a tree diagram leading to $\frac{5}{9} \times \frac{1}{9} + \frac{5}{9} \times \frac{1}{9}$ seen</p> <p>A1 $\frac{10}{81}$</p> <p>Or</p> <p>B1 $\frac{5}{9}$ or $\frac{1}{9}$ seen</p> <p>M1 $\frac{5}{9} \times \frac{1}{9} \times 2$</p> <p>A1 $\frac{10}{81}$</p> <p>Alternative Scheme - Without Replacement</p> <p>B1 for $\frac{5}{9}$ or $\frac{1}{9}$ seen</p> <p>M1 Indication of correct 2 branches from a tree diagram leading to $\frac{5}{9} \times \frac{1}{8} + \frac{1}{9} \times \frac{5}{8}$ seen</p> <p>A0 for $\frac{10}{72}$</p>
5MM1H_01				

Question	Working	Answer	Mark	Notes
21	(ii) $\frac{1}{9} \times \frac{5}{9} + \frac{3}{9} \times \frac{5}{9} + \frac{5}{9} \times \frac{5}{9}$ $+ \frac{5}{9} \times \frac{3}{9} + \frac{5}{9} \times \frac{1}{9}$ $\frac{5}{81} + \frac{15}{81} + \frac{25}{81} \times \frac{15}{81} + \frac{5}{81}$ or $1 - \frac{4}{9} \times \frac{4}{9}$	$\frac{65}{81}$		M1 adding at least 3 of the 5 products for correct combinations with at least one white A1 for $\frac{65}{81}$ Alternative M1 $1 - \frac{4}{9} \times \frac{4}{9}$ A1 for $\frac{65}{81}$ Alternative scheme – without replacement M1 adding at least 3 of the 5 products for correct combinations with at least one white $\frac{1}{9} \times \frac{5}{8} + \frac{3}{9} \times \frac{5}{8} + \frac{5}{9} \times \frac{5}{8}$ $+ \frac{5}{9} \times \frac{3}{8} + \frac{5}{9} \times \frac{1}{8}$ A0 for $\frac{65}{72}$ Alternative M1 $1 - \frac{4}{9} \times \frac{3}{8}$ A0 for $\frac{60}{72}$
5MM1H_01				

Question		Working	Answer	Mark	Notes
22	(a)	$\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	$\frac{6\sqrt{5}}{5}$	2	M1 $\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ A1 cao
	(b)	$2\sqrt{5} + \sqrt{10} \sqrt{5} + 2\sqrt{20} + \sqrt{10} \sqrt{20}$ $2\sqrt{5} + \sqrt{50} + 2\sqrt{20} + \sqrt{200}$ $2\sqrt{5} + 5\sqrt{2} + 4\sqrt{5} + 10\sqrt{2}$	$6\sqrt{5} + 15\sqrt{2}$	4	M1 for 3 of no more than 4 correct terms of expansion, (may be shown in a table or without + signs) $2\sqrt{5} + \sqrt{10} \sqrt{5} + 2\sqrt{20} + \sqrt{10} \sqrt{20}$ oe M1 or $\sqrt{50}$ or $\sqrt{(10 \times 5)}$ or $\sqrt{200}$ or $\sqrt{(20 \times 10)}$ M1 $5\sqrt{2}$ or $10\sqrt{2}$ or $4\sqrt{5}$ A1 cao
23	(a)	$(x-8)(x+2)$	8 or -2	3	M1 for $(x \pm 8)(x \pm 2)$ A1 for 8 A1 for -2 (Note: If trial and improvement used, both answers must be correct for award of marks)
	(b)	$x + 2 = 8$ $x + 2 = -2$ $x^2 + 4x + 4 - 6x - 12 - 16 = 0$ $x^2 - 2x - 24 = 0$ $(x-6)(x+4)$	6 and -4	2	M1 for $x + 2 = 8$ or $x + 2 = -2$ A1 both 6 and -4 cao Or M1 for multiplying out the brackets to give $x^2 + 4x + 4 - 6x - 12 - 16 = 0$ oe A1 both cao

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