Mark Scheme (Results)

June 2012

GCSE Mathematics (2MB01)
Paper 5MB1H_01 (Calculator)

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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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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)	$1 - (0.15 + 0.32 + 0.27)$ $1 - (15 + 32 + 27)$ $1 - (\frac{15}{100} + \frac{32}{100} + \frac{27}{100})$	0.26 26% $\frac{26}{100}$ (oe)	2	M1 for $1 - $ "$(0.15 + 0.32 + 0.27)$" oe A1 for 0.26 or $\frac{26}{100}$ (oe) or 26% (must include the % sign) [Note: 0.26 seen in the table and contradicted by an incorrect answer on the answer line gets M1A0]
	(b)	0.15×300	45	2	M1 for 0.15×300 (= 45) oe A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
2	(a)	96 ÷1.20 OR 1÷1.2 = 0.833… 96 × 0.833…	80	2	M1 for 96 ÷1.20 or 1÷1.2 (= 0.833…) and 96 × "0.833…" A1 cao
	(b)	64.80 ÷1.20 = £54 OR 52.50 × 1.20 = €63 OR 64.80 ÷ 52.50 = 1.23(428….)	Comparison	3	M1 for 64.80÷1.20 A1 for £54 ('£' sign must be included although this could be quoted in their comparison, eg difference of £1.50) C1 (dep on M1) for more (expensive) in Paris oe or ft from their '£54' (the difference in cost is not required but one of the values compared must be one of the values given) OR M1 for 52.50 × 1.2 A1 for €63 ('€' sign must be included although this could be quoted in their comparison, eg difference of €1.80) C1 (dep on M1) for less (expensive) in Manchester oe or ft from their '€63' (the difference in cost is not required but one of the values compared must be one of the values given) OR M1 for 64.80 ÷ 52.50 A1 for 1.23(428….) C1 (dep on M1) for more expensive in Paris since the exchange rate of 1.23(428…) is greater than the given exchange rate of 1.20

Question		Working	Answer	Mark	Notes
3	(a)		(5, 300) plotted	1	B1 for points plotted at (5, 300) allow ± ½ square tolerance
	(b)		The greater the age the less the value	1	B1 for the greater the age the less the value (price, cost etc.) oe Accept negative correlation, but "negative" or "negative relationship" gets B0
	(c)		500 to 800 inc.	2	B2 for an answer in the range 500 to 800 (inc.) OR M1 for a single straight line segment with negative gradient that could be used as a line of best fit A1 ft reading from their line of best fit at Age = 4 [SC: B1 ft reading from their single line of best fit (must be of negative gradient) at Age = 4 if M0 scored]

Question	Working	Answer	Mark	Notes
*4	$2 \times 39.50 + 3 \times 23.75 = 150.25$ $150.25 \div 3 = 50.08(33..)$ $150.25 - 50.08(33..) = 100.16(66..)$ $2 \times 40.25 + 3 \times 21.85 = 146.05$ $146.05 \div 4 = 36.51(25)$ $146.05 - 36.51(25) = 109.53(7)$ $2 \times (1 - \frac{1}{3}) \times 39.50$ $+ 3 \times (1 - \frac{1}{3}) \times 23.75$ $+ 2 \times 0.75 \times 40.25$ $+ 3 \times 0.75 \times 21.85$	Easy ferry	5	M1 for 2×39.50 (=79)　　or 3×23.75 (= 71.25) 　　or 2×40.25 (= 80.50) or 3×21.85 (= 65.55) M1 for 2×39.50+3×23.75 (=150.25) and 2×40.25+3×21.85 (=146.05) M1 for $(1 - \frac{1}{3}) \times$ '150.25' oe or (100 – 25)% × '146.05' oe A1 for (£)100.16 to (£)100.17 and (£)109.53 to (£)109.54 C1 for "Easy Ferry is cheaper" oe or ft from their 2 totals provided at least 2 Ms scored and it is clearly stated which total relates to which ferry company OR M1 for $(1 - \frac{1}{3}) \times 39.50$ oe (= 26.33) or $(1 - \frac{1}{3}) \times 23.75$ oe (=15.83) or (100 – 25)% × 40.25 oe (= 30.19) or (100 – 25)% × 21.85 oe (= 16.39) M1 for 2×"26.33" (= 52.66) or 3×"15.83" (= 47.50) 　　or 2×"30.19" (= 60.38) or 3×"16.39 (= 49.17) M1 for 2×"26.33" + 3×"15.83" and 2×"30.19" + 3×"16.39 A1 for (£)100.15 to (£)100.16 and (£)109.55 C1 for "Easy Ferry is cheaper" oe or ft from their 2 totals provided at least 2 Ms scored and it is clearly stated which total relates to which ferry company

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Question		Working		Answer	Mark	Notes
5	(a)			<table><tr><td>5</td><td>9</td></tr><tr><td>6</td><td>3 5 6 6</td></tr><tr><td>7</td><td>1 2 5 5 6 7 9 9</td></tr><tr><td>8</td><td>3 9</td></tr></table> Key: eg, 7/2 represents 72	3	M1 for at least 2 correct 'rows' with correct stem and correct ordered or unordered leaf Note: stem could be 5,6,7,8 or 50,60,70,80 A1 for a fully correct ordered stem and leaf diagram B1 for a key [Ignore spacing on leaves provided the order is` correct]
	(*b)	<table><tr><td>Gill</td><td>Jamal</td></tr><tr><td>HV 95 ></td><td>HV 89</td></tr><tr><td>LV 75 ></td><td>LV 59</td></tr><tr><td>Mean 80 ></td><td>Mean 73</td></tr><tr><td>Range 20 <</td><td>Range 30</td></tr></table>		Comparison	5	M1 for '72+59+76+...'÷15 or 1095 ÷ 15 (= 73) M1 for 95 – 75 (=20) **or** '89' – '59' (= 30) or '89' and '59' seen ft from their stem and leaf diagram in (a) A1 for mean of Jamal's scores is 73 cao or for ranges of 20 and 30 cao C1 (dep on first M1) ft for a correct comparison of mean scores, e.g. Gill's mean score > Jamal's mean score oe C1 ft for a correct comparison of ranges, (dep on M1 awarded for correct method to find range) e.g. The range of Gill's scores < The range of Jamal's scores **or** a correct comparison of both end values (dep on M1 awarded for '89' and '59' seen) , e.g. Gill's lowest score > Jamal's lowest score and Gill's highest score > Jamal's highest score. oe [For the award of C2, the word 'score' must be explicitly stated. If not deduct 1 mark]

Question		Working	Answer	Mark	Notes
6		(7×35 + 22×45 + 34×55 + 12×65) ÷75 = (245 +990 + 1870 + 780) ÷75 = 3885 ÷75	51.8	4	M1 for use of *fs* with *s* consistent within intervals (including end points) accept one error M1 (dep) for use of *s* as the correct midpoints [Note: ∑*fs* = 3885 seen automatically gets the first two method marks] M1 (dep on 1st M1) for use of ∑"*fs*" ÷75 (or divided by their total of 7+22+34+12 if 75 not used) A1 cao
7	(a)		(4), 11, 24, 36, 40	1	B1 for all correct
	(b)			2	B1 ft for 4 or 5 "points" plotted correctly ± ½ full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative Ignore any part of graph outside the range of their points (SC: B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)
	(c)		36.5 to 38 (inc.)	1	B1 for an answer in the range 36.5 to 38 (inc.) or ft (dep on graph being cf) for reading from graph at 20 ± 1 full (2mm) square

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Question		**Working**	**Answer**	**Mark**	**Notes**
8		(23×153 + 17×165) ÷ (23+17)	158.1	3	M1 for 23×153 (= 3519) or 17×165 (= 2805) M1 for '3519' + '2805' (= 6324) ÷ '40' (= 23+17) A1 cao [An answer of 158 with no working gets no marks]
9	(a)		Box plot	2	B2 for correct box plot (B1 for box plot with at least 3 pieces of information correctly plotted) Note: There must be a box
	(b)	75% × 60	45	2	M1 for 0.75 × 60 oe A1 cao [SC: B1 for an answer of 15 if M0 scored]

	Question	Working	Answer	Mark	Notes
10	(a)		e.g. How often do you visit the sport centre each week? 0, 1, 2, 3 more	2	B1 for an appropriate question with reference to a time period or a question with time period implied by responses B1 for at least 3 non-overlapping boxes (ignore if not exhaustive) **or** for at least 3 exhaustive boxes (ignore if any overlapping) [Note: labels on response boxes must **not** be inequalites] Do not accept frequency tables or data collection sheets
	(b)		Reason	1	B1 for a correct reason, e.g. may be biased, sample too small, not a random sample, ……
	(c)	e.g. 45/365 × 50 = 6.16...	6	2	M1 for 45/365 × 50 (= 6.16….) oe A1 for 6 OR M1 for an attempt to divide 50 in the ratio 45:320 oe A1 for 6

Question	Working	Answer	Mark	Notes
11	$\dfrac{40}{N} = \dfrac{5}{50}$	400	2	M1 for an attempt to compare fractions, e.g. $\dfrac{40}{N} = \dfrac{5}{50}$ or $40 \times 50 = 5 \times N$ or $40:N = 5:50$ A1 cao OR M1 for an attempt to compare percentages, e.g. $\dfrac{5}{50} \times 100 = 10\%$ or $10\% \times N = 40$ A1 cao [SC: B1 for sight of $\dfrac{40}{N}$ or $\dfrac{5}{50}$ if M0 scored]

Question		Working	Answer	Mark	Notes
12	(a)		Tree diagram with p and $1 - p$ on branches	2	B2 cao (B1 for $1 - p$ seen on at least one branch)
	(b)		$p \times p$	1	B1 for $p \times p$ or p^2 or pp oe
	(c)		$p \times (1 - p) + p \times (1 - p)$	2	M1 for $p \times$ '$(1 - p)$' oe, provided the expression is in terms of p only OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer OR M1 for $1 - p \times p - $ '$(1 - p)$' $\times$ '$(1 - p)$' oe OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer [SC B1 for $2 \times f \times (1 - f)$, where f is a fraction or decimal less than 1 used as a value for p in tree diagram]

Question	Working	Answer	Mark	Notes
13	$\dfrac{17.24}{57} \times 285 = 86.2$ $\dfrac{86.2}{285} \times 285 = 86.2$ $\dfrac{431}{1425} \times 285 = 86.2$	86 or 87 .	3	M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 0.2** $285 \div [21+9.8+11.2+10+5 \ (=57)] \ (= 5)$ At least 3 of these 5 frequency values must be correct M1 for ('2.24'+10+5) × '5' A1 for 86 or 87 (accept 86.2) OR M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 1** $285 \div [105+49+56+50+25 \ (=285)] \ (= 1)$ At least 3 of these 5 frequency values must be correct M1 for ('11.2'+50+25) × '1' A1 for 86 or 87 (accept 86.2) [SC: B1 can be awarded for correct labelling of fd axis using the scale of 1cm = 1 if M0 scored] OR M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 5** $285 \div [525+245+280+250+125 \ (=1425)] \ (= 0.2)$ At least 3 of these 5 frequency values must be correct M1 for ('56'+250+125) × '0.2' A1 for 86 or 87 (accept 86.2)

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Question	**Working**	**Answer**	**Mark**	**Notes**
	$(2.24+10+5) \times 5$ = for $17.24 \times 5 = 86.2$			OR M1 for 1 cm^2 = 5 farms M1 for ('2.24'+10+5) $\times$ 5 A1 for 86 or 87 (accept 86.2)

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Question		Working	Answer	Mark	Notes
14		$\frac{3}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{1}{5} = 8/30$ $1 - \frac{8}{30} = \frac{22}{30}$ OR $2 \times \frac{3}{6} \times \frac{2}{5} + 2 \times \frac{3}{6} \times \frac{1}{5} + 2 \times \frac{2}{6} \times \frac{1}{5}$ OR 	$\frac{22}{30} = \frac{11}{15}$	4	M1 for $\frac{3}{6} \times \frac{2}{5}$ or $\frac{2}{6} \times \frac{1}{5}$ M1 for $\frac{3}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{1}{5}$ M1 for $1 - (\frac{3}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{1}{5})$ A1 for $\frac{22}{30}$ oe OR M1 for $\frac{3}{6} \times \frac{2}{5}$ or $\frac{3}{6} \times \frac{1}{5}$ or $\frac{2}{6} \times \frac{1}{5}$ M1 for $\frac{3}{6} \times \frac{2}{5} + \frac{3}{6} \times \frac{1}{5} + \frac{2}{6} \times \frac{1}{5}$ M1 for $2 \times (\frac{3}{6} \times \frac{2}{5} + \frac{3}{6} \times \frac{1}{5} + \frac{2}{6} \times \frac{1}{5})$ A1 for $\frac{22}{30}$ oe OR M2 for $\frac{3}{6} \times \frac{3}{5}$ or $\frac{2}{6} \times \frac{4}{5}$ or $\frac{1}{6} \times \frac{5}{5}$ M1 for $\frac{3}{6} \times \frac{3}{5} + \frac{2}{6} \times \frac{4}{5} + \frac{1}{6} \times \frac{5}{5}$ A1 for $\frac{22}{30}$ oe

OR			OR		

OR

A^1A^2 A^1A^3 **A^1B^1 A^1B^2 A^1C**
A^2A^1 A^2A^3 **A^2B^1 A^2B^2 A^2C**
A^3A^1 A^3A^{32} **A^3B^1 A^3B^2 A^3C**
B^1A^1 B^1A^2 B^1A^3 B^1B^2 **B^1C**
B^2A^1 B^2A^2 B^2A^3 B^2B^1 **B^2C**
CA^1 CA^2 CA^3 CB^2 CB^2

OR

M2 for diagram showing all 30 possible outcomes
(M1 for diagram showing 15 possible outcomes. ie without any repeats)
M1 (dep) for identifying all outcomes in their diagram with different letters (underlining, circling, etc.)
Or 30 – all outcomes where the letters are the same

A1 for $\dfrac{22}{30}$ oe

Alternative scheme for replacement

M1 for $\dfrac{3}{6} \times \dfrac{3}{6}$ or $\dfrac{2}{6} \times \dfrac{2}{6}$ or $\dfrac{1}{6} \times \dfrac{1}{6}$

M1 for $1 - (\dfrac{3}{6} \times \dfrac{3}{6} + \dfrac{2}{6} \times \dfrac{2}{6} + \dfrac{1}{6} \times \dfrac{1}{6})$

OR

M1 for $\dfrac{3}{6} \times \dfrac{2}{6}$ or $\dfrac{3}{6} \times \dfrac{1}{6}$ or $\dfrac{2}{6} \times \dfrac{1}{6}$

M1 for $2 \times (\dfrac{3}{6} \times \dfrac{2}{6} + \dfrac{3}{6} \times \dfrac{1}{6} + \dfrac{2}{6} \times \dfrac{1}{6})$

				OR
				M1 for a diagram showing all 36 'possible' outcomes A1 for $\dfrac{22}{36}$ (= 0.6111…) **Special cases:** B2 for $\dfrac{22}{36}$ (= 0.6111…) or $\dfrac{28}{36}$ (= 0.777..) or $\dfrac{16}{30}$ (= 0.533..) if M0 scored

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