GCSE

Mathematics A

General Certificate of Secondary Education

Unit **A502/02:** Mathematics B (Higher Tier)

Mark Scheme for November 2012

Annotations

Annotation	Meaning
✔	Correct
✘	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
∧	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A, B**, etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.
It is vital that you annotate these scripts to show how the marks have been awarded.
It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

1. **M** marks are for <u>using a correct method</u> and are not lost for purely numerical errors.
    A marks are for an <u>accurate</u> answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
    B marks are <u>independent</u> of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
    SC marks are for <u>special cases</u> that are worthy of some credit.

2. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is <u>not from wrong working</u> **full marks** should be awarded.

    Do <u>not</u> award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen <u>and</u> the correct answer clearly follows from it.

3. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

    Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT 180 × (*their* '37' + 16), or FT 300 − √(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *their* (a).

    For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

    - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
    - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
    - **nfww** means **not from wrong working**.
    - **oe** means **or equivalent**.
    - **rot** means **rounded or truncated**.
    - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
    - **soi** means **seen or implied**.

6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

   (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.

8. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

9. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

10. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

11. Ranges of answers given in the mark scheme are always inclusive.

12. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

13. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part Marks and Guidance	
1	**(a)**		2 points plotted ± ½ vertical unit	2	**B1** for 1 point plotted ± ½ vertical unit If > 2 points plotted –1 for each extra. Ignore points from (c) ie on line is ok	Overlay available
	(b)		Ruled line drawn	1	From age 10 to 20	Within tramlines
	(c)	**(i)**	4.7-5.1 5.8-6.3	1 1		
		(ii)	Marco Data more strongly correlated for younger ages	M1 A1	Accept *their* value for Marco	Condone other relevant arguments. Mark best part even if contradictory. **A0** for 'More accurate', 'More points', 'fits the pattern'
2			Line (curve) joining (9, 160) to (9-10, 180) Horizontal line from *their* (9-10, 180) to (12, *their* 180) Line joining *their* (12, 180) down to (…., *their* 180 ÷ 2) and line back up to (1, *their* 180) Horizontal line from *their* (1, 180) to (3-3.30, *their* 180) then down to (3-3.30, 0)	1 1 1 1 1	Or **SC2** for 4 correct corners identified Or **SC1** for 2 correct corners identified	Mark to candidate's benefit Overlay available Mark corners by eye Condone freehand No credit for sections > 180 LHS scheme does not apply to lines that 'go back in time' Includes U shaped (even straight lines) from *their* (12, 180) to any point (12, *their* 90) to (1, *their* 180)

Question			Answer	Marks	Part Marks and Guidance	
3	(a)		23 (after figs 234[0] seen)	4	**B3** for 23.4[0] Or **B2** for figs 234[0] Or **M1** for complete method seen AND **B1** for answer > 2 sf correctly rounded to 2sf	
	(b)		10^9	1	Accept 1 000 000 000	
4	(a)		25	3	isw **M2** for $\dfrac{100}{2^2}$ Or **B1** for approximations of 100 or 2 seen	
	(b)	(i)	Underestimate. (BMI will be higher than 25 as) numerator has been rounded down or denominator up.	1		Not contradictory statements
		(ii)	Lose weight [because overweight]	1	Condone eat more healthily, exercise more etc providing no contradiction	Dependent on 25 and underestimate
5	(a)		$\dfrac{13}{20}$	3	**B2** for $1-\dfrac{7}{20}$, $\dfrac{26}{40}$ oe Or **M1** for common denominator found and at least one fraction correctly converted	Allow whether mixed number or proper fraction converted

	Question		Answer	Marks	Part Marks and Guidance	
	(b)	(i)	$\dfrac{2}{5}$	3	**M2** for attempt at $1 \div \dfrac{5}{2}$ seen or $\dfrac{4}{10}$ oe or 0.4 Or **M1** for $1 \div 2.5$ seen, 2.5^{-1} seen or $\dfrac{5}{2}$ seen or any a/b written as b/a or a written as 1/a or a^{-1} seen	
		(ii)	0	1		
6	(a)		Correct shading or label	1	Any subset of the correct area shaded	
	(b)		Correct line Correct shading or label	M1 A1	 Any subset of the correct area shaded	Overlay available
	(c)		Price of coffee > price of muffin Both multiples of 50p Coffee 1.00, 1; Muffin 0.50, 50p	1 1 1	 Do not condone poor money notation but accept 0.50p Or **SC2** for £1 < price of coffee ≤ £1.11 and price of muffin = £2 – coffee Or **SC1** for £1 ≤ price of coffee ≤ £1.11 And if < 2 scored allow extra **SC1** for $y = x$ drawn	 eg £0.5 Mark LHS or RHS to candidate's advantage From main scheme or SC
7	(a)		Correct reflection	2	**B1** for reflection in $y = 1$ or $x = k$ or reflection of T in $x = 1$	Ignore label. Clear intention to plot these points, condone freehand. [Overlays available]

Question			Answer	Marks	Part Marks and Guidance	
	(b)		Enlargement only [SF =] ⁻2 Centre (0, 0)	1 1 1	If **0** allow **B1** for 'enlargement & rotation' Allow O or origin	'Centre of enlargement' alone does not earn this mark
8			4.5 oe	3	**M2** for $\dfrac{6}{4} \times 3$ oe or $\dfrac{3}{4} \times 6$ Or **M1** for $\dfrac{6}{4}$, $\dfrac{3}{2}$ or $\dfrac{3}{4}$ oe seen	Condone reciprocals, decimals, 6 ÷ 4 etc but not 6 : 4 Withhold **M1** if used in wrong context
9			$y = 6x - 5$ oe isw	2	**B1** for $y = ax - 5$ or $y = 6x \pm b$ or $6x - 5$	Any a or b (incl. 0)
10			$\begin{array}{l} 15x+10y = 25 \\ 15x-9y = 63 \end{array}$ or $\begin{array}{l} 9x+6y = 15 \\ 10x-6y = 42 \end{array}$ $19y = ^-38$ or $19x = 57$ $y = \dfrac{^-38}{19}$ or $x = \dfrac{57}{19}$ $x = 3$ $y = ^-2$	M1 M1dep A1FT A1	For multiplying both equations to make either coefficient equal (allow 1 error) If substitution used **M1** for rearranging one equation to get x or y (allow 1 error) For adding or subtracting as appropriate (allow 1 error) **M1dep** for substitution (allow 1 error) For either x or y correct oe isw Mark final answer	If candidate starts again mark to candidate's advantage Withhold **A** mark if addition/subtraction leads directly to $\pm x = \dots$, or $\pm y = \dots$ Correct answer with no working scores **4**
11	**(a)**		6	1		

Question	Answer	Marks	Part Marks and Guidance	
(b)	$\frac{1}{2}$ or equivalent fraction or 0.5	2	**M1** for $\frac{1}{8^p}$ soi or $\sqrt[3]{8}$ soi	eg $\pm\frac{1}{8}$, $\pm\frac{1}{64}$, ±2, $-\frac{1}{2}$, $\frac{1}{\sqrt[3]{8}}$, 2^{-1} all get **M1**
12 (a)	$\begin{pmatrix} 2 \\ 4 \end{pmatrix}$	1		Condone fraction line

(b)	$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a}$ oe	2	Allow algebraic equivalents eg $\frac{1}{2}(\mathbf{c}-\mathbf{a})$
			M1 for $\overrightarrow{MN} = \overrightarrow{MB} + \overrightarrow{BN}$
			     or $= \overrightarrow{MA} + \overrightarrow{OA} + \overrightarrow{OC} + \overrightarrow{CN}$
			     or $= \frac{1}{2}\overrightarrow{OC} - \frac{1}{2}\overrightarrow{OA}$
			     or $= \frac{1}{2}\overrightarrow{AB} + \frac{1}{2}\overrightarrow{BC}$
			or $\overrightarrow{BN}$ or $\overrightarrow{NC} = -\frac{1}{2}\mathbf{a}$ or $\overrightarrow{MB}$ or $\overrightarrow{AM} = \frac{1}{2}\mathbf{c}$
			Or **SC1** for $\frac{1}{2}\mathbf{c} + \frac{1}{2}$ -**a**
				To earn any marks the intention should clearly be *vectors* not just line lengths
				0 for A etc

Question			Answer	Marks	Answer
13*			h = 30 with clear correct steps and reasons	5	eg ABT = BAT = 75 Alt(ernate) seg(ment) (AST) h = 180 – 75 – 75 Angles in (isosceles) triangle [= 180°]
			As above but missing one reason or working unclear Or fully correct method, with full reasons, but one arithmetic slip	4-3	For lower mark – h = 30 is reached with more than one reason missing or one reason missing and working unclear Or fully correct method, with one reason missing, and one arithmetic slip
			Any correct angle calculation, clearly seen with reason	2-1	For lower mark – one step seen without reason or a 'correct' reason given soi with an incorrect conclusion in that step May be on diagram
			No relevant working	0	

APPENDIX 1

Exemplar responses for question **1cii**

Response	Mark awarded	Reason
More younger people jumped near the line of best fit	1	Implies "better correlation" or clustering around the line
There is more of a clear correlation at Marco's age	1	Implies "better correlation" or clustering around the line
The points are closer together	0	Doesn't describe closer to the line but implies "to each other
The younger people who took part jumped closer to the line of best fit	1	Describes closer clustering
They are all around an average and the line of best fit is better there	0	They are not around an average and the **correlation** is not better
It is closer to the line which is positive correlation	0	The reading is from the line and no mention of greater clustering of points
His age section eg 10, 11 and 12 are all close to 4.9	0	False statement
Ages 10 and 11 show a pattern of the distance they jumped and Marco's distance was more reliable as it was similar to the pattern	0	Doesn't define "better correlation"
All the other jumpers in that region are about the same	0	Doesn't define "better correlation"
It's supposed to be closer to the actual jump because the others near his age will have roughly the same	0	Doesn't define "better correlation"
That's where his age range should have jumped	0	Doesn't define "better correlation"
It's right between people who are older or younger than him	0	Doesn't define "better correlation"
It best fits on the line and is equal to the others	0	Doesn't define "better correlation"

Response	Mark awarded	Reason
Marco is much closer to the line of best fit and Carl isn't near anyone in his age group	**0**	Doesn't define "better correlation"
The estimate is similar to those near it but the older ones are more spread out	**0**	Doesn't define "better correlation"

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