GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for January 2013

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)**		4 correct points	2	**B1** for 1 correct	Overlay available Accuracy: vertical - to within one division; horizontal - intention is on the line Condone any 'joining'
	(b)		No correlation	1		
2	**(a)**		12	4	**B1** for use of a correct unit change **M1** for 2(0) × 21 or 42(0) or figs 67/figs 2 or figs 335, 33 **M1** for (*their* 67(0) – *their* 42(0))/2(0) or *their* 67(0)/2(0) – 21(0)	Condone 66(0) used ie units must be consistent here so (670 – 420)/2 scores **B1M1M0** Division may be implied eg 11 × 2 = 24 with answer of 11 or by 'counting on' Condone 67(0) ÷ 2(0) = 33.1, 33.05 etc, similarly 25 ÷ 2 = 12.1 etc
	(b)		£3.53	3	**M1** for 20 – (3.99 + 5.49 + 6.99) soi **B1** for £16.47 seen	eg answer of 2.53 following 17.47 scores **M1**
3	**(a)**		Ruled line drawn	1		Overlay available

Question			Answer	Marks	Part Marks and Guidance	
	(b)		$-\dfrac{2}{3}$	2FT	**B1** for $-\dfrac{8}{12}$ or $-\dfrac{4}{6}$ (and other correct unsimplified forms eg $-\dfrac{1}{1.5}$) or $\dfrac{2}{3}$ or $^-0.66$ (or better) or $-\dfrac{2}{3}x$ isw	If wrong points plotted allow correct or FT for **2** provided non integer, otherwise max **1**
	(c)		$y = -\dfrac{2}{3}x + 8$	2FT	FT *their m* and *c* **B1** for $y = mx + 8$ or $y = -\dfrac{2}{3}x + c$ or $-\dfrac{2}{3}x + 8$ or $y = -\dfrac{2}{3} + 8$	Allow correct or FT Any *m* or *c* including 0 eg **B1** for $y = mx + 12$ if (0, 12) plotted
	(d)		$\dfrac{3}{2}$ or $1\dfrac{1}{2}$ or 1.5 isw	1FT	FT $-1/(their\ m)$	Allow other forms if correct eg $\dfrac{-3}{-2}$ etc **0** for $\dfrac{3}{2}x$ etc
4	(a)		6 correct points	2	**B1** for 2 correct Or **SC1** if all plotted 'correctly' in Wk 1	Tolerance ½ text Overlay available
	(b)		62	4	**B1** for (Wk 1 =) 160 or (Wk 2 =) 130 **M1** for *their* (160 or 130) × 0.2 or 1.2 oe **A1FT** for 192 or (160 – 130) + 32 Or if **0**, then **SC1** for 1.2 × 37	Allow FT from multiples of 10 only

Question			Answer	Marks	Part Marks and Guidance	
5			$n > {}^-5$ or ${}^-5 < n$	3	**M2** for $5n - 2n > -13 - 2$ or better Or **M1** for $5n - 2n$ or $-13 - 2$ or better in an inequality, or $13 + 2 > 2n - 5n$ If **0**, then **SC1** for $(n =) {}^-5$ nfww	If $13 + 2 > 2n - 5n$ allow **M2** only if inequality sign correct after division. Otherwise allow **M1** If solved as an equation **M1** or **M2** can be implied if correct inequality symbol used in answer Condone x used rather than n
6	(a)	(i)	30 (30) 30 (30) 32 34 36 (38) 40	2	**B1** for all 30s correct or 32 to 40 correct	
		(ii)	Correct ruled graph from 60 to 140	2	**B1** for 4 points from *their* table plotted or either straight line section correct	Overlay available Allow top of histogram to imply points so long as consistently top left, right or middle
	(b)	(i)	Correct ruled graph from 60 to 140	2	**B1** for at least 2 correct (and not more than one incorrect) points plotted or for part of the correct line	Overlay available Covering a range of at least 40 Ignore labels
		(ii)	120 ($\pm$ 2)	1FT	Correct or FT *their* single point of intersection from (b)(i) ($\pm$ 2)	
7	(a)		$\dfrac{7}{40}$ isw	2	**M1** for use of common denominator with one correct conversion	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		$2\dfrac{4}{5}$	4	**M1** for one correct conversion to top heavy	
					M1 for multiplying either numerators or denominators	Indep. Could be implied eg $\dfrac{3}{5}\times\dfrac{3}{4}=\dfrac{6}{20}$ gets **M1**
					A1 for $\dfrac{14}{5}$ oe	
					B1FT for correct conversion to simplified mixed number as their answer	
8			30	3	**B1** for EBA = 75 soi	May be seen on diagram or may be implied by 150
					M1 for 180 – (2 × *their* EBA)	180 – 150 scores **M1B1**
9	(a)		22	1		
	(b)		3*t* + 3*c* = 66 4*t* + 4*c* = 88	M1	For multiplying equation to get either coefficient equal (allow 1 error)	If both attempted mark the best
			For subtracting (allow 1 error)	M1dep	<u>Or for substitution</u> 3(22 – *c*) + 4*c* = 76 **M1** 3*t* + 4(22 – *t*) = 76 66 – 3*c* + 4*c* = 76 **M1** 3*t* + 88 – 4*t* = 76	If answer to (a) is wrong then max **M1M1**
			c = 10 *t* = 12	A1	Both *c* and *t* correct Mark final answer	Correct answer with no working scores **3**
10	(a)		54	1		Both marks are independent
			Opp(osite) angles (in a) cyclic quad(rilateral) add to 180°	1	'Add to 180°' can be implied (eg by correct answer) but not by 126°	Condone reasonable abbreviations and poor spelling
	(b)		81	1		

Question			Answer	Marks	Part Marks and Guidance	
11	(a)		⁻2	1		
	(b)		Correct enlargement	3	**B2** for enlargement SF ½ with wrong centre Or **B1** for enlargement centre (4, 4) and wrong SF or for 2 vertices correct or correct enlargement of triangle L	Condone freehand Mark vertices Ignore any labels Overlay available
12	(a)		$\sqrt{6}$ final answer	2	**B1** for $\sqrt{36}$ seen or $\sqrt{\sqrt{4} \times \sqrt{3} \times \sqrt{3}}$ or better	Accept $\sqrt{2} \times \sqrt{3}$ Condone $6^{\frac{1}{2}}$ $2\sqrt{36}$ etc scores **0**
	(b)		$\dfrac{2\sqrt{5}}{5}$	1	isw	

Question	Answer	Marks	Part Marks and Guidance
13*	Correct proof with working and reasons • AD stated correctly • Attempt at stating ±PQ or ±QR • Method for ±PS or ±SR seen • PQ = (or parallel to) SR or QR = (or parallel to) PS stated • Convincing correct conclusion	5	$\overrightarrow{AS} = \dfrac{1}{2}\overrightarrow{AD}$ $= \dfrac{1}{2}(2\mathbf{e} + 2\mathbf{f} + 2\mathbf{g})$ $= \mathbf{e} + \mathbf{f} + \mathbf{g}$ $\overrightarrow{PS} = \overrightarrow{PA} + \overrightarrow{AS}$
	As above but conclusion not convincing or error in method seen	4–3	For the lower mark - method will be missing or incorrect and conclusion not convincing ie 3 of the bullet points	$= ^-\mathbf{e} + \mathbf{e} + \mathbf{f} + \mathbf{g}$ $= \mathbf{f} + \mathbf{g}$ $\overrightarrow{QR} = \overrightarrow{QC} + \overrightarrow{CR}$ $= \mathbf{f} + \mathbf{g}$
	$\overrightarrow{AD}$ found with working or $\overrightarrow{AD}$ *and* one side of PQRS stated without working or 2 sides of PQRS stated without working ie 2 of the bullet points	2–1	For the lower mark - one side found ie 1 of the bullet points	Opposite sides equal length and parallel therefore PQRS is a parallelogram
	No correct work seen	0		