

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for June 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations used in the detailed Mark Scheme.

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 using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases 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 not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and 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 $180 \times (\text{their '37' } + 16)$, or FT $300 - \sqrt{(\text{their '5}^2 + 7^2)}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \text{their (a)}$.

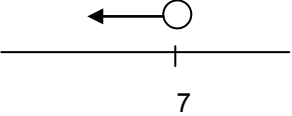
For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

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.
 - **nfw** 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 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. In questions with a final answer line:
 - (i) If one answer is provided on the answer line, mark the method that leads to that answer.
 - (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.
 - (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.
9. In questions with no final answer line:
 - (i) If a single response is provided, mark as usual.
 - (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.
10. 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.

11. 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.
12. Ranges of answers given in the mark scheme are always inclusive.
13. 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.
14. 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)		41	2	B1 for ($1\frac{1}{4}$ lb =) 20 (oz) or ($2\frac{1}{4}$ lb =) 36 (oz) or ($\frac{1}{2}$ lb =) 8 (oz) or $7\frac{1}{4}$ or 116	
	(b)	(i)	$31\frac{1}{4}$	2	M1 for $\frac{5}{4} \times \frac{25}{(1)}$ or $\frac{125}{4}$ oe or $25 + 25 \times \frac{1}{4}$ or full method for 1.25×25 with no more than one arithmetic error or 32 nfw	eg $\frac{500}{16}$ earns M1 but $1\frac{1}{4} \times 25$ only does not score Condone 31.25 for 2
		(ii)	11	2	M1 for (<i>their</i> 125) $\div 12$ or 10(...) or an embedded answer of 10 or 11	eg $10 \times 12 = 120$ or $12 \times 11 = 132$ Could be through clear counting on
2	(a)		3 correct points	2	B1 for 1 correct	Correct intention Ignore extras
	(b)	(i)	Positive	1		Ignore strong/weak Contradictory statements score 0
		(ii)	Because of the outlier or anomaly or E Too few crosses	1	Must state or imply only 1 outlier or anomaly; may be a description Ignore further comment	Unless their plots form outliers "Outliers" implies more than 1 eg to be reliable
	(c)		C	1		
	(d)		E	1		

Question			Answer	Marks	Part Marks and Guidance	
3	(a)		$m < 7$ final answer	2	M1 for $5m < 43 - 8$ or better or $(m =) 7$	Condone other variable eg $x < 7$ Condone embedded answer for M1 If solved as an equation but 1 error made allow M1 if answer given as “correct” inequality eg $5m = 43 - 8$ $5m = 30$ $m = 6$ $m < 6$
	(b)			1FT	FT <i>their</i> solution provided between 2 and 12	Condone a solid circle or other clear indication Only FT from an inequality Ignore left hand end of arrow unless a circle
4			180	1		
			“triangle” with “angles”	1		Ignore ‘isosceles’ etc
			“line” with “angles”	1		<u>For the second and third mark:</u> Provided there is no implication that they add to anything other than 180 degrees
			interior oe	1		eg allow 'internal', 'inside' and 'inner'

Question			Answer	Marks	Answer and Guidance	
5			Full correct conclusion with correct working, clearly laid out or a fully correct, justified and reasoned solution based on clear estimates	5	Ignore any calculations or conclusions about energy	<i>Corny Flakes</i> for 100g, 10g, 1g Sugar = 21, 2.1, 0.21 Fat = 3, 0.3, 0.03 Fibre = 3, 0.3, 0.03 Salt = 1, 0.1, 0.01
			As above but with ≤ 2 errors or if solution is not easy to follow	4 – 3	For the lower mark $\geq$ half of the required calculations will be correct and some conclusions (correct for their calculations) will be drawn or a full solution based on estimated amounts (eg using 3 or 3.3 instead of $\frac{10}{3}$)	<i>Super Fibre</i> for 10g, 1g Sugar = 2.77, 0.277 Fat = 0.94, 0.094 Fibre = 0.84, 0.084 Salt = 0.01, 0.001
			Half of the required calculations will be correct	2 – 1	For the lower mark there will be <ul style="list-style-type: none"> • one correct calculation • or an attempt to draw conclusions based on wrong (but relevant) calculations • or a realisation that they need to compare equivalent amounts of each cereal 	<i>Corny Flakes, Super Fibre</i> for 300g Sugar = 63, 83.1 Fat = 9, 28.2 Fibre = 9, 25.2 Salt = 3, 0.3
			No relevant comment eg subtracting raw data with or without conclusions	0		Therefore the makers are wrong on sugar and fat (ie <i>SF</i> has more) but right on fibre (<i>SF</i> has more) and salt (<i>SF</i> has less)

Question			Answer	Marks	Part Marks and Guidance	
6	(a)	(i)	-4, 2, 4	2	B1 for one correct	
		(ii)	Correct ruled line	2	Within overlay B1 for two correct (or FT) points plotted	At least for $-3 \leq x \leq 1$
		(iii)	0-0.2 and 2.1-2.4	1FT	FT <i>their</i> crossing point (± 0.1)	
	(b)	(i)	$x = \frac{1}{7}$, $y = 2\frac{2}{7}$ oe fractions or correct recurring decimal as final answer	4	<p>M1 for $14x + 7y = 18$ oe $14x - 7y = -14$</p> <p>DepM1 for $28x = 4$ or $14y = 32$</p> <p>A1 for $x = \frac{1}{7}$ or $y = 2\frac{2}{7}$ oe</p> <p>Or if substitution used eg M1 for $14x + 7(2x + 2) = 18$ DepM1 for $28x = 4$ oe</p> <p>A1 for $x = \frac{1}{7}$ oe fraction or correct recurring decimal</p>	<p>For multiplying to get coefficients equal (allow 1 error)</p> <p>For adding or subtracting (allow 1 error)</p> <p>For either x or y correct as a fraction or recurring decimal isw Dep on M2</p> <p>If no more than 1 error in multiplication (either method) follow through for a maximum of 3 marks</p> <p>Condone missing brackets</p> <p>Correct answer with no working scores 4</p>
		(ii)	Fraction, or recurring decimal, needed for exact answer	1		

Question			Answer	Marks	Part Marks and Guidance	
7	(a)		$0.\dot{4}$	1		Condone 0.444...
	(b)		$(\checkmark)$ $(\checkmark)$ $\checkmark$ $\checkmark$	2	Allow B1 for 2 correct	
	(c)		$\frac{3}{11}$	3	M1 for $27.\dot{2}\dot{7}$ A1 for $\frac{27}{99}$ or $\frac{9}{33}$	M1 implied by correct answer nfw
8	(a)		15	2	M1 for $m = \frac{145 - 70}{8 - 3}$ or better	Ignore units
	(b)		$J = 15t + 25$ oe	3	B1FT for <i>(their 15)t</i> M1 for method to find constant term Or SC2 for <i>(their 15)t + 25</i> or $y = 15x + 25$ Or SC1 for $mt + 25$	Condone other variables used instead of t Ignore units
9	(a)		15	3	M1 for $\frac{18}{6}$ or $\frac{6}{18}$ DepM1 for $5 \times \text{their} \frac{18}{6}$ or $5 \div \text{their} \frac{6}{18}$	SC1 for SF can be awarded here if (a) is not attempted and at least M1 scored in (b)
	(b)		5.4	2	M1 for $16.2 \div \text{their} \frac{18}{6}$ oe	

Question			Answer	Marks	Part Marks and Guidance	
10	(a)		$7\sqrt{7}$ final answer	1		
	(b)		64 final answer	2	M1 for 8^2 or $(\sqrt{8} \times \sqrt{8}) = 8$ Or if $\sqrt{8} = 2\sqrt{2}$ allow if $(\sqrt{2})^4 = 4$	Identities must be clear
11			63 Alt(ernate) Seg(ment theorem)	1 1		
12	(a)		Correct point marked A	1		Allow BOD if neither labelled
	(b)		Correct point marked B	1		
	(c)		$\frac{13}{3}\mathbf{a} - 6\mathbf{b}$ oe	3	B1 for unsimplified version of $\frac{13}{3}\mathbf{a}$ B1 for unsimplified version of $-6\mathbf{b}$	Condone $\mathbf{a}\frac{13}{3}$ etc. Condone 4.33(333..)

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