

Mathematics A

General Certificate of Secondary Education

Unit **A501/02**: Mathematics A (Higher Tier)

Mark Scheme for November 2012

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
	Correct
	Incorrect
	Benefit of doubt
	Follow through
	Ignore subsequent working (after correct answer obtained), provided method has been completed
	Method mark awarded 0
	Method mark awarded 1
	Method mark awarded 2
	Accuracy mark awarded 1
	Independent mark awarded 1
	Independent mark awarded 2
	Misread
	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 $180 \times (\textit{their} '37' + 16)$, or FT $300 - \sqrt{(\textit{their} '5^2 + 7^2')}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \textit{their} (a)$.

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)	(i)	<table border="1"> <tr> <td></td> <td>21</td> </tr> <tr> <td>37</td> <td></td> </tr> <tr> <td>77</td> <td>53</td> </tr> </table>		21	37		77	53	3	B2 for two correct entries Or B1 for one correct entry	If a space is blank, accept clear evidence in working space eg Joe White = 21
			21									
37												
77	53											
		(ii)	8 : 7	1	Accept 1 : 0.875 or 1.14[...] : 1							
	(b)		12	3	nfw M2 for $\frac{60}{their (7 + 5 + 3)} \times 3$ oe Or M1 for $60 \div their (7 + 5 + 3)$ oe or for 4							
2	(a)		There are overlaps eg 5 comes in two boxes	1	Or needs responses with no overlaps eg 0-4, 5-9 etc	See exemplars						
			There is no box for over 20 CDs (accept a numerical example eg 30)	1	Or needs responses covering all eventualities eg extra box for "21 or more" or extra box for "other"							

Question		Answer	Marks	Part Marks and Guidance	
	(b)	260	4	nfw M1 for midpoints 50, 150, 250 etc (at least 3 correct) soi M1 for <i>their</i> 'midpoints' \times freq attempted soi by 10400 or 10420 or at least 3 products seen FT <i>their</i> 'midpoints' M1 for <i>their</i> sum of $f \times x \div$ <i>their</i> sum of f Or SC3 for final answer 260.5 Or SC2 for final answer 210 or 310	eg may be seen by table Condone 50.5, 150.5 etc eg at least 3 of 100, 1500, 3750, 3150, 1350, 550 or total 10400 Working may be by table If correct: $10400 \div 40$ eg allow 2 nd and 3 rd M1 s for use of endpoints not midpoints First two M1 s may be earned for correct work seen even if not then used in the final answer
3	(a)	47.52	1		
	(b)	15.2	1		
4	(a)	96	2	nfw M1 for $[6 \times] 16$ Or SC1 for answers of -96 or 576	
	(b)	7, 11, 15	2	M1 for two terms in correct place Or SC1 for 3, 7, 11	eg M1 for 3, 11, 15
	(c)	$3y(2y + 3)$	2	M1 for $3y(\dots)$ or for $y(6y + 9)$ or for $3(2y^2 + 3y)$	Condone missing final bracket

Question		Answer	Marks	Part Marks and Guidance	
	(d)	$\frac{15}{4}$ oe isw	3	<p>M2 for $15 = 4x$ oe OR M1 for xs or numbers collected and simplified correctly M1FT for final answer FT <i>their</i> $ax = b$ with $a \neq 1$ or 0 or b and $b \neq 0$</p> <p>Allow B3 for correct answer given embedded as final answer</p>	<p>Allow M1 for eg $2x = 6x - 15$</p> <p>eg $2 \times \frac{15}{4} + 7 = 6 \times \frac{15}{4} - 8$</p>
	(e)	$[x =] \frac{y-6}{4}$ or $\frac{y}{4} - 1.5$ oe	2	M1 for a correct constructive first step, or for answer correct except for a sign error	eg M1 for $\frac{6-y}{4}$ (sign error in denominator)
5		<p>Correct perpendicular line</p> <p>Arcs showing compasses used correctly</p> <p>14.8 to 15.2</p>	<p>1</p> <p>1</p> <p>2</p>	<p>Within tolerance 88 to 92° of AB and within 1mm of D; line to reach at least from D to within 2mm of AB</p> <p>As well as standard two pairs of two arcs, condone arc touching line drawn and radius drawn, condone 'kite construction'</p> <p>M1 for 7.4 to 7.6 [cm] or 1480 to 1520 [cm]</p>	<p>'Kite construction' arcs through D, centre A, above and below AB intersecting with similar arcs centre B</p> <p>Also condone 'half kite' with just the intersecting arcs below AB but with radii AD and BD Ignore perp. bisector if also drawn</p> <p>NB 0 for spurious arcs drawn after the line – watch for these</p>

Question		Answer	Marks	Part Marks and Guidance	
6	(a)	$2^3 \times 3$ oe	2	M1 for factor tree or division of 24 with 2 and 3 found as factors	Index form not required but product needed for 2 marks
	(b)	168 and 600	3	M1 for $4200 = 2^3 \times 3 \times 5^2 \times 7$ oe seen (need not be formally expressed as product) M1 for correct Venn diagram oe seen OR M1 for $4200 \div 24$ or 175 seen M1 for 7×24 or 25×24 oe If M0 , then SC1 for 168 or 600 seen as a final answer	eg clear split of 52 and 7
7	(a)	76.3 to 76.4[0]	3	nfw M2 for $85 \times \sin 64$ or $2 \times 42.5 \times \sin 64$ Or M1 for $\sin 64$ used Allow A1 for 76 if correct method seen Or SC2 for 78.2 to 78.3 (radians) or 71.7 to 71.8 (grads)	Allow M2 for complete equivalent method involving $85 \times \cos 64$ [= 33.3...] followed by Pythagoras From scale drawing, allow only B1 for 76.3 to 76.4

Question		Answer	Marks	Part Marks and Guidance	
	(b)	68.3	3	nfw B2 for other rot version of 68.34... Or M2 for $\sin^{-1}\left(\frac{79}{85}\right)$ oe Or M1 for use of inverse trig fn If M0 scored, allow B1 for 68.2 or 68.4 following $\sin x = \left(\frac{79}{85}\right)$ oe seen Or SC1 for 1.2 (radians) or 75.9 (grads)	0 from scale drawing Condone poor notation Allow even with wrong trig fn – will usually have already been penalised for this in part (a)

Question	Answer	Marks	Part Marks and Guidance	
<p>8 (a)</p>	<p>Vert. dist = 449 – 170 or 279</p> <p>Unit conversion before Pythagoras/trig: Either Horiz. dist. = 1.293 × 1609 or 2080[.437..] Or Vert. dist. = <i>their</i> 279 ÷ 1609 or 0.17[3...]</p> <p><i>Their</i> $h^2 + \textit{their } v^2$ [= 4406059 or 1.7019..]</p> <p>$\sqrt{\textit{Their } h^2 \pm \textit{their } v^2}$</p> <p>2098.6 to 2100</p>	<p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>M1 for 279 seen</p> <p>Allow M1 for 449 ÷ 1609 or 170 ÷ 1609 or clear indication that either 449 [metres] = 0.279[...] or 0.28 [miles] or that 170 [metres] = 0.105[...] or 0.11 [miles]</p> <p>Allow even if units are not consistent</p> <p>Allow even if units are not consistent Square root step may be implied</p>	<p><u>Alternative method using trig:</u> M1 for vert. dist as opposite M1 for unit conversion as opposite M1 for use of \tan^{-1} to find an angle (note they could be finding either angle) M1 for correct selection of a length and trig ratio consistent with the angle found A1 for 2098.6 to 2100</p>
<p>(b)</p>	<p>Use at least two triangles/use interim point</p>	<p>1</p>		<p>See exemplars</p>
<p>9</p>	<p>Frequency densities 1, 1.6, 2, 2.2, 1.6, 0.2 soi</p> <p>Heights correct</p> <p>Widths correct</p> <p>Sensible scale and fd axis labelled</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p>	<p>Seen or plotted Condone one error</p> <p>No FT from wrong freq density</p> <p>Accept 'Frequency density' or 'Fd' and/or 'people per £10k' oe</p>	<p>0 if labelled 'Freq' oe</p>

Question		Answer	Marks	Part Marks and Guidance	
10	(a)	$p = 12$ $r = 9$	2	B1 each	
	(b)	$5c - cn = 9d - 6d$ [or = $3d$] $c(5 - n) = 9d - 6d$ [or = $3d$] or FT $[c =] \frac{3d}{5 - n}$ oe	M1 M1 A1	For collecting c terms on one side, non- c terms on the other; condone one error For factorising; may be implied by final answer Numerator must be simplified	
11	(a)	19	1		
	(b)	$15t + 3$	3	nfw Condone $3 + 15t$ M1 for $5(2 + 3t) - 7$ M1 for $10 + 15t - 7$	
				Allow x instead of t for M marks	

APPENDIX 1

Exemplar responses for question 2(a)

Response	Mark awarded
She has included the last number from the previous category.	1
She has one same option in each of the boxes.	1
It is not suitable for all possible responses.	0
Not a true representation of population, age groups stop at 20 years old.	0
How many CDs a person has is too specific – needs a more general question to be asked.	0

Exemplar responses for question 8(b)

Response	Mark awarded
Work out separate sections of the graph and not just use the line of best fit.	1
He could have used multiple smaller triangles.	1
It is just working it out as a whole, they should work out for every 0.2 miles then add together.	1
Split into smaller sections on the graph.	1 relates to the graph
Include the changes in steepness he climbed.	0 how?
Use a smaller triangle.	0
Use a bigger more precise triangle.	0
By following the graph more closely instead of putting it in a triangle.	0
He could use a pedometer.	0
Have all the lengths in the same units.	0
Calculate how far he climbed in 1m and multiply that by 2080.	0
Start at 0m altitude and walk a whole number of miles.	0
He could have taken the readings himself as the Sat Nav may have had no signal in some areas and not been accurate.	0

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