

GCSE

Mathematics A

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

General Certificate of Secondary Education

Mark Scheme for November 2015

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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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12. Annotations used in the detailed Mark Scheme.

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.
 - **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)	Gold	Silver	Bronze	Total	3	B3 for all 5 entries correct; B2 for 3 or 4 entries correct; B1 for 2 entries correct	[Common with Foundation] B0 just one entry correct
		13	11	9	33			
		11	5	10	26			
		10	10	5	25			
		34	26	24	84			
	(b)	2h 8m 2s				2	B1 for 2 elements correct or for 2h 7m 62s	
2	(a)	0.59				2	B1 for other rot versions of 0.58618...	
	(b)	$3 \times (6 + 5) - 1 = 32$				1	condone extra superfluous pairs of brackets	Attach image of page 16 to this part or to 4(b)
3	(a)	(i)	9			2	B1 for 8 shares seen or used eg $24 \div 8 [= 3]$ or B1 for 3×3	B0 for just 3 seen [Common with Foundation]
		(ii)	10					2
	(b)	2.20 pm or 14:20				3	B2 for 80 or 1h 20m or 2:20 or M1 for prime factor decomposition of 16 and/or 20 found $16 = 2^4$, $20 = 2^2 \times 5$ but need not be expressed as product or M1 for 16, 32, 48 and 20, 40, 60 seen (oe in counting on from 1 pm) or M1 for $16 = 4 \times 4$ and $20 = 4 \times 5$	eg correct factor tree or division list [Common with Foundation]
4	(a)	(-4, 5) plotted				1		

Question		Answer	Marks	Part Marks and Guidance	
	(b)	(3.5, 0.5)	1		
	(c)	(2, 0) or (2, -6) or (-6, 0) or (-6, -6) or (1, 1) or (1, -7) or (-5, 1) or (-5, -7)	2	M1 for suitable strategy seen e.g. circle centre A rad 5 cm, or statement such as 3, 4, 5 triangle;	
	(d)	accurate angle bisector drawn with correct arcs	2	B1 for correct arcs but no line drawn or for correct line but no arcs	watch for spurious arcs ignore extra bisectors eg bisector of BC
5	(a)	[x =] 5.5	3	oe; nfw M2 for $2x = 11$ oe or M1 for xs or numbers collected and simplified correctly and M1FT for final answer FT <i>their</i> $ax = b$ or $ax - b = 0$ with $a \neq 1$ or 0 or b and $b \neq 0$, provided at least M1 earned SC2 for correct embedded answer	allow from trials
	(b)	$3n + 1$	2	oe; need not be simplified M1 for $3n$ oe SC1 for $3x + 1$ oe using other letters	accept $n \times 3$. $n3$ etc; [Common with Foundation]
6	(a)	Jenny has divided by the smaller number	1	oe condone 'by smaller decimal'	see appendix for examples [Common with Foundation]
	(b)	multiplying by a number less than 1 makes the answer smaller	1	oe condone decimal or fraction instead of number less than one	[Common with Foundation]

Question		Answer	Marks	Part Marks and Guidance	
7	(a)	± 4	3	B2 for one solution Or M1 for $y^2 = 16$	
	(b)	$4a - ac = 6 + 3c$ $a(4 - c) = 6 + 3c$ or FT $[a =] \frac{6 + 3c}{4 - c}$ or $\frac{-3c - 6}{c - 4}$ or FT as final answer	M2 M1 M1	oe; for correctly collecting a terms on one side, non-a terms on the other; M1 if one sign error For correct factorising; may be implied by final answer; FT if at least M1 gained oe with numerator factorised; FT if at least M2 gained	may be done earlier
8	(a)	Cfs [2, 12], 30, 42, 47, 50 soi Points plotted at correct endpoints [3, 5], 10, 15 etc Points plotted at correct heights, FT one error in cf all 7 points joined with smooth curve or straight line segments	1 1 1 1	May be implied by plots at correct heights FT for ascending graph only FT for ascending graph only	

Question		Answer	Marks	Part Marks and Guidance	
	(b)	<p>Marika has shorter average time</p> <p>Marika med 8 – 9 Paul med 12.0</p> <p>Marika has more consistent times</p> <p>Marika range = 25 (or less with reason) Paul range = [29.2 – 3.3 =] 25.9 or Marika IQR = 7.4 to 8.35 Paul IQR = [19.2 – 7.6 =] 11.6 to 11.75</p>	<p>1 dep</p> <p>1</p> <p>1 dep</p> <p>1</p>	<p>dep on valid reason</p> <p>values for both M and P must be shown; if 0, allow SC1 for correct conclusion with values for both but slight error in one</p> <p>dep on valid reason</p> <p>values for both M and P must be shown; if 0, allow SC1 for correct conclusion with values for both but slight error in one P range accept 3.25 to 3.35 and 29.15 to 29.2</p> <p>M LQ accept 5.05 to 5.3 M UQ accept 12.7 to 13.4</p> <p>P LQ accept 7.5 – 7.6 P UQ accept 19.2 – 19.25</p>	<p>0 in this part if their graph is not increasing, unless there is evidence of linear interpolation of table</p> <p>the last two marks are both obtainable from an increasing graph in part (a) plotted at midpoints, with corresponding LQ and UQ if shown</p> <p>condone both sets of correct endpoints and statement P's range larger, oe for IQR</p>
9	(a)	300 cos 30	2	<p>allow 2 for 259.807611 rot to 1dp or more</p> <p>M1 for cos 30 = AD/300</p>	<p>or complete method using sin to find DB, then Pythag.</p>

Question	Answer	Marks	Part Marks and Guidance	
(b)	$300 \sin 30$ or $\frac{BD}{300} = \sin 30$ DB = 149.6 to 150.1... DC = 329.6 to 330.1...	M1 A1 A1	or $260 \times \tan 30$ or $\sqrt{300^2 - 260^2}$ oe FT their DB, only if M1 earned	or using unrounded AD DB may have been found in (a), but allow credit for this in (b) only if it is clear that they know it is DB [image dim to include diagram and (a) below (b)]
(c)	308(.2...)	4	Obtained from correct calculations M1 for attempt at using tan with <i>their</i> DC and 260 or their AD (or attempt at using cos with <i>their</i> BC and DC, following cos rule attempt) and M1 for inverse trig function seen or used A1 for ACD = 38.2(...) ^o or CAD = 51.7...to 51.8 ^o , with angle clearly identified; accept 38 or 52 for A1 if method seen allow B2 for 38.2(...) ^o or 51.7...to 51.8 ^o , with angle not clearly identified correctly; accept 38 or 52 with method seen	

Question		Answer	Marks	Part Marks and Guidance													
10		7.6 to 7.7	3	nfww M2 for $\sqrt{5.4^2 + 4.1^2 + 3.6^2}$ oe Or M1 for $5.4^2 + 4.1^2 + 3.6^2$ oe [=58.93]	may be in two stages of 2D Pythagoras; M0 for just one stage of 2D Pythagoras												
11		$15x + 5$	2	M1 for $3(5x + 2) - 1$	brackets oe required for this M1												
12		pair of values satisfying $5c + d = -1$ except $c = 2, d = -11$	3	M2 for $5c + d = -1$ Or M1 for LHS = -1 or for $2x - 11 = cx + d$ if 0, allow SC1 for $c = 2, d = -11$	eg <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td><i>c</i></td> <td>3</td> <td>1</td> <td>0</td> <td>-1</td> <td>-2</td> </tr> <tr> <td><i>d</i></td> <td>-16</td> <td>-6</td> <td>-1</td> <td>4</td> <td>9</td> </tr> </table> need not be integers	<i>c</i>	3	1	0	-1	-2	<i>d</i>	-16	-6	-1	4	9
<i>c</i>	3	1	0	-1	-2												
<i>d</i>	-16	-6	-1	4	9												

APPENDIX 1

Exemplar responses for Q.6(a) [common with Foundation]

Response	Mark
The larger the number you divide by, the smaller your answer will be	1
Dividing by a number less than 1 makes the answer larger	0 not sufft

Exemplar responses for Q.6(b) [common with Foundation]

Response	Mark
The answer should be smaller than 12	1
Multiplying by a number less than 1 makes the answer smaller not bigger	1

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