

GCSE

Mathematics A

Unit **A503/02**: Mathematics C (Higher Tier) Paper 1

General Certificate of Secondary Education

Mark Scheme for November 2016

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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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SUBJECT-SPECIFIC MARKING INSTRUCTIONS

1. 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.

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 awarded for a correct final 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 you must ensure that you refer back to the relevant previous answer. You may find it easier to mark follow through 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.
- cao** means **correct answer only**.
 - 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).
 - 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. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
7. 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).
8. 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.
9. 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.

10. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. If the answer is missing, but the correct answer is seen in the body allow full marks. If the correct answer is seen in working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded.
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.

MARK SCHEME

Question		Answer	Marks	Part Marks and Guidance	
1	(a)	1850.10	2	M1 for 132.15×14 soi by 1850.1	
	(b)	4h 40m	3	B2 for 4.66[...] or 4 ² / ₃ Or M1 for 14÷3 soi by 4h...min	
2	(a)	Correct drawing, no extra lines	2	B1 for 5 correct edges	Condone freehand. Condone cube join lines.
	(b)	18	1		
	(c)	16 4	2	B1 for 16 or 4 Or for 36 and 6 or 128 and 8 etc	
	(d) (i)	A (0, 3, 0) B (-2, 0, 0) C (-1, 3, 1)	1 1 1		
	(ii)	Cross in correct position	1		
3	(a)	3	2	B1 for 25 seen	
	(b)	3	3	M1 for $17 = 7x - 2^2$ or better And M1 for $7x = 17 + their(4)$	Or M1 for $[x =] \frac{T+y^2}{7}$ And M1 for $\frac{17+2^2}{7}$
4	(a)	P = 48.6 A = 128.7	3	B2 for one value correct Or for correct answers reversed Or B1 for 16.2 or 14.3 soi	
	(b)	3 9	1 1		Condone 3 ² for 9

Question		Answer	Marks	Part Marks and Guidance	
5	(a)	35	2	M1 for $140 \times \frac{1}{4}$ oe	
	(b) (i)	2 3 .. 5 3 4 5 6 4 5 6 7 5 6 7 8	2	B1 for 8 entries correct	
	(ii)	$\frac{3}{16}$ oe	2	B1 for $\frac{n}{16}$ or $\frac{3}{k}$, $k < 25$	-1 for poor notation
6		Eg. 7 to 7.4 8 to 8.2 2 litre is better value	B2 B2 B1	M1 for $700 \div 95$ B1 for 2000 soi Dep. on B2B2 scored	Or other correct consistent method Eg. p/ml or scaling up 700 to 2000 or scaling down 2000 to 700 Values rot to at least 2figs.
7		a= 8 b= $1\frac{1}{2}$ oe c= $-2\frac{1}{2}$ oe	1 2 1ft	B1 for $2b = 11 - \text{their}(a)$ oe soi $7 - \text{their}(a) - \text{their}(b)$	Mark answers
8	(a)	$2 \times 6 \times 9$ [= 108]	1		
	(b)	8 3 6 4 12 2 24 1	4	B3 for three correct Or B2 for one correct Or M1 for $108 \div 4.5$ soi by 24	Ignore repeats and extras. Accept embedded answers Eg $4 \times 6 \times 4.5 = 108$
	(c)	108000	2	B1 for 1000 soi	
9		8995 to 8995.43	3	M2 for 15000×0.88^4 oe Or M1 for 15000×0.88 oe	Max. 2dp answers

Question		Answer	Marks	Part Marks and Guidance
10	(a)	0.00000054	1	
	(b)	1.85 or 1.9 or $2[.0] \times 10^9$	3	B2 for 1851851852 rot to more than 3sf in any form Or M1 for $1000 \div 5.4 \times 10^{-7}$ soi

Question		Answer	Mark	Answer
11	(a)*	<p>2A, 4P, 2C correct, with clear commentary</p> <p>[A=one set of arrangements, P=probability, C=correct conclusion]</p> <p><i>For 5 marks or fewer, allow a pair of correct probabilities to imply a correct arrangement.</i></p> <p>2A, 2P, 1C</p> <p>2A, 1P, 0C <u>OR</u> 2A, 0P, 1C <u>OR</u> 1A, 2P, 0C <u>OR</u> 1A, 1P, 1C <u>OR</u> 0A, 2P, 1C</p> <p>1A, 0P, 0C <u>OR</u> 0A, 1P, 0C</p>	<p>6</p> <p>5-4</p> <p>3-2</p> <p>1-0</p>	<p>Eg.</p> <p>1) white moved Darius: 2W, 2B Ellie: 5W, 1B P(W) 0.5 oe 0.83 oe So, Ellie more likely</p> <p>2) black moved Darius: 3W, 1B Ellie: 4W, 2B P(W) 0.75 oe 0.67 oe So, Darius more likely</p> <hr/> <p>2A, 2P, 0C <u>OR</u> 1A, 2P, 1C</p> <p>2A, 0P, 0C <u>OR</u> 1A, 1P, 0C <u>OR</u> 1A, 0P, 1C</p> <p>No worthy work.</p>

Question			Answer	Marks	Part Marks and Guidance	
11	(b)	(i)	Correct tree	3	B1 for 0.7 oe correctly placed once And B1 for 0.3 oe correctly placed once	
		(ii)	0.49 oe	2	M1 for <i>their</i> 0.7 × <i>their</i> 0.7 oe	
12	(a)	(i)	5x(2x + 3y)	2	B1 for 5(2x ² + 3xy) or x(10x + 15y) <u>After zero scored</u> SC1 for 10x(x + 1.5y) oe	
		(ii)	(x – 5)(x + 5)	1		
	(b)	(i)	(x – 7)(x + 5) 7 and -5	M2 B1	M1 for (x ± 7)(x ± 5)	M2 for correct formula Or M1 for correct formula with max one error
		(ii)	-0.35 and -5.65	3	B2 for one correct value Or for -0.3542486.. and -5.645751.. rot Or B1 for -0.3542486.. or -5.645751.. rot Or M1 for $\frac{-6 \pm \sqrt{6^2 - 4 \times 1 \times 2}}{2 \times 1}$ oe	Condone one error
13	(a)		0 0.5 [0.87] 1 0.87 0.5 0	1		
	(b)		6 or 7 of <i>their</i> points correctly plotted Curve joining <i>their</i> 7 points	1 1	½ small square accuracy ½ small square accuracy	
	(c)		16 to 19 161 to 164	1 1		Accept embedded Eg sin(18) = 0.3

Question		Answer	Marks	Part Marks and Guidance	
14	(a)	$R = \frac{200}{D^2}$ oe	2	M1 for $R = \frac{k}{D^2}$ oe seen	
	(b)	10 and -10	3	B2 for 10 Or M1 for $2 = \frac{\text{their } 200}{D^2}$ oe	
15		496	3	M2 for $23.5^2 - 7.5^2$ oe Or B1 for 23.5 or 7.5 used	
16		three of $\sqrt{3}\sqrt{3}$, $-[1]\sqrt{3}$, $[+]5\sqrt{3}$, -5 -2 + 4 $\sqrt{3}$	B2 B1	B1 for two of $\sqrt{3}\sqrt{3}$, $-[1]\sqrt{3}$, $[+]5\sqrt{3}$, -5	Accept 3 for $\sqrt{3}\sqrt{3}$
17	(a)	10.4 to 10.5	3	M2 for $\sqrt{(7^2 + 6^2 + 5^2)}$ oe Or M1 for 7^2+5^2 or $6^2 + 5^2$	
	(b)	34.8 to 35	3	M2 for $\sin^{-1}(6 \div \text{their}(a))$ oe Or M1 for \sin and $\frac{6}{\text{their}(a)}$ oe	
18		$3x^2 + 2x - 11 = 2x + 1$ $3x^2 - 12 [= 0]$ $x = 2$ or -2 $x = 2$, $y = 5$ and $x = -2$, $y = -3$	M1 A1 B1B1 B1	Or any attempt to subtract the equations Oe Both pairs correct	

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