OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for January 2013

Oxford Cambridge and RSA Examinations

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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.

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 × (*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)	(i)	[FC], FS, CF, CS, SF, SC only	2	**B1** for 3 of these 5 seen	
		(ii)	$\frac{4}{6}$ or $\frac{2}{3}$ or 0.66 to 0.67 or 66 to 67% nfww isw	2	**M1** for $\frac{n}{6}$ soi $n < 6$ but NOT after denominator = 12 Or **SC1** for answer $\frac{5}{9}$	For (a)(ii) and (b) –1 once for poor notation eg 4 : 6, 4 in 6, 4 out of 6 etc
	(b)		$\frac{1}{7776}$ or 0.00012 to 0.00013 or 0.012% to 0.013%	3	**M2** for $\frac{1}{6^5}$ oe soi Or **M1** for $\frac{1}{6}$ seen	
2	(a)	(i)	Rectangle 10 by 6 Any line down middle of a rectangle, parallel to length	1 1FT	Ignore extra lines anywhere Any rectangle with no extra lines	Condone freehand The edge of the grid may be used as the side of the rectangle
		(ii)	Rectangle 10 by 4	1 1	Ignore extra lines anywhere Rectangle with no extra lines	Condone freehand The edge of the grid may be used as the side of the rectangle
	(b)		184	4	**M1** for [1 or 3 ×] 10 × 6 soi by 60 (or 180) **M1** for [2 or 3 ×] 5 × 10 soi by 50 or 100 (or 150) **M1** for [2 ×] $\frac{6 \times 4}{2}$ soi by 12 or 24 but not if goes on to 24 × 2	Allow **M1**, **M1** for combining areas eg (5 + 6) × 10 or 16 × 10 Condone if part of volume calc.

Question			Answer	Marks	Part Marks and Guidance	
3	(a)		5 Litres per hour oe	2 1	**M1** for $\frac{\textit{their}(\text{change in litres})}{\textit{their}(\text{change in time})}$ oe soi Or **SC1** for answer 10	
	(b)		13.00 and 15.00 oe	1		Ignore am/pm with 24h clock times
	(c)	(i)	Stopped oe	1	Or acceptable alternative	Ignore extra/incorrect comments
		(ii)	Fill up tank oe	1	Or acceptable alternative	Ignore extra/incorrect comments
4	(a)		0.08 oe	2	**M1** for 1 – (0.4 + 0.17 + 0.35) soi by answer of 0.44	Allow **M1** for answer 0.8 after 0.92 oe seen in working. For (a) and (b) –1 once for poor notation eg 0.57/1. Ignore wrong cancelling after correct fraction
	(b)		0.57 oe	2	**M1** for 0.4 + 0.17 soi by answer of 0.21	
	(c)		875	2	**M1** for 2500 × 0.35 or for $\frac{875}{2500}$	

Question			Answer	Marks	Answer
5*			$6x + 2y + 30$ and $2x + 6y + 10$ **both** correctly found with diagrams and clear working	5	Ignore all arrangements other than the correct two
			$6x + 2y + 30$ and $2x + 6y + 10$ **both** correctly found with correct diagrams but with less clear or no working	4−3	**One** correct arrangement considered with diagram and clear working and correct formula found or **both** correct arrangements considered with diagrams and one correct formula but with little or wrong or no working or **both** correct formulae with no diagrams but with clear working
			Both correct arrangements considered with diagrams but with little or wrong or no working or **one** correct arrangement considered with diagram and correct formula but with little or wrong or no working or **both** correct formulae with no diagrams and little or wrong or no working	2−1	**One** correct arrangement considered with diagram but with little or wrong or no working or **one** correct formula with no diagram and little or wrong or no working
			No relevant comment	0	

Question			Answer	Marks	Part Marks and Guidance	
6			35 730.48 or 35 730	4	**M3** for $30\,000 \times 1.06^3$ oe Or **M2** for $30\,000 \times 1.06^2$ oe soi by 33 708 Or **M1** for 30 000 × 1.06 oe soi by 31 800 Allow **SC3** for answer 37 874 or 37 874.30 or 37 874.31 Or **SC3** for answer 5730.48 or 5730 Or **SC2** for answer 35 400 Or **SC1** for answer 5400	For **M3** accept $30\,000 \times 1.06^4$ oe
7	(a)		$4\frac{7}{12}$ final answer	1		
	(b)		3125	1		
8	(a)		2(3*x* + 4) final answer	1	Condone missing final bracket	
	(b)	(i)	16	1		
		(ii)	7	1		
	(c)		(*x* – 3)(*x* + 3) final answer	1	Condone missing final bracket	
9	(a)		21 × '2.2' > 42 or = 46.2 or 42 ÷ '2.2' < 21 or = 19.1 'Yes' oe	1 1	Or 1 kg ≥ 2 lb so 21 kg ≥ 42 lb oe soi Or <u>using</u> a lb/kg comparison that would lead to a correct conversion factor Or 42/21 = 2 and correctly comparing with some conversion factor Dependent on correct work	Allow any conversion factor from 2 to 2.5 or 0.4 to 0.5

Question			Answer	Marks	Part Marks and Guidance	
	(b)		40.5 39.5	2	Condone 40.49[99..] or 40.50[0..] and 39.50[0..] **B1** for one value correct in correct place or for both correct values reversed	
	(c)		365.3 to 365.5 or 365	2	**M1** for 17 × 21.5	Condone 21.49[99..]
10	**(a)**		25.4 to 25.5	2	**M1** for 28 ÷ 1.1	
	(b)		399 or 400	3	**B2** for 399.3 Or **M1** for 1.1^3 oe seen	
11	**(a)**		$x^3 - 3x^2 + [1]x$ final answer	3	**B2** for two of x^3, $-3x^2$, $+ [1]x$ seen Or **B1** for one of x^3, $-3x^2$, $+ [1]x$ seen	
	(b)		$2x - 9$ final answer	3	**B1** for $12x + 3$ seen **B1** for $-10x - 12$ seen If **B0** scored, then **SC1** for answer $2x \pm k$, $k \neq 0$	Condone $-10x + -12$ seen
	(c)		$x^2 - 8x - 20$ final answer	2	**B1** for three of x^2, $-10x$, [+] $2x$, -20 seen	
12	**(a)**		E	1		
	(b)		C	1		
	(c)		D	1		
13	**(a)**		93.3 to 94.3 or 30π	2	**M1** for $\frac{1}{3} \times \pi \times 3^2 \times 10$	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		73 or 73.3 to 73.31	3	**M2** for $\tan^{-1}\frac{10}{3}$ seen Or **M1** for $\tan x = \frac{10}{3}$ seen	<u>For sine rule or cosine rule</u> **M2** for $\sin^{-1}\frac{10}{\sqrt{(10^2+3^2)}}$ or $\cos^{-1}\frac{3}{\sqrt{(10^2+3^2)}}$ Or **M1** for $\sin x = \frac{10}{\sqrt{(10^2+3^2)}}$ or $\cos x = \frac{3}{\sqrt{(10^2+3^2)}}$
14	**(a)**		0.6, 0.4 oe correctly placed throughout	2	**M1** for 0.4 oe placed correctly once	
	(b)		0.48 oe	3	**M2** for (0.6 × 0.4) + (0.4 × 0.6) oe soi Or **M1** for 0.6 × 0.4 oe soi Or **SC1** for 1 – (0.4 × 0.4) oe soi	FT from *their* tree for M marks only
15	**(a)**		$y = \frac{21}{x}$ oe	2	**M1** for $y = \frac{k}{x}$ oe Or **B1** for $7 = \frac{k}{3}$ oe	
	(b)		2.1 or *their* (k ÷ 10)	1FT	Dep. on $y = \frac{k}{x}$ oe in (a), numerical k	
	(c)		2.1 or *their* (k ÷ 10) or *their* (b)	1FT	Dep. on $y = \frac{k}{x}$ oe in (a), numerical k	
16	**(a)**		0.25 or ¼, …, 1, 2, …, 8, …	2	**B1** for 2 correct values	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		*Their* 7 points correctly plotted 'Curve' through *their* 7 points	1FT 1FT	± ½ small square Continually increasing graph Within ½ small square of *their* 7 points	 Curve by eye
	(c)		1.7 to 1.85	1		NOT embedded answers
17	**(a)**		Any attempt to use cosine rule $5^2 = 10^2 + 8^2 - (2 \times 10 \times 8 \times \cos x)$ oe [x =] 29.68(6…)	M1 A1 B1		
	(b)		19.8 to 19.82	2	**M1** for ½ × 10 × 8 × sin (*their* 29.7)	After answer 20, look back for more accurate value for 2 marks
18	**(a)**		$(x+3)^2 - 8$	2	**M1** for $(x+3^2)$ soi	
	(b)		$(x+3^2) = 8$ $x + 3 = [\pm]\sqrt{8}$ $^-0.17$ and $^-5.83$	M1FT M1FT B2	FT from *their* $(x+a)^2 \pm b$ ± not necessary for this mark **B1** for one of the values correct or two values correct but not to 2dp	*a* and *b* integers

Question			Answer	Marks	Part Marks and Guidance	
19			$\frac{34}{360} \times \pi \times 7^2$	M2	Soi by 14.538…or 29.077…rot **M1** for [2 ×] $\pi \times 7^2$ soi	For the first **M2**, allow **M2** or **M1** if part of volume calculation
			$\frac{34}{360} \times \pi \times 14 \times 5$	M2	Soi by 20.769…rot **M1** for $\pi \times 14 \times 5$ soi If **M0, M0**, then **SC1** for $\frac{34}{360}$ soi	
			2 × *their* top + *their* end only	M1		
			49.8 to 50	A1		

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