OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

Unit **A503/02:** Mathematics C (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.

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 × (*their* '37' + 16), or FT 300 – $\sqrt{}$(*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			7 7 7 10 33 53 22	3	**B2** for 5 correct Or **B1** for 2 correct	
2			11.7 to 13.2 or 1170 to 1330 cm^2 mm^2	2 1	**M1** for (4.9 to 5.1) × (2.4 to 2.6) oe Indep	eg rectangle and two triangles with correct (± 1 mm) measurements
3			4700	3	**M2** for 2.35 × 2000 oe Or **M1** for 1.35 × 2000 oe soi by 2700	
4	(a)		81	2	**M1** for $45 \times \frac{9}{5}$ oe or for 9 minutes for 1 km oe	
	(b)		6.6 or $6.\dot{6}$ or 6.7 or $6\frac{2}{3}$ or 7	3	**M2** for $\frac{5}{0.75}$ oe or $\frac{9}{their(a)/60}$ oe Or **M1** for $\frac{5}{45}$ oe or $\frac{9}{their(a)}$ oe	eg $\frac{60}{9}$
5	(a)		0.13 oe	2	**M1** for 1 – (0.2 + 0.15 + 0.11 + 0.17 + 0.24) soi by answer of 0.31	
	(b)		0.48 oe	2	**M1** for 0.2 + 0.11 + 0.17 soi by answer of 0.30	
	(c)		0.0225 oe	2	**M1** for 0.15 × 0.15	
	(d)		27 or 28	3	**B2** for 27.5 Or **M1** for 250 × 0.11	

Question			Answer	Marks	Part Marks and Guidance	
6	(a)		6 correct rectangles, correctly joined	3	**B2** for 6 correct rectangles only, incorrectly joined or 5 correct rectangles only, correctly joined or 4 correct rectangles in a 'correct' net of 6 sides Or **B1** for any correct 3 of *their* 6 rectangles in an attempt at a net Or **SC1** for a correct net of any closed cuboid	Condone freehand. Condone outline only ie open top cuboid
	(b)		A (4, 0, 0) B (4, 3, 2)	1 1	**SC1** for reversed answers	
7	(a)		$10x - 3$	3	**Final answer** **B1** for $4x + 12$ soi **B1** for $6x - 15$ soi After **0**, then **SC1** for $10x + k$	
	(b)		$5x(y + 2)$	2	**Final answer** **B1** for $5(xy + 2x)$ or $x(5y + 10)$ seen Or **SC1** for $2x(2.5y + 5)$ or $10x(0.5y + 1)$ seen	Allow for **2** marks $(5x + 0)(y + 2)$ etc Allow for **1** mark $(x + 0)(5y + 10)$ Condone missing final bracket
8			(No) Trial repeated a lot of times 315 ÷ 600 soi by 0.525 Comparing 0.5 and '0.525' soi	 1 1 1	Allow Yes oe Or 600 × 1/2 oe soi by 300 Or comparing 300 and 315 soi or 300 and 285	**All three marks independent** Or mention of 50/50, evens etc soi Or comparing 315 and 285 soi

Question			Answer	Marks	Part Marks and Guidance
9*			7 times from 7.0735.. using 2000 and $\pi \times 3^2 \times 10$ or 2 and $\frac{\pi \times 3^2 \times 10}{1000}$. Correct and clear method shown. Appropriate language and labelling throughout.	5-4	For lower mark – Answer of 7.0735… rot from $2000 \div \pi \times 3^2 \times 10$ oe. There might be a slight slip in accuracy (premature approximation) and/or less structure to solution. Condone no/minimal words.
			Figs (2) $\div \pi \times 3^2 \times 10$ oe	3-2	For lower mark – $\pi \times 3^2 \times 10$ oe
			Knowing to divide 2 litres by *their* volume of glass. Little structure to the solution.	1-0	No relevant comment

Question			Answer	Marks	Part Marks and Guidance	
10	(a)		$p = \frac{t+3}{2}$	2	**Oe final answer** **M1** for $t + 3 = 2p$ oe or $\frac{t}{2} = p - \frac{3}{2}$ or $\frac{t+3}{2}$ Or **SC1** for final answer $p = \frac{t}{2} + 3$ or $p = \frac{t-3}{2}$ or $p = t + \frac{3}{2}$ oe or $p = t + 3 \div 2$ or $p = \frac{-t-3}{2}$ oe	
	(b)		$x = 2$ $y = 5$	2	**B1** for $x = 2$ or $y = 5$ or for $x = 5$ and $y = 2$ Or **M1** for attempt to add/subtract equations	Answers reversed With 2 of the 3 terms correct

Question			Answer	Marks	Part Marks and Guidance	
11	(a)		7.5 m/s	2 1	**M1** for 90 ÷ 12 soi Or 'metres per second', ms^{-1} etc	Indep
	(b)		Constant speed	1 1	Marks independent	
	(c)		Horizontal line from (12,90) to (22,90)	1	Accept freehand, ± 2 mm	Ignore any extra lines
12			1887 ÷ 1.02 oe 1850	M2 A1	**M1** for $1.02x = 1887$ oe	
13			$12x^2 + 9x$	3	**M2** for $3x(4x + 3)$ or $6x(2x + 1½)$ Or **M1** for $6x \times (4x + 3)$ oe	Condone omission of brackets for **M2** or **M1**
14	(a)		$2\frac{11}{12}$	1		
	(b)		0.015625 isw	1		
	(c)		125	1	Condone 125.0	
	(d)		3.458×10^8	2	**B1** for 345800000 soi Or **SC1** for 3.458×10^8 rot	
15	(a)		$x^2 + 2x - 15$	2	**Final answer** **B1** for three of x^2, (+)5x, $^-$3x, $^-$15	
	(b)		$(2x + y)(2x - y)$	2	**Final answer** **M1** for $(2x \pm y)(2x \pm y)$	
	(c)		$(x - 3)(x - 4)$ 3 and 4	M2 B1	**M1** for $(x + a)(x + b)$ where ab = 12 or a + b = $^-$7 Final answers	Final mark independent of method

Question			Answer	Marks	Part Marks and Guidance	
16	(a)		0.8, 0.2 correctly placed throughout	2	**M1** for 0.2 placed correctly once	
	(b)		0.32 oe	3	**M2** for 0.8×0.2 + 0.2×0.8 oe Or **M1** for 0.8×0.2 oe soi	0.8×*their*0.2 + *their*0.2×*their* 0.8 oe 0.8×*their*0.2 or *their*0.2×*their* 0.8 oe seen
17	(a)		0.5 to 0.6 inclusive $^-$3.5 to $^-$3.6 inclusive	1 1	Or **SC1** for (0.5 to 0.6, $^-$3.5 to $^-$3.6) or ($^-$3.5 to $^-$3.6, 0.5 to 0.6)	Throughout Q17 do not accept (*x*, *y*) coordinate point answers
	(b)		Correct graph of $y = x + 2$ 1.2 to 1.3 $^-$3.2 to $^-$3.3	M1 A1 A1	After **M1**: **SC1** for (1.2 to 1.3, $^-$3.2 to $^-$3.3) or ($^-$3.2 to $^-$3.3, 1.2 to 1.3) After **M0**: **SC2** for *their* 2 correct *x* values ± 0.1 Or **SC1** for *their* 1 correct *x* value ± 0.1	**FT only** for straight line graph through (0, 2) and with +ve or –ve gradient. Curve may be extended for **FT SC** marks
18	(a)		$\sqrt{\left(10^2 - \left(3^2 + 3^2\right)\right)}$ oe 9.05 to 9.08	M2 A1	**M1** for $\sqrt{\left(3^2 + 3^2\right)}$ or $\sqrt{\left(6^2 + 6^2\right)}$	
	(b)		64.8 to 65.6	3	**M2** for $\sin^{-1}(9.1 \div 10)$ or better or for $\cos^{-1}(\textit{their}\sqrt{18} \div 10)$ oe or for $\tan^{-1}(9.1 \div \textit{their}\sqrt{18})$ oe or better Or **M1** for sight of $\sin x = \frac{9.1}{10}$ oe etc or for $\frac{\sin x}{9.1} = \frac{\sin 90}{10}$ oe Or **SC1** for answer 72.54.. rot	For $\sqrt{18}$ accept 4.242640687 rot For 9.1 accept 9.05538513 rot Any correct trig. equation for the appropriate triangle

Question			Answer	Marks	Part Marks and Guidance	
19	(a)		850	1		
	(b)		348 or 350	2	**M1** for 850×0.8^4 soi by 348.16 rot	
20			$(2x - 1)(x - 4)$ $(x - 4)(x + 2)$ $\frac{2x-1}{x+2}$	M2 M1 A1	**M1** for $(2x + a)(x + b)$ where $ab = 4$	
21			$\frac{106}{360} \times \pi \times 8^2$ $\frac{1}{2} \times 8^2 \times \sin 106$ 59 to 60 or $\frac{848}{45}\pi$ oe or 30 to 31 28.4 to 28.5 inclusive	M2 M1 A1 A1	**M1** for $\frac{106}{360}$ oe or $360 \div 106$ seen Or $2 \times \frac{(8\sin 53 \times 8\cos 53)}{2}$ oe	
22	(a)		ANY U shape, vertex on positive *y*-axis	1	Vertex of U may be labelled 4	
	(b)		Narrower U shape, vertex at origin	1		
	(c)		ANY inverted U shape, vertex at origin	1		

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