OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for June 2012

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.

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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.

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 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 × (*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).
- **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 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 of working

i. and the answer given in the answer space 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. but the answer space is blank, allow full marks. Place the annotation ✓ next to the correct answer.

iii. but a completely different answer is seen in the answer space, 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.

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			882[.00] 216.65 6.19 222.4[0] 1334.40	1 1 1FT 1 1FT	 *Their* 216.65 ÷ 35 rot to 2dp Must be correct money notation for final mark 1112 + *their* 222.4[0]	 If VAT is blank but answer 1334.4[0] then VAT mark can be implied
2	(a)		Correct front elevation with or without join lines or other interior lines Correct plan including two hidden edges only	2 2	**M1** for 9cm by 1cm rectangle seen or for a 3cm by 1cm rectangle seen **M1** for 9cm by 3.5cm rectangle seen *For reversed answers, mark as scheme and then –1*	Condone freehand Allow 3.5 ± 0.2 cm Hidden edges dotted or solid
	(b)		52 500 or 0.0525 cm^3 or m^3 or in words or in words	3 1	isw after a correct answer if attempt to convert to other units **M2** for complete correct method Or **M1** for correct method for one relevant volume Or **SC2** for answer 52.5 from using measurements from part (a) Independent	*Accept lengths in metres, consistent and correct* **eg** **M2** for 90 × 35 × 10 + 30 × 35 × 10 × 2 Or **M1** for 90 × 35 × 10 (31500) or 30 × 35 × 10 [×2] (10500, 21000) **OR** **M2** for 90 × 40 × 35 – 70 × 30 × 35 Or **M1** for 90 × 40 × 35 (126000) or 70 × 30 × 35 (73500) etc

Question			Answer	Marks	Part Marks and Guidance	
	(c)		UB = 75.5 LB = 74.5	1 1	Condone 75.5[0] or 75.49[9..] Condone 74.5[0] After **0** scored allow: **SC1** for one correct value in wrong position	
3*			Shows fully correct calculation of **both** CI (4000×1.05^3 oe **and** 4630.5[0] or 630.5[0]) **and** SI (4000×1.15 oe **and** 4600 or 600) **and** that answer is £30.50. Well laid out answer with correct and clear labelling throughout.	5	***No misread allowed*** *other than 400 or 40000 used consistently*	'Labelling' means identifying work as CI or SI and any other explanation. Accept 200, 210, 220.5[0] seen for 630.5[0] and 200, 200, 200 seen for 600
			Correct answers of (4630.5[0] or 630.5[0]) **and** (4600 or 600) and that answer is £30.5[0]. There may be little working shown and no/incorrect labelling.	4-3	For lower mark – Finds 4630.5[0] **or** 630.5[0] **or** (uses 4000×1.05^3 oe and 4000×1.15 oe). Any working is clear and well presented. Labelling may not be correct.	
			Finds 4600 **or** 600 **or** uses 4000×1.05^3 oe. Any working for that value is clear and well presented. Labelling may not be correct.	2-1	For lower mark - Finds 4200 **or** 200 **or** uses 4000×1.15 oe. Little structure to solution. Other work and labelling may not be correct.	
			No correct work or no relevant comment.	0		
4	(a)	(i)	0.3 oe nfww	2	**M1** for $1 - (0.2 + 0.35 + 0.15)$ soi by answer of 0.48	*In this question −1 once for poor notation in answers* *eg* $\frac{0.3}{1}$ *or 0.3 : 1 etc*
		(ii)	0.55 oe	2	**M1** for $0.2 + 0.35$ soi by answer of 0.37	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		0.0225 oe	2	**M1** for 0.15 × 0.15 oe	
	(c)		40	3	**M2** for 8 ÷ 0.2 oe or for <u>two</u> of 6 [red], 14 [blue], 12 [green] soi Or **M1** for 8 = 0.2, so 4 = 0.1 oe soi or for <u>one</u> of 6[red], 14 [blue], 12 [green] soi	eg 16 = 0.4
5	(a)		21*x* + 18 final answer	2	**B1** for 21*x* or [+]18 seen	
	(b)		10*y* – 24 or 2(5y – 12) final answer	3	**B1** for 6*y* – 30 soi **B1** for 6 + 4*y* soi After **0** scored allow: **SC1** for 8*y* seen in answer	
6			Correctly evaluates one value from 2 to 3 inclusive Correctly evaluates one more value between 2 and 3 exclusive Correctly evaluates 2.7 to 2.732 **and** 2.7321 to 2.8 Answer 2.7 with justification	1 1 1 1	*Ignore incorrect trials* *Correct trials for 2.7 and 2.8* ***only*** *or 2.7 and 2.75* ***only*** *or 2.7 and 2.74* ***only*** *implies the first 3 marks* **Final mark dependent** on 3 scored. Indicating outcome for 2.7 is closer to 4 **or** evaluating a value between 2.71 and 2.75 inclusive	*Their values rot to at least 1dp* 2 $^{-}4$ 2.1 $^{-}3.339$ 2.2 $^{-}2.552$ 2.3 $^{-}1.633$ 2.4 $^{-}0.576$ 2.5 0.625 2.6 1.976 2.7 3.483 2.71 3.6425 2.8 5.152 2.72 3.8036 2.9 6.989 2.73 3.9664 3 9 2.74 4.1308 2.75 4.2969
7	(a)		Large number of observations oe	1	Ignore extra statements	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		$\frac{\textit{Their}(\text{total of 275, 255 and 241})}{\textit{Their}(\text{total of all 6 values})}$ $\frac{771}{1310}$ isw Or 0.58 to 0.59 or 58% to 59% Or 0.6 or 60%	M2 A1	For M2, allow rounded or truncated values **B1** for 771 <u>or</u> 1310 seen Dependent on **M2** scored	**<u>Also allow</u>** **M2** for $\frac{275}{449}$ **and** $\frac{255}{450}$ **and** $\frac{241}{411}$ [0.61.., 0.56 to 0.57, 0.58 to 0.59 oe] Or **M1** for $\frac{275}{449}$ **or** $\frac{255}{450}$ **or** $\frac{241}{411}$ oe **<u>OR</u>** **M2** for $\frac{257}{436 \text{ to } 437}$ oe Or **M1** for (275 + 255 + 241) ÷ 3 soi by 257 or for (449 + 450 + 411) ÷ 3 soi by 436 to 437
8	(a)	(i)	(0, 5, 3)	1		
		(ii)	(6, 5, 0)	1		
		(iii)	(3, 0, 1.5)	1		
	(b)		9	2	**M1** for 6 × 3 ÷ 2 oe	
	(c)		8.36 to 8.4 or $\sqrt{70}$ final answer	3	**M2** for $6^2 + 5^2 + 3^2$ oe soi by 70 Or **M1** for ($6^2 + 5^2$) <u>or</u> ($6^2 + 3^2$) <u>or</u> ($5^2 + 3^2$) soi	May be in two steps for **M2**
9	(a)		186 000	1		
	(b)		$4.5[0..] \times 10^{13}$	2	**M1** for correct substitution of all values into formula or for answer figs 45	For **M1**, condone any errors in conversion to ordinary numbers

Question			Answer	Marks	Part Marks and Guidance	
	(c)		$c = \sqrt{\frac{E}{m}}$ or $c = \frac{\sqrt{E}}{\sqrt{m}}$ or $c = \sqrt{E \div m}$	2	**B1** for correct form but with 'c =' omitted or for $c^2 = \frac{E}{m}$ Or **SC1** for $c = \frac{\sqrt{E}}{m}$	
10	(a)		Splitting into rectangles and correctly finding the areas in terms of x	M2	**M1** for splitting into rectangles and correctly trying to find area of one in terms of x	Eg for **M2** $x \times x + 2x \times 3$ $x \times x + x \times 3 + x \times 3$ $x \times (x + 3) + x \times 3$ $2x \times (x + 3) - x \times x$ Etc
	(b)		7, 55	1, 1		
	(c)		5 or 6 points correctly plotted <u>Curve</u> joining 5 or 6 points	1FT 1FT	Within half small square of *their* 'correct' position Within half small square of *their* points	
	(d)		3.5 to 3.7 inclusive	1	Independent	
11	(a)		$(x - 5)(x - 2)$ 5 and 2	M2 B1	**M1** for $(x + a)(x + b)$ where $a + b = -7$ or $ab = +10$	 Final mark independent of method
	(b)		Substitute for y or equalise coefficients Obtain <u>any</u> correct equation in x (or y) $x = 3$ $y = -2$	M1 A1 B1 B1	Allow one error	 Final 2 marks independent of method

Question			Answer	Marks	Part Marks and Guidance	
12	(a)		17.1	3	**M2** for $\frac{19.5}{6.5} \times 5.7$ Or **M1** for $\frac{19.5}{6.5}$ soi by 3	
	(b)		52	1		
	(c)		459 nfww	2	For 2 marks condone answer in range 452 to 460 nfww **M1** for 51 × (*their* 3)^2	If using $A = \pi r^2$ must be full and complete method to score **M1**
13	(a)		3	1		
	(b)		Any three of 8, $28\sqrt{3}$, $10\sqrt{3}$, $35\sqrt{9}$ $113 + 38\sqrt{3}$ isw	M2 B1	**M1** for any two of these	Accept 35×3 or 105 or $35\sqrt{3^2}$ for $35\sqrt{9}$ Final mark independent of method

Question			Answer	Marks	Part Marks and Guidance	
14			$\frac{5}{12}$ oe isw nfww	5	*–1 for poor notation in answer* **EITHER** **M2** for complete, correct tree diagram Or **M1** for correct tree with no/wrong probs **OR** **M2** for identifying there are exactly 5 required pairs Some of these may be implied……. Or **M1** for 3 of these **AND** **EITHER** **M2** for $\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{1}{3}$ oe Or **M1** for $\frac{1}{4}\times\frac{1}{3}$ or $\frac{1}{4}\times\frac{2}{3}$ or $\frac{2}{4}\times\frac{2}{3}$ oe soi **OR** **M2** for identifying there are exactly 12 possible pairs. May be implied. Or **M1** for 8 of these	Must include probabilities for **M2** Eg (3, 5) (3, 5) (4, 4) (4, 5) (4, 5) Or in a 2-way table Eg (3, 5) oe and using probability 2/3 Or 5 in numerator of answer eg 5/20 eg $\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{2}{3}$ oe Decimal equivalents rot to 2dp at least May be in a 2-way table More than 12 outcomes implies wrong work

Question			Answer	Marks	Part Marks and Guidance	
15			61.8 to 62 final answer	4		Correct method with: Rads gives 81.8.. Grads gives 84.0…
					B1 for angles 137 <u>or</u> 16 seen **AND**	May be on diagram
					M2 for $\frac{25}{\sin(their16)} \times \sin(their137)$	*Their* 137 > 90
					Or **M1** for any fully numerical attempt at sine rule	ie <u>Any</u> equation with <u>two</u> sin terms and 25
16			$a = 2$ $a = 2k$ $b = 5$ or $b = 5k$ $c = -6$ $c = -6k$	1 1 2	Any consistent k ≠ 0 **M1** for $(their\ b)^2 - 4 \times (their\ a) \times c = 73$ oe	 Must be an equation
17			550.18 to 551.09 final answer	5	*Final answer must be 2dp* *For answer 550 look back for 2dp value in range to score 5* **M2** for $(\pi \times 2.5 \times 3) \times 8.99$ Or **M1** for $\pi \times 2.5 \times 3$ soi by 23.5 to 23.6 **AND** **M2** for $(2 \times \pi \times 2.5 \times 2.4) \times 8.99$ Or **M1** for $2 \times \pi \times 2.5 \times 2.4$ soi by 37.6 to 37.7	**Ignore any extra values calculated** May find total area first before multiplying by 8.99 Multiplying by 8.99 may be implied

Question			Answer	Marks	Part Marks and Guidance	
18			$\frac{4x-15}{(x-2)(x-3)}$ or $\frac{4x-15}{x^2-5x+6}$ final answer	3	**SC2** for $\frac{2x^2-15}{(x-2)(x-3)}$ or $\frac{2x^2-15}{x^2-5x+6}$ or $\frac{-15}{(x-2)(x-3)}$ or $\frac{-15}{x^2-5x+6}$ **OR** **M1** for common denominator $(x-2)(x-3)$ or x^2-5x+6 soi **And B1** for $x^2+5x-3x-15-x^2+2x$ oe soi	Final answer Fractions may not be joined Condone any errors in multiplication. MUST be a quadratic Condone one error May not be in a fraction

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