OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for June 2013

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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 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 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)	(i)	4.18	2	**B1** for 4.177[….] seen	
		(ii)	1.4	2	**B1** for 1.42[….] seen	
		(iii)	0.0625 final answer	1		
	(b)		UB: 6549 LB: 6450	1 1	Condone 6550 After **0** allow **SC1** for correct answers reversed	
2	(a)		A at $\frac{4}{6}$ B at $\frac{3}{6}$	1 1	Each ± 1 mm After **0** allow **SC1** for 2 correct arrows, no labels	
	(b)		Large number of trials How many 4s Divide by total number of trials	1 1 1	≥ 50 trials (if mentions a number) May be by example	Condone ‘many’, ’multiple’ etc for ‘large’ NOT ‘times it lands on each no.’ NOT ‘work out %, etc’ with no details <u>For final mark, if 100 trials then accept</u> ‘the number of 4s is the [probability as a] percentage’
3	(a)		22 700	3	**SC2** for answer 23 400 or 18 850 OR **M2** for 2(60 × 55 + 60 × 70 + 55 × 70) oe Or **M1** for two of 60 × 55, 60 × 70, 55 × 70 seen	4 faces same or open top Soi by 3300, 4200, 3850 or by 6600, 8400, 7700

Question			Answer	Marks	Part Marks and Guidance	
	(b)		60 × 55 × 70 231 000 *Their* volume ÷ 1000	M1 A1 M1	Independent of first **M** mark May be implied by 1000 cm^3 = 1 litre	
	(c)		6 mins 25 secs	3	**M1** for 231 ÷ 0.6 **A1** for 385 soi by 6.416…rot	
4	**(a)**	**(i)**	62.5 or 62½	2	**M1** for 6¼ × 10 oe After **0** allow **SC1** for answer 31.25 or 31¼ or answer 87.5 or 87½	5 days one way or 7 days both ways
		(ii)	18 mins 45 secs	4	**B3** for 18.75 seen or for ans. 187 m 30 s Or **M2** for (*their* 6¼) ÷ 20 × 60 [× 60] oe Or **M1** for (*their* 6¼) ÷ 20 After **0** allow **SC1** for 18 m *p* s ($p \neq 0$) or 19 m 15 s	*Their* 6¼ may be 62.5 or *their* (a)(i) or *their* (a)(i) ÷ 10
	(b)		39	3	**B2** for answer of 26 Or **M2** for $65 - \frac{2}{5} \times 65$ oe Or **M1** for $\frac{2}{5} \times 65$ oe	ie $\frac{3}{5} \times 65$
	(c)	**(i)**	0.12 oe	2	**M1** for 1 – (0.4 + 0.33 + 0.15) soi by answer of 0.48 Ignore incorrect conversion after correct answer	<u>In parts (c)(i) & (ii)</u> ⁻1 once for poor notation eg $\frac{0.12}{1}$; 1 : 0.12 etc
		(ii)	0.55 oe final answer	2	**M1** for 0.4 + 0.15 soi by answer of 0.19	
		(iii)	375	2	**M1** for 2500 × 0.15 oe	

Question			Answer	Marks	Part Marks and Guidance	
5	(a)		$8x^2$ final answer	2	**B1** for $\frac{8x^3}{[1]x}$ or $\frac{40x^2}{5}$ or $\frac{8x^2}{1}$	
	(b)		$11x - 23$ final answer	3	**B1** for $3x - 3$ **B1** for $8x - 20$ After **0** allow **SC1** for $11x \pm n$ any $n \neq 0$ or for $ax - 23$ any $a \neq 0$	$11x$ + – 23 scores **B2**
6			$x = 2$ gives $x^3 - x = 6$ $x = 3$ gives $x^3 - x = 24$ 20 lies between 6 and 24 [so solution lies between 2 and 3] oe	1 1 1Dep	Or, for example: 2.8 gives 19.152 2.9 gives 21.489 Dependent on 2 previous marks scored Solution is 2.8[…] or solution is between 2.8 and 2.9	2.1 7.161 All outcomes rot 2.2 8.448 2.3 9.867 2.4 11.424 2.5 13.125 2.6 14.976 2.7 16.983 2.8 19.152 2.85 20.299 2.9 21.489
7			Any square with any 4 triangles 3 by 3 square Correct compass construction All four triangles sides 4 cm ± 2 mm and 3 cm ± 2 mm	1 1 M1 A2	Appropriately joined attempt at a net Correct for at least one triangle All four correctly compass constructed **A1** for one triangle correctly constructed After **M0** allow **SC2** for 4 triangles correct but with no/wrong arcs Or **SC1** for one triangle sides 4 cm ± 3 mm but with no/wrong arcs	Allow freehand for first mark only Arcs must be visible
8			Expression Equation Identity	1 1 1		

Question			Answer	Marks	Part Marks and Guidance	
9	(a)		$2x(2x - 3y)$ final answer	2	**B1** for $x(4x - 6y)$ or $2(2x^2 - 3xy)$ or $4x(x - 1.5y)$ Or **SC1** for $(x + x)(2x - 3y)$ or for $2x(2x + 3y)$	Allow for 2 marks $(2x + 0)(2x - 3y)$ Allow for 1 mark $(x + 0)(4x - 6y)$etc Condone missing final bracket
	(b)		$x^2 + 9x + 14$ final answer	2	**B1** for three of x^2, (+)7x, (+)2x, (+)14 soi	
10			104 ÷ 0.8 oe *Their* 130 × 0.85 oe 110.50	M2 M2 B2	Soi by 130 **M1** for 0.8 × n = 104 **M1** for *their* 130 × 0.15 oe **B1** for 110.5	
11	(a)		C = 53 soi Y = 30 soi Triangles contain same angles oe	1 1 1Dep	May be on diagram May be on diagram Dependent on 1 previous mark scored	 Ignore extra statements
	(b)		7.45 to 7.5	3	**M2** for $\frac{6}{8}$ × 10 oe Or **M1** for $\frac{6}{8}$ or $\frac{8}{6}$ oe seen OR **M2** for $\frac{6 \times \sin 97}{\sin 53}$ Or **M1** for $\frac{x}{\sin 97} = \frac{6}{\sin 53}$ oe	Condone 1.3[3…] for $\frac{8}{6}$
12			$y = x^2 + 4$ $y = x^3 - 2x$ $y = \sin x$	1 1 1		$^-$1 once for omission of y =

Question			Answer	Marks	Part Marks and Guidance	
13			$(x + 2)^2 = 3^2 + x^2$ oe soi	M2	**M1** for any combination of $(x + 2)^2$, 3^2 and x^2 in an equation	Condone omission of brackets for **M2** or **M1**
			$x^2 + 4x + 4$ oe	B1		
			$4x + 4 = 9$ oe	B1		
			1.25 or 1¼ or $\frac{5}{4}$	B1		
14	(a)		14	1		
	(b)	(i)	$6x + 4$ final answer	1		
		(ii)	$6x + 2$ final answer	1		
15			5.76 to 5.8	3	**M2** for $\frac{8.5 \times \sin 36}{\sin 60}$ oe Or **M1** for $\frac{x}{\sin 36} = \frac{8.5}{\sin 60}$ oe	
16			$\frac{2}{3} \times \pi \times 6^3$ oe	M2	May be implied by 144π **M1** for $\frac{4}{3} \times \pi \times 6^3$ or 288π	Condone (447 to 455) for **M2** Condone (894 to 905) for **M1** Condone (373 to 378) for **M1**
			$\frac{1}{3} \times \pi \times 6^2 \times 10$	M1	May be implied by 120π	
			264π final answer	A2	NOT from decimals Or **A1** for 264π final answer from decimals or for 144π or 120π seen After **0** scored **SC4** for 264π without work	

Question			Answer	Marks	Part Marks and Guidance	
17			$2x^2 - 4x + 1 = 6 - x$	M1	Or for an attempt to subtract the equations	**Alternative method** **M1** for $y = 2(6 - y)^2 - 4(6 - y) + 1$
			$2x^2 - 3x - 5$ [= 0]	A1		**A1** for $2y^2 - 21y + 49$ [= 0]
			$(2x - 5)(x + 1)$	M2FT	FT *their* $2x^2 + px + q$, $pq \neq 0$ (NOT the given quadratic) **M1** for $(2x \pm a)(x \pm b)$ a, b ≠ 0 OR **M1** for $\frac{^-(^-3) \pm \sqrt{(.....)}}{2 \times 2}$ oe **M1** for $(^-3)^2 - 4 \times 2 \times ^-5$ oe	**M2FT** for $(2y - 7)(y - 7)$
			$x = 2.5$ oe	B1		**B1** for $y = 7$
			$x = ^-1$	B1		**B1** for $y = 3.5$ oe
			$y = 3.5$ oe and 7	B1	Correctly linked to x	**B1** for $x = ^-1$ and 2.5 oe

Question			Answer	Marks	Answer
18			Clear method shown and correct answers correctly assigned to Alice and George. A correct comparison to conclude that George is more likely eg 'George is more likely because his probability is greater'	6	*FOR EXAMPLE:* *George :* $\frac{6}{10} \times \frac{6}{10} = \frac{36}{100} = 0.36$ *Alice:* $\frac{6}{10} \times \frac{5}{9} = \frac{30}{90} = 0.33\ldots$ *(Allow 0.55 to 0.56 for* $\frac{5}{9}$*)* *0.36 > 0.33, so George is more likely* *(Alternatively may change fractions to a common denominator to compare)*
			Clear method shown and correct answers correctly assigned to Alice and George **but** with an incomplete comparison eg 'George is more likely' but without justification	5 – 4	$\frac{36}{100}$ oe and $\frac{30}{90}$ oe obtained
			$\frac{30}{90}$ oe obtained	3 – 2	$\frac{36}{100}$ oe obtained
			Some idea to multiply fractions oe or an attempt to draw a tree diagram	1 – 0	No relevant comment

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