OCR
Oxford Cambridge and RSA

GCSE

Mathematics A

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

General Certificate of Secondary Education

Mark Scheme for June 2016

Oxford Cambridge and RSA Examinations

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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 <u>using a correct method</u> and are not lost for purely numerical errors.
     A marks are for an <u>accurate</u> answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
     B marks are <u>independent</u> of **M** (method) marks and are awarded for a correct final answer or a correct intermediate stage.
     SC marks are for <u>special cases</u> 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 <u>not from wrong working</u> **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen <u>and</u> 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 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.
   i. **cao** means **correct answer only.**
   ii. **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.
   iii. **isw** means **ignore subsequent working** (after correct answer obtained).
   iv. **nfww** means **not from wrong working.**
   v. **oe** means **or equivalent.**
   vi. **rot** means **rounded or truncated.**
   vii. **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.
   viii. **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.

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Question			Answer	Marks	Part Marks and Guidance	
1	(a)		3.70	1		
	(b)		5 : 4 or 1.25 : 1 or 1 : 0.8	2	**M1** for 2.7[0] : 2.16 or better After zero scored **SC1** for answer 4 : 5	For M1 ignore units
2	(a)	(i)	$\frac{3}{8}$	2	**M1** for $\frac{12}{32}$ oe	
		(ii)	5 nfww	3	**M1** for 27×0.18 oe **And A1** for 4.86	
		(iii)	12	2	**M1** for $\frac{2×30}{5}$ soi	
	(b)	(i)	0.18 oe	2	**M1** for 1-(0.4+0.17+0.25) soi by answer 0.54	In (b)(i)(ii)(iii): : Ignore qualifying words : Ignore any conversion attempts : -1 once for poor notation Eg $\frac{0.42}{1}$, ratio etc
		(ii)	0.42 oe	2	**M1** for 0.25+0.17 oe	
		(iii)	0.16 oe	2	**M1** for 0.4×0.4 oe	
		(iv)	255	2	**M1** for 0.17×1500 oe	Ignore rounding after correct answer
	(c)	(i)	Correct complete tree diagram	2	**B1** for 0.8 placed correctly once	
		(ii)	0.32 oe	3	**M2** for 0.2×*their*0.8+*their*0.8×*their*0.2 oe **Or M1** for 0.2×*their*0.8 or *their*0.8×*their*0.2 oe	

Question			Answer	Marks	Part Marks and Guidance	
3	(a)		111	3	**M2** for 13×12 – 0.5×9×10 oe Or for 3×12 + 10×3 + 0.5×9×10 oe Or for 3×13 + 9×3 + 0.5×9×10 oe Or for 3×12 + 0.5×10×(3+12) oe **Or M1** for 0.5×9×10 oe Or for 0.5×10×(3+12) oe <u>After zero scored</u>: **SC1** for answer 109.5	
	(b)		11100	1FT	*their(*a)×100	
4	(a)		$8y^2$ final answer	2	**B1** for $\dfrac{8y^4}{y^2}$ or $\dfrac{16y^2}{2}$ or $\dfrac{8y^2}{1}$	
	(b)		$4x^3 - 24x^2$ final answer	2	**B1** for $4x^3$ or $-24x^2$ seen	
	(c)		$13x - 16$ final answer	3	**B1** for $3x - 21$ **And B1** for $10x + 5$	
5	(a)		Large number of trials oe	1		
	(b)		$\dfrac{123}{500}$ isw or 0.246 or 24.6%	2	**B1** for 500 seen **Or M1** for $\dfrac{123}{their\,500}$	
	(c)		-Fair <u>and</u> frequencies approx. same oe - All approx. ¼ of 500 (125)	1 1indep	Or -Fair <u>and</u> all probs approx. same oe -All approx. 0.25 oe	See appendix 1

Question	Answer	Mark	Answer

6*			Eg. Rectangle oe = 9×6
			    [Semi-]circle oe = ½×π×3^2 oe
			      [Total area] = 2×(9×6) − ½×π×3^2 oe
			             = 93.86 to 94 cm^2

	93.86 to 94 with commentary	**5-4**	93.86 to 94 with no/poor commentary
	2×(9×6) − ½×π×3^2 oe	**3-2**	½×π×3^2 oe **OR** 9×6 <u>and</u> π×3^2 oe
	9×6 <u>or</u> π×3^2 oe	**1-0**	No worthy work.
		AND	
	cm^2 with *their* final answer	**1**	

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Question			Answer	Mark	Answer	
7	(a)		2x(2y − 5w) final answer	2	**B1** for 2(2xy − 5xw) or x(4y − 10w) <u>After zero scored</u>: **SC1** for 4x(y − 2.5w) oe	
	(b)		7 -7	1 1		Accept ±7 for 2 marks
	(c)		$\frac{-(-2)}{2 \times 3}$ oe soi ±√[(-2)^2 − 4x3x(-7)] oe soi 1.90 final answer -1.23 final answer	M1 M1 B1 B1	 Indep. <u>After B0 scored</u> **SC1** for 1.8968… <u>and</u> -1.2301… rot	 Condone -2^2 for (-2)^2
8	(a)		9.2	3	**M2** for 23 × $\frac{6.2}{15.5}$ oe **Or M1** for $\frac{6.2}{15.5}$ oe soi by 0.4 or 2.5 or $\frac{x}{6.2} = \frac{23[.0]}{15.5}$ oe	<u>OR</u> M1 6.2^2+9.1^2-2×6.2×9.1×cos71 A1 84.5… A1 9.19 to 9.2
	(b)		71	1		
	(c)		1/2×6.2×9.1×sin71 26.66 to 26.67…	M1 A1		
	(d)		166.6 to 167	2	**B1** for (*their* 2.5)^2 oe seen	<u>OR</u> M1 ½ ×15.5×(9.1×2.5)×sin71

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Question			Answer	Mark	Answer	
9	(a)		−4, −4, −2, 2	2	**B1** for two values correct	
	(b)		6 or 7 of their points correctly plotted Smooth U-shape curve thro' their 7 points	1 1	Points and curve ±½ small square Curve must go below $y = -4$	
	(c)		0.4 to 0.7 -3.4 to -3.7	1 1		
10	(a)		4244.83 or 4245	3	**M2** for 4000×1.02^3 oe **Or M1** for 4000×1.02 oe <u>After zero scored</u> **SC1** for answer 4240	
	(b)		7850	3	**M2** for $\dfrac{8164}{1.04}$ oe **Or M1** for 1.04 correctly linked to 8164 oe	Eg 104% is 8164
11	(a)		7.01×10^{-6} on left 7.01×10^{-5}, 7.1×10^{-5} 7.1×10^5 on right	1 1 1	As middle pair, in this order <u>After zero scored</u> **SC2** for correct reverse order	Accept equivalents
	(b)		500	3	**B2** for answer 0.5 **Or M1** for $\dfrac{\text{figs }15}{\text{figs }3}$	

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Question			Answer	Mark	Answer	
12			35.5 to 36	3	**M2** for $\dfrac{11.2 \times \sin 42}{12.9}$ soi by 0.5809... **Or M1** for $\dfrac{\sin x}{11.2} = \dfrac{\sin 42}{12.9}$ oe	
13	(a)		Rectangle 5 high and 3 wide Isosceles triangle 2 high and 3 wide	1 1	 <u>After zero scored</u> **SC1** for correct outline with curved join	Condone by hand Condone outline only
	(b)		Complete circle Radius 3	1 1	Any attempt Compass drawn ±2mm	
	(c)		$\pi \times 3^2 \times 10$ oe $\frac{1}{3} \times \pi \times 3^2 \times 4$ oe 102π isw	M1 M1 A2	Soi by 282.7 to 283 Soi by 37.69 to 37.7 **A1** for 90π or 12π seen	Accept all answers $\times 10^6$ oe Ignore conversion attempts
14	(a)		$\dfrac{x-1}{x+2}$ final answer	4	**M3** for $(x-4)(x-1)$ <u>and</u> $(x-4)(x+2)$ **Or M2** for $(x-4)(x-1)$ <u>or</u> $(x-4)(x+2)$ **Or M1** for $(x \pm 4)(x \pm 1)$ <u>or</u> $(x \pm 4)(x \pm 2)$	
	(b)		$a = -4$ $b = 18$	3	**B2** for $a = -4$ **Or M1** for $x^2 + ax + ax + a^2$ or $(x-4)^2$ <u>After zero scored</u> **SC1** for *their b* = $(their\ a)^2 + 2$	
15	(a)		Curve moves horizontally to right	1	Correct by eye	
	(b)		$y = \sin(x) + 4$	1		
	(c)		$y = \sin(\frac{1}{2}x)$	1		Accept $y = -\cos(\frac{1}{2}x)$

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APPENDIX 1

Exemplar responses for question 5(c)

Response	Mark awarded
Fair, results are close	1,0
Fair, it lands an even amount of times	0,0
Fair, the numbers are close together	1,0
Biased as the frequencies are not all the same	0,0
Fair, an equal amount of numbers on the spinner	0,0
Fair, all the numbers are in the 100's and the biggest gap is 15	1,0
Biased, as you should get 125 for each number	0,1
Fair, all the numbers are close to 125 which is what you expect	1,1
Fair, as there are no drastic anomalies in the frequencies	1,0
Fair, all the probabilities are approximately 0.25	1,1
Fair, all frequencies are in a range of 9	1,0
Fair, each result was similar	1,0
Fair, lands on each of them a lot of times	0,0

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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