OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

Unit **A501/02:** Mathematics A (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.

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
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 – $\sqrt{}$(*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 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)		13 : 15	3	Or $\frac{13}{15}$: 15 or $0.8\dot{6}$: 1 or 1 : $\frac{15}{13}$ or 1 : $1.\dot{1}5384\dot{6}$ **M1** for correct conversion of m to cm or vv **M1FT** for correct partial simplification of *their* ratio Allow **M2** for 13 cm to 15 cm or 15 : 13 or 13 : 1500 or rot versions of $0.8\dot{6}$: 1 or 1 : $1.\dot{1}5384\dot{6}$, if exact answer is not seen	**M2** for 78 : 90 or 52 : 60 or 39 : 45 or 26 : 30 or 0.78 : 0.9 etc Condone inclusion of units for the Ms 2nd **M1** may be gained if conversion is not attempted 0.13 m : 15 cm gets **M0M1** 1.15 : 1 gets **M1**
	(b)		Sarah 2220 and David 1480	3	**B2** for one correct or for answers reversed Or **M1** for 3700 ÷ 5 or 740	
2			Perpendicular bisector of AB drawn with correct arcs (two pairs)	2	**M1** for perpendicular bisector of AB with no/wrong arcs or correct arcs and too short or for the perpendicular bisector of another side with correct arcs	Use overlay; their line must pass between parallel lines on overlay and be at least as long; condone touching these lines but not crossing them
			Circle centre D radius 4 cm drawn	1	At least the relevant part of the arc	Tolerance 2 mm
			Correct region shaded	1	Garden to left of perpendicular bisector and outside circle; dependent on circle centre D attempted and reasonable attempt at perpendicular bisector of AB (a line passing through somewhere near the middle of AB and approaching an angle of 90° with it)	Allow correct region indicated by label not shading Ignore other constructions if correct ones are there

Question			Answer	Marks	Part Marks and Guidance	
3	(a)		1.6 or $\frac{8}{5}$ oe	3	**M1** for $10x - 15$ soi or for $2x - 3 = \frac{1}{5}$ oe **M1** for $10x = 16$ or FT *their* first step **M1** for answer FT *their* $ax = b$, with $a \neq 1$ or 0 and $b \neq 0$	Award **M3** only if answer correct Only FT for last mark if **M1** has been earned already
	(b)		$2a(3a - 5)$ as final answer	2	**M1** for $2a(....)$ or $2(3a^2 - 5a)$ or $a(6a - 10)$	Condone omission of final bracket; accept inclusion of multiplication symbols
	(c)		$^{-}6$	1		
4	(a)		At least 3 response boxes covering all eventualities from at least 1 m to 20 m	1	For this mark they must mention appropriate units Condone heights implicitly to nearest metre or better as having no gaps eg 0-2 m, 3-5 m etc	Condone < 20 m as upper limit; condone omission of 'no trees in garden' or 'no garden' category; top category must start from 3 m or more
			No overlaps between categories (must have at least 3 categories; categories must not be more than 1 m apart)	1	After **0** for question allow **SC1** if clear intent to cover all eventualities (as for first mark) but poor notation (eg of inequality signs) has meant they earned 0	**0** for eg ...10-15 then 15-20 etc but bod intent with ...10-14 then 15-20 then 20+ or with ...10-14 then 15-19 then 20+ Condone no boxes if clear categories
	(b)		12	2	nfww **M1** for $\frac{202}{823} \times 50$ oe or for 12.2 to 12.3	eg **M1** for 823 ÷ 50 [= 16.(46)] then 202 ÷ answer Or **M1** for 823 ÷ 202 [= 4.07(...)] then 50 ÷ answer

Question			Answer	Marks	Part Marks and Guidance	
	(c)	(i)	Plots at midpoints of groups	1	At 2, 7, 12, 17; condone one error within the correct interval	Use overlay
			Heights correct	1	Tolerance 1 mm	As well as correct, allow heights mark for bars or for plots not at midpoints but elsewhere in correct interval
			Joins with ruled straight lines	1	Within 1 mm of points; ignore joins to axes from endpoints, but **0** if endpoints are joined	Ignore bars if a frequency polygon also seen; otherwise bars can earn the mark for heights correct
		(ii)	7.6	4	nfww **M1** for midpoints 2, 7, 12, 17 seen or used **M1** for *their* midpoints × frequency (14, 70, 72, 34; total 190) **M1** for (*their* sum of midpoints × frequency) ÷ *their* 25; FT *their* (7 + 10 + 6 + 2) **A1** for 7.6 Accept 8 for **A1** if M3 earned and no errors seen	At least three of them seen At least 3 correct or for total 190 nfww Allow first two **M1**s if seen even if not used for answer on answer line Second and third **M**s are available for '*their* midpoints' being an attempt using other points in interval, or endpoints (at least 3 seen) Answers of 5.6 or 9.6 imply second and third **M1**s
5	**(a)**		$2^2 \times 3$ oe	1	Must be product	

Question			Answer	Marks	Part Marks and Guidance	
	(b)	**(i)**	48	2	**B1** for answer as 24 or a multiple of 24 that is greater than 48 eg 72 or 96 Or **M1** for lists of multiples of 8 and of 12 (at least 3 each)	
		(ii)	[48 or *their* (i)] + multiples of 24	2	Or go up in 24s oe **B1** for multiples of 24 oe mentioned or for 'multiples of 48'	See appendix for examples
6	**(a)**		$4n + 1$ oe	2	Mark final answer **M1** for $4n$ oe Or **SC1** for $4n$th + 1	Condone $4 \times n$, $n4$, use of other letters instead of n Ignore 'n =' or 'nth ='
	(b)	**(i)**	3, 9, 27	2	**B1** for two correct, in correct position Or **SC1** for 1, 3, 9 or 9, 27, 81	**B0** for 3, 6, 9
		(ii)	1 594 323 and 13th term	3	**B2** for one of these or 3^{13} as answer Or **B1** for 1 594 323, 531 441 or 4 782 969 seen eg as trials	
7			(4.5, 4)	2	**B1** for 4.5 or 4 as correct coordinate or for (4, 4.5) If **B0**, allow **M1** for $\frac{10+^{-}1}{2}$ or $\frac{7+1}{2}$	May do sketches; condone scale drawing instead of calculation
8			11.6(...)	3	nfww **M2** for $\sqrt{6.7^2 + 6.7^2 + 6.7^2}$ oe Or **M1** for $6.7^2 + 6.7^2 + 6.7^2$ Or **SC1** for 9.47(5...) rot to 1dp or more	

Question			Answer	Marks	Part Marks and Guidance	
9	(a)		16.2 to 16.3	3	nfww **M2** for $AP = \frac{50}{\tan 72}$ or $50 \times \tan(90 - 72)$ Or **M1** for $\tan 72 = \frac{50}{AP}$ or $\tan(90 - 72) = \frac{AP}{50}$ **SC1** only for 16.2 or 16.3 from scale drawing	Or **M2** for $AP = \frac{50 \sin 18}{\sin 72}$ or for complete correct method using sin or cos and Pythagoras Or **M1** for $\frac{50}{\sin 72} = \frac{AP}{\sin 18}$
	(b)		[0]77.7 to [0]77.82	3	nfww **M1** for $\tan APC = \frac{75}{\textit{their}\ AP}$ **M1** for inverse trig fn soi If **M2** earned, allow **A1** for [0]78	Allow **M1** for $\tan ACP = \frac{\textit{their}AP}{75}$ provided angle is clearly indicated eg invsin seen earns **M0M1** **0** for scale drawing
10			Frequency densities: 3, 4, 5, 1, 0.4 Bars all correct height Bars all correct width	1 1 1	Seen or used as heights; condone two errors	May be by table
11	(a)		$a = 6$ $b = 20$	1 2	 **M1** for $b = 2 + 3a$ seen Or **B1** for *their* answer FT $2 + 3 \times$ *their a*	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		$[p =]\sqrt[3]{\frac{cH^2}{10}}$ oe	4	nfww **M1** for $H^2 = \frac{10p^3}{c}$ **M1** for $cH^2 = 10p^3$ or FT *their* expression for H^2 **M1** for $p^3 = \frac{cH^2}{10}$ or FT **M1FT** for cube root of *their* expression for p^3; cube root symbol must extend below fraction line	ie **M1** for correct squaring **M1** for dealing correctly with denominator of fraction after squaring **M1** for dealing correctly with result to get p^3 as subject **M1** for correctly finding cube root of *their* expression for p^3 (middle two **M**s may be earned for a combined step) Award full marks only if fully correct

APPENDIX 1

Exemplar responses for Q5(b)(ii)

Response	**Mark**
Every 24th number after 48 will leave no sweets	2
Must go up from 48 in multiples of 24	2
It has to be a multiple of 24 above 48	2
Start at 48 and make 24 more each time	2
48 + 24*n* with *n* being one extra load of sweets	2 bod
Any number that is exactly divisible by 24, as 24 is the LCM of 8 and 12. It must be 36 or more so that 12 people can have at least 3 sweets	2 bod
Use multiples of 24 eg 48, 72	2 bod
She could times 24 by 8 or 12, depending on the number of people she has invited	1
Multiply the least number of sweets by 2 each time	1
12 times an even number equals a number that will go into 8. Multiply 12 by an even number and she will have a number of sweets to make that will work with 8 people too	1 equivalent to mentioning 24, but 24 itself not excluded
It has to be a multiple of 48	1
The number must be divisible by 12 and 8 and over 48	0 not sufficient
Go through the multiples of 8 and 12 on multiple and make that number of sweets	0 not sufficient
The amount of sweets she makes must be a multiple of 12 and 8	0
48 + *sn* where *n* is the number of people and *s* is the number of extra sweets	0
It has to be a multiple of 12 but not 12 itself	0
Multiply the greatest number of people at the party by the number of sweets per person	0

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

OCR Customer Contact Centre

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

www.ocr.org.uk

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Facsimile: 01223 552553