OCR
Oxford Cambridge and RSA

GCSE

Mathematics A

Unit **A501/02:** Unit A (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2015

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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.

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.

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, i.e. 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, e.g. 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 e.g. 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 e.g. 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 (i.e. **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.

MARK SCHEME

Question			Answer	Marks	Part Marks and Guidance	
1	(a)		Samira 420 and Joanne 280	3	**B2** for one of these correct or **M1** for 700 ÷ 5 or 140 **SC2** for answers reversed	
	(b)		210	3	**M2** for 5/2 × 84 oe or **M1** for 84 ÷ 2 or 42 or for 126 found	e.g. M2 for 84 + 42 × 3 or 84 + 126
2	(a)		0.089	2	**B1** for other rot versions of 0.08854... to 2 or more dp or **SC1** for answer 13.553 or 3.627	allow B1 for 0.089 seen in body and spoilt on answer line e.g. answer of 0.110 – bod wrong rounding
	(b)		700	2	**B1** for other rot versions of 718.40... to 2 or more sf	
3	(a)	(i)	25	1		
		(ii)	−2000	1		
		(iii)	−0.5 oe or $-\frac{1}{2}$	1	0 for $\frac{1}{-2}$	

Question			Answer	Marks	Part Marks and Guidance	
	(b)	(i)	0.75	**4**	oe, nfww; isw wrong conversion after ¾ **M1** for $6x - 2$ [$= 10x - 5$] oe and **M2** for $3 = 4x$ oe or FT or **M1FT** for collecting xs or numbers correctly FT on opposite sides of equation and **M1FT** for *their* final answer FT *their* $ax = b$, dep on at least M1 already earned, for $a \neq 0$ or 1 and $b \neq 0$ (isw wrong conversion)	for dealing with brackets correctly, or division by 2: [$3x - 1 =$] $5x - 2.5$ oe award a max. of M3 if answer is not correct
		(ii)	8 or –8 (both required)	**3**	**B2** for one solution or for $x = \pm\sqrt{64}$ or **M1** for $x^2 = 64$ or for $(x - 8)(x + 8)$ [$= 0$] **or SC1** for $8^2 = 64$ or $8^2 - 4 = 60$ **and SC1** for $(-8)^2 = 64$ or $(-8)^2 - 4 = 60$	

Question			Answer	Marks	Part Marks and Guidance	
4			arc of circle centre T radius 6 cm drawn	1	arcs for B and T circles must be compass drawn; radius tol 2 mm, and extending for a sector of at least 30°	
			arc of circle centre B radius 4 cm drawn	1		
			Perpendicular bisector of WS drawn with correct arcs	2	must be at least 3 cm long **B1** if no/wrong arcs e.g. arcs touching at midpoint of WS; line must be within 1 mm of centre of WS and tol 1°; or allow **M1** for two correct pairs of arcs but no line or line inaccurate or too short (e.g. if arcs too close)	
			Correct region indicated clearly, dep on arcs centres B and T drawn and straight line attempt at perpendicular bisector	1	accept lack of label R if other indication is clear; assume their region is bounded by the requested loci – ignore construction arcs for the perpendicular bisector going through this region	
5	(a)		4, 10, 16	2	**B1** for two of these correct and in the correct position or associated in working with correct value of n; or B1 for -2, 4, 10	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		no, following work gaining both M marks	**3**	**M1** for $n^2 = 200$ soi **and M1** for $\sqrt{200}$ or $10\sqrt{2}$ is not an integer, or $\sqrt{200} = 14.1...$ **or** **M1** for $5 \times 14^2 = 980$ **and M1** for $5 \times 15^2 = 1125$ **or** **M1** for one of $5 \times 14^2 = 980$ and $5 \times 15^2 = 1125$ **and M1** for $5 \times 14.1..^2 = 999$ to 1001 or for another trial of 14 to 15, so that the two trials have straddled 1000	e.g. M2 for '200 is not a square number' ignore subsequent trials once M2 earned
6	(a)	(i)	6-10	**1**	0 if 8 also mentioned unless it is clearly given as reason	

Question			Answer	Marks	Part Marks and Guidance	
		(ii)	11.4(3...)	**4**	nfww **M1** for midpoints 3, 8, 13 etc seen or used **and** **M1** for *their* midpoints × freq (0, 6, 64, 91, 108, 46, 28) **and** **M1** for (*their* sum of midpoints × freq) ÷ 30 Allow **A1** for 11 if **M3** earned and no errors seen	At least three of them seen; may be implied by products At least 3 correct or total 343 seen; Allow first two **M1**s if seen even if another method 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 9.7 or 13.16 -13.17 imply second and third M1s
	(b)	(i)	4	**2**	**M1** for $\frac{93}{1043} \times 50$ oe or for 4.4(...) rot to 2 or more sf	e.g. M1 for 93/20.86… after 1043/50 = 20.86 If nothing on answer line, allow 2 marks for 4 written by table by year 13

Question			Answer	Marks	Part Marks and Guidance	
		(ii)	advantage: more reliable results	**1**	oe; accept 'more reliable' or 'more representative' 0 for 'more accurate' or 'more precise' without any reference to reliability or representation	see appendix for exemplar comments accept valid reasons even if qualified with additional comments
			disadvantage: takes longer to do survey	**1**	or longer to process results; or more difficult to collect/process results oe; or more work oe 0 for harder to interpret results	
7	(a)		$a^2 + 294^2 = 343^2$	**M1**	oe; for correct Pythagoras statement	allow M1 for $a^2 = 31\,213$
			$\sqrt{343^2 \pm 294^2}$	**M1**		
			176.6 to 177	**A1**	or **B3** nfww; allow **A1** for 180 if correct method seen	
	(b)		e.g. $\cos PLS = \frac{294}{343}$	**M1**	for a correct trig statement with clearly identified angle; may use their answer in (a); may find either angle in the triangle	Condone poor notation [S here is 3rd vertex of triangle; candidates will use other refs, e.g. o, a and h marked on the triangle.]
			use of inverse trig function	**M1**	allow even if wrong trig function used	if e.g. 31 appears with no identification, allow this to imply the second M1
			bearing = 148.9 to 149.1	**A2**	A1 for LPS = 58.9 to 59.1 or for PLS = 30.9 to 31.1	allow 148.0 to 149.1 to imply the correct angle used

Question			Answer	Marks	Part Marks and Guidance	
8			arcs on AB equidistant from C (may be small arcs) correct perp drawn with a correct pair of arcs	1 1	accept one arc where distance from C = BC 0 if no arcs; Allow 2nd mark even if pts on AB equidistant from C have been obtained without arcs	0 for arcs centres A and B through C and common tangent at C drawn NB check that arcs are not spurious; e.g. perp drawn using protractor, and then arcs from A and B crossing on perp.
9	(a)		Frequency densities 0.12, 0.2, 0.18, 0.17[2], 0.13[2], 0.02 soi Heights correct Widths correct	1 1 1	Seen or plotted Condone one error No FT from wrong frequency density 0 for widths mark if polygon drawn as well	 accept plotting within square for 0.17 to 0.172, and similarly for 0.13 to 0.132 for 100, 300, 500, 1500 condone vertical up to half a square out
	(b)		54	1		
	(c)		the groups go up to 2000+1200 = 3200 max, but the person who spent most can spend less than this	1	or 'they may not have been the top person in each category but spent most overall' bod 'they' as being the person who spent most	Condone omission of being the person who spent most if valid spending itemised e.g. 2000 + 1100 [= 3100]; must reference 3200 (or 2000 and 1200) or reference both 1500 - 2000 and 900 – 1200 See appendix for exemplar comments

Question			Answer	Marks	Part Marks and Guidance	
10	(a)		$5a + 5b$ [$= 2ab$]	**M1**	for expanding brackets correctly	
			$5b = 2ab - 5a$ oe	**M1**	for collecting a terms correctly on one side, non-a terms on the other, FT	[no ft for remaining Ms from rhs = $2a + b$ oe resulting in one a term when rearranged]
			[$5b =$] $a(2b - 5)$ oe	**M1**	for factorising correctly FT; may be implied by final answer	condone no equation
			$[a =] \frac{5b}{2b-5}$ oe	**M1**	for correct division FT by *their* two-term factor	award 4 marks only for correct work; withhold last M1 if further work such as incorrect cancelling
			Or for those who divide first:	**Or**		
			$a + b = \frac{2ab}{5}$	**M1**	oe for each mark	
			$a - \frac{2ab}{5} = -b$	**M1**	[apply equivalent FTs as above]	
			$a(1 - \frac{2b}{5}) = -b$ or $\frac{a}{5}(5 - 2b) = -b$	**M1**		
			$a = \frac{-5b}{5-2b}$	**M1**	M0 for triple-decker fraction in final answer	
	(b)	(i)	2	**1**		
		(ii)	$6x + 3$ as final answer	**2**	**M1** for $2(3x + 4) - 5$	

APPENDIX 1

Exemplar responses for question 6(b)(ii) advantage

Response	Mark awarded
The sample will be more representative of the whole school and she will have more valid results	1
More representative results	1
More representative, more accurate results	1
Gives a wide range of views from more people to improve the reliability of the survey	1
The results are much more reliable and become more accurate with more data	1
It gives more precise results	0
It would give her a more precise sample	0
It would give her more accurate results	0
You get a wider range of results to work from	0
More accurate results as easier to spot anomalies	0
Gives a wide range of views from more people to improve the accuracy of the survey	0
A wider variety of results so fair and less biased	0

Exemplar responses for question 6(b)(ii) disadvantage

Response	Mark awarded
Difficult to collect and analyse results	1
More time-consuming to collect/process results	1
It is more difficult to organise with more people	1
It involves more work	1
More chance of making an error when calculating with more/larger numbers	0
Time	0 not sufft
There may not be enough people in each group/class/year to get a larger sample	0 plenty in each year…
You may get bias/a lot of outliers etc	0
A greater chance of anomalies occurring	0
There will be more people in one year group than another	0
There will be too much data to compare	0
The data is harder to interpret	0
There may be too many people/numbers to work with	0

Exemplar responses for question 9(c)

Response	Mark awarded
It is possible that one person who spent between 1500 and 2000 in (a) is the same person who spent between 900 and 1200 in b) e.g. £2000 from (a) and £1100 from (b)	1 bod error the 'same person'
It is possible because the highest amounts are £2000 and £1200 spent on accommodation etc. These are not necessarily the actual amounts spent – they are merely the average. So while £3200 would be the highest amount, £3100 is likely as people did not necessarily spend the highest amounts in each category	1 in spite of error 'the average' and 'people'
They might have spent £2000 on travel etc but only £1100 on food etc because although the group is from 900 to 1200 it doesn't mean the biggest value is £1200, all the values could be £1100 or less but it still goes into that category	1
They could have spent up to £2000 on tr and acc and up to £1200 on food etc which is £3200 so it is possible they spent £3100	1 bod; the 'up to's help to give the mark
The max was 3200 but nobody spent as much as that	0 not sufft
The person was in the top band for both	0 not sufft
The most is 3200. You would have to spend £100 less than that	0 not sufft
They could have spent £2000 on travel and accommodation and spent £1100 on food, drink and entertainment.	0 not sufft
The groups show a range of spending. They might have spent £2000 on travel and acc. And £1100 on food etc with no one actually spending £1200 on that	1 bod

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