OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for June 2011

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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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.

   - **cao** means **correct answer only**.
   - **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 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'. Place the annotation ✓ next to the correct answer.

    If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

    If the correct answer is seen in the 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. 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.

MARK SCHEME

♠ = common with A501/01

Question			Answer	Marks	Part marks and guidance	
1	(a) ♠	(i)	6.75 or 6.7 or 6.8	1		
		(ii)	614.125	1	Condone rot to 3sf or more	
	(b)		2 + 3 × (2 + 7) = 29	1		ignore superfluous pairs of extra brackets eg 2 + (3 × (2 + 7)) = 29 but 0 for extra single brackets or for extra brackets giving wrong result eg (2 + 3) × (2 + 7) = 29
	(c)		231	2	**M1** for 3.85 × 60 or for 0.85 minutes = 51s soi	
2	(a) ♠		Arcs drawn with radii 9.5 and 4.8 cm centres A and C resp.	1	Tolerance 2mm	the arcs should be inside circles on overlay but condone outside and very nearly touching circles when screen is set to width; one of the arcs should extend through at least three circles, including D NB spurious arcs put in afterwards do not gain credit; ignore other arcs on the diagram
			Quadrilateral completed with ruled lines, with D in tolerance	1	[This mark available even if no arcs seen] condone dashed lines, if 0, allow **SC1** for one correct arc	condone wrong / no label for D; tolerance – the vertex should be inside circle on overlay but condone outside and very nearly touching circle when screen is set to width allow SC1 for quadrilateral completed, with arcs, using CD = 9.5 cm and AD = 4.8 cm

Question			Answer	Marks	Part marks and guidance	
	(b) ♠		Correct construction arcs	**1**	Check by eye; use marking tool if in doubt	NB spurious arcs put in afterwards do not gain credit; ignore other arcs on the diagram
			Correct ruled bisector drawn	**1**	Within tolerance on overlay	to extend at least to the circles on overlay, going through or touching these
3	**(a)** ♠		70*n* + 150 oe	**2**	**M1** for 70*n* oe or for e.g. 70*x* + 150 oe	Accept 70 × *n*, *n*70, etc; or capital N ignore £ or p;
	(b) ♠		70*n* + 150 = 3300 or 3300 − 150 = 70*n*	**1**	or FT from *their* (a); must see equation to gain this mark	Allow other letters
			45	**2**	**M1** for one correct step in solving *their* equation eg 70*n* = 3150 but M0 for just 3300 − 150 = 70*n* – not sufficient **SC1** for embedded answer on answer line or in body of script	allow M1 for $n = \frac{C - 150}{70}$ seen and then 3300 substituted for C even if no equation with *n* then seen ignore £ or p allow M1 for correct step in solving inequality and then A1 for *n* ≤ 45

Question			Answer	Marks	Part marks and guidance	
4			70/42 or 1.66 – 1.67 or 1.7 [gallons used] FT *Their* gallons × 4.5 or 7.47 to 7.65 [litres used] FT *Their* litres for 70 miles used × 121.9 or × 1.219 9.09 to 9.17 or 9.32 to 9.34 <u>Or</u> for 42/4.5 or 9.3(3...) [miles per litre] 70 ÷ *their* mpl or 7.5 [litres used] t*heir* litres for 70 miles used × 121.9 or × 1.219 9.09 to 9.17 or 9.32 to 9.34	**M1** **M1** **M1** **A1** **or** **M1** **M1** **M1** **A1**	in principle: **M1** for dealing correctly with any two elements of $\frac{70}{42}\times 4.5\times 121.9$, **M1** for correctly combining the result with a third, **M1** for correctly combining the result with the fourth. For A1 accept unrounded answers as well as answers to nearest penny. or **B4;** **B3** for 909 to 917 or **B4** for 9.09 to 9.17	<u>Or</u> **M1** for 121.9 × 4.5 or 548.(55) [cost of one gallon, in pence] or 70/42 or 1.66 – 1.67 or 1.7 [gallons used] then **M2** for 70/42 or 1.66 – 1.67 or 1.7 [gallons used] and *their* (1.66 – 1.67) × *their* 548.(55) proportion methods: 7.5 litres used in 70 miles earns M2– then 7.5 × 121.9 earns last M1 42 miles costs 548.(55)[p] earns M2 then [×] 70/42 or informal proportion used correctly earns last M1 M0 for just 70 × 121.9 allow B3 for 8.7768 rot to 2 dp or more, [from premature approxn to 1.6 gallons used]
5	(a) ♠		$1 \le g < 1.5$	**1**	Condone poor notation such as '1 to 1.5' or '<' used instead of '≤'	0 for single value within correct interval or for 13 0 for '$1 \le g < 1.5$ 13' but allow '$1 \le g < 1.5$ <u>because</u> 13' oe

Question			Answer	Marks	Part marks and guidance	
	(b) ♠		Plots at midpoints of intervals	**1**		Use overlay
			at least four heights correct: 5, 7, 13, 5, 2	**1**	tolerance 1mm (eg accept ht of 5 on nearest gridlines)	as well as correct, allow heights mark for bars or for plots not at midpoints but elsewhere in correct interval;
			Plots joined with straight line segments	**1**	Within 1 mm of points	Ignore joins to axes from endpoints, but last mark not earned if endpoints are joined ignore bars if a frequency polygon also seen; otherwise bars can earn the mark for heights correct
6	**(a)** ♠	**(i)**	0	**1**		0/2 not sufficient
	♠	**(ii)**	45	**1**		
	(b) ♠		$4n - 2$ oe	**2**	Mark final answer **M1** for $4n$ oe SC1 for $4n\text{th} - 2$	Condone $4 \times n$, $n4$, use of other letters instead of n, or $4n + -2$; ignore 'n = ' or 'nth = '
7	**(a)**		$6x^2 - 10x$	**2**	**1** for each term; mark final answer If **0**, allow **SC1** for $6x^2 - 10x$ seen then spoilt by further 'simplification' or **SC1** for $6x - 10$ [possible MR of multiplication sign instead of x]	eg 1 mark for $6x^2 + -10x$

Question			Answer	Marks	Part marks and guidance	
	(b)		$5y(2x + 3y)$	**2**	Mark final answer **M1** for $5y$ (....) or for $5(2xy + 3y^2)$ or for $y(10x + 15y)$ **SC1** for $10y(x + 1.5y)$	condone missing final bracket
8	**(a)**		(3, 6.5) oe	**2**	**1** each; accept 13/2 oe isw	
	(b)		9.8 or 9.84 to 9.85	**4**	NB **0** for scale drawing **M1** for 4 and 9 seen or used on diagram or in this part; **M1** for *Their* $4^2 + 9^2$ **M1** for $\sqrt{Their\,9^2 \pm their\,4^2}$ **A1** for 9.8 or 9.84 to 9.85	Allow **M1** for $a^2 + b^2$ attempted with any numbers ft their numbers used
9	**(a)**	**(i)**	12	**1**		
		(ii)	68 to 74	**2**	**M1** for [UQ] 210 to 216 or [LQ] 138 to 144	
	(b)	**(i)**	Delta + [larger] median Values: Delta 190 (±2) compared with median for Pellow 178 to 184	**1** **1**	condone Delta + [larger] average only if correct figures for at least one median shown	condone 'medium' but not 'mean' instead of 'median' for this first mark eg Delta's median is 10g more is not sufficient for this second mark without values shown

Question			Answer	Marks	Part marks and guidance	
		(ii)	Pellow + smaller IQR oe	**1**	cao	condone Pellow + lower IQR; no FT for this first mark 0 for just 'Pellow does not vary as much' oe
			Values: Delta IQR 98 (±2) compared with Pellow FT	**1FT**	FT (a)(ii) If **0** in this part, allow **SC1** for 'Either + ranges same'	since Pellow IQR already stated in (a)(ii) we do not require it to be restated here
10	**(a)**		[$11a + 5c =$] $6d + 2cd$	**M1**	Expanding brackets	condone $d6$ etc
			$5c - 2cd = 6d - 11a$	**M1**	Collecting c terms on one side, remaining terms on other, dep on having a cd term	Each **M1** is for a correct constructive step, FT previous error if of equivalent difficulty
			$c(5 - 2d) = 6d - 11a$	**M1**	Factorising c terms (may be implied by correct division); dep on having an nc term and a cd term	
			$[c =]\frac{6d - 11a}{5 - 2d}$ oe	**M1**	Final division by factor allow **B4** for $[c =]\frac{6d - 11a}{5 - 2d}$ oe	for M4, answer must be fully correct
	(b)	**(i)**	8	**1**	mark final answer	
		(ii)	$5x - 7$	**2**	mark final answer **M1** for $5(x + 1) - 12$ soi	

Question			Answer	Marks	Part marks and guidance	
11			Freq densities: 0.7, 1.6, 2, 1, 0.3, 0.2	1	Seen or used as heights; condone two errors	may be by table
			Bars all correct height	1		
			Bars all correct width	1		

Question			Answer	Marks	Part marks and guidance	
12			180 ÷ 10	M1	or eg $\frac{2}{10}\times 180$ seen oe for at least one angle	
			Angles 36, 54, 90	A1	or **B2**	
			6 used as hypotenuse of right-angled triangle (may be implied by sketch or attempt at trig with 6 as hyp)	M1	if this and subsequent M marks not earned, allow SC1 for the strategy of any attempt at using trig	allow this second M1 for accurate drawing
			Use of sine *their* 36 (attempt at right- angled trig or sine rule) or of cos *their* 54	M1		or equivalent methods to find other side and then correct use of Pythagoras
			6 × sin 36 or 6 × cos 54 oe	M1	For this last **M1**, must work with correct angles	Condone poor notation e.g. sin (36 × 6) for this last **M1**
			3.5(267...) rot to 2 sf or more	A1	After marks for angles; Allow **B4** for 3.5(267...) rot to 3 sf or more (need not be identified as shortest side). If 3.5(267...) not found, allow **SC2** for 4.8(541...) rot to 3 sf or more	or **SC2** for 4.8 or 4.9 after correct use of trig
			Showing *their* answer : 6 ≠ 2 : 5 or obtaining for sides to be in same ratio, shortest side should be 2.4	B1	accept using 3.5 to 3.53 from correct answer but not approximation to 4 (oe FT *their* shortest side found) B0 for just '3.5 : 4.9 : 6 is not the same as 2 : 3 : 5'	using 3.5, 4.9 and 6 may eg work out perimeter and divide 14.4 in ratio 2:3:5 as 2.88: 4.32 :7.2; allow B1 for 2.4 : 3.6 : 6 seen NB in the absence of clear evidence of trigonometry used, the max mark is M1A1M1M0M0A0B1

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