OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education

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

Mark Scheme for January 2011

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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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A501/02   **Mark Scheme**   **January 2011**

Confidential marking instructions for examiners (January 2011)
A501/02 GCSE Mathematics A (J562)

Marking instructions

1   Mark strictly to the mark scheme.

2   Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.

3   Work crossed out but not replaced should be marked.

4   **M** (method) marks are not lost for purely numerical errors.
    A (accuracy) marks depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
    B marks are independent of **M** (method) marks and are awarded for a correct final answer or a correct intermediate stage.

5   Two additional situations may appear in the mark scheme allowing the award of **A** marks or independent (**B**) marks:
    i.   Correct answer with no working
    ii.   Follows correctly from a previous answer whether correct or not ("ft" on mark scheme and on the annotations tool).

6   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).

7   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.

8   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.

9   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.

10 Ranges of answers given in the mark scheme are always inclusive.

11 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work.

12 For answers scoring no marks, you must either award NR (no response) or 0, as follows:

Award NR (no response) if:
- Nothing is written at all in the answer space
- There is any comment which does not in any way relate to the question being asked ("can't do", "don't know", etc.)
- There is any sort of mark that is not an attempt at the question (a dash, a question mark, etc.)

Award 0 if:
- There is any attempt that earns no credit. This could, for example, include the candidate copying all or some of the question, or any working that does not earn any marks, whether crossed out or not.

13 Where a follow through mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question.

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.

Abbreviations

The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- Where you see **oe** in the mark scheme it means **or equivalent.**

- Where you see **isw** in the mark scheme it means **ignore subsequent working** (after correct answer obtained), provided the method has been completed**.**

- Where you see **cao** in the mark scheme it means **correct answer only.**

- Where you see **soi** in the mark scheme it means **seen or implied.**

- Where you see **www** in the mark scheme it means **without wrong working.**

- Where you see **rot** in the mark scheme it means **rounded or truncated.**

- Where you see **seen** in the mark scheme it 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.

- Where you see **figs 237**, for example, this 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.

1	(a)	27[.00]	2	**M1** for 45 × 0.6 oe or 45/5 or 9	Condone 27.0, 27.00p
	(b)	3 : 8 or 0.375 oe : 1 or 1:2.$\dot{6}$ or exact equivalent mark final answer	2	**M1** for 6 : 16 or 1 : 2.6-2.7 or correct answer seen then spoiled After 0 scored allow **SC1** for correct ratio but reversed e.g. 8:3	Condone £3 : £8 for **1** or **2** marks
2	(a)	12a^3	2	Condone 12 × a^3 for **2** marks **B1** for 12 [a^k] ,accept $k = 0$ **or B1** for [k]a^3 k not equal to 0 **or SC1** only for 12 + a^3	so 12 only scores **B1** so a^3 only scores **B1**
	(b)	25	2	**M1** for 4 × −2.5 × −2.5 or better soi **or** for 6.25 seen **or SC1** for answers of −25 or 100	
	(c)	10x − 35 [= 3] or 2x − 7 = 3/5 10x = 38 or 2x = 7.6 or FT [x =] 3.8 oe (accept 38/10 or better isw)	**B1** **M1FT** **M1FT**	For dealing with brackets correctly For getting to form $ax = b$; FT *their* wrong first step for $a \neq 0$ or 1 and $b \neq 0$ FT *their* $ax = b$ with $a \neq 0$ or 1 or b and $b \neq 0$ Allow **B3** for 3.8 www	Allow FT at division step isw – does not need to be evaluated If division step not shown accept answer for 2nd **M1** correct to 2 sf or better Allow correct embedded solution in original equation as final answer to score full marks i.e. 5(2 × 3.8 - 7) = 3
	(d)	4x(3x + 2y)	2	**M1** for 2(6x^2 + 4xy) or 4(3x^2 + 2xy) or 2x(6x + 4y) or x(12x+ 8y)	Condone final bracket omitted Allow with '×' signs

3		3.51	2	**M1** for 3.509677... rounded or truncated to 1 dp or more **or SC1** for 5.73	5.73 from 6.26 − 0.82 ÷ 1.55 to 2 dps
4	(a)	$2^2 \times 3 \times 5 \times 7$ oe	2	Must be expressed as product **M1** for at least two of 2, 3, 5, 7 seen as factors isw	Do not allow 1 in the product for 2 marks e.g. may be seen in division or factor tree
	(b)	HCF = 6	1		
		LCM = 1260	2	**M1** for any of the following seen anywhere 3 multiples of 18 **and** 3 multiples of 420 or 420 × 3 **or** for $2^2 \times 3^2 \times 5 \times 7$ or any multiples of 1260	e.g. HCF = 1260 scores **M1**
5		Number of matches × frequency soi e.g. 46 × 7, 47 × 18 etc or 322, 846, 672, 490, 50 or 2380	M1	At least 3 correct products or values seen or total correct seen	Beware 2380 / 5 = 476 is incorrect and gets **M1**. Allow **M1** implied for 476 as answer without working
		÷ 50	M1	2nd **M1** independent of first	Could be implied
		47.6 www	A1	Allow **A1** for 48 only if first **M1** is earned and there is no wrong working or more accurate answer given as well Allow **B3** for 47.6 www	Beware 48 without working scores 0

6	(a)	$[h^2 =]$ 2.8^2 ± 2.5^2 oe	M1		Allow correct use of trig if angle EAD or ADE found first – **M2** for correct explicit statement e.g. AE = 2.5 tan 26.7 or **M1** for correct implicit statement e.g. AE/2.5 = tan 26.7 (angle EAD = 63.2…) (angle ADE = 26.7…)
		$\sqrt{2.8^2 - 2.5^2}$	M1		
		1.26[...] or 1.3	A1	Implied by 3.36[...] or 3.4	
		3.36[...] or 3.4	A1	After **A0**, **SC1** for 2.1 + *their* 1.26[..]or 1.3 after the first **M1** earned Scale drawing alone scores 0 Allow **B4** for 3.36… or 3.4 www	Can earn **M1M0A0SC1** but not **M0M0A0SC1**
	(b)	cos [θ] = 2.5/2.8 oe	M1	correct cos statement or other trig fn used correctly with other side of triangle found in (a); condone poor notation	Could use longer methods finding other angle **and then** subtracting from 90 Could use a reverse method using 15° to show that the height is less than 1.3 **M2** for correct explicit trig statement e.g. h = 2.5 tan 15 or **M1** for h /2.5 = tan 15 and **A1** for correct answer **and** yes
		Inverse trig fn seen or used	M1	Independent of first **M1** Condone poor notation	Allow clear intent e.g. invcos, 2nd function cos, shift cos Check on calculator from first statement if not shown (acc to 2 sf)
		26.7 to 26.8 or 27 **and** yes oe	A1	Allow **B3** for 26.7 to 26.8 or 27 **and** yes www	

7		Correct line through A on bearing of 128°	**1**	Tolerance 2°	Use overlay – allow provided their line does not cross red lines (allow touching lines) – if just out then check with protractor
		Perp. bisector of AB drawn with correct intersecting arcs (must be at least 2 cm long)	**2**	Line must be accurate between the green lines and as far as the blue lines (it can be shorter) isw sections after that **M1** if accurate part of perp bisector (at least 2 cm long) but no arcs or contrived arcs	Allow one pair of arcs shown for perp bisector (not for just touching arcs) Use overlay
		Distance = 1.9 to 2.1 km	2FT	Correct or FT ± 0.1 km **Dep** on at least 1 mark earned previously for distance from intersection or clear point marked to L If the point is not clearly indicated then no marks available e.g. several points marked with no line to L several points marked all joined to L or the end of a line with no clear indication that this is being used **or B1** for distance in cm ± 0.2 cm (or mm) e.g. 3.8 to 4.2 cm If 0 scored then **SC2** for FT distance in km from L to a clearly marked point that must lie between the red lines **or** the green lines (when extended if necessary) or **SC1** for FT dist in cm as above If no lines shown and only one point between the red lines **or** the green lines then allow **SC2** or **SC1**	Accept written on diagram if answer space is empty Allow **2** marks for answer in range 1.9 – 2.1 km without measuring if 1 mark already scored Accept 1900 **m** to 2100 **m** for **2** marks **cm** must be written for **B1**

6

8	(a)	$[a=]\dfrac{P-c}{2}$ oe final answer	2	**M1** for $P-c=2a$ or $\dfrac{P}{2}=a+\dfrac{c}{2}$ oe or correct answer seen then spoilt **or SC1** for final answers $\dfrac{P+c}{2}$ or $\dfrac{c-P}{2}$ or $P-c/2$ or $P-c\div2$ or $P/2-c$ oe	Do not allow for final answer $\dfrac{a=P-c}{2}$
	(b)	$A^3=36V^2$ or $\sqrt{A}=\sqrt[3]{6V}$	**B1**		
		$\dfrac{A^3}{36}=V^2$ or $\sqrt{A^3}=6V$	**M1FT**	**M1** for each of 2 correct constructive steps leading to answer, FT earlier errors	If extra FT steps are shown then mark to the benefit of the candidate
		$[V=]\sqrt{\dfrac{A^3}{36}}$ or $\dfrac{\sqrt{A^3}}{6}$ oe final answer	**M1FT**	Allow **3** for correct answer www	

9	(a)	5	1		
	(b)	7 points plotted correctly	1	Tolerance 1 mm Ignore additional plotted points	The centre of their plot should be within or touching the circle on overlay
		Joined with smooth curve or line segments, within 2 mm of their plots	1FT	Ignore to the left of 34 and then allow FT for curve through at least 10 of their remaining points i.e. allow to miss one point or one section not drawn	Curve not too thick and not more than two 'double line' or feathered sections e.g. can allow curve mark for last FT section not joined
	(c)	(i) 35.9 to 36	1	Do not accept inequality e.g. $t \leq 36$	[35.9 from condoning reading off at 47.5 not 48]
		(ii) 38.1 to 38.5 - 34.7 to 35 3.1 to 3.8	M1 A1	Allow B2 for 3.1 to 3.8 www (check graph that readings have been not been taken at incorrect quartiles e.g. must not come from reading UQ at 75) After 0 scored, **SC1** for UQ = 38.1 to 38.5 **or** LQ = 34.7 to 35	Not just for these values seen – must be associated with LQ or UQ e.g. on graph or in subtraction
	(d)	[00:] 35.7 seconds	2	**B1** for 35.7 seen or for seconds with another answer of between 10 and 40;	accept s or sec[s] for seconds

10		$\sqrt{35^2 + 28^2 + 15^2}$ oe	M2	**M1** for $35^2 + 28^2 + 15^2$ oe or 2234 (may be in two steps of 2D Pythagoras')	If in two steps then figures are (35, 28) pair = 2009 sq root = 44.82…, (35, 15) pair = 1450 sq root = 38.07…, (28, 15) pair = 1009 sq root = 31.76.. + must combine to score **M2** or **M1**
		47.2[65…] or 47.3 www and **no**	A1	Ignore additional comments after 'no' Allow 47 only after $\sqrt{2234}$ or $\sqrt{35^2 + 28^2 + 15^2}$ is shown with no premature approximation Allow **B3** for 47.2[65…] or 47.3 and no www	
11	(a)	(i) 1/6 oe	2	Condone answer in range 0.16 - 0.17 **M1** for $1 - 6x = 0$ or better	mark at most accurate e.g. 0.16 = 0.1 gets **2** marks **M0** for $6f(x) = 1$
		(ii) $a = 1$	1		
		$b = -12$	1	After 0 scored, **M1** for $1 - 6(2x)$ seen	
	(b)	$2[x +] 4$	1		

12		Using frequencies: Up to 30: 7, 14, 35, 40; [total 96] Over 30: 24, 18, 12; [total 54] [Total 150]	**B2**	Award for seen Need 6 or 7 frequencies correct for **B2** **OR** Accept **two of** 54, 96 or 150 shown **or B1** for at least 3 frequencies correct or for **one of** 54, 96 or 150 shown	Figures could be seen written on diagram and may break down the frequencies into smaller blocks e.g. 12 = 4 + 4 + 4 **Accept multiples of these values for B2 or B1** e.g. 14, 28, 70, 80 etc

		Calculation
		e.g. (1) 1/3 of *their* 150 = 50
		or (2) 96/54 = 1.77 to 1.78
		and correct conclusion:
		    (1)[< 54] so no
		or (2) so no [since < 2]
		                 isw further comments
			M1FT
			
			A1
				FT *their* values for **M1** must evaluate their
				fraction correctly in some way e.g. to a
				decimal **or** find 1/3 of their total; award
				when a relevant calculation done even if
				incorrect/no conclusion
				All must be correct to award A1
					Accept other valid comparisons
					e.g. 54/150 = 0.36 **M1** which is greater
					than 1/3 **A1**
					54/96 = 0.56[25] **M1** which is greater than
					0.5 **A1**
					A0 if any error seen

		OR Using rectangles: Up to 30: 1.4 , 2.8 , 7 , 8 [= 19.2] Over 30: 4.8, 3.6, 2.4[= 10.8] [Total 30]	**B2**	Award for seen Need 6 or 7 rectangles correct for **B2** **OR** Accept **two of** 19.2, 10.8 or 30 shown **or B1** for at least 3 values correct [allow different sized unit rectangles used from this solution]	Other variations using scaling e.g. Up to 30: 2.8, 5.6, 14, 16 [= 38.4] e.g. Over 30: 9.6, 7.2, 4.8 [= 21.6] [Total 60] both sets of values could also be scaled further e.g. 10 times the values here or in the scheme

		Calculation
		e.g. (1) 1/3 of *their* 60 = 20
		or (2) 38.4/21.6 = 1.77 to 1.78
		and correct conclusion:
		    (1) [<21.6] so no
		or (2) [< 2] so no
		                 isw further comments
			M1FT
			
			A1
				FT *their* values for **M1** must evaluate the
				fraction correctly in some way e.g. to a
				decimal **or** find 1/3 of their total; award
				when a relevant calculation done even if
				incorrect/no conclusion
				All must be correct to award A1
					
					A0 if any error seen

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