GCSE 2004
November Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics A (3301)
Paper 2H

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX. *Dr Michael Cresswell Director General*

AQA GCSE Mathematics Specifications A & B

Notes for Examiners

In general if a response is fully correct then it is sufficient to tick the final answer and put the mark for that part in the margin. Parts not attempted or totally incorrect must have 0 for that part in the margin. Negative marks must not be used.

Errors **must** be underlined or ringed.

Responses that are partly correct will generally be awarded marks for method or partial working. In that case the following should appear in the margin to indicate what the mark(s) has been awarded for. These are detailed in the mark scheme.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M dep or **DM**	A method mark dependent on a previous method mark being awarded.
B dep or **DB**	A mark that can only be awarded if a previous independent mark has been awarded.
Ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.

Within the script the following notations can be used to explain the decision further. These should appear next to the place in the script where the error or omission is made.

ft or ✓	Follow through marks. Wrong working should not be penalised more than once so that positive achievement later in the question can be recognised.
✗	An answer that does not follow through from previous working.
MR or **MC**	Misread or miscopy. Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up

	to a maximum of 2 marks are penalised. The method marks can still be awarded.
Fw	Further work. Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.
Choice	When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.
Wnr	Work not replaced. Erased or crossed out work that is still legible can be marked.
Wr	Work replaced. Erased or crossed out work that has been replaced is not awarded marks.
^	Work incomplete or method missing.
Allow	In general decisions should support the candidate. If an examiner feels that work is worthy of a mark then it can be allowed.
BOD	Benefit of the doubt should only be given in cases where evidence is not secure. For example overwriting numbers. It should not be used to avoid making a decision. Examiners are expected to make decisions based on the scheme.
seen or ✓	Every page containing working should be annotated to show it has been considered.
From page 23 ↘	Marks transferred from another part of the paper. Candidates often make a mistake in their original work and do the question on the back page or another page with some space. The part marks should be credited there **within the script** and the marks transferred to the margin by the printed question.
Wrong method	Candidates sometimes obtain the correct answer via a completely wrong method. If an examiner is sure that this is the case then the Method mark should not be awarded and subsequently the accuracy mark cannot be awarded. This notation should also be used when candidates 'fiddle' algebra to demonstrate a given result.
Pa	Premature approximation. Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise in the standardising meeting.

Unusual responses
Very occasionally situations may occur which are not covered by the above notations. In these rare cases examiners should write brief comments in the script to explain their decision, such as ignore, irrelevant etc.

Blank answer spaces and blank pages
Blank answer spaces should be crossed through to show that they have been seen. Blank pages at the end of a paper should also be crossed through to indicate that they have been seen. Any working on these pages must be marked.

Diagrams

Diagrams that have working on them should be treated like normal responses and marked with same notations as above. If the diagram is written on but the correct response is within the answer space the work within the answer space should be marked and the diagram ticked to indicate that the examiner has seen it. Working on diagrams that contradicts work within the answer space is **not** to be considered as choice but as working.

Responses which appear to come from incorrect methods
Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised as directed at the standardising meeting.

Questions which ask candidates to show working
Instructions on marking will be given at the standardising meeting but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working
As a general principle, a correct response is awarded full marks.

Probabililty
Answers should be written as fractions, decimals or percentages. If a candidate uses an incorrect notation such as "1 out of 4" for ¼ consistently through the paper, then penalise the first occurrence but allow any following answers. Ratio is not acceptable as incorrect notation.

Recording Marks
Part marks for a question should be shown in the margin at the side of the work. The totals should be shown in the oval either at the end of each question or after each double page. These marks should be transferred to the appropriate box on the front of the paper. The grand total for the paper should also be shown in the appropriate box on the front of the paper. This total should agree with the total of the part marks within the paper.

Checkers at the board will first check that the part marks agree with the ringed totals, either at the end of each question or after each double page. They will then check that these marks have been transferred correctly and finally that the total on the front cover is correct. Papers that contain clerical errors may be returned to examiners.

Paper 2H

1	$160^2 + 75^2$ (25600+5625)	M1	**If Trig used** Must find correct angles (64.9 or 2.1) and use a complete method e.g. $\frac{x}{\sin 90} = \frac{75}{\sin 25.12} = \frac{160}{\sin 64.88} = 176.67..$
	31225	A1	
	176.7….	A1	
	177 or 180	B1	Independent mark. Award for any value seen (or implied by a calculation) greater than 3 s.f. that is rounded to 3 s.f. or 2 s.f.

2	$250 = \pi r^2 h$	M1	
	$250 \div 25\pi = h$	A1	
	h = 3.2 or 3.18(…….)	A1	3.19 A0

3(a)	6	B1	
(b)	15th and 16th values in 5/3 box	M1	Accept cumulative frequencies as evidence of working (0, 1, 5, 13, 21, (30)) or listing of values 2, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, …. 30 ÷ 6 = 5 M0.
	5	A1	
(c)	3 ×1+5×2+10×3+7×4+4×5+1×6	M1	Allow 1 error for first M1
	97 ÷ 30	DM1	Must divide by 30
	3.2(3….)	A1	If mean for French calculated (4.66..) give M1, DM1, A0
(d)	Most pupils in bottom section of table or No pupils with higher grade in Spanish than French.	B1	No incorrect statements.

4(a)	$20 = 4x$	M1	$20/4 = x$
	5	A1	
(b)	$y + 5 \times 3 = 9 \times 3$	M1	$y/3 = 9 - 5$, $y/3 = 9 + 5$ M1. ($3y + 15 = 27$ M0)
	12	A1	

5	Always even	B1	
	Could be either odd or even	B1	

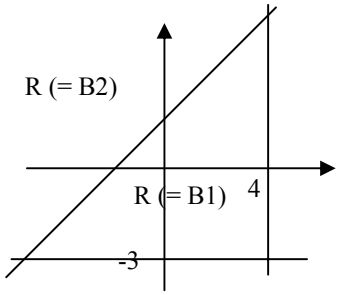
6	Arcs drawn from any one vertex	M1	Allow dotted lines or solid lines
	Arcs drawn from all vertices	M1	Allow dotted lines or solid lines If arcs drawn inaccurately allow ≤4mm difference (overlap or not) for M1
	Correct area indicated	A1	Accept any indication. If midpoints joined with straight lines after arcs drawn give M2 but A0 if area of triangle indicated as required area.

7(a)	Intercept = 9	B1	i.e. identifying that 9 is the constant term in the equation.
	Gradient = $-{}^{9}/_{3} = -3$	M1	Any attempt at gradient for M1.i.e ±9/±3
	$y = -3x + 9$	A1	Accept equivalent forms. NB y = 3x + 9 is B1, M1, A0
(b)	Substitute $x = 6$ into their equation	M1	Or recognise that y-step from 0 to 3 is the same as 3 to 6. eg sight of 9. M1 can be implied by answer only.
	−9	A1	
(c)	${}^{1}/_{3}$	B1ft	ft on their gradient in (a), Allow an 'embedded' answer in an equation, e.g. y = ${}^{1}/_{3}x + 9$

8	$4\pi \times 6400^2$	M1	
	514718540.4…….	A1	5144…… to 5149……
	$5.(147\ldots..) \times 10^8$	A1	No working 5E08 sc2 or 5^{08} sc 2 , 5^8 M0 Accept 5.1, 5.15 $\times 10^8$

9	Sight of sine	M1	If sine rule used then must have correct values substituted in
	$x = 32 \times \sin 20$	DM1	
	= 10.9(…) or 11	A1	

10(a)	4 correct values	B1	Red 0.4, blue 0.6 3 times
(b)	0.4^2 or 0.6^2	B1	
	0.4^2 + their 0.6^2	M1	
	0.52	A1	

11	All 3 line correct. R marked in correct region.	B3	Allow dotted lines Special case if $y \leq 4$ and $x \geq -3$ drawn as $y \geq -3$ and $x \leq 4$ then this is one error. So if region marked correctly relative to these lines it is B1 and if correct relative to $y = x + 2$ also it is B2 

12(a)	372 – 350 (22)	M1	372/350 × 100 (= 106.28)
	22/350 × 100	M1	oe 106.28 – 100
	6.29	A1	Accept 6.3 or 6.286(…….)
(b)	2576 = 92%	M1	0.92 seen B1
	1% = 28	A1	2576 ÷ 0.92 M1
	2800	A1	

13(a)	$c^2 = E/m$	M1	
	$c = \sqrt{(E/m)}$	A1	$c = \sqrt{E/m}$ without working is M0 as it can come from wrong work. E.g. $mc = \sqrt{E}$, $c = \sqrt{E/m}$, but $c^2 = E/m$, $c = \sqrt{E/m}$ is M1, A0
(b)	$2E = 2mgh + mv^2$	M1	$E = m(gh + {}^1/_2\, v^2)$ M1
	$m = 2E/(2gh + v^2)$	A1	Or equivalent e.g. $m = E/(gh + {}^1/_2\, v^2)$ Sc $\frac{2E}{gh + v^2}$ B1

14(a)	$(n + 2)^2$, $(n + 1)(n + 4)$	B2	-1 eeoo
(b)	Expand Bert $3n^2 + 10n + 8$	M1	Allow one error but not $3n^2 + 10n + 3$
	Expand Charu $4n^2 + 12n + 9 – (n^2 + 2n + 1)$	M1	$4n^2 + 6n + 6n + 9 – n^2 + n + n + 1$
	Convincing algebra that these are equivalent. Allow dealing correctly with $– (n^2 + 2n + 1)$ as minimum.	A1	e.g. $4n^2 + 12n + 9 – n^2 – 2n – 1$ is M1 A1

15	$8 + 4\sqrt{3} – 2\sqrt{3} – 3$	M1	Allow 1 error
	$a = 5$, $b = 2$	A1	Must have both Accept $5 + 2\sqrt{3}$

16	$(x\text{-}1)^2 - 6 = 0$	M1	Use of formula: $x = \frac{2 \pm \sqrt{(4 - 4 \times 1 \times -5)}}{2 \times 1}$ M1 (allow 1 error in formula from wrong sign for b (-2), b^2 as –4, 4ac as $–4 \times 1 \times 5 = -20$) Not dividing whole top by 2a is M0 unless recovered.
	$x = 1 \pm \sqrt{6}$	A1	$x = \frac{2 \pm \sqrt{24}}{2}$ A1
	$x = -1.45, 3.45$	A1 f.t.	f.t. their a and b or their formula if one error and root is not negative. i.e. wrong sign for b (1.45, -3.45) b^2 as –4 (3, -1) If CTS used and $1 + \sqrt{6} = 3.45$ only answer give M1, A1, A0.

17	Angle ATB = 13°	B1	
	$\frac{BT}{\sin 18} = \frac{20}{\sin 13}$	M1, A1	M1 for use of sine rule, A1 for correct substitution. $\frac{AT}{\sin 149} = \frac{20}{\sin 13}$
	BT = 27.47(41539..)	A1	AT = 45.79112344
	H = BT × sin 31	M1	
	H = 14.2 or 14.15(……..)	A1ft	Ft only if both Ms awarded. NB 14.2 can come from BT = 27.5 or AT = 46 Deduct 1 for pa if seen.

18	Car A 10% decrease for at least 2 values	M1	
	9000, 8100, 7290, 6561, 5904.90, 5314.41	A1	Allow rounding to nearest £ (£5905, £5315) Must be accurate for as many values as needed to compare providing at least 3 shown.
	Car B 9200, 8400, 7600, 6800, 6000, 5200	B1	B1 for 9200 etc… for as many correct values as needed to make a comparison providing at least 3 (9200, 8400, 7600,..) are shown.
	6 weeks	B1ft	Accept between 5 and 6 weeks. Last B1 ft providing M1 awarded and B1 awarded.

19	BC/1 = (BC + 5)/4	M1	If attempt made to find angle at B with horizontal. $\sin^{-}1(3\div5)$ M1
	$4x = x + 5$	A1	Angle = 36.869…. A1 1:3 M1, A1 1:4 M1, A0
	$x = {}^{5}/_{3}$	A1	4 ÷ sin 36.89.. M1 BC = 5/4 A1 ft
	AC = $6\,{}^{2}/_{3}$	A1	Accept decimals or equivalent fractions. AC = 6.25 A1 ft.

20	2.75 x 27	M1	M1 for 3^3
	74.25 …..	A1	Accept 74 or 74.3 Height first pyramid is 2.0625 Height second is 6.1875 Volume is ${}^{1}/_{3} \times 6^2 \times 6.1875 = 74.25$ This line M1, A1.

21	1.75, 3.05, 1.315 or 1.325	B2	-1eeoo
	Their $a_{max} \times b_{max}$	M1	The 'calculation' must be seen not just answer to get this mark unless 5.3375 seen
	$- c_{min}^2$	M1	The 'calculation' must be seen not just answer to get this mark unless 1.729225 seen
	3.61 or 3.608(….)	A1	Accept 3.6 but careful as this comes from $a_{max} \times b_{max} - c_{max}^2$ rounded

22(a) (i)	a + b	B1	b + a
(ii)	2a + b	B1	b + 2a
(iii)	b – a	B1	– a + b
(b)	CF = OE	M1	
	a + 2b	A1	a + b + b oe
(c)	Straight line because OD = a + b	B1	
	3 times bigger because OF = 3a + 3b	B1	

23	$(2x - 1)(x + 3)$	M1 A1	M1 for attempt to factorise with $(2x + a)(x + b)$ where $ab = \pm3$
	$(x - 1)(x + 3)$	B1	
	$\frac{2x - 1}{x - 1}$	B1ft	Ft their factorisations if M1 awarded. Incorrect fw penalise 1 mark.

24(a) (i)	40	B1	
(ii)	20	B1	
(b)(i)	25	B1	
(ii)	Bar(s) with area 15 between 30 and 40	B1	
	Bar(s) with area 25 between 40 and 50	B1	
	Bar(s) with area 25 above 50	B1	