GCSE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics A (3301)
Higher Tier Paper 1

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 from:

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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 1H

1	Attempt to find LCM of 2, 5 and 8 **or** any common multiple of 2, 5 and 8, eg. 80, 120 …	M1	or 1, 3 ,5, 7, 9 ... **and** 1, 6, 11, 16, 21 ... **and** 1, 9, 17, 25, 33, 41 ...
	40	A1	or 41

2 (a)	w^8	B1	
(b)	x^{-2}	B1	accept $1/x^2$
(c)	y^6	B1	

3	(300, 315, 316 or 320) × 4 ÷ 0.2	M1	2 approximations correct. If 316 used, must see 4 and 0.2
	(1200, 1260, 1264 or 1280) ÷ 0.2	M1	or (300, 315, 316 or 320) × 20
	6000, 6300, 6320 or 6400	A1	

4 (a)	πab or formula 2	B1	
(b)	*ab* indicates product of two lengths	B1	or formula 2 would give cm^2 or valid rejection of the other two formulae

5 (a)	1.75×10^6	B1	or 1750000
(b)	8.2×10^{-3}	B1	or 0.0082
(c)	0.049	B1	
(d)	2.6×10^6	B1	

6	$t - 40 = 5p$ or $t \div 5 = p + 8$	M1	oe condone one sign error in rearranging to isolate the term in *p*, for M1
	$(t - 40) \div 5 = p$ or $t \div 5 - 8 = p$	A1	$t - 40 \div 5 = p$ (without brackets) scores M1 only $t - 40 \div 5 = p$, seen without working, implies M1

7 (a)	5	B1	
	–3	B1	
(b)	Points plotted Smooth curve	B1ft B1ft	± ½ square through their 6 points, ± ½ square
(c)(i)	Intersection with *x*-axis	B1	
(ii)	–0.2	B1ft	± ½ square

8 (a)	correct midpoints × correct frequency.	M1	1 × 12, 3 × 18, 5 × 10, … allow one error
	∑their(midpoints × frequency)	M1	their(1 × 12) + their(3 × 18) + their(5 × 10) + …
	(their 190) ÷ 50	M1	(their 190) ÷ 50
	3.8 **or** $3^4/_5$	A1	SC These values with full method: 4.8 (using ucb as midpoints) **or** 2.8 (using lcb as midpoints) **or** 4.3 (using 1.5,3.5,5.5, …as midpoints) **or** 3.3 (using 0.5,2.5,4.5, …as midpoints)
(b)(i)	3.4 to 3.5	B1	
(ii)	UQ – LQ	M1	or attempt to find both UQ and LQ with either correct and their (UQ – LQ) or distances at CF 12.5 and 37.5 marked on graph and their (UQ – LQ) seen
	3.3 to 3.6	A1	

9 (a)	$15^2 – 10^2$	M1	
	225 – 100 or 125	A1	
	√125 or 5√5	A1	
(b)	25 ÷ 10 or 2.5	M1	or 10 ÷ 25 or 0.4 or 10/25 = 15/PR oe
	15 × 2.5	M1	or 15 ÷ 0.4 or (25 × 15) / 10 oe
	37.5	A1	
(c)	Sight of tan	M1	can be implied from table, 1.192 or 0.839
	tan 50 = DE/10 **or** tan 40 = 10/DE	M1dep	oe or M2 *DE*/sin 50 = 10/sin 40 oe

	11.92 or 11.9 or 12	A1	

10	C	B1	
	D	B1	
	B	B1	

11	Sight of –1½ or – 1.5 or –3/2	M1	accept –1 / (⅔) or –1 / 0.66... for M1 only
	$y = -\frac{1}{2}x + 5$	A1	oe eg. $2y = -3x + 10$

12 (a)	$x = 0.5858...$ $100x = 58.5858...$	M1	for × 100 'x' might not be seen but these steps must be implied
	$99x = 58$ $x = 58/99$	A1	for subtraction
(b)	$x = 0.15858...$ $10x = 1.5858...$ $10x = 1\frac{58}{99}$	M1	$x = 0.15858...$ $x = 0.15858.$ $10x = 1.5858...$ $x = 0.1 + .05858...$ $1000x = 158.5858...$ $x = 1/10 + 58/990$ M1 M1
	$10x = 157/99$ $x = 157/990$	A1	$990x = 157$ $x = (99 + 58)/900$ $x = 157/900$ A1 $x = 157/900$ A1
			$x = 0.15858...$ $100x = 15.858...$ $99x = 15.7$ M1 $x = 15.7 / 99$ $x = 157 / 990$ A1

13 (a)	angle *QPR* = 32º	B1	Base angle of isosceles triangle	
	angle *QSR* = 32º	B1	equal to angle QPR, angles in same segment oe **precise** explanation for 2 marks	
(b)(i)	116º	B1		
(ii)	Line from *O* to *A*, creating 90º		Join *OA* using alt seg thm	
	angle *OAB* = 16º	M1	angle *CA(X)* = 48º M1	angle *BCA* = 74º M1
	angle *OAC* = 42º	M1	angle *OAC* = 42º M1	angle *BCO* =32° M1
	angle *OCA* = 42º	A1	angle *OCA* = 42º A1	angle *OCA* = 42° A1

14	**Either,** $(x+3)(x-5) = x^2 - 2x - 15$	M1	Expansion not necessary for M1 **Note** starting with $(x-3)(x+5)$ could give $c = -15$ and will score M1, A0, A1
	$b = -2$	A1	
	$c = -15$	A1	
	Or, substituting coordinates (–3,0) and (5,0) into equation to get: $0 = 9 - 3b + c$ and $0 = 5 + 5b + c$	M1	correct substitution which might be unsimplified eg. $0 = (-3)^2 - 3b + c$ and $0 = 5^2 + 5b + c$
	Solving to give $b = -2$	A1	
	$c = -15$	A1	

15	$2 \times \pi \times 9$	M1	or equivalent
	$80/360 \times$ their$(2 \times \pi \times 9)$	M1	
	$4\pi + 18$	A1	or equivalent

16 (a)	$(2n \pm 3)(n \pm 1)$ **or** $(2n \pm 1)(n \pm 3)$	M1	
	$(2n + 3)(n + 1)$	A1	
(b)	23×11	B1	Must see both factors

17 (a)	The number chosen from each sub-group(strata) must be proportional to the size of the sub-group	B1	'proportionality' (select from all sub-groups)
	Selection from each sub-group must be representative	B1	random selection from within each sub-group is acceptable, just ... 'random selection' is not
(b)	Division by 8	M1	use of the fraction ⅛ oe
	4.375, 7.25, 15.625, 12.875, 9.875	A1	Not rounded but accurate …or… Rounded (at least 3 correct)
	4, 7, 16, 13, 10	A1	All correct

18 (a)(i)	$(x - 5)(x - 5)$ or $(x - 5)^2$	B2	B1 for incorrect signs
(ii)	Indicating replacement of x by $y - 3$	M1	Might just see $(y - 3 - 5)^2$ or $(y - 8)^2$ Re-starting ?… must get as far as $y^2 - 16y + 64$ or $(y - 8)^2$ to score M1
	$y = 8$	A1	
(b)	$(x - 3)(x + 3)$	M1	
	$x(x + 3)$	M1	
	$\frac{x - 3}{x}$	A1	

19 (a)(i)	Even × odd, so even product	B1	or equivalent
(ii)	$2 \times n$ always even, so $2n+1$ is odd	B1	or equivalent
(b)	$4n^2 + 2n + 2n + 1$	M1	3 or 4 terms correct
	$4n^2 + 4n + 1$	A1	Must simplify
(c)	$\text{Odd}^2 - 1 = (2n+1)^2 - 1$ $= 4n^2 + 4n$ $= 4n(n+1)$	B1	Must factorise
	= 4 × even	B1	Deduce 'even' connection
	= multiple of 8	B1	Concluding statement

20 (a)	$(a =)\ 3$	B1	
	$(b =) -12$	B1	
(b)	$(x+3)^2 = 12$ **or** $(x =)\ \frac{-6 \pm \sqrt{\{6^2 - 4(1)(-3)\}}}{2}$	M1	using their values from (a) Substitution into formula (allow 1 error)
	$x + 3 = \sqrt{12}$ **or** $(x =)\ \frac{-6 \pm \sqrt{\{36 + 12\}}}{2}$	DM1	using their values from (a)
	$(x =)\ \pm\sqrt{12} - 3$ or $\frac{-6 \pm \sqrt{48}}{2}$	A1	or $-3 \pm 2\sqrt{3}$

21	Sight of 5250 or 5350	B1	
	Sight of 95 or 105	B1	
	Their correct combination ie. $\frac{\text{Min strain}}{\text{Max crate}}$ $\frac{5250}{105}$	M1	
	= 50	A1	Accept 49, with explanation that 50 would be right on the limit, hence 49 is the maximum

22	Sight of $(0.6)^2 \times (0.4)$	M1	Could be part of a tree diagram...**must** multiply
	Indication of 3 possible ways (**must** show addition) ie. $3 \times (0.6)^2 \times (0.4)$	M1	Could also be part of a tree diagram ... might just indicate the 3 routes through the tree but **must** add ie. $0.6 \times 0.6 \times 0.4 + 0.6 \times 0.4 \times 0.6 + 0.4 \times 0.6 \times 0.6$
	$= 0.432$	A1	

23 (a)(i)	$\boldsymbol{a} + \boldsymbol{b}$	B1	
(ii)	$\boldsymbol{b} - \boldsymbol{a}$	B1	
(iii)	$\boldsymbol{a} + 2\boldsymbol{b}$	B1	or equivalent eg. $\boldsymbol{b} + \boldsymbol{a} + \boldsymbol{b}$
(b)(i)	P in correct position Q in correct position	B1 B1	'by eye' judgement … tolerance of ±2mm in any direction (if no labels then B1, B0)
(ii)	$PQ = 3\boldsymbol{b}$	B1	Accept $PQ = PO + OQ = \boldsymbol{b} - \boldsymbol{a} + \boldsymbol{a} + 2\boldsymbol{b} = 3\boldsymbol{b}$