



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# Mark scheme

# June 2003

## GCSE

### Mathematics A

#### 3301 Higher

#### Paper 1

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## 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.

<b>M</b>	Method marks are awarded for a correct method which could lead to a correct answer.
<b>A</b>	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>B</b>	Marks awarded independent of method.
<b>M dep</b> or <b>DM</b>	A method mark dependent on a previous method mark being awarded.
<b>B dep</b> or <b>DB</b>	A mark that can only be awarded if a previous independent mark has been awarded.
<b>ft</b>	Follow through marks. Marks awarded following a mistake in an earlier step.
<b>SC</b>	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.

<b>ft</b> 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.
<b>MR</b> or <b>MC</b>	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.
<b>fw</b>	Further work. Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.
<b>Choice</b>	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.
<b>wnr</b>	Work not replaced. Erased or crossed out work that is still legible can be marked.
<b>wr</b>	Work replaced. Erased or crossed out work that has been replaced is not

	awarded marks.
<b>^</b>	Work incomplete or method missing.
<b>allow</b>	In general decisions should support the candidate. If an examiner feels that work is worthy of a mark then it can be allowed.
<b>BOD</b>	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.
<b>seen</b> or ✓	Every page containing working should be annotated to show it has been considered.
<b>From</b> <b>page 23</b> ↓	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 <b>within the script</b> and the marks transferred to the margin by the printed question.
<b>Wrong</b> <b>method</b>	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.
<b>pa</b>	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.

**Probability**

Answers should be written as fractions, decimals or percentages. If a candidate uses an incorrect notation such as “1 out of 4” for  $\frac{1}{4}$  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.

<b>1</b>	180 – 162 or 18	M1	$(n - 2) \times 180 = 162n$
	360 ÷ their 18	M1dep	
	$x = 20$	A1	

<b>2</b>	Sight of 50 or 5	B1	Allow 49
	Sight of 10 <sup>2</sup> or 100	B1	
	2.5 or 2½ or 5/2	B1	Allow 2.45

<b>3</b>	<i>C</i>	B1	
	<i>D</i>	B1	

<b>4</b>			All loci must be within lake
	Arcs centre <i>B</i> radius 3cm (±2mm) and 5cm (±2mm)	B1	Consistent use of scale 1cm to 100m , B3 max. (–1 MR)
	Construction arcs for perp. bisector	B1	Two sets of intersecting arcs centres <i>A</i> and <i>C</i>
	Perp.bisector of <i>AC</i> (±2mm)	B1	
	Line 2cm (±2mm) from path	B1	
	Correct region shaded	B1	

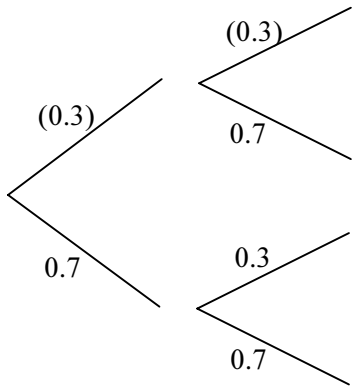
<b>5 (a)</b>	$4y(3y - 2)$	B2	B1 for one factor correct eg. $4y(3y - 4)$ or for partial factorising eg. $2y(6y - 4)$ , $y(12y - 8)$ , $4(3y^2 - 2y)$ , $2(6y^2 - 4y)$ (only these)
(b)	-2, -1, 0, 1, 2, 3, 4	B3	-1 eoo -2 ≤ <i>n</i> < 4.3... scores B1 (SC)
(c)	$8x^3y^6$	B2	-1 eoo

<b>6 (a)</b>	$a = 2$	B1	
	$b = 3$	B1	
(b)	(1),2,3,6,9,18,27,(54) and (1),3,5,9,15,27,45,(135) ... allow two errors or omissions	M1	Or $3 \times 3 \times 3 \times 5$ or $135 \div 5$
	27	A1	SC1 for 9

7 (a)	Eg. How <u>often</u> do you read for pleasure?	B1	Time related <u>and</u> reading for a purpose
	Response section eg. Daily (frequently) Every 2 or 3 days (often) Weekly (sometimes) About once a month (rarely) Never	B1	Choice of time categories only
(b)	$16/50 \times 1000$	M1	
	320	A1	

<b>8</b>	Incorrect standard form notation Eg. $7.2 \ 6$ or $7.2^6$		Penalise first time only
(a)	$7200 \times 1000$	B1	$7.2 \times 10^3 \times 1000$ or $7200 \times 10^3$
	$7.2 \times 10^6$	B1ft	eg. $7200 \times 100 = 7.2 \times 10^5 \dots$ B0 B1
(b)	$6 \times 10^{-4}$	B1	
(c)	$(7.2 \times 10^6) \div (6 \times 10^{-4})$ oe	M1	Or their (a) $\div$ their (b) oe <u>or</u> $1.2 \times 10^7$
	$1.2 \times 10^{10}$	A1ft	Ft for $1.2 \times 10^7$ only

<b>9 (a)</b>	$4m + 12 + 6m - 15$	M1	Allow one error
	$10m - 3$	A1	Allow $10m + -3$
(b)	$6x + 9y = 27$ $4x + 6y = 18$ <u>and</u> <u>or</u> <u>and</u> $6x + 4y = 2$ $9x + 6y = 3$	M1	Allow one error in <u>either</u> first
	$5y = 25$ <u>or</u> $5x = -15$	M1dep	<u>or</u> second method mark
	$y = 5$ <u>or</u> $x = -3$	A1	
	$x = -3$ <u>and</u> $y = 5$	A1	SC1 correct answers only or correct answers by T&I
(c) (i)	$(x + 8)(x - 2)$	B2	B1 for $(x \pm 8)(x \pm 2)$
(ii)	$x = -8$ <u>and</u> $x = 2$	B1	ft. from their factors, must have both solutions

<b>10 (a)</b>		B1	
(b)	$0.3 \times 0.3$	M1	
	0.09	A1	

<b>11 (a)</b>	1	B1	
(b)	$(\sqrt[3]{8})^2$ or $\sqrt[3]{(8^2)}$	M1	Cube root <u>and</u> square attempted
	4	A1	
(c)	$6^{-2} = 1/6^2$ or $1/36$	M1	
	$144^{0.5} = \sqrt{144}$ or 12	M1	
	$\frac{1}{3}$ or 0.33...	A1	Allow $12/36$ or equivalent $1/36 \times 12$ is not fully simplified ...A0

<b>12 (a)</b>	Any correct attempt at $(y\text{-step}) \div (x\text{-step})$	M1	Might be marked on diagram
	-2	A1	
(b)	$y = -2x + 3$	B1	ft. their gradient
(c)	Gradient = $\frac{1}{2}$	M1	Attempt at gradient of perpendicular line, ft. from their gradient in part (a) using $(m_1 \times m_2 = -1)$ as long as there is no contradiction between parts (a) and (b)
	$y = \frac{1}{2}x + 3$	A1ft	or equivalent

<b>13 (a)</b>	$15 \times 1.4$ <u>or</u> $30 \times 1.1$	M1	Sight of 21 or 33 indicates M1
	21 <u>and</u> 33	A1	
(b)	(Good) attempt at cutting off area	M1	Calculation of 16 mins ( $\frac{4}{5} \times 20$ mins) or 4 mins ( $\frac{1}{5} \times 20$ mins) ... M1
	$T = 64$	A1	must be correct
<b>14 (a)</b> (i)	40	B1	
(ii)	140 <u>or</u> 180 – their $x$	B1ft	Do not ft if answer = 140 in (a)(i)

(b)	Logical and precise explanation (Either written or as a calculation)	B2	One angle labelled or stated correctly, no reason, B1
(c)	angle $ADB = 32^\circ$	B1	Reasons not needed in any part Alt.seg.thm. In all parts accept angles
	angle $DBC = 32^\circ$	B1dep	Alternate angles marked on the diagram
	angle $BDC = 32^\circ$	B1ft	Base angles isos. triangle as 'evidence'
	angle $BCD = 116^\circ$	B1ft	Angle sum of triangle
	angle $BAD = 64^\circ$	B1ft	Opp.angles cyclic quad.

<b>15 (a)</b>	$W \propto \sqrt{P}$ or $W = k\sqrt{P}$	M1	$12 \propto \sqrt{16}$ or $12 = k\sqrt{16}$ acceptable for M1
	$k = 3$	A1	
	$W = 3\sqrt{P}$	A1	ft. their $k$ , but must be formally stated Accept equivalent form eg. $P = (W/3)^2$
(b)	$W = 15$	B1	ft. their $k$
(c)	$\sqrt{P} = 21 \div 3$ or $\sqrt{P} = 7$	B1	allow $21 \div$ (their $k$ )
	$P = 49$	B1	ft. for their $\sqrt{P}$ value 'squared'

<b>16 (a)</b>	$\sqrt{12} = 2\sqrt{3}$ or $\sqrt{27} = 3\sqrt{3}$	M1	
	$a = 5$	A1	
(b)	$\sqrt{2 + \sqrt{8}} = \sqrt{2} + 2\sqrt{2}$ or $3\sqrt{2}$	M1	$(\sqrt{2 + \sqrt{8}})^2 = (\sqrt{2})^2 + \sqrt{2}\sqrt{8} + \sqrt{2}\sqrt{8} + (\sqrt{8})^2$ (full, correct expansion)
	$(\sqrt{2 + \sqrt{8}})^2 = (3\sqrt{2})^2 = 18$	A1	$= 2 + 8 + 2\sqrt{2}\sqrt{8} = 2 + 8 + 8 = 18$

<b>17</b>	Sight of: $5/10 \times 4/9$ or $3/10 \times 2/9$ or $2/10 \times 1/9$	M1	
	Correct evaluation of <u>at least two correct products</u>	M1	$20/90, 6/90, 2/90$ or equivalent
	Attempt at addition of their three relevant products	M1	This could be left as $(5/10 \times 4/9) + (3/10 \times 2/9) + (2/10 \times 1/9)$
	$28/90$ or $14/45$	A1	Note: $(5/10 \times 5/10) + (3/10 \times 3/10) + (2/10 \times 2/10)$ $= 38/100$ or $19/50$ M1 A1 (SC)

<b>18 (a)</b>			
(i)	$BA = a - 2b$	B1	or equivalent
(ii)	$MQ = MB + \frac{1}{3} BA = b + \frac{1}{3}(a - 2b)$	M1	Attempt to set up a route, must include substitution of $a$ and $b$ , condone one error
	$MQ = \frac{1}{3} a + \frac{1}{3} b$ or $\frac{1}{3} (a + b)$	A1	Need not be simplified
(iii)	$OP = OA + \frac{1}{3} AB = a + \frac{1}{3} (2b - a)$	M1	or $OP = OB + \frac{2}{3} BA = 2b + \frac{2}{3} (a - 2b)$
	$OP = \frac{2}{3} a + \frac{2}{3} b$	A1	M1 as above, need not be simplified for A1
(b)	$OP = 2 \times MQ$	B1	or equivalent, must have $MQ$ and $OP$ correct
	Trapezium	B1	only if accompanied by a sound reason

<b>19 (a)</b>	$\frac{3}{4} \times (2 \times \pi \times 12)$	M1	
	$18\pi$	A1	Not $\pi 18$ , unless notation previously penalised $\pi \times 18$ is acceptable
(b)	$2 \times \pi \times r = \text{their } 18\pi$	M1	Or their $18\pi \div 2\pi$
	$r = 9$	A1ft	$r = \frac{3}{4}$ of $12 = 9$ scores 2 marks

<b>20 (a)</b>	Attempt at translation of $45^\circ$ to the right	M1	
	$P = (135, 1)$	A1	
(b)	Attempt at sine curve of twice the amplitude of the original	M1	
	$P = (90, 2)$	A1	

<b>21</b>	$a = 5$	B1	from expansion $x^2 - 2ax + a^2$ and comparing coeffs. or simply spotting that $a = 5$
	$b = -7$	B1ft	ft. from their $a$ using $a^2 + b = 18$ ie. $b = 18 - a^2$ or by inspection

