



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

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# Mark scheme November 2003

## GCSE

### Mathematics A

### Paper 2: Higher

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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.

1	Sight of 360	B1	Totalling ratios and dividing into 'their 360'	
	$360 \div 20 (=18)$	M1		
	$7 \times 18 = 126$	A1		
2	$2\pi \times 4.5, 2\pi \times 9, \pi \times 4.5, \pi \times 9$	M1	Attempt to find circumference of circle or semicircle.	
	14.1...	A1	Allow (their 14.1...) + 9	
	23.1	A1 f.t		
3(a)	0.28	B1	Accept equivalent fractions or 28%	
(b)	$320 \div 0.2$ $=1600$	M1 A1	M1 for equating 320 with 0.2	
4(a)	$10a - 5c + 12a + 8c$ $22a + 3c$	M1 A1	Allow one error	
	(b)	$3x - 6 = 5x - 5$ $-6 + 5 = 5x - 3x$ $x = -0.5$	M1 DM1 A1	Expanding brackets allow one error For collecting x's one side, numbers on other
(c)	$3x < 1 - 7$	M1	Allow one error. $6 < 3x, 3x < 6, 3x < 8$	
	$x < -2, x \leq 2, -2 > x, -2 \geq x$	A1	Allow $\leq$ but not $=$ unless recovered in answer	
5(a)	Graph D	B1	Steady rate and an indication why quicker at top	
	Slow, steady, faster steady	DB1		
(b)	Any container with uniform vertical cross-section	B1	Allow 2-d, e.g. rectangle, and/or substantially uniform cross-section.	
6(a)	$12 - y = 3 \times 5$ $12 - 15 = y$ $y = -3$	M1 A1 A1	M1 for cross multiplying 3 A1 collecting terms A1 cao	
	(b)	$6(2x + 1) + 4(4x+1) = 24$	M1 A1	M1 for multiplying by 24 or 12 (allow one error) A1 correct multiplying
		$28x + 10 = 24$ $x = 0.5$	M1 A1 f.t	M1 for collecting terms to get single x term. A1 f.t their collected terms if both Ms awarded.

7	$6^2 + 2.5^2 (= 42.25)$ $\sqrt{42.25}$  6.5 AB = 4	M1 DM1  A1 A1 f.t.	Squaring and adding M1 sight of tan Square root DM1 for $6 \div \cos 22.6$ or $2.5 \div \sin 22.6$  ft their 6.5 – 2.5 sc 2.95 from incorrect Pythagoras B1
8(a)	Sight of sin 48 or cos 42 $x = 5.1 \times \sin 48$  $x = 3.79003861$ cm $x = 3.8, 3.79$	M1 DM1  A1 B1	$5.1 \times \cos 42$ $\sqrt{(5.1^2 - (5.1 \cos 48)^2)}$ M2  Rounding mark is independent for a value or calculation that is four sf or greater
(b)	Area = $6.8 \times (\text{their } x)$ $= 25.77 \text{ cm}^2$	M1 A1 f.t.	$5.1 \times 6.8 \times \sin 48$ f.t. their value for $x$ .
9	$1 + 2 + 3 = 6 = 2 \times 3$ $2 + 3 + 4 = 9 = 3 \times 3$ $3 + 4 + 5 = 12 = 4 \times 3$ Goes up in 3s so must always be a multiple of 3.	B1 B1 DB1	B1 for any numerical example B1 Must have indication that any total is a multiple of 3 DB1 for statement that in 3 times table
9 Alt	Convincing algebraic proof e.g. $n + n+1 + n+2$ B1 $= 3n + 3$ B1 $= 3(n + 1)$ B1		B1 for identifying consecutive integers in an algebraic form B1 for sum B1 for $3 \times (\dots\dots)$
10	$u - 5 = \frac{t}{3}$ or $5 - u = \frac{t}{3}$  $t = 3(u - 5)$ or $3u - 15$	M1  A1	$3u = t + 3 \times 5$  $u - 5 \times 3$ A0, $3u - 5$ A0
11(a)	$7 \times 10^9$	B1	
(b)	0.0045	B1	
(c)	Sight of 8 $8 \times 10^{-3}$	M1 A1	
12(a)	100	B1	
(i)			
(ii)	$106 - 93$ $= 13$	M1 A1	93 – 106 Reading from graph
(b)(i)	George, lower interquartile range	B1	Accept smaller range/smaller spread oe
(ii)	Brian, lower median	B1	oe (B0 Brian 70, George 85)

<p><b>13</b></p>	$100x = 31.5151\dots$ $99x = 31.2$ $x = \frac{312}{990} = \frac{52}{165}$	<p>M1 A1 A1</p>	<p>For <math>\times 100</math> or equivalent (eg <math>\times 10000</math>)</p>
<p><b>14</b></p>	$(x - 5)^2 - 30 = 0$ $x = \pm\sqrt{30} + 5$ $x = 10.48, -0.48$	<p>M1 A1 A1</p>	<p>For attempt at <math>(x - 5)^2</math>, For <math>-5</math> and <math>-30</math> Both answers (accept 10.5, <math>-0.477</math>)</p>
<p><b>14</b> Alt</p>	$x = \frac{10 \pm \sqrt{10^2 - 4 \times 1 \times -5}}{2 \times 1}$ $x = \frac{10 \pm \sqrt{120}}{2}$ $x = 10.48, -0.48$	<p>M1 A1 A1</p>	<p>For substitution into formula (allow one error) Correct substitution Both answers (accept 10.5, <math>-0.477</math>)</p>
<p><b>15</b></p>	$27.5 \times 12 - 250 (=80)$ $cv/250 (\times 100)$ 32% increase	<p>M1 DM1 A1</p>	<p>330/250 or 330/2.5 get M1 For completion of method. 32% must be stated. Special cases, all get M1, DM1, A0 Misreads both as 10% <math>\Rightarrow</math> 21% Misreads both as 20% <math>\Rightarrow</math> 44% Misreads both as decreases <math>\Rightarrow</math> 28%</p>
<p><b>15</b> alt</p>	$1.10 \times 1.20$ $= (\text{their } 1.32) - 1$ 32% increase	<p>M1 DM1 A1</p>	<p>M1 for 110% <math>\times</math> 120% A1 for 132% or equivalent A1 stating answer Special cases as above with equivalent values.</p>
<p><b>16</b></p>	$\cos A = \frac{11^2 + 10^2 - 9^2}{2 \times 11 \times 10}$ $\cos A = 0.6363\dots$ $A = 50.5^\circ$ $\text{Area} = 0.5 \times 10 \times 11 \times \sin 50.5$ $= 42.43 \text{ cm}^2$	<p>M1 A1 A1 DM1 A1 f.t</p>	<p>If other angles found answers are (to 1 d.p) <math>C = 70.5, B = 59.0</math> Mark as scheme with different values</p>
<p><b>17</b></p>	$9.60 + (x - 5) \times 1.30$ $= 1.50x$ $3.10 = 0.20x$ $x = 15.5$	<p>M1 M1 A1 A1</p>	<p>Alt: M1 for graph of alpha parcels M1 for graph of beta A1 accuracy A1 answer. Accept 16 but not 15 T&amp;I gets M1 iff taken as far as 15 A1 for both schemes at 15 A1 for both schemes at 16 A1 conclusion.</p>

<b>18</b>	Volume cube = $20^3 = 8000$	B1	ft 8000 – 2000 – their cylinders. Only ft if attempt made to find volume circular holes not using 20 cm as height (e.g. 5 or 4 or 10) Units mark independent
	Square hole = $10^2 \times 20 = 2000$	B1	
	Circular holes = $2\pi \times 4^2 \times 5 = 502.7$	B1	
	Volume left = 5500	B1ft	
	cm <sup>3</sup>	B1	
<b>19(a)</b>	43, 57, 57, 81	B3	–1 eeo. See below NB allow $\pm 2$ for each value (count up to 2 errors maximum) NB Phys and Chem <u>must</u> be same NB Total of all four values must be 237 or 238
<b>(b)</b>	Sex of students	B1	Any relevant factor – ages etc.
<b>20</b>	$(x-2) + 5x(x+1) = 3(x+1)(x-2)$	M1	Allow 1 error
	$5x^2 + 6x - 2 = 3x^2 - 3x - 6$	A1	
	$2x^2 + 9x + 4 = 0$	M1	
	$(2x+1)(x+4) = 0$	A1	
	$x = -1/2, -4$	A1	
<b>21</b>	$45 \leq \text{distance} < 55$	B1	B1 for both limits (either plus or minus) M1 correct combination (their least distance $\div$ their greatest speed) A1 answer, accept 8.2, 8.181818...
	$4.5 \leq \text{speed} < 5.5$	M1	
	Least = $45 \div 5.5$	A1	
	= 8.18 sec		
<b>22</b>	$y(x-3) = 3x+4$	M1	M1 for cross-multiplying and expanding bracket A1 correct expansion M1 for collecting terms and factorising A1 correct factorisation and division
	$yx - 3y = 3x + 4$	A1	
	$yx - 3x = 3y + 4$	M1	
	$x(y-3) = 3y + 4$	A1	
	$x = (3y+4)/(y-3)$		
<b>23</b>	BB or WW	M1	M1 for BB or WW with attempt to substitute probs. A1 correct probs A1 answer
	$5/8 \times 4/7 + 3/8 \times 2/7$	A1	
	13/28, 46%, 0.46(...)	A1	

<b>24(a)</b>	$(0.5, -12.25)$	B1	
(b)	$x^2 - x - 6 = x + 2$	M1	Alt: $(x - 4)(x + 2)$ M1
	$x^2 - 2x - 8 = 0$ or equivalent	A1	Accept $(x + 4)(x - 2)$ for M1 $(x - 4)(x + 2) = 0$ or equivalent
<b>25</b>	Height = $100 \times 3 \div 25$	M1	Alternative: B1 for length of median of side
	=12	A1	(=12.25)
	Diagonal base = $\sqrt{50} = 7.07$ (or half base = 3.535...)	B1	M1 for pythagoras on half of side triangle.
	$x = \sqrt{(12^2 + 3.535^2)}$	M1	$x = \sqrt{(12.25^2 + 2.5)^2}$
	= 12.5	A1	