



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCSE

Mathematics A

3301 Intermediate

Paper 2

Copyright © 2003 AQA and its licensors. All rights reserved.

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.

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 (a)	400×1.64	M1	
	656	A1	
(b)	$672 \div 1.05$	M1	
	640	A1	

2	$(C=) \frac{22 - 30}{2}$	M1	Allow $22 - 30 \div 2$ 4 with no working implies M1
	-4	A1	

3 (a)	$180 - 48 (= 132)$	M1	Provided that the candidate has not used $R = 48^\circ$
	Their $132 \div 2 (= 66)$	DM1	
	$180 - 66 = 114$	A1cao	$66 + 48 = 114$ scores A1
(b)	Angle sum of triangle = 180°	B1	
	Quadrilateral = 2 triangles	B1	Quadrilateral = 4 triangles – 360° or $4 \times$ st. lines – sum of ext angles i.e. $4 \times 180 - 360$

4 (a)	$\frac{1}{4} \times 2200 (= 550)$ or $\frac{2}{5} \times 2200 (= 880)$	M1	Attempt to calculate $\frac{1}{4} + \frac{2}{5} = \left(\frac{13}{20}\right)$ but $\frac{3}{9}$ or $\frac{1}{3}$ on its own does not score M1
	$2200 - \text{their } (550 + 880)$	DM1	their $\frac{7}{20} \times 2200$
	770	A1cao	Can score both M marks for $2200 - \frac{1}{4}$ of 2200 (=1650), then (their 1650) – $\frac{2}{5}$ their 1650 (=990)
(b)	$12000 \div 24 (= 500)$	M1	
	$7 \times 500 = 3500$	A1	

5 (a)	Not moving	B1	Or equivalent. Accept "stays same distance"
(b)	16 (miles)	B1	
(c)	Their (b) $\div 2$	M1	
	8 (mph)	A1ft	
(d)	Line (or curve) joining (10,20) to (11,0)	B1	Line may be stepped [buses do stop]

6 (a)	$8z = 11 + 5$	M1		
	$z = 2$	A1		
(b)	$3w - 6 = 9$	M1	$w - 2 = 3$	SC scores SC1 $3w - 2 = 9, 3w = 11, w = 11/3$ Must complete solution
	$3w = 9 + 6$	DM1	$w = 2 + 3$	
	$w = 5$	A1	$w = 5$	
			Reverse flow chart method also acceptable	

7 (a)	$C = 2 \times \pi \times 2.2$	M1		
	$= 13.8$ (2300768) or 14	A1	Accept any value rounding to 14 from below	
(b)	$A = \pi \times 2.2^2$	M1		
	$= 15.2$ (0530844) or 15	A1	Accept any value rounding to 15 from above	
	Units m^2	B1	This mark is independent of previous working	

8 (a)	$p(\text{male}) = \frac{23}{40}$	B1 for 23 B1 for 40	Accept 0.575, 0.58 or 57.5% (% sign essential)
(b)	$p(\text{pass}) = \frac{16}{40}$	B1	or equiv or $\frac{16}{\text{their denominator from (a)}}$
(c)	Harder at A since $0.4 < 0.7$	B1ft	Accept "cannot tell as results are only for one day", "more failed than passed at A", "more than half failed at A" but NOT just "more failed at A" or "p(pass) is only 0.4"

9(a)	Correct line within limits	B1	Must be straight ruled and pass between (or through) (0,20) and (0, 40) and (68,200) and (70, 180)
(b)	Positive correlation or "the higher the temperature the more ice creams sold"	B1	Accept equivalent wording but not strong or direct correlation or direct proportion

10	Consider price per sheet $95 \div 150$ or $320 \div 500$	M1	$\frac{95}{150} \times 500$ scores M1A1 (or multiply 95 by 3.3 or 3.3333....)
	Standard: 0.63(3)(p)	A1	
	Regular: 0.64(p)	A1	£3.17 (Accept £3.15 or £3.16) A1
	Standard better buy	A1	Standard better buy A1
	or considers sheets per p $150 \div 95$ or $500 \div 320$	M1	or $\frac{320}{500} \times 150$ scores M1A1
	Standard: 1.57(89) or 1.58	A1	
	Regular: 1.56(25)	A1	96 A1
	Standard better buy	A1	Standard better buy A1
	Accept any other valid method which leads to a valid comparison [e.g. 1500 sheets of each]		
	N.B. To score the second A1 in either method the calculations must be in the same units (which do not need to be stated) i.e. both in pence per sheet or sheets per penny or equivalent. E.g. 0.63 and 0.0064 would score M1A1A0 The final A1 may still be awarded if the answer given is “standard”		

11 (a)	D: probability > 1	B1	Accept "top number can't be bigger than bottom number" or "improper fraction"
(b)	A: 13 soft and 28 sweets	B1	Need to see that they understand that there are 28 chocolates in total
(c)	D: Probability still $\frac{1}{2}$	B1	Accept "coin only has two sides" or equiv

12 (a)	Mrs E: $\frac{3.5}{100} \times 240$ or Mr D: $\frac{4}{100} \times 220$	M1	M1 is for attempting to calculate either 3.5% of £240 or 4% of £220 M1 for attempting any valid method of comparison i.e. $240 \times \frac{3.5}{n}$ and $220 \times \frac{4}{n}$
	(£)8.4(0)	A1	If only both weekly wages are calculated then award SC1 but if weekly wages are calculated followed by an answer of Mr D award full marks
	(£)8.8(0)	A1	
	∴ Mr D	A1	
(b)	102% = £78.03	M1	Watch out for 98% of £78.03 = £76.46(94) which is then rounded to £76.50. This scores M0
	$\frac{78.03}{102} \times 100$ or	A1	78.03 ÷ 1.02 scores M1A1
	= (£) 76.50	A1	Must be two figures after the decimal point

13	$x^2 = 1.2^2 + 3^2 (=10.44)$	M1	Correct statement of Pythagoras with relevant numbers; Must add two squares
	$\sqrt{\text{(their answer)}}$	DM1	
	3.2(31098884)	A1	PA of 10.44 to 10.4 , then square root gives 3.224903099. An answer of 3.2 would score the A1 but an answer of 3.22 would score A0 3 with no working scores M0. If 3.2(3...) is seen call the answer 3 further working
	Trigonometry: Angles are 68.2° and 21.8° . Only give credit if these angles are used correctly to get x i.e. $1.2 \div \sin 21.8$ or $\cos 68.2$ or $3 \div \cos 2.8$ or $\sin 68.2$. Then award M1DM1A1		

14	A trial between 2 and 3	In this question a final answer on its own will not score full marks, Working must be shown. All trials must be correctly evaluated either rounded or truncated to a degree of accuracy that allows comparison. e.g. whole nos for 1 dp values of x and 1 dp for 2 dp values of x Values are:			
	Trials between 2.3 and 2.4 inclusive that 'sandwich' the answer	2.1	23.961	2.31	28.496391
		2.2	26.048	2.32	28.727168
		2.3	28.267	2.33	28.959337
		2.4	30.624	2.34	29.192904
		2.5	33.125	2.35	29.427875
		2.6	35.776	2.36	29.664256
		2.7	38.583	2.37	29.902053
		2.8	41.552	2.38	30.141272
		2.9	44.689	2.39	30.381919
	A trial at 2.35 or 2.36 or 2.37 and 2.4 stated as the answer	N.B. Possible misreads $x^3 + 7$ (ans 2.8) deduct 2 $x^2 + 7x$ (ans 3 exactly) scores B0 $x^3 - 7x$ (no poss ans between 2 & 3) scores B0			

15	Finding midpoints	B1	Must have them all: 3, 5, 7, 9, 11, 13
	$\Sigma(xf)$ (= 228)	M1	Using their 'mid-points' but any errors must be consistent. lower interval boundary gives 198, upper interval boundary gives 258, using 3.5, 5.5 etc gives 243
	Their $\Sigma(xf) \div 30$	DM1	Must divide by 30
	7.6 (minutes)	A1cao	

16 (a)	(i) Reflection	B1	Accept mirror image or mirrored but not mirror or flip
	in $x = -1$	B1	Must give equation of mirror line
	(ii) correct triangle	B1	
(b)	(i) $\frac{1}{2}$	B1	
	(ii) $(-2, -1)$	B1	1mm tolerance on reading from graph

17 (a)	$6x$	B1	
(b)	(i) x^3	B1	
	(ii) y^7	B1	
(c)	$4x^2 + 20x - 3x - 15$	M1	Expanding to give four terms one of which must be an x^2 term; allow one error
		A1	All four terms correct
	$4x^2 + 17x - 15$	A1ft	correct simplification of their expression if M1 awarded
	Alternative: Answer seen with no or partial working can award B1 for each correct term provided that there are 3 terms, one in x^2 , one in x and a constant term. Use the scheme that gives most advantage to the candidate		

18	Sine	M1	Sight of sine scores M1 provided use of sine is clearly intended
	$\sin 33 = \frac{125}{x}$		Accept $125 \div 33 \sin$
	$x = \frac{125}{\sin 33}$	DM1	Using rads gives 125.0110185 Using grads gives 252.2914785
	$= 229.5(098073)$	A1	Using cos 57 and rads gives 138.9094433 Using cos 57 and grads gives 199.9223801
	$= 230 \text{ (m)}$	B1	For rounding any value with 4 or more figures or calculation seen to 2 or 3 sig figs e.g. $125 \times \sin 33 = 68$ or 68.1 scores M1DM0A0B1
	Use of sine rule: M1 for $\frac{x}{\sin 90} = \frac{125}{\sin 33}$ M1 for $x = \frac{125 \times \sin 90}{\sin 33}$ A1 for 229.5(....) B1 for rounding		
	Use of Pythagoras $AB = 192.(....)$ gets no credit until used i.e. M1 for $x^2 = 125^2 + 192^2$ DM1 for $x = \sqrt{52674}$ A1 for $x = 229.5(....)$ then B1 for rounding		

19 (a)	(i) 27.383067(76)	B1	Accept 27.383068
	(ii) 27.4	B1	ft provided there are more than 3sf in (i)
(b)	1.3515×10^9	B1 DB1	B1 for digits 13515 or 1352 or 135 B1 for correct standard form
	SC: 1.351×10^9 scores B0B1		

20	Scale factor $= 9 \div 6 = 1.5$	M1	Accept 9/6 or 6/9 or 4/6 or 6/4 or ratios	$\frac{4}{4+x} = \frac{6}{9}$ or $\frac{4+x}{4} = \frac{9}{6}$
	$AB = 4 \times 1.5 (= 6)$	M1	Correct use of their scale factor	$36 = 24 + 6x$ or equiv
	$BD = \text{their } AB - 4 = 2$	A1cao		

21	Sight of 4000	B1	B1 may be awarded later for dividing their cm^3 answer by 1000
	Vol of cup = $\pi \times 3^2 \times 10$	M1	
	= 282.7(433388)	A1	Accept $280 \leq \text{vol} \leq 283$
	(their 4000) \div (their 282.7(...))	DM1	
	= 14(.14710....)		
	= 14	A1	

22	$x^2 = w - y$	B1	Or equiv $-x^2 = y - w$
	$x = \sqrt{(w - y)}$	B1	Accept $\pm\sqrt{(w - y)}$ and $-\sqrt{(w - y)}$ $x = \sqrt{(y - w)}$ gets B1B0 Common errors: $x = \frac{w-x}{x}$ $x = \frac{w-x}{2}$ $x = \sqrt{w - y}$ all score B1B0

23	Using multiples	M1	Using prime factors: $30 = 2 \times 3 \times 5$; $16 = 2^4$
	30, 60, 90, ..., 240 16, 32, 48, ..., 240	A1	LCM = $2^4 \times 3 \times 5 = 240$ Sight of 240 scores M1A1
	8 packs buns. 15 of sausages	A1	A pair of values giving equal numbers of buns and sausages score M1A1A0 Correct answer with no working scores full marks

24 (a)	$23 - 2x = 15$ or $4.6 - 0.4x = 3$	M1	May allow one numerical error e.g. $23 - 2x = 8$
	$23 - 25 = 2x$ or $4.6 - 3 = 0.4$	A1	
	$x = 4$	A1ft	ft if M1 awarded e.g. $23 - 2x = 15$, $2x = 38$, $x = 19$ scores M1A0A1ft
(b)	$3x < 21$	M1	$3x = 21$ scores M1 if and only if recovered later
	$x < 7$	A1	Must have inequality in answer. Accept \leq Also accept $x = < 7$, x is less than 7, x is < 7 $x < 7$ and $x > -7$ or $-7 < x < 7$ is choice of answers not method; award M1A0

25	Reading two quartiles from graph	M1	Accept any indication; e.g. lines at 10 and 30 or marks at relevant points on cf graph or horizontal axis $19 - 11 = 8$ also acceptable
	11 (mins) and 19 (mins)	A1	Accept either order