



General Certificate of Secondary Education

Mathematics 3301 *Specification A*

Higher Tier Paper 1

Mark Scheme

2005 examination - June series

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.

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 $\frac{1}{4}$ 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.

Paper 1H

1	$5000 \div (11 + 8 + 6)$	M1	
	200	A1	
	2200, 1600, 1200	A1	all correct

2(a)	$4y < 6$	M1	oe $y = 1.5$ oe scores M1 A0
	$y < 1.5$	A1	oe
(b)	$p - 3 = 2r$ or $\frac{p}{2} = \frac{3+r}{2}$	M1	or $(p+3)/2$ or $(3-p)/2$
	$\frac{p-3}{2} = r$ or $\frac{p-3}{2} = r$	A1	oe
(c)	$2x - 20 = x + 12$ allow <u>one</u> error	M1	or $\frac{1}{2}x - \frac{1}{4}x = 3 + 5$ allow <u>one</u> error or $\frac{1}{4}x$ or 8 in $\frac{1}{4}x = 8$
	$x - 20 = 12$ or $2x = x + 32$	A1	or $\frac{1}{4}x = 8$
	$(x =) 32$	A1	

3(a)	0	B1	
	-6	B1	
(b)	At least 5 points plotted correctly	B1ft	$\pm \frac{1}{2}$ square
	correct curve from $x = -2$ to $+4$	B1	smooth curve through 7 points $\pm \frac{1}{2}$ square

4(a)	50 is not a multiple of 4 or 50 is not a multiple of 20	B1	$\frac{1}{4}$ or $\frac{9}{20}$ of 50 is not an integer oe
(b)	$\frac{1}{5} + \frac{1}{10}$	B1	
	$\frac{2}{10} (+ \frac{1}{10})$	DB1	

5	Straight lines each side of straight sections of L	M1	
	Semi circles at each end of L or quadrant at outside corner of L	M1	
	Complete locus 2cm \pm 2 mm from L	A1	

6(a)	10^6	B1	oe
(b)	8×10^9	B1	
(c)	2.4×10^{22}	B2	B1 2.4 or 22 as power or 2400000000000000000000 oe e.g. 24×10^{21}

7	3 and common denominator	M1	or $\frac{7}{3} + \frac{7}{4}$	2.33(3...)
	$3 (+) \frac{4}{12} + \frac{9}{12}$	M1	or $\frac{28}{12} + \frac{21}{12}$ allow <u>one</u> error in numerator	1.75
	$4\frac{1}{12}$	A1	oe e.g. $\frac{49}{12}$ SC2 $1\frac{1}{12}$ oe	4.083(3...) 4.08 scores M2 A0

8(a)	$30 - x$	B1		
(b)	$4x - 1(30 - x) + 25$	B2ft	ft from their $(30 - x)$, -1 each 'new' error	
(c)	$4x - (30 - x) + 25 = 80$	M1	for equating their expression to 80	
	$5x = 85$	M1	for simplifying their equation allow <u>one</u> error if coefficient of x in (b) = 1 then M0	
	$(x =) 17$	A1	T and I giving $(x =) 17$ scores 3 marks in (c)	

9	20 (seconds) seen	B1	approximating to 1 s.f. at any stage	
	$200 \div 20(.42)$ (m/s) or 3×200 (m/min) or 5×200 (m) in 100 (s)	M1	for speed = dist \div time or distance in 100 sec	
	(their 10) $\times 3600$ or (their 600) $\times 60$ or (their 1000) $\times 36$	M1	for a conversion of distance to km or time to hours	
	36	A1		

Common responses 0.2 seen scores B0M0M1 (for conversion of distance to km)
 10 from $200/20$ scores B1M1M0 (for approximation and speed calculation)

Other examples 0.2 $\div \frac{20}{3600}$ or $200 \div \frac{1}{180}$ or 0.2/20 scores B1M2
 3600 $\div (20.42 \times 5)$ or 0.2/20.42 scores B0M2 (complete method/no estimation)

10(a)	Stratified sampling	B1		
(b)	1,13,2	B3	1,14,2 or 0,14,2 scores B2, 0.4, 13.6, 2.1 scores B1	

11(a)	$\pi (\times) 5^2$	M1	condone 3.1... $\times 5^2$
	$\pi (\times) 5^2 \times 10$ or (their area) $\times 10\pi (\times) 5^2 \times 10$ or (their area) $\times 10$	M1	condone 3.1... $\times 10 \times 5^2$ their area must contain π
	250π or $250 \times \pi$ or $\pi \times 250$	A1	775 to 790 scores M2 A0 do not accept $\pi 250$ ignore fw 250π can be recovered in (b)
(b)	40×50	M1	$10 \times 10 \times 10$ 40×50
	their 2000×10	M1	their $1000 -$ their 250π $20 \times$ their $(\pi \times 5^2)$
	$20 \times$ their 250π	M1	$20 \times$ their $(1000 - 250\pi)$ their $2000 -$ their 500π
	$20000 - 5000\pi$	A1	$20(1000 - 250\pi)$ $10(2000 - 500\pi)$
			4290 to 4500 scores M3 A0 ignore fw except 15000π

12(a)(i)	$360 - (90 + 90 + 40)$	M1	oe
	140	A1	
(ii)	70	B1ft	
(b)(i)	angle $OBA = 28^\circ$	B1	or angle $ACB = 62^\circ$ B1
	$(x =) 180 - (28 + 28) = 124$	B1ft	ft from their 28° $(x =) 124$ B1
(ii)	angle $OAC = 70^\circ - 28^\circ = 42^\circ$	B1ft	ft from their 28° and/or their 140° or angle $AOC = 96^\circ$
	$(y =) 42$	B1ft	

13(a)	$0 = 4 + 2p + q$ $-5 = 9 - 3p + q$	M1	for substitution of <u>both</u> sets of coordinates allow <u>one</u> error
	$5 = -5 + 5p$	DM1	oe for correct attempt at elimination of p or q
	$p = 2$	A1	
	$q = -8$	A1	$p = 2$ <u>and</u> $q = -8$ from no obvious working scores 4
(b)	Solving their $x^2 + px + q = 0$	M1	if 'formula' used substitution must be completely correct
	$(-4, 0)$	A1	

14	$10x = 4.2727...$ $1000x = 427.2727...$	M1	$x = 0.4 + 0.02727...$ $x = 0.42727...$ $100x = 42.727...$
	$990x = 423$	M1	$x = \frac{4}{10} + \frac{27}{990}$ $99x = 42.3$
	$x = \frac{423}{990}$	A1	$x = \frac{(396 + 27)}{990} = \frac{423}{990}$ $x = \frac{423}{990}$
	$x = \frac{47}{110}$	A1	

15(a)	$8x^{12}y^3$	B2	-1 eooo
(b)	$2(x^2 - 25y^2)$	B1	for common factor of 2 correctly removed
	$2(x + 5y)(x - 5y)$	B2	B1 for each algebraic factor in its simplest form ($2x + 10y$)($x - 5y$) or $(x + 5y)(2x - 10y)$ score B2

16(a)(i)	$\sqrt{20} = \sqrt{(4 \times 5)} (=2\sqrt{5})$	B1	must show $\sqrt{(4 \times 5)}$ since answer given
(ii)	$2 + \sqrt{2}\sqrt{10} + \sqrt{2}\sqrt{10} + 10$	M1	oe e.g. $2 + 2\sqrt{20} + 10$ or $\sqrt{4} + \sqrt{2}\sqrt{10} + \sqrt{2}\sqrt{10} + \sqrt{100}$ allow <u>one</u> error
	$12 + 2\sqrt{20}$ or $12 + 4\sqrt{5}$	A1	
(b)	$(2 + \sqrt{5})^2 + (\sqrt{3})^2$	M1	oe
	$(2 + \sqrt{5})^2 = 4 + 4\sqrt{5} + 5$ oe	A1	
	$12 + 4\sqrt{5}$ <u>and</u> valid conclusion	A1ft	conclude 'yes' or 'no' if (a)(ii) is incorrect

17	$BC = t - s$ or $BM = \frac{3}{4}(t - s)$	M1	or $CB = s - t$ or $CM = \frac{1}{4}(s - t)$
	$AM = s + \frac{3}{4}(t - s)$	M1	or $AM = t + \frac{1}{4}(s - t)$
	$AM = \frac{1}{4}s + \frac{3}{4}t$ or $\frac{1}{4}(s + 3t)$	A1	

18(a)	$x = 110$	B1	430° scores B1
(b)	$x = 250, x = 290$	B2	B1 for each
(c)	correct sketch of 'double' cycle	B2	B1 for sketch only as far as 180 or slight inaccuracy
(d)	$x = 35, x = 55$	B1	must have 35 <u>and</u> $\frac{1}{2}$ of their (a)
	$x = 215$ $x = 235$	B1ft B1ft	B1 for each of (their $35 + 180$), (their $55 + 180$)

19(a)	$(2x - 3)^2 = 4x^2 - 6x - 6x + 9$	M1	condone <u>one</u> error $4x^2 + 9$ is <u>two</u> errors
	$4x^2 - 12x + 9 = 8x - 16$ or $4x^2 - 20x + 25 (= 0)$	M1	for equating expressions and/or simplifying this must lead to a quadratic equation
	$(2x - 5)(2x - 5) (= 0)$	M1	ft from their <u>quadratic</u> equation (if 'formula' used, substitution must be completely correct)
	$x = 2.5$	A1	
	$y = 2$	A1	
(b)	Only one solution so straight line must be a tangent to the curve Hence sketch 2	B2ft	ft from their solution(s) to (a) clear solution(s) in (a) \Rightarrow 'correct' sketch in (b) can earn B1 (no explanation) or B2 (with explanation)

alternatively

19 (a)	$x = \frac{y+3}{2}, y+3 = 2x, 4y = 8x - 12$	M1	oe for setting up attempt to eliminate x
	$y^2 - 4y + 4 (= 0)$	M1	oe condone <u>one</u> error this must lead to a quadratic equation
	$(y-2)(y-2) (= 0)$	M1	ft from their <u>quadratic</u> equation (if 'formula' used, substitution must be completely correct)
	$y = 2$	A1	
	$x = 2.5$	A1	
(b)	Only one solution so straight line must be a tangent to the curve Hence sketch 2	B2ft	ft from their solution(s) to (a) <u>clear</u> solution(s) in (a) \Rightarrow 'correct' sketch in (b) can earn B1 (no explanation) or B2 (with explanation)

20(a)(i)	0.25 <u>and</u> 0.4	B1	oe
(ii)	0.25×0.4	M1	oe or $1 - [0.75 + (0.25 \times 0.6)]$ using their probabilities from (a)(i)
	0.1	A1ft	
(b)	sight of 0.9 or $(1 - 0.1)$ or $(1 - \text{their } 0.1)$	M1	
	$(0.9)^3$ or $(1 - \text{their } 0.1)^3$	M1	oe
	0.729	A1	