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General Certificate of Secondary Education
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Mathematics 43601H

Unit 1 Higher tier

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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.

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Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

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.
Q	Marks awarded for Quality of Written Communication
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
(a, b)	Accept values between a and b **not** inclusive.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.149.
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

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.

Questions which ask candidates to show working

Instructions on marking will be given 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.

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.

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.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Unit 1 Higher Tier

Q	Answer	Mark	Comments
1a	Appropriate key	B1	
	All leaves correct and ordered: 3 4 5 5 6 8 0 3 3 5 5 6 7 9 4 6 8 8 0 1	B1	
	Appropriate alignment of leaves	Q1ft	ft their single digit leaves Strand (ii) Logical organised working so row lengths show distribution
1b	$\frac{\text{their } 16}{20}$ ($\times$ 100)	M1	oe Condone working out **25 or more** for M1 ie $\frac{\text{their } 18}{20}$ ($\times$ 100)
	80	A1 ft	Correct or ft **more than** 25 from their ordered stem-and-leaf SC1 90 or 20

2a	Any four correct plots	M1	$\pm \frac{1}{2}$ square
	All seven correct plots	A1	
2b	Continuous line within limits	B1	Straight line, negative gradient, at least 3 large squares wide that passes / would pass through gate at (2, 8) and (2, 11) and gate at (5, 1) and (5, 5)
2c	Negative (correlation)	Q1	Strand (i) Correct vocabulary Must use the word 'negative' Ignore extra words eg strong, weak, ...
2d	Reads across from 5 on the vertical axis	M1	Must have a straight line of best fit
	Answer appropriate to their straight line of best fit with negative gradient	A1 ft	ft their line of best fit $\pm \frac{1}{2}$ square SC1 Answer [3.9, 4.3]

Q	Answer	Mark	Comments
3a	(0 +) 2 + 4 + 5 + 2 + 3 + 2 + 1 (+ 0)	M1	oe Allow one error, omission or extra
	19	A1	SC1 17 (exactly one A*) or 21 (counts A*A* twice) or 81 (no A*)
3b	6 + 3 + 9 + 2 + 3 + 8 (+ 0) + 2 + 4 + 5 or 6 + 12 + 13 + 11 or 6 + 3 + 2 (+ 0) + 9 + 3 + 2 + 8 + 4 + 5 or 11 + 14 + 12 + 5	M1	Allow one error, omission or extra Allow one error Allow one error, omission or extra Allow one error
	42	A1	SC1 30 (G < H) or 70 (G ≥ H)
4a	5 × 4 (= 20) or 6 × 2 (= 12) or 7 × 8 (= 56) or 8 × 10 (= 80) or 9 × 6 (= 54)	M1	oe
	5 × 4 + 6 × 2 + 7 × 8 + 8 × 10 + 9 × 6 (= 222)	M1dep	oe Allow one error or omission
	222 ÷ 30	A1	oe 222 must be evaluated and correct

Q	Answer	Mark	Comments
	In all these schemes Q1 may be awarded for Yes if qualification is given eg Yes, almost		
4b	1.15 × 6.5	M1	1.15 × 195
	7.47(5) or 7.48 or 7.5 with working	A1	224.(25)
	No	Q1 ft	Strand (iii) ft their answer if M1 awarded
	Alternative method 1		
	$\frac{7.4 - 6.5}{6.5}$ (× 100) or 0.13...	M1	$\frac{222 - 195}{195}$ (× 100)
	13.(8..) or 14	A1	
	No	Q1 ft	Strand (iii) ft their answer if M1 awarded
	Alternative method 2		
	0.15 × 6.5	M1	0.15 × 195
	0.9 **and** 0.97(5) or 0.98	A1	27 **and** 29.(25)
	No	Q1 ft	Strand (iii) ft their answer if M1 awarded **NB** Also need 0.9 or 27 for comparison in this method
	Alternative method 3		
	$\frac{7.4}{6.5}$ (× 100)	M1	$\frac{222}{195}$ (× 100)
	1.13(8..) or 1.14	A1	
	No	Q1 ft	Strand (iii) ft their answer if M1 awarded
	Alternative method 4		
	7.4 ÷ 1.15	M1	222 ÷ 1.15
	6.4(...)	A1	193.(...) **and** 195
	No	Q1ft	Strand (iii) ft their answer if M1 awarded **NB** Also need 195 for comparison if using right hand method

Q	Answer	Mark	Comments
5	$\frac{3}{4} - \frac{1}{4} \left(= \frac{1}{2}\right)$	M1	
	$6 \div 2 \times 3$	M1	3 and 9 chosen
	9	A1	SC2 blue = 3 or red + blue = 12
	Alternative method 1		
	Pair of integers with a difference of 6 eg 2 and 8 or Pair of integers with P(blue) = $\frac{1}{4}$ eg 1 and 3, 2 and 6, $\frac{2}{8}$, $\frac{3}{12}$	M1	1 : 3 or 3 : 1
	3 and 9 chosen	M1	3 : 9 or 9 : 3 chosen
	9	A1	SC2 blue = 3 or red + blue = 12
	Algebraic methods are not expected on Unit 1 but, if seen, apply the following schemes		
	Alternative method 2		
	$b + 6 = 3b$	M1	$r - 6 = \frac{r}{3}$
	$2b = 6$ or $b = 3$	M1	$3r - 18 = r$ or $2r = 18$
	9	A1	SC2 blue = 3 or red + blue = 12
	Alternative method 3		
	x red, $(x - 6)$ blue, $\frac{x - 6}{x + x - 6} = \frac{1}{4}$	M1	oe
	$4x - 24 = 2x - 6$	M1	Expanding and eliminating fractions
	9	A1	SC2 blue = 3 or red + blue = 12

Q	Answer	Mark	Comments
6	Lower quartile at 12	B1	($\pm \frac{1}{2}$ square)
	Upper quartile and lower quartile drawn **and** inter-quartile range of 4	B1ft	($\pm \frac{1}{2}$ square) ft their lower quartile + 4 for upper quartile
	$16 \times \frac{7}{8}$ (= 14)	M1	oe 16 : 14 seen in working with no or incorrect plot
	Median at 14	A1	($\pm \frac{1}{2}$ square) NB Must have a fully correct diagram for all 4 marks
7a	130, 190, 200	B1	
7b	Plotted at UCBs ($\pm \frac{1}{2}$ square)	B1	10, 15, 20, 25, 30 Increasing function not straight line Allow one error or omission
	Heights correct ($\pm \frac{1}{2}$ square)	B1 ft	12, 60, 130, 190, 200 if correct Allow one error or omission Increasing function not straight line ft values from table
	Smooth curve or polygon through **all** their points	B1 ft	ft their 5 plots Increasing function not straight line B3 only for fully correct

Q	Answer	Mark	Comments
7c	**Using graph**		
	Attempt to read off at 16 or 22	M1	Must be an increasing graph Condone reading off at 15.5 and/or 21
	Their value at 22 – their value at 16	M1 dep	oe Condone reading off at 15.5 and/or 21
	$\frac{\text{their difference}}{200}$	A1 ft	oe fraction ft actual difference from their graph ± 4 (not from a misread of horizontal scale) Ignore incorrect cancelling
	Alternative method - using table		
	$\frac{4}{5} \times 70$ (= 56) or $\frac{2}{5} \times 60$ (= 24)	M1	
	$\frac{4}{5} \times 70 + \frac{2}{5} \times 60$ (= 80)	M1 dep	
	$\frac{80}{200}$	A1	Fraction equivalent to $\frac{2}{5}$ Ignore incorrect cancelling

Q	Answer	Mark	Comments
8a	1.12 seen	M1	$1072 + 1072 \times 0.12$ (= 128.(...)) or 1200.(...) or 1201 oe eg Complete build-up
	1072×1.12^2	M1dep	Their 1200 + their 1200×0.12 oe
	1344 or 1345 or 1346	A1	SC2 Non-integer (1344, 1346) 1329.(...) or 1330 implies M1M0A0
8b	Any **one** of $\frac{500}{4000} \times 1072$ or $\frac{500}{4000} \times 2392$ or $\frac{500}{4000} \times 316$ or $\frac{500}{4000} \times 220$	M1	oe Any **one** of these values in the correct position: 134 or 299 or 39.5 or 27.5 or 39 or 28 or 40 or 27
	Any **two** of $\frac{500}{4000} \times 1072$ or $\frac{500}{4000} \times 2392$ or $\frac{500}{4000} \times 316$ or $\frac{500}{4000} \times 220$	M1dep	Any **two** of these values in the correct position: 134 or 299 or 39.5 or 27.5 or 39 or 28 or 40 or 27
	134 and 299 and 39 and 28 or 134 and 299 and 40 and 27	A1	SC1 Answer of 268, 598, 79, 55

Q	Answer	Mark	Comments
9	$\frac{6}{10} \times \frac{6}{10} \left(= \frac{36}{100}\right)$ **or** $\frac{4}{10} \times \frac{4}{10} \left(= \frac{16}{100}\right)$	M1	oe Accept on tree diagram
	$\frac{6}{10} \times \frac{6}{10} + \frac{4}{10} \times \frac{4}{10}$	M1 dep	oe
	Jack and $\frac{52}{100}$ (and $\frac{48}{100}$)	A1	oe SC1 Tree diagram with the 6 correct probabilities shown SC1 Sample space diagram with 100 outcomes
	Alternative method		
	$\frac{6}{10} \times \frac{4}{10} \left(= \frac{24}{100}\right)$	M1	oe Accept on tree diagram
	$\frac{6}{10} \times \frac{4}{10} + \frac{4}{10} \times \frac{6}{10}$	M1 dep	oe
	Jack and $\frac{48}{100}$ (and $\frac{52}{100}$)	A1	oe SC1 Tree diagram with the 6 correct probabilities shown SC1 Sample space diagram with 100 outcomes

10a	$(60 - 20) \times 5$	M1	oe $5 \times 5 \times 8$
	200	A1	SC1 400

Q	Answer	Mark	Comments
10b	224 – their 200 (= 24) or 8×10 (= 80)	M1	oe $\frac{1}{10}$ or 1 column width = 8
	$\frac{\text{their}24}{10 \times 8}$ ($\times$ 10) (= 3)	M1 dep	oe $24 = \frac{3}{10}$ or $24 = 3 \times 8$ scores M2
	20 – their 3	M1 dep	oe dep on M2
	17	A1 ft	ft their part a SC1 Answer in range (15, 20)
	Alternative method 1		
	600 – 224 – 5×25 – 5×39 (= 56) or 8×10 (= 80)	M1	oe $\frac{1}{10}$ or 1 column width = 8
	$\frac{\text{their}56}{10 \times 8}$ ($\times$ 10) (= 7)	M1 dep	oe $56 = \frac{7}{10}$ or $56 = 7 \times 8$ scores M2
	10 + their 7	M1 dep	oe dep on M2
	17	A1 ft	ft their part a SC1 Answer in range (15, 20)
	Alternative method 2 – Working out 224 travel *less* can score max 3 marks		
	224 – 125 (= 99)	M1	oe
	$5 + \frac{\text{their } 99}{195}$ ($\times$ 5)	M1dep	oe
	7.54	A1	
	Alternative method 3 – If their answer to part (a) is greater than 224		
	Their (a) – 224	M1	oe
	$\frac{\text{their (a) - 224}}{\text{their (a)}} \times 40$	M1	oe $\frac{224}{\text{their (a)}} \times 40$ scores M2
	$20 + \frac{\text{their (a) - 224}}{\text{their (a)}} \times 40$	M1	oe $60 - \frac{224}{\text{their (a)}} \times 40$
	Correct result for their (a)	A1ft	

Q	Answer	Mark	Comments
11	79.5 or 80.5 or 1.35 or 1.45 seen	B1	
	min shelf [75, 80) ÷ max bottle (1.4, 1.5)	M1	
	79.5 ÷ 1.45	A1	Condone 1.4499 or better
	54	A1 ft	ft answer rounded down if M1A0 awarded