AQA Qualifications

GCSE

Mathematics

Unit 1: Higher 43601H

Mark scheme

43601H
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Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer 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 associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

Further copies of this Mark Scheme are available from aqa.org.uk

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.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
M dep	A method mark dependent on a previous method mark being awarded.
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.
B dep	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.
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 $a \leq$ value $< b$
3.14…	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416

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.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the candidate intended it to be a decimal point.

Q	Answer	Mark	Comments
1(a)	Any two of the three valid criticisms ie the overlap the options not being exhaustive the lack of a time frame	B2	B1 Any one valid criticism eg If you had stayed in 3 which box would you tick? Some people might have stayed in more than 14 Should say 'How many hotels have you stayed at in the last week/year'
	Additional Guidance		
	Do not accept the same criticism repeated eg 1 There is no box for 15 2 There is no box for 16		B1 B0
	Ignore irrelevant statements		
	Ignore criticisms of the question (other than lack of time frame)		
	The numbers collide 0 – 3, 3 – 6		B1
	No box for Other		B1
	No box for Don't know		B1
	There is a gap		B1
	They assume everyone has stayed in a hotel and it doesn't have an option for over 14 (ignore any non-contradictory statement)		B1
	There are not enough boxes		B0
	The boxes are wrong		B0

Q	Answer	Mark	Comments
1(b)	Suitable response section covering 0 to 7, exhaustive, no overlaps, with at least 3 separate numerical choices	B1	
	Additional Guidance		
	Interpret box labelled eg 5+ in favour of the student		
	Ignore boxes that extend beyond 7 and do not count them eg 0 – 2, 3 – 5, 6 – 8 0 – 5, 6 – 10, 11 – 15		 B1 B0
	Ignore boxes labelled Other and Not sure etc		
	A box including 0 with another box labelled None (oe) is an overlap		B0
	If inequalities are used they must be correct		
	Allow tally table even if filled in		
	Boxes (oe) for 0 oe, 1, 2, 3, 4, 5, 6, 7		 B1
	Boxes (oe) for Mon, Tues, Wed, Thurs, Fri, Sat, Sun		 B0

Q	Answer	Mark	Comments
2	**Alternative method 1**		
	36(%) or 0.36 or 64 : 36 or 32 : 18	M1	oe
	16 : 9	A1	Accept 1 : 0.5625 or 1 : $\frac{9}{16}$ or $1.\dot{7} : 1$ or $\frac{16}{9} : 1$ SC1 correctly simplifying any given ratio SC1 for simplified ratio in reverse eg 9 : 16
	Alternative method 2		
	$\frac{16}{25}$ or $\frac{9}{25}$ or $\frac{16}{9}$ or $\frac{9}{16}$	M1	Must be simplified fraction
	16 : 9	A1	Accept 1 : 0.5625 or 1 : $\frac{9}{16}$ or $1.\dot{7} : 1$ or $\frac{16}{9} : 1$ SC1 correctly simplifying any given ratio SC1 for simplified ratio in reverse eg 9 : 16
	Additional Guidance		
	16 : 9 seen then answer 4 : 3		M1A0
	16% : 9%		M1A0

Q	Answer	Mark	Comments
3	**Alternative method 1**		
	360 – 165 – 60 or 135	M1	Angle for cows May be on diagram
	their 135 ÷ 360 (× 100) or 0.375	M1dep	oe Proportion of cows
	37.5	A1	Accept 38 with method
	Alternative method 2		
	60 ÷ 360 (× 100) or 0.166(6..) or 16.6(6..) (%) **and** 165 ÷ 360 (× 100) or 0.458(3..) or 45.8(3..) (%) or (60 + 165) ÷ 360 or 0.625	M1	Proportions of chickens and sheep oe May be on diagram
	(1 – their 0.1666... – their 0.4583...) (× 100) or their 16.66... + their 45.83... or (60 + 165) ÷ 360 × 100 or 62.5 (%)	M1dep	Proportion of cows oe Percentage of chickens and sheep
	37.5	A1	Accept 38 with method
	Additional Guidance		
	0.625		M1
	62.5 or 0.375		M1M1
	Accuracy lost through truncation or rounding is only penalised in the final mark		

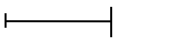
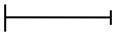
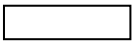
Q	Answer	Mark	Comments
4(a)	Positive	B1	Ignore any indication of strength eg weak
4(b)	7	B1	Accept any answer in range [6.8, 7.2]

5(a)	Appropriate key	B1	
	Stem 2, 3, 4, 5	B1	or 5, 4, 3, 2
	Leaves correct and ordered 1 4 9 2 5 6 8 8 9 0 3 7 8 2 6	B1	Must match the order of their stem if present eg if 5, 4, 3, 2 leaves should be 6 2 8 7 3 0 9 8 8 6 5 2 9 4 1
	Appropriate alignment of leaves	Q1ft	ft their single digit leaves Strand (ii) Logical organised working so row lengths show the distribution
	Additional Guidance		
	For the Q mark: • Leaves may be unordered and/or incorrect (but need at least 13) • Leaves must be single digit • Lengths of rows need to correspond to *their* number of leaves ie row with most leaves should be longest etc		
	The Q mark is independent so B0B0B0Q1ft is possible		
	Ignore eg lines between numbers which may be working for 5b and commas		
	If not crossed out and replaced, mark the stem-and-leaf on the grid		

Q	Answer	Mark	Comments
5(b)	**Alternative method 1**		
	11 × 10 or 110 or 2 × 20 or 40	M1	oe Implied by 4.40 or 440 or 1.60 or 160
	(their 110 + their 40) × 0.04 or (their 110 + their 40) × 4 or 600	M1dep	oe
	6	A1	
	Alternative method 2		
	10 × 0.04 or 0.4 or 10 × 4 or 40 or 20 × 0.04 or 0.8 or 20 × 4 or 80	M1	oe Allow 30 × 4 or 1.20 or 120 for M1 only
	their 0.4 × 11 + their 0.8 × 2 or their 40 × 11 + their 80 × 2 or 600	M1dep	oe
	6	A1	
	Additional Guidance		
	(Total points =) 150 scores the first mark		M1
	13 × 10 + 2 × 20 = 170 170 × 4 = 680 £6.80		M1 M1dep A0

Q	Answer	Mark	Comments
6	4 or 5 correct plots	M1	(25, 5), (35, 13), (45, 9), (55, 6), (65, 2) $\pm\frac{1}{2}$ small square Accept 5 points plotted at the correct heights consistently on the lower bound or upper bound for M1 only
	5 correct plots joined with straight lines to form a frequency polygon	A1	$\pm\frac{1}{2}$ small square
	Additional Guidance		
	Accept unruled lines if intention for straight lines is clear		M1A1
	Bar chart and frequency polygon drawn – mark frequency polygon		
	Bar chart only		M0
	Ignore other points or lines before first plot and after final plot and a line joining first and last plot		
7	$\frac{3}{25} \times 100$ or 12	M1	oe Allow $\frac{12}{100}$ or 12%
	$\frac{1}{10} \times (100 - 20)$ or 8	M1	oe Allow $\frac{8}{80}$
	4	A1	
	Additional Guidance		
	$(\frac{3}{25} - \frac{1}{10}) \times 100$		M1 M0 A0
	$(\frac{3}{25} - \frac{1}{10}) \times 80$		M0 M1 A0

Q	Answer	Mark	Comments
8(a)	24	B1	
8(b)	F(45) = [71, 73] or F(44) = [70, 72] or F(37) = [57, 59] or F(36) = [55, 57] or F(>45) = [7, 9] or F(>44) = [8, 10] or F(>37) = [21, 23] or F(>36) = [23, 25]	M1	
	F(45) = [71, 73] or F(44) = [70, 72] and F(37) = [57, 59] or F(36) = [55, 57] **or** F(>45) = [7, 9] or F(>44) = [8, 10] and F(>37) = [21, 23] or F(>36) = [23, 25]	M1dep	
	[12, 17]	A1	
	Additional Guidance		
	Answer only in range		M1M1A1
	Answer in range from wrong working		M2 max

Q	Answer	Mark	Comments
9	Upper quartile drawn at 41	B1	$(\pm\frac{1}{2}$ square)
	Upper quartile and lower quartile drawn with interquartile range of 20	B1ft	$(\pm\frac{1}{2}$ square) ft their upper quartile – 20
	$44 \times \frac{3}{4}$	M1	oe eg 44 : 33 seen in working
	Median at 33	A1	$(\pm\frac{1}{2}$ square) NB Must have a fully correct diagram for all 4 marks
	Additional Guidance		
	Line drawn at 33 (not LQ or UQ)		M1A1
	Box with two medians can still score LQ and UQ		B1B1M0A0 possible
	Instructions for incomplete diagrams: • If a line at 33 is shown can imply this is their median • If three lines are drawn assume LQ, median, UQ, even without box • For the following:  implies LQ  implies UQ  implies LQ and UQ		

Q	Answer	Mark	Comments
10(a)	Selects 4.2×10^{-4} and 0.005	B1	oe 0.000 42 5×10^{-3} May be implied by 0.002 7(1) oe
	Finds the midpoint of any two of the numbers eg $(4.2 \times 10^{-4} + 0.005) \div 2$ or 0.002 7(1)	M1	Allow an incorrect number of leading zeros if numbers converted incorrectly 0.000 245 or 0.002 535 or 0.003 235 or 0.003 41 or 0.005 7 all imply B0M1 oe
	$2.7(1) \times 10^{-3}$	Q1ft	Strand (i) ft B0M1 for correct midpoint of two of the numbers, given in standard form SC2 2.45×10^{-4} or 2.535×10^{-3} or 3.235×10^{-3} or 3.41×10^{-3} or 5.7×10^{-3}
	Additional Guidance		

10(b)	stays the same	B1	

Q	Answer	Mark	Comments
11	Selects at least two (and no others) from Centre (and miss) or miss and centre or outer and outer	B1	Seen or implied eg At least two pairs selected from 0.2 (and 0.3) 0.3 and 0.2 0.5 and 0.5 (and no others) Allow outer-outer repeated as a fourth pair
	0.2 × 0.3 (× 2) or 0.06 or 0.12 or 0.5 × 0.5 or 0.25	M1	oe Allow other combinations seen
	0.2 × 0.3 (× 2) or 0.06 or 0.12 and 0.5 × 0.5 or 0.25	M1	oe No other combinations used
	0.37	A1	oe fraction, decimal or percentage SC3 for 0.31 (ignoring reverse) SC3 for 0.51 (assumes one dart allowed) SC2 for 0.61 (for total of 50+) SC2 for 0.62 (outer-outer twice) SC1 for 0.45 (50+ with order ignored)
	Additional Guidance		

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<table>
<tr><td>2550</td><td>850</td><td>1400</td></tr>
<tr><td>383</td><td>127</td><td>210</td></tr>
</table>
or
<table>
<tr><td>2550</td><td>850</td><td>1400</td></tr>
<tr><td>382</td><td>128</td><td>210</td></tr>
</table>
</td><td>B2</td><td>B1 for any one correct entry
<table>
<tr><td>2550</td><td>850</td><td>1400</td></tr>
<tr><td>382
or 382.5
or 383</td><td>128
or 127.5
or 127</td><td>210</td></tr>
</table>
</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2"></td><td></td></tr>
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Q	Answer	Mark	Comments
13(a)	**Alternative method 1**		
	Attempt at frequency density 300 ÷ 30 or 10 or 200 ÷ 10 or 20 or 260 ÷ 20 or 13 or 80 ÷ 40 or 2	M1	One frequency ÷ one class width
	4 correct frequency densities	A1	10, 20, 13, 2
	Widths correct and bars in correct positions	A1	Must have correct frequency density for at least two bars
	Bars to correct heights and vertical scale or key	A1 ft	ft their frequency densities with M1 awarded $\pm\frac{1}{2}$ small square
	Alternative method 2		
	Attempt at standard frequencies eg 300 ÷ 3, 200 ÷ 1, 260 ÷ 2, 80 ÷ 4	M1	Any two attempted
	4 correct standard frequencies	A1	eg 100, 200, 130, 20
	Widths correct and bars in correct positions	A1	Must have correct standard frequency for at least two bars
	Bars to correct heights and key	A1 ft	ft their standard frequencies with M1 awarded $\pm\frac{1}{2}$ small square
	Additional Guidance		
	Accept any scale that fits eg 1 cm ≡ 2.5, 1 cm ≡ 3, 1 cm ≡ 4, 1 cm ≡ 5, 1 cm ≡ 10		

Q	Answer	Mark	Comments
13(b)	$\frac{3}{4} \times 840$ or 630 or $\frac{1}{4} \times 840$ or 210	M1	oe
	110	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
14	**Alternative method 1**		
	$\frac{9}{15} \times \frac{x}{14}$ or $\frac{3}{15} \times \frac{x}{14}$	M1	oe
	$\frac{9}{15} \times \frac{6}{14}$ or $\frac{54}{210}$ or $\frac{9}{35}$ or $\frac{9}{15} \times \frac{3}{14}$ or $\frac{27}{210}$ or $\frac{9}{70}$ or $\frac{3}{15} \times \frac{12}{14}$ or $\frac{36}{210}$ or $\frac{6}{35}$ or $\frac{3}{15} \times \frac{9}{14}$ or $\frac{27}{210}$ or $\frac{9}{70}$ or $\frac{3}{15} \times \frac{3}{14}$ or $\frac{9}{210}$ or $\frac{3}{70}$	M1dep	P(R, R') P(R, Y) or P(R, G) P(Y, Y') or P(G, G') P(Y, R) or P(G, R) P(Y, G) or P(G, Y) oe 0.257(142) or 0.128(571) or 0.171(428) or 0.042(857)
	$\frac{9}{15} \times \frac{6}{14} + \frac{3}{15} \times \frac{12}{14} + \frac{3}{15} \times \frac{12}{14}$ or $\frac{9}{15} \times \frac{3}{14} \times 2 + (\frac{3}{15} \times \frac{9}{14} + \frac{3}{15} \times \frac{3}{14}) \times 2$	M1dep	oe $\frac{54}{210} + \frac{36}{210} + \frac{36}{210}$ or $\frac{27}{210} \times 2 + (\frac{27}{210} + \frac{9}{210}) \times 2$
	$\frac{126}{210}$ or $\frac{3}{5}$ or 0.6	A1	oe SC2 for $\frac{126}{225}$ or $\frac{14}{25}$ oe

Q	Answer	Mark	Comments
14 cont.	**Alternative method 2**		
	$\frac{9}{15} \times \frac{x}{14}$ or $\frac{3}{15} \times \frac{x}{14}$	M1	oe
	$\frac{9}{15} \times \frac{8}{14}$ or $\frac{72}{210}$ or $\frac{12}{35}$ or $\frac{3}{15} \times \frac{2}{14}$ or $\frac{6}{210}$ or $\frac{1}{35}$	M1dep	P(R, R) P(Y, Y) or P(G, G) oe 0.342(857) or 0.028(571)
	$1 - (\frac{9}{15} \times \frac{8}{14} + \frac{3}{15} \times \frac{2}{14} + \frac{3}{15} \times \frac{2}{14})$	M1dep	oe $1 - (\frac{72}{210} + \frac{6}{210} + \frac{6}{210})$
	$\frac{126}{210}$ or $\frac{3}{5}$ or 0.6	A1	oe SC2 $\frac{141}{225}$ or $\frac{47}{75}$ oe
	Additional Guidance		
	Probabilities combined on a tree diagram		M1M1
	Note that P(R) = 0.6		

Q	Answer	Mark	Comments
15	**Alternative method 1**		
	455 or 465 or 505 or 515 seen	B1	May be implied by 960 or 980
	their 455 + their 505 or 960	M1	their 455 must be [450, 460) their 505 must be [500, 510)
	26 000 ÷ (455 + 505) or 26 000 ÷ 960 or 27.0833...	M1	Allow 26 005
	27	A1	Must be using 26 000 and 960 SC2 26 from 26 000 ÷ 980
	Alternative method 2		
	455 or 465 or 505 or 515 seen	B1	May be implied by 960 or 980
	their 455 + their 505 or 960	M1	their 455 must be [450, 460) their 505 must be [500, 510)
	(455 + 505) × 27 = 25 920 and (455 + 505) × 28 = 26 880 or 960 × 27 = 25 920 and 960 × 28 = 26 880	M1	
	27	A1	Must be using (26 000 and) 960 SC2 26 from 26 000 ÷ 980
	Additional Guidance		