



GCSE

Mathematics

Higher Tier Unit 1 Statistics and Number
Mark scheme

43601H
November 2015

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.
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.
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.
3.14 ...	Accept 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.

Q	Answer	Mark	Comments
1(a)	Negative	B1	Accept eg strong negative, weak negative
1(b)	One straight line through both gates (20, 75 – 90) and (80, 30 – 40)	B1	
	Additional guidance		
	Ignore outside gates		
	Line must cross at least 5 large squares		
	Joining points only		B0
If the points are joined and a line of best fit is also drawn then mark the line of best fit			
1(c)	66	B1ft	ft their line of best fit $\pm \frac{1}{2}$ small square Accept any value in the range [62, 70] if B0 awarded in (b)
2(a)	$\frac{1}{6}(\times 420)$ or $\frac{70}{420}$ seen	M1	oe
	70	A1	Accept 70 out of 420
2(b)	$\frac{23}{50}$ and 0.46 and 46%	B2	B1 circles one or two correct values and no more than one incorrect value

Q	Answer	Mark	Comments
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3	9 brown-eyed girls and 23 girls	B1	9 brown-eyed boys and 17 boys																				
	(their 23 – their 9 – 2) + 3 or 15	M1	40 – 18 – ((their 17 – their 9 – 3) + 2) or 15																				
	their 15 ÷ 40 (× 100)	M1	their 15 must be their total blue																				
	37.5	A1ft	ft their 9 and their 23 or their 9 and their 17 if B0 M2 scored Condone an answer of 38 if full method or 37.5 seen																				
	Additional guidance																						
	If build up is used for the percentage, the answer must be correct or a fully correct method seen																						
	The 2 nd M may be implied by a correct ft percentage for their total blue																						
The table does not need to be completed and only the relevant parts need be correct (ie 9, 12, 23 and 15 or 9, 17, 5, 7 and 15) but the correct table for reference is																							
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">Boys</th> <th style="text-align: center;">Girls</th> <th style="text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Brown</td> <td style="text-align: center;">9</td> <td style="text-align: center;">9</td> <td style="text-align: center;">18</td> </tr> <tr> <td style="text-align: center;">Blue</td> <td style="text-align: center;">3</td> <td style="text-align: center;">12</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">Green</td> <td style="text-align: center;">5</td> <td style="text-align: center;">2</td> <td style="text-align: center;">7</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">17</td> <td style="text-align: center;">23</td> <td style="text-align: center;">40</td> </tr> </tbody> </table>					Boys	Girls	Total	Brown	9	9	18	Blue	3	12	15	Green	5	2	7	Total	17	23	40
	Boys	Girls	Total																				
Brown	9	9	18																				
Blue	3	12	15																				
Green	5	2	7																				
Total	17	23	40																				

4	States a valid reason about increasing sample size or interviewing a variety of people	B1	eg ask more people ask boys and girls ask adults too
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Q	Answer	Mark	Comments
5	$\frac{1}{4} \times 20$ or 5 or 6 seen	M1	May be implied by $\frac{5}{20}$ or $\frac{6}{20}$
	$\frac{6}{21}$ or $\frac{2}{7}$	A1	oe Accept 0.29 or 29% (or better)
	Additional guidance		
	Decimal answer is 0.285714...		

6	Alternative method 1		
	Correct conversion of one value to another form $\frac{5}{12}$ oe fraction or 2 : 3 oe ratio 41.(...)% or 42% or 40% 0.41(...) or 0.42 or 0.4	M1	Accept in words eg 5 out of 12 Accept missing percentage signs
	Box A and correct comparable forms eg $\frac{25}{60}$ and $\frac{24}{60}$ or $\frac{10}{24}$ and $\frac{10}{25}$ or 15 : 21 and 14 : 21 or 41.(...)% or 42% and 40% or 0.41(...) or 0.42 and 0.4	Q1	oe Strand (ii) Logical argument with steps shown
	Alternative method 2		
	$\frac{2}{5} \times 12$ or 4.8 or $\frac{5}{12} \times 5$ or 2.08... or 2.1	M1	oe
	Box A and 4.8 (and 5) or Box A and 2.08... or 2.1 (and 2)	Q1	oe Strand (ii) Logical argument with steps shown

Q	Answer	Mark	Comments
7	4×4 or 16 or 7×13 or 91 or 11×8 or 88 or 16×5 or 80 or 22×1 or 297	M1	Attempt at fx using one correct midpoint
	(their 16 + their 91 + their 88 + their 80 + their 22) \div 31	M1	Condone missing brackets eg 275.7(...) implies M1M1A0
	9.58(...) or 9.6	A1	Accept 10 if correct method shown SC2 8.09 or 8.1 (lower class bounds used) or 11.06 or 11.1 (upper class bounds used)
	Additional guidance		
	Ignore rounding/ truncation once 9.6 or better seen		M1 M1 A1
	$(4 \times 4 + 7 \times 13 + 11 \times 8 + 16 \times 5 + 22 \times 1) \div 31$, answer 10		M1 M1 A1
	Ignore incorrect/ no use of brackets if correct answer given		M1 M1 A1
	59.4 implies $297 \div 5$		M1 M0 A0
	$297 \div 31$ seen rounded to $300 \div 30 = 10$		M1 M1 A0
	297 in table then $300 \div 30 = 10$ (no rounding shown)		M1 M0 A0
A correct product in the table or 297 seen does not imply M1 if there is a choice of methods			
8(a)	20	B1	

Q	Answer	Mark	Comments
8(b)	Vertical line drawn at 34 (for median)	B1	$\pm \frac{1}{2}$ small square
	Vertical lines drawn at 30 and 38 (for lower and upper quartiles)	B1	$\pm \frac{1}{2}$ small square
	Whiskers drawn to 5 and 70 and complete, correct plot	Q1ft	ft B0B1 or B1B0 if fully correct structure and 4 out of 5 measures correctly plotted $\pm \frac{1}{2}$ small square Strand (ii) Correct structure
	Additional guidance		
	Mark intention throughout		
	Accept unconventional plots eg line through middle of box arrows/ dots/ longer vertical lines/ no endings on whiskers any depth of box		
	Median at 35 is in tolerance so give benefit of the doubt (even if median = 35 stated)		B1
9	3×6 or (total =) 18	M1	Implied by three integers with a sum of 18
	1, 1, 16	A1	May be implied by an answer of 15
	15	A1ft	ft correct calculation of the range of a group of three integers with a sum of 18
	Additional guidance		
	The 'three integers' must be clearly in a group of three		
	If more than one group of 'three integers' is given but all have a sum of 18		M1A0
	0, 0, 18 with no or incorrect range given		M1 A0 A0
	0, 0, 18 with answer = 18		M1 A0 A1ft
	1, 3, 15 with answer = 14		M0 A0 A0
	1, 2, 15 with answer = 14		M1 A0 A1ft
	1, 1, 16 with answer = 14		M1 A1 A0

Q	Answer	Mark	Comments
10(a)	Men and modal class (women) = 160 – 170	B1	Condone mode = [164, 166]
	Additional guidance		
	Women chosen		B0
	Ignore reference to range if mode also seen in (a) and Men chosen		B1
	Ignore reference to median or mean if mode also seen in (a) and Men chosen		B1
	Range or median or mean only		B0
10(b)	190 – 160 or (range =) 30 or 195 – 155 or (range =) 40 or 200 – 150 or (range =) 50	M1	Condone [194, 196] – [154, 156]
	Men and minimum range (women) is 30	A1	Condone Men and range (women) is 40 or result of [194, 196] – [154, 156]
	Additional guidance		
	Correct working or value for any of the three ranges, even if seen in part (a) scores the M mark but must be referring to range in (b) to score the A mark		M1
	Any suggestion of using the mode for the decision in this part		A0
	NB The frequency for 170 – 180 (ie at 175) is 30		M0
	The range of frequencies = 35 – 1 = 34		M0
	Use of men's range as 180 – 170 or 10		A0
11	0.73 or 73(%) or $\frac{73}{100}$ or $\frac{100}{73}$ seen	B1	
	1138.8(0) ÷ 0.73	M1	oe
	1560	A1	SC2 896.69
	Additional guidance		
	Misread as increase		SC2

Q	Answer	Mark	Comments
12	Mean	B1	
	One value not representative	B1	oe Accept any indication that one of the values is non-typical, or that the mean would be non-typical
	Additional guidance		
	Mark the reason independently of the given average		
	Ignore non-contradictory statements alongside a correct reason		
	Accept any indication that 3420 is significantly different compared to all others		B1
	Accept outlier, anomaly, extreme value etc		B1
	Accept an indication that it would skew the mean		B1
	Do not accept inaccurate to mean unrepresentative if this is the only reason given		B0
Just stating that 3420 is very large with no comparison		B0	
13(a)	$\frac{4}{625}$	B2	B1 0.0064 or $\frac{64}{10000}$ oe fraction
	Additional guidance		
	If 0.0064 or $\frac{4}{625}$ seen but then further work can score B1 max (but not if choice) eg $\frac{4}{625}$ seen with answer $\frac{16}{25}$		B1
	Condone an attempt to change form eg correct fraction to percentage or correct decimal to fraction for max B1 eg $\frac{4}{625} \times 100 = \frac{8}{125}$ eg $0.0064 = \frac{64}{1000}$		B1 B1

Q	Answer	Mark	Comments
13(b)	$1.5 \times 10^{-2} \times 1.5 \times 10^{-2}$ or 0.000 225 or $\frac{9}{40\ 000}$	M1	oe
	2.25×10^{-4}	A1	SC1 for an incorrect answer (< 1) correctly converted to standard form
	Additional guidance		
	$1.5 \times 10^{-2} \times 2 = 0.03$ Answer 3×10^{-2}		SC1
	$1.5 \times 10^{-2} \times 2$ Answer 3×10^{-2}		SC1
	Answer only of 3×10^{-2}		SC0

14	<table border="1"> <tr><td>5</td><td>4</td><td>9</td></tr> <tr><td>16</td><td>35</td><td>51</td></tr> <tr><td>21</td><td>39</td><td></td></tr> </table>	5	4	9	16	35	51	21	39		B3	B2 at least five cells correct B1 three or four cells correct or $60 \div 500$ or 0.12 oe seen or $500 \div 60$ or 8.3(...) oe seen For B2 or B1 accept any of these values:
	5	4	9									
	16	35	51									
	21	39										
	or											
	<table border="1"> <tr><td>6</td><td>4</td><td>10</td></tr> <tr><td>15</td><td>35</td><td>50</td></tr> <tr><td>21</td><td>39</td><td></td></tr> </table>	6	4	10	15	35	50	21	39			
6	4	10										
15	35	50										
21	39											
<table border="1"> <tr><td>5.4</td><td>3.96</td><td>9.36</td></tr> <tr><td>15.6</td><td>35.04</td><td>50.64</td></tr> <tr><td>21</td><td>39</td><td></td></tr> </table>	5.4	3.96	9.36	15.6	35.04	50.64	21	39				
5.4	3.96	9.36										
15.6	35.04	50.64										
21	39											

Q	Answer	Mark	Comments
15(a)	Alternative method 1		
	Counts the 'squares' in one rectangle	M1	eg 7.2 or 3 or 4 or 2 (squares) respectively or 180 or 75 or 100 or 50 respectively
	their 7.2 + their 3 + their 4 + their 2 or 16.2 or their 180 + their 75 + their 100 + their 50 or 405	M1dep	If correct, the areas will be in the ratio 36 : 15 : 20 : 10 At least two must be in the correct ratio
	$\frac{\text{their } 7.2}{\text{their } 16.2} (\times 81)$ or $81 \div \text{their } 16.2$ or $\frac{\text{their } 180}{\text{their } 405} (\times 81)$ or $81 \div \text{their } 405$	M1dep	5 small squares \equiv 1 tree or 1 small square \equiv 0.2 tree
	36	A1	SC1 frequency density scale 1 cm \equiv 5
	Alternative method 2		
	Labels vertical axis $1x, 2x, 3x, 4x, 5x$	M1	
	$2.4 \times 3x + 0.6 \times 5x + 1 \times 4x + 2 \times x$ (= 81)	M1dep	Allow one error or omission
	$16.2x = 81$ or $x = 5$	M1dep	
	36	A1	SC1 frequency density scale 1 cm \equiv 5
	Additional guidance		
	NB If the student only labels the widths of the rectangles: 2.4 (often 2.5), 0.6 (often 0.5), 1 and 2 then this 2 is a width and not an area		M0
	For the 1 st M1 any other method must be clear and must include at least two areas in the correct ratio		M1
	If the frequency density scale is linear but incorrect eg 1 cm \equiv 20, then at least two areas correct for that scale implies the first M mark		M1
Dividing the rectangles into squares is not enough for the first mark, the number of squares needs to be stated		M0	
Answer of 36 implies 4 marks (unless clearly from wrong working)		M1 M1dep M1dep A1	

Q	Answer	Mark	Comments
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15(b)	$6 \div 16.2$ or $150 \div 405$ or 30	M1	oe
	$\frac{150}{405}$ or $\frac{30}{81}$ or $\frac{10}{27}$	A1	oe fraction
	Additional guidance		
	Correct use of their areas from part (a)		M1

16	Alternative method 1		
	47.5 or 48.5 or 6995 or 7005 seen	B1	
	$6995 \div 48.5$ or 144.22... or 144.23	M1	Condone $[6995, 7000) \div (48, 48.5]$
	144	A1	Must be using 6995 and 48.5
	Alternative method 2		
	47.5 or 48.5 or 6995 or 7005 seen	B1	
	$48.5 \times 144 = 6984$ and $48.5 \times 145 = 7032.5$	M1	Condone $(48, 48.5] \times n = a$ and $(48, 48.5] \times (n + 1) = b$ where $a < 6995$ and $b > 6995$
	144	A1	Must be using (6995 and) 48.5
	Additional Guidance		
	Answer only of 144		B0 M0 A0
	$6995 \div 48.49 = 144.256$, answer 144		B1 M1 A0
	$7005 \div 48.5 = 144$		B1 M0 A0
	48.49 is equivalent to 48.5 so can have full marks, however eg 48.499 will not gain the A mark		

Q	Answer	Mark	Comments
17	$\frac{a}{11} \times \frac{b}{10}$ or $\frac{7}{n} \times \frac{6}{n-1}$ or $\frac{4}{n} \times \frac{3}{n-1}$	M1	
	$\frac{7}{7+4} \times \frac{6}{7+4-1}$ or $\frac{7}{11} \times \frac{6}{10}$ or $\frac{42}{110}$ or $\frac{21}{55}$ or 0.38... or $\frac{4}{7+4} \times \frac{3}{7+4-1}$ or $\frac{4}{11} \times \frac{3}{10}$ or $\frac{12}{110}$ or $\frac{6}{55}$ or 0.109... or 0.11	M1dep	oe
	$\frac{7}{7+4} \times \frac{6}{7+4-1} + \frac{4}{7+4} \times \frac{3}{7+4-1}$ or $\frac{7}{11} \times \frac{6}{10} + \frac{4}{11} \times \frac{3}{10}$	M1dep	oe
	$\frac{54}{110}$ or $\frac{27}{55}$ or 0.49... or 49.(...)%	A1	oe SC2 $\frac{54}{121}$ or $\frac{65}{110}$ or $\frac{43}{99}$ oe SC1 $\frac{65}{121}$ oe