

GCSE

MATHEMATICS

Unit 1 43601H

Mark scheme

43601H
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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.

- 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.
- Q** Marks awarded for Quality of Written Communication
- 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.

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) | 40 | B1 | | | | | |
| 1(b) | Circles the outlier (58, 14) | B1 | | | | | |
| 1(c) | Links middle graph to strong positive correlation Links bottom graph to little or no correlation | B2 | B1 for each | | | | |
| 2(a) | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td>✓</td> </tr> <tr> <td></td> <td>✓</td> </tr> </table> | | ✓ | | ✓ | B1 | |
| | ✓ | | | | | | |
| | ✓ | | | | | | |
| 2(b) | 101 × 65 or 6565 or 64 × 75 or 4800 or 25 × 85 or 2125 or 10 × 95 or 950 or 14 440 | M1 | Attempt at fx using one correct midpoint 3610 implies M1M0A0 | | | | |
| | (their 6565 + their 4800 + their 2125 + their 950) ÷ 200 | M1dep | Condone missing brackets eg 13494.75 implies M1M1A0 | | | | |
| | 72.2 | A1 | SC2 77.2 or 67.2 Accept 70 or 72 with fully correct working | | | | |

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|-------------|--|-----|----|----|--|
| 2(c) | | 101 | B2 | B1 | all frequencies correct or all tallies correct or two rows correct |
| | | 66 | | | |
| | | 29 | | | |
| | | 14 | | | |

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| 2(d) | frequency polygon and histogram | B1 | |
|-------------|---------------------------------|----|--|

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|-------------|--|------|---|
| 3(a) | Appropriate key | B1 | |
| | Stem 2, 3, 4, 5 | B1 | |
| | Leaves correct and ordered 8 9 1 3 5 6 7 7 8 2 4 6 9 0 1 | B1 | |
| | Appropriate alignment of leaves | Q1ft | ft their single digit leaves Strand (ii) Logical organised working so row lengths show the distribution |

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|-------------|----|----|--|
| 3(b) | 50 | B2 | B1 33 or 46 SC1 Answer of 34 (from 51 – 17) |
|-------------|----|----|--|

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|-------------|-------------------------------|----|-------------|
| 4(a) | (0).5 or 50% or $\frac{1}{2}$ | B1 | oe fraction |
|-------------|-------------------------------|----|-------------|

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| 4(b) | Refers to number of trials eg Spin the spinner 60 times (and record the result) | B1 | Accept 'lots' or a number of trials greater than or equal to 30 |
| | Refers to theoretical probability eg Probability of each side = $1/10$ if fair or Works out expected number for each score using number of trials eg (For 60 trials) it should land on each number (approximately) 6 times if fair | B1 | oe eg Should be (approx) same frequency for each number if fair or If the relative frequencies or (experimental) probabilities are not (roughly) equal it is biased |

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|----------|---|-------|---|
| 5 | Alternative method 1 | | |
| | 360 – 50 or 310(°) | M1 | Allow [86, 86.2](%) or [0.86, 0.862] |
| | 15074 × 13.7 or [206 513, 206 514] | M1 | oe |
| | their 310 ÷ 360 × their 206 513. ... or their 86 ÷ 100 × their 206 513. ... | M1dep | oe dep on second M |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |
| | Alternative method 2 | | |
| | 360 – 50 or 310(°) | M1 | Allow [86, 86.2](%) or [0.86, 0.862] |
| | their 310 ÷ 360 × 13.7 or their 86 ÷ 100 × 13.7 or [11.78, 11.81] | M1 | oe |
| | 15074 × their [11.78, 11.81] | M1dep | oe dep on second M |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |
| | Alternative method 3 | | |
| | 360 – 50 or 310(°) | M1 | Allow [86, 86.2](%) or [0.86, 0.862] |
| | their 310 ÷ 360 × 15074 or their 86 ÷ 100 × 15074 or 12980. ... or [12 963, 12 994] | M1 | |
| | 13.7 × their 12 980. ... | M1dep | |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |

Question 5 is continued on next page

| | | | |
|---------------|---|-------|---|
| 5 cont | Alternative method 4 | | |
| | 15074 × 13.7 or [206 513, 206 514] | M1 | |
| | 50 ÷ 360 × their 206 513. ... or 28 682. ... or [28 498, 28 912] | M1 | oe Condone [0.138, 0.14] for 50 ÷ 360 |
| | their 206 513.8 – their 28 682. ... | M1dep | oe |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |
| | Alternative method 5 | | |
| | 15074 × 13.7 or [206 513, 206 514] | M1 | |
| | 50 ÷ 360 × 13.7 or [1.89, 1.92] | M1 | oe Condone [0.138, 0.14] for 50 ÷ 360 |
| | their 206 513.8 – 15 074 × their 1.9... | M1dep | oe |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |
| | Alternative method 6 | | |
| | 15074 × 13.7 or [206 513, 206 514] | M1 | |
| | 50 ÷ 360 × 15074 or 2093. ... or [2080, 2110.4] | M1 | oe Condone [0.138, 0.14] for 50 ÷ 360 |
| | their 206 513.8 – 13.7 × their 2093. ... | M1dep | oe |
| | [177 571, 178 025] | A1 | May be implied by correct method and 177 000 or 178 000 or 180 000 |
| | 180 000 | B1ft | ft any answer > 2sf correctly rounded |

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|-------------|---|------|---|
| 6(a) | $1.9(00) \times 10^{27}$ | Q1 | Strand (i) Correct notation |
| 6(b) | $(5.97 \times 10^{24}) \div (1.08 \times 10^{21})$ or $\frac{5.97 \times 10^{24}}{1.08 \times 10^{21}}$ | M1 | Condone omission of brackets |
| | 5527.(...) | A1 | oe May be implied by 5500, 5530 or 5528 |
| | 5500 or 5530 or 5.5×10^3 or 5.53×10^3 oe | B1ft | ft their answer rounded to 2 or 3 sf SC2 5.5×10^{45} or 5.53×10^{45} SC1 Digits 55 or 553 |
| 7(a) | Yes and (women's median) 18 or Yes and lines at 16 and 18 on graph or Yes and (men) 2 minutes faster (on average) | B1 | Condone [17.5, 18.5] for 18 |
| 7(b) | 25 – 14 or 11 | M1 | Seen in either part or on graph Condone [13.5, 14.5] for 14 and [24.5, 25.5] for 25 |
| | Yes and (women's IQR) 11 or Yes and (women's IQR) is 6 minutes less | A1 | Condone [10, 12] if both quartiles seen and in tolerance Must not refer to median |
| 8 | 1.24 or 124% or $\frac{124}{100}$ or $\frac{100}{124}$ seen | B1 | |
| | $6014 \div 1.24$ | M1 | oe $6014 \div 124 \times 100$ |
| | 4850 | A1 | |

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|----------|---|--|--|--|-------|-------------------------------------|
| 9 | Alternative method 1 | | | | | |
| | 0.032 × 500 or A = 16 or 0.04 × 500 or B = 20 or 0.026 × 500 or C = 13 or 0.016 × 500 or D = 8 or 0.028 × 500 or E = 14 | | | | M1 | |
| | 0.04 × 500 or 20 and 0.016 × 500 or 8 | | | | M1dep | Selects the frequencies for B and D |
| | 12 | | | | A1 | |
| | Alternative method 2 | | | | | |
| | Subtracts any pair of relative frequencies | | | | M1 | |
| | 0.04 – 0.016 (× 500) or 0.024 | | | | M1dep | |
| | 12 | | | | A1 | |

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|--------------|--|-----|------|------|-------|--|
| 10(a) | 2520 ÷ 126 or 20 or 126 ÷ 2520 or 0.05 | | | | M1 | oe |
| | 44 × their 20 or 44 ÷ their 0.05 or 4960 ÷ their 20 or 4960 × their 0.05 or 880 or 248 | | | | M1dep | oe M2 44 ÷ 126 × 2520 or 4960 ÷ 2520 × 126 |
| | 2520 | 880 | 1560 | 4960 | A1 | |
| 126 | 44 | 78 | 248 | | | |

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| 10(b) | (minimum) 3785 | B1 | SC1 correct answers interchanged |
| | (maximum) 3794 | B1 | |

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|--------------|----------------------------------|-----------|---|
| 11(a) | Fully correct | B3 | <p>oe</p> <p>B2 all pairs of probabilities add to 1 with one right hand side pair correct or four correct probabilities in correct positions</p> <p>B1 two correct probabilities in correct positions</p> <p>Accept decimals or percentages rounded or truncated to 2 significant figures or better</p> |
| | $\frac{7}{10}$ $\frac{3}{10}$ | | |

| | | | |
|--------------|--|--------------|--|
| 11(b) | <p>their $\frac{7}{10} \times$ their $\frac{3}{9}$ or</p> <p>their $\frac{3}{10} \times$ their $\frac{7}{9}$ or</p> <p>$\frac{21}{90}$ or $\frac{7}{30}$ oe</p> | M1 | Multiplies along one of the two relevant branches using their probabilities ($0 < p < 1$) |
| | <p>their $\frac{7}{10} \times$ their $\frac{3}{9} \times 2$ or</p> <p>their $\frac{3}{10} \times$ their $\frac{7}{9} \times 2$ or</p> <p>their $\frac{7}{10} \times$ their $\frac{3}{9} +$ their $\frac{3}{10} \times$ their $\frac{7}{9}$</p> | M1dep | Doubles their product of a correct branch or adds the products of the two relevant branches using their probabilities |
| | <p>$\frac{42}{90}$ or $\frac{21}{45}$ or $\frac{7}{15}$ or</p> <p>0.46 or 0.47</p> | A1ft | <p>ft their tree diagram if B2 scored in part (a)</p> <p>oe</p> <p>SC2 $\frac{21}{50}$ oe SC1 $\frac{21}{100}$ oe</p> |

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|-----------|--|-------|---|
| 12 | Alternative method 1 | | |
| | 10×5 or 5×7 or 5×15 or 10×11 or 10×9 or 50 or 35 or 75 or 110 or 90 | M1 | Works out the frequency for 1 bar oe |
| | their 110 + their 90 or $360 - \text{their } 50 - \text{their } 35 - \text{their } 75$ or $\frac{\text{their } 110}{360} \times 100$ and $\frac{\text{their } 90}{360} \times 100$ | M1dep | Works out the number between 20 and 40 minutes oe |
| | 200 or 30.(...)% or 31% and 25% | A1 | |
| | 0.6×360 or 216 or $\frac{\text{their } 200}{360} \times 100$ or 55.(...)% or 56% or their 30.(...)% + their 25% | M1 | oe their 200 may be 20 |
| | No and 200 and 216 or No and 55.(...)% or 56% | Q1ft | Strand (iii) ft their 200 or their 55.(...)% compared with 60% if at least M2 awarded |
| | Alternative method 2 | | |
| | 1.4 or 4.4 or 3.6 or 8 squares | M1 | oe Must clearly be squares |
| | their 2 + their 1.4 + their 3 + their 4.4 + their 3.6 or 14.4 squares | M1dep | oe |
| | 8 and 14.4 | A1 | |
| | $0.6 \times \text{their } 14.4$ or 8.6(4) or $\frac{\text{their } 8}{\text{their } 14.4} \times 100$ or 55.(...)% or 56% | M1 | oe |
| | No and 8 and 8.6(4) or No and 55.(...)% or 56% | Q1ft | Strand (iii) ft their 8 and their 14.4 or their 55.(...)% compared with 60% if at least M2 awarded |

Question 12 is continued on next page

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|---|--|--|--|
| 12 cont | Alternative method 3 | | |
| | 7 or 11 + 11 or 9 + 9 or 40 strips | M1 | oe Must clearly be strips of 5 squares |
| | their 5 + their 5 + their 7 + their 15 + their 11+ their 11 + their 9 + their 9 or 72 strips | M1dep | oe |
| | 40 and 72 | A1 | |
| | 0.6 × their 72 or 43.2 or $\frac{\text{their 40}}{\text{their 72}} \times 100$ or 55.(...)% or 56% | M1 | oe |
| No and 40 and 43.2 or No and 55.(...)% or 56% | Q1ft | Strand (iii) ft their 40 and their 72 or their 55.(...)% compared with 60% if at least M2 awarded | |