AQA Qualifications

# GCSE

# Statistics

## 43101F Unit 1: Statistics Written Paper (Foundation) Mark scheme

43101F
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Version/Stage: Final v1

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. |
| **E** | Explain marks are awarded for a full and detailed explanation |
| **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.<br>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, 3.1416. |
| **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 Foundation Tier

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **1** | C | B1 | |
| | D | B1 | |
| | B | B1 | |
| **2(a)** | 7 | B1 | |
| **2(b)** | $\frac{1}{4}$ | B2 | B1 $\frac{11}{44}$ or 0.25 or 25% or $\frac{25}{100}$ oe |
| **2(c)** | Bars of height 6 and 11, in any order | B1 | ± 1 mm |
| | All bars of equal width and gaps of equal width, and correctly labelled | B1 | ± 1 mm |
| | **Additional Guidance** | | |
| | Ignore shading | | |
| **2(d)** | (vertical) Scale should start at 0 | B1 | oe<br>Accept (scale) starts at 50 |
| | Bars of unequal width (for Tim) | B1 | oe |
| | Label (for Rob) missing | B1 | oe |
| | **Additional Guidance** | | |
| | Condone any mention of a broken scale | | 1st B1 |
| | Tim isn't in proportion to the others<br>Tim is wrong<br>Tim's has been drawn differently | | 2nd B1<br>2nd B0<br>2nd B0 |
| | The x-axis is wrong | | 3rd B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 3(a) | Qualitative | B1 | Accept any indication |
| | **Additional Guidance** | | |
| | 2 or more boxes ticked with no attempt to cross one out scores B0 | | |
| 3(b) | Sight of one five bar gate | B1 | |
| | Tallies 4, 7, 9 | B1 | |
| | All 3 frequencies correct | B1ft | ft their tallies |
| | **Additional Guidance** | | |
| | Frequencies can either be correct for the data or correct for their tallies<br>Correct frequencies are 4, 7, 9 | | |
| 3(c) | Mode | B1 | |
| | The data is non-numerical | B1dep | oe |
| | **Additional Guidance** | | |
| | Candidates must have written mode as their average to score any marks on this part of the question<br>Candidates can score the second B1 by explaining why it cannot be mean or median (they must mention both) | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 3(d) | 1 angle correct<br>or<br>1 sector drawn within tolerance | B1 | May be seen next to the table<br><br>± 2° |
| | Fully labelled | B1 | Must be in proportion |
| | Fully correct | B1 | All sectors must be within ± 2° |
| | **Additional Guidance** | | |
| | Correct angles are 135° for green, 45° for red and 180° for black<br>Labelling mark can be awarded for any pie chart with 3 sectors only, in descending order of size labelled Black, Green, Red<br>Accept G, R and B for the labels but not 15, 5 and 20 | | |

| | | | |
|---|---|---|---|
| 4(a) | Ticks Route A and explains that the mean is higher | B1 | Ticks Route A and explains that the mean is lower for Route B |
| | **Additional Guidance** | | |
| | Candidates who have not ticked a box may refer to their chosen route in their explanation which we will accept | | |
| | Ticks Route A and:<br>55 is bigger than 40<br>It is 15 minutes slower | <br>B1<br>B1 | |
| | Ticks Route A and:<br>It is 15 minutes quicker<br>Route B only takes 40 minutes | <br>B0<br>B0 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 4(b) | Ticks Route B and refers to the maximum journey time for Route A being less than 70 (minutes) | B1 | Ticks Route B and refers to the maximum journey time for Route A being 65 (minutes) |
| | **Additional Guidance** | | |
| | Ticks Route B and comments that it is past the total for the mean and range for Route A | B1 | |
| | Ticks Route B and comments that Route A only goes up to 65 | B1 | |
| | Ticks Route B and comments that the journey times are more varied, or that Route B has a higher range | B0 | |
| 4(c) | It is less time consuming | B1 | oe<br>Must be comparative |
| | **Additional Guidance** | | |
| | It's easier | B1 | |
| | It's cheaper | B1 | |
| | It takes too long to do a census | B1 | |
| | It's more effort to do a census | B1 | |
| | So that he doesn't have to ask all of the passengers | B0 | |
| | A census creates too much data scores B0 (as in this case there are only 53 passengers) | B0 | |
| 4(d) | The passengers | B1 | |
| | **Additional Guidance** | | |
| | Any reference to 53 is B1, eg the 53 people | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 4(e) | Give each passenger a number from 1 to 53<br>and<br>Use a random number generator to select (10) passengers | B2 | oe<br>B1 for<br>Give each passenger a number from 1 to 53<br>or<br>Use a random number generator to select (10) passengers |
| | **Additional Guidance** | | |
| | For B2 candidates must use random numbers<br>Allow any reference to a list or register for B1<br>Candidates can score a maximum of 1 mark if they mention picking from a hat | | |
| | Put the names of the 53 passengers in a hat and pull out 10<br>Give each passenger a unique number<br>Give each passenger a number | | B1B0<br>B1<br>B0 |
| | Use a calculator/computer/table to pick 10 random numbers<br>Use a calculator/computer/table to pick 10 passengers | | B1<br>B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 5(a) | 5.03 | B1 | |
| | **Additional Guidance** | | |
| | Accept £5.03p | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 5(b) | **Alternative Method 1** | | |
| | 6.31 – 5.03 or 1.28 | M1 | |
| | their 1.28 × 18 | M1dep | |
| | 23.04 | A1 | SC2 46.62<br>SC1 23.58 |
| | **Alternative Method 2** | | |
| | 18 × 6.31 and 18 × 5.03<br>or 113.58 and 90.54 | M1 | |
| | their 113.58 – their 90.54 | M1dep | |
| | 23.04 | A1 | SC2 46.62<br>SC1 23.58 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6 | Decide on a sample / sample frame / population / sample size / sampling method<br>or decide on a data collection method<br>or decide on what data is needed | B1 | |
| | Any reference made to a conclusion<br>or interpreting graphs/calculations<br>or analysing/evaluating results<br>or making a decision on the original hypothesis | B1 | |
| | **Additional Guidance** | | |
| | Who she is going to ask | | 1st B1 |
| | Refer to finding data from years | | 1st B1 |
| | Decide on a census | | 1st B1 |
| | Conduct a pilot study | | 1st B1 |
| | Sample the data | | 1st B1 |
| | Gather a sample | | 1st B1 |
| | Tests the hypothesis | | 1st B0 |
| | Plan the investigation / decide on a strategy | | 1st B0 |
| | Decide which graphs/calculations to use | | 1st B0 |
| | Write a report on her findings | | 2nd B1 |
| | Any reference to any of the other tasks | | 2nd B0 |
| **7(a)** | 3 points plotted correctly<br>± ½ square tolerance | B2 | B1 1 or 2 points plotted correctly<br>± ½ square tolerance |
| **7(b)** | 0.93 | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **7(c)** | Double mean point plotted at (5,8)<br>or line of best fit drawn through the double mean point | M1 | ± ½ square tolerance |
| | Line of best fit drawn through (1.5, [2, 5]) and (9.5, [12, 16]) | A1 | Line of best fit must pass through both windows |
| **7(d)** | Correct value from their line | B1ft | ± ½ square tolerance |
| | **Additional Guidance** | | |
| | Condone poor money notation<br>Their line must extend as far as 7 miles | | |
| **7(e)** | Correct value from their line | B1ft | ± ½ square tolerance |
| | **Additional Guidance** | | |
| | Their line must extend as far as £15 | | |
| **7(f)** | Ticks 7(d) and refers to interpolation<br>or ticks 7(d) and refers to the answer being within the range of the data | B1 | oe |
| | **Additional Guidance** | | |
| | Candidates must tick the 7(d) box to score in this part of the question or refer to it in the answer<br>Positive marking so ignore incorrect / irrelevant statement with the correct statement seen<br>Candidates can comment that 7(e) is extrapolation / outside the range of the data | | |
| | Ticks 7(d), it's closer to the mean point / original data | | B1 |
| | Ticks 7(d), 15 goes beyond the last point | | B1 |
| | Ticks 7(d), because you can read it off the graph | | B0 |
| | Ticks 7(d), there isn't as much data around £15 (as there is for 7 miles) | | B0 |
| | Ticks 7(d), it isn't in the table | | B0 |

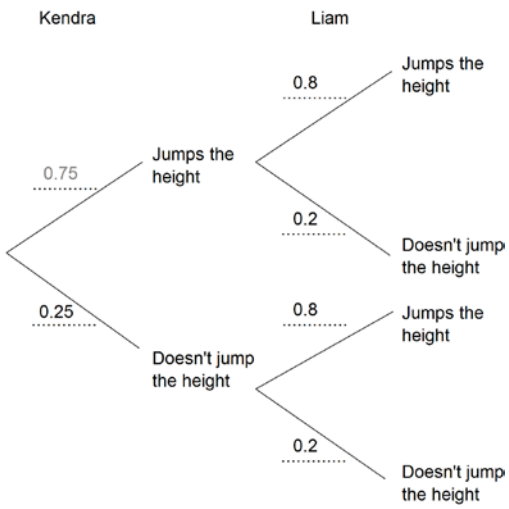
| Q | Answer | Mark | Comments |
|---|---|---|---|
| **8(a)** | 1983 thousand or 1 983 000 | B2 | B1 digits 1983 seen |

| | | | |
|---|---|---|---|
| **8(b)** | Age group 20-29 is the highest (in both years)<br>or<br>Age group 90+ is the lowest (in both years)<br>or<br>The numbers decrease for every age group except 20-29<br>or<br>The numbers increase for the 20-29 age group | B1 | oe |
| | **Additional Guidance** | | |
| | Do not allow any reference to as people get older they go to Accident and Emergency less | | |
| | From the age of 20 - 29 the numbers decrease | B1 | |
| | Any comparison between age groups saying that the number of people is similar | B0 | |
| | In 2011 numbers have gone up for every age group | B0 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 8(c) | **Alternative Method 1** | | |
| | 2 536 + 2 239 or 4775 | M1 | |
| | their 4 775 ÷ 17 462 (x 100) | M1dep | |
| | 27.34(…) | A1 | |
| | 27 or 27.3 or 27.35 | B1ft | ft must see an unrounded answer which has then been rounded correctly |
| | **Alternative Method 2** | | |
| | $\frac{2536}{17462}$ (× 100) or $\frac{2239}{17462}$ (× 100)<br>or 0.145(…) or 0.128(…)<br>or 14.5(…) or 12.8(…) | M1 | |
| | their 0.145(…) + their 0.128(…)<br>or 0.2734(…)<br>their 14.5(…) + their 12.8(…) | M1 | |
| | 27.34(…) | A1 | |
| | 27 or 27.3 or 27.35 | B1ft | ft must see an unrounded answer which has then been rounded correctly |
| | **Additional Guidance** | | |
| | 27 or 27.3 or 27.35 with no incorrect working scores full marks | | |
| | 28 or 27.8 or 27.78 (2010 data) | | SC3 |
| | 27.77(…) | | SC2 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 9(a) | Numbers placed in order and an attempt made to find the middle number | M1 | oe |
| | 6.5 | A1 | SC1 6 and 7 indicated |
| | **Additional Guidance** | | |
| | Crossing off from each side of a correctly ordered list | M1 | |
| | Arrow between the 4th and 5th numbers of a correctly ordered list | M1 | |
| 9(b) | $\frac{7+7+9+5+7+6+7+6}{8}$ or $\frac{54}{8}$ | M1 | oe<br>Allow one missing, or one repeated, or one error in the numerator |
| | 6.75 | A1 | SC1 48.75 |
| | **Additional Guidance** | | |
| | 6.75 seen in the working and rounded to 6.8 scores full marks | | |
| 9(c) | (Median for Judge B =) 7<br>or<br>(Mean for Judge A =) 6.25<br>or<br>(Total for Judge A =) 50 and (Total for Judge B =) 54 | M1 | |
| | Correct box ticked | A1ft | ft using their median from part (a) or their mean from part (b) |
| | **Additional Guidance** | | |
| | Candidates are not allowed to compare mode as Judge A has two modes<br>If candidates have rounded the correct answer in part (a) or part (b) then they must use the unrounded answer in part (c) | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 9(d) | The judges awarded different scores to the same dancer(s)<br>or any reference to averages or totals being different<br>or judges gave different rankings | B1 | oe<br>Answers must not be ambiguous |
| | **Additional Guidance** | | |
| | eg Nina scored 5 with Judge A but 7 with Judge B | B1 | |
| | There was only one dancer that they gave the same scores to | B1 | |
| | Judges awarded different scores | B0 | |
| 9(e) | Cruz | B1 | |
| 9(f) | Agree marking criteria (beforehand)<br>or<br>Give the judges some training<br>or<br>Have a practice run | B1 | oe |
| | **Additional Guidance** | | |
| | Watch video footage beforehand implies training | B1 | |
| | Watch video footage / a replay | B0 | |
| | Have only one judge / increase the number of judges | B0 | |
| | Make judges discuss each dance during or after | B0 | |
| 10(a) | (The number of) train journeys that took more than 100 minutes | B1 | oe |
| 10(b) | 32 (+) 25 | M1 | 32 and 25 selected |
| | 57 | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **10(c)** | $\frac{15}{47}$<br>or 0.31(…) or 0.32<br>or 31.9(…)% or 32% | B2 | B1 Numerator 15<br>B1 Denominator 47 |
| | **Additional Guidance** | | |
| | For B1 the fraction must be proper | | |
| **11(a)** | Completely correct tree diagram<br>  <br> | B2 | oe<br>B1 for 0.25 for Kendra<br>or 0.8 with 0.2 on one pair of Liam's branches in either order |
| **11(b)** | 0.75 × their 0.8 | M1 | oe<br>0 < their 0.8 < 1 |
| | 0.6 | A1 ft | oe<br>Follow through from (a) provided that 0 < their 0.8 < 1<br>Do not penalise subsequent change of form |
| | **Additional Guidance** | | |
| | For M1 do not ignore further working following on from 0.75 × their 0.8 | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12(a) | Any suitable hypothesis relating to the number of (free / included) minutes for men and women | B1 | oe<br>Must be comparative |
| | **Additional Guidance** | | |
| | Women have more minutes than men | | B1 |
| | The number of minutes for women is higher | | B1 |
| | Women and men choose the same number of minutes | | B1 |
| | Women and men choose a different number of minutes | | B1 |
| | Any questions | | B0 |
| 12(b) | She will only be asking customers from one (mobile phone) shop<br>or<br>She will only be asking people for a short period of time<br>or<br>She will only be asking people on one day | B1 | oe |
| | **Additional Guidance** | | |
| | She may only be able to ask a few people | | B0 |
| | There could be more of one gender than the other | | B0 |
| | Biased | | B0 |
| | Results not representative | | B0 |
| | Not everyone will be buying a contract | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12(c)(i) | Any reference to non-exhaustive / gaps<br>eg no box for under 100<br>or no box for 400 – 500 | B1 | |
| | Any reference to overlaps<br>eg 200 is covered by two boxes<br>or 500+ overlaps with unlimited | B1 | |
| | **Additional Guidance** | | |
| | 2 correct reasons for the same category scores B1 only | | |
| | Do not accept any reference to other to satisfy the non-exhaustive mark | | |
| | Any reference to the number of minutes changing each month | | B0 |
| | No option for people without contracts | | B0 |
| 12(c)(ii) | Due to the unlimited minutes (on some monthly contracts) | B1 | |
| | **Additional Guidance** | | |
| | Any reference to an open-ended response, or missing data, or no box to tick or more than one box to tick | | B1 |
| | Because not all the data are numerical | | B1 |
| | Because they do not know the exact number of minutes | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12(d) | A suitable question with a time frame | B1 | |
| | At least 3 boxes, all of which satisfy all 3 of the following conditions:<br>exhaustive<br>non-overlapping<br>all boxes numerical | B2ft | ft their question, responses must be numerical<br>B1 for at least 3 numerical boxes, 1 of which accepts a range, and exhaustive<br>or<br>B1 for at least 3 numerical boxes, 1 of which accepts a range, and non-overlapping |
| | **Additional Guidance** | | |
| | Condone for the exhaustive condition boxes that are just in pounds,<br>eg 1 – 5, 6 – 10 or 1, 2, 3, etc | | |
| | Candidates do not need to include a box to cover 0 | | |
| | For B2 do not allow the use of other / more / less, however, 30+, more than 30, less than 10, etc are acceptable | | |
| | For either B1 do not allow other / more / less for the range box<br>For either B1 condone the use of other at either end, and more at the top end, and less at the bottom end, as an extra box to satisfy the exhaustive condition | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12(e) | Any suitable extraneous variable but it must be clear that this will affect the cost of the contract rather than the cost of the monthly bill | B1 | oe |
| | **Additional Guidance** | | |
| | Any reference to<br>internet access or data allowance or 3G/4G / text messages / multimedia messages | B1 | |
| | or<br>the initial cost of the phone / upfront costs / make or model / length of contract / age of the phone, eg new, second hand, refurbished, etc | B1 | |
| | or<br>the service provider | B1 | |
| | or<br>the amount of cashback | B1 | |
| | or<br>the cost of insurance | B1 | |
| | How long you use your phone for | B0 | |
| | How long you have used your phone for | B0 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **13(a)** | 80<br>106<br>116<br>120 | B1 | |

| | | | |
|---|---|---|---|
| **13(b)** | Points plotted at correct heights | B1ft | ± ½ square tolerance |
| | Points plotted at upper class boundary | B1 | Must be an increasing graph |
| | Points connected with curve or lines | B1ft | |
| | **Additional Guidance** | | |
| | The graph does not need to be drawn down to the horizontal axis, ie the point (40, 0) does not need to be plotted<br>Ignore line or curve before (their 50, 8) and after (their 100, 120) | | |
| | If they have drawn bars accept the heights as their points, the maximum mark is B1<br>A cumulative frequency step polygon can score a maximum of B1 if the steps are at their correct heights | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 13(c) | **Alternative Method 1** | | |
| | Draws a line up from 75 to their graph and across to get a value for the cumulative frequency ( ± ½ square accuracy) | M1 | This could be implied by a correct value for the cumulative frequency (± ½ square accuracy) or a correct mark on the vertical scale<br>Graph must be a cumulative frequency graph |
| | 90 seen and a correct decision<br>or<br>(their value)/120 expressed as a decimal/percentage and a correct decision | A1ft | oe<br>ft their graph only |
| | **Alternative Method 2** | | |
| | Draws a line across at 90 (or at 0.75 × their 120) to their graph and down to the horizontal axis (± ½ square accuracy) | M1 | This could be implied by a correct value for the fuel used (± ½ square accuracy) or by a correct mark on the horizontal axis<br>Graph must be a cumulative frequency graph |
| | Correct working with 90 used and a correct decision | A1ft | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 13(c) | **Alternative Method 3 – Linear Interpolation** | | |
| | $\left(\frac{75-70}{10}\times 26\right)+50+22+8$ or<br>$\frac{\text{their } 80+\text{their } 106}{2}$ or 93 seen<br>or<br>$\left(\frac{80-75}{10}\times 26\right)+10+4$ or 27 seen | M1 | |
| | Target met and 93 and 90 seen<br>or<br>Target met and 93/120 expressed as a decimal/ percentage<br>or Target met and 27 and 30 seen<br>or<br>Target met and 27/120 expressed as a decimal/ percentage and 0.25 or 25% or ¼ | A1 | |
| | **Alternative Method 4** | | |
| | $\frac{(90-80)}{26}\times 10$ or 3.8... | M1 | |
| | 73.8, so target met | A1 | |
| | **Additional Guidance** | | |
| | **Alternative method 1:** For the A1 mark, follow through is from their graph only but not on 90 or 120. For the accuracy mark, any values given must be correct | | |
| | **Alternative method 2:** For the A1 mark, follow through is from their graph but not on 90 | | |
| | If the candidate uses Alternative Method 1 or Alternative Method 2, they cannot score if their graph is a bar chart or a cumulative frequency step polygon | | |
| | If both a bar chart and a cumulative frequency curve/ polygon are seen, the curve/polygon takes precedence | | |