



# GCSE **Statistics**

8382/2H Paper 2 Higher

Report on the Examination

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## Summary

This was Paper 2 for the Higher Tier in the third summer sitting of the new GCSE Statistics specification since the pandemic. The performance was significantly better than the previous two years although still below that of June 2019. Students showed good numerical skills throughout the paper although there still was a high number of non-attempts in the paper. This was at a lower level this year compared to last year, although still higher than 2019. Overall, the challenge of this paper was commensurate with both June 2023 and June 2019, and with a mixture of topics examined across the various levels of demand.

### Areas/topics/skills where students excelled

- Calculating 4-point moving averages
- Interpreting and comparing choropleth maps
- Calculating probabilities from two-way tables
- Calculating a percentage of an amount
- Interpreting statistical findings
- Comparing data from percentage bar charts
- Completing a scatter diagram

### Areas/topics/skills where students struggled

- Calculations involving use of the weighted mean
- Commenting on how changes in weightings affect the weighted mean
- Calculating the standard deviation when given the summary statistics and formula
- Calculating probabilities using the binomial distribution
- Apply the formula to determine Spearman's rank correlation coefficient
- Know and interpret the characteristics of a Normal distribution

## Multiple-choice questions

### Which questions did students find most accessible?

Questions 1 and 3 were the best answered multiple-choice questions.

### Which questions did students find least accessible?

Questions 2 and 4 were the worst answered multiple-choice questions.

### Which non-multiple-choice questions did students find most accessible?

Questions 5a, 6a, 6b, 7a, 7b, 8a, 9, 10a, 10b, 12a and 13 were the questions that the most students attempted.

### Which non-multiple-choice questions did students find least accessible?

Questions 11c, 15a, 15b, 16bi, 16bii, 16biii, 18, 19d, 19e, 19f were the questions that more students found difficult.

## Common misunderstandings

### Question 15a

A high number of students did not understand the need to divide by the sum of the weightings and therefore could not access the rest of the question.

## Individual questions

### Question 5

This was a well-attempted question. The majority of the cohort in part a stated that users may have downloaded but not used the app.

In part b, a very high proportion (over 80%) of students could calculate the 4-point moving average, although some did find the mean of the final two downloads.

In part c, plotting the moving averages and a trend line, in line with previous series, had mixed success. Many students did not plot at the midpoints and, on occasions, drew lines joining the student's plotted points as a trend line.

Part d saw many students identifying the increasing trend, but some didn't provide a comment in context, which usually involved a comment relating to positive correlation or a positive trend.

### Question 6

Part a was extremely well-answered with over 90% of the cohort successfully cross-hatching field F on the choropleth map.

For part b, a high proportion of students could give reasons for and against the conclusion that fields that had more fertiliser produced better quality crops. The most common correct responses were that fields B and G had most fertiliser and excellent crops; and that field C had most fertiliser but poor crops. Some students didn't make it clear which fields they were referring to in their reasons, and therefore lost marks.

Part c required students to give a reason why the farmer could gain greater detail from the maps with the aim for them to identify the need for smaller areas, or to have more specific labels such as having actual measurements of fertiliser/amounts of crops. This was the case with most of the correct responses saw students referring to having more sections within each field or showing amounts of fertiliser.

Incorrect answers involved comments relating to adding to the key, creating a new choropleth map and growing different crops.

Part d required an understanding of extraneous variables, and this was generally well answered with many correct responses referring to weather conditions.

### Question 7

Part a was extremely well answered with over 90% of the cohort being able to correctly calculate the probability of online fraud. Some incorrect responses gave the probabilities as  $\frac{1370}{3272}$ .

Part b was also well done with just under 90% being able to calculate the probability that the fraud was not a bank account fraud. Some students incorrectly calculated the probability that the fraud was a bank account fraud.

The conditional nature of part c meant that students were less successful. Students were required to work out the probability of a shopping fraud given that it happened offline. Some calculated the probability that it happened offline given that it was a shopping fraud  $\frac{116}{969}$  or the probability of a shopping fraud  $\frac{969}{3272}$ .

### Question 8

Part a saw a very high success rate of students being able to calculate the percentage of teenagers who spent a night alone at home.

Part b required an understanding of how samples can predict population proportions with an assumption. Many students stated an incorrect assumption relating to pupils not telling the truth rather than the sample being representative of the population.

### Question 9

This question was extremely well answered with over 95% correct responses. The most common response referenced the weather or temperature. Some of the common incorrect answers were 'school holidays' or 'day of the week'.

### Question 10

Part a required two comparisons of the sales of dog food across two weeks, interpreting a percentage bar chart. Just over 40% scored full marks with over 40% not scoring. Many students referred to amounts rather than percentages, with some comparing types of food within a week and didn't compare week 1 to week 2.

The intention of part b was to test understanding of the cumulative nature of the bar chart. A very high proportion of students could do this with common answers stating that Food B was 25%, or that 65% represented both Food A and Food B.

### Question 11

Just over half of the cohort on part a could successfully give a reason why stratification was appropriate for sampling the 50 runners. Although ensuring a representative sample was the common correct answer, many students focused on saving time, avoiding bias and acquiring fair results without sampling the whole population.

The intention of part b was for students to extract the correct proportion of runners who travel by car and multiply by 50 to get 33 runners. Just over half of the cohort scored full marks here, although many embedded answers were seen; hence not a complete solution to get both marks. The fact that the 33 runners were given in the question may have caused some confusion as to what appropriate workings were needed.

Part c showed a reasonable understanding how to rearrange an equation to calculate that there were 25 runners in the sample. Common incorrect responses were  $\frac{108}{300} \times 100$  or  $\frac{108}{300} \times 9$  or  $\frac{9}{108} \times 100$ .

**Question 12**

The quality of student's responses varied greatly in this question. In part a, some students plotted cumulative frequencies at the correct height but at the midpoint of the interval. Other students drew a cumulative step polygon and not a cumulative frequency diagram. Unfortunately, some students drew a fully correct diagram but didn't label the vertical axis correctly. Those students who did not score just plotted the given frequencies and didn't calculate the cumulative frequencies at all.

For part b, many students read from their diagram correctly at 7 hours but didn't write their answer as a probability or wrote the probability of a person sleeping for less than 7 hours as their answer.

**Question 13**

Around one-third of the cohort could correctly work out the probability of at least one of the sweets was a Chewie, with just over a half scoring at least 2 marks. Many students did not recognise that 'two differently flavoured sweets' has two outcomes and not one. Some did not recognise the conditional nature of the question and calculated the probability that at least one of the sweets is a Chewie with replacement, and not without replacement. A number of students did not understand what "at least one" meant and failed to calculate  $P(\text{both Chewies})$ .

**Question 14**

Part a was quite well answered, with students being more likely to be honest, it was a sensitive topic or that the process would be anonymous, being the most common correct responses. Common incorrect answers included reasons related to the method being easy, quick, simple or unbiased.

Less than one-third of students were successful on part b with  $634 \div 6 = 106$  seen as a common incorrect answer, rather than subtracting  $\frac{5}{6}$  of 720 from 634 to get 34 students.

**Question 15**

In part a of this weighted mean question, students scored full (just over 40%) or zero marks (just under 40%) predominantly. A common error was to form an appropriate equation with an incorrect

denominator eg  $\frac{780 + 40x + 6660}{26 + x + 74} = 60$  or  $\frac{780 + 40x + 6660}{100} = 60$ . Not having a correct denominator

showing the sum of the weightings meant that these students could not progress any further in this question.

Part b was not well answered at all with only around 14% scoring, commonly stating that the weighted mean would be 62. Many responses lacked enough detail and were too vague. Common errors were just to comment that Clara was wrong, as the weighted mean will increase or because the proportions will change. The intention was for students to say that the third module will have increased proportion, but this was not seen.

**Question 16**

In part a, it was common for students not to explain explicitly why Dorota was correct through a calculation such as  $0.3 + 0.7 = 1$ . Many students just stated, 'eat in is 30%, so take away is 70%'. Another common error was to refer to the events being independent.

Part bi required an understanding of how to use the Binomial distribution. Those who had were usually successful in this question. Less successful students used 0.02835 in a calculation.

Part bii saw some students correctly using the Binomial distribution to find the probability that 1, 2 and 3 of the orders were 'eat in' but omitted the probability that none of the five orders were 'eat in'. Another common error was to include the probability of 4 of the orders being 'eat in'. Just under 70% of the cohort either did not score or did not attempt the question.

Part biii saw just under one-third of students scoring. Common correct responses mentioned people coming in groups/families and so ate/ordered together. Some students' responses lacked detail, as they just referred to weather or the time of day without a supporting statement.

### Question 17

Part a was not answered as well as expected with under 40% scoring full marks, as many students didn't apply the formula for the standard deviation correctly. A significant number did not understand that the

mean was  $\frac{\sum x}{n}$  and therefore divided the mean by 10 and then squared the result, and then subtract this figure from  $\frac{17960}{10}$ .

For part b, many students could make a correct average comparison between the chemistry and biology tests and generally in context. However, the context was missing with the standard deviation comparison with students just stating that the standard deviation of the chemistry test was larger. These generic comments didn't receive any credit.

### Question 18

The intention was for there to be an understanding that the mean and median are equal in a normal distribution (just over a quarter of the cohort scored the mark). Some responses lacked enough detail, as they just stated that the mean is double the median and didn't give a reason why the set of data cannot be normally distributed.

### Question 19

Part a was successful with just under 80% of students correctly plotting the scores of the songs.

Part b required the type of correlation to be stated and this was extremely well answered with over 90% being successful.

Part ci required the calculation of a double mean point with a line of best fit drawn. Just under half of the cohort scored full marks. Some students calculated the median for Sid's and Bobbi's scores respectively and plotted this point. Others calculated the mean for Sid's and Bobbi's score respectively but then found the median of these values. Unsuccessful students just plotted an incorrect mean point without showing any calculations.

Part cii required students to read from their line of best fit. This was answered well with nearly 85% scoring the mark.

Part ciii wasn't well answered (under one-third scoring the mark). Although the most common correct response mentioned extrapolation, students weren't specific enough in their answers. Incorrect responses included comments relating to Sid's score not following the trend, no data being close to 6 or 6 being beyond the last point.

The quality of responses in part d, the Spearman's Rank question, varied greatly. Some students knew they had to rank the scores but didn't deal with the tied ranks accurately. These ranks were then used

appropriately to find the sum of the differences squared and substituted correctly into the formula for Spearman's rank correlation coefficient. Many students didn't rank the scores and just found the differences between the original data, and then squared and summed these figures. Some students didn't interpret their value in the context of the question.

The aim of part e was to identify the small sample size, and this was the most common correct response (just under one-third scored the mark). Incorrect responses focused on Sid and Bobbi not telling the truth or having different views at different times.

Part f wasn't well answered at all. A correct response would have been to say that the ranks would remain the same or that tied values may be given different scores on a wider scale. Many responses were too vague, and just stated that the scores wouldn't change or there would be a wider range of values.

### **Mark Ranges and Award of Grades**

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.