AQA

GCSE
STATISTICS

8382/2H: Paper 2 Higher
Report on the Examination

8382
June 2022

Version: 1.0

General

This was Paper 2 for the Higher Tier in the first summer sitting of the new GCSE Statistics specification since the pandemic. Overall, the challenge of this paper was commensurate with June 2019 with a mixture of topics examined across the various levels of demand. Students showed good numerical skills throughout the paper. It was slightly more challenging due to more explanation/interpretation questions, although some students did not seem to take advantage of the advanced information.

The vast majority of questions appeared to be accessible and there seemed to be no time issues as attempts at the last question were as proportionately high as any others.

Summary comparison to the June 2019 examination

The first four multiple-choice questions were answered significantly better in 2019, maybe due to a more numerical requirement.

Compared to the cumulative frequency curve in 2019, a slightly higher proportion scored full marks on the cumulative frequency step polygon, but a higher proportion scored zero marks.

The binomial distribution question was answered slightly better this year, maybe due to the advanced information. A much lower non-response percentage but a higher failure rate (58.13% v 48.84%).

Topics which were done well included:

- Calculating the probability of independent events
- Interpreting a line graph/commenting on trend
- Question design comments
- Time and percentage calculation
- Estimating data from a graph
- Drawing a cumulative frequency step polygon
- Capture/re-capture criticisms

Topics which students found difficult included:

- Conditional probability
- Correcting or detailing accurately, the steps required to take a random sample
- Recognising a dual bar chart
- Describing features of a time series graph
- Knowing when a moving average is appropriate
- Sampling to use as estimates
- Interpret, in context, the equation of the line of best fit
- Comment on data selection
- Binomial probability calculation
- Interpreting Spearman’s Rank Correlation Coefficient

Question 1

This part was very well answered.

Question 2

This part was not well answered. Less than half of students understood that skewness was not a measure of spread.

Question 3

This part was well answered.

Question 4

This part was well answered.

Question 5

Part (a) was well answered.

Part (b) was very well answered with most students identifying that the BMI value is always above the healthy range and that BMI values are increasing over time. There was a minority who failed to give comments in context.

Question 6

Part (a) was well answered (two-thirds correct), with many successful students using some words from the stem of the question. Typically, some students gave an opinion or question, rather than a hypothesis.

Part (b) was very well answered with most students being able to identify two problems and nearly all being able to identify at least one problem. The missing option for 70+ and uneven group widths being the problems that most students identified. Sensitivity of the question was also a common response.

Part (c) was very well answered with nearly three-quarters of students identifying a problem with the open question, with having no time frame being the most common response. Sensitivity of the question was also a common response.

For part (d) it was rare to get a fully correct answer, and for those who knew how to take a random sample the biggest omission was to disregard repeats (or equivalent). Just under a half of students failed to score any marks.

For part (ei) the most common, correct answer was “convenience” with “opportunity” the second most common.

For parts (eii) and (eiii), just over a half and just under a half, respectively, answered these correctly. Most of the incorrect responses referred to bias or a lack of bias. The students were not showing a good understanding of the questions asked, in this context.

Part (eiv) showed a better understanding with over three-fifths of answering correctly. The most common response was identifying that a broader range of answers would lead to better data.

In parts (fi) and (fii) although only one-third were able to correctly name the diagram shown, they were able to do a decent job of reading the data from the dual bar chart and interpreting the time differences shown. Stating that it was a bar chart was a common response.

Part (g) was very well answered with seventy percent scoring full marks for 44 minutes and 34.4%. Those who dropped a mark had not rounded to 1 decimal place to be consistent with the percentages in the table.

Question 7

Part (a) was extremely successful with the vast majority of students being able to estimate the year and number of sunspots from the time series graph.

Part (b) was not very well answered with just over one-fifth scoring. Students did not seem to spot the cyclical nature and give a correct comment across the time period. Many just commented that there were fluctuations.

Part (c) was not well answered at all. Hardly any students gave the correct answer of a 12-point moving average and less than one-sixth knew that a moving average was required to smooth out the variations. This clearly showed a lack of knowledge of what a moving average does.

Question 8

An extremely high proportion scored at least 3 marks out of 5. To score higher than 3, students needed to understand set notation of $B \cap D \cap L'$ *and* $L \cap D \cap B'$, although some did follow through their values to get the final mark.

Question 9

Part (a) was not well answered. Only one-fifth of students showed the correct method to gain 2 or 3 marks. $\frac{2}{5}$ was given by a number of students who simply wrote $\frac{1}{5}$ x 2 with no supporting evidence, showing a lack of understanding conditional probability. Many of the successful students constructed a tree diagram.

Part (bi) was not well answered with a quarter of students scoring the mark for giving the correct statistical reason that Option D would mean using all of the available data or that it would be a census. Many students just gave the reason that Option D would use the most data or that the more data you use the more accurate it is.

Part (bii) was well answered with nearly two-thirds of students scoring the mark. Many of these gave one of the options A, B or C and that they would use more recent data. Typically, an incorrect

response was referring to Option A having a small sample size, but this option was not an appropriate sample size.

Question 10

Part (ai) was very well answered with a high proportion (nearly four-fifths) scoring 2 or 3 marks for correctly plotting cumulative frequencies then forming a cumulative frequency step polygon. Many of the students who scored 0 or 1 mark simply plotted the frequencies.

Part (aii) was less successful with less than one-third of students identifying that the data are discrete.

Part (b) was not very well answered especially as is common type of question of similar demand to previous series. Although students could calculate the median and/or interdecile range, there seemed to be a lack of interpretation of the median/interdecile range in context. There was quite a high non-response percentage.

Part (c) was very well answered with nearly three-quarters of students scoring full marks for identifying the problems with the capture/recapture method used. Some students stated that she should have collected the same amount of voles, but this did not imply collecting more voles.

Question 11

Part (a) was a multiple-choice question answered correctly by just over half of students, identifying that there were 4 babies who had a due date of March 10th, 2021. Many students were confused with how to interpret the scale on the x-axis.

Part (b) was well answered with nearly two-thirds of students scoring the mark for identifying that there needs to be a whole number of days. Some students were not specific enough when commenting about the plot being between two lines rather than referring to the plot being between vertical lines or lines on the x-axis.

Parts (ci) and (cii) were not very well answered with only twelve percent and less than ten percent, respectively, of students scoring the mark for interpreting the equation of the line of best fit in context. In Part (cii), many students either re-stated the value of 0.04 or commented that it was the gradient, but few gave the comment in context. Successful students, in part (ci), mentioned that 4.01 was the expected mass in kilograms of a baby born on its due date, and in part (cii), about the 0.04 kg daily increase in mass. There was a 13.64% and 17.20%, respectively, non-response rate.

For part (ciii), just over a third of students could draw a fully correct line of best fit through (0, 4.01), with two-fifths gaining one mark for a line with a positive gradient going through this coordinate. A very high proportion of students simply drew a typical line of best fit with a positive gradient.

Part (d) was not well answered with a quarter of students scoring at least 2 marks. Those who were successful could comment, in context, on the validity of using interpolation (or equivalent) to estimate the birth mass of a baby born 15 days before its due date with a correct estimate read of

the line of best fit. In addition, some students could comment, in context, on the unreliability of estimating data outside of the data set or extrapolation. Nearly two-fifths of students scored 1 mark for estimating a value off their line of best fit or stating the value of 3.4(1) kg from the equation of the line.

Question 12

Part (a) was reasonably well answered. Nearly half of students correctly calculated the expected profit and identified that the windows which could not be sold still incurred the same cost as those which were not damaged. Those that did not score full marks tended not to take into account that the damaged 4% could not be sold so subtracted the cost of 768 and not 800 windows, so scored up to 2 marks.

Part (bi) was extremely poorly answered with less than ten percent of students scoring the mark for correctly identifying that it was poor practice to take 5 in a row or that the sample needed to be spread out more. Many commented on the poor or small sample size rather than the practice of sampling 5 in a row.

Part (bii) was not well answered with one-quarter of students correctly using the Binomial distribution to calculate the probability of exactly one of the five windows being damaged. Many failed to realise that there were 5 combinations of one window out of five being damaged. A considerable proportion of students did not include the $(0.96)^4$ for the probability of four of the windows not being damaged. Nearly three-fifths of students failed to score any marks with just over ten percent not responding.

Question 13

Part (a) was not well answered with three-tenths of students being able to interpret the value of Spearman's Rank Correlation Coefficient in context. Successful students identified that there was a positive correlation between the marks scored on both papers, with some stating that there was a positive agreement between the rankings of the marks. Many students commented that there was a positive correlation or that they did well on both tests, but no context and reference to marks or papers. Nearly eleven percent of students did not respond.

Part (bi) was not well answered with two-fifths being able to comment on how an additional pair of papers would change the value of SRCC. The successful students stated that the value would increase.

Part (bii) was not well answered with students either scoring full marks (nearly one-third) or no marks (just over one-third). The requirement of the question was to substitute values into the formula given and equating this to 0.8, then re-arrange the equation in order to find $\sum d^2$. Once found, this value, together with the value of 6 to include the extra pair of papers was again substituted into the formula to calculate the new value of the SRCC. Those that did not score full marks failed to form an equation and correctly rearrange it to find $\sum d^2$. Nearly 18% failed to respond.

Question 14

Part (a) was not well answered with one-third of students being able to state that the data has been ordered by size and not chronologically, so it was unclear whether the values of 0 were for consecutive days. Many simply commented that the data was in order.

Part (b) was reasonably well answered with students either scoring full marks (just over one-third) or 2 marks (just under one-third). Substitution into a formula and the correct use of a calculator were the main parts of this question. Successful students correctly calculated the mean, median and standard deviation then substituted these three values into the skew formula to justify the value of +1.14. Those that did not score full marks seemed to be confused between $\sum x^2$ and $(\sum x)^2$, and the value of 51 or 51^2 for $\sum x^2$. The requirement was that students could calculate a value of 1.138…although a number tried to work backwards from 1.14 in order to try and find the standard deviation. Thus, the maximum score possible was for correctly finding the mean and median.

Part (c) was a multiple-choice question where nearly three-fifths of students could identify the diagram which showed a positive skew. Many identified the diagram with a negative skew.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.