



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 fourth summer sitting of this GCSE Statistics specification since the pandemic. Students showed good numerical skills throughout the paper although they struggled with some of the interpretation/reasoning questions. There was a lower proportion of non-attempts this year compared to last year. Overall, the challenge of this paper was commensurate to 2024, and with a mixture of topics examined across the various levels of demand.

Areas/topics/skills where students excelled:

- interquartile range
- population from birth rate
- calculate the probability of risk
- identify multivariate data
- control group – hypothesis comment
- calculate skew
- calculate Spearman's Rank Correlation Coefficient

Areas/topics/skills where students struggled:

- describe sample frame
- reasoning with histograms
- suitability of comparative pie charts
- appropriateness to remove outlier
- interpreting regression formula
- commenting on how changes in scores/weightings affect the weighted mean

Which questions did students find most accessible?

Questions 1, 2, 3, 4, 5(b)(i), 5(c), 5(e), 7(a), 7(b)(i), 7(d)(ii), 8(a), 9(b)(i), 13(c)(iv) and 13(d) were the questions that the most students attempted and found easier to score.

Which questions did students find least accessible?

Questions 7(c)(i), 10(b), 11(a), 13(a)(i), 13(b), 13(c)(iii) and 14 were the questions that more students found difficult.

Common misunderstandings

Question 15

Majority are scoring either 0 or 4. Many who have scored full marks have gone straight into a division of the two fractions (or equivalent). Some students have used Venn diagrams but not many, and some have attempted probability formulae, but again not many have done this.

Individual questions

Question 1

This was a well-attempted question. The majority of the cohort could state that 50% represents the interquartile range, although 25% was the most common incorrect answer.

Question 2

This question tested a student's ability to substitute values into the given birth rate formula and rearrange to work out the total population. This was very successful with most students scoring both marks. Those who didn't achieve both marks generally either used 100 rather than 1000 or were unable to rearrange the formula.

Question 3

This was a standard probability question, asking students to calculate the risk of not finishing the race. It was mostly well answered, although a number of students converted to a percentage but omitted the percentage sign, thus not answering with a probability and scoring zero.

Question 4

This question tested a student's ability to calculate a probability using independent events.

This was quite well answered with students understanding the need to multiply $\frac{40}{200}$ by $\frac{30}{200}$.

The most common mistake was to add $\frac{40}{200}$ and $\frac{30}{200}$.

Question 5

Part (a) required students to state the population of a hypothesis investigating ages and jobs of people who live on St. Mary's. Approximately two-thirds could state that it was 'all of the people who live on St. Mary's'. Some students dropped the mark due to mentioning 'all of the people who live on St. Mary's *who have jobs*'. Part (b)(i) was well-answered with students being able to give correct reasons for non-responses. The question being personal/private or that people do not want to disclose their age/too embarrassed to do so were common correct answers. Part (b)(ii) tested students' ability to give reasons for overcoming non-responses. This was less successful with just under half stating that having option boxes for grouped ages was needed. If the answer mentioned grouping ages, any suggested options needed to be exclusive. If the answer did not mention grouping ages, any suggested options needed to be

exclusive and exhaustive (or implied by, etc). The most common errors here were overlapping boxes. Part (c) was an extended response question which had varying degrees of success when naming and comparing sampling methods. The majority of students could name convenience/opportunity and random sampling, with the latter being a much more successful response.

The most common correct disadvantage for convenience sampling was that it is unrepresentative or only undertaken in one place. Some students incorrectly stated that Method A was biased rather than a high likelihood of bias or that Method B was unbiased rather than a low likelihood of bias. The most common correct disadvantage for random sampling was that it is time consuming. When choosing their preferred method, students who chose convenience sampling mostly stated that it is quick/easy; whereas those who chose random sampling mostly stated that everyone would have an equal chance of being chosen. Part (d) expected students to estimate the mean from a frequency polygon. Just over half of the cohort scored full marks by multiplying the midpoints by the frequencies, dividing by the total frequency and converting into thousands. Errors were made with the products and the addition of these. A small proportion of students did not convert to thousands, losing one mark. A significant proportion of students failed to use the correct midpoints. Part (e) saw just over two-thirds of students successfully drawing a frequency polygon and gaining full marks. Those who lost marks mainly plotted at an incorrect boundary. Part (f) required a comparison of the two frequency polygons. Less than one quarter of students score full marks.

The main correct comments mentioned that on average salaries were higher in Hugh Town than Old Town, or that Hugh Town had a greater proportion of people earning the highest salaries compared to Old Town, although many incorrectly compared actual salaries. Many of the unsuccessful comments were usually due to these not being comparisons. Part (g) asked students to evaluate the reliability of two sets of data. Almost half of the cohort correctly stated that Thea's data was more up to date/relevant/primary data or that the council's data came from a wider sample. Incorrect responses stated that the council's data was from more a reliable source or that the council had more resources.

Question 6

Part (a) was generally well-answered, with students being more likely to be honest or that it was a sensitive topic being the most common correct responses. Part (b) was not answered very well with over one half of the cohort not scoring. A high proportion of students found the 20 who answered 'yes' from the truthful group but then this was used as a fraction of the 200 rather than 100 to give 10% instead of the correct answer of 20%. A number of the cohort incorrectly started by finding 50% of 120. Several students didn't do any working and tried to explain an answer to this question without any calculations.

Question 7

Part (a) was extremely well-answered with a correct answer of qualitative data. Part (b)(i) required students to identify 'census' as the data collection method which samples every member of the population. Only half of the cohort could successfully answer this. Part (b)(ii) was poorly-answered in terms of gaining full marks with less than one-third of students managing to give an advantage and a disadvantage of a census. A very low proportion of the

cohort could state that an advantage was that it would give more reliable results. Students were much more successful with the disadvantage stating that the census would be more expensive, more time consuming or that there may be too much data. Part (c)(i) tested students' ability to identify the sampling frame as the list/register of all students (who were available when the survey was completed). Very few students showed any understanding of what a sampling frame is, most referring to either 60 students (sample size) or all of the students at school.

Part (c)(ii) required students to state why two students with the same surname would both be unlikely to be selected using systematic sampling. Just under 40% could do so with a typical correct answer stating that two students with the same surname would be close to each other on the list, resulting in only one of them being chosen. Another correct response seen was that there would need to be more than ten students with the same surname for two of them to be chosen. Very few students could relate to the systematic nature of the sampling method, that due to every 10th person being chosen, students next to each other couldn't both be chosen. Part (d)(i) was answered reasonably well with the most common correct response being that the control group could be used to compare against those who did the homework on paper. Part (d)(ii) was very well-answered with the vast majority of students correctly stating that the control group completed more of the homework, thus not supporting the hypothesis.

Question 8

Part (a) was answered reasonably well, although only around 40% could complete a fully correct Venn diagram. Many had a mix of probability notation, for example 25% was often written as $\frac{1}{4}$ whilst the rest written as percentages or decimals. There were a lot of students

who had a fully correct Venn diagram but with missing percentage signs, meaning they only scored 2 marks instead of 3. Most students got at least 1 mark for the 25%. Many were unable to calculate the rest of the probabilities after the 25%. Part (b) tested students' ability to identify errors in the expected profit method. 0.8 was identified as an error by a high proportion of students with a many identifying the cost price and selling price being subtracted the wrong way around. Students were more successful when showing the correct calculations/values rather than explanations in words.

Question 9

Part (a) required students to estimate the median through interpolation. This was poorly-answered with a significant number of students calculating the mean. Many students could identify the median class interval and scored one mark but could not go any further. A high proportion of students could not use interpolation. Part (b)(i) was extremely well-answered with nearly all of the cohort managing to correctly calculate the skew value of 1.34 using the formula. Part (b)(ii) required students to interpret their value of skew. Although a significant number of students correctly stated that it was positive skew, very few could interpret this in context; namely, stating that there were a few days with a high number of visitors or most days have a low number of visitors.

Question 10

Part (a) was reasonably well-answered, testing students' ability to use the histogram to calculate frequencies and then drawing the rest of the histogram. Just over half of students scored full marks. Most students that scored 3 for a correct frequency table then went on to score the final 2 marks for a correct histogram. Many students attempted to draw the histogram using frequencies which meant that they were unable to access any marks here. Some had correct heights of bars but with a frequency scale and no or little working, therefore scoring zero. Nearly one quarter of students did not score any marks. Part (b) required students to state that histograms with unequal class widths can be used to describe distributions. This was very poorly-answered as very few mentioned that the areas of the bars represent the frequencies, thus enabling a description of the distribution to be made. There was no mention by students that all class widths being equal may cause some groups to be too big or too small to be accurately represented.

Question 11

A very low proportion of the cohort correctly answered part (a), where students were asked to state a suitable reason why comparative pie charts can compare data between towns. Many have referenced that you can see the size of the population but did not refer to proportion. Part (b) required students to calculate the amount of people represented by the pie chart for town A. The most common (or equivalent) method that gave the correct answer of 40 saw students use the areas of the pie charts being equated to the proportion of people, ie

$\frac{\pi \times 4^2}{\pi \times 6^2} = \frac{x}{90}$. Many incorrectly used the length rather than the area scale factor, so in essence divided by 1.5 and not 2.25 to get 60. Part c saw just under 40% of students scoring full marks for showing calculations $\frac{[82, 86]}{360} \times 90 \approx 21$ people, and for rejecting the statement that

suggested that if the angle for town B is smaller than town A then there must be fewer people in town B. Those who were unsuccessful had attempted to compare angles rather than number of people. Many attempted to recalculate the 11 people that was given in the question but produced an incorrect value for that.

Question 12

This question intended students to calculate the interdecile range and to compare these values for the two teams. A small proportion of the cohort could subtract the 2nd deciles from the 8th deciles for the two teams and correctly give a comparison. The most common responses were that Team B's times were more consistent or less varied than Team A's. Many students dropped one mark due to a lack of context. A significant number of students who failed to score any marks subtracted the 2nd decile values and the 8th decile values.

Question 13

Part (a)(i) asked students to give a reason why an outlier may be removed was poorly-attempted with only one-third being successful. The most common correct responses stated that the point doesn't fit in with the other data or that it may affect the average. Many of the incorrect responses stated that the outlier would affect the average/skew the data rather than it may do. Part (a)(ii) asked students to give a reason why an outlier may not be removed. Again, this was poorly-attempted. The aim was for students to state that the outlier may still be a valid/genuine piece of data, but this was rarely seen. A more commonly seen incorrect response was that someone with that many subscribers cannot have that many views. Part (b) asked students to identify the explanatory variable. Approximately one-quarter of the cohort correctly indicated that the number of subscribers is shown on the x -axis. Many incorrectly thought that the explanatory variable was the number of views. Part (c)(i) wasn't particularly well-answered with fewer than half of the students correctly drawing a regression line. Those who scored full marks plotted at least three correct points joined with a correct straight line. The vast majority of students drew a line of best fit with varying degrees of success. Around one half of the cohort who hadn't plotted any points drew a line outside of tolerance and failed to score any marks. Part (c)(ii) asked students to say why estimating 250,000 views was not appropriate. The majority of successful students had referred to extrapolation to gain this mark. Those that were unsuccessful had generally not answered or referred to it not being accurate without further clarification.

Again, more than half of the students were unsuccessful. The aim of part (c)(iii) was for students to state that for every additional subscriber there are an additional 750 views each year. Very few referenced the 750 and many incorrectly stated it was simply the number of subscribers. Many students did not give context and just referred to it as the gradient. Nearly three-quarters failed to score with an additional 10% not responding. Part (c)(iv) tested students' ability to use the regression formula to estimate the number of additional subscribers there would be. The most popular method was to substitute the values into the formula to give $58000 = 750n - 25800$, correctly rearrange to get 112 subscribers then subtract the original 86 subscribers to give an answer of 26. Some got to 111.73 or 112 subscribers but then were unsure of the final step. Many calculated the 112 yet failed to recognise that the requirement was to work out the extra subscribers, hence failed to subtract the 86 from 112. Some substituted 86 into the formula, but after getting 38700 or 19300, were unsure of next step and so restarted with the more popular method with many getting full marks. Other common mistakes where students were less successful was due to a lack of understanding of the variables and therefore substituting incorrectly. Part (c)(v) required students to assess the accuracy of an estimated PPMCC value of 0.92. Fewer than half could correctly say that it was accurate due to being close to 1 or that it was accurate due to there being a strong positive correlation. Those who were unsuccessful with the latter type of response stated that it was accurate due to positive correlation, omitting the requirement of it being strong.

Part (d) was well answered with around three quarters of the cohort successfully calculating a correct Spearman's Rank Correlation Coefficient of 0.85. Some common errors were forgetting to subtract from 1 at the start of the formula. Many incorrect answers came from an incorrect value of n . Part (e) saw very few students articulating that PPMCC would change and why. Where they were successful, they mentioned that the PPMCC would decrease as the point is further from the regression line/making it less linear. Students were more successful

with SRCC and could explain that the ranks did not change meaning the SRCC did not change. Nearly two-thirds of the cohort failed to score any marks.

Question 14

This weighted mean question was very poorly answered with only a small proportion scoring the mark. A correct response such as the student with the lower total marks could have done better on Test 1 was rarely seen. Many students concluded that the student with the lower total marks could have done better on one test than the other but did not specify that this would need to be Test 1.

Question 15

This question was designed to test students' ability to use the formal notation for conditional probability to calculate how many times bigger $P(A)$ is than $P(B)$. This notation was rarely successfully seen or used. Many students had gone straight into a division of the two fractions $\frac{2}{5}$ and $\frac{1}{4}$ (or equivalent), giving the answer of 1.6. A small proportion of students successfully used Venn diagrams and divided $\frac{8}{11}$ by $\frac{5}{11}$. More than half of the students failed to score.

Mark Ranges and Award of Grades

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