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Examiners' Report
Principal Examiner Feedback

June 2023

Pearson Edexcel GCSE
In Statistics (1ST0)
Foundation Paper 2F

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GCSE (9 – 1) Statistics – 1ST0

Principal Examiner Feedback – Foundation Paper 2

General comments

It was pleasing to see students performed well on questions requiring standard techniques such as tally charts (Q02), probability (Q05) and two- way tables (Q05). They were generally confident at completing calculations and diagrams and demonstrated good statistical understanding when asked to interpret these.

Like previous exam sessions students were still less familiar with certain topics e.g. cumulative frequency step polygons and experimental tests. It is worth mentioning here that centres must impress upon their students the importance of legible handwriting as a few responses were very difficult to read. Students were generally able to attempt the whole paper within the time allowed, although some students made no attempt on some questions and many responses were left blank. Centres should also encourage students to show full working and set this out clearly so that partial credit can be awarded if a fully correct solution is not obtained.

Question 1

Most students were able to complete the comparative bar chart in part (a). Very few incorrectly shaded the bar, but many did not use a ruler, although we did condone bars not drawn with a ruler and of varying width. Some students did leave this part of the question blank which may have been because they did not read all the information given and missed this question out by mistake.

In part (b) students had to extract numerical information from the comparative bar chart and were generally very successfully in doing this. Many gave the correct answer of 10 although when incorrect responses were seen it was from using the 2018 figures instead of the 2014 figures.

In part (c), they were able to use the chart to make comparisons. Most students scored at least one mark, usually for identifying that Sweden won the most or Great Britain won the least. Some students incorrectly compared the two years (2014 and 2018) instead or made comparisons using totals from both years. Some students merely listed the numbers of medals won and did not make a comparison.

In part (d) they needed to explain what quantitative data was. A significant minority made the error of stating that quantitative data was a quantity, a total or how many and not having the understanding that it was numerical data.

Question 2

The tally chart in part (a) was completed accurately by the vast majority of students. A small number of students clearly appeared not to understand how to tally and instead wrote the numbers on the tally column.

In part (b) the vast majority were able to state the number of students in the class or were able to get this as a follow through mark from their tally chart.

Part (c) was also well answered, and students could give a probability and it was rare to see instead a description of the probability.

Many students were able to give a comparison in part (d), with the most common answers of '5 more liked apple' or 'more prefer apple', although some students did score no marks for simply stating how many students preferred apples and pears and not giving a comparison or for an answer of $3:8$ or $8 - 3 = 5$.

In part (e) the majority of students misunderstood that the question was asking why the mode was appropriate and instead gave a description of what the mode was 'the most favourite fruit'. Very few used specific vocabulary such as 'qualitative.'

In part (f) it was pleasing to see that most students could give an advantage of the tally chart over the raw data. Most students who scored said a tally chart was 'easy to read' or 'clear' but very few gave any detail such as easier to analyse or read frequencies. When students did not score it was to give a response which commented on the accuracy and reliability of the data. Part (g) was very well answered with students indicating that the most suitable diagram was the bar chart.

Question 3

Part (a) was generally well answered. Most students correctly stated that the spinner landed on 1 the most/more than the others. The most common errors for those who did not answer it correctly were for stating that 'it always had to land on 1' or for stating that it landed on one less than all the others or for giving a description of the investigation e.g. spin the spinner 40 times.

Most of the students answered part (b) of this question well or were able to give at least a correct reason but with no/incorrect conclusion. However, those who did not score marks did so because the question asks "discuss" and some students just wrote a statement like "yes, the table shows he is correct because it landed on number 1 a total of 24 times" and gained no marks. Other common mistakes were students not reading the table and stating that there is an 'equal chance' of landing on each number or for saying that the numbers in the table are down to 'luck' and therefore rejecting the statement.

Most students scored the mark in part (c) by correctly stating that the accuracy of the experiment could be improved by repeating the investigation or by 'spinning it more times'. Many suggested a number of additional spins, which gained them the mark. Of those who answered incorrectly, common errors were suggesting changing the spinner or the environment. Many of these stated that 'extra numbers' should be added or that the spinner 'should be changed for a fair one' or 'spin it on a different table'.

Question 4

Most successful answers in part (a) mentioned sample size or that only two-year groups had been asked (or equivalent.) Some incorrect answers did not understand the command 'assess', instead simply describing the method used with some misuse of statistical terms.

In part (b) students were asked how many students have 2 or more brothers and sisters. This was well answered on the whole by students. Many students did not show any working out which meant that if their answer was incorrect no marks were scored. A large number of students who provided incorrect answers used "20" as their answer.

Finding the mode in part (c) was mostly well done with many students achieving the mark.

In the final part of this question students need to assess Rose's conclusion. The most common answer that earned the mark referred to only asking two-year groups or a small sample size. Incorrect answers did not consider that the sample was not representative and simply said that there was no 5+ line on the graph so Rose was correct or described the method as fair due to an equal number from each year being asked.

Question 5

Virtually all students attempted part (a) with few not scoring both marks. In part (b) students had to use the two-way table to find three probabilities. Students were more successful in parts (i) and (ii) and answers were generally expressed in fraction form with few using decimal or percentages. When there were errors, this included using 55 as the denominator or for stating $\frac{6}{25}$ as the probability and not realising that 25 needed to be the numerator. In part (ii) errors included making the mistake of writing $\frac{20}{55}$ or $\frac{20}{39}$ and therefore used the column/row total instead of 80.

A small minority continue to present the answer in a ratio form, '25:80', which is not an acceptable format for a probability nor is '25 out of 80' though this is now rarely seen. Part (iii) was not as well answered as students mistakenly didn't use the total column for not ordering a ham sandwich and instead used the value for ham and fruit scone and subtracted this from 80 giving the incorrect answer ' $\frac{45}{80}$ '. Some students also failed to read the start of the question 'write down the probability' and gave their answers without placing them over a denominator of 80.

In part (c) students needed to decide what scones needed to be ordered and give a reason. Most were able to correctly pick fruit scones and give the reason 'more fruit scones were sold'. Where marks were not scored was when students gave incorrect figures from the table e.g. '35 fruit scones were sold and 6 plain were sold' or mistakenly thinking that the table showed how many scones were left in stock so they needed to order more plain scones as there weren't many left.

Question 6

Referring to the internet/online was the most common type of correct answer in part (b), with a few referencing weather reports. When incorrect answers were seen it was to misinterpret the question and describe what secondary data was e.g. 'data collected by someone else'.

Part (c) presented the total rainfall for each month in 2019 in London. Students were then asked to decide if Connie's conclusion was correct. This was very successful with lots of students getting full marks. Where marks were lost here, they tended to be slips with the addition, though this wasn't especially common. Almost all students who correctly found the mean also concluded that Connie was correct. The ones who scored no marks tended to be because of a conclusion with no mean to support their answer or to attempted to calculate the median.

Question 7

In part (a) most responses correctly identified that the report should include the source of the data.

In part (b), very few students could give a description of what the population would be. '60 people' was a common incorrect answer, as was '30000' or 'the visitors'. For the students that did understand what the population meant, but often failed to include the word 'all' and wrote 'the visitors/customers at the theme park' which was not enough to be awarded the mark.

In part (c), many students scored at least one mark with many only attempting to make one point. The most common correct answers were small sample, pressuring people to answer, it would be time consuming, may not want to answer or asking a range of people/ages but all the points on the scheme were seen. Some students misunderstood the question and described Navine's plan again instead of assessing it. This question was worth 3 marks and many students failed to give three different valid assessments of the plan. Centres need to remind students to check how many marks each question is worth and ensure that they give enough points in their answers to gain the marks.

Question 8

Knowledge of experimental tests seemed unfamiliar to the majority of students, although many were still able to score some marks. Part (a) of this question wanted a description of how to carry out an experimental test. The majority of students did not give reference to giving the same students a test before some revision and then after some revision another test and then comparing the results. Instead, they decided to split the group into two and give half a test with some revision and half a test without. We did condone this answer in part (a), although many then did not make a clear enough suggestion of comparing the responses of the two groups. Many responses suggested a plan which would have not been sensible or manageable for the teacher – such as each pupil doing different amounts of revision or a different revision technique.

In part (b) the most common response here was that people had different ability levels and that this would make the test unfair. This was only awarded if in part (a) they had provided a description about dividing the class into two groups. Some were able to get the mark by recognising the small sample size even if they had not scored the mark in part (a).

Question 9

Part (a) of this question asked students to explain how the graph supported the conclusion that the total population of Malta has increased between 2000 and 2014. This question was not well answered, and students were not able to conclude that the graph showed the birth rate was always higher than the death rate. Many responses did not make a comparison and just instead discussed one of the lines on the graph. Many students talked about the crude birth and death rate lines increasing or decreasing, without stating that the birth rate was always higher. Others stated that because the graph only went up to 2014, the results were invalid and that the conclusion could not be supported. A significant proportion mentioned just birth rates.

Part (b) of this question was also poorly answered, with very few students scoring a mark. Most either left the question blank or discussed what the graph was showing. Some also came to the conclusion that some births/deaths would not be recorded or that the data may have errors and very few thought of migration as a factor.

The final part of this question was very well answered as many were correctly able to substitute the values into the formula and achieve an answer of 9.9 (or 9.88... without rounding). A large proportion did this correctly without any working shown, but still scored both marks. However, there were a number of responses which seemed to have substituted the values correctly but made an error when rounding and therefore picked up no marks as there was no working shown. Other common mistakes seen were students using 100 instead of 1000 or adding the number of births given to the total population ($4398 + 445\,053$) and using this as the total population in their calculation.

Question 10

Part (a) (i) and (ii) of this question was not answered well with many answers being too vague. Even those that earned one mark did not fully convince of their understanding of grouped frequency. One mark was often given for the data is easier to read. Some seemed to be trying to use general words (easier, faster) in the hope of getting a mark or incorrectly stating that grouping the data would be more accurate. Students again struggled to give a disadvantage for using grouped data and when successful, answers generally referred to loss of detail or precision, though rarely using those exact words. Common misconceptions seen included that grouped data was quicker to collect, you'd have more data with grouped data and that it was more accurate. Some said that there may be mistakes in grouped data, presumably from transferring raw data into a table.

In part (b) of this question students were asked to give a reason why the table cannot be used to show the data for all 50 riders. This was answered correctly by some students, generally by referring to the table only going up to 18 minutes. Many students though focused on the frequency total and stated that there were only 49 results in the table instead of the reason why the 50th rider wouldn't be able to be displayed in the table.

Stronger responses were seen in part (c) and the word 'outlier' and 'anomalous result' were well-used and was the most common way to earn marks. Other responses included 'anomaly', despite inconsistent spelling. Some incorrect answers stated that the graph would be 'the graph doesn't go that far' or 'it doesn't fit on the graph.'

In the final part of this question (part(d)) students were asked to use the frequency polygon to describe the skew of the distribution of the time taken by the cyclists. Students who knew that skew could be positive or negative chose 'positive' more often than 'negative', though there were enough 'negative' answers to suggest poor understanding or guesswork. Although many had no idea what was meant by skew and would give any numerical answer (often 25) instead from the frequency polygon. Many students left this question blank. However, very few were able to correctly interpret that skew, and especially not in context. Most students would say 'more cyclists took between 12 and 13 minutes' or 'the distribution is high at the start and then goes low'.

Question 11

This was an unusual Venn diagram question as it required the students to draw the Venn diagram in part (a) for the data provided. Most students knew how to draw a Venn diagram and achieved the first two marks for correctly placing 17 in the centre and 23 in Spain. Although some did instead draw other diagrams e.g. frequency tree or a tally chart. Failure to subtract meant that progress was limited for some, and it was fairly common to see 33 instead of 16 and many did not have any value outside of the circles. Those who did work out 16 generally went on to achieve full marks, but the majority of responses were 2 marks. A significant minority of students used tally marks or crosses instead of figures in the diagram.

In part (b) students had to discuss the validity of two conclusions based on the Venn diagram. It was poorly answered, with many students scoring no marks and very few achieving full marks. Many stated that the first conclusion was correct, but very few gave a valid reason. Most simply said that 'more than half' have visited France but did not state that 33 is more than half or that 33 is more than 30 (which is half). For the second comment, more students were able to pick up at least one mark by stating that it is a 'small sample' or by stating that 'we don't know how many people' live in the town or equivalent. The most common errors were students not giving a conclusion or stating that Grace needed to ask the full town.

Question 12

This question was an extended response question where students were given a box plot for male giraffes and a table of summary statistics for female giraffes. They were then given two conclusions and were asked to assess them and show values of any statistics used. Many students did not attempt this question and left it blank. When students did attempt this question, their responses were often not awarded any marks due to them comparing the maximum/minimum values and lower/upper quartiles instead of comparing the medians and IQR or range.

The first conclusion needed the students to compare the medians. Many students failed to recognise this and would instead compare the maximum values for males and females instead, which was not awarded any marks. When students were successful in realising that they needed to compare the medians they often incorrectly stated the males median as 5.7, as they struggled to use the scale on the box plot, thinking 1 small square was 0.1 when it was actually 0.05. Many who did correctly find the males' median at 5.6 then just quoted figures without using comparative language. A few confused what average the box plot used and compared 5.6 to the mean for the females.

The second conclusion needed the students to compare the IQR or range. When students did manage to score marks it was often for calculating the range or IQR using the data given in the table for the female giraffes. They were less successful in calculating the range or IQR for the male giraffes as again they struggled to use the scale on the box plot. Again, many who realised that they needed to be comparing the IQR or range for this conclusion often just stated the figures and didn't make a comparison. Of the small number who achieved the first four marks through comparison, almost all were able to relate this to the claims in the question, earning the fifth mark.

Question 13

This question was a cumulative frequency step polygon and from the responses seen it was evident that this was an unfamiliar diagram for most students. Although a large proportion of students did still attempt this question and achieved some marks. Only a few correct responses were seen in part (a). Many students misunderstood why a cumulative frequency step polygon would be used and often referred to the graph rather than focusing on the type of data when answering this question. E.g. scores being clearer/more accurate/curve not being accurate. Some students understood the nature of the data and could express the idea of discrete data in context, e.g. can't have a fraction of a goal.

In part (b) they needed to find the mode from the cumulative frequency step polygon and some students were able to give the correct answer of 4. Students found part (c)(i) challenging where they had to write down the number of matches that exactly 6 goals were scored. A common incorrect answer of 23 was given where students incorrectly read off the height of the graph and didn't understand that a horizontal line meant that this was a value of 0.

In (c) (ii) the majority of students did not score any marks, although some did identify 23 and score a mark. Common incorrect answers involved adding a variety of numbers together from the graph.

Part (d) was not answered well. In this part of the question students were asked to find in the 24 matches fewer than n goals were scored. Again, many responses just wrote down any value from the graph.

Finally in part (e), very few students scored the mark with many referring to a maximum of 12 goals on the graph so the interquartile range couldn't be 14 or that 14 was the median as it was half the total frequency, so using the y axis instead of recognising that the maximum number of goals scored is 10.

Question 14

The final question on the paper was a choropleth map and was a very accessible question with the majority of students scoring mark. Part (a) was a well answered question with most responses receiving full marks. There were a large number who gave the answer of 54 with no working shown. Where incorrect answers were seen it was to not use the midpoint of the groups and instead use the minimum or maximum values.

Part (b) was also a very well answered question with many students scoring full marks. On occasions some failed to respond to the validity, and a few misunderstood the question, saying that the litter bin should go in the top left as they hadn't found any litter there.

Part (c) was the least successful part of this question. A large proportion of responses suggested Ian was incorrect as they were focused on what the choropleth map suggests, rather than making any reference to the method of collecting the data. A lot of responses also suggested Ian was correct, but for the incorrect reason that the last two colours were grouped data and not accurate.

Summary

Based on the performance in this paper, students are offered the following advice:

- Ensure that correct statistical language is used throughout when making comparisons, just stating figures is not a comparison.
- Revise how to carry out an experimental test
- Revise cumulative frequency step polygons
- Show working in calculations - marks were lost in questions 9c and 14a where no working was shown.
- Revise skew in distributions and be able to interpret it in context.
- If asked to 'assess' or 'discuss the validity' of a conclusion make sure that you include this in your answer. Many students failed to do this in question 11, 12 and 14.

