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GCSE Statistics 2ST01 Principal Examiner Feedback – Foundation Paper 1

Introduction

Candidates on the whole seemed to find the paper accessible and generally had time to attempt all questions.

In this final paper of the series, candidates appeared well prepared for most topics on the specification, though lack of clarity in written expression tends to be a problem for some candidates at this level. Correct statistical language, which is expected when comparing distributions, was not always used. When interpreting or discussing results, where more than one mark is available for a question, candidates should be aware that the number of marks generally indicates the number of comments expected.

Topics which candidates generally did well on included work with tables and two-way tables, basic probability, composite bar charts, reading scales on graphs and the calculation of summary statistics including mean, median, mode and range.

There are some topics in particular which were not well attempted including calculating and interpreting simple index numbers, comparing distributions on a box plot, understanding of what a pilot study is and calculating a percentile from a histogram.

Report on individual questions

Question 1

The first question on this paper was accessible to candidates at all levels and provided a good start to the paper for many. Nearly all correctly read and interpreted the table to identify 'Oceania' in part (a) and 'Europe' in part (b). Some quoted figures instead of naming the region. Part (c) had a slightly lower success rate with some candidates identifying the correct figures, but making arithmetic errors in an attempt to find the difference between them.

The vast majority of candidates scored the mark in part (d) with the most common answers including 'Female life expectancy is longer' or 'females live longer'. There were some candidates' descriptions which incorrectly commented on the number of males and females stating that there were more females than males in each region.

Question 2

Question 2 of the paper was also successfully completed by the vast majority of candidates. In part (a) most candidates correctly completed the tally and the frequency to score the mark. The most common mistake was to give an answer of 8 instead but these were then able to pick up follow through marks in part (b).

Again, part (b) was generally well answered and the majority of candidates scored full marks. Some candidates omitted a scale or used an inconsistent scale. Other

candidates made an error with at least one of the heights of the bars, usually the bar for tea.

Part (c) was also completed accurately by the majority of candidates. The most common correct answers were 'only asking 20 people' or 'only on a Monday morning'.

A common error was to conclude that Howard may be incorrect since the frequency for coffee and water together was greater than the frequency for tea. Others misread the question and concluded that Howard was indeed correct.

Question 3

The performance on this question was not as strong as expected with many candidates struggling to identify the appropriate variables in part (a). When presented with a list of variables, candidates are usually good at selecting which is quantitative and which is qualitative. Here the open choice of having to select a variable caused difficulty for many candidates, even though both of the required variables were given to them in the question.

The majority of candidates were not able to identify a census in part (b) even though many were able to give a suitable advantage of using one in part (c). 'Accurate' was the most common response. Some candidates tended to restate a definition rather than an advantage e.g. 'you ask everyone'.

Part (d) was generally very well answered with 'time consuming' being the most popular response. Most common errors tended to claim that there would be too many different responses or they might not get the answers they want. Fewer candidates responded with another correct answer that some people may not want to give their age.

Question 4

This question on probability was very well attempted and many fully correct responses were seen. Nearly all candidates gave 'grey' as the correct answer in part (a). Some misread part (b) and gave a colour for the answer instead of the size, but, on the whole, this was also well answered. Again, nearly all candidates were able to suitably describe the probability as 'impossible' in part (c) with many just writing down the figure 0 or stating 'no chance'. It was pleasing to see that most candidates gave their answer as a fraction in part (d), though equivalent percentages and decimals were also accepted. Finally, in part (e), the '54' and '36' entries were nearly always correct, but the remaining entries in the table were not always accurate as it seemed that some candidates were just making up the figures required rather than using the information in the first two-way table.

Question 5

The summary statistics in question 5 were generally well known to candidates, but the statistical reasoning required in part (d) was more discriminating. Part (a) was generally well answered with many understanding that the reason there is no

mode is that the rainfall was different each month. A significant number of responses incorrectly focused on the fact that December was not in the data set.

Parts (b) and (c) were again usually correct. On some occasions candidates gave an answer of 160 for the mean in part (b) thinking it was the nearest whole number. The most common mistake in part (c) was to give the subtraction the wrong way round $34 - 243$ and this was not allowed to score the mark.

There were many correct responses seen in part (d), but in general candidates showed a better understanding of what would happen to the range in (d)(ii) than the mean in (d)(i). Many, unnecessarily, spent time recalculating both figures, but of these some did not go on to describe the change in words. Weaker candidates simply stated the values would change but gave no indication how.

Question 6

Candidates performed well on this question which involved reading and interpreting information from composite bar charts. The vast majority found the number of hours spent on the internet for Northern Ireland at home from the graph correctly in part (a), but a significant number could not do the same for Wales at work in part (b). A common mistake was to simply read the value off the graph or to add the two relevant figures rather than subtract them.

The majority of candidates scored at least one mark in part (c), usually for stating that adults in Northern Ireland spent more time on the internet in total. The most common second mark was for stating that adults in Wales spent more time on the internet at home. Some candidates simply stated figures without making a comparison. Candidates should be aware that 2 comparisons were necessary since 2 marks were available here.

Question 7

At this point in the paper, candidates found this question more demanding as it tested some of the deeper knowledge associated with scatter diagrams. Many of the candidates scored the mark for plotting the point on the scatter diagram in part (a), but a significant number misread the scale and did not realise it went up in 2s. Many were plotted one square further right than it should have been.

Candidates did not generally show good understanding of the explanatory variable in part (b), but some were able to score the mark by implying that the price depended on the size of a house or by stating the larger the house the more expensive it is.

Most candidates at this level were able to identify the positive correlation in part (c), but its interpretation in context was less common.

In (d) many candidates used the line of best fit correctly to find the required estimate, but struggled to give a reason why their estimate was reliable. The term *interpolation* is generally not well-understood and rarely used by candidates.

Some candidates correctly stated that the correlation was strong, but many just stated it is reliable 'because it is on the line of best fit'.

The term *extrapolation* is also not well-understood in part (e) and even more rarely used by candidates. Here candidates did not read the question carefully as only an example was asked for, so the answer 'a house of 110 m²' was enough to gain the mark; some candidates correctly gave 'a house in a different city' as an example. The most common incorrect answers were either describing a scatter diagram with no correlation or identifying what they thought was an outlier on the given scatter diagram.

Question 8

There was better performance on the opening parts of this question as many candidates confidently read and interpreted information off this graph of reported crimes plotted over the years in England and Wales. In part (a), many correct answers were seen, although some neglected to omit 2008 from their answer and simply wrote all years from 2007 to 2011.

Correct answers in part (b) were rare as many focused on the idea that this graph only showed reported crimes and not all crimes. Others stated what the graph showed rather than explaining why it was misleading. The majority correctly described the trend in part (c). The main mistake was commenting on fluctuations rather than the overall trend. A few claimed negative correlation.

Parts (e) and (f) were two of the most discriminating marks on the entire paper. The calculation and interpretation of simple index numbers is something that the vast majority of foundation level candidates find challenging. Many incorrectly attempted a subtraction of figures to end up at the given result in part (e). Of those who seemed to understand the concept of index numbers most said that there had been a decrease, but did not explain the significance of the index number 58, i.e. a decrease of 42% of the number of crimes reported.

Question 9

There was mixed performance on this question with parts (a), (b) and (f) being the most challenging.

Very few achieved both marks in part (a) for a full description of the data as being continuous, though many achieved one, usually for stating 'quantitative' or implying that the data was numerical.

Again, full marks in part (b) were rare as many did not make the distinction that the data Supul was using was secondary as he did not collect it himself. Most achieved one mark here, usually for saying that the reliability is unknown as students might lie.

Most understood what a stem and leaf diagram is and had a good attempt at completing one in part (c). A handful of attempts were left unordered. There were many that had an error or two and a significant amount did not write a key, even

though the question specifically told them to include a key. There were a surprising number of responses which created something that was not a stem and leaf diagram, usually involving tally marks.

Most candidates seemed to know how to find the median in part (d) although this was not always carried out accurately. The most common incorrect answers were '6' or '45'.

Part (e) had a higher success rate with many achieving this mark. There were a few errors with the counting, often when the stem and leaf diagram was unordered or not very neat. The most common incorrect answer was '10' from a correct stem and leaf.

Finally in part (f), very few realised that this was a bounds question with most working out the range using the given figures. The emboldening of the word 'maximum' in the question was not a strong enough clue. Where they understood that this was relating to bounds candidates tended to get at least one figure correct, usually the lower bound. It was not uncommon to see 64.4 being used.

Question 10

The structure of this question helped candidates achieve marks as the answers were given in parts (a) and (b). The multiplication of probabilities is usually something that only the most able foundation level candidates achieve well on. Here, however, most candidates answered correctly mainly using the multiplication rule. A smaller proportion of correct answers were given by calculating the difference from 1 of the all of the other probabilities, which whilst marked correct, would not have been a usual method of answering when presented with all the information in the tree diagram. A common incorrect attempt was to calculate 0.4×2 and then try to manipulate this result into 0.16.

In part (b), the majority of candidates scored the mark for recognising that there are two ways to get one head and one tail but most did not reference 0.5 as being evens, directly or indirectly. Incorrect answers made comments about a coin having a head or a tail so it was 50% chance of getting each one.

Part (c) was the least successfully attempted part of this question as many candidates ignored the working space and gave an answer without justification. Some candidates scored no marks for not finding any related probabilities or expected number of times. Those candidates that did usually scored full marks for pairing it with a correct comparison.

Question 11

Question 11 allowed all candidates to display their knowledge of pie charts. Most, however, still confuse proportion with number and part (c) discriminated the most able candidates on this paper.

Most candidates answered part (a) correctly, although many commented that 'England had more losses' rather than truly interpreting the proportion. Some scored 0 for not understanding that the question was looking for proportion and

they answered with great clarity that as there were no values they could not calculate who lost more games.

In part (b) candidates usually scored either full marks or zero. The angle was given to candidates, but many did not know what to do with it. There were a range of different calculation steps taken to reach a correct answer but those who got a wrong answer usually did no credible work.

Some candidates in part (c) scored the mark for comparing the angle/proportion of the draw sector in both pie charts but many incorrectly concluded that Switzerland played more matches since its proportion of draws was bigger.

Question 12

At this stage of the paper, many candidates found the work quite challenging. Comparing distributions using box plots is a topic for the most able foundation tier candidates.

In part (a) there were a lot of responses that compared highest and lowest values and many who thought that the range was actually how long the race was. Statistical language was needed on this QWC question to get marks, and for many this meant that they achieved no marks. Lots recognised that the athletes in July were quicker but didn't make a comparison of the median or range/IQR to get the marks.

In part (b), whilst many were able to say that there were more athletes running less than 24 minutes in July, very few mentioned the median of July and the lower quartile of January. The question asked to compare proportions, and actually very few did that.

Question 13

The vocabulary associated with sampling was not widely known at this level and many candidates struggled to express themselves clearly on this question.

In part (a) most identified 'customers' as the population, but very few included 'all' or 'everyone' thus not scoring the mark here

The most common reason given in part (b) why the sampling frame may not be suitable was that customers might not want to be on the database and this was seen fairly often. Others were concerned that the database would include all of the employees of the company.

It was clear that a large number do not know what a pilot study is. In part (c), some tried to rely on stock answers like 'it is faster' or 'it is cheaper'. Even where they struggled to gain the mark for (c)(i) some did then go on to achieve the mark in (c)(ii) for explaining why a pilot study is used. The most common correct response was that it 'allows you to make improvements'.

The responses in part (d) showed that most understood what open and closed questions were but many struggled to effectively describe an advantage of using

closed questions, again giving answers like cheaper or quicker. Candidates need to be careful not to repeat the definition but to give a suitable advantage instead.

A variety of answers were given in part (e) with knowledge of the term bivariate limited. Amongst the most common incorrect suggestions were tally chart, bar chart, histogram and Venn diagram.

Question 14

The final and most demanding question on the paper did offer some marks to those who persevered. The most often score mark was part (a) for obtaining a correct cumulative frequency from the histogram.

Few candidates answered part (b) correctly and of those that did only a small proportion used correct class interval notation. Many candidates were interpreting the height of the bar as the answer, rather than the class interval, a common misconception.

In part (c) the vast majority of candidates scored no marks with a large proportion of non-response. Most candidates attempted to describe the shape as a pyramid or in terms of increases and decreases. Only the most able candidates at this level described the skew shown in the distribution.

Part (d) had a surprisingly low success rate with the vast majority of candidates scoring no marks. Many candidates attempted to divide by the number of bars in the histogram rather than the total frequency. Some candidates worked out $\sum fx$ from the chart, although the value was given. A number of candidates gave the answer 3.8 with no working so gained no marks. Presumably many candidates are not familiar with the formulae on page 2 of the examination paper.

The calculation of the 95th percentile in part (e) of this question was beyond most candidates. Even those who found 57 were unable to link it with the histogram and give an answer in minutes. A correct answer was rarely seen here.

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