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General Certificate of Education (A-level)
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Statistics SS03

(Specification 6380)

Statistics 3

Report on the Examination

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General

Students generally managed to attempt all questions within the allocated time and demonstrated sound knowledge of all the topics. Students usually remembered to quote final answers to three significant figures and to provide written evidence of the method used, particularly the rankings for the Wilcoxon and Kruskal-Wallis test statistics and the Spearman's rank correlation coefficient. More students were using graphics calculators effectively but the need for double checking is vital if the full method, particularly for the χ^2 test statistic, and the use or not of Yates' correction, is not written down. Frequently, students who did not explain their conclusions in the context of the question lost marks.

Question 1

It was encouraging that many students scored highly on this question. Hypotheses should be worded so as to make sense in relation to the context of the question or should simply identify H_0 Independent and H_1 Not independent. The test statistic was evaluated successfully in the majority of cases but good practice would be to show at least the first term of the test statistic so that an incorrect answer does not lose all marks. An effort to express the conclusion in context was seen in almost all solutions.

Question 2

In part (a), few students remarked that sibling pairs were used so that any difference that might exist between CAT scores for autumn and summer birthdays would be more likely to be detected. The paired sign test was one that students felt confident to tackle and the majority made a very good effort at the test. Several students incorrectly used $\mathrm{B}(10, 0.5)$ or $\mathrm{B}(9, 0.1)$. The conclusion was generally clearly stated in context and the main source of lost marks was the failure to state the probabilities used either for the tail to be compared with the significance level or for finding the critical region. Probabilities must be evaluated and a comparison with the significance value seen for full marks to be awarded.

Question 3

Most students made a good effort at this Wilcoxon test and found the value of the relevant differences. Not all students remembered that these differences needed to be ranked before totals are found.

Question 4

It was good to see that most students showed the rankings used and managed to evaluate H correctly. There were still some errors in applying the formula for H and this continues to be an area on which students should focus before the exam. Very few students used incorrect degrees of freedom. In part (b) there were many sensible comments in the context of this question.

Question 5

In part (a), not all students correctly decided that a Mann-Whitney test was appropriate. For those who did, there were frequent errors in ranking, especially with the ties. The method used was well explained in most cases. The selection of the relevant U-test statistic and the comparison with the correct choice of critical value was not always shown. In part (b), the most common errors were to incorrectly place frequencies in the table of observed values and to either forget to use Yates' correction or incorrectly apply the formula. Students would benefit from practice at evaluating $|O-E|-0.5$ and then using this in the test statistic. Part (c) saw many excellent responses but some students did not seem to have fully read through all the information and conclusions. Consequently, students struggled to interpret their results in context.

Question 6

Students appeared confident to evaluate Spearman's rank correlation coefficient and only a few found the product moment correlation coefficient in error. There were a few students who found the product moment correlation coefficient from their calculator and then also evaluated correctly Spearman's rank correlation coefficient. Marks are lost if two solutions are offered so students should ensure they select the correct coefficient and clearly label this as their answer. The test in part (c) was carried out well by most students but few interpreted their findings in context with reference to both mother & son and mother & daughter.

Mark Ranges and Award of Grades

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