GCE
STATISTICS

SS03 Statistics 3
Report on the Examination

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General

The majority of students demonstrated a sound knowledge of the topics in the specification and made a good attempt at all questions. Students seemed more competent this year at using a scientific calculator correctly for the evaluation of the Kruskal Wallis test statistic, H, and the χ^2 test statistic.
Final answers were usually quoted to 3 significant figures but some marks were lost unnecessarily because only 2 significant figures or even 1 significant figure were quoted. Written evidence of the method used, particularly for the χ^2 test statistic and the Spearman's rank correlation coefficient, was not always supplied and some marks were lost as a consequence.
Students frequently did not make the requested comments or explain their conclusions in the context of the question as required. Careful reading of the information in the question and repeating the context given when commenting is advised.

Individual question comments are as follows:

Question 1

Students made a good effort at this sign test and many gained full marks. The hypotheses were usually stated correctly but a few students lost marks when using the critical region method because no relevant probabilities were quoted to explain how the critical region had been identified.

Question 2

The Wilcoxon signed-rank test was attempted confidently by most students in part (a) with most remembering to write down the differences between the paired data. Hypotheses were usually correct and stated, using words or symbols, in terms of the population parameter.
In part (b)(i), the comment needed to refer to the context of the question and students should realise that comments such as 'Normal' will not gain marks. In part (b)(ii), many students lost a mark because they did not state '<u>paired</u> sign test'.
Part (c) was done quite poorly this year and many students seemed unprepared for this request.

Question 3

There was a significant minority of students who did not know which test to carry out here and this emphasises the need for students to be aware of the possible need to select the appropriate test when presented with data in SS03. The data was clearly not paired and there were 2 samples to be used for comparison and hence the Mann-Whitney test was the relevant test to carry out.
Those who selected the correct test in part (a)(i) generally stated hypotheses accurately referring, in symbols or words, to the population median or to samples being taken from identical populations. The null hypothesis 'Samples are identical' is incorrect but was often stated.
The comment in part (a)(ii) was frequently not given in context and comments such as 'Random' did not gain marks.
In part (b) some students were muddled about Type I and Type II errors and they often forgot to explain the error in the context of the question.

Question 4

Students are confident with this topic and many fully correct solutions were seen. However the hypotheses were often stated the wrong way round with H_0 'An association between mouthwash type and infection category.' Some hypotheses were poorly worded and did not gain marks, for example, H_0 'Patient and new mouthwash independent'.
In part (b), difficulties with using Yates' correction were seen. Too frequently students knew they should use Yates but evaluated $\sum \frac{(O-E-0.5)^2}{E}$ or $\sum \frac{(O-E)^2-0.5}{E}$ instead.
If students made an arithmetic slip in part (a), it was unfortunate that lack of evidence of any method frequently led to the loss of most of the marks in part (b). Students should state their expected values and indicate their method for evaluating the test statistic, as $\frac{2.26^2}{6.24}+.....$ even if the bulk of the evaluation is then done on the calculator.

Question 5

Some excellent attempts were seen in part (a) and almost all students realised that a Kruskal-Wallis test was required. Far fewer students struggled to apply the formula for H than has been the case previously and most demonstrated good calculator skills. However some students totalled the raw data and forgot to find the ranks.
The critical value was still sometimes found from using 15, rather than 2, degrees of freedom.
Part (b) provided many correct answers to which Psychological Approach should be used but the reason for the selection was often 'The total of the ranks is lowest (or highest depending on ranking used)' when the decision should be made on which approach had the lowest (or highest) average rank.

Question 6

Part (a)(i) was extremely well done by the majority of students. Some comments in part (a)(ii) were too vague although usually in context. Students should refer to the largest contributors to the test statistic in order to determine where the most significant sources of association lie.
Part (b)(i) caused few problems for students although many re-ranked the already ranked data. The hypothesis test was also done well by most students and those who lost marks generally stated an incorrect critical value.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion