A-LEVEL
STATISTICS

SS05 Statistics 05
Report on the Examination

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General

Most students were able to complete the paper in the time allowed. Generally, working was clear and students gave good responses when writing the conclusions to their hypothesis tests. Students were well-prepared for questions involving hypothesis tests or confidence intervals but the responses were less successful on continuous probability distributions. The questions on the rectangular and exponential distributions and the goodness of fit test to a normal distribution posed problems for many students.

More students this year seemed to be using the statistical tests on their calculators. This is to be encouraged and the mark-scheme takes this into account. Students, however, do need to understand how to complete a test using a p - value rather than a critical value and must appreciate that showing intermediate values can provide evidence where there is miscalculation.

There were some scripts lacking written clarity; students must be encouraged to write legibly and to use black ink.

Question 1

This proved to be a good opening question. Most students successfully calculated the correct confidence interval. The responses to the required interpretation in **part a(ii)** and **part (b)** were more mixed. Some students thought the variance given in the question as $5\ \mathrm{ml}^2$ was meant to be "25" and others failed to appreciate that a 95% confidence interval is contained within a 98% confidence interval. Colloquial descriptions such as "stricter" or "tighter" needed more explanation before a mark could be awarded.

Question 2

This question modelled a rectangular distribution. Most students could show that the exact value of k was $1/50$, many also appreciated that the probability that $X = 100$ was zero. However the interpreting of this answer was more mixed. It was expected that both $X = 100$ and the probability of zero should be interpreted as eg "It is impossible for a child to estimate $100\ \mathrm{cm}$ exactly". In **part (c)** a lack of appreciation that the rectangular distribution is a continuous one led many students to use a continuity correction erroneously in **part (c)(i)**.

Question 3

This was a question using an F-test for equal variances and was generally successfully performed. The conclusion to the hypothesis test was sometimes written quite lazily where the student had failed to realise that they were not testing the actual brand of ball but the Lucy's driving distance with that brand of ball. The request for the necessary assumptions in **part (b)** needed to be answered, in many cases, with more attention to detail and in the context of the question, to be awarded the marks.

Question 4

This question and the following question proved to be the most challenging questions on this paper. There were some excellent solutions seen and those students who were confident with the statistical functions on their calculator were often successful. It is wise to include some intermediate steps in the working, however, to show method.

In **part (a)** many students did not appreciate the need for a continuity correction when calculating the value of y. This could have been avoided (or checked) by first calculating w and z and then subtracting the known frequencies from 200 to find y. Incorrect values of any of these 3 frequencies affected the response to **part (a)(ii)** often with severe consequences.

Part (a)(ii) completed the goodness of fit test. Some students included the calculated parameters in their hypothesis and consequently miscalculated the number of degrees of freedom. Others had made errors in the frequencies in **part (a)(i)** which led them to fail to combine the last 2 classes or to combine both the first 2 and the last 2 classes.

Part b was generally answered well.

Question 5

This was a question involving knowledge and application of the exponential distribution. **Part (a)** was generally well- answered and only a few students failed to give the expected answers of 40 and 1600.

In **part (b)** a common mistake was to give the probability that the time between successive vehicles was less than 30 seconds rather than greater than 30 seconds.

The use of the Central Limit Theorem in **part (c)** and the required distributional approximation of $\mathrm{N}(40,1600/75)$ was not often seen. Some students seemed confused between numbers of vehicles and times between them and insisted on using a continuity correction.

Question 6

This was generally successfully completed. **Part (a)** was a standard application of a test for a normal population standard deviation. The calculation was often completed successfully and those students who made errors in both the conclusion of the hypothesis test and in their answer to **part a(ii)** needed to read the question more carefully.

Part (b) was a straight-forward hypothesis test for a given difference between two means. Students are now handling the inequality between the means in this test more successfully than in previous years and there were many solutions that gained full marks.

Mark Ranges and Award of Grades

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

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UMS conversion calculator