GCE

STATISTICS

SS04 Statistics 4

Report on the Examination

6380

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Question 1

Part (a) was a well answered question indicating that construction of confidence intervals is generally well understood.

Answers to (b) often lost marks because they were either not in context or stated "…because it's only a sample". Clearly most statistical research involves sampling thereby this comment gained no marks. Two essentially different contextualised comments were needed.

Question 2

In part (a), hypotheses were generally correctly stated with the most common error being use of 35 rather than 27. If using the z-value/critical value approach, the 2-tailed nature of the test was nearly always acknowledged by use of 1.6449. However, if using the p-value / significance level approach, this was often ignored and many solutions wrongly compared p with 0.10 rather than with 0.05. There were a few students who mixed their methods, comparing a z-value with 0.05 or a p-value with 1.6449. Several students used $\sqrt{35}$ in the denominator for z rather than $\sqrt{27}$ which is the correct value assuming H_0 is true. The test statistic is $z = \dfrac{\hat{\lambda} - \lambda_0}{\sqrt{\lambda_0}}$ not $\dfrac{\hat{\lambda} - \lambda_0}{\sqrt{\hat{\lambda}}}$.

In part (b), there was some confusion over identifying which type of error may have been committed and the wording used was often clumsy.

Question 3

Calculations in part (i) were well done with only a few students incorrectly using normal values rather than *t*-values. Some answers to (ii) were just too brief and vague to get the marks, for example "No because it's in the interval". Students should be precise in these explanatory parts and state clearly **what** is in the interval in context.

In part (b), the majority used critical values rather than p-values. Unfortunately, when p-values were used, they were often incorrectly obtained from a normal distribution rather than a t-distribution. It was pleasing to see that nearly all conclusions were made in context but it should be noted that a comment such as "There is evidence that the mean is 92" is too strong. In general, in a test where we are unable to reject H_0, students should state "There is no significant evidence to support the hypothesis that…(whatever H_1 says, in context)".

In part (c), most identified the standard deviation as the most striking difference between the distractors and were able to offer some explanation of what this implied.

Question 4

In part (a), calculations were generally very well executed. Most used the correct binomial distribution in part (i), the most common error being to find $P(C \geq 4)$ rather than $P(C > 4)$. In part (ii), nearly all students recognised that a normal approximation should be used although the required continuity correction was often missing or incorrect. A few students failed to square root the variance.

In part (b), the assumptions required for a binomial distribution were, in general, not well described. Statements such as "friends are independent" were common and not precise enough to gain marks. However, despite imprecise wording in part (i), many realised that friends arranging to log on at the same time to chat to each other would violate the requirement of independent log-ons and so marks were often gained in part (ii).

Question 5

Part (a) was answered well. The only consistent error was with the continuity correction in part (ii) – either omitting it entirely or getting it wrong.

In Part (b), a common error here was $4^2 \times 10^2$ for the variance rather than 4×10^2. A number of students did not read the question fully and attempted to include the time for personal dedication into the calculation for (b)(i). This affected not only part (i) but parts (ii) and (iii) as well. Method marks throughout part (b) were still available but, for many, a more careful reading would have saved the later accuracy marks. Part (iii) was tough for many and, although some attempted to answer it without doing any calculations, it was good to see that most recognised that a difference between random variables was required. However, only a few managed to get full marks here.

In part (c), solutions showed that nearly all students know something about the conditions required for a Poisson distribution and were able to contextualise it. There was a more or less equal split between comments about varying means because of flight times and comments about lack of independence because many people will arrive in groups.

Finally, it is unfortunate that a number of students still adopt the high risk strategy of simply writing an answer down from their calculators with no intermediate working or indication of what they are actually doing. Although use of a graphical calculator is to be encouraged, if no method is shown then part marks cannot be awarded in case of error in the final solution.

Question 6

In part (a)(i), most recognised this was a one-tailed test but many found $P(X > 2)$ rather than $P(X \geq 2)$ as required. In tests using an exact Poisson or Binomial distribution, the probability of the "observed value or more extreme", not just "more extreme", should be evaluated. It was good to see that final conclusions were generally contextualised.

In part (ii), the majority of students gained this mark but those that didn't had usually named some factor that was essentially 'reliability' again.

Part (iii) proved to be too difficult for all but a very few students. Only a handful managed full marks, a few managed some sort of reasonable explanation with no probability for 1 mark but many didn't even attempt an answer. Of those that made an attempt, the most common reason for scoring no marks was trying to incorporate the tour data, 2 breakages in 14 nights, into the calculation despite the question instructing "irrespective of the data collected…".

In part (b), a significant number of students gained the answer 0.88 by the erroneous calculation $1 - 6 \times 0.02 = 0.88$. Many of those that calculated $0.98^6 = 0.886$ stopped there with no further explanation as to why the final probability must be > 0.88.

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