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Principal Examiner Feedback

Summer 2013

GCE Statistics S2 (6684)
Paper 01R

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Statistics S2 (6684R)

Introduction

On the whole this paper was well answered. Very few questions were left blank and it appeared that there were no issues with candidates having enough time to answer the questions.

Report on Individual Questions

Question 1

This question was answered well by many candidates. In part (a) the vast majority of candidates were able to score one mark and many scored both marks as they could list all 8 combinations.

Part (b) caused some candidates problems as they failed to recognise that the range was the difference between the largest and smallest values. Some candidates found the sampling distribution of the mean or the sum rather than the range. Others thought that all samples were equally likely and hence obtained the wrong probabilities.
Those candidates who could identify the range usually went on to calculate the correct corresponding probabilities. A common error was to give the range as 0 and 1.

Question 2

This question was answered well by many candidates. The vast majority used F(2) = 1 and went on to find $k = 6$ and proceeded to a correct version of f(x), maybe with a few algebraic errors. Other errors included integrating between 0 and 2 which resulted in $k = \frac{16}{3}$.

Part (b) was done well by the majority of candidates and those candidates who had lost marks previously were able to differentiate for their value of k.
Some candidates lost the final mark as they failed to specify the probability density function fully or incorrectly; usually saying 0 for $y < 0$ and 1 for $y > 2$.
A few candidates when multiplying out the bracket only multiplied the first term and failed to realise that it is multiplied by all terms in the bracket.

In part (c) most candidates used 1 – F(y) but some integrated f(y) with correct limits. The main errors included candidates using f(x) without integrating or finding the wrong area, for example finding F(1) and not subtracting from 1 or finding F(2).

Question 3

Part (a) frequently involved complicated quadratics and substitution without realising that the quadratic could easily be eliminated immediately from the variance equation as b-a>0. Even those that managed to set up two correct linear equations continued with a substitution rather than simply adding the two equations.

Part (b) was done well and most candidates took the route of calculating a value for c and then calculating the required probability. Some candidates made arithmetic errors and some correctly calculated $c = 28.4$ but then failed to do anything with it. Others forgot that 23 was the mean and so $P(X < 23) = 0.5$ had to be worked out.
Although the majority of candidates succeeded in finding the correct answers here, few achieved neat and mathematically fluent solutions.

Question 4

Most candidates were able to access this question. Candidates seemed well rehearsed in show that $k = \ldots$ although a few candidates lost marks as they failed to show the correct use of the limit 3 and thought it was enough to state $k = 1/9$ after integrating.

Finding the mode caused candidates the most difficulty with some candidates not realising that the mode is always a value of x and not $f(x)$. Those candidates that differentiated and put $f'(x) = 0$ were usually very successful although a minority went on to spoil their approach by stating the mode was 4/9. Some candidates used completing the square and again were usually successful. Errors included a list of substituted values or factorising and stating the mode was 3.

Part (c) was done well by the majority of candidates. Errors included integrating $f(x)$ or making arithmetical errors when substituting into the correct integral.
In part (d) candidates knew how to use their values to describe the skewness. The usual errors were to use median instead of mean or to say negative when it was positive.

Question 5

This question allowed candidates to score many marks and only part (e) seemed to cause problems.

In part (a) some used the incorrect value for λ (usually 6) or calculated P($X \leq 5$) – P($X \leq 4$) or just calculated P($X \leq 4$). In part (b) the errors included using the incorrect value for λ (usually 9) or calculating 1 – P($X \leq 9$).

Part (c) was generally correct with only a very few putting 0.7.
In part (d) some candidates decided to calculate values rather than use the tables in (d) even though they had done so successfully in (b). The main error was to calculate 1 – P($X \leq 1$).

In part (e) it was evident that many candidates did not understand the context of the question clearly enough. Others correctly identified 0.8 but nothing else whilst some identified Po(1.2) and used it correctly Those who calculated both generally went on to score full marks but a few candidates lost the final mark as they either added the values to give a probability > 1 or gave the answer as 0.24 and not 0.241.

Question 6

Many candidates were able to find the correct critical region for part (a) although the upper region, as usual, caused more problems. The most common error was to write the upper CR as $X \geq 13$. A few candidates gave their CR as probability statement and some lost all the marks as they used Po(10) instead of Po(8).
The concept of the actual significance level was well understood even if they didn't always manage to obtain the correct answer.

Part (c) had many good solutions although for some clearly there was great confusion between the test statistic, 95, and the null value of the population parameter, 8 or 80. This was more evident amongst those who made the fundamental mistake of altering the test statistic and dividing 95 by 10 creating a different hypothesis test altogether. The most common error was to use N(8, 8)

Candidates seemed to know that they needed to use a continuity correction but many candidates applied it incorrectly. The final M mark saved many candidates as they could give a correct statement based on their probability.

Contextual statements were generally very good and candidates seemed to have improved in this area. However those candidates that took the route involving the 'bakery's claim' were more successful than those who tried to write a contextualised statement involving 'raisins' and 'muffins'. If the second approach was taken and the mark was not awarded it was usually because the word 'muffin' was not used.

Question 7

This question allowed candidates to score some marks and a variety of solutions were seen. Only the best candidates were able to score full marks and part (b) caused the major problem.

Part (a) was done well by the majority of candidates and errors included either leaving out the 20 and 0.2 or stating a Poisson instead of binomial.

Part (b) was either done well or poorly. A few candidates left this part out whilst others showed that $S = 5X\text{-}20$ for a particular value and not for the general case.
In part (c) there was some confusion between X and S. Some candidates could only state $E(X) = 4$ and $\text{Var}(X) = 3.2$. Others assumed S to be uniform.
Those candidates who were able to answer the question often scored full marks but the common error for these candidates was to incorrectly calculate Var (S) (often giving an answer of – 0.4).

In part (d) many candidates realised that they had to solve an inequality for X and usually scored full marks, with only a minority making the error of using $P(X \geq 8)$ as $1 - P(X \leq 8)$. Candidates that failed to realise that they needed to solve the inequality in X assumed here that S was normal or at least that they could approximate to the normal.

Part (e) was well done by large numbers of candidates and even those who obtained few marks elsewhere in the question often gave a completely correct solution here. It appeared that candidates have been well trained in answering normal approximation questions. Some answers gave the wrong variance, 40, assuming that the mean and the variance were the same, as with the Poisson. There were a surprising number of candidates who did not show the details of their standardisation which would have been advisable as marks could not be awarded if they had an incorrect value or the variance or mean.

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