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Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel GCE
Statistics 3
(6691/01)

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Summer 2016
Publications Code 6691_01_1606_ER

Principal Examiner's Report

GCE Mathematics

Statistics 3 (6691/01)

Introduction

Overall this was an accessible paper with students typically producing some very good solutions. The paper also gave the most able students a chance to show their ability. The weakest feature for a significant number of students was the lack of understanding shown of some underlying theory. This meant that question 5, question 6 and question 7 discriminated well.

Report on individual questions

Question 1

For some students, the clarity of expression was poor, showing a lack of clear understanding and making it difficult to give credit. In part (a), the most common comments to gain credit related to representation of all groups, appropriateness for large samples or reflecting the population structure. The most common incorrect responses referred to large populations instead of samples or were too vague e.g. referring to better representation of 'the population' without reference to subgroups or structure. In part (b), common correct comments referred to interviewer bias for quota sampling and to calculation of sampling errors. Most common responses not scoring referred to sampling frames, recording of non-responses, or were too vague with simple reference to randomness

Question 2

Hypotheses and final conclusions were usually stated correctly although some were imprecise, missing out either 'concentration' or 'drug'. Many students were accurate in their calculations and most had the correct degrees of freedom. A few, however, read the critical value from the wrong column in the tables. Not all students are showing the calculation needed for expected values, but the majority gave a correct explicit statement regarding their null hypothesis based on their values.

Question 3

Many students are able to offer a correct reason in part (a), usually referencing normality or less often linearity. Some answers incorrectly referred to tied ranks or vaguely to discrete or subjective data. Calculations in part (d) were correct most of the time. In part (c), hypotheses were usually stated correctly in terms of ρ rather than r although a few erroneously stated in words. The correct critical values were usually found in parts (c) and (d) and most explicitly stated a correct decision for the null hypothesis. However, the mark most commonly lost was for concluding in context; too many were incomplete referring only to correlation rather than positive correlation. A majority of students realised that the difference in the results from part (c) and part (d) meant there was a non-linear relationship. There are a number, however, who appear unaware of the distinction between the two coefficients.

Question 4

On the whole, this was a well attempted question with many students gaining full marks. Most commonly where marks were lost was in part (a), where students did not consider both tails in investigating the 'difference' in weight. Nearly all had the correct mean and variance.

In part (b) and part (c) the few errors seen were commonly arithmetical.

Question 5

Students are correctly stating their hypotheses in part (a) in terms of the population parameter and most of these define their subscript notation. The calculation of the test statistic is well known although a small number made errors in the standard error e.g. by squaring the variances. The accurate critical value was stated by most students, but those who concluded by re-stating the claim, rather than simply saying the doctor's claim was supported, were not always precise and so lost a mark. Most students gained at least one mark in part (b), often by stating $\sigma^2 = s^2$ or that sample means were normally distributed. Gaining two marks was less common. Errors seen were to simply state that the variables not the means were distributed normally, that people were independent rather than the individual results, or by mentioning the Central Limit Theorem without mention of sufficiently large samples. Part (c) was less successful for many students. The clarity of calculations could have been better; those with arithmetical slips were less likely to gain the method marks as they did not make clear at each stage what they are finding. Not all found the new mean explicitly and whilst many were able to find Σx^2 from s^2 there was less success in then using this correctly to find the new value of s^2.

Question 6

A number of students were quite disorganised with their hypothesis tests with untidy working and hypotheses not appearing at the start. Most students had hypotheses the correct way around in part (a) although some failed to mention the specific parameter which was part of the claim being tested. Others fully specified the distribution, sometimes incorrectly with 'n=5' or 'n=50' not being too uncommon. Most students correctly pooled for low values of E with sufficiently accurate calculations. The critical value was commonly correct, although some did erroneously subtract 2 from n for the degrees of freedom. In part (b), some candidates evaluated λ from the first (non-exact) expected frequency and so were inaccurate.

Most students found r and s to the correct accuracy and were able to use these in part (c). In the final hypothesis test there was no specified parameter, but this time some students incorrectly specified 'λ=1.8' in the hypotheses and conclusion, leading to marks being lost. Generally, the calculations were accurate with most correctly subtracting 2 from n for degrees of freedom.

Question 7

Students typically managed to gain full marks in part (a), although stating the final confidence interval was not always clearly done. Very few students failed to use the correct z-value from the percentage points table, but the most common error from a minority of students was to use '20' rather than the sample mean in the calculation. This led to problems reaching an appropriate conclusion in part (b). A small number of students in part (b) failed to make an explicit comparison of the stated value with their confidence interval and so did not score. The question asked for action over the stated fat content, but some students chose to suggest increasing the fat content of the burgers instead, which does not address the question. Although there were correct answers to part (c), this was found to be the most demanding part of the question. Students found it difficult to make progress with the question, but many students finally reached the key statement with usually a correct z-value. Having done so the correct answer was usually reached. A few made the common error of using the 10% z-value, failing to split the critical region into two tails. A small number of students unhelpfully used decimals (eg 0.195 for 19.5%) in part (a), as the units for the variable was percent. This caused a problem in part (c) when comparing with a given value of 0.5 which should have been interpreted as 0.5%.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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