Examiners' Report

Principal Examiner Feedback

January 2022

Pearson Edexcel International Advance Level In Statistics S3 (WST03)

Paper : WST03/01

General

Overall, candidates were well prepared for this paper and, in most cases, were able to attempt all questions.

Comments on individual questions

Question 1

(a) Generally, a good source of marks for most candidates except for a few who used the wrong formula for the unbiased estimator of the variance (s^2). Most of the candidates correctly calculated $\bar{x} = 11.42$ and proceeded to use this in the formular $s^2 = \frac{\sum x^2 - n\bar{x}^2}{n-1}$ to obtain 0.7. Candidates who failed to score full marks in this question were those who used $s^2 = \frac{\sum x^2 - n\bar{x}^2}{n}$ or $s^2 = \frac{\sum x^2 - \bar{x}^2}{n-1}$.

(b) Most candidates correctly calculated the limits for the 95% confidence interval (CI) and scored full marks. Candidates who failed to score the 2nd B1 mark for this question used 0.96 instead of 1.96 which led to the wrong limits for the CI, though this was a very small proportion. A small proportion of the candidates failed to score the final A1 as they gave limits as 10.9 and 11.9 rather than the degree of accuracy asked for in the question.

(c) Strong candidates performed very well in this part of the question and gained full marks. However, some candidates struggled from the beginning as they failed to identify the correct parameters required for the normal distribution, especially by using a mean of 11.42 instead of 11.92 or any value within the CI. Many also incorrectly divided the variance by 10 in the standardisation.

Question 2

(a) On the whole, there were many complete and accurate attempts at this part of the question. Candidates generally defined their hypotheses clearly using appropriate notation, but some attempted alternate notation, such as μ_x and μ_y, without defining how this related to Year 7 and Year 8. Others gave their hypotheses in words.

The standard error was often calculated correctly but some errors in the formulae (introducing squaring) were seen on some occasions. Candidates generally did a good job of showing their working with substituted values shown. Many accurate standardisations were seen, and candidates who slipped up with the formula needed for SE usually identified at least the numerator correctly.

There was a generally good use of notation with candidates labelling their test statistic and CV clearly. Values were almost always stated to the required level of accuracy. Conclusions were almost always written in context. Some candidates muddled the contextual answer by giving the opposite conclusion whilst others lost the mark by being too vague regarding the context.

(b) This part was, as anticipated, less successfully answered with candidates relying on stock responses rather than engaging with the actual demand. Many vague responses said that the means were normally distributed but did not explicitly state that the CLT allows us to use the distribution of the **sample** means as being normally distributed.

Question 3

(a) The PMCC was calculated accurately and candidates virtually always gave r to the required degree of accuracy.

(b) The hypotheses were stated correctly in terms of rho, a correct critical value given and a correct evaluation was given in nearly all cases. On some occasions the final mark was not awarded as some omitted the word 'positive' whilst others neglected to include the context.

(c) This mark was lost in almost all scripts. A popular response was measurements are independent.

(d) Candidates lost marks in this part for not working out the Spearman ranks between MR and DPA as occasionally the Spearman rank was calculated against MR and BMI. A mix of increasing and decreasing ranks was seen here. Marks were sometimes not earned in this part when not enough working was shown leading to an incorrect answer.
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(e) The critical value was given accurately and was consistent with the value in part (d) in most cases. Although candidates correctly deduced they did not reject the null hypothesis, many were not able to give a statement in context and sometimes lost this final mark.

Question 4

(a) In general, this part was not answered well, with few candidates really understanding either the question or the principles of quota sampling. Too many responses included the idea of randomly selecting participants from a list – clearly not appreciating that a quota sample is not used when there is a sampling frame available.

(b) This part was very successfully attempted by most candidates. Hypotheses were usually correct and the vast majority of candidates showed enough working, including expected values and gave a correct test statistic. Degrees of freedom and the critical value were invariably correct. The majority of candidates came to the correct conclusion with a minority failing to give any or getting the conclusion the wrong way round.

(c) Here, most candidates earned the first two marks but nothing thereafter. Only a few candidates understood the idea that doubling was involved and that the result might be different but were many responses lacked detail and sufficient reasoning. Only the most able candidates scored full marks here.

Question 5

(a) Very well attempted and nearly always correct, this was a good start to the question for most candidates. Almost all knew to sum the means and the variances and went on to standardise correctly. A small number did not them find the correct probability, neglecting to do $1 - p$.

(b) Again very few problems obtaining the mean and variance. Slips on some occasions included difficulties with inequalities but most were fully correct.

(c) This part was less successfully answered with some failing to use the required accuracy on the z-value. An even more common mistake was an incompatible standardisation leading to a time which was exceeded on 5% of occasions rather than 95%.

(d) This part was very well attempted. A common error was to find the probability that his time would exceed three hours on more than one occasion rather than at least one occasion.

(e) A significant number stated that Jane was correct or incorrect without explanation which could not gain any credit since reasoning was required. Most were able to explain that the condition of independence was now not valid, some giving practical interpretations such as fatigue.

Question 6

(a) This part was well answered with the majority of candidates scoring all 5 marks. Most ensured their values added up to 100.

(b) Though all candidates did make an attempt at hypotheses some were insufficient stating that any normal distribution would be suitable without explicitly referring to the given normal distribution.

The calculation of the test statistic was generally done accurately, though on numerous occasions some believed that 9.71 was the final value of the test statistic, not realising that two additional terms needed to be added.

The degrees of freedom and critical value were generally correct, though it was not uncommon for some to incorrectly subtract an additional degree of freedom. Follow through was available for the CV if this was done. The conclusion was generally consistent with the values found, correct and in context.

(c) A challenging finisher for some with many incomplete answers seen. 'Unchanged' or 'reduced' were seen frequently. Only the most able deduced that that the degrees of freedom would be reduced by 2.