Examiners' Report
Principal Examiner Feedback

October 2023

Pearson Edexcel International Advanced Level
In Statistics (WST02) Paper 01

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General Introduction

Overall, this paper allowed all students to demonstrate their ability and knowledge of the WST02 specification. There were several places where students struggled to translate the context into correct statistical processes/calculations. In particular questions that ask a student to show something is true require all the steps in the working to be shown.

Report on Individual Questions

Question 1

Part (a) (i) was a nice easy start to the paper with many students using the correct binomial expression for P($X = 2$). However too many students gave a rounded answer rather than the 4 decimal place answer which was required.

Part (a) (ii) was answered well by the majority of students with many scoring full marks. The common error seen was to find $\mathrm{P}(X > 3) = 1 - \mathrm{P}(X \leqslant 2)$ rather than $\mathrm{P}(X > 3) = 1 - \mathrm{P}(X \leqslant 3)$.

Part (b) (i) was answered well as the vast majority of students realised that $np = 6$ was required leading to $n = 30$

Part (b) (ii) was slightly more problematic for students. Those that used $\mathrm{P}(Y = 0) < 0.05$ often went on to find that n = 14. However, too many students failed to translate the context into a correct statistical calculation. A common error was to use $1 - \mathrm{P}(Y \leqslant 1) > 0.95$ rather than $1 - \mathrm{P}(Y = 0) > 0.95$. As this led to an inequality involving ${}^{n}C_{1}$ students should have realised they had made an error.

Question 2

Part (a) was answered well with the vast majority of students correctly identifying the mode as 4. A few incorrectly thought that the most was $64a$.

Part (b) stated 'Use algebraic integration to show that $a = \frac{1}{128}$' and whilst most students followed this instruction, some students did not and therefore were not awarded any marks. A few correctly integrated to obtain $\frac{ax^4}{4}$ but then either failed to set this equal to 0.5 or failed to show the substitution of 4 and so lost unnecessary marks.

Part (c) caused students the most problems. Those that realised that all they needed to do was set the area of the triangle equal to 0.5 often went on to find a correct value for d (6). Various approaches were seen and the common incorrect value of d seen was 8

In part (d) many students gained the first two M marks. This was usually for obtaining $4b + c = 0.5$ and $10b + 2c = 0.5$ or $'6'b + c = 0$. When taking this approach obtaining an incorrect value for d meant that the answers given were incorrect. The most common incorrect answers were $b = -\frac{1}{8}$ and $c = 1$, which comes from $d = 8$.

Question 3

Part (a) was answered well with virtually all students showing that $\alpha = 32$ and $\beta = 47$

Part (b) produced varied solutions. Many were able to specify a fully correct pdf and scored full marks. However too many students used inconsistent lettering and it was not unusual for students to use f(x) and then t when specifying the range. This meant that the final A mark was withheld.

Part (c)(i) and (ii) was answered well by the vast majority of students and full marks were often awarded. The most common error seen was use of $\text{Var}(T) = \frac{(47-32)^2}{2}$ rather than $\text{Var}(T) = \frac{(47-32)^2}{12}$.

Part (d) proved more challenging for students. Too many students failed to translate the context into a correct statistical calculation. The most common errors included $(35-32)\times\frac{1}{15}$ which comes from not understanding the context of the question and $(40-30)\times\frac{1}{15}$ which comes from not realising that the model was only valid for $32 \leqslant t \leqslant 47$

Question 4

As an answer of 13.1 was allowed then Part (a) was answered well by virtually all students.

In part (b), for those students that correctly interpreted the context i.e. ‘individual selling prices’ it was answered well. If an error occurred, then this was usually the omission of 10 12 15. Too many students did not interpret the context of this part of the question and decided to list all the possible combinations of sizes i.e. S M L and in this case no credit was given.

In part (c) many fully correct answers were seen, often given in a table. Where full marks were not awarded then the most common error was an incorrect probability calculated for $M = 12$ was calculated. It is worth encouraging students to check that the sum of the probabilities = 1. Some students interpreted this question incorrectly and tried to find the sampling distribution of the total price of the 3 t-shirts.

Question 5

In part (a) it was obvious that students know the conditions required for a Poisson distribution, unfortunately too many failed to give the context required 'complaints' and so lost the B mark.

In part (b) (i) most students calculated the correct probability and gave a correct answer of 0.0620 so scored B1.

In part (b) (ii) most students gained full marks. A few, however, calculated $1-\mathrm{P}(X \leqslant 6)$ rather than $1-\mathrm{P}(X \leqslant 5)$ and so lost both marks.

In part (c), most students were able to score marks at some point in the question. Many were able to state their hypotheses in terms of λ, but a few either did not write hypotheses or used no letter at all. The majority of students took a probability route rather than a critical region approach and most students scored M1A1. A few lost this mark as they incorrectly calculated $\mathrm{P}(X \geqslant 12)=1-\mathrm{P}(X \leqslant 12)$ rather than $\mathrm{P}(X \geqslant 12)=1-\mathrm{P}(X \leqslant 11)$ and so lost 2 marks. Most students could then give a correct non contextual statement consistent with their probability or critical region. Conclusions were generally well written with the required context.

In part (d), like part (c), most students were able to score marks at some point in the question. Many were able to state their hypotheses in terms of λ, but a few either did not write hypotheses or used no letter at all. The majority of students took a probability route rather than a critical region approach with varied degrees of success. N(36, 36) was often used but some students thought that N(6, 6) was appropriate and therefore lost the next 3 marks. Those students that used N(36, 36) often standardised correctly and usually with the correct continuity correction. However too many students failed to use a continuity correction at all. Most students could then give a correct non contextual statement consistent with their probability or critical region. Conclusions were generally well written with the required context.

Question 6

In part (a) most students were able to write a correct probability statement or a correct ratio of probabilities. The most common error seen was $\dfrac{\frac{1}{21}\left(\frac{k}{4}\right)^2}{\frac{1}{21}k^2}=\dfrac{\frac{k^2}{84}}{\frac{k^2}{21}}=\dfrac{1}{4}$

Part (b) was answered particularly well and most students scored full marks. The majority of students took the route of setting the line of the given cdf equal to each other. Those students that obtained an incorrect three term quadratic often failed to show their method for solving this quadratic. It is worth highlighting to students that when this happens, they will lose the M mark available for solving the three-term quadratic.

Part (c) was more challenging for students. Those that realised that the pdf was needed often scored well in this part of the question. The most common error seen was the use of F(y) instead of f(y) and in this case students scored 2 marks at best. It is worth highlighting to students that when they have an incorrect integral then substitution of limits should be shown.

Question 7

This was a 'show that question' and students should be encouraged to show full working if they want to achieve full marks.

In part (a) whilst many students were able to set up two equations, a number of common errors were seen. These included incorrect use of a continuity correction or no continuity correction, inconsistent z values or no z values used. As this was a 'show that question' students were expected to show their method for solving simultaneously. Some students with correct equations failed to show this and so lost the last 2 marks.

Part (b) was answered well by students with many scoring full marks. The most common error seen was for use of $np(1-p)=6$ rather than $np(1-p)=36$, which meant that students could score M1 only if they showed their method for solving simultaneously.

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