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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International A Level
In Statistics (WST02)

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General Introduction

The paper was accessible to all students but there were several places (Qu.2(e), Qu.3(a) and Qu.4(e)) where students struggled to translate the context into correct statistical processes/calculations. Whilst parts of all questions were accessible, only the most able students made full progress with the most demanding questions on the paper, Qu 4 and Qu 6. A large number of questions were left blank indicating that not all students were prepared for the entire syllabus.

Reports on Individual Questions

Question 1

This was a fairly accessible start to the paper for most students with nearly one-quarter achieving full marks here. Part (a) essentially tested knowledge from the WST01 syllabus so it was somewhat disappointing to see errors and incorrect or inaccurate z-values being used. Many students used values for z such as 1.64 or 1.645 in their standardisation which led to an acceptable answer of 200.3 but lost the first accuracy mark for not quoting a full 4-decimal place value from the tables. Students must be reminded to use the value in the table or a value with greater accuracy from their calculator which should be stated to at least 4 decimal places. A common error was to apply the continuity correction to 200 thus using 199.5 which gained zero marks. Another surprisingly common error was to have incompatible signs thus leading to an answer of 199.7

Parts (b) and (c) were more successfully answered with many students achieving full marks. Of those students writing down the correct distribution, B(8,0.05), most went on to use the correct expression $1 - P(X \leq 2)$. A common error was to use $1 - P(X \leq 3)$ instead. Others incorrectly attempted Poisson or Normal distributions and generally scored no marks. Performance in part (c) was very similar to part (b). A common error was to use the Normal distribution or use the expression $1 - P(X \leq 4)$.

Question 2

This question proved to be a good source of marks for many students with nearly two-thirds scoring 10 or more marks. In part (a), the required integration was generally carried out correctly and most students substituted the limits in to the integrated expression and equated it to 1. It should be reminded to the students as this is a 'show that' question they should show their full method clearly in order to gain full marks. Weaker students failed to multiply out the given expression for f(s) and made little progress.

In part (b) most students obtained a correct answer of 6, but many did not realise the symmetry. Instead of simply writing down the answer as directed in the question, pages of algebraic integration were often seen. Good progress was made in part (c) and many students gained 5 marks but virtually all lost the final mark as they did not multiply their standard deviation by 1000 to give their answer in the required units. Other common mistakes included only calculating $E(S^2)$ or forgetting to take the square root of their variance.

The standard of response in part (d) was not as high as previous parts of this question with many students not showing an understanding of how to use the probability density function to find the required probability. A large number of students worked out the wrong side of the probability and as such obtained 0.7. Some students worked out the cumulative density function but forget to work out the value of '+c' whilst others thought that it would be appropriate to use the Normal distribution here.

The number of marks in part (e) should have been a sign to students about the amount of working that was required. Many simply multiplied 12 by their answer to (d) and though that was sufficient. Some students did work out the correct probabilities and went on to multiply 1000 and 5000 but forget to add thus losing the final 2 marks. Even when $P(X=6)$ was found correctly, many had trouble finding $P(X \geq 7)$ and length calculations were often seen in place of using values from the tables.

Question 3

Overall students found this the second hardest question on the paper with only around 10% of students achieving full marks. Part (a) saw all of the usual errors, (e.g $1 - P(B \leq 10)$, $P(B = 9)$, $P(B \leq 10)$) with students often unable to translate the demand not being met into a correct probability statement. Most went on in part (b) to multiply their answer by 50 and earn at least the method mark in this part. In part (c), setting up the initial inequality proved difficult. Many understood the need to use Po(8) but often students found the lower tail probability instead of searching for the upper tail.

It was good to see that even students who struggled in the earlier parts of this question persevere and make some pleasing progress in part (d). Many were able to set up their hypotheses using correct notation and understand that a Normal approximation with mean = variance was required to carry out the test. Although most students attempted the continuity correction, the most common error was to use 95.5 instead of 94.5 in the standardisation. Other slips included forgetting to square root the variance for use in the standardisation or using a mean ≠ variance. Of those who correctly standardised, virtually all gave a correct conclusion in context.

Question 4

On the whole students found this question challenging, particularly the latter parts, and less than 10% of students earned full marks. Most were able to correctly obtain 15 in part (a) using a sketch or using a correct probability statement. Those who mistakenly thought $P(X < 6) = 0.6$ ended up with a common incorrect answer of 10 in this part. Part (b) caused little difficulty and most scored at least the method mark if not both marks. The best performance was seen in part (c) where students easily applied the formulae for mean and standard deviation from the continuous uniform distribution, though on some occasions they forget to square root and gave the variance instead.

Parts (d) and (e) were significantly more challenging. In part (d) many candidate believed $P(|Y - 4| < 2)$ to be two separate regions ($P(Y < 2)$ or $P(Y > 6)$) and added two probabilities. Some mistook the modulus sign for a conditional probability and inevitably scored no marks here. Part (e) was the most challenging part of the paper. Successful students drew a clear sketch and used areas to find the required probabilities. In part (e)(i) only a few students correctly placed the square at the centre of the screen. Some thought the area was 4cm^2 and others used ± 4cm for the side lengths resulting in a square with side lengths of 8cm. In part (e)(ii) only the most able students were able to identify the required area of the screen. Again, sketches are advised here as they greatly help simplify the problem.

Question 5

Question 5 tested fundamental techniques and understanding of the cumulative distribution and it was surprising to see such mixed performance. Nearly 30% of students achieved full marks demonstrating the ability to find k most efficiently by setting $4k(2y - 7) = 6$. Finding α was more challenging and many did not realise they could use the fact that the value of F(α) had to be the same at the end of the 2nd line and the start of the 3rd line. Some did not see that k cancelled out and attempted to solve rather complicated simultaneous equations. There were a number of responses that did not find α and did not make it clear how they knew which line of the cumulative distribution function to substitute 4.5 and 5.5 into. The majority of students did appreciate that F(5.5) – F(4.5) was required, though on some occasions the integration of F(y) was seen.

In part (b) most students were able to score at least the method mark for differentiating their cumulative distribution function. Some left things in terms of k and α (or followed through their values) so went on to score 2 marks in this part. It is still common to see the incorrect line '1 for $y > 6$' being given in the probability density function.

Question 6

Though a challenging question to finish off the paper, many students made good progress here and nearly one-quarter went on to achieve full marks. Equally so just over one-quarter of students made no progress here. For those who identified the correct Normal approximation to be used virtually all went on to achieve the first 5 marks for standardising and using the continuity correction. Even if students got the wrong values for the mean and variance most still picked up at least 2 method marks for using continuity correction with 49 or 50 and most of these then went on to gain another method mark for setting their standardisation to a z-vaule, $|z|=2.4$, though not always with compatible signs. Only the most competent students managed to construct a correct 3TQ and solve it correctly to reach the final required answer. Students are reminded to make all methods clear; in particular how they solved their quadratic equation as in many instances an additional method mark could have been scored. Some squared their quadratics resulting in an extra 'solution' being introduced. This needed to be rejected if found since.

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