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Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel International A-Level
Statistics 2
(WST02/01)

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Introduction

The question paper proved accessible to all the candidates but the latter parts of several questions such as 3, 4, 5 and 7(c) provided plenty of discrimination for the top grades.

Comments on individual questions

Question 1

Most candidates could use the Poisson distribution confidently, adjusting the mean and using a normal approximation accurately.
In part (a) some gave an answer of 10 and others $v > 11$ but there were many correct answers seen. Part (b) was probably the least well answered part with many candidates unable to interpret $\text{P}(4 \leqslant X \leqslant 11)$ correctly with $\text{P}(X \leqslant 11) - \text{P}(X \leqslant 4)$ leading to an answer of 0.7480 being far too common. In part (c) many indicated that they were using Po(1.5) but there were problems in dealing with the phrase "more than 1". Some got as far as $\text{P}(Y > 1)$ but this was sometimes followed by $1 - \text{P}(Y = 0)$. Part (d) was generally answered very well and it was encouraging to see the continuity correction being applied correctly too. A few used 79.5 and occasionally an 80 was seen but the majority secured all of the marks here.

Question 2

In part (a) most were able to write down an expression for $\text{P}(X = 3)$ but the interpretation of "...16 times the value of" seemed to cause problems for many candidates. In this part and also in part (b) a sizeable proportion of the candidates had the multiplier on the incorrect side of the equation. Sometimes we saw $\text{P}(X = 3) = 16\text{P}(X = 7)$ written down but even then the 16 later switched sides or disappeared altogether. A similar situation arose in part (b) but candidates were able to gain some credit for solving their equations. The responses to part (c) were usually more successful; the most common error was to confuse α with the standard deviation and give $\sqrt{19.2}$ as the final answer but there were many fully correct answers seen here.

Question 3

There were many fully correct solutions to this question but some candidates still find the concept of critical regions quite challenging. In part (a) only a few lost marks for writing their critical region as $\text{P}(X \geqslant 9)$ rather than $X \geqslant 9$ and occasionally candidates misinterpreted the test as a 2-tail test. Part (b) caused few problems and those who had a critical region in part (a) could usually give a correct conclusion in part (c). There were many good answers to part (d) too, some very brief and others finding the new critical regions to support their answers.

Question 4

In part (a) many wrote down "uniform" which was fine but some simply wrote "continuous" (without "uniform") or "standard". Part (b) was usually answered correctly and many made a promising start on part (c) finding $\text{P}(X > 6)$ as 0.2 but many failed to see the embedded binomial distribution and made no further progress. Part (d) was answered very well with most candidates demonstrating a clear understanding of the steps required to find a cumulative distribution function. Sadly they were less successful in part (e) with many forgetting to give sufficient values on their axes to show the scale effectively and some having an incorrect straight line. In part (f) some used the formulae in the formula booklet along with the rules for $\text{E}(X + a)$ and Var(X +

a) and this was often successful. Others tried to use integration but there was sometimes a mis-match between their integral limits and the value they were using for the mean.

Question 5

Part (a) was generally answered very well with most candidates listing all 9 ordered pairs but some of those who just listed the 6 different pairs ran into difficulties in part (b). The candidates' responses to part (b) were very mixed. Some never seemed to realise that $q + r + s = 1$ and often got lost in a sea of algebra. A good proportion of the candidates realised that $q^2 = \frac{1}{25}$ and were therefore able to find the value for *q*. A number went on to form a quadratic equation for *r*, based on P(M = 5), but the "2" was often missing or sign errors arose during their solution and so the correct value for *r* was not always reached. A surprising number used a similar method to form a quadratic equation for *s*, rather than using $q + r + s = 1$, but still over 40% of the candidates achieved full marks on this question.

Question 6

In part (a) most candidates chose to differentiate f(x) using the result that the mode was a turning point. This was a "show that" question and we expect candidates to provide a full and clearly explained solution. Some for example attempted to use "$\frac{-b}{2a}$" from the quadratic equation formula but simply writing down $1 = \frac{-a}{-2b}$ or $1 = \frac{a}{2b}$ with no explanation is not sufficient for a question of this type. Some candidates saw that f(2) – f(0) = 0 gave $a = 2b$ but did not, of course, score any marks!

In part (b) there was plenty of confident use of integration and a clear understanding that the area under the curve between 0 and 2 had to equal 1 and many reached $2a - \frac{8}{3}b = 1$ but some failed to use the result from part (a) and solve the simultaneous equations to complete this part. Part (c) was answered well with candidates showing a good understanding of the statistical properties of these functions and a sure grasp of the calculus techniques needed to arrive at the answer. There were a sizeable minority of candidates who simply found f(1.5) = $\frac{9}{16}$ and this was a common incorrect answer. Those who found F(1.5) = 0.844 in part (c) were often able to score both marks in part (d) but some failed to compare their answer to part (c) with 0.75. Some candidates formed a cubic equation for Q_3 and then, presumably using a calculator, solved it. Usually they were able to select the correct value and make a correct statement but such an approach was not what the examiners intended and obviously took a lot more time.

Question 7

In part (a) candidates who used $\sqrt{np(1-p)} = 1.44$ were usually able to score all the marks but a number simply wrote down $np(1 - p) = 1.44$ and were unable to answer either part correctly.

Most answered part (b) correctly and they usually identified $X \sim B(20, 0.04)$ as the distribution to use in part (c). The conditional probability caused problems for many candidates though and many failed to deal with this correctly. Some found P(X = 3) and often P(X …1) too but then they multiplied instead of dividing. Rounding errors caused a problem for some here too with answers of 0.0652 or 0.0654 often being seen. Part

(d) was often answered very well, with many candidates showing a clear understanding of the stages in a hypothesis test, others though still find this type of question challenging. A small minority of candidates used P(X = 10) failing to appreciate the central feature of probabilities in a hypothesis test. A number of candidates used a normal approximation which, with a value of p = 0.04, was clearly not appropriate: the basic criteria of large n and p close to 0.5 were clearly not known or applied. Others omitted some important feature: sometimes the hypotheses and occasionally the conclusion in context. Only a small minority used a two-tailed test and candidates are generally much better at determining this feature of the test from the wording in the question.

Grade Boundaries

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