A-LEVEL
Mathematics

MS2B – Statistics2B
Report on the Examination

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General

Students generally demonstrated a high level of competence in the various computational skills, although some rounded values early in their calculations. Where the first step is a subtraction of two similar numbers, as in questions 2 and 6, this can lead to effectively working to two, or even one, significant figures. The algebraic work was much less competently completed, often with steps omitted on the way to a given or known answer. There was much slackness in the use of brackets and in the details of integrations. Nearly all students seemed to have had adequate time to attempt all the questions to the best of their abilities.

Question 1

The calculation part was generally well handled, the main errors being in the use of a z-value or the wrong t-value. Part (b) proved surprisingly challenging. Although most students identified the correct value, answers covered the whole range from 0 to 30, and even beyond.

Question 2

Only a tiny minority ignored the request of part (a) and used the percentage values. Some felt it necessary to combine Wales and Northern Ireland, looking at the observed rather than the estimated values, but most did the correct calculation. The hypotheses were well stated and the conclusion was often clearly stated in context. Although the question specifically asked for only one comment in part (c) many felt obliged to say more and, often, additional incorrect comments could lose the mark. Students should appreciate that features worthy of comment are those making the largest contributions to X^2, in this case Scotland and Northern Ireland. To say that Wales was under-represented, when it could not have been closer to its expected value, shows a lack of appreciation of the underlying process.

Question 3

Most correctly identified the probability for one pod to contain 4 or fewer peas, but many stopped there. The majority correctly identified the two equations required in part (b)(i) and solved for a and b. Students should realise that it is not acceptable to use information from later in a question, in this case the value of the variance, to solve earlier parts. The evaluation of the variance was correctly shown by most, realising that the derivation of the $\mathrm{E}(X^2)$ value of 27.3 was required. The final part was well done, apart from those who gave the variance instead of the standard deviation.

Question 4

Considering that so much of this question covered book-work required by the specification, it was very poorly answered. The concept of a proof seemed alien to many students. Some simply stated "Because it is a rectangular distribution $k = b - a$." or started with "$^1/_k \times (b - a) = 1$" with no justification. Even amongst those who started with the area of the rectangle or the integral being equal to 1, the use of brackets was sporadic. By part (a)(ii), most had recognised the distribution and just stated the mean, as asked, but some wasted time deriving it by integration. Most started part (iii) well, but many seemed never to have seen the completion. In part (iv), most realised the formula that they were heading towards and contrived to get there, often despite, rather than because of, their working. Part (b) was well done, with wiser students abandoning their algebra in favour of the correct variance formula, thereby obtaining the right value for $\mathrm{E}(X)$.

Question 5

Most correctly stated values for the mean and variance but did not always tie these in to the Poisson distribution. Parts (b)(i) and (b)(ii) showed the common confusion over end values, and in part (b)(iii) many worked with a λ value of 6.4, instead of 3.2. Part (c) was well done.

Question 6

The hypotheses were generally well expressed in terms of μ, although some felt they must use words, often not clearly. The calculation of the test statistic was well done, but the critical value was frequently wrong, often being a z-value rather than t-value. The statement of the conclusion, in context, was poor. Many seem to think that the double negative "there is not significant evidence that the mean …. is not 20 …." is clumsy, so replace it with "there is significant evidence that the mean ….is 20…." as if that were the same thing. In part (b), many spoilt their attempt by using a value of 1.96, while others, having reached 20.756, rounded to 20.76. There were, on the other hand, some excellent answers to this whole question, showing a fine grasp of all the principles.

Question 7

Part (a) was generally well done, although in some cases the answer seemed to have been amended to $^4/_5$ to make it easier to fraudulently obtain the -16 in part (b)(i). Here, incorrect or total omission of limits led to many intricate incorrect ways of arriving at the given expression. Many students seemed not to recognise that part (a) had already asked them to find $\mathrm{F}(1)$, although not expressed as such. Part (b)(ii) allowed different routes to the solution, but despite the requirements of the question, many failed to mention the word 'median' and hence lost the explanation mark.

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