AQA

A-LEVEL
FURTHER MATHEMATICS

MS03 Statistics 3
Report on the Examination

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General

Almost all students sitting this paper were well versed in the topics examined. As a result, very few indeed achieved marks that did not warrant a grade, whereas a significant proportion achieved marks worthy of the highest grade. It was pleasing to see adequate working for final answers so the awarding of zero marks for unsubstantiated answers was a very rare event.

Question 1

This proved to be an initial confidence booster for most students with most scoring full marks. A small minority of students lost a couple of marks through omitting the factor of '2' when stating a formula for the confidence interval width or using an incorrect z-value.

Question 2

Again most students score full marks by stating "random" and then calculating the correct limits for the confidence interval. The usual rare error was to use other than $\sqrt{\frac{0.175\times 0.825}{400}}$ for the estimated standard error of $\hat{p}$.

Question 3

In part **(a)**, some students ignored "Use an exact test to ..." and so attempted a normal test so losing most, if not all, of the available marks. In part **(b)**, there were many correct solutions with the straightforward $z=\frac{348-400}{\sqrt{400}}$ more popular than the equivalent $z=\frac{6.96-8}{\sqrt{8/50}}$. Such is the power of modern calculators that one or two students actually quoted the value for $\mathrm{P}\left(X \leq 480 \,|\, \lambda = 400\right)$; something not prohibited by the question's wording.

Question 4

It was gratifying to see the large proportion of students who first drew a tree diagram or less frequently constructed a 2-way table; something encouraged in previous reports. As a result, all these students, and some others, scored highly in parts **(a)**, **(b)** and **(c)**.

Part **(d)**, which involved the double "does not", proved more challenging, particularly for those students working directly from the information provided.

Question 5

The overall standard of answers here showed a marked improvement over that achieved on similar questions in previous series. Thus it was not unusual to see a student score full marks. Where marks were lost, it was usually for premature approximation or, in part **(b)**, for using correlation instead of covariance.

Question 6

In part **(a)**, most students were clearly aware of what was needed but some derivations lacked sufficient clarity or accuracy.

Similarly in part **(b)**, similar uncertainties were in evidence when proving that $\mathrm{E}\left(Y\left(Y-1\right)\right)=\lambda^2$. A few students took the time and trouble to show that $\mathrm{E}\left(Y\right)=\lambda$, this despite the result been given in the question.

Almost all students correctly used $\mathrm{B}\left(50,\ 0.005\right)$ in part **(c)(i)**, and $\mathrm{Po}\left(1.25\right)$ in part **(c)(ii)**, although, in the latter, worthless attempts at a normal approximation was seen. In part **(c)(iii)**, most students realised that a normal approximation was needed but many used $\mathrm{N}\left(250,\ 250\right)$ instead of $\mathrm{N}\left(250,\ 248.75\right)$ and/or omitted the continuity correction. A minority used $\mathrm{Po}\left(250\right)$ for 3 marks.

Question 7

In part **(a)**, answers were much improved with an award of full marks not at all unusual. A minority of students lost marks for:

- using $\overline{X}$ and $\overline{Y}$ in hypotheses;
- calculating biased estimates of variances;
- pooling variances for a *t*-statistic; incorrect here as $\sigma_X^2 \neq \sigma_Y^2$.

In part **(b)**, students were required to evaluate their expressions to more than two decimal places and not just state "$= 1.68$". Students are now much better at calculating the power, or Type II error, of a test with the result that many completed the paper with 4/4 marks.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.
UMS conversion calculator