A-LEVEL

Mathematics

MS03 – Statistics 3
Report on the Examination

6360
June 2014

Version: 1.0

General

The generally high performances of the students sitting this paper showed clear evidence that they had been well prepared in the topics examined. Answers were usually clear and concise, and to a sensible level of accuracy with calculators and tables used appropriately. It was pleasing to see that most conclusions were not definitive but were phrased with regard to the percentage of the confidence interval or significance test.

Question 1

This first question was usually answered correctly. Most students knew the necessary formula in part (a) and took note of the emboldened **96%**. A small minority mixed numbers with proportions in their formulae which, of course, resulted in nonsensical confidence intervals. Answers to part (b) compared correctly 0.04 with the confidence interval from part (a).

Question 2

It was disappointing to see the number of students who in answering this question spoilt their otherwise correct solutions by squaring 0.5625 and 0.9025; surely the standard notation of $N(\mu, \sigma^2)$ should have been familiar? Save for this rather common error, solutions involved correct hypotheses, critical values and follow-through conclusions.

Question 3

Tree diagrams were drawn and labelled correctly with correct percentages or probabilities. Those students who displayed good practice by multiplying out the branch probabilities (some even checking that they totalled 1) were then well on the road to answering parts (b) and (c) successfully. Perhaps this good practice would be beneficial in future even if a tree diagram is not requested. Answers to parts (b)(i) and (iii) were invariably correct but, part (b)(ii) caused more difficulty. Most students made a worthwhile, if not fully correct, attempt at part (c), where they usually realised that the solution involved an expression of the form $\dfrac{6\left(p_1 \times p_2 \times p_3\right)}{\left(p_1 + p_2 + p_3\right)^3}$.

Question 4

Answers to part (a) were almost always completely correct with almost no students opting for the unnecessary pooling of sample variances. Answers to part (b)(i) usually included the phrase 'randomly selected' or equivalent. However in part (b)(ii), whilst 'large samples' was often stated or inferred, the consequential reference to 'Central Limit Theorem' was less so.

Question 5

Answers to this question were often very impressive, despite the fact that the information was given in a previously unseen form. In part (a)(i), most students evaluated $E(X)$ rather than indicate the symmetry of the distribution of X. In showing that $Var(X) = 0.9$, it was not sufficient to simply write $Var(X) = 16.9 – 16 = 0.9$ or an equivalent statement. Where an answer is given, adequate justification of working is required; here it was expected to see, as a minimum, $E(X^2) = 2^2 \times 0.5 +$ etc $= 16.9$ and hence $Var(X) = 16.9 – 16 = 0.9$. Correct answers to part (a)(ii) were the norm, though a small minority of students omitted the square root in the denominator of their evaluation of ρ_{XY}. Again in part (b), there were many fully correct answers. Where marks were lost, it was usually either for omitting $2Cov(X, Y)$ or, to a lesser extent, for using $Cov(X, Y)$.

Question 6

The better students scored the 2 marks in part (a). Others made generally valid attempts, often obtaining $\frac{2\sigma^2}{n}$ or $\frac{\sigma^2}{n_1}+\frac{\sigma^2}{n_2}$ both of which suggested the need for a more careful reading of the question. There were fewer correct answers to part (b), with 80 or 20 sometimes seen instead of 40. It was not unusual to see a candidate's answer to part (a) ignored in part (b), with $\sqrt{\frac{18.8}{n}}$, or even $\sqrt{\frac{37.6}{n^2}}$, replacing $\sqrt{\frac{37.6}{n}}$. Despite such errors, such students were able to accumulate up to 3 of the 5 marks available.

Question 7

Parts of this question proved a step too far for many students, though all 20 marks were awarded on one or two scripts. In answering part (a)(i), too many students fudged the final steps in their proofs by simply equating the sum of a series to λ or 1 without any justification and so lost a mark. However, most students scored the mark in part (a)(ii), even if their deduction was unnecessarily complicated. Those students who read carefully the request in part (b)(i), and so carried out an exact test, scored well; those who carried out an approximate normal test did not score well. Somewhat surprisingly in part (b)(ii)(A), some students opted for using $z=\frac{\frac{241}{20}-10}{\sqrt{\frac{10}{20}}}$ instead of $z=\frac{241-200}{\sqrt{200}}$. Whilst this was perfectly acceptable here, most then carried the method forward into part (b)(ii)(B) and did not find the critical value for the total number of faults — perhaps yet another example of careless reading of the question. This had a major knock-on effect in part (b)(ii)(C), though the more able students were able to carry through the use of 'average', rather than 'total', number of faults, sometimes even to a correct final answer.

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 www.aqa.org.uk/umsconversion