

Version



General Certificate of Education (A-level)
June 2011

Mathematics

MS04

(Specification 6360)

Statistics 4

Report on the Examination

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General

The improvement in the quality of work was maintained for a second year running. Good answers were produced, usually to the appropriate degree of accuracy, for all questions, so showing evidence of generally good preparation. Substantial attempts were made at all questions, indicating that there was sufficient time to work through the paper. Candidates continued to make good use of the new style answer booklet and had plenty of space for their solutions. Statistical tests and calculations were performed accurately and clearly. As last year, hypotheses were clearly stated. Similarly, comments after calculations were clear and relevant. Candidates continued to make good use of the appropriate formulae and tables in the booklet provided.

Question 1

This question was well done by the majority of candidates and so most of them got off to a good start on the paper. The majority stated hypotheses correctly. An occasional candidate forgot to square 0.3147 or 0.7 when calculating the test statistic. The number of degrees of freedom and the appropriate critical value were invariably correct, although the occasional candidate only had the upper critical value, which was redundant in this question. The conclusion was usually correct and in context.

Question 2

All candidates realised that this was paired data, which has not always been the case in previous papers. Most were able to find the confidence interval accurately. In part (b), only the rare candidate failed to state that the distribution of D was normal. The marks for part (c) were generally earned by making a correct comment comparing the value 5 with the confidence interval that had been obtained.

Question 3

The good level of performance exhibited thus far was maintained on this question. The candidates clearly had been well prepared. Part (a) posed no difficulties to candidates at this level. In part (b)(i) degrees of freedom were mostly correct and used in the correct order to obtain F -values from tables. Mostly, ratios were correct, so that many candidates obtained a correct confidence interval. Some comments made in part (b)(ii) referred to 0 rather than 1, causing the loss of 2 marks.

Question 4

This goodness-of-fit question was answered better than any other question on the paper, with many completely correct solutions. Almost all candidates scored all 4 marks in part (a). In part (b), a few candidates forgot to combine the first two classes, as the expected frequency in the first class fell below 5. Degrees of freedom and the critical value were mostly accurate, and a correct conclusion, referring to the null hypothesis, was stated.

Question 5

Answers to this question were rather mixed. Some candidates could do part (a) but not part (b), and others vice versa. Complete answers did appear, although rarely. Part (a) depended on the relevant bookwork being learned. In part (b), the answer to part (a) should have suggested to the candidate that the expected number of throws in the game was 6; 'something to prove is something to use' goes the old maxim. This should have led to the equation $6x - 10 = 1$. Some candidates successfully argued that £11 pounds was required from 6 games.

Question 6

The method marks in parts (a)(i) and (ii) were generally earned. Almost inevitably there were errors with signs, integration and use of logarithms, costing accuracy marks. Most candidates stated the correct probability in part (b)(i), but failed to recognise that it was needed in part (b)(ii)(A). The hope that 2 marks could be gained by writing down what was on the question paper was forlorn. Candidates needed to state that $P(T > t)$ was the

probability that 0 strikes occur in the interval $(0, t)$ and hence that $P(T < t) = F(t) = 1 - e^{-\frac{t}{\lambda}}$ for $t \geq 0$. Most candidates knew that they needed to differentiate F with respect to t in order to obtain $f(t)$, but some then forgot to state the distribution of T , which was asked for in the question.

Question 7

Despite not being able to write $E(T) = \theta$, or words to that effect, for part (a), the majority of candidates could find $E(T_1)$ and equate to μ in order to find the value of a in part (b)(i). Most could then find $\text{Var}(T_1)$ and $\text{Var}(T_2)$, although the occasional candidate did not realise that

$\text{Var}\left(\bar{X}\right)$ was $\frac{\sigma^2}{n}$, despite one of the answers being given on the paper. In part (b)(iii), the

majority of candidates were able to get the relative efficiency ratio correct and make an appropriate comment. If the fraction that they gave was the reciprocal of the correct fraction, and a consistent comment was made, then the final 2 marks could be earned by applying a follow through.

Mark Ranges and Award of Grades

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