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General Certificate of Education

Mathematics 6360

MS04 Statistics 4

Report on the Examination

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General

The overall standard of work was of a similar quality to that produced last year. Good answers were produced for all questions, showing evidence of generally sound preparation. Answers were given to the appropriate degree of accuracy so maintaining the pleasing improvement established last year. Those questions requiring a more mathematical insight still proved to be an area of difficulty for weaker candidates. On the other hand, there was often well-presented and highly accurate work on statistical tests for all topics. Candidates also continued to make good use of the appropriate formulae and tables in the booklet provided.

Question 1

The majority of candidates were very well-prepared for this question and so gained most of the marks available. On very rare occasions, a candidate found a confidence interval for the variance, thus losing the final mark in part (a). Those candidates who spoke about weather conditions or the load being carried by the aircraft gained the mark in part (b). Other sensible comments also gained this mark.

Question 2

The bookwork for part (a) was known by candidates and the series was summed correctly by a number of different methods. Likewise, most candidates could write down the answer to part (b)(i). In part (b)(ii), those candidates who summed the geometric progression were generally successful, but a number of those who tried to write down the appropriate power of $\frac{5}{6}$ gave the index as 5, rather than 6, and so lost all 3 marks. In part (b)(iii), most candidates had the general idea, but weaker candidates inevitably made errors with inequalities and logarithms. The index $r-1$, instead of r, also appeared, leading to an answer of 14 rather than 13. Those candidates who worked with equality and then gave the correct answer were not penalised.

Question 3

The work on this question was pleasingly accurate. Minor errors did occur in identifying the number of degrees of freedom and the corresponding t-value. A small number of candidates made a more serious error in their expression for the standard error. Those who did make mistakes in part (a) were still able to gain both marks in part (b) on a follow-through basis.

Question 4

Parts (a)(i) and (a)(ii) were answered correctly by the majority of candidates. The few errors that did occur usually involved finding the complement of the required probability. Part (a)(iii) caused major difficulties to many candidates. Nearly all such candidates did not divide by $\mathrm{P}(X > 120)$ and/or did not include all relevant probabilities in the numerator. In part (b), many candidates found difficulty in establishing the correct equation. However, some were able to earn a method mark for solving their equation using exponentials and logarithms correctly.

Question 5

This question was done extremely well and a number of candidates earned full marks. In part (a), sketches were mostly of the correct shape, but a sizeable number of candidates positioned 50 halfway between 0 and 75. This did not incur a penalty since only 2 marks were available. Those candidates who attempted to find the expected frequencies in part (b) by using areas of triangles and/or a trapezium were generally more successful than those who used integration. Some candidates whose expected frequencies were incorrect ended up combining classes and so reducing the number of degrees of freedom. A correct conclusion based on incorrect working earned a follow-through mark. In part (b)(ii), candidates often

mentioned 'combining classes' but did not then mention the effect that this had on the number of degrees of freedom. This was necessary in order to earn the second mark available.

Question 6

This question was also done well by many candidates with hypotheses generally stated correctly in both parts, as were conclusions, albeit sometimes via follow-through reasoning. In part (a), the common error was to only give the upper critical value of chi-squared. This meant that candidates had nothing with which to compare their test statistic and consequently they could not draw a conclusion. Part (b) produced few errors but some candidates slipped up with degrees of freedom and so ended up with the incorrect critical value of F.

Question 7

This proved to be by far the most challenging question on the paper. Nevertheless, completely correct solutions were presented. Whilst an initial mark was earned by many candidates in part (a)(i), the remainder could not complete the request since they seemed unaware of the required expression for $\mathrm{Var}\left(\bar{X}\right)$. Part (a)(ii) was the part of the question where some candidates were able to earn more marks. However, it was not always clear if they were talking about expectation as the expectation symbol E was often absent in their work. Those candidates who made progress in part (b) generally used the alternative method detailed in the mark scheme rather than making use of earlier results. Some errors occurred with multiplying expressions involving brackets and with obtaining correctly-signed terms.

Mark Ranges and Award of Grades

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