Version 1.0

**General Certificate of Education (A-level)**
**June 2012**

# Mathematics MS03

# (Specification 6360)

# Statistics 3

# *Report on the Examination*

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## General

It was pleasing to see a 40% increase in the number of students taking this paper as compared with the number in June 2011. The majority of students entered were well prepared for most of the topics examined, with the result that the overall performance was very much in line with the improved level seen in 2011.

In general students made appropriate use of their calculators and the supplied tables and usually provided sufficient detail of the methods used. However too many students showed no working in providing incorrect answers to parts (b)(ii) & (iii) of Question 6 and so, because of incorrect answers to some of part (a), lost all of the 7 marks available. Using only a calculator's in-built function to answer questions which were based on previous working was a particularly dangerous strategy.

## Question 1

This question provided a confident start for most students with many scoring full marks. Where this was not the case, it was usually due to incorrect hypotheses (eg. in $H_1$) or an incorrect critical value. Thankfully, fewer students than previously expressed the hypotheses in terms of $r$ instead of $\rho$.

## Question 2

This question also proved to be a confidence booster with many students again scoring full marks. Whist some hypotheses were in terms of $\bar{x}$ instead of $\mu$, most students stated the correct critical $z$-value and evaluated the correct $z$-statistic without pooling variances. Conclusions were usually stated appropriately as was a named characteristic in part (b).

## Question 3

Answers to this topic continued to show an improvement and it was not unusual to see students scoring at least 12 marks. In part (a), the most common error was to state $0.10$ as the answer to part (a)(i). It was then rare to find further incorrect answers in part (a). However part (b) proved to be more of a challenge. Some students ignored the fact that all 3 rooms were unoccupied. Of those students who obtained 3 correct individual probabilities ($p_1$, $p_2$ and $p_3$), many omitted a multiplier or used 3 instead of 6, whilst a few others evaluated $(p_1 + p_2 + p_3)^6$ or $\left(p_1^3 + p_2^3 + p_3^3\right)$.

## Question 4

Most students had no real idea as to what was required here and so scored minimal marks at best. The most common incorrect approach was to consider a test for the difference between two Poisson means based on $2.6$ and $2.752$ instead of a test for $\lambda > 2.6$ (or $650$) based upon $\hat{\lambda} = 2.752$ (or $688$). Teachers may wish to note that, here as an example, using $z = \dfrac{688 - 650}{\sqrt{650}}$ instead of $z = \dfrac{2.752 - 2.6}{\sqrt{\dfrac{2.6}{250}}}$ often gives students a better chance of success! As a result of the aforementioned incorrect approach, students were often restricted to a total of at most 3 marks; for the two hypotheses (in terms of 2 means was accepted), the correct $z$-value and the use of $2.752$ or $688$.

## Question 5

Answers to this question, particularly in part (a), were generally good. The only mistake of note in part (a) was to ignore the emboldened word '**percentage**' and so forfeit one mark. In part (b), most students knew what was required but a minority could not solve the resultant inequality/equality for $n$.

## Question 6

Overall, answers to this question showed an improvement over comparable questions on previous papers. In part (a)(i), all but the better students failed to allow correctly for the fact that $\rho_{UV} = -0.6$ and so stated that $\text{Var}(M) = 45$. Answers to part (a)(ii) were better since $\rho_{UW} = 0$. Students scored the 2 marks in part (a)(iii) due to the acceptance of follow-through answers. Far too many students determined a non-zero answer to part (b)(i) which was AS material. Correct answers were seen to parts (b)(ii) & (iii) with or without working. However, as mentioned earlier, those students who simply stated incorrect answers scored 0 out of 7 marks as did the small minority who attempted continuity corrections.

## Question 7

This final question proved very challenging to all but the best students. In answering part (a)(i), there were some fudged/incomplete proofs. However, answers to part (a)(ii) were usually sufficiently convincing to be awarded the 2 marks. Correct, or even sensible attempts, at part (b)(ii) were reserved for the best students often due to an apparent lack of algebraic knowledge and related manipulative skill. This did not prevent such students from scoring at least 2, and often 3, marks in answering part (b)(ii). In part (c), strong students scored all 3 marks whilst others often scored one mark for identifying $\text{Po}(3.8)$ but could then not use parts (b)(i) & (ii) to identify that $k = 3$.

## Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website. UMS conversion calculator www.aqa.org.uk/umsconversion