Version : 1.0 0607

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MS03 Statistics 3

Report on the Examination

2007 examination - June series

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX
Dr Michael Cresswell Director General.

General

Overall, candidates found this paper more challenging than last year's initial paper. Whilst no question appeared to catch a significant proportion of candidates unawares, only a small minority were apparently capable of scoring high marks across all seven questions.

Centres' attention is drawn in particular to making clear to candidates the difference in context between the variance of $\sum_{i=1}^{n} X_i$ and that of nX (question 5), and to encourage candidates to first refer to Tables 1 or 2 before opting for approximations in hypothesis tests (question 7).

Question 1

In part (a), many candidates indicated that the necessary assumption was 'normally distributed'. Given the large sample sizes, this was unnecessary. However, the samples did need to be 'independent' or 'random'. Most constructions of the confidence interval were essentially correct but spoilt at times by numerical errors. In part (b), many candidates appeared to have forgotten their relevant knowledge gained in MS1 and MS2 and so wrote statements such as 'large difference in salaries' or '98% of salaries are included in the confidence interval'. Thus the expected reference as to whether their confidence interval included zero was rare indeed.

Question 2

A minority of candidates apparently ignored the preliminary explanations and treated the given table as a simple 2-way frequency table, as might be found on an MS1 paper. A significant proportion of the remaining candidates quoted (0.85×0.25) as their answer to part (a), apparently ignoring the second paragraph of the question. However, these and many others then proceeded to gain most of, if not all, the marks available for answering parts (b), (c) and (d).

Question 3

In part (a), hypotheses too frequently involved $\hat{p}$, or even μ, rather than p. Approximately 50% of candidates lost the 2 marks available for pooling the two sample proportions but then often scored the remaining 5 marks for calculating a *z*-value and stating a conclusion in context. However, the small minority of candidates who first evaluated the sample proportions as $\frac{28}{150}$ and $\frac{34}{250}$ forfeited more than 2 marks. It was indeed rare to see a worthwhile attempt at part (b). The vast majority of candidates simply stated 0.05, and explained this as being the result of changing the stated significance level percentage into a probability.

Question 4

Centres are to be congratulated on their candidates' many fully correct answers to this question. Where marks were lost, it was usually for omitting the factor 2 in the formula for the confidence interval width or, less frequently, for deducing that 67.9 was 75 to the nearest 5.

Question 5

Almost all candidates recognised that the distribution of $\sum^{3} X_i - \sum^{2} Y_j$ was required, though this was often incorrectly expressed as $3X - 2Y$. Most of the candidates using the latter then fell into the trap of evaluating the variance as $3^2\mathrm{Var}(X) + 2^2\mathrm{Var}(Y)$, rather than $3\mathrm{Var}(X) + 2\mathrm{Var}(Y)$, and so lost at least 3 of the 7 marks available.

Question 6

Answers to part (a) were generally sound. In part (a)(i), some proofs were somewhat short on detail and so lacked conviction for full marks. Answers to parts (a)(ii) and (iii) usually scored full marks. In part (a)(iv), a small minority of candidates used $\mathrm{N}(3, 3)$ or even $\mathrm{N}(30, 30)$, the latter by apparently equating 300×0.01 to 30. Of the many candidates who opted correctly for $\mathrm{Po}(3)$, a small number incorrectly equated $\mathrm{P}(X > 2)$ to $1 - \mathrm{P}(X \leq 1)$.

In part (b), the only mistake of note was the misuse (250.5) or non-use (250) of the continuity correction. Centres may wish to note that, for a normal approximation to a binomial distribution, candidates are usually more successful by considering the distribution of X rather than that of $\hat{p}$.

Question 7

In part (a), candidates were expected to use an 'exact' test since Table 2 tabulates $\mathrm{P}(X \leq x \mid \lambda = 13)$. Those who did often scored full marks whereas those who attempted a normal approximation sometimes introduced further inaccuracies. Only the best candidates, usually those who used an exact test in part (a), scored marks in part (b). The same candidates often then scored well in part (c). Those candidates determined to use a normal approximation at all costs usually opted for $\mathrm{N}(6.5, 6.5)$ or even $\mathrm{N}(6.5, 13)$, neither of which was accepted.

Mark Ranges and Award of Grades

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