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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360
Statistics 6380

MS/SS1A Statistics 1A

Report on the Examination

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General

It is pleasing to report that, on average, the standard of achievement, as measured by marks gained, was slightly higher than on recent papers. Whilst only a very small percentage of candidates gained minimal marks, it was somewhat disappointing that the number of candidates achieving very high marks was also small. As a result the spread of marks achieved was considerably less than on previous papers. Also, there was a marked decrease in the proportion of candidates failing to score at least a gradable mark, coupled with a small increase in the proportion gaining the highest grade.

In general, candidates appeared well-prepared for the topics examined, particularly as regards those parts of questions that required calculations. As previously, those parts that required interpretation or comment proved much more challenging to most candidates. Questions 1, 2, 3(a) and 4 were the prime source of marks for average candidates who invariably found Questions 5 and 6 more difficult.

Most candidates provided sufficient evidence of working to permit the awarding of method marks even when an answer was numerically incorrect. The minority of candidates who attempted to maximise the use their calculators' statistical inbuilt functions to determine normal and binomial probabilities and to construct confidence intervals often needed to take greater care in simply quoting answers. Thus, for example, in Question 1, candidates who quoted $\Phi(z)$ rather than $1 - \Phi(z)$ and/or, in Question 6, quoted $\mathrm{P}(X \leq x)$ rather than $\mathrm{P}(X < x)$ lost most, if not all, of the available marks. The use of the supplied booklet as a source of tables and, to a lesser extent, formulae was generally very sound.

Question 1

Almost, without exception, candidates scored the first 3 marks. In part (b), it was all too common to see the answer 0.03 instead of 0.97; a loss of 2 marks. This error was invariably compounded in part (c) where incorrect reasoning of '(a) minus (b)', instead of '{(a) minus (1 – (b))}', resulted in the correct answer but a loss of a further 2 marks.

Question 2

Answers to part (a) were often fully correct with most candidates capable of applying the general multiplication law and the addition law for mutually exclusive events. Answers to part (b) were much less impressive. Whilst most candidates clearly had some notion of what was needed, their attempts were only partially correct. All too often such answers were the evaluation of $\binom{4}{3}(0.68)^3(0.32)$ or $(0.68)^3(0.105)$.

Question 3

Most candidates ignored the request for a necessary assumption in part (a)(i) or stated that 'Volumes', or 'The sample' or even 'They' were normally distributed. An answer needed to indicate that the 60 containers were '*A random sample*' or were '*Selected independently*' or were '*Representative*'. Construction of the confidence interval was almost invariably correct. However teachers should note that, from page 12 of the supplied booklet, s^2 is an unbiased estimate of variance and so no 'correction' to s was required; but this was not penalised here.

In part (a)(ii), many candidates' answers revealed confusion between mean volume (confidence interval) and the volumes (10 litres) of individual containers. Such confusion was not helped by definitive statements. However marks were awarded for reasonable comments. In answering part (b), most candidates stated the equivalent of 'Yes as $n > 30$' when, in fact, the reason was that there was no indication that volumes were normally distributed. If there had been such an

indication, then the Central Limit Theorem would not have been needed. Of course, the Central Limit Theorem does not result in the sample data being normally distributed, as was stated by a significant number of candidates.

Question 4

Answers to parts (a), (b), (c) and (d)(i) were usually faultless. As a consequence, the great majority of candidates scored 10, or almost 10, marks. Most candidates used the relevant statistical functions on their calculators accurately and to maximum effect. However, almost no candidates scored marks in answering part (d)(ii). The usual answers stated were 'Reliable as interpolation' or 'Reliable as estimating the value from my graph is same as the value calculated from my equation'. Candidates were expected to consider the scatter or residuals, in real or relative terms, of the 10 points about the fitted line.

Question 5

Whilst answers here revealed an improvement in general standard over those to similar questions on previous papers, there is still room for improvement. Most candidates stated the correct value for the median but fewer were able to determine the $\text{IQR as } 4 - 1 = 3$. It was not unusual to see $285.75 - 95.25 = 190.5 \Rightarrow \text{IQR} = 2$. Correct values for the mean and standard deviation usually resulted directly from calculators but a minority of candidates stated, for example, $\bar{x} = \frac{380}{10} = 38$ revealing a total lack of understanding of both the data and the context.
In answering part (b), where marks depended on approximately correct relevant answers to part (a), too many candidates failed to state overall conclusions for comparisons of average and spread as was requested. Simply comparing their four answers from part (a) with those of Jole and Katie was not sufficient.

Question 6

In part (a), most candidates realised that $\text{B}(50, 0.08)$ probabilities were required and so used the booklet provided. However, a significant proportion evaluated $\text{P}(X \geq x)$ as $1 - \text{P}(X \leq x)$ rather than $1 - \text{P}(X \leq x - 1)$ and so obtained incorrect answers. In part (b)(i), many candidates obtained correctly 0.684 from $(0.975)^{15}$ but then, for some unknown reason, some attempted part (b)(ii) as $1 - \text{P}(X \leq 1)$ by interpolation from $\text{B}(15, 0.02)$ and $\text{B}(15, 0.03)$, when all that was needed was $1 - 0.684 = 0.316$.

In part (c), many candidates recognised the need for {(a)(ii) $\times$ (b)(i)} but not for {(a)(i) $\times$ (b)(ii)}. However, it was most pleasing to see that a significant number of candidates were able to score full marks on this question.

Coursework Component

- A number of scripts had little marking on them or were marked in pencil. Centres should ensure that scripts are marked in red pen and that calculations are checked for accuracy (and indicated as such on the scripts).
- All Candidate Record Forms must be signed by the candidate and the teacher responsible for the assessment of the script.
- Please ensure that all work is dispatched using appropriate AQA stationery.

- In 'other areas of work' candidates should quote other tasks ***not specific to or modifications of their task,*** which would use similar skills and techniques which were used in their task.

There was some good work seen, but there was a tendency for the highest scoring scripts to be over-marked. This was usually caused by the discussion of the sampling being too brief, along with a lack of depth in the interpretation strand. In tasks involving regression some of the variables being linked were statistically questionable. The use of football statistics for regression can be difficult and is probably best avoided as a task.

Mark Ranges and Award of Grades

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