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Mathematics MS/SS1A

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Statistics 1A

Report on the Examination

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Written Component

General

The vast majority of candidates were able to make at least worthwhile attempts at the first three questions, with many stronger candidates scoring almost all of the 34 marks. However, questions 4, 5 and 6 proved much more of a challenge, with weaker candidates scoring very few of the 34 marks. As a result, there were few very weak scripts (< 20 marks) and also very few strong scripts (> 50 marks).

In general, candidates showed sufficient working to allow some method marks to be awarded for incorrect numerical answers and, at the same time, made appropriate use of their calculators and the supplied blue booklet of formulae and statistical tables.

As has been the case on previous papers, candidates made much better attempts at numerical work than at parts that required discursive answers. This weakness was particularly noticeable in question 5 and parts of question 6. In particular, future candidates should be advised that 'it' is rarely, if ever, an acceptable descriptor when making a comment or interpretation.

Question 1

This first question proved a good source of marks for almost all candidates; clearly they had a very sound grasp of the applications of binomial distributions. By far the most common approach in part (a) was to use the formula in part (a)(i) and then tables in parts (a)(ii) and (a)(iii). In part (a)(iii), the usual confusions sometimes arose as to whether to use the values for x = 9 or 10 or for x = 4, 5 or 6. In part (b), the only noticeable error was to evaluate $(32 \times 0.15 \times 0.85)$ as 4.08 but then not take the square root; a loss of 1 mark.

Question 2

Most candidates scored well on this question involving normal distributions, with full marks often achieved in part (a). However, weaker candidates lost 2 marks in part (a)(ii) for calculating $\mathrm{P}(X < 2000)$ as 0.106. Most such candidates then lost a further 2 marks in part (a)(iii) by evaluating [(i) – (ii)] since, whilst this gave the correct answer of 0.864, it was the result of two errors. Answers to part (b) showed a marked improvement over similar questions on previous papers with the result that many candidates scored full marks. Where this was not the case, it was usually through equating $\frac{1000-1125}{\sigma}$ to +1.2816 and then trying surreptitiously to lose the negative sign attached to σ; a loss of 1 mark.

Question 3

This question on regression was a good source of marks for most, if not all, candidates. They invariably scored all 5 marks in part (a), through accurate use of their calculators' regression functions. Interpretations in part (b) were somewhat less impressive. Whilst most candidates identified a = 5.35 as the calorific value for dry wood, many fewer could interpret fully the value of b = –0.758. The usual partially correct interpretations were 'negative correlation' or 'as moisture increases, calorific value decreases'. Answers to part (c) were usually correct but the same cannot be said in relation to part (d). Many candidates gave an answer of +0.2 instead of –0.2, a loss of 1 mark, whilst others attempted to find a value of x or even the PMCC , r. The majority of candidates indicated 'accurate' in part (e) but some answers stated 'likely' and/or involved very strange reasoning.

Question 4

This probability question unexpectedly proved a major or even unachievable challenge to many candidates since they appeared to have no real grasp of a scenario involving two non-mutually exclusive events but instead considered them to be independent events. As a result, common worthless answers to part (a) were: $0.15 \times 0.40 = 0.06 \approx 0.10$; $(0.85 \times 0.40) + (0.15 \times 0.60) + 0.55 = 0.98$; (iii) $(0.85 \times 0.40) + (0.15 \times 0.60) = 0.43$. Centres are reminded that the addition law for two non-mutually exclusive events is part of the specification. Those better prepared candidates who were able to construct a correct 2 × 2 table or draw a correct Venn diagram, scored at least 3 and often all 5 marks. Those candidates scoring few, if any, marks in part (a), faired a little better in part (b) since they were often able to score the 2 marks in part (b)(i) and then one further mark in part (b)(ii) for 0.55×0.70. This expression was often accompanied by several incorrect expressions each the product of three probabilities (independence again). The best candidates who scored full or nearly full marks in part (a) usually followed this by a similar impressive performance in part (b), where some very succinct and elegant solutions were seen to part (b)(ii).

Question 5

Many answers to this question scored no marks and suggested that such candidates, despite completing a piece of coursework, had little experience of assessing the likely accuracy of calculations. A small minority of candidates recognised that 151.5 cm was approximately 1.5 m and so Ashley's mean value was likely to be correct. However, only the few very best candidates realised that the standard deviation would be $\frac{2 \times 10}{4} \approx 5 \text{ cm}$ (a property of a normal distribution) so that 26.6 cm was likely to be incorrect. Common worthless attempts were to simply compare 26.6 cm with 10 cm or to attempt a standardisation of 151.5 using 150 and 26.6 or 10.

Question 6

Most candidates found all but part (b)(ii) of this question very challenging. In part (a), the common incorrect answers were verbose about university salaries or simply that 24.0 was too large when compared to 45.8. Even those candidates who calculated, for example $(45.8 - 2 \times 24.0)$, simply stated that a normal distribution, instead of salaries, could not take negative values. Answers to part (b)(i) were slightly better with candidates indicating a 'large sample' so 'Central Limit Theorem applied'. Some candidates lost both marks for 'if sample is large' whilst others lost a mark for suggesting that other than the sample mean could be assumed to be normally distributed. There were many correct answers to part (b)(ii) though some candidates lost marks for multiplying 24.0 by some combination of n and $(n - 1)$ or for an incorrect z-value. In answering part (c), a majority of candidates attempted the comparison of 55 with their CI or UCL. However, far too many then did the same with 60 rather than compare $\frac{6}{50} = 12\%$ with 25%. This perhaps suggested that they had not read the question with sufficient care.

Coursework Component

The administration for this series was good, and no addition errors in the samples moderated were noted.

The work seen was of a good standard and generally appropriately assessed, although there was a tendency to mark on the lenient side. Please note the comments on feedback forms alluding to samples being 'just within tolerance', as further drifting in standards could lead to an adjustment of the centre's marks.

The approach taken by candidates to the tasks set was appropriate and there was some good work on comparing confidence intervals, in particular looking for overlap and the interpretation of these overlaps. It is important that candidates display a high standard of statistical techniques in their analysis and interpretation to achieve the highest marks for 'depth and difficulty' in strand 4 of the assessment grid.

Internal moderation remains an important part of the responsibility of centres and it may be that some sharing of good practice of what should be marked on scripts would facilitate the process of moderation of the scripts. In particular, a signpost of 'checked' for checked calculations would be useful.

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