AS
MATHEMATICS

MS1B Statistics 1B
Report on the Examination

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General

Most students were generally well prepared for this paper. This resulted in a similar overall level of performance to that established over previous series. However, as usual, many students found calculations more accessible than comments and interpretations. Students made good use of the supplied booklet and some relied more heavily than previously on their calculators' statistical functions, usually successfully. Many students needed to read the questions more carefully and, in particular, to note both general and specific accuracy requirements, something that too many ignored at some cost. Similarly, other students would have benefitted from a quick assessment of the likely sense of their numerical answers or by not leaving multiple non-crossed out attempts.

Question 1

In part (a), most students were able to find values of b and a correctly to within the required accuracy tolerances, although some students, who had found the former correctly, were then unable to find the value of a. Some students attempted to find a value for r by concocting a value for S_{yy}. Almost all students gave a correct estimate in part (b)(i), but many explanations in part (b)(ii) lacked clarity. Students were required to compare 4 m or 400 cm to the observed dropped heights of 25 cm to 300cm. Statements such as

- extrapolation
- above/outside observed heights (x or y?)
- terminal velocity reached

did not score the mark.

Question 2

Most students had the correct form for the confidence interval, with use of an incorrect z-value being the most common error. A small minority were penalised for using their calculated sample standard deviation of 9.98 instead of 7.5. A significant proportion of students provided no assumptions and, for those who did, a mark for "random sample" was much more common than "normal distribution" since the latter usually referred to the sample instead of the (population of) durations. Other incorrect stated assumptions were "CLT" or "small sample". Answers to part (b) were much improved with many students stating that 25, instead of "it", "this" or "mean", was within the confidence interval. Those students who hedged their bets, due to 25 being towards the upper confidence limit, were penalised.

Question 3

In part (a), most students used correct midpoints and their calculators' function to state a correct value for the mean but far too many simply quoted the value for the standard deviation as the variance. Those students who ignored the frequencies and simply worked with midpoints scored minimal marks for the whole question. Correct answers in part (a) were usually followed by correct answers in part (b) and for the mean in part (c). The requirement for a linear scaling involving division of variance was beyond many students, with division of variance by 30.48 being the most common error.

Question 4

Whilst finding the correct value of r directly from calculators was by far the more common method, some students had been taught to use the formulae, pleasingly with more success than in previous series. Most students score the two marks in part (b), one for "moderate negative correlation" and one for the context. When a mark was lost, it was usually for “moderately strong negative correlation” or adding a qualifier to “moderate” and rarely for using x and y. Although many students realised that Howard’s claim was wrong, very few students were able to justify this in terms of positive versus negative correlation. All too often, students attempted to compare, in great detail, the given pairs of values to no real effect and thus gained no reward.

Question 5

There were many fully correct answers to part (a) with a minority of students showing no working whatsoever. Errors seen included:

- lengthy calculations in part (ii), only rarely leading to an answer of 1
- no area change in part (iii)
- use of incorrect x-values (eg 103 and/or 107) in part (iv).

A wide range of answers was seen in part (b)(i). Many students correctly used $z = -1.645$, but too many nonsensical z-values were seen, such as $z = 1.645$ or $z = 0.51994$. In part (b)(ii)(A) far too many students introduced an inaccuracy by calculating $\mathrm{P}(Y > 150)$ from scratch rather from the given $\mathrm{P}(Y < 150) = 0.05$. Incorrect answers in part (b)(i) usually had a severe knock-on effect in part (b)(ii)(B), but otherwise attempts were very sound.

Question 6

Most students scored one mark in each of the three parts of part (a) for multiplying three probabilities, but many then lost up to four marks for omitting or using incorrect multipliers. Better students were often fully successful in part (b) and the level of success in calculating the conditional probability in part (b)(ii) was particularly pleasing. In each of parts (b)(i) and (ii), a variety of methods, all used with equal success, were in evidence:

- statements involving combinations of probabilities
- tree diagrams
- two-way tables.

Question 7

Notation used by students suggested that the proportion using a binomial facility on their calculators had increased on previous years and that their ability to do so correctly had improved. Nevertheless, use of supplied tables remained the more common approach. Having said this, part (a)(i) was answered well usually using the binomial formula rather than tables. Parts (a)(ii) and (iii) produced the usual array of errors when interpreting the words ‘fewer’, ‘at least’ and ‘at most’. Working suggested that most students knew the process required but the frequent use of incorrect x-values in tables or on calculators resulted in wrong answers. Part (a)(iv) caused more difficulty with $\mathrm{P}(X > 7.5)$ often been evaluated as $1 - \mathrm{P}(X \le 8)$ or even as $\frac{1}{2}\left(\mathrm{P}(X > 7) + \mathrm{P}(X > 8)\right)$. In attempting part (b)(i), almost all students stated $np = 16$ but were then fairly equally divided between those who stated $np(1-p) = 2.4$ and those who correctly stated $np(1-p) = 2.4^2$. Not surprisingly, the former made little progress here, and none in part (b)(ii), whereas the latter were almost always able to solve the two equations for full marks. The majority of students with $\mathrm{B}(25,\ 0.64)$ provided a correct answer in part (b)(ii), but a minority scored no marks for an unsupported answer given to three decimal places instead of three significant figures.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.
UMS conversion calculator