A-LEVEL

Mathematics

MS1B – Statistics1B

Report on the Examination

6360

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General

The general level of attainment on this paper was somewhat higher than that on the corresponding papers of recent series. This, in part, was probably a result of longer (no January 2014 series), and therefore better, preparation. It was possibly also due to a smaller number of overall marks allocated to comments and interpretations that involved similar responses to those on previous papers albeit in different contexts.

Most students produced adequate justifications in their solutions, with few opting for statistics functions on their calculators beyond those expected for calculating correlation and regression coefficients, means, and variances. The use of formulae and tables from the supplied booklet was in evidence with few students apparently hindered through a lack of knowledge of the information in the booklet.

As detailed in the July 2013 report, far too many students penalised themselves unnecessarily, perhaps often at the expense of a grade, through inabilities in simple algebra, arithmetic manipulation, evaluation of values and in levels of accuracy.

Question 1

This was a high scoring question for many students. In part (a)(i), it was rare not to see 71 quoted for the mode, but too often the range was quoted as $8 – 1 = 7$. Again in part (a)(ii), answers were often correct though with little or no working, suggesting use of calculators. A common incorrect answer for the median was 70.5, found by ignoring the frequencies. Surprisingly, this was often accompanied by correct derivations of the interquartile range. The majority of students who used the statistics functions on their calculators scored full marks in part (a)(iii), but those attempting the long-hand approach frequently had errors. The weakest students often came to grief here by working with either only x-values or, even worse, only f-values. In part (b), many students correctly subtracted 60 from their mean in part (a)(iii) and left their standard deviation unchanged. Despite the word ‘state’ in the question, lengthy renewed calculations were too much in evidence and, whilst this method often scored the 2 marks available, it did waste valuable time.

Question 2

Students scored across almost the full range of marks on this question. The weakest students simply used the x-values as z-values throughout part (a) for no reward, but most others scored at least the marks in part (a)(i). In part (a)(ii), many students found the area as 0.067, instead of 0.933 — perhaps a sketch would have shown this mistake — and this followed through in to part (a)(iii) where, in such cases, the use of (i) – (ii) = 0.774 gained no marks as the answer here involved the equivalent of [(i) – (1 – (ii))]. Some students, having found the correct answers in parts (i) and (ii), then answered part (iii) as (ii) – (i). Common incorrect answers to part (iv) were 0, 0.5 or a lengthy worthless calculation. In part (b), a significant minority of students scored no marks for treating 0.98 as a z-value. Of those who identified the corresponding z-value, about half failed to realise that it needed to be negative. These students often realised their error at the final step and usually then fudged their answers. Full marks required correct consistent signs throughout.

Question 3

Evidence from previous series has shown that students are usually much more confident at answering probability questions based on a given 2-way table than those based on combinations of probabilities; this evidence was reinforced here. However, it should be noted that many students lost a mark in part (a) for ignoring the emboldened instruction '**to three decimal places**'. Common examples that forfeited a mark were fractional answers, 0.0320 and 0.290.

Whilst many students scored well in part (a), other common more serious errors were

- assuming independence and so multiplying two probabilities in part (ii)
- not taking note of 'not both' in part (iii)
- providing switched answers in parts (iii) and (iv).

The awarding of full marks in part (b) was very rare. Those students who considered 'with replacement' scored no marks as did those who decided that addition, rather than multiplication, was the way forward. Of the many students who considered 'without replacement', the majority multiplied a correct expression, worth 2 marks, by either 1 or 6 instead of 3; the use of 6 perhaps suggested a blind repetition of the multiplier needed on previous papers.

Question 4

Scoring 6 of the 7 marks available on this question was very common. The majority of students used their calculator's correlation functions to obtain the correct answer in part (a)(i), evidencing accurate data input. However, some students calculated the value of r by use of a formula, although, pleasingly, correct answers often resulted. In part (a)(ii), almost all students were aware that the value of r remained unchanged, but only a small minority referenced 'linear' in their reasons. Most students scored both marks in part (b) by using the phrase 'strong positive correlation' and then making the required reference to the context.

Question 5

Answers to this question were very inconsistent. Whilst many students scored full marks, equally many scored very few marks, often through working with incorrect values of p. In part (a)(i), some students used 0.10 instead of 0.18, and far too many of those using 0.18 could not subtract the value from 1 correctly; 0.72 was common. In parts (a)(ii) to (a)(iv), most students used tables, though others used their calculator's cumulative binomial functions, often less successfully. The usual problems of translating phrases into inequalities were often compounded by incorrect values of p, with 0.25 regularly used instead of 0.35 in part (a)(iii). Most students were aware of the need to use np and npq in part (b), but the use of an incorrect value for p and, less frequently, for n were too prevalent. Some students found values for 'one' and 'two' separately and then added their results, which worked for the mean but not for the variance.

Question 6

Answers to part (a)(i) suggested that many students had first answered part (a)(ii), as 14.9 was seen almost as often as 15. The calculations of a and b, usually directly from calculators, were generally correct, though too many students did not provide sufficient accuracy. Rounding –0.029 to –0.03 and, less in evidence, 14.9 to 15 was deemed too severe and so lost accuracy marks here and in later parts. Those students who attempted the long-hand approach invariably produced inaccurate answers. In part (a)(iii), most students realised that 'as x increased then y decreased' but few gave the required detail to score both marks. In fact, here and later in the question, there was evidence that some students had clearly not read the question's stem carefully as their comments related to swimming mammals. Use of the regression equation in part (b) was sound even when at times inaccurate. In part (c)(i), most students mentioned or inferred 'extrapolation' and so scored the mark. However, in part (c)(ii), statements of 'negative depth' without an accurate numerical justification scored no marks. Additionally, replacing 'depth' by 'length' was not acceptable.

Question 7

Few students were able to give a numerical justification in part (a)(i) with many responses describing people's different washing habits, usually individually but sometimes in pairs. Whilst answers to part (a)(ii) were slightly better, many students, who correctly identified 'large sample', then failed to link this to the Central Limit Theorem. Answers to part (b)(i) were very impressive with full marks the norm. Occasional errors were usually as a result of an incorrect z-value. The comments in part (b)(ii) were again disappointing, particularly as it required a standard interpretation following the calculation of a confidence interval. Failure to clearly compare 140 with a confidence interval or the use of the word 'it' frequently lost both marks.

Mark Ranges and Award of Grades

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

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UMS conversion calculator www.aqa.org.uk/umsconversion