A-LEVEL

Mathematics

MS1A – Statistics 1A

Report on the Examination

6360
June 2014

Version: 1.0

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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.

Question 1

The majority of students who used the statistics functions on their calculators scored full marks in part (a), 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) and left their standard deviation unchanged. Despite the word 'state' in the question, lengthy renewed calculations were sometimes in evidence and, whilst this method often scored the 2 marks available, it did waste valuable time.

Question 2

Answers to part (a) of this question spanned almost the full range of marks available. In part (a)(i), most students standardised 345 correctly to obtain $z = 1.56$, but somewhat careless working occasionally resulted in an answer of 0.941 instead of 0.059. Similarly in part (a)(ii), whilst most students scored full marks, a minority scored no marks for an answer of 0.986. The answer to part (a)(iii) required the equivalent of 1 – (i) – (ii) and the 2 marks available were often scored by those students with two previously correct answers. Those with previously incorrect answers sometimes fluked the correct answer but were not awarded marks for two cancelling errors. It was rare not to see the correct answer of 0 in part (a)(iv) but 1 and 0.5 were seen. In part (b)(i), most students indicated that $\frac{(330+345)}{2}$ was equal to 337.5 without any reference to 'symmetry' but were awarded the mark. Almost without exception, students identified 1.96 as the z-value and then equated it to $\frac{7.5}{\sigma}$. However, careless use of signs sometimes resulted in a fudged loss of a negative sign in order that $\sigma > 0$. Surprisingly, a small minority of students struggled to solve $\frac{7.5}{\sigma} = 1.96$ to find σ.

Question 3

Evidence from previous series has usually shown that students are 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 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).

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. 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 part (a) of this question were somewhat inconsistent. Whilst some students scored full marks, just as 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. In parts (a)(ii) to (a)(iv), most students used tables. The usual problems of translating phrases into inequalities were often compounded by incorrect values of p, with 0.25 used instead of 0.35 in part (a)(iii). Most students were aware of the need to use np and npq in part (b)(i) and so scored both marks. However, answers to part (b)(ii) often scored no marks. This was, in the main, due to general comments about students' abilities rather than a comparison of the given values of 6 and 21.2 with the corresponding calculated values in part (b)(i).

Question 6

Few students were able to give a numerical justification in part (a)(i), with many responses describing people's different washing habits. Whilst answers to part (a)(ii) were somewhat better, some 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 frequently awarded. 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.

Coursework

The coursework was dispatched as requested and all appropriate paperwork was completed by centres. In terms of administration, centres must take care when completing the mark breakdowns in the coursework record forms as there were 2 sampled scripts where scores of 4 and 2 were entered on the forms instead of the intended 10 and 4 respectively, leading to issues with the script totals.

There was a good range of tasks seen, and students used a variety of techniques in their write ups. In some cases students seemed to follow a very formulaic approach across all scripts sampled from a centre, and this did make it more difficult for the more able students to display the higher-level statistical-interpretation skills required to access the highest marks.

Students were very brief, and often too brief in the write up of their design of their tasks. This was particularly prevalent in the discussion of the sampling methods used, especially when using secondary data. The discussion of the theory was also variable in quality for the marks awarded. The standard of the analysis was very strong across the range of scripts sampled and students displayed some excellent skills.

The interpretation was improved this year, and appropriately assessed by centres, although it should be noted that it would be unexpected for students who score low marks in interpretation to achieve full marks in the 'work of sufficient depth and difficulty' strand.

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 www.aqa.org.uk/umsconversion