AQA

A-LEVEL
FURTHER MATHEMATICS

7367/3S Paper 3 Statistics
Report on the Examination

7366/3S
June 2023

Version: 1.0

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General

The paper appeared to offer ample opportunities for all students to score marks. Students fared less well in questions where they were required to explain their reasoning, but performed strongly in calculation based questions.

Question 1

The majority of students scored the mark. The most common error was to simply read 0.6 from the table and not recognise that it was the cumulative distribution function that had been given. A significant proportion gave an answer of 0, not recognising that the variable was discrete and not continuous.

Question 2

The majority of students scored the mark but not as many as did in question 1. The most common error was not to convert the given mean to the value of the parameter whilst identifying the correct distribution. However, a significant proportion of students chose exponential distributions.

Question 3

The majority of students scored full marks. Some students lost marks for using incorrect z-values or t-values. Less successful students, attempted to "adjust" the population variance to s^2 or used incorrect formulae for the limits of the confidence interval. A small minority of students used probabilities in place of the z-value.

Question 4

The majority of students scored at least three marks but a significant proportion scored no marks. Students just missing out on full marks tended either to find an incorrect critical value, usually corresponding to the 90th percentile of the distribution, or stated an incorrect conclusion from a correct comparison. Some students attempted a confidence interval or critical region solution but these often omitted a comparison from which to reach a conclusion. Some students used incorrect formulae, often using $n - 1$ instead of n. Less successful students attempted a normal distribution hypothesis test which belongs to the A-level Mathematics specification.

Question 5

(a) The majority of students scored full marks for this part. A significant proportion of students lost a mark for either not explaining their calculation sufficiently by either showing the full method or giving the formula, or did not clearly state that two rows or two columns would need to be merged.

(b) The majority of students scored at least four marks for this part. A significant proportion lost mark for errors in either the hypotheses or the conclusion. Hypotheses were sometimes swapped around or omitted the variables or occasionally were not stated. The most common conclusion error was to make a definite conclusion, using words such as "prove", "show" and "say" rather than "suggest" and "support". Some students found an incorrect critical value but were able to score follow-through marks. A minority of students gave an incorrect conclusion for their comparison

(c) The majority of students did not score the mark for this part. A significant proportion of students chose the smallest value. Many students chose the correct value but did not correctly explain their reasoning and some did not attempt to explain at all.

Question 6

(a) The majority of students did not score the mark for this part. Most students mistook the situation as one that could be modelled by a discrete uniform distribution, not appreciating that any real number could be outputted so that a continuous uniform distribution was the correct model.

(b)(i) The majority of students scored at least two marks for this part. Many students modelled both scenarios with the discrete uniform distribution and obtained an incorrect E(X) or a correct one from incorrect working.

(b)(ii) The majority of students scored at least two marks for this part but a significant proportion scored no marks. A significant proportion of students continued to assume that X was a discrete uniform distribution and so obtained an incorrect Var(X). Many students did not apply the correct variance formula to the correct distribution, given the similarity of the formulae for continuous and discrete uniform distributions. A minority of students multiplied their variances together instead of adding them.

Question 7

(a) The majority of students scored at least six marks for this part with a significant proportion losing the final mark for errors in the hypotheses or the conclusion. Some students wrote the hypotheses the wrong way round or wrote 16 instead of 25 even though their model used 25. A significant proportion of students wrote an incomplete conclusion, often missing “per week”, or a definite conclusion, using words such as “show”, “prove” rather than “suggest” or “support”. Some conclusions did not include context. Students who were less successful did not attempt to find the correct probability, either finding an individual probability rather than a cumulative one or looking at the wrong tail of the distribution.

(b) The majority of students did not score the mark for this part. Again, “per week” was missing from many descriptions and some described the probability instead of the event. A minority of students gave a description without context. A significant proportion of students gave a description of a Type I error.

(c) The majority of students scored the mark for this part. The most common errors included incorrect addition or not explicitly naming the distribution.

(d) The majority of students scored at least one mark for this part, usually for describing independence. Some students gave generic descriptions and gave no context. Many students claimed that the mean was not equal to the variance but there was no evidence to back this up. That failures didn’t occur singly was a common answer but not valid given the scenario and the fact it was taking place in continuous time.

Question 8

(a) This was the most successful part on the paper with the vast majority scoring full marks. Those students who lost marks, did not usually set up the correct equation or made errors on integrating. Some students successfully used the double angle formulae but most students who attempted this approach were unable to integrate the result. Students could evaluate $\int_0^{\frac{\pi}{6}} \sin 2x \, \mathrm{d}x$ using a calculator.

(b) The majority of students scored at least one mark for this part. Many students did not consider the lower limit or assumed that it would give a value of zero. Some students who integrated correctly did not fully specify the function or made errors in doing so, such as omitting 1 or 0. A minority of students differentiated instead of integrating or attempted to find the mean instead of the function.

(c) The majority of students scored full marks for this part, with many recovering from an incorrect answer in part (b). Many set up a correct equation with their function and then found a value that was not a plausible solution. A minority of students substituted 0.5 into the function instead of setting the function equal to 0.5.

(d) The majority of students scored full marks for this part, showing an ability to apply integrating by parts within a statistical context. Some students made errors on integration, very often dropping an x or making a sign error. A minority of students factorised the 4 out early on in their solution and then lost it!

Mark Ranges and Award of Grades

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