Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2019

Pearson Edexcel GCE AS Mathematics

In Statistics (8MA0/21)

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Introduction

This is the second year of this new specification and candidates appeared to be better prepared than in the previous sitting. Still over a quarter of candidates made no progress at all on Q2, Q3 and Q5. Questions which required explanation and statistical reasoning were generally not well answered.

Comments on individual questions

Question 1

This proved to be an accessible start to the paper with most scoring at least 1 mark in part (a) for a partial description of a stratified sample. Very few gained the first mark for clearly describing the method of splitting the population into two groups and labelling these groups. Most realised that a random sample must be taken within each strata and the correct calculation for the number of candidates for each year group was commonly seen.

In part (b), most candidates scored the mark for indicating both ‘increase’ and ‘2.8’. A minority however worked out the number of points scored when $s = 0.5$. Others just mentioned the ‘increase’ but failed to quantify it appropriately.

Part (c) was very well answered and most gained a mark here by coming up with a plausible limitation of the model. The majority referred to ‘other factors affecting performance’ or ‘not specifying a range so candidates could not score less than 26.1 marks or could get infinitely high marks’.

Question 2

Only around 10% of candidates achieved full marks on this question, but there were many strong attempts made. Most scored the first mark for identifying that $x = 0$. The most common error across the question was to ignore the intersections and calculate $P(A) \times P(C)$ as 0.1×0.39. The majority of candidates scored the final method mark for a correct equation in y and z, demonstrating knowledge of probabilities summing to 1. Surprisingly, of candidates who did set up all of the equations required, many were unable to manipulate the algebra to solve them. Those who confused independent and mutually exclusive events tended to make no progress.

Question 3

Whilst over half of candidates were able to score at least 3 marks on this question, only 3% went on to achieve full marks. Virtually all candidates struggled to name the distribution in part (a) with the vast majority opting for ‘binomial’. It would appear that the ‘uniform’ distribution is a topic unfamiliar to many candidates.

Part (b)(i) was well answered as most candidates correctly identified the binomial distribution required here and confidently used $1 - P(X \leq 6)$ to calculate $P(X \geq 7)$. Usual errors were seen, notably attempting $1 - P(X \leq 7)$. Whilst there was some good use of calculators seen, a significant amount of candidates are still calculating these probabilities out by hand in full which costs them a large amount of time. Candidates are expected to use their calculators to find binomial probabilities and cumulative probabilities from the binomial distribution.

Part (b)(ii) was more discriminating and correct attempts here were rare. The most common mistake was made by those candidates who found $P(X \leq 7)$ and subtracted $\{1 - P(X \leq 3)\}$ from it. Those candidates who wrote out the required probabilities in full, i.e. $P(X = 4) + P(X = 5) + P(X = 6) + P(X = 7)$, tended to score full marks.

Question 4

In part (a) most candidates referred to data that was n/a, anomalies or outliers with only a small proportion appreciating that the data set contained trace values for rainfall which needed replacing with numerical values.

For part (b) most candidates are familiar with using linear interpolation though slips appear often. Errors with endpoints often resulted in multiplication by 5. Other mistakes included 23 in the denominator or 6 on the numerator. For those using an $(n + 1)$ method, it was not uncommon to see 7.5 being used in the numerator instead of 7.75.

In part (c) most candidates were able to use the given information to arrive at the required result. There are still a large number of candidates who do not work to the appropriate degree of accuracy and 5.8 and 5.76 were often seen. Candidates are encouraged to write down all figures from their calculator before rounding to ensure accuracy marks are scored. Those who did not achieve full marks here often had an incorrect denominator or forgot to include the square root.

The underlying assumption in part (d)(i) was generally identified but not always with sufficient clarity to gain the mark. Common errors were: 'data uniformly distributed' (failing to mention within each class); the average of each class is the midpoint (failing to specify the mean of each class); most of the data is located at the midpoint (failing to identify that the midpoint is assumed to represent all of the data).

It was clear from the responses seen here that many candidates have little or no experience with the large data set. In (d)(ii) quite a number referred to the data being based on weather which is unpredictable and that therefore the previous assumption was unrealistic. Good explanations involving the distribution of the bottom class were rare with very few making reference to the majority of data being either 0 or close to 0.

Little progress was made in (d)(iii) as many mentioned irrelevancies such as the great storm or the fact that it was during the summer or that the database did not cover a full year. Many did not realise that they were comparing an estimated mean with an actual mean for the same time span and said the actual mean would be higher because the winter months were excluded.

Question 5

Only the most able candidates on the paper made significant progress through this question on hypothesis testing. In part (a) the first error in writing down the alternative hypothesis was identified and corrected more often than the error in the probability statement. Some candidates lost the marks by identifying where the error was but without correctly identifying what the error was. It was not uncommon for candidates to say that the probability distribution was used rather than the cumulative distribution; likely referring to calculator functions rather than demonstrating a formal understanding of hypothesis testing.

Part (b) was less successfully done and where attempted the mark was not always awarded because insufficient details of the calculation and its implication were given.

Despite the question stating the test should be one-tailed in part (c) some candidates found a two-tail critical region or went for the left hand tail rather than the right hand one. Where the upper tail was found the critical region was usually correct although some gave a critical value rather than a region or wrote it as a probability i.e. $P(X \geq 9)$. Some candidates rewrote Julia's hypothesis test correctly at this point, not appreciating the difference between this and a critical region approach.

Part (d) was usually correctly done by those who were successful in part (c). On some occasions answers were given only to two significant figures. Just over 5% of candidates scored full marks on the final question on this paper.

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