Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel GCE

In AS Level Mathematics (8MA0)

Paper 21 Statistics

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Introduction

Questions 1(a)(b), 2(b)(i), and 5(a) proved to be accessible to nearly all students taking this examination and questions 1(c), 2(c), 3(b)(ii) and 5(c) offered challenge for the more able. Most students made their method clear and this is particularly important when selecting the correct probability distribution or completing a hypothesis test.

Question 1

Students were able to find a probability using the Binomial distribution and part (a) and part (b) were answered very well. Students sometimes lost marks for not giving an answer to at least three significant figures. Even though there was a Special Case on the mark scheme, not many students picked up this mark as they had incorrectly answered part (c).

Part (c) was not answered well. Students failed to understand that an integer value is needed for the use of Binomial distribution and their calculator did not give them an answer when 5.7 was used. Often students said the answer was not possible or they did not attempt it. For those students who understood that it needed to be an integer, they often incorrectly found $P(X \leq 6)$ rather $P(X \leq 5)$, or used interpolation to arrive at an answer in between these values.

Question 2

In part (a), many students were unaware that the use of all data was called a census and a common answer was "systematic sampling" and "opportunistic sampling".

Most students were able to complete part (b)(i), calculating the lower outlier limit correctly and then showing that 1007 was an outlier. The most common mistakes were calculating 1007.5 but then concluding there were no outliers or only finding the IQR and thus attaining no marks.

The drawing of outliers on a boxplot caused problems, with many students getting (b)(i) correct but then being unable to illustrate this correctly on the box plot. Often students made bottom whisker end at 1009 but did not mark in the outlier. There was also a significant minority who were unable to read the scale correctly when plotting values. There was follow through available in (b)(ii) for those who made a slip calculating the lower outlier limit in part (i).

Part (c) proved more challenging for most, demonstrating that students are still not familiar with the large data set and how to apply it to a scenario. Of the students who were able to successfully identify the number of moderate days, most were able to make use of the upper quartile to arrive at a correct estimate of 5 or 6 days. A small number of students calculated three quarters of the days instead of one quarter.

Question 3

Most students found $p = 0.16$ easily but then they did not make the connection that they needed to state the full distribution. A common misunderstanding was to use the probabilities to calculate the expected number of counters of each colour in a sample of 40.

In (b)(i) the hypotheses were usually correctly stated with most students using a one-tailed test. On some occasions students are writing these hypotheses in words rather than using appropriate notation. Most students were able to select and use the correct Binomial distribution. Many, however, then calculated $P(X = 11)$ or incorrectly attempted $P(X \geq 11) = 1 – P(X \leq 11)$. Of the students who gained the A mark for the probability 0.16, the conclusion was usually correct and mostly given in sufficient contextual detail. Those students who used a critical region approach generally did less well, as most omitted the required *p*-value and scored a maximum of 3 marks.

In (b)(ii) students appeared unfamiliar with the vocabulary 'acceptance region'. A very common mistake was an attempt to find the critical region. It was not uncommon to see $P(X \leq 12) = 0.9568$ followed by an acceptance region of $X \geq 13$. Those who did realise that the acceptance region was not the same as the critical region often reverted to a 2-tailed approach. Students were able to earn the method mark here by calculating one or more relevant probabilities at some point in part (b). A few students gave a probability rather than a region as their final answer here.

Question 4

In part (a), it appeared that many students did not recognise the sum given as that used in the original definition of variance/standard deviation and so were unable to attempt an answer. Common errors were $\sqrt{394}$ and $\frac{394}{25}$ although other wrong solutions involving extensive calculations were also seen.

For part (b) many students misinterpreted the information in the first bullet point and used the incorrect equation $3.5 = a + 500b$ together with the correct one of $20 = a + 1700b$.
Those who had interpreted the information correctly generally used it in conjunction with the second bullet point to obtain $16.5 = a + 2200b$ as their equation together with $20 = a + 1700b$ although a few of those using this approach used $1200b$ instead of $2200b$.
Those who used the gradient approach with $b = \frac{\mp 3.5}{500}$ were more successful although some of these did not pick up that the gradient was negative. There were some students who had the gradient upside down.

Question 5

Students were very confident in answering part (a) with most arriving at the correct value of u.

Those who understood that P(A or C) represented $p + q + s + t$ were generally able to successfully calculate the value of r , with the majority of students scoring full marks in part (b).

Those attempting part (c) often gained one of the two method marks available. More commonly this was for realising that $q + s = 0.18$. To score the second method mark, students needed to use two pieces of information and this proved difficult for many. Had students realised that numerical values could be substituted into their expressions at an early stage, they would have avoided pages of unnecessary algebraic expansion and simultaneous equations. This part proved to be one of the most discriminating parts of the entire paper.

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