Examiners' Report
Principal Examiner Feedback

Summer 2022

Pearson Edexcel Level 3 Core
In Mathematics (7MC0) Paper 02

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Introduction

This session saw an increase in the number of entries compared to that of 2019 and students appeared to be well prepared for some of the topics that are beyond GCSE content but a small number of topics included in the specification, particularly content that should be familiar from GCSE Mathematics was not attempted well.

The paper appeared to be accessible to most students, with the majority of questions being attempted. However, calculations were not always shown clearly, systematically or at all and communication of results was not always clear or unambiguous.

The level of engagement with more familiar content appears to be at a consistent standard of work compared to that seen during the last session, with students not always appearing to be able to respond to questions that were set in a non-routine way successfully or not being able to take a creative approach to solving problems.

Questions that require evaluation, justification mathematical reasoning or a conclusion-based comment relating to the method used, are still areas of weakness for students and should be addressed during teaching of the specification content. Centres should also give students an opportunity to revisit and practice topics from the GCSE specification, particularly content appearing on the Higher tier such as, reverse percentages, drawing graphs from equations or inequalities and drawing and using cumulative frequency graphs and histograms.

Report on Individual Questions

Question 1

(a) The majority of students were able to use knowledge of decimal equivalents for percentages to identify the correct year from the source booklet to gain the first mark.

(b) This part was not attempted well. Whilst some students were able to select the correct percentage change from the source booklet and gain a mark, the majority were unable to show a valid method for reverse percentages and instead performed a percentage decrease of 3.9%. This topic should be familiar to students from GCSE Maths at both Higher and Foundation tiers and is historically poorly attempted on this specification.

Question 2

It was disappointing that students showed little understanding of the type of correlation that should be expected for the given scenario described in part (a)(i), with the majority stating that they expected positive correlation rather than negative correlation. In part (ii) many students simply restated the information given in the question when deciding whether there would be a causal relationship rather than giving a reason such as affordability or that some may only buy necessities regardless of price.

Part (b) required students to use knowledge of explanatory and response variables to select the response variable, providing a reason as well. Whilst some students were able to correctly identify the correct variable as the quantity purchased but the majority were unable to provide a suitable reason.

Many students were able to gain at least 1 mark for using the formula for finding the product moment correlation coefficient in part (c)(i). However, accuracy was often lost due to omitting the negative sign when substituting S_{xy} but this was condoned for the method mark. Many then also gained the mark for a correct interpretation and justification of their value in (ii) which was pleasing. Students who did not gain the interpretation mark often did not relate the value to Uzma's theory due to not commenting on the strength of the correlation.

Question 3

This question presented a slightly different style of assessing students understanding of many aspects of linear programming using graphs. Part (a) was attempted very well with the majority of students correctly explaining in context what the given inequality represented.

Part (b) was answered less well, with many not being able to write the equation of the line as an inequality. As a prior GCSE skill that should be familiar, this was disappointing.

It was pleasing to note that responses to part (c) were more successful with at least 1 mark for giving a partially correct inequality for the given information and many writing a fully correct inequality. When a mark was lost it was often due to the incorrect inequality being stated.

Drawing the constraints on the grid to find the feasible reason was a challenge for most with only the more able students being able to gain full marks. Again, as this skill should be familiar from the GCSE specification and is a routine procedure on this specification, learners should be able to have a greater level of success. However, greater success was demonstrated when answering part (e), with many students gaining at least one mark for correctly testing one of their vertices and a second mark was often also awarded for finding accurate sales for their vertex tested.

Question 4

This question marked the beginning of the second section of the paper and introduced a new context. Part (a) required students to draw a cumulative frequency graph for the given data. Two marks were often awarded for stating the cumulative frequencies either next to the table or being implied from their diagram, but the final mark was often lost due to the common misconception that points should be plotted at the midpoints of the class intervals rather than the endpoints.

Part (b) required students to interpret both the given cumulative frequency graph and their own drawn from part (a) to find the median time spent walking by dog owners and those that do not own dogs in order to conclude whether a claim was valid. Of those students who were able to select the method they should use to answer this non-routine style of question, many gained full marks and when full marks were not awarded it was often due to incorrectly interpreting the scale resulting in lost accuracy, but credit was still given frequently for a correct interpretation when the accuracy mark was not awarded. Another common error was to read off at a cumulative

frequency of 150 for both dog owners and non-dog owners' rather than 125 for the non-dog owners.

Question 5

It was pleasing to see that the majority of students were able to write two equations to represent the information given to gain at least on of the two marks available in part (a). The second mark was often lost due to not defining the variables used or for using inequality symbols instead of an equals sign but this was less frequently seen.

Part (b) was also attempted extremely well with nearly all students gaining at least two of the three marks for finding comparable figures using the equation for percentage mark-up given appropriately. When a mark was lost it was often due to inaccuracy or for not stating a decision as to which of the bag or sack had the greatest mark-up.

Students were required to solve simultaneous equations, a skill that should be familiar from GCSE Maths, in part (c). Students rather disappointingly either gained full marks or no marks, with very few gaining partial marks for using an appropriate method. A greater number of students appeared to use their calculators to find solutions, which is acceptable and gained full marks. A small number of students showed that they knew they needed to create equivalent equations to be able to eliminate a variable but unfortunately then subtracted rather than added when trying to eliminate the *y* variable. When students failed to gain any credit, it was often due to trying to solve just one equation at a time incorrectly or attempting to use trial and improvement which gains no credit unless accurate values are found.

Question 6

The final question in Task 1 required students to apply knowledge of risk to select the cheapest option for pet insurance. Of the students who attempted this question, many gained at least 2 marks for working fully with one of the options and often this was for the option of no insurance. The third mark for working with both standard insurance and no insurance was often not awarded, mainly because students simply multiplied the £75 per treatment type three times rather than using the probabilities to find the expected value for the standard insurance. This skill is beyond the GCSE specification, and it was pleasing to note that a greater number of students were very successful compared to previous series but a number of scripts were blank. Students should be encouraged to attempt all questions including topics that are unfamiliar to previous learning such as risk.

Question 7

The first question of the second task in section B was attempted extremely well with nearly all students being awarded full marks for correctly using the formula provided to find the number of points awarded. When credit was given, the final mark was lost mainly due to an incorrect inequality symbol being used.

Part (b)(i) was poorly attempted with very few gaining any credit for a correct equation or partially correct inequality. However, a greater level of success was seen in part (ii) with many students choosing to use trial and improvement as an alternative method to formally solving their inequality in part (i) to find an estimate for the maximum time to run the 800 metre race. This was pleasing to see as it meant that students to not lose valuable marks as a result of not being able to write an inequality in part (i). This method was sometimes incomplete or inaccurately concluded, however, partial marks were awarded for showing sufficient trials to identify 125 and 126. When students attempted to manipulate their inequality from (i), lost marks were often as a result of not eliminating the power of 1.88 correctly or subtracting 254 as a first step.

Question 8

Although using a formal method to find outliers for a data set is new content for students at this level, it is a routine procedure on this specification and the majority of students tackled part (a) very well, with many gaining full marks or partial marks for either selecting the correct values to use for the lower and upper quartiles or for using their values correctly. When full marks were not awarded it was often due to either using incorrect values for the quartiles, arithmetic errors or not making a comparison of their calculated values with the minimum and maximum values to show there were no outliers. Arithmetic errors often occurred when calculating the interquartile range, but some students were still able to gain the final mark for making a valid comparison using their figures and only losing the accuracy mark. It was a shame that a very small number of students were able to identify the correct LQ and UQ values correctly but then used alternative values when trying to use the equations.

Students were required to draw a box plot in part (b) with many students successfully gaining both of the marks available. The most common cause of a lost mark was to inaccurate plotting of one of the quartiles or to not use the minimum and maximum values for the end points of their box plot

and marking these at the ends of the graph paper provided but this was rare.

Question 9

Part (a) in the final question in Task 2 was attempted well with many stating the type of sequence was arithmetic or linear which was acceptable. The most common incorrect name seen was geometric and nth term was also an incorrect response seen which was not sufficient for the mark.

Part (b)(i) was poorly attempted with very few students gaining any credit. Whilst many were able to identify 125, this was often given to be q rather than p and gained no credit.

Part (ii) was very well answered in comparison, with the majority of those gaining full marks doing so from continuing the sequence to find 16 weeks were needed rather than setting up and solving equations. Again, it was pleasing to note that marks were not lost due to gaining no credit in part (i) due to using an alternative and valid method.

Question 10

The final task used the context of a Health Centre, with question 10 assessing students' ability to use frequency tables and draw and interpret histograms, skills that should be familiar following GCSE learning. A larger than expected number of blank responses were seen for some parts of this question.

Part (a) was generally attempted well with many gaining full marks for correctly finding 19 or 20. Of the students that gained partial credit, the first mark was often awarded for correctly finding the probability for the class interval $0 \leq t < 1$ to be 0.248 but unfortunately for some students, no further marks were awarded due to multiplying the probability by the 500 people in the survey rather than the additional 80 people.

It was very pleasing to note that the majority were able to explain why the final interval in the frequency table could not be shown on a histogram in part (b), with there being no endpoint, end boundary or incomplete interval being the most frequently seen valid responses.

Part (c) was attempted with varying levels of success. When frequency density was calculated, invariably full marks were awarded a fully correct histogram. Two marks were often also awarded with the final bar being drawn incorrectly being the cause of a lost mark. As with previous series,

the common response that gained no credit was for drawing a bar chart and not working with frequency density at all.

Students were not able to use either the frequency table or their histogram to calculate an estimate for the median waiting time to be able to make a comparison with the average UK waiting time in part (d). Responses included finding the waiting time interval containing the median, finding the median frequency density or a calculation to find the estimated mean.

Part (e) required students to use an appropriate method to find an estimate for the number of people that had a waiting time of less than 10 days and as with other parts to this question, was poorly attempted and partial marks rarely being awarded.

Question 11

Each part of the final question assessed students' ability to use a range of probability skills based upon the completed Venn diagram provided and most parts were answered very well.

Nearly all students answered both (i) and (ii) of part (a) correctly, with a range of fractions, decimals and percentages being given.

Student understanding of terminology was assessed in part (b)(i) with at least one mark often being awarded for selecting the correct two events that were mutually exclusive. The reason required for the second was often omitted but when a reason was provided, the second mark was often awarded.
Parts (ii), (iii) and (iv) assessed students understanding of probability notation, which should be familiar from GCSE learning.

Part (ii) was answered most successfully, with many able to describe the intersection between S and T correctly in context. Part (iii) however was poorly attempted with the most common incorrect response being to shade all regions that included T or to shade the outer region of the diagram.

Finally, part (iv) required students to interpret more challenging notation to find a correct probability. The method mark was often awarded for a correct numerator but unfortunately the denominator was commonly given as 500 rather than the total number of people requiring a telephone appointment which demonstrated that students need to continue to develop their understanding of the probability of one event given that another event has occurred.

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