Principal Examiner Feedback

Summer 2018

Pearson Edexcel Level 3 Mathematics in Context

Paper 2: Applications (7MC0/02)

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Introduction

The paper gave a good range of challenge, allowing students to demonstrate their knowledge whilst allowing effective discrimination for the more able students. Solutions were generally well presented and calculations were generally well done.

When responses required either an explanation or an interpretation, these types of response seemed to cause more problems for students. Students should also be advised to check their answers at the end to ensure that numerical answers are sensible in the given context.

Many students did not seem to be well-prepared for topics such as Linear Programming (including drawing straight line graphs and showing inequalities on a graph), least squares regression and Venn diagrams. Students also do not seem comfortable in using the formulae given for Geometric series.
Surprisingly, questions which required some GCSE knowledge such as histograms and combined means were poorly answered. Centres need to ensure coverage of content as well as the problem solving aspects of the course.

Report on Individual Questions

Question 1

There were few students who could not start this question, although many could not successfully complete the Venn diagram. The vast majority gained either one mark or five marks for this question. Almost all students knew they should draw three intersecting circles with 56 in the centre overlap to gain the first mark. The more able students went on to complete an accurate correctly labelled diagram.

Question 2

Although many students answered this question correctly, a large number were unable to give an answer in context. It was common to see 320 or 420 or a probability fraction and no explanation at all. It was also common to see explanations using mathematical expressions such as 'the intersection of C with not D'. Some students did not attempt this question.

Question 3

(a)
(i) Many incorrect answers were seen following an incorrect Venn diagram. Few students used the information at the start of the question where the number of people who had diabetes was clearly stated.
Part (ii) was generally well answered with the majority of students gaining this mark following through from their value on the Venn diagram.
Part (iii) was challenging for the majority of learners. Very few could deal with the conditional probability correctly. Some got 145 but gave 2000 as the denominator.

(b)
(i) There were few fully correct answers to this question. Many incorrectly attempted an explanation in words which gained no marks. Of those who quoted formulae, a large majority used $P(B) \times P(D) \neq P(B \cap D)$ and it was rare to see the use of $P(B|D)$.
(ii) Those who showed that the events were not independent correctly in (i) almost always gave a correct interpretation or stated that Pedro was correct.

Question 4

There were many fully correct answers to this question.

(a) was answered well although some students attempted to work backwards from 62.9% which caused issues with rounding.

Part (b) caused problems for students who either have a poor understanding of decimals, or who made a slip through not reading the question correctly, as it was common to see 0.387 used instead of 0.0387 Most students knew that the branches on each part of the tree diagram should add up to 1, although there were a small number of students who did not know this.

In part (c), those with the correct tree diagram usually went on to answer this part correctly and those with an incorrect tree diagram often gained marks provided they were clear with their method and conclusion. There was a pleasing range of different correct approaches used in this part as detailed in the mark scheme.

Question 5

This question was answered well with many students achieving all three marks. A small number were not able to read accurately from the graph or made slips such as 125 instead of 135. Many students used the method as detailed in the mark scheme achieving the expected 32.16%. A significant number of students expressed their '135' as a percentage of '199' but many of these did not complete the method by subtracting from 100 to get the required answer. Some used '135' as their denominator.

Question 6

(a) Many students were unable to interpret the meaning in context. There were many references to gradient and correlation coefficient but not many clear concise answers stating a decrease of 0.147 minutes each year. Minutes were often omitted from the explanation.

(b) The majority of students were able to get the method mark. To gain both marks, students had to either test 2027 and 2028, or test 2027 explain why the time would fall below 120 during that year. Many did not gain the second mark. On "show that" questions there has to be a completely correct solution.

(c) Attempts at this question mainly fell into two categories. Many students were well drilled in the method and gained most or all of the marks. A significant number did not know how to start the question and often made no progress and gained no marks. Some students who successfully calculated a and b and the two means, did not write the final formula correctly.

(d) Trial and Improvement was the most common method used here but these were often incomplete. Those who solved an equation were often unable to interpret their solution correctly. E.g. if they found an x value of 2009.6… they put the year as 2010 not 2009.

(e) Many failed to attempt this question and there were many incorrect comments about extrapolation or correlation. There were many statements such as - "it's only an estimate"; "times vary a lot and don't follow a pattern".

Question 7

(a) Although there were many correct answers that k=12, there were many incorrect values of k given. Some did not include 132 at all in their equation but the main error was a failure to understand 1.029^0 with $1.029^0 = 1.029$ being very common.

(b) Students who were successful in (a), usually achieved the correct answer of 122.5 with the main error being using a power of 55 following sign errors instead of -55. Those who had an incorrect k and were clear in their method often gained 'follow through' marks.
(c) There were very few students who could explain clearly that a number raised to a negative power cannot be negative, so you would always be adding on to the 120.

Question 8

(a) Almost all correct responses to this part used 6 ÷ 0.3, although many students gave no answer.

(b) Some students clearly knew this topic well and drew neat and accurate histograms with the correct class widths, frequency densities and an appropriate vertical scale. Many students used the given frequencies but drew an incorrect histogram or a frequency polygon. Some students drew a cumulative frequency curve or polygon. Despite being given a hint in (a), a good number of students failed to calculate the remaining frequency densities.

(c) Very few students knew how to calculate a median from the histogram and the expectation to interpolate was not understood by the vast majority of students. Many were able identify the correct interval or state a value in the correct interval this gaining one mark. There were some accurate answers from those students who had drawn a cumulative frequency diagram.

(d) This part of the question was generally answered with more success. Some students forgot to subtract from 100 and gave an answer of 80 instead of 20. Again a variety of methods were seen for this question though it was sometimes difficult to follow the method that students were trying to use.

Question 9

Many students gave no answer to this. Of those who did, there were many totally incorrect attempts as students were guessing a method. It was common to see just one standard deviation being added and subtracted or just 1.28. The more able students gained all three marks and most others gained no marks.

Question 10

This question was surprisingly poorly answered given that it is a GCSE topic. The most common incorrect answer was to find the mean of 8.4 and 7.8 though many other incorrect answers were seen with 0.108 and 1230 not being uncommon with no recognition that these were not sensible answers given the context of the question.

Question 11

Most students answered by working out each individual term rather than by using the formula. By either method the most common error was getting the number of years wrong. Using the longer method, a small number of students did not write their terms down accurately and thus introduced an accumulation of rounding errors. Many did not realise that you could do the calculation more concisely by working in 'millions'. A number of students didn't realise that the question was compound 'interest' and mistakenly used an Arithmetic Progression thus scoring no marks.

In part (b) it was rare to see the formula for summing a geometric progression and most successful students used the longer method. The main error again to sum the wrong number of years or failing to start with 20million.

Question 12

(a) Some students missed out this question. There were many careless errors such as using an incorrect inequality or omitting a variable (usually z, even if the coefficient was included) or using 28, 32 or 48 mistakenly instead of one of the coefficients. Many students simply wrote $x+y+z\leq 100$ and $x+y+z\leq 1200$.
(b) There were very few correct answers to this part of the question. Many started with $x\geq 20$ so $y+z\leq 80$ but a more thorough algebraic explanation was required.

(c) was well answered by the majority of students but again there were slips with using 28, 32 or 48 instead of one of the coefficients.

Question 13

(a) This was not answered well by a good number of students. A number of students did not attempt to answer, but those who did often failed to address each inequality. The one that caused most difficulty was showing $4x\geq y+z$ becomes $y\leq 2x$. Quite often, an attempt at the objective function was seen but nothing else.

(b) A number of students did not attempt this but of those that did, few gained full marks. Some students could not draw the lines and some did not read the scales correctly. Many drew $y=0.5x$ instead of $y=2x$. Even those students with 3 correct lines often identified an incorrect region R.

(c) Some students did not attempt this but those that had identified a region usually knew they should check the coordinates of the points of intersection. It was rare to see the objective line method used. There were few students who gained full marks as they were often working with the wrong points of intersection. Very few students used simultaneous equations to get exact solutions.

(d) Very few had the correct solution of (17,4,4). Many had the same values for x,y,and z. Some substituted incorrectly, often multiplying 280 by 2y. Most students who attempted this part realised the need for integer values.

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