Examiners' Report

Principal Examiner Feedback

Summer 2019

Pearson Edexcel Mathematics in Context

Level 3 Core Mathematics (7MC0/02) Paper 02

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Introduction

This is the third time the qualification has been set and candidates appeared to be better prepared for a number of topics included in the specification.

The paper was accessible to nearly all candidates, with the majority of questions being attempted by a good proportion of candidates. However, calculations were not always shown clearly or systematically and communication of results was not always unambiguous.

The level of engagement with more familiar content appears to be similar to the standard of work seen last year, with candidates being able to draw upon the information provided in order to respond to questions successfully. Candidates generally display confidence in selecting he appropriate method to use to answer a question correctly, with many applying the method chosen successfully.

Questions that require interpretation of results or comments relating to the method used, amongst other evaluative questions, are still areas of weakness for a large number of candidates and should be addressed during teaching of the specification content. The use of sigma notation in applications and the use of inequalities, particularly feasible regions, was also an area of weakness and centres would do well to offer more practice for this part of the content.

Report on Individual Questions

Question 1

(a) (i) Responses to the opening question varied in terms of successful explanations being given. Some candidates were focussed on the benefits of using a moving average to identify trends, rather than why a four-point moving average in particular was appropriate for the data set provided. A common response what that it was "more accurate" which indicates a lack of understanding of the purpose of the moving average. Referring to or implying that 4 points represented quarters of a year was sufficient.
(a)(ii) Calculating the missing 4-point moving average was generally well done with nearly all demonstrating how to calculate the moving average accurately.
(b)The graph was usually plotted well with only a small number of candidates plotting inconsistently or at the wrong position within the year. Most candidates plotted 9 points with no extra points.
(c) Most candidates continued their trend line and appreciated that extrapolation was required. However, some only found one value, often 60 million, rather than using four quarters in a year to find a total for the year. Some found four suitable values, correctly added but then found the mean of them and so lost the final mark. Other candidates repeated the seasonal shape of the graph, and usually successfully found four values leading to an acceptable answer.

Question 2

All parts of this question were attempted poorly with very few full marks being awarded.
Very few were able to identify the correct class interval containing the median in part (a).
In part (b)(i), many knew how to calculate the mean of the frequency distribution and showed their calculations clearly and accurately, making good use of the table. Whilst many chose the correct mid-points to use at the start of their calculations, some divided by an incorrect value and others had arithmetic errors in their calculations and so were awarded only partial marks.

Part (b)(ii) of the question was disappointingly attempted very poorly. Very few candidates calculated the standard deviation correctly. Most had little idea how to make progress and did not use the frequency as required. Of the candidates who knew they needed to use fx^2, many did this incorrectly by often calculating fx and then squaring the result. A larger than expected number of blank responses were seen for this part.

Part (c) required a comparison of the results obtained in part (b). Many candidates had difficulty in writing a clear concise explanation to a written question, with very few making a correct comparison between their results and the estimates given. It was common to see candidates confuse the years they were comparing, with many comparing the mean with the standard deviation, or only commenting on the mean in reverse. Quite a few candidates lost a mark for not commenting on the claim at all, following an otherwise correct comparison.

Part (d) required interpretation of how using the midpoint rather than an exact mean would effect the results obtained. Many recognised that the mean would decrease but only the more able provided the required justification that this was due to the midpoint being bigger.

In general, careful reading of the question was needed in order to be more successful with the majority of this question as a whole.

Question 3

The majority of candidates answered part (a) well with many fully correct answers being seen. The most common cause of lost marks was to provide a formula using an incorrect multiplier such as 1.15 rather than 1.015 or to show a formula using addition rather than multiplication.

Approximately 50% of the candidates correctly identified the correct graphical representation that represented the value of the investment bond over time.

Question 4

Part (a) required candidates to use compound interest calculations to find the total amount owed at the end of 3 years and was attempted well by many. Partial marks were often awarded for correctly calculating the value for one year but were unable to interpret the need to consider that £1500 was borrowed each year rather than just once. Errors in finding 1.061 were rare, although 1.61 was sometimes seen as multiplier. A very small number of learners multiplied the yearly loan by 3 and then applied compound interest of 6.1% incorrectly. Justifying the mistake made in context was required in part (b) and was reasonably well answered, with the majority of candidates appreciating that the interest also increased on the previous years' loans as well as for the additional amount borrowed. A large number of candidates calculated 1900.87 as a way to explain why the given answer was wrong. The candidates who were unable to gain any marks often failed to understand what the question was asking.

Question 5

The first two parts of the question required learners to firstly calculate the total amount invested in a given time frame and then write a suitable expression to represent the total amount invested algebraically. Whilst the majority of responses were fully correct, some candidates did not use the correct number of months to find the total additional amount invested. When forming an expression to represent the investment, it was common to see 3000 + 250n rather acknowledge the need to subtract 1 from the number of months with (n-1) rarely being seen. Other errors included the omission of brackets or forgetting to add the initial £3000 but these were much less common.

Identifying assumptions made when designing a model was required in part (b)(i) with nearly all learners providing at least one suitable assumption. The most popular answers were assuming that the interest rate or amount paid in stayed the same, followed by no withdrawals or tax. It was also common to see answers referring to assumptions that the situation continued for 3 years or more which was not a valid additional assumption on top of the information supplied in the information given about the model.

Part (b)(ii) required learners to state the name of the sequence being represented and was answered correctly by fewer than expected candidates. The most common incorrect response was that the sequence was Fibonacci rather than geometric.

Very few part marks were awarded in part (b)(iii) involving the use of sigma notation, with a greater than expected number of blank responses also being seen. Only the more able candidates showed any understanding of sigma notation with most only being awarded the first method mark for interpreting the initial stage of the model but being unable to make further progress. Centres should ensure greater practice of evaluating models that are presented with sigma notation, paying particular attention to what the notation represents when written in full.

Question 6

The use of formulae in spreadsheets continues to be a part of the content that is not understood well by the majority of candidates. The most common error with the responses seen was to use an incorrect multiplier to represent 9%, with a multiplier of 1.09 being seen frequently.

Question 7

Part (a) required candidates to estimate the probability of an event and was generally answered correctly. Responses showed a variety of probability notations being used but very few used estimated figures.

It was disappointing to note that less than half of the candidates could correctly identify that probability could not be greater than 1 in part (b). Common incorrect explanations included "people cannot have more than one phone" rather than interpreting the numerical value of 1.22 or relating this to the probability scale.

Part (c) was generally well attempted, with many extracting the correct figures to use in order to provide a probability within the given range. The most common error was to use a denominator that represented the number of people who had access to the internet rather than the whole population or dividing by 100 twice to find 5.2% rather than 52%. A very small number of candidates rounded the values to give an estimate, using the numbers as given in the question exactly but this was acceptable.

Question 8

Interpreting the cumulative frequency graph given proved to be challenging for the majority, with many using inaccurate values of the median and quartiles when showing that there were no outliers in part (a). Very few candidates correctly identified that the graph represented 182 countries and used 200 as the total number when calculating where on the y-axis readings should be taken from. However, method marks were still often awarded for a correct method to calculate the maximum and minimum values for outliers using their figures. A greater than expected number of candidates read values from the graph by using the x-axis, commonly using 20, 40 and 60 to identify values for the median and quartiles. In this instance, the special case was commonly awarded for demonstrating knowledge of how to determine the limits for outliers. Inaccuracies when reading from any point on the graph was also seen but this was less rare. It is important for candidates to reiterate the importance of formally acknowledging that there were no outliers as this was often omitted.

Drawing box plots to represent data from the graph was required in part (b), with values used in part (a) being followed through successfully by the majority. Common errors seen included incorrect maximum values and median values being used.
Given that both cumulative frequency graphs and box plots are part of the GCSE specification and should therefore be more familiar to candidates, performance with this area of the content is not as good as expected.

Question 9

Many candidates appeared to be familiar with applying Spearman's rank to calculate the correlation coefficient, with many accurately finding the correct result of 0.06. Ranking errors were frequent, with many not able to use tied ranks or listing one set of data in ascending order and the other in descending order. Method marks were often awarded for correctly substituting values of d and d^2 into the formula for rankings used, although some arithmetic errors were seen when totalling.
When interpreting the result found in part (a), many candidates knew that the small coefficient value indicated no correlation but were unable to communicate the link between this and the statement given. Some were also unclear about the meaning of a negative or positive correlation and were therefore not able to identify that negative correlation was needed to show that the statement was true.

Question 10

This question required candidates to communicate knowledge about the method of sampling used and was largely well answered, with a very small number not being awarded marks at all. The majority of candidates recognised that the sample was not representative both in terms of size and demographical representation. Of those who only gained one of the two marks available, it was often due to one or more reasons being an irrelevant reference to gender or ethnicity or was due to both reasons given being too similar, such as "only uses two places" and "only asks people from London and Manchester". It was pleasing to note though that there were very rare instances of ambiguous responses being given.

Question 11

Part (a) required candidates to set up and solve a pair of simultaneous equations, with many performing very well and thus gaining full marks. Of those who wrote suitable equations to represent the situation, many were able to make a good start when attempting to solve, often by elimination, but there were some instances of trial and improvement being used a s a method of solving or substitution, with both being less successful in finding correct solutions. A small number of candidates were able to demonstrate a correct method of solving but either lost marks due to arithmetic errors or did not use the values found to find the total cost of the required items.
Candidates were required to give a formula in part (b), with many correct formulas being seen. The most common loss of a mark was to give an expression rather than a formula.
Interpretation of the requirements in part (c) was poor. Very few recognised the need to use inequalities to find a solution, with most opting to use trial and error approaches with varying levels of success. Candidates gaining no marks often made the error of not engaging with the minimum order correctly and simply divided 200 by 15 to get 13 and a third and giving an answer of 13 or 14. Another common wrong answer was to use inequalities correctly to find that 12 bags would equal a 10% delivery charge but did not realise that the the answer had to be greater than 12 for the delivery to be less than 10% However, all method marks were awarded. Those who arrived at the correct answer rarely used inequalities but used a written explanation and supporting calculations to demonstrate understanding.

Question 12

There were very few candidates being awarded full marks for this question and this topic area continues to be an area of weakness. It was also disappointing to not the larger than expected number of blank responses for all parts of the final question.

The first part was generally answered well, with many using the information given to write starting inequalities and show how these could be simplified to the form given. For some candidates, finding a starting point seemed too challenging and were unable to write down the correct inequalities from the information given or did not attempt to engage at all

Responses to part (b) were often incorrect, with very few being able to give a correct inequality to represent the additional constraint. The most common incorrect answer was $y > 4x$ and again, many blank responses were seen. However, part marks were often awarded in part (c), regardless of engagement with parts (a) and (b), with many candidates gaining one or two marks for drawing the graphs of the given inequalities correctly. Some careless plotting was seen on occasion and some, surprisingly, mixed up the coordinates from the 2 graphs to produce incorrect lines. Very few candidates gained the last 2 marks, often not having another constraint from part (a)(ii) to plot. Of the very small number with 3 correct lines, few indicated the correct region R.

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