Pearson Edexcel

Principal Examiner Feedback

Summer 2018

Pearson Edexcel Level 3 Mathematics in Context

Paper 1: Comprehension (7MC0/01)

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Summer 2018
Publications Code 7MC0_01_1806_ER

Introduction

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

The paper was accessible to all students, with all questions attempted by a good proportion of students and calculations shown clearly by the majority.

The level of engagement with the source booklet appeared to show an improvement on the standard of work seen last year, with students being more able to draw upon the information needed to respond to questions successfully. Students also seemed more confident in selecting the appropriate method to use to answer a question correctly, with many successfully applying their chosen method.

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 students and should be addressed during teaching of the specification content.

Report on Individual Questions

Question 1

In part (a), many correct answers were seen, with part (i) being slightly more successful than part (ii). A small number of responses showed the answer to part (ii) being given for part (i), with some giving the same answer for both parts. This question relied on the use of the source booklet to extract the correct information to use.

Part (b) was answered very well, with the majority being able to state two comparative statements about the distribution of males and females and many able to make one valid comparison to demonstrate the ability to interpret a statistical diagram in context. A small minority incorrectly stated that the longest bars represented the median age rather than this showing the modal age. It was pleasing to note how many responses gave both a statement relating to numerical comparisons and to the shape of the distributions. A few blank responses were seen.

Question 2

The majority of students were able to use the source booklet to complete the table accurately, with many continuing to draw a cumulative frequency graph correctly. The most common cause for a loss of marks was due to an incorrect scale being used for the *x*-axis, choosing to use the class intervals of 0-9, 10-19, ... as the marker points and so not using an appropriate scale. A small number of students used a scale with intervals of 10 and plotted using these instead of 9, 19, ... etc. The number of learners plotting at the midpoint of the class interval was lower, with many correctly plotting at the endpoints.

Part (iii) proved difficult for many students as the aim of this question was to recognise how to deal with an interval that had no endpoint assigned. Only a small number recognised that 90 was not necessarily the greatest age, with some continuing to explain how they overcame this problem. Many chose to comment about assuming they needed to use the midpoints to plot points or comment irrelevantly about the growth or trend of the data.

Several approaches were seen with students generally responding well to part (iv). The main method seen was recognising that the cumulative frequency curve could be used to estimate by reading the cumulative percentage at 65 years and subtracting from 100. On the whole this was the most successful method seen and should be encouraged. Less commonly seen, but as successful, was to use the full data set in the source booklet to answer the question via addition. Both methods were acceptable and used successfully. A small number of students who tried to use the table in the question paper, which combined 2 groups from the source booklet, using a proportion method of finding five ninths of the 60-69 group. Using this method was generally unsuccessful as most did not complete the calculation, forgetting to add the percentages for the other 3 groups to this value. Another common error was to forget to subtract the reading from the cumulative frequency curve from 100, often finding 85% and not recognising that this was an estimate for the percentage of the population below 65%. Some did not show their calculation or method used and centres should encourage students to show all calculations so that method marks may be awarded for answers outside of the acceptable range.

Question 3

Part (a) was attempted well by many students, with a lot of fully correct responses seen. Of those who did not gain full marks, most were able to be awarded at least 1 mark for engaging correctly with a method to calculate an estimate for the number of obese children. Errors often occurred as a result of misinterpreting the data in the source booklet and working with two thirds rather than a third due to working with the percentage of 66.6% given for men in table 2a in the source booklet.

However, the majority of students were able to communicate a valid reason in part (b) to explain, often using equivalent fractions or percentages to compare 10% with a third, why the probabilities would not be the same. Explanations were often clear and contained detail to provide evidence of deep understanding. Occasionally there were errors with accuracy, with no sensible rounding used and therefore no understanding that an integer value was required to represent people.

Question 4

The source booklet was interpreted well in this question, with the majority of students extracting the correct information needed to be able to estimate the population size for 2013. The most common error was to find 30% of 2.1 million and not recognising that 2.1 million represented 30% and using a reverse percentage method. A very small minority forgot to put billions on their final answer, either writing the word billions or multiplying by 10^7 was acceptable. Students should be encouraged to read the information in the source book carefully and highlight the key information when it has been identified.

Question 5

This one mark interpretation question required students to recognise that the percentages stated only represented proportions of a population and that the population sizes would need to be equal in order for these proportions to be comparable. The majority of successful students used their own knowledge of country populations to explain correctly that the UK had a greater population than Iceland and so would most likely have a greater number of obese people than Iceland. Students need to develop a deeper level of understanding that percentages represent proportions and do not automatically allow for direct comparisons based on percentage values alone.

Question 6

Most students were able to score a mark for a correct substitution in to the formula, some were then unable to engage fully and could not rearrange and solve to find the least and greatest weight. The most unsuccessful method was seen by students who used a trial and improvement method rather than rearranging, with this often leading to the loss of the accuracy mark. Students should be encouraged to use algebraic manipulation wherever possible and avoid using a trial and improvement method.

Question 7

It was pleasing to see an increase in the proportion of students who could successfully calculate the Spearman's rank correlation coefficient. Many fully correct answers were seen for part (a), however the spread of marks was variable for this question. Accuracy was sometimes a problem when finding the sum of the differences in ranking and this was often due to not engaging with or recognising that the data contained items with tied ranks. Some recognised that tied ranks needed to be used, such as 12.5 and 12.5 but then continued to rank using 13 instead of 14. A minority of students still fail to rank the data consistently when calculating the Spearman's rank correlation coefficient, but were able to use the formula correctly for their figures, thus gaining a mark. Centres are advised that this in an essential skill for this qualification and should practise application with data that leads to tied rankings.

Whilst most students recognised the correct effect that removing the data for Norway would have on the Spearman's rank correlation coefficient, many failed to give a reason to support their statement. A simple explanation that implied that Norway was a potential outlier or referred to the difference being very large was sufficient. A few empty responses were seen.

Question 8

Part (a) relied on students to recognise that a maximum of 75 points still available for the season meant that there were 3 races left, given that first position in each race scored 25 points. It was disappointing to see that many blank response were seen and less than half of the students scored the mark.

Most students wrote the correct formula in parts (b) and (c), with part (b) being slightly more successful. Some gained a mark for stating a partial formula, with the most common error for both parts being to not include the equals sign.

Question 9

The majority of students demonstrated that they could accurately calculate the standard deviation in part (a). Most were also able to calculate the mean but more often, this calculation was omitted, leading to the loss of a mark. The most common error when calculating the standard deviation was to use denominator of 14, presumably from reading about 14^{th} place in the source booklet, rather than 18 as stated in the question. Less commonly seen was incorrect processing when using the standard deviation formula such as not squaring the denominator when brackets were not used.

Part (b) required a comparison and interpretation of the values for 2015 found in part (a) with the equivalent statistics from 2014. The majority were awarded a mark for a simple comparison of values for either the mean or the standard deviation. Most were able to compare the mean in context but only the minority were able to compare the standard deviation in context to gain the third mark. A common error when comparing either statistic in context was to state that a longer time implied they were faster or an improvement.

Question 10

Some students used the formulae given in part (a)(i) efficiently, using correctly identified upper and lower quartiles, with many students using the table to indicate the key data, and this was an acceptable method to show that there were no outliers. Of the errors seen, most were arithmetic due to not being able to process the decimal part of the seconds correctly. The most successful students converted the times into seconds rather than try to work with a decimal of a decimal to represent minutes and seconds and this should be encouraged when the units are unfamiliar. Some calculation errors were seen when calculating the interquartile range, but method marks were awarded when the student had clearly indicated how their IQR value had been calculated and went on to use the formulae correctly. The most common reason for the final mark not being awarded was due to failing to interpret values calculated and not comparing these to the minimum and maximum data values to ascertain that there were indeed no outliers.

The box plot in part (a)(ii) was often fully correct or at least partly correct with the main error often being due to inaccurate plotting. This seemed to be mainly due to identifying an incorrect quartile or working with a given scale that used unfamiliar time notation. This could be one area in which centres could help students to improve for future series. A small minority did not show the tails to indicate the maximum and minimum values.

Part (b) required interpretation and comparison of the distributions, as with these questions in previous examinations, the answers were variable and most were not given with reference to the context or misinterpreted a longer time duration as being faster. Students should try to compare both the median and the spread of the data in context and should use the correct terminology e.g. median not middle to gain full marks. More often than not, the median was the only statistic commented upon.

Question 11

Part (a) was answered very well by the majority, with most being awarded full marks. When marks were occasionally lost by those who attempted to draw the graph, it was often due to missing labels with the appropriate units or for not plotting all 18 data points accurately, with some being omitted. Centres would do well to encourage students to tick or cross out once they have plotted a point so that they do not lose track and include all data points, particularly when there are many points to plot. It was surprising to see more than expected blank responses.

The majority of students gained a mark in part (b) for estimating a suitable value using their graph. However, many did not use a line of best fit to inform their estimate and so were at risk of losing the mark if the value was outside of the given range. Therefore, students should be encouraged to draw a line of best fit to support any values stated that require reading from a graph they have drawn. Of those students who attempted this part of the question, very few answered the whole question as they often did not comment on the reliability of their estimate. Suitability could be justified in this case by a simple statement relating to the lap length given being within the data range plotted or referring to interpolation. It is vital that students attempt to answer the whole question and should therefore be reminded to read the whole question carefully, particularly after responding, to check that they have addressed all points in the question set.

It was pleasing to see an increase in the proportion of students who could successfully calculate the product moment correlation coefficient accurately in part (c). However, attempts to answer this question were variable, with just as many blank responses being seen as fully correct responses. Inaccurate final answers were few and far between and the most successful students often showed some intermediate steps in their working, therefore less likely to make input errors when typing a complex calculation into calculators. The interpretation required in part (d) of the PMCC value often correctly concluded the strength of the correlation was strong and positive. An interpretation in context was required for the second mark and was often omitted.

In summary the following advice to centres is offered

- Students should cover all the specification prior to exam entry
- Students should have access to all previous questions, particularly the sample paper and previous series
- This specification focuses on application of a range of Mathematics set in a range of contexts. Students should therefore be encouraged to offer a contextualised interpretation in any question or part question that requires a comparison or interpretation, even when not explicitly asked to comment in context
- As this is a comprehension paper, students must read all of the question carefully, extract information from the relevant places and then process it using the appropriate method. It is easy under these circumstances to lose focus on the question asked and therefore it is advisable for centres to actively encourage students to check final answers and ensure they have covered all the points in the question set.

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