Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2022

Pearson Edexcel International GCSE

In Mathematics B (4MB1)

Paper 02R

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Introduction

In general, this paper was well answered by the overwhelming majority of students. Some parts of questions did prove to be quite challenging to a few students and centres would be well advised to focus some time on these areas when preparing for a future examination.

In particular, to enhance performance, centres should focus their student's attention on the following topics:

- Showing clear working particularly when it is requested in the question
- Understanding the terminology n(A) in sets and the difference between the elements of a set and the number of elements of a set
- Calculating estimates of means from grouped data
- Correct terminology for describing transformations
- Correct use of percentage profit formula
- Use of bounds before any calculation is performed
- Add and scale vectors in geometrical problems

In general, students should be encouraged to identify the number of marks available for each part of a question and allocate a proportionate amount of time to each part of the question. In addition, students should also be advised to read the demands of the question very carefully before attempting to answer. It should be pointed out that the methods identified within this report and on the mark scheme may not be the only legitimate methods for correctly solving the questions. Alternative methods, whilst not explicitly identified, earn the equivalent marks. Some students use methods which are beyond the scope of the syllabus and, where used correctly, the corresponding marks are given.

Report on Individual Questions

Question 1

This question proved to be an accessible start to the paper with the majority of candidates scoring either 6 or 7 marks on this question. Parts (a) and (b) were rarely answered incorrectly although part (c) showed a few candidates who either couldn't show the correct region with shading or misunderstood the demand entirely and tried to give a numerical answer. In (d) many candidates gave fully correct answers with the most common issue seen being a single value misplaced on the diagram, this could still allow candidates to gain 2 marks. A small number of candidates showed values repeated in multiple sections of the Venn diagram, this is an error which demonstrates a fundamental misunderstanding of the structure of these. Part (e) proved to be the most problematic from the candidate's point of view. A number of candidates mistook the values in the region for the number of values, considered the region $B \cap A'$ or quite commonly both.

Question 2

This question proved to be more demanding with a quarter of candidates gaining no marks. A number of candidates failed to use the given formula correctly to find the interior angle of the 16 sided polygon and a number of candidates used an angle of 28 degrees. Although unusual it was still possible to gain marks for the trigonometric aspects of the question from an incorrect angle like this. Candidates who gained the correct angle for BAC seemed to be split almost evenly between those using the exterior angle, which is significantly simpler than using the interior angle and using the interior angle formula given. Candidates who achieved a viable angle for BAC were then able to access the main marks of the question which required use of trigonometry. Few candidates used right angled trigonometry in half the triangle ABC with most successful candidates using either sine or cosine rule in the whole triangle ABC. It would be good to ensure candidates were trained to consider simpler methodologies before attempting more complex methodologies. Although many candidates found themselves unable to access this question over half of candidates gained full marks on this question.

Question 3

A straightforward question which highlighted that a number of candidates have a poor understanding of statistics. Part (a) required candidates to fill in a table of frequencies and angles from a pie chart. A large proportion of the candidates gave a fully correct answer here, but a few issues were seen. A number of candidates failed to consider the fact that the total of the angles should equal 360 with a small number apparently assuming the frequencies would total 100. This still allowed candidates to gain one of the two marks in this part and access the method marks in the second part of this question. Of more concern were a number of candidates who gained non integer values for their frequencies. Candidates should realise these are not viable values and indicates an error in their methodology.
In part (b) many candidates had the method basically correct but it was not uncommon to see the incorrect mid-point 2.5 used for the first class. As this was usually an isolated mistake candidates generally still gained full marks here. A surprising number of candidates used half the class width in place of the mid-point and these candidates gained no marks as their method was clearly flawed and gave an answer which was not reasonable for the given data. Just over half of all candidates gained either full or 5 marks for this question.

Question 4

The responses to this question varied significantly. In part (a) most candidates gave a correct answer of reflection in $y = -2$. A number of candidates either failed to give the line of reflection or in a few cases gave the wrong line usually $x = -2$. In part (b) a number of candidates did not use the correct terminology for a translation, many candidates used transformation instead and could therefore only gain a maximum of 1 mark for this part. In part (c) many candidates gained the mark for rotation and most of these gained the mark for 90° anticlockwise. Finding the centre of rotation proved to be more of a challenge. Unusually, we did allow the first two marks for candidates who attempted to give the transformation as a rotation and translation as we felt they were making an attempt to deal with the centre of rotation even though this did not follow the demand to give a single transformation. A small number of candidates showed construction perpendicular bisectors to find the centre of rotation. While this is a correct method it is not likely to be effective in terms of the time required. In part (d) many candidates provided good responses although the negative scale factor was sometimes misinterpreted, and fractional scale factors were often seen. Candidates who tackled this question graphically generally performed better than those who attempted to use numerical approaches

involving matrices and vectors where the requirement to perform four steps to the process gave many opportunities for errors to occur.

Question 5

This question worked well to differentiate between candidates. The vast majority of candidates scored well on part (a) although a number of candidates made mistakes, usually relating to either failing to ensure probabilities from a node add to 1 or assuming the two branches need different probabilities. Part (b) was well completed by the majority of candidates, a standard application of probabilities from a tree diagram should be well within the capacity of the majority of candidates. Part (c) proved considerably more demanding, as expected. Very few candidates showed any understanding of conditional probability, although I would expect this question to prove difficult, candidates should be aware of the basic idea of conditional probability and the necessity to divide probabilities when calculating one.

Question 6

This question proved to have a wide variety of responses. The earlier parts of the question were generally well answered but as each part was independent of the other candidates who made a mistake on one part could still access the other parts. Part (a) generally was well answered, the main mistake was candidates interpreting 30 or older as just the 30 to 60 group. Part (b) was still answered well despite being more complex. Candidates who failed to gain the correct answer also often had working which was unclear and impossible to follow and so failed to gain the method marks. Candidate methods should always be clearly shown, as an absolute minimum the calculation used to gain every number which is not directly given in the question should be seen. Part (c) was generally well answered although candidates should note $65 \times (1+4\%)$ is not acceptable to gain a method mark whereas 64×104 would be. A number of candidates misunderstood the demand of the question and worked out the increased total fees paid by the over 65s, this was awarded a mark for the 4% increase if performed correctly. Part (d) proved to be more problematic for the candidates. Mistakes seen included mixing up the cost and income for 1 and 12 shuttlecocks, either could be used but candidates needed to be consistent, again candidates whose working was difficult to follow were more likely to suffer this issue. Another commonly seen issue was percentage profit calculated as profit / income $\times$ 100 rather than profit / cost $\times$ 100. This is a commonly seen issue and would be easy to address. Part (e) was a bounds question in context which often proves difficult for candidates to access. A small number of candidates made no attempt to use bounds and gained no marks. A surprisingly large number of candidates found the height of the net using the values given and then attempted to find bounds. Candidates should be aware that bounds should always be considered before any calculations are made. Candidates who did this could only gain a maximum of 1 mark if they considered the bounds of the length of the net correctly which some did not, often those who did this incorrectly considered the net length correct to 2 significant figures. Candidates who considered bounds before any calculations were performed often gained a fully correct solution.

Question 7

For many candidates this question proved to be a good source of marks. In part (a) the vast majority of candidates gained both marks, a small number lost one mark, usually for incorrectly rounded values and it was rare to see anyone score zero on this part. For part (b) the vast majority of candidates gained all three marks for plotting the points and drawing a smooth curve. Of those who made an error on this part the most commonly seen issue was plotting the first point at (1, 5.4) which was well

outside of the tolerance allowed. For part (c) the demand of the question was to use the curve. Where candidates clearly did not use the curve to gain their answer they did not gain the mark here. While it may well be sensible to use the formula to check their answer it should be obvious to the examiner that this is not where the answer originated. For part (d) many candidates tried to use acceleration = velocity / time. This is only ever viable for a constant acceleration which is clearly not the case in this example. Those candidates who realised they needed to differentiate usually managed to gain one mark at least. Gaining both marks required candidates to be able to deal with a negative index which proved more demanding. In part (e) candidates with incorrect results in (d) could usually only gain the first method mark as their expression would not usually give a reasonable equation once equated with 0. Candidates who had the correct derivative in (d) usually managed to gain the correct solution in this part.

Question 8

This function question targeted high grades and it was pleasing to see most candidates make a good attempt at this question with over a quarter gaining full marks. Part (a) was relatively straightforward, but a number of candidates only found one of the intercepts and so only gained 1 mark. Part (b) proved more straightforward with the vast majority of candidates gaining the correct answer. In part (c) many candidates formed a correct equation gaining some marks. Rearranging this to gain the correct quadratic proved to be more difficult with a number of different issues seen. Candidates were still able to gain marks if they gained a three term quadratic if they showed their working when solving the quadratic equation. Those who failed to show their working need to be made aware that they are not going to gain marks. The quadratic formula was given, and so few candidates attempted to complete the square, while this is a viable method using the formula is usually simpler in a case like this. A small number of candidates gained a correct answer but lost a mark as the format of their answer did not match that required in the demand of the question. In part (d) a small number of candidates mistook the notation and attempted to find the reciprocal rather than the inverse, these candidates could still gain one mark for finding an expression for the composite function. As with the previous part of the question there were a number of issues with some of the responses, many related to dealing effectively with the algebraic fractions.

Question 9

Candidates struggled with this vector question. In part (a) most candidates scored some marks but it was not uncommon for errors in the vectors to be seen. The most common issues related to vectors being oriented the correct way around or the ratio of AD:DC not being dealt with correctly. A number of candidates failed to gain any marks as they clearly were considering just lengths rather than vectors given that one of the vectors given was a radius of the circle. Candidates generally only made any progress in part (b) if they had made a good attempt at part (a). Given that the questions specified a particular method to use the very small number of candidates who gained the answer by considering an alternative method eg. considering similar triangles gained no credit for this. Many candidates failed to gain any marks as they did not use two variable coefficients for the ratio of DE:DB and CE:EO which was essential to gain any marks. As the choice of coefficient was left to the candidates it was also essential that their working was sufficiently clear and complete to allow them to gain any marks here. Part (c) showed a number of candidates consider that they could consider lengths of vectors by just adding the lengths of the components. They could only gain one mark for this by considering the length of AC and AB. Candidates who used the fact that angle ACB was 90° generally found the correct answer, although a small number of candidates lost the final mark as they did not give their final answer in surd form.

Question 10

While testing high level algebraic skills candidates performed well on this question. In part (a) the formula for the determinant was given and meant many candidates gained marks on this part. In part (b) many candidates who failed to gain the marks lost these as they showed ($k + 5$) was a factor using long division rather than the required factor theorem. In part (c) it was obvious that some candidates were using their calculator to find the roots and so gained no marks. Apart from this, issues seen included errors in the method to find a quadratic factor to go with the given factor of ($k + 5$) sign errors in factorising the resulting quadratic or failing to combine all three factors into a single expression. In part (d) a large number of candidates managed to gain a mark by substituting a positive root into the matrices but very few used the correct order for the matrix multiplication.

Question 11

Despite being a challenging question many candidates were able to gain a mark for this by considering the perimeter of *ABCD*. Dealing with the area of *EFG* was generally more demanding. A number of candidates attempted to use the area formula $\frac{1}{2}ab\sin C$ which proved to be considerably more difficult than the intended $\frac{1}{2}base \times height$ due to the fact that this would involve considerably more awkward results. Once a reasonable attempt to form the area of *EFG* were seen this then allowed candidates a chance to form quadratic inequalities. It seemed that due to the difficulty of forming the quadratic that the candidates who gained a quadratic made a better attempt at dealing with the resulting quadratic than usual and the majority of those who formed a quadratic considered the correct region in between the two critical values. It was very rare to see a candidate manage to gain the final mark which required a candidate to consider that the length *BC* must be positive.

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