Examiners' Report

Principal Examiner Feedback

Summer 2023

Pearson Edexcel International GCSE

In Mathematics B (4MB1)

Paper 01

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Introduction

In general, this paper was well answered by the majority of students. Some parts of the paper did prove to be quite challenging to some students, such as question 14 on congruent triangle, problem solving questions 22, 24 and 26 and some advanced algebra in questions 23 and 26

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

- Ensuring candidates have correct mathematical drawing equipment for construction questions such as question 4
- Dealing with numbers in standard form, particularly strategies for adding and subtracting number in standard form as in question 12
- Properties of quadrilaterals as often candidates failed to appreciate that in general trapezia do not have any symmetry in question 14
- Finding vectors given coordinates or position vectors of the end points as the sum rather than difference of vectors was often seen in question 16
- Differentiation of integer powers as in question 21
- Expanding squaring brackets as required in question 26
- Structuring and labelling working in multistage problem-solving questions such as 16, 18, 22, 23, 24, 26, 27 and 28.

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

A fairly straightforward question which allowed many candidates to make a good start. Just over half of candidates gained 2 marks and just under a third gained 1 mark. The most commonly seen incorrect answer was to identify $\sqrt{36}$ and $\sqrt{18}$ as the irrational numbers, clearly some candidates have the misconception that square roots are automatically irrational.

Question 2

Another very accessible question with around two thirds of candidates gaining full marks. The most commonly seen error was to simply list the 2nd and 6th terms of the sequence rather than find the sum of these. This at least allowed the candidates to gain one mark. Knowledge of common mathematical terms like, sum, difference and product is well worth emphasizing with candidates.

Question 3

This proved to be the most accessible question with a significant majority of candidates gaining full marks. The most commonly seen error was in failing to deal with $(-4)^2$ correctly. Writing powers of negative numbers using parentheses would at least gain the method mark even if evaluated incorrectly although very few candidates who wrote $(-4)^2$ then evaluated this as –16.

Question 4

Another very accessible question with around three quarters of candidates gaining full marks. Many of the remaining candidates made no attempt at this or drew a line freehand in approximately the correct position. As this question is testing the ability to perform a standard construction, candidates need appropriate equipment in order to be able to demonstrate this skill.

Question 5

Just over half of candidates managed to gain full marks on this question, making it somewhat more challenging than most of the other early questions. Candidates who failed to gain full marks rarely had a valid approach and so the vast majority of these candidates gained no marks. There were a few cases of candidates who managed to achieve the correct answer using incorrect methodologies, usually involving assuming that angles BAC and CDE were right angles. Candidates need to be aware that a correct answer which follows from incorrect methods or unsupported assumptions will not be given credit.

Question 6

A purely algebraic question which allowed candidates to show their ability in this area with over half scoring full marks. However, since candidates following the standard convention of keeping the variable on the left needed to invert the inequality sign many candidates lost a mark for failing to appreciate this aspect of the question.

Question 7

Another question where the majority of candidates gained full marks but those who failed to achieve the correct answer generally gained no marks. Many candidates made the common error of assuming that an 8% increase will counteract an 8% decrease, not only is this incorrect but it gives an answer which is not a viable amount being to 4 decimal places which is not appropriate for currency. A few candidates attempted to decrease $2.53 by a further 8%, clearly misunderstanding the context presented in the question.

Question 8

This question proved to be a good test of understanding of inequalities with a fairly even split between all available marks. Common mistakes included, giving inequalities indicating the wrong side of the given line, failing to use $x = 0$ and $y = 0$ as the boundaries seen on the axes and attempting to rearrange the given equation into a different form, which is unnecessary, and making a mistake in the process.

Question 9

This question tested candidates' ability to complete the square of a simple quadratic. This method seems to be the least well understood of the methods related to quadratics. It was pleasing to see that the majority of candidates managed to gain some marks on this question. Most candidates gained a correct answer for the coefficient a and the majority of those who gained this mark then also gained a mark for the correct coefficient b with the most common issues relating to incorrect signs.

Question 10

Candidates seem to be learning what is required for questions involving the manipulation of fractions. The vast majority of candidates gaining at least one mark. Few candidates gained incorrect answers, the main issues seen were candidates who failed to show the individual fractions with common denominators who generally gained 1 mark and candidates who left their final answer as an improper fraction who generally gained 2 marks.

Question 11

An accessible question where around three quarters of the candidates gained full marks. The main errors seen were candidates making mistakes in expanding the brackets and sign errors seen when isolating the x term.

Question 12

Only a minority of candidates gained any marks on this question. Since the addition needed to be completed first this prevented many candidates from gaining any marks. Many candidates either multiplied the two terms on the denominator or made an attempt that totaled the indices of the two terms. This then prevented candidates gaining any marks. A minority of candidates clearly attempted this using a calculator, failing to appreciate that the numerator would be too small for a calculator to deal with giving a value of 0. This then led to serious issues for these candidates who were then attempting to perform an invalid mathematical operation. Candidates need to be aware of the limitations of their calculators in dealing with standard form.

Question 13

Another accessible question where the majority of candidates gained fully marks. Part (a) was generally answered correctly with a few candidates providing only partial factorisations and gaining only 1 mark. Part (b) was also generally well answered but a number of candidates who achieved the correct answer then went on to find the roots of the quadratic losing the final mark. Candidates need to ensure they follow the demand of the question, continuing will generally be interpreted as misunderstanding of this demand.

Question 14

This question proved to be particularly difficult for candidates with very few scoring above 1 mark. Candidates made a variety of errors but by far the most common were using the assumption that angle AED = angle BEC to prove the same and assuming that a trapezium contains a line of symmetry. The first of these will always lead to an apparently successful result but clearly can gain no credit. The second was true in this instance but is not a general property of trapezia and could not be directly justified from the information given. In order to succeed in question like this, candidates need to ensure their work is clearly structured, in many cases correct statements were seen in the candidates working but unless there is a clear logical structure this may not gain marks. A good example here was that in order to establish that angle AED = angle BEC we need to consider that AED = CDE, CDE = DCE and DCE = BEC. If this is not clearly stated in a logical order the fact that a candidate has considered all these is not easily inferred.

Question 15

Another question, like question 10, where candidates have learned what is required to be seen in a question such as this. Only a small minority gave an answer of $4\sqrt{5}$ with virtually no working suggesting they had just used a calculator. However, many candidates did stop at this point, failing to gain the final mark. Candidates who worked by breaking down their values to obtain smaller radicals generally fared better than those attempting to combine their values before dealing with the radicals.

Question 16

A significant number of candidates failed to gain any marks on this question. A significant number failed to gain a correct expression for the vector AB. However, if they labelled their attempt and then made a correct attempt to find the modulus of their vector they could then gain one mark, this could have helped a number of candidates where incorrect values were seen but as they failed to give a vector they could not be given credit for finding the modulus of their vector. It should be relatively easy to see the correct vector if a simple diagram is drawn, but few candidates attempted this.

Question 17

Most candidates gained either full or no marks for this question. Candidates who understood that the area represents the frequency generally fared well, although a small minority failed to label the frequency density axis and so lost one mark for this. Most of the remaining candidates drew the bars so the height represents the frequency and so gained no marks.

Question 18

This question proved to be a good discriminator with significant number of candidates scoring all available marks. Most candidates who had correct methodologies gained the correct answer showing that few candidates made minor numerical slips. Common errors included incorrect expressions for the mean or median which lost marks but as long as algebraic expressions were used and at least one was correct did not preclude the award of later marks, incorrectly dealing with the difference of 2 which again did not preclude the final method mark being awarded and errors dealing with the fractions within the equation generated.

Question 19

In part (a) the value of a was not needed as the a and $-a$ in the probability for 2 and 4 cancelled out. As only 1 mark was awarded for this question candidates should realise that multiple steps were not required.
In part (b) the value of a was required and if found in part (a) needed to be used to gain credit in part (b). A number of candidates gave the result in terms of a which failed to gain any marks as the fundamental result being tested was the total of all probabilities is 1.

Question 20

A fairly standard question which saw the majority of candidates gaining 3 or 4 marks. Candidates who lost marks generally failed to use correct notation, for example using proportional sign rather than an equals sign for answer in part (a).

Question 21

Despite being generously marked approximately half of candidates failed to gain any marks in this question. The first mark was awarded for dealing with the rational part of the expression. This did not require correct differentiation, just writing in index form. The second mark was for a correct term differentiated, however as the derivate of x^2 was sufficient to gain this mark dealing with the rational expression was not required for this. As long as the candidates was able to gain the mark for differentiating the final method mark was awarded for setting their derivative to 0 and substituting $x = 1.5$. Although the whole question was demanding, the mark scheme allowed marks for candidates who could demonstrate any understanding of this topic. Differentiation should be considered as a relatively easy way for candidates to gain some marks on this specification.

Question 22

This problem-solving question proved difficult for candidates to access with nearly two thirds failing to gain any marks. A large number of candidates were put off by the fact that the edges of the cube were not directly given. Candidates who made no attempt to find the edge could only gain one mark whereas those who found an incorrect edge were able to use this to gain 3 marks. This shows the importance of making an attempt to answer all aspects of the question. Candidates need to ensure they attempt to find required values and label what they believe they have found and show full working with these values. Failing to follow these steps will prevent candidates gaining fairly easy marks within these problem-solving questions.

Question 23

Another discriminating question which showed candidates well spread across all available marks. Many candidates showed an understanding of the steps required to gain a single fraction in its simplest form but made errors in this particularly demanding example. As a general point, candidates who attempted to factorise and simplify their work as they went along were more successful than those who failed to simplify intermediate results.

Question 24

Another problem-solving question but this proved straightforward for candidates to make a start on with the majority gaining some marks on this question. The first 2 marks for finding the height of the trapezium proved accessible to a significant number of candidates. Forming a right triangle using half the differences between the parallel edges then gained the third mark, with many candidates picking this up. Candidates then needed to use trigonometry which proved to be a little more challenging. Finally converting their angle to a bearing caused a minority of candidates to miss out on gaining full marks. Again, candidates who organized their work in a logical fashion generally performed better on this question.

Question 25

An accessible question at this late stage in the paper. Many candidates showed a good understanding of the required matrix manipulation. Errors were fairly evenly split between minor numerical errors and candidates who did not know how to find the inverse of a matrix, in some cases giving the reciprocal of each term.

Question 26

A fairly standard if demanding question. A significant number of candidates attempted to use the elimination method appropriate for linear simultaneous equations and failed to gain any marks. Of those who realized that they needed to use a substitution method a significant number then failed to expand the squared bracket correctly often failing to gain a three-term quadratic which significantly simplifies the problem and so precludes the award of any further marks. Many candidates could have gained more method marks if they'd made a better attempt at the expansion rather than just squaring both parts.

Question 27

Another problem-solving question where many candidates failed to gain any marks. The first two marks for dealing with the required angle BOF and BCF was gained by a significant number of candidates and a slightly smaller number managed to find the length FE or FD using the intersecting chord theorem. Candidates who failed to manage either of these steps could still gain method marks but this was fairly infrequently seen. Candidates who gained the first 3 marks then generally went on to gain full marks, or made an unwarranted assumption, usually that BC = CF and failed to pick up any marks. As has been stated in the previously in the problem-solving question candidates who presented their work in a logical fashion generally fared much better than those whose work was difficult to follow.

Question 28

A particularly demanding question which saw around three quarters of candidates fail to gain any marks. Due to the variety of method candidates could use in this question candidates who managed to find any details of the shape were likely to gain some marks. This was evident with a significant number of candidates finding one angle of the triangle using the cosine rule for two marks with no further working towards the required answer. The minority of candidates who did gain the correct solution generally made good use of annotations on the given diagram to help organize their results. A number of candidates were able to use more advanced results such as Heron's theorem in this question, while these are never required, they will gain credit where used correctly

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