Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE

In Mathematics B (4MB1) Paper 01

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Paper 01

Introduction to Paper 01

While examiners did report a number of excellent responses to questions, in general, the majority of students seemed under-prepared for this paper with examiners reporting many blank responses to nearly all questions.

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

• Reasons in geometric problems

• Questions that involve the demand to show all working (most notably questions 7 and 9)

• Probability

• The determinant of a 2 by 2 matrix and the magnitude of a vector

• Unstructured trigonometry questions

• Applications of differentiation

• Questions requiring algebraic proof

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

The vast majority of students correctly found the second, third and fourth terms of the sequence although a number of students did not read the question carefully and found the first three terms.

Question 2

The vast majority of students added 180 to 54 and therefore found the correct bearing of town B from town A. Students are once again advised to read the question carefully as a number found the bearing of town A from town B. In questions which involve finding a bearing students are strongly advised to provide their own sketch which would probably help to locate the required angle.

Question 3

The vast majority of students correctly calculated the percentage loss in Amrit's weight by first finding the difference in the two values, dividing this result by 75 (which was Amrit's weight at the beginning of the summer) and then correctly converting their answer to a percentage by multiplying by 100. The most common error was dividing by Amrit's weight at the end rather than the beginning of the summer.

Question 4

Many students incorrectly gave the answer of $(1, -2)$ for the coordinates of A; this was once again down to not reading the question carefully as many incorrectly thought that the coordinates of A were found by considering $\overrightarrow{OA} = \begin{pmatrix} -1 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ rather than the correct $\overrightarrow{OA} + \begin{pmatrix} 2 \\ -5 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

Question 5

While many students correctly stated in (a) that only I had exactly two lines of symmetry far few correctly stated that only I and N had rotational symmetry of order 2.

Question 6

Although the question explicitly stated that only two of the six numbers were irrational a number of students stated more than two answers. Approximately half of students correctly stated that the two irrational numbers were 2π and $4\sqrt{2}$.

Question 7

Far too many students did not show sufficient working in simplifying the given fraction with many stating the correct answer $\frac{1}{8}$ without showing the key steps of converting the mixed number $2\frac{1}{4}$ to an improper fraction. The most common error noted by examiners was the confusion in how to multiply fractions together with many students believing that a common denominator was required. While this approach is not technically incorrect many students then proceeded in multiplying only the numerators together (an indication of confusion with the method for adding fractions together).

Question 8

Students dealt with this linear equation involving standard form extremely well with the vast majority correctly arriving at an answer of 4 405 000. However, many did not convert this into standard form as requested.

Question 9

While the correct answer of $10\sqrt{5}$ was seen in the vast majority of scripts very few students scored full marks on this question as they failed to show sufficient working when simplifying the two surds. While it is debateable whether students would know that $\sqrt{80} = 4\sqrt{5}$ without the need for working, examiners were less convinced by those who simply wrote that $\sqrt{180} = 6\sqrt{5}$ without showing at least one intermediate step. It is strongly advised that in questions like this that students refrain from using calculators or doing the working in their heads as they need to write down all steps so that examiners know that a logical sequence of deductions have been made from the beginning to the end of the question.

Question 10

Very few correct solutions were seen to this question and it is clear that many students were unfamiliar with the determinant of a 2 by 2 matrix with many totally blank responses seen by examiners. The most common error from those that did have some understanding of this topic was to write $\det\begin{pmatrix} 2x & 1 \\ 5x & 4 \end{pmatrix} = \frac{1}{4(2x)-1(5x)}$ rather than the correct $4(2x)-1(5x)$. Those that did have the correct expression for the determinant usually went on to find the correct value of *x*.

Question 11

This question on algebraic fractions was answered extremely well with many students understanding the processes required to write $\frac{3}{2x-1}-\frac{4}{x+2}$ as a single fraction in its simplest form. While nearly all students re-wrote both terms with a correct denominator the most common mistake thereafter was the standard sign errors, for example, $\frac{3x+6-8x-4}{(2x-1)(x+2)}$. In cases like this the use of brackets, for example, $\frac{3(x+2)-4(2x-1)}{(2x-1)(x+2)}$, would, examiners believe, cut down the number of errors of this type.

Question 12

Part (b) proved to be quite challenging for more than half of all students. While most correctly used the fact that the angle at the centre is twice the angle at the circumference to get the correct answer of 64 for part (a) many could not deal with the stages required to find angle *OCA* in part (b). While many correctly realised that triangle *ABC* was isosceles which therefore implied that angle *ACB* was 32° many could make no further progress as they did not realise that triangle *OBC* was isosceles too.

Question 13

The vast majority of students began this question by attempting to expand both brackets, however, the following two mistakes

- $(4n \pm 3)^2 = 16n^2 \pm 9$
- $(4n+3)^2 - (4n-3)^2 = 16n^2 + 24n + 9 - 16n^2 - 24n + 9$

were seen far too often with the second of these errors caused once again by students not using brackets. A number of students attempted to use the difference of two squares to expand and while some did manage this correctly, many once again made mistakes due to sign errors. Of those that correctly arrived at the expression 48*n* many did not infer (with sufficient detail) why this proved that the original expression was a multiple of 12.

Question 14

This question proved to be demanding for the majority of students with many either leaving it blank or failing to understand that the question concerned the modulus of a vector. A number of students simply summed the two components and equated the resulting expression with 5. Those that did correctly state the modulus of **a** as $\sqrt{(2x-1)^2+9}$ usually went on to score full marks although when faced with the need to solve the quadratic equation $(2x-1)^2+9=25$ many felt the need to expand the brackets first. Some students realised immediately that if the modulus of the vector was 5 and one of the components was -3 then by Pythagoras the remaining component in x must have a magnitude of 4. However, of those that took this approach many only stated that $2x-1=4$ rather than the fully correct $2x-1=\pm4$.

Question 15

The majority of students found this question rather demanding with most attempting to prove the congruency of the two triangles by SSS with many only scoring one mark for stating that AC was common to both. While some students did state the correct reason for why $AB = AD$ most could not give a fully correct reason for why $BC = CD$; for this reason examiners expected to see an answer involving the fact that tangents to a circle from an external point are equal in length.

Question 16

While nearly all students simplified part (a) correctly to $16x^{10}$ the responses seen to part (b) were more mixed with the most common error being $(27y^9)^{\frac{4}{3}}=27y^{12}$.

Question 17

On the whole this question was answered well with the majority of students realising that the two lower bounds were required for part (a) and the two upper bounds for part (b). Errors came in part (a) by not adding together two lots of each lower bound and in part (b) some gave the upper bounds as 296.4 or 296.49 (and similarly for 210). One common misconception regarding bounds which was seen again this series was by those students who worked out either the perimeter and/or the area using the values given in the question and then round up or down thinking that the bounds are to be found after the operations have been performed.

Question 18

Students often had a good level of success on this question with many scoring all four marks. A few responses got the concepts of direct and inverse proportion confused and a number read the question, which asked for the cube root, as requiring either the cube, square or square root. A number failed to give the values of x^2, as required and instead only gave the value of x when $y = 704$.

Question 19

The responses to this question were mixed, with one mark being the most common mark for the correct factorisation of the denominator. Many students tried to factorise the numerator, but failed to give the same terms in both brackets. A few responses were seen which just cancelled terms out without factorising and therefore arriving at completely incorrect answers. A number of students who correctly arrived at an answer of $\frac{5-x}{2x-y}$ continued to 'simplify' this expression and so lost the final mark.

Question 20

Apart from the common error of drawing a bar chart (of which many did not even fit on the grid provided) this question was answered well with many students correctly drawing the required four bars to complete the histogram. Students are reminded that in order to score full marks the frequency density axis must be given a correct scale.

Question 21

Examiners noted that many students correctly dealt with the need to use both formulae for the area of a sector and the area of a triangle using $\frac{1}{2}ab\sin C$ to calculate the area of the required segment. The most common errors were in using incorrect formulae for one or both of these two areas.

Question 22

This question presented a significant challenge to most students with over half only scoring one mark. Many of these students failed to adjust for the difference in scale factors between area and volume and therefore gave an answer of 324. Of those who correctly worked out the length scale factor first the vast majority then went on to score full marks for an answer of 540.

Question 23

While it was pleasing to see many correct responses to this probability question many students could not deal with the demands of this question and spent what examiners can only assume was a significant amount of time drawing tree diagrams which were used to varying degrees of success. A number of students incorrectly considered this scenario as a replacement problem when in fact the context made it clear that the sweets were not being replaced in the bag. The most successful responses considered the complement (that is subtracting from 1 the two cases in which the 3 sweets are of the same colour); those that tried to consider all the scenarios of when the 3 sweets were not of the same colour usually did not realise that there were 6 possible ways that this would occur.

Question 24

The responses to this question were very mixed with many students leaving both parts blank. Part (b) did not rely on part (a) and considering part (b) was a standard question on rearranging the subject of a formula it was disappointing to see so many blank responses here. With regards to part (a) students are reminded two things about 'show that' questions, the first is that the students are expected to start from the information given in the question and show that the given result is true and not start with this result (in an attempt to work backwards). The second is the need to show sufficient working/detail as far too many times examiners reported a lack of working making it extremely difficult, at times, to know if students had genuinely derived the given answer or in fact had attempted to work back from the result and were therefore effectively trying to 'fudge' their response.

Question 25

Many students realised the need to differentiate the expression for displacement to find the acceleration but unfortunately a number only differentiated once and not twice. However, examiners noted that most students who attempted this question did indeed differentiate at least once correctly. In part (b) a number of students either put the expression for displacement or velocity equal to zero and of those who did put the acceleration equal to zero a number either failed to substitute for t at all or substituted for t into an incorrect expression.

Question 26

This question was answered extremely well with many students correctly stating the gradient of **L** as -2, unsurprisingly the answer of 2 was probably the most common incorrect answer seen. Part (b) was also answered well with many students correctly stating the coordinates of both A and B before going on to find the area of the triangle. Some confusion with the line lead to negative areas which surprisingly didn't seem to concern those students.

Question 27

This question was probably the most challenging on the whole paper and so therefore the majority of students either scored zero or only one mark for the correct application of the sine rule. Of those that did realise the cosine rule had to be applied first to find x many found the working and corresponding algebraic manipulation too complicated with only a few arriving at the correct three term quadratic in x. For those that did manage to obtain this quadratic and solve it correctly the size of angle ACB usually followed.

Question 28

Part (a) of this final question was answered extremely well with many students obtaining the correct answer of $x < 3$ although the usual errors with inequality signs were in evidence. In part (b) it was pleasing to note that many students understood that in essence the method for solving a quadratic inequality is similar to solving a quadratic equation with many correctly finding the critical values of 4.5 and -1, however, many either stopped at this point or failed to realise that due to the orientation of the inequality sign the inside region (between these two critical values) was required. Very few students made any progress in part (c) which required the bringing together of the results from these two previous parts.