Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2023

Pearson Edexcel International GCSE

In Mathematics B (4MB1)

Paper 01R

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Summer 2023
Publications Code 4MB1_01R_2306_ER

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Introduction to Paper 01R

Students were generally prepared for this paper and there were some excellent responses.
To enhance performance in future series, centres should focus their student's attention on the following topics:

- Finding the median of a set of numbers
- Questions that involve the demand to show all working
- Formula for the volume of a sphere and cone
- Using bounds
- The relationship between the scale factors for length area and volume
- 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 was a straightforward question for the majority of students with most adopting the table approach or finding the prime factors of each number. The most common errors were trying to find the HCF rather than the LCM or finding $12\times14\times15=2520$ and making numerical errors, particularly when using the table method.

Question 2

The vast majority of students successfully converted the first term to a correct improper fraction and showed it multiplied by $\frac{7}{12}$. Not showing any further working to arrive at the given answer of $\frac{7}{10}$ proved to be the undoing of a significant minority of students. Overall, though, the number of fully correct answers far surpassed those scripts where less than 2 marks were earned.

Question 3

This was a standard indices question and was answered well by most students with many correct answers seen. The most common errors were

- taking x^2 as a common factor in part (a)
- multiplying 2 by 3 to give a power of 6 rather adding the indices

Question 4

Many correct answers were seen in part (a) For those he did not gain full marks the diagram was either left blank or, as a square was given, four lines were drawn
In part (b), a majority of students scored the mark but there were many diverse, but incorrect answers seen such as 0, 1,2 and 4

Question 5

The overwhelming majority of students scored full marks on part (a).
Part (b) was also well answered. The popular, but erroneous answers of 87 or 108 perhaps indicates students need to read the questions carefully

Question 6

Typical of the cohorts for this paper, the majority of students showed good, algebraic skills. However, the issue here was that the question was asking for the factorisation of a quadratic **expression** not the solution of a quadratic **equation**. Students who used the quadratic formula and arrived at the answer $x = 7$ and $x = -2$, scored no marks. Other students who factorised first and then solved the equation did, at least, earn the method mark.

Question 7

In both parts, students fared well. In part (a) there was confusion between the mode and the maximum as the most popular incorrect answer was '11'. In part (b), students knew that the numbers needed to be placed in order before finding the median value. However, some then went on to find the mean and others stated that the median was 5.5 rather then find the average of the 5th and 6^{th} values. A minority of students, simply found the middle of the given set of numbers as they were printed. As a result, $\frac{2+7}{2} = 4.5$ was an infrequently seen incorrect answer.

Question 8

The majority of students knew what was expected of them and gained full marks. Of the minority who didn't achieve full marks, many simply stopped at finding the exterior angle (15) or the sum of all the interior angles (3960).

Question 9

The overwhelming majority of students scored full marks on this question. On very few scripts, students unsuccessfully removed the square root sign.

Question 10

The majority of students were able to demonstrate that they knew how it differentiate with those who successfully removed the brackets generally gaining full marks. A popular, but erroneous, method stemmed from students not multiplying out the brackets before attempting to differentiate usually resulting in the answer $\frac{\mathrm{d}y}{\mathrm{d}x} = 20x^3 + 2x \times (3)$

Question 11

This question was the first to discriminate well with just over 50 % of students gaining full marks by gaining the required answer of $8\pi + 24$ (or any equivalent un-simplified form)
The most common errors were not including the radii in the perimeter or not giving the answer in terms of π

Whilst not within the specification a minority of students attempted to use the formulae, $\frac{1}{2}r^2\theta$ for the area of the sector and $r\theta$ for the length of the arc. Unfortunately, many of these students seemed unaware that they needed to use $\theta = \frac{2\pi}{3}$ rather than $\theta = 120^o$ and lost marks.

Question 12

Good algebraic skills led to the vast majority of students scoring full marks here. Of the minority of students who failed to achieve full marks, the main error was not multiplying the right-hand side when removing the denominator.

Question 13

This question proved to be challenging for the majority of student with around 40% gaining full marks. Students knew they needed to equate the coefficients usually found the value of p correctly however, subsequent arithmetical errors in determining the value of q were common.

Question 14

About a third of students did not understand the requirement for part (a) with the most popular, incorrect answer being $7\%y$. Interestingly, this error did not prevent these students going on to gain full marks in part (b).

Question 15

The majority of students scored full marks here. they knew what was expected and showed the steps in their working clearly. The occasional arithmetical slip led a small number of students to lose marks. Students seem, year on year, to be well drilled with this topic.

Question 16

Whilst the vast majority scored full marks on this question, a significant number of students did not realise that the 208 represented 10.4 % of the total number of students. Whilst there were attempts to add 208 and 510, the vast majority who scored zero marks did not use 10.4% or $(100-10.4)\%$ in any meaningful way. Those who did determine the total number of students or the number who travelled by car or the percentage of students who walked to school invariably went on to achieve full marks.

Question 17

In part (a), whilst most students knew how to deal with the scale many did not change from metres to cm so 0.335 was a common incorrect answer. This value, as an answer should perhaps have raised alarm bells for the student as this would be a very small model indeed. In part (b) many students used a scale factor that was not cubed and a conversion to m^3 by dividing (and even multiplying in some cases) by 10^4

Question 18

The vast majority of students were able to score at least one mark usually for a correct arc of radius 10 cm. The main errors were

- drawing the bisector of the wrong angle
- drawing the bisector of a line
- identifying *P* as a region rather than a point.

Question 19

The vast majority were able to populate the diagram correctly in part (a) and this was usually followed by a correct equation to find x in part (b). Surprisingly, despite the good responses to the first two parts of the question, a correct answer proved elusive to a significant minority of students in part (c). Whilst the numerator of 11 was usually correctly found, the denominator of 30 was not always seen. It should be noted that if errors were made in the earlier part of the question, then full working needs to be seen to show that the probability has come from correct working.

Question 20

This question required an equation to be set up where $\frac{(volume\ of\ the\ cone)}{(volume\ of\ the\ hemisphere)} = \frac{3}{4}$

Whilst there were many blank responses those who made an attempt were often able to gain marks for writing the volumes with r = 10 substituted at some point. By far the most common error was not realising that the height of the cone is (h – 10) and not just h, leading to h = 15 being a popular but erroneous answer earning 3 marks out of a possible 5 marks. Other common errors included

- forgetting to find half the volume of the sphere
- using $\frac{(volume\ of\ the\ cone)}{(volume\ of\ the\ hemisphere)} = \frac{4}{3}$

Question 21

This question was well answered with the majority of students gaining full marks. A few students used approximate values in their working, consequently reaching an incorrect answer.

Question 22

As well as no response, there were a significant minority of students who scored nothing for a variety of attempts. It should be noted that whilst past questions often say "using the factor theorem…" the question will not always give this hint and students need to know when it is the most suitable method to be used. Whilst long division was often seen here it was rarely successful due to the algebraic nature of the equation. Of those students who used the factor theorem the majority went on to provide a complete, and correct, solution.

Question 23

This question proved to be challenging to the majority of students. Part (a) was a 'show that' question and students should be reminded that a complete solution is required. Simply stating a Pythagorean statement that $ON^2 = 19.5^2 - 18^2$ earns the 1st mark but more work needs to be shown for the final mark. Despite a diagram which showed a right-angled triangle and intersecting chords there were many blank responses seen in part (b) as students did not seem to know where to begin. The vast majority scored either zero or one mark (for either EN = 10 or $AE \times EC = 28 \times 8$) and nothing more. The crucial process of $\sqrt{19.5^2 - 10^2}$ was missed by the majority and consequently only about 20% of students scored more than 1 mark.

Question 24

Many students still do not know how to interpret upper and lower bounds and when to apply to data which is given. Many students equated the mean to 2 and added/subtracted 0.05 to their value of k rather than finding and using the upper and lower bound for the mean.in the 2 calculations. Of those students who did realise that two equations were required with boundary values of 1.95 and 2.05, many scored at least five out of the six marks. A score of five marks was usually achieved by students who gave their final answer using at least one < inequality sign.

Question 25

Parts (a) and (b) were generally done well with much correct working seen. Problems arose, however, on part (c) where the majority of students thought it was sufficient to simply show the matrix multiplications of **BC** and **CB** for the marks rather than using parts (a) and (b). It was a rare event indeed to see something like $\mathbf{A}^{-1}\mathbf{ABA}^{-1} = \mathbf{A}^{-1}\mathbf{BAA}^{-1}$ or CABC = **CBAC** and only approximately 5% of students scored both marks. With well over half the students scoring no marks here, the remainder did manage to score one mark for stating **AB** = **BA**.

Question 26

Many students who attempted part (a) used AAA to try and prove congruency. Others assumed *PR* and *PQ* were parallel. A significant number of students simply tried to equate any pairs of angles which they thought were equal. This often led, at best, to two marks although the vast majority scored either zero or one mark here. Of those that failed to score, many attempts were either left blank, vertically opposite angles at *T* only were given, or there was an attempt at intersecting chords ($PT \times TS = QT \times TR$). Where one mark was awarded, the vast majority of students gave correct pairs of angles but for different methods on the mark scheme.

Part (b) discriminated well at the top level. The vast majority of scripts were left blank. Many who did write anything simply wrote down $1+4+'x'$ where $'x'$ was either blank or any number that the student could think of (other than ‘4’). Of those who were successful the majority gave a length for *PQ* or *RS* and used the areas of the triangles to determine the height of the trapezium thus enabling them to find the area of the quadrilateral *PQSR*.

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