Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel International GCSE
In Mathematics B (4MB1) Paper 02

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Introduction

Students were generally prepared for this paper and there were some excellent responses. It was pleasing to see that students are now labelling what they are finding.

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

- Reciprocal graphs
- Following the instruction in graph questions when asked to find by drawing a line
- Visualising triangles in 3D shapes
- Matrices associated with the various transformations
- Enlargement and how to describe it. Particularly the scale factor and when it is negative.
- 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.
- Use of brackets was poor and centres could be reminded that correct use would be helpful to minimise candidates' sign errors when manipulating a lot of terms in algebraic questions.
- Students would be advised to think about how they layout their work, particularly on the problem-solving questions. Working down the page rather than a mix of across up and down. If they want to use both sides of a page, it may help them to draw a line down the middle, so the sides do not get muddled up and merge into one. This may help them eliminate careless mistakes in selecting the incorrect numbers, from their working, to use in in later calculations.

Report on Individual Questions

Question 1

Part (a) was answered well with many students scoring this mark. The most common error was to leave out the negative sign on the power e.g. 1.596×10^5 Other errors included answers not given in standard form e.g. 0.1596×10^{-4}

In part (b) students generally used one of the 2 methods given in the mark scheme.

Those that took the 1st method often gained the 1st M mark as they used speed = distance / time. Many were then able to change their speed from km/day to km/seconds. However, a common error included division by $60 \times 60 \times 60$. Many students were able to get to awrt 300000, but some then failed to write this value in standard form.

Question 2

This question on constructions and locus was generally well answered. Part (a) caused the most problems with the vast majority of students drawing only a partial circle, within the boundaries of the triangle and failing to recognise that the loci of points would form a full circle around point *B*. The perpendicular bisector and angle bisector were well executed but students should be reminded to make their arcs clear. Once all loci were drawn the region was generally identified correctly with shading. Some students mistook their construction arcs for the perpendicular bisector as a boundary of the required region, other's just shaded part of the required area. students. Whilst the majority of candidates shaded a few chose to just label it R which did not gain the mark.

Question 3

This question began by testing student's understanding of set notation to fill in the Venn diagram. This was quite well answered but students made errors in the intersections and knowing where there was the need to subtract the *x* in the centre, either not subtracting from 48 or subtracting from 35 in addition. In part (b) there were two possible methods, adding up those outside *C* to 105 or adding up those inside *C* to 115 with the former being the most common. Parts (c) and (d) were very well answered.

Question 4

This question is dealing with transformations and was a good source of marks for many students.
In part (a) the majority of students were able to reflect the given triangle in the *x*-axis and score full marks. A few students reflected in the *y*-axis, but it was pleasing to see that very few students left this part blank.
In part (b) many students were able to rotate the given triangle 90° about (0, 0) clockwise. The most common errors were, getting one point incorrect, rotating anticlockwise rather than clockwise or rotating 90° clockwise about the incorrect point, often (–2, 3)

Students found part (c) slightly harder than previous 2 parts. The common errors were stating multiple transformations or giving the incorrect scale factor (usually 2 or $-\frac{1}{2}$) or stating an incorrect centre (usually (1, 2)

In part (d) students were usually able to demonstrate that they knew the order they need to multiple the matrices in and how to multiply. When marks were lost students often scored 1 mark (for plotting one correct point) or 2 marks (for plotting two correct points). Some students stated 3 correct points and then only plotted 2 correct points. Usually plotting (2, –10) at (1, –10)

Students found part (e) challenging. Students that found the inverse matrix for M and the matrix for reflection in the *x*-axis were most successful although some students stated one of these and then made no further progress. A few that stated both gave the product the wrong way round. Those that took the approach of setting up a matrix equation usually failed to have the points in the same order

in both matrices. Those who had the correct order were usually able to form the right simultaneous equations and solve them accurately leading to the correct answer.

Question 5
It was pleasing to see that roughly 75% of students were able to gain at least the first mark for realising they needed to differentiate to find the velocity.

Some students then proceeded to differentiate a second time even though acceleration was not mentioned in the question. Those who differentiated twice often used both equations, one to find k and the other to find t rather than using the equation involving the velocity.

A few students who differentiated and substituted 2 into the differential sometimes set this $= 0$ set this $= 24$ then made arithmetic errors when solving to find k with $k = 3$ being the most common incorrect value. Students who had values for k and t ($k \neq 0$ and $t \neq 2$) and used a correct method to find either k or t knew they needed to substitute this into x to find the distance. A few students got the value of 108 m but then spoilt their answer by subtracting a distance from 108m.

Question 6
Parts (a), (b) and (c) were generally answered well by students. However, students found part (d) challenging with many have several attempts.

In part (a) the majority of students gave a correct answer of 0.4

In part (b) around 50% of students knew the correct method and gained at least 1 mark. The most common error seen was an answer of 0.8 from adding rather than multiplying ie $0.4 + 0.4$

In part (c) the majority of students understood what was being asked of then and went on to correctly calculate the expected number of times the spinner will land on red.

The students found part (d) challenging with only the most able students able to access this part of the question. Some students were able to give a fully correct expression, usually writing down the equation to find the number of green counters and scored M2 but a number could only set up an expression with at least one of the numerators correct and all the denominators correct, scoring M1. Very few students realised that it was possible to cancel down the fractions and form a liner equation. Most went on to try and reduce the equation to a quadratic although very few were able to do this accurately. Often the solutions to the equations they achieved were either fractions, negative values or a number less than 3. Those who realised these were not possible often made a second attempt and found their error and went onto gain full marks.

Question 7
Part (a) of this question was very well answered with the majority of students demonstrating good use of right-angled trigonometry and Pythagoras' theorem to prove the side length.

Part (b) however, was only completed successfully by the most able students, with the most successful method used being the one given in the mark scheme. Other successful methods were very rarely seen. The value 22.1 was seen quite often but it came from incorrect working in many cases and scored no marks. The main error made was to treat everything as a right-angled triangle. Whilst some sides were calculated accurately using Pythagoras, they were usually then used in an incorrect method to find *DH*

Some used the cosine rule but thought the triangle *EHD* was isosceles with both sides being 102.5, failing to recognise that there was more work needed to find the second side.

Question 8
It was pleasing to see that students scored well in this question.

In part (a) many students scored full marks as they could calculate the number of diver watches made in January. Some students scored 1 mark as the mark scheme condoned $\frac{54}{15} \times 5$. Often those students that scored 0 did not know how to start or found the total number of watches to be 135 and proceeded no further.

Many students were able to show a correct method for calculating the total amount Mel earnt in January in part (b) and it was not unusual to award full marks. Generally, those that scored 0 marks often only calculated 120×32 and proceeded no further.

Part (c) was again answered well by many students and many fully correct solutions were seen. Some students found $8040 - 150 \times 32$ [=3240] and proceeded no further. The most common error for those that proceed was to multiply "3240" by 1.06 rather than dividing by 0.06

Many fully correct solutions to part (d) were seen, even by students who had dropped marks previously. The majority of students were able to gain the first 3 method marks but then failed to take away the 250×80 and so an incorrect answer of 40400 was seen. A few students who got the answer 20400 the proceeded to try and calculate the percentage profit and so lost the final mark.

Question 9
Part (a) of this question with very well answered with almost all students able to fill in the table correctly.

In part (b) students were asked to plot the graph of a reciprocal function. Very few students were able to complete this correctly and few were awarded the full 3 marks. The majority of students did not break the graph into two parts with an asymptote at $x = 0$. In part(b) many students gave only 2 values in part (c) as they were missing one solution at $y = 0$ and very few scored the mark in this part. In part (d) many students were able to rearrange the equation to recognise that they needed to draw the line $y = -1$. Those who drew the line and then proceeded usually gave the 3 correct values.

Any incorrect extras being ignored. Students often stopped at this point but those who went on found it hard to form inequalities from these values. Some were able to provide one correct inequality for the left side of the graph but only a very few made an allowance for the break in the graph for the second inequality.

Question 10
Students found this question difficult. In both parts (a) and (b) many seemed to know that that they needed to use substitution but were unable to expand brackets correctly and made multiple errors with negative numbers. In part (a) the required expression was given but it was common to see incorrect workings leading to either a different expression or a changed number or sign in the last line of working rather than finding their error in their earlier workings and correcting that. Again, in part (b) errors made in the algebra leading to an incorrect quadratic but some marks were gained by those that showed their workings for solving their quadratic and substitution to find q. Of those who answered this correctly a few gave both pairs of solutions at the end failing to read the instructions that p must be an integer. Few students attempted part (c) as they needed a value for p and q from part b. Of those that did, most used algebraic division by $(2x + 1)$ or $(x - 2)$ and then factorised the resulting quadratic. Very few students compared the given factors with the coefficient of x^3 and the value +2 which would have possibly been more efficient.

Question 11
This question was a good source of marks for many students with roughly 75% gaining full marks in part (a) and over 80% gaining the mark in part (b)

In part (b) a minority of students thought g(–1) meant they needed to fond the inverse of g which invariable they did correctly but gained no marks. Students would be advised to consider the marks given to a question. One mark normally indicates no working is needed.

In part (c) students who understood what was being asked usually gained the mark.

Part (d) was well answered with many students gaining full marks. Those who attempted this part knew what was required and gained at least the first 2 marks. The most common error was made with the x terms when simplifying the equation to get $16x$ or $–16x$

It was pleasing to see students making a good attempt at part (e). The majority used completing the square rather than multiplying out the given expression and equating coefficients to find a, b and c.

In (f) some students did not realise that the word hence means "using your previous answer" and started to try and rearrange the function h with little success. Those who used their answer to (e) were able to rearrange it correctly and most gave just the positive root.