Examiners' Report
Principal Examiner Feedback

November 2020

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

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International GCSE Mathematics – 4MB1
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Introduction

On the whole, a small number of the students sitting this examination seemed unprepared and lacking knowledge in many subject areas that were being examined. This was across all areas but particularly noticeable with probability, matrix transformations and sets. Most students seemed well prepared and were able to demonstrate their knowledge and understanding across most of the questions covered.
Problem areas that should receive special attention by Centres are as follows:

- Read questions carefully
- Read answers from calculators carefully and make appropriate use of more advanced facilities
- Do not use premature rounding as it may lose final accuracy marks
- Drawing lines to show the region defined by inequalities. (Q2)
- Using the correct order of operations when simplifying algebraic fractions (Q3)
- Set working out logically so it is able to be followed by examiners including labelling what th e calculation is finding (Q4)

Report on individual questions

Question 1

Generally parts (a) and (b) were well answered by a majority of students.
In part (a) most chose the economical method of $\cos x = \frac{5}{9.3}$ but others used the other trigonometric ratios or even the sine rule having worked out the length of *CB*.
In a small minority of cases, weaker students in part (b) assumed that simple trigonometric formulae apply to scalene triangles and offered $\sin y = \frac{5}{10.8}$ as their method. In paper 2 if there is a formula given it is generally required for a more direct route to solving the problem – although there may be longer more involved methods using other formula.

Question 2

This question was poorly done with many students unable to draw the lines $y = 4$, $x = 1$ and $x = 4$ in addition to the more challenging $2x + 3y = 6$. A variety of incorrect regions emerged, which were not always finite and often not bounded by the lines drawn.
Better students identified the correct region but lost marks in part (b) by either failing to recognise that integer coordinates were required or included all boundary points of the region **R** in their answer. Other students did not recognise the connection between part (a) and part (b) and tried to solve the inequalities.

Question 3

Many students were able to use the reciprocal and change the division sign to a multiplication sign. However, they were often unable to simplify this question by factorising the denominator using the difference of two squares and therefore found themselves completing more complicated algebra than was required.

Those that attempted to multiply first, with or without the cancelling of $(5x-6)$, generally demonstrated good algebraic skills to multiply out the brackets on the left but did not always do so well with the negative sign on the right hand side. They were then generally able to combine the 2 fractions gained over a common denominator. One of the more common errors was to ignore the operation rules of doing division before subtraction.

Question 4

In part (a) two main methods were seen. Approximately half of the students used Pythagoras to find the height of the triangle and then used $\frac{1}{2}\times\text{base}\times\text{height}$. The other half used the cosine rule, usually to find angle *BAC* and then used $\frac{1}{2}ab\sin C$. The usual issues with early rounding of answers to either the height or the angle led to a final answer of 37.5 on several occasions.

Part (b) proved to be beyond most students. Of those students who made an attempt, usually manged to find the volume of the *ABC* prism using their answer from part (a). Few students calculated the perimeter of *ABC* and equated it to the perimeter of *DEFG*. Some of those who did used the perimeters of the entire prisms rather than just the cross-section. Many divided *DG* into two parts and used Pythagoras to calculate the smaller, right-hand section, then tried to calculate *EF*. There were some who assumed *EF* = 4.5cm or 5.5cm.
Only a small number recognised that to find the area of the trapezium they only required *EF* + *DG* and not *EF* and *DG* as separate values. It is important that students make their working clear. Labelling any lengths found such as *EF* and *EG* enables the values to be followed through in further calculations. When lengths are not labelled and have come from incorrect working there is usually no way of knowing what the figures found represent.

Question 5

This question was well answered and a good proportion of students gained the majority of marks. However, students should be aware of the validity of their answers within the context of the question. For example, the number of cups of coffee is unlikely to be $\frac{2}{9}$

Many correct responses were seen in part (a). The most common errors were adding $\frac{8}{100}$ to 12.50 and dividing by 0.8 or 1.08

There was a good understanding of ratio demonstrated in part (b). It was generally well answered and 168 clearly calculated with subtraction shown. Unfortunately, a number of students calculated the difference between the number of cups of tea and the number of cups of hot chocolate in error. Some calculated both 210 and 42 correctly but did not subtract at the end.

The fractional calculation in part (c) was answered well. However, a fair number found the value of $\frac{3}{8}\times 378$ or $\frac{3}{8}\times 126$ (the number of cups of tea) instead of the correct value of $\frac{3}{8}\times 210$

The majority of responses to part (d) included a correct conversion but lacked a worded comparison. Students appeared unsure how to interpret the instruction to 'compare' prices and thought stating the two values was sufficient. Some students chose to show the two values as a proportion rather than difference and in these cases, the answers always omitted to include a word comparison. In some cases, marks were lost from rounding errors.

In part (e) most students were able to arrive at £3.19 with the two clear steps shown. The most common errors were dividing by 0.75 and multiplying by 1.24.

Question 6

Those students who knew how to use substitution to solve this type of simultaneous equations were often able to score full marks on this question. Others who did not, and attempted to add, subtract or multiply the equations scored zero marks.
Most chose to substitute for y using $y = 9 - 2x$. Following the substitution, the most common error was in the expansion of $(9-2x)^2$ to give $81 - 4y^2$. Once the three term quadratic was derived, the correct solutions were usually obtained, either by factorising, or more commonly using the quadratic formula. A few forgot to calculate y values once the two x values had been found.

Question 7

For many students this was a challenging question with most not fully understanding where to start. For those employing a vector approach, two different paths, involving two different parameters and the vectors **a** and **b** had to be stated for any vector passing through the point P. The coefficients of **a** and **b** then needed to be equated to reach values of $\frac{3}{8}$ and $\frac{5}{8}$ for the parameters. If students reached this stage they usually went on to gain full marks.
In a small minority of cases very able students noticed that triangles OBP and CAP were similar with their corresponding sides in the ratio of 6:10 and therefore $OP = 3/5\ PC$. This was a much more economical method to reach the correct answer and was acceptable as a vector method had not been asked for.

Question 8

Parts (a) and (b) were the most accessible parts to this question. In a significant number of cases students reflected kite A in the x axis rather than in the line $y = -1$ and only gained 1 of the 2 marks. Many students overlooked part (b)(ii) and failed to provide an answer for the coordinates for the centre of rotation.
Part (c) proved to be a challenge for many but the ones that did succeed inevitable multiplied the matrices **M** and **N** together first (in the correct order) before applying the resultant matrix to the coordinates of kite A.
Those attempting part (d) usually worked out the areas of kite D and kite A separately before dividing one by the other, failing to spot that the area scale factor is given by the determinant of matrix **MN**

Question 9
In general, this question was poorly done. Although almost all students achieved at least 1 mark in part (a), there were a lot of errors. These include missing terms in the Venn diagram, and confusing the phrase ‘study Chemistry’ for ‘only study Chemistry’ and therefore not subtracting the intersection values before entering them into the Venn diagram. Many did not include x or $3x$ anywhere on their Venn diagram despite being clearly told in the question to include the numbers of students in terms of x where necessary.

Most students attempted to find a value for x and understood that their entries on the Venn diagram needed to add to 90. However, due to blanks and missing terms on their diagram they were unable to make a proper attempt at this calculation.

All marks in (c) where available to students whether their Venn diagram was correct or not, unless they had left blanks in the required sections in their diagram. Students who did not understand the set notation were unable to answer this question but those that did generally scored at least 2 of the 3 marks available.

It was clear from the responses to part (d) that conditional probability from a Venn diagram is an area that many students struggle to grasp. There was often no response at all to this question, or an answer with a denominator of 90 given.

Question 10

Question 10 had 7 separate parts in increasing order of difficulty and challenge.
In part (b) many lost marks due to unacceptable notation. The most common incorrect notation was $x \geqslant 4$ which gained no marks as this was mixing up the concepts of range and domain.

Students who were familiar with function notation and questions from past papers usually performed well on parts (c), (d) and (e).

Weaker students did not recognise that part (f) was testing knowledge of composite functions and a disappointing number who did, then stated that $\frac{12}{(x-3)^2}+4$ reduced down to $\frac{144}{(x^2-9)}+4$

For part (g) students could take the given expression for hg(x) and equate it to 5 or take the easier route of solving $\frac{12}{(x-3)^2}+4=5$

Question 11

The table in part (a) was generally filled in correctly. A few miscalculated the first item, often getting a positive value from $(-2)^3 = 8$ instead of –8, leading to 26. These students then tended to then plot the first point as +19.75 rather than –1.75, compounding their errors.
There was some incorrect plotting of points from weaker students in part (b); particularly misusing the scale as 10 small squares equals 1 rather than 5. A few missed the first or last points or the one near the origin.
Generally, points were joined using a reasonable curve.
In part (c) students the more able students demonstrated that they understood how to draw a tangent at $x = 2$. A few students misread the values on their graph when attempting to calculate the gradient and some calculated values just outside of the acceptable range. A few used calculus rather than drawing a tangent to find the gradient and thus were not able to gain the marks since the question stated that the graph should be used.
There were very few attempts at this part (d). Only a small proportion drew $y = 5x$ on their graph. A minority of those who drew $y = 5x$ attempted to find an interval with even fewer realising there were two ranges to be found.

Question 12

A number of students spoilt their answers in parts (a) and (b) by assuming the taking of counters was with replacement even though the question clearly stated the counters were to be drawn from 2 separate bags. Hence 14 was a common incorrect denominator for the probabilities for Bag *B*. In part (b) the most common method used was to add together the different probabilities with the most common error being to miss out yellow followed by green

Part (c) was a challenging question which discriminated well at the top grade boundaries. It was pleasing to see the success many able students had with this last aspect on the question paper.

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