Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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In Mathematics B (4MB1) Paper 2

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Introduction to Paper 02

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:

- HCF and LCM when numbers are given as a product of primes.
- Lines of symmetry and rotational symmetry.
- Questions that involve the demand to show all working.
- Questions that use previous parts indicated by the word hence.
- 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

Students found this question difficult and rarely were full marks awarded. In part (a) and (b) students were unable to cope with the numbers being given as a product of primes. Many wasted time trying to write the numbers as normal numbers before attempting to work out the HCF and LCM. Part c proved to be the most challenging aspect of this question and very few correct answers were seen.
In part (d) most students were able to score at least M1. The most common answer was 15×10^{410} suggesting a lack of understanding of what constitutes Standard Form. A few gained the method mark for 1.5×10^n where n was an integer.

Question 2

In almost all cases A was plotted and drawn correctly. Most students were able to translate the shape to find B although some tried to draw the parallelogram using the point (2, – 5) as the coordinate of one point of the shape. The reflection in the line $x = 2$ was well done, on occasion $y = 2$ was used but this was rare. Part (d) was by far the most poorly answered, with students often rotating around (0, 0) or not attempting this part at all. 1 mark was awarded in some cases for a 90 degree rotation in either direction from a correct or incorrect shape C.

Question 3

This question was answered well and many fully correct solutions were given. For those that did not score full marks part (a) was better than part (b).
In part (a) errors included using an incorrect formula for the area of the circle (too often circumference was used) or calculating an incorrect value for OA.
In part (b) many students were able to calculate the area of the triangle. Those who attempted to use $\frac{1}{2}ab\sin C$ were often less successful in their calculation. Some students failed to calculate the area of the sector and instead assumed that the

shaded region = the area of a circle – area of the triangle.

Question 4

In part (a) those who understood the requirements of the question and were able to set up a speed, distance, time equation for the speed with $x = ...$ were generally able to rearrange the equation correctly and gain full marks. In (b) most students used factorisation to solve the equations, with some using the quadratic formula. However, since this question specifically required "clear algebraic working", marks were not awarded without this being shown, and therefore an answer of 7.5 with no working was not awarded some of the marks. Students who use their calculator to solve quadratic equations must ensure they also show additional workings to gain marks in these types of questions. For the second step of this question the substitution was well done, and marks were given here regardless of the methods used to obtain their value of x. Students needed to choose one value for the distance, only using the positive x value of 7.5 as their final answer. It is important for students to recognise the context of the question and thus choose to discard the negative value of x. The answer must be positive,

Question 5

Parts (a) and (b) were answered well by many students. Errors in part (a) included matching pairs incorrectly or failing to use $1 - p$ to gain matching pairs. Pleasingly most students gave their answers as fractions rather than decimals.
Part (c) was answered less well and those that failed to score marks either failed to realise that 2 parts were required or mixed up which parts needed to be added and which parts needed to be multiplied.
In part (d) many students took $\frac{3}{5}$ to be the probability of wearing a hat, and did not realise this was only the probability of wearing a hat when also wearing a scarf and a coat.
It is important that students read the whole stem before answering the question to ensure they have all the required information.

Question 6

Part (a) was well done in general with students able to use the denominator of $g(x) = 0$ to find the relevant value of x. Parts (b) and (c) were the least well answered in this question. Of the students who understood what part (b) was asking them to do very few were able to complete the square correctly. In part (c) the concept of range was not well understood with most students making no attempt at this part. Even those who were able to complete the square correctly demonstrated that they did not understand the link to the minimum value of $g(x)$ and did not use their value of b in this part of the question. Where an answer was given; $f(x) > 6$ was a common answer. Students had more success with part (d) and by far the most popular method was to find the inverse of g and substitute $x = 0$. This was often done correctly and the value of 12 for c obtained. Very few used the much easier and more efficient method of solving $g(x) = 0$.
Part (e) was the highest scoring part of this question. Most students were able to rearrange $f(x) = g(x)$ to get to the required equation. Part (f) was also well answered. Provided students had knowledge of the factor theorem

they were successfully able to substitute $x = -\frac{1}{2}$ and state = 0. Some completed the first part of (g) under (f) using algebraic division to show that $(2x + 1)$ was a factor, omitting to use the factor theorem as requested and scoring no marks for part (f). Often they made no progress from here under part (g). Students who used algebraic division, did it well, and usually obtained $x^2 - x - 6$ and were subsequently able to factorise this correctly. In this part of the question the students were able to use their calculator to solve the cubic without loss of marks as there was no indication in the question that working needed to be shown, The correct value of $x = 3$ was chosen by most students but a significant number of students then proceeded to find $y = 0$, by substituting 3 into the cubic, rather than either f(x) or g(x), thereby losing the final mark of part (g).

Question 7

This question proved to be quite challenging. In part (a) many students failed to use Pythagoras' to find r^2. Of those who used Pythagoras' to find r^2 a sizeable number thought $\sqrt{16 - h^2} = 4 - h$ and then went on to use $(4-h)^2 = 16 - 8h + h^2$. Others used $(4-h)^2 = 16 - h^2$ but all lost the final A mark as there were errors in their working.
In part (b) many students failed to realise that the question involved differentiation and so scored 0 marks. Of those that recognised that differentiation was required many scored 2 marks as they attempted the differentiation and set the derivative to 0 and solved for h. Some then did not go on and complete the question as they failed to realise that V_{max} was required

Question 8

The more successful answers here were from students who had used their diagram to label the sides and areas needed. In part (a) the most common errors were to add only 4 or 5 sides or include extra x or y terms. However, many students were able to correctly reach $4x + 4y = 68$. In part (b) responses were mixed. Many jumped straight to the answer with no explanation or justification. Students must ensure that they set out all the steps in their workings sufficiently for a "show that" question. Surprisingly few students made use of the diagram to label sides or areas to assist with their working. Most correct answers split the shape into two rectangles and clearly showed the algebraic area calculation for each rectangle before adding them together. Part (c) followed from their answer to (a) with marks allowed for an incorrect perimeter equation rearranged and substituted correctly. Students found this part of the question difficult and those with an incorrect (a) or who had not simplified to $x + y = 17$ often found the algebra too complicated to simplify to a quadratic. Those that did solve it correctly regularly omitted units in their final answer.

Question 9

This proved to be a challenging question to most students and very few scored full marks.
Many failed to set up a correct equation at the beginning. The most common error was to use **C** = **AB**. Some students realised that they had been given the formula for finding the inverse of a matrix and used it to find the inverse of **A** and **B** even though they did not know what to do with them, gaining 2 marks. If formulae are given it is always a good idea to use them.
The alternative method was rarely used. When used B2 was often awarded for 4 correct equations.

Question 10

Part (a) was well answered with the majority of students demonstrating a good knowledge of the cosine rule, rearranging it successfully to find one of the angles in the triangle. Most continued to find the area using the correct sides for their calculated angle. Part (b) was extremely poorly answered with very few correct answers seen. Of those who did attempt this part, the vast majority assumed that the perpendicular height of the triangle went through the centre of the circle and/or that it divided the base of the triangle in two equal parts of 5cm. Both of which were false assumptions. There are many ways of solving this part but the simplest is to use the answer to part (a).

Question 11

This question produced a range of marks. Most students were able to reduce the linear inequality to $ax > b$ with either a or b correct. Many then scored the 1st A1 as they reached the correct range of $x > \frac{4}{5}$

For the quadratic inequality many were able to expand the brackets to give a correct 3 term quadratic (3TQ) and went on to find the 2 critical values. Very few students were able to choose the outside region for their 2 critical values and candidate's use of inequalities was often poor. Only the most able scored the final A mark, and very few fully correct solutions were seen.

Question 12

Part (a) was almost universally correct. However, part (b) showed a very poor understanding of reverse percentages with the most common solution being to find 17.5% of the price and subtracting the answer from that amount. In part (c) most students were able to find the number of grams per second and 1448000 was often seen but the last step was missing. Students were not able to use the 30kg weight of each bag given prior to part (a) in this part of the question. Another common answer was 381.6, showing that the students had not read the question carefully and did not give their answer as "complete" bags.
Part (d) was well done. There were many correct ways to answer this part, however the most common conversion seen was to \$ per kg for each farmer. For those that opted to work out \$ per kg, most incorrectly chose the lower amount as the cheapest which was Farmer *A*.
Part c was answered well and many scored 2 marks as they gave answers in the given range.
Some scored 1 as they gave one answer in the given range.

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