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Examiners' Report
Principal Examiner Feedback

Summer 2017

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In Mathematics B (4MB0) Paper 02

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Introduction

It was pleasing to observe that, overall, the clarity of work was high. However, there were some candidates whose work was poorly presented and thus was difficult to follow and, in a few cases, was illegible.

The question paper did highlight the following problem areas, followed by their corresponding question numbers, which should receive special attention by Centres:

- Basic set manipulation, number types, set notation ((1))
- Manipulation of negative indices ((2))
- Multiplication of algebraic matrices ((4))
- Functional notation. Values excluded from the domain of a function ((6))
- Reflections, descriptions of transformations ((7))
- Tree diagrams (8)
- Trigonometry (9)
- Mixing scalars and vectors in expressions and equations ((10b & c)). Definition of a parallelogram (10(d)).
- Careless plotting of curves (11)

Report on individual questions

Question 1

This question tested the candidates' understanding of number types and then their ability to manipulate sets. The first hurdle resulted in a number getting part (a) wrong with the result that they could only manage to collect, at best, the two follow through marks. Of those who successfully overcame these hurdles, a number demonstrated that they had not mastered set notation and thus lost one or more of the last two marks. A significant number did collect full marks.

Question 2

Poor algebra and an uncertainty about the handling of negative indices resulted in the loss of the first method mark in part (a). Most of these candidates did manage to collect the method mark in (b) for substituting $x = -2$. A small number of candidates attempted to use the product differentiation formula, usually successfully, whilst those attempting to use the quotient formula were not, because of either not remembering the formula correctly or because of poor algebra. Also noticed was that a number of candidates, who arrived at a quotient, just differentiated their numerator and denominator separately in an incorrect attempt to find the derivative of their quotient. Many fully correct attempts were seen.

Question 3

Part (a) was in the main successfully attempted by the majority of candidates. There were two strategies for part (b), the most popular was a numerical approach. The second was an algebraic one which treated the percentage profit or the loss gained in selling the remaining 80 pineapples as an unknown in an equation or treating the selling price of the pineapples as an unknown in an equation. Many successful numerical approaches were seen but few successful algebraic approaches. Unfortunately a small minority had no idea of method for part (b), primarily because they were not able to or did not try to break the question down into its basic parts.

Question 4

This question required the candidates to first multiply out the matrices on the left hand side of the given equation then equate elements resulting in four equations for x, y and z, and finally to solve for these unknowns. Many candidates had problems with the algebra needed to correctly perform the matrix multiplication with the result that some of these scored no marks or one for finding a correct equation. Indeed, a surprising number of candidates thought that $\frac{x}{x} = 0$, demonstrating a basic problem with algebra. If the multiplication was correct, full or nearly full marks were usually collected.

Question 5

There were many fully correct attempts at this popular question. A number of candidates swapped the role of the cows and hens in their equation for (a). Such candidates, who had a correct equation for (b) but not for (a), had four of the seven marks for the question available to them. Overall the solution of the two equations in (c) was performed correctly as was part (d).

Question 6

As in previous examinations, a number of candidates lost a mark in (a) and (b) for not leaving their answers in the form required by the question. A few were not able to correctly write down the value of x excluded from the domain of their inverse function. Others displayed casual algebra losing one or both the marks in part (c). It was pleasant to note that there were a significant number of candidates collecting full marks for this question.

Question 7

Overall, this question posed few problems to the gifted candidates. The weaker ones displayed an incomplete grasp of reflection transformations usually resulting in the loss of some or all of the marks for (b). Some of these candidates did manage to go on and collect two of the three marks available in (c). Many candidates scored full marks for (d) but, unfortunately there were a number who incorrectly stated their translation vector, usually mixing up the components or mixing up the signs.

Question 8

Numerous candidates had difficulty with transcribing the information given in the question onto their tree diagram resulting in such candidates scoring poorly on the rest of the question. It was pleasing to note that those who had a correct tree diagram usually carried on successfully and collected most of the remaining marks for the question. In part (e), many students did not realise that one of the two ingredient probabilities was actually given in the question $\left(\frac{1}{10}\right)$ and so usually lost the second method mark.

Question 9

Many students scored well on part (a). Part (b) proved enigmatic to many, many of whom just picked up one mark for a necessary angle for the method and a mark for a method for finding *AC* or *FC*. Others managed to score most of the marks but usually failed to have a complete method for the problem. A few incorrectly thought that $\angle CXB$ was right angle. It pleasant, however, to observe the number of students who were adept at handling two dimensional trigonometry.

Question 10

Many candidates scored well on part (a) and usually collected the mark for part (b). Many students used the equation, $\overrightarrow{AD} = \lambda\overrightarrow{AE}$, given in part (c), and their versions of $\overrightarrow{AD}$ and $\overrightarrow{AE}$ to collect at least the following three method marks. It was noted, however, as in previous examinations, that there still are a number of students who think that it is mathematically correct to mix vectors and scalars (masquerading as vectors) in expressions and equations. These students lost all of the marks in (b) and (c). Most candidates thought that it was sufficient just to state that the opposite sides of *OACE* were parallel without any mention of the magnitudes of the opposite sides, losing the B mark in part (d). Many candidates failed to realise that triangles *ACD* and *DBE* were similar and so collected no marks in (e). Overall, there was a significant number of candidates collecting most of the marks available in this question.

Question 11

Parts (a) and (b) were usually done well although there are a number of students who would benefit from enhancing their ability at sketching curves. Such students, as in past examinations, unnecessarily lost valuable marks. Most students drew a tangent at (2, 2.67) (M1) in part (c) and then attempted to substitute two coordinates on their tangent into $\frac{\Delta y}{\Delta x}$ (M1), possibly collecting the final accuracy mark depending on the accuracy of their drawn tangent. Use of calculus in (c) was penalised as it was excluded by the question as a valid method for finding the gradient. In part (d), a sizeable number of candidates managed to rewrite the give equation into the form $-\frac{8}{3}x^3 + 7x^2 - 4 = \frac{5}{3}x - \frac{1}{2}$ and thus potentially gained the first three marks and gained at least some of the following three marks depending on the accuracy of the their curve and line.

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