Version : 1.0 0107

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General Certificate of Education

Mathematics 6360

MFP4 Further Pure 4

Report on the Examination

2007 examination - January series

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Set and published by the Assessment and Qualifications Alliance.

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General

Most of the candidates seemed to have studied all the topics on the specification, which was pleasing as it has not always been the case previously. Two topics in this unit that did not appear on the now-defunct MAP6 have been badly handled in the past, probably due to a lack of awareness of the differences between the specifications. On this occasion, however, the overwhelming majority of candidates coped very easily with the questions on these two topics. Taking this into account, it was no surprise that a very healthy number obtained very high scores, while there were relatively few at the other end of the mark range.

A small number of candidates seemed to have difficulty completing attempts to all questions within the set time, but these were generally the candidates that were struggling throughout. Therefore, in general, time did not seem to be much of an issue.

Question 1

Although intended as a straightforward starter, this question caused as much difficulty as any on the paper. Around a third of candidates thought that it was sufficient to show that the determinant of the coefficient matrix was zero – ie for non-uniqueness of solution(s) – while many others relied on faulty arithmetic to support their claim of inconsistency.

Question 2

This was the type of question previously handled very badly, but this time most candidates appeared well-drilled in how to manipulate determinants. The greatest obstacles to a completely successful conclusion to the question lay in the widespread instinct to expand the remaining determinant at too early a stage, leaving many candidates unable to factorise a quadratic expression in two variables, for instance; and in the more minor error of assuming that the final expression was fully cyclically symmetric in a, b, c, but failing to check that there was a 'minus sign' difference between what they were expecting and what they had been given.

Question 3

This question was handled very well indeed, apart from minor slips in the arithmetic. The geometrical interpretation of linear dependence sought was that $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$ were co-planar. Many candidates eased their uncertainty as to what was required by saying it in several different ways.

Question 4

This question relied on the use of information given in the formulae booklet, and the majority of candidates coped very well with it. Many fell at the obvious hurdle in part (b), by supposing that "A followed by B" was represented by the matrix $\mathbf{M}_A\mathbf{M}_B$, rather than $\mathbf{M}_B\mathbf{M}_A$. Candidates who failed to attempt to describe the three transformations by a single, rather than multiple (ie composite), description were not awarded marks. There was no penalty for candidates who, for instance, called a plane a line, so long as they gave the right equation.

Question 5

This was the longest question on the paper, and contained a mixture of ideas from across the unit's topics. Most candidates coped very favourably with this variety and, minor arithmetical slips apart, marks were high. The biggest obstacle to success came in part (b)(i), where candidates needed to find the coordinates of any one point on the line of intersection. Setting x, y or z equal to zero and finding a value for the other two variables from the resulting simultaneous equations was the most common approach, and this worked well for most candidates.

Question 6

This question was handled very confidently by most candidates, and apart from a small number of candidates who clearly deduced the matrix $\mathbf{X}^5$ from a calculator, despite the question's injunction to use the previous results, marks of 10, 11 or 12 were very common indeed.

Question 7

This question was slightly tricky in some respects. However, the right approach cut through the apparent problems remarkably quickly, and many candidates were well up to the task. In part (a), it was essential to note that $x' = x$ and $y' = y$ in order to make rapid progress, although many candidates took the alternate route and found a single (repeated) eigenvalue of 1 for the matrix before proceeding successfully by that means. In part (b), it was important to work with $\mathbf{M}\begin{bmatrix} x \\ x+c \end{bmatrix}$ from the outset, and then note that $y' = x' + c$ also. In part (d), a similar start with $\mathbf{M}\begin{bmatrix} x \\ -x \end{bmatrix}$ again cut out unnecessary work.

Question 8

This was the last question on the paper because, since it involves a 3×3 matrix, it was potentially the most time-consuming question. However, candidates found the structure of the question very helpful.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.