Version : 1.0 0607

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MFP4 Further Pure 4

Report on the Examination

2007 examination - June series

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX
Dr Michael Cresswell Director General.

General

This summer's MFP4 paper was a good test of the module's content and posed a challenge to candidate's at about the right level. Many of the demands of the paper were routine and approachable, yet there was still sufficient material to challenge the most able. Marks gained by some candidates covered almost the entire range, with very few failing to reach 20 marks, and with a handful scoring full marks – and many more not so far off – at the other end of the scale. The length of the paper seemed to be right, since there were very few instances of candidates appearing to have run out of time; indeed, several seemingly moderately able candidates had sufficient time to make several attempts at a number of question parts.

As usual, candidates' working varied from those producing not quite enough to demonstrate that they were doing the right thing to those producing so much work that they were unnecessarily penalising themselves for time, and often confusing themselves into the bargain. The basic techniques were handled well for the main part, although algebraic skills were still generally a little below par for further mathematicians.

Question 1

This was a straightforward opener, and was usually handled very well indeed. There was no need to provide reasons to support answers here, though it was pleasing to see many give suitable explanations. In the case of part (d), however, it would have been better for some candidates not to have attempted an explanation, and they shot themselves in the foot in so doing. For instance, the simple statement $\mathbf{a} \,.\, (\mathbf{a} \times \mathbf{c}) = 0$ would have scored the mark. But many candidates invented a new distributive law and wrote $\mathbf{a} \,.\, (\mathbf{a} \times \mathbf{c}) = \mathbf{a} \,.\, \mathbf{a} \times \mathbf{a} \,.\, \mathbf{c} = 0$ and lost the mark for getting the right answer but for the wrong reason.

Question 2

The manipulation of determinants continues to be a problem area for many candidates. Expanding from the outset is not really a good idea at all, and all who did so failed to cope satisfactorily with the resulting cubic expression. Even amongst those who found one linear factor before expanding, it was almost invariably the case that they were unable to cope with the resulting quadratic factor. This is very disappointing in its own right, especially when they often had a difference of two squares expression clearly written out in front of them.

Many candidates who used the expected row/column operations approach seemed ill-inclined to state anywhere what operations they were doing. This leaves the markers the task of guessing or deciphering the intended approach, and marks are not credited if the working proves too obscure to figure out.

Question 3

This was one of the most successfully attempted questions on the paper for most candidates, although marks were often lost through a lack of care with signs somewhere along the line. In part (a), a small number of candidates evaluated the determinant for the scalar triple product using a calculator (it was presumed) in order to show that it is zero. This means that they showed no working, their solution thus being indistinguishable from the working of a candidate who is unable to evaluate it and simply states it is zero. No marks were awarded in such cases. (For those who seemingly repeated this process in question 4(a), marks were given **bod** in question 4 on the basis that we were not happy with penalising them a further three marks just for having a useful calculator facility). Many forgot the factor of $\frac{1}{2}$ in part (b) (ii), but otherwise this was a high-scoring question for the majority of candidates.

Question 4

This algebra question was the one that produced the most variable set of responses from candidates, from the outstanding to the careless to the "haven't got a clue what to do" variety. In part (a), the general approach is to find the determinant of the coefficient matrix in terms of k and see when this is zero. The alternative is to evaluate it using $k = 4$ **and** -4. It was really shocking to see how few candidates appeared to realise that $k^2 = 16$ gave rise to the two values of k. As mentioned earlier, the manipulation of some fairly simple equations in order to eliminate one or other of the three variables left a lot to be desired, and many candidates would have scored several more marks with just a little more care.

Moreover, the question itself implies that there are no solutions to part (b) and infinitely many in part (c), so it was surprising to see so many submissions moving towards a unique solution to the system in these cases. Finally, in part (b), the widespread inability of candidates to demonstrate an inconsistency was disappointing. Very few candidates did so successfully, predominantly because much of their prior working was error-strewn, rendering a valid conclusion impossible, despite their claims.

Question 5

Parts (a) to (d) of this question were usually very well done, and candidates were able to score a lot of the marks. The big surprise came in part (e) when so few arrived at the correct final answer. In almost all cases, a simple diagram would have helped enormously, and they would then have seen that a simple bit of basic trigonometry would have done the trick. In most cases, candidates seemed to be working with randomly-selected vectors from the first few parts of the question and trying to insert them into some (often half-) remembered vector formula.

Question 6

The two product matrices **AB** and **BA** in part (a) of this question were very popular and the majority of candidates gained all 5 marks. The rest of the question really was poorly done on the whole, but this was the most demanding work on the paper. In part (b), many of candidates noted that det (**AB**) was zero, but failed to explain why. In part (c), most seemed to resort to guesswork, especially regarding the transformation F. A shear was, marginally, the most popular choice, with a 90° rotation close behind. The majority of candidates seemed to have no method of approach to the problem. Those that took a scalar factor out of the matrix usually contented themselves with 2, 4 or 8 as the scale factor of the enlargement E; thereby leaving themselves with a matrix they simply did not know what to do with. Those who chose "rotation" as their answer then did so from a matrix with $\det \neq 1$ and consequently did not gain all the marks available.

Question 7

This question was so structured that, carelessness apart, it proved a very good source of marks and the majority of candidates found it so, if not in its entirety then at least in part.

Mark Ranges and Award of Grades

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