Version : 1.0 0110

General Certificate of Education

Mathematics 6360

MFP1 Further Pure 1

Report on the Examination

2010 Examination – January series

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

Most of the candidates were well prepared for this paper and showed a very high degree of algebraic competence, though many of them failed to find concise methods, particularly in questions 8 and 9. Some candidates appeared to have spent a great deal of time on some parts of these questions, which may have caused them to run out of time in the final parts of question 9. The first five questions proved very straightforward indeed, and even the less able candidates were usually able to score highly on this part of the paper. As in all Mathematics papers, there were several occasions where an answer was given in the question as a target for the candidates to aim at. Two faults occurred frequently in connection with this: one was to omit essential steps in the reasoning, and the other was to make small errors such as sign errors and then pretend to have arrived at the correct answer, copied down from the question paper.

Question 1

Most candidates seemed to be very familiar with the techniques needed in this question. The formula for the sum of the cubes of the roots was either quoted confidently and correctly or worked out from first principles. Errors occurred mainly in part (c): algebraic errors in finding the sum or even the product of the roots of the required equation; errors in choosing which numerical values to substitute for $\alpha\beta$ or $\alpha+\beta$; and, very frequently, a failure to present the final answer in an acceptable form, with integer coefficients and the "$= 0$" at the end.

Question 2

Full marks were usually awarded in this question. Answers to part (b) were sometimes very laborious but eventually correct, but by contrast some answers were so brief as to be not totally convincing, earning one mark out of two. A few candidates fell short of full credit in part (c) by working on $(z^*)^2$ but not mentioning $-z^2$.

Question 3

This trigonometric equation was slightly more straightforward than usual, in that there was only one solution of the equation between 0 and 2π. For many candidates, this did not appear to make things simpler at all: they applied a general formula for $\sin\theta = \sin\alpha$ and did not always realise that their two solutions were equivalent. They were not penalised as long as the second solution was correct, but this was not always the case. What was extremely pleasing to see from an examiner's point of view was that the majority of candidates carried out the necessary operations in the right order, so that all the terms, including the $2n\pi$ term, were divided by 4.

Question 4

As usual on this paper, the work on matrices was very good indeed, with most candidates working out all the steps efficiently. Some tried to expand the expressions $(\mathbf{A}-\mathbf{I})^2$ and $(\mathbf{A}-\mathbf{B})^2$ but almost invariably assumed commutativity of multiplication. A rather silly way to lose a mark was to work correctly to the equation $3-p=12$ and then to solve this equation incorrectly, which happened quite frequently.

Question 5

Most candidates showed confidence with the integration needed in this question but were much less confident with the concept of an improper integral. The explanations in part (a) were often very wide of the mark, and indeed quite absurd, while in other cases the statements made were too vague to be worthy of the mark, using the word "it" without making it clear whether this referred to the integrand or to the integrated function. Another mark was often lost at the end of the question, where candidates thought that $0^{-1/4}$ was equal to zero.

Question 6

As the candidates turned the page to tackle this question, there was a noticeable dip in the level of their performance. The majority of candidates showed a surprising lack of ability to work out the coordinates of image points under a transformation given by a matrix. A common misunderstanding was to carry out a two-way stretch with centre $(1, 1)$ instead of with centre $(0, 0)$. Luckily the candidates still had the chance to carry out the required rotation in part (b)(i) using their rectangle from part (a). Part (b)(ii) was often answered poorly, some candidates being confused by the clockwise rotation, when the formula booklet assumes an anticlockwise rotation, and many candidates failing to give numerical values for $\cos 270°$ and $\sin 270°$. Most candidates realised that a matrix multiplication was needed in part (c), but many used the wrong matrices or multiplied the matrices in the wrong order.

Question 7

Most candidates started well by writing down $x = 2$ as the equation of one asymptote to the given curve, and then struggled to find the horizontal asymptote, though most were ultimately successful. The graph was often drawn correctly but almost equally often it appeared with one of its branches below the x-axis. In part (b), most candidates went to some trouble establishing a function which would have the value 0, or 1, at the point of intersection. The most popular technique for this was to clear denominators to obtain a cubic in factorised form, often converted unhelpfully into expanded form. Other candidates often used subtraction to obtain a suitable function. Once this was done, the way was clear for a candidate to earn 5 marks, but in some cases only 2 of the 5 were gained as interval bisection was not used as required by the question.

Question 8

Candidates who were accustomed to look for common factors — an approach almost always needed in questions on this topic — were able to obtain high marks in both parts, though some of these candidates surprisingly failed to solve the quadratic in part (b). Candidates who preferred to expand and simplify everything and then hope to spot some factors were often successful in part (a) but could not realistically hope for more than one mark in part (b).

Question 9

Part (a) was found very hard by most candidates. Many failed to use both pieces of information supplied just before part (a), so that they could establish $a = 2$ or $b = 2a$ but could not hope to complete the two requests. Whether they were attempting one half or both halves of the question, they often wrote down the results they were supposed to be proving, possibly earning some credit for verifying these results, though the reasoning was sometimes very hard to follow. Part (b) was much more familiar to well-prepared candidates, but marks were often lost either by a failure to form a correct equation for the straight line or by sign errors after the elimination of y. The solutions to parts (c) and (d) were often presented in the reverse order, but full credit was given for all correct working shown. In part (c), many candidates made a good attempt to deal with the discriminant of the quadratic equation printed in part (b), but were careless about indicating that this discriminant should be equal to zero for equal roots. Once again, sign errors often caused a loss of marks. In part (d), the unique value of x was often found correctly by the stronger candidates, but relatively few of these went on to find the values of y, and those who did sometimes did so via a rather roundabout approach.

Mark Ranges and Award of Grades

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