Version 1.0

General Certificate of Education (A-level)
January 2011

Mathematics **MFP1**

(Specification 6360)

Further Pure 1

Report on the Examination

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Set and published by the Assessment and Qualifications Alliance.

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General

The candidates generally seemed to find this paper to their liking and did very well, though there were some who showed a poor grasp of several topics. The parts of questions which caused the greatest difficulty were question 1(c), question 5(c), question 6(b)(ii) and question 8(c). To a large extent, this was to be expected. On the positive side, there was a great improvement in the response to question 4, where most candidates brought in the general term $2n\pi$ (or where appropriate just $n\pi$) at an early stage so that it could then be divided by 4 as required.

As usual on this paper, there were some failures to spot short methods. In question 8(b)(i), those who did not take out the common factors at an early stage were not unduly penalised, as they usually managed to obtain the correct answer by a slightly longer route, but in question 6(b)(ii) some candidates attempted extremely long and difficult calculations even though the mark allocation was only 2 for this part.

Question 1

Most candidates started the paper in confident fashion, earning the first six marks with apparent ease, though some lost the sixth mark through failing to write '$= 0$' to complete their equation in part (b). Relatively few candidates realised that they were being tested on their knowledge of complex numbers in part (c), and even those who did sometimes failed to obtain the one mark on offer by misidentifying the two correct roots of their equation.

Question 2

This question again provided a good number of marks for the vast majority of candidates, who showed an adequate knowledge of integration, but in an unexpectedly large number of cases sign errors were made in part (a), causing the letters p and q to be interchanged. In part (b), most candidates were able to identify correctly which integral had the finite value.

Question 3

Like the preceding questions, this one produced a good opportunity for most candidates to score high marks. The first two marks were sometimes lost because the candidate failed to provide numerical values for the sines and cosines in their matrices. Also the first matrix was often that of a 90° anticlockwise rotation, rather than a clockwise one as required. Most candidates earned two marks in part (b)(i), relatively few finding $\mathbf{BA}$ instead of $\mathbf{AB}$. Full marks were very common in part (b)(ii). The geometrical interpretations asked for in part (c) were mostly correct, though some floundered somewhat in the first part. In part (c)(ii), the answer 'enlargement with scale-factor −25' was acceptable, and very common.

Question 4

As mentioned above, there was a pleasing improvement in the way candidates approached this trigonometrical equation, in contrast to what has been seen over the years. Marks were lost, however, by a failure in many cases to find a correct second particular solution before the general term was added in. The fact that the sine of the angle in the equation was negative clearly made this task a little harder than usual.

Question 5

The first six marks in this question were obtained with apparent ease in the great majority of scripts. Part (c) usually produced no further marks as the candidates omitted the star from z^* without explaining why this was legitimate. Many candidates seemed to treat the given equation as a quadratic, despite the fact that two roots had already been found and two more were now being asked for.

Question 6

In part (a) of this question, most candidates managed to draw an acceptable attempt at an ellipse touching the given circle in the appropriate places. Occasionally the stretch would be applied parallel to the y-axis rather than the x-axis. The required coordinates were indicated with various levels of accuracy, sometimes appearing as integers, sometimes with minus signs omitted.

In part (b), the most successful candidates were often the ones who wrote the least — all that was needed was to replace x by $\frac{x}{2}$ in each of the two given equations. Many candidates answered part (b)(i) concisely and correctly but then went into a variety of long methods to find the equation of the tangent in part (b)(ii). Some used implicit differentiation and were usually successful. Others used chain-rule differentiation and usually made errors. Yet others embarked on a very complicated piece of work based on quadratic theory and using a general gradient m. This must have consumed a large amount of time and was almost invariably unsuccessful.

Question 7

Part (a) of this question was not always answered as well as expected. Many candidates gave a good explanation for the absence of a vertical asymptote but omitted to attempt the equation of the horizontal asymptote. When both parts were answered, the attempts were usually successful, but an equation $y = 1$ instead of $y = 0$ was quite common.

Part (b) was absolutely straightforward and afforded two easy marks to almost all the candidates.

Part (c) involved inequalities, and while most candidates were familiar with the need to work on the discriminant at this stage, many lost a mark through not clearly and correctly stating the condition for real roots; another mark was lost when the candidate, having legitimately obtained the two critical values, failed to justify the inequalities in the final answer. Again, a sign error in the manipulation of the discriminant often spoiled the attempt to find the two critical values.

It was good to see many candidates gaining full credit in part (d) even when they had struggled unsuccessfully in part (c). The majority of candidates had clearly practised their techniques in this type of question. Sometimes the finding of the y-values required an unwarranted amount of effort, since they were known from the outset, and some candidates lost the final mark because of a failure to give the correct y-coordinates.

Question 8

Most candidates applied the Newton–Raphson method correctly in part (a) of this question and obtained a correct value. They then proceeded in many cases to prove the result given in part (b)(i), often by expanding fully before attempting to find the factorised form. Luckily in this case it was not very hard to obtain the factors from the expanded form, particularly as the answer was given. Some candidates, however, lost credit through not showing steps at the end, which they may have thought unnecessary as the answer was 'obvious', but this overlooked the importance of good examination technique when the answer is printed on the question paper. For a similar reason, some candidates lost the one mark available in part (b)(ii), no doubt thinking that the result was 'obvious' and not writing enough steps.

Part (c) required an awareness that N must be an integer, and also that the answer to part (a) was not necessarily an accurate guide to the root of the equation given there. Many candidates did a lot of work to find that root more accurately, or indeed quoted the value found on a calculator (45.75), but failed to draw a correct conclusion about the value of N. A more successful approach, in general, was to evaluate the left-hand side of the inequality for

$N = 46$ and then for $N = 45$, thus showing that the former value was the lowest integer for which the inequality was satisfied.

Mark Ranges and Award of Grades

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