Version 1.0

General Certificate of Education (A-level)
January 2013

Mathematics MFP1

(Specification 6360)

Further Pure 1

Report on the Examination

Set and published by the Assessment and Qualifications Alliance.

General

Presentation of work was reported as being very good. A large majority of students completed their solution to a question at a first attempt. Students generally found the paper to be very straightforward and most were able to score high marks on each of the nine questions.

Question 1

This opening question, which tested numerical methods, was answered correctly by the majority of students. The most common error was in the evaluation of $\frac{\mathrm{d}y}{\mathrm{d}x}$ at $x=1.1$. Students who showed the substitution in addition to its evaluation generally gained an advantage over those who just wrote down the incorrect value in a table. Most students gave their final answer to the required degree of accuracy.

Question 2

Many correct answers were submitted for parts **(a)** and **(b)(i)** in this question which tested the complex numbers section of the specification. In part **(b)(ii)** a common mistake was an incorrect z^* value either $i+3$ following $z= i-3$ in **(b)(i)** or, more frequently, z^* written incorrectly as $i(1-i)(2-i)$. Students who obtained an incorrect value for z in part **(b)(i)** were awarded credit for a correct follow through value for z^* in part **(b)(ii)**. Most students showed that they appreciated the need to equate the real parts and the imaginary parts for their resulting equation.

Question 3

In part **(a)** many students gave the correct general solution of the given trigonometric equation with a variety of methods seen, including a correct conversion of the given equation in sine into one involving cosine before using the appropriate general solution formula. Although the usual errors were seen (only dealing with one set of solutions, incorrect rearrangement to '$x=\ldots$'), most students now have a thorough understanding of this topic.

Part **(b)** provided more of a challenge. There was a significant number of students who did not appreciate that n had to be an integer. Some others stopped after finding the value of n, not apparently appreciating that the greatest solution required had to be a value of x. Some other students gave their final answer as the 'pair' of solutions $\frac{121\pi}{24}$ and $\frac{125\pi}{24}$.

Question 4

Those students who wrote the integrand in the form $x^{-1.5}$ normally presented a correct solution although some did not adequately deal with ∞ as a limiting case. There were a number of incorrect solutions seen with terms which included $\ln x$, and these scored no marks.

Question 5

This question, which tested roots and coefficients of a quadratic equation, proved to be a good source of marks for many students. Generally parts **(a)** and **(b)** were answered correctly. In part **(c)** a large majority of students used the appropriate identity $\alpha^3\beta+\alpha\beta^3=\alpha\beta\left(\alpha^2+\beta^2\right)$ to find the sum and products of the new roots correctly, although the error $(-5)^4=-625$ was not a rarity in finding an incorrect product. Although not as common as in recent papers, the omission of '=0' from the final answer was seen.

Question 6

In this question on matrices, parts **(a)(i)** and **(a)(ii)** were almost always answered correctly, although some students left their answer to **(a)(ii)** in the form $\begin{bmatrix}6 & 0\\ 0 & 6\end{bmatrix}$ without indicating that they clearly appreciated what $\mathbf{I}$ represented. A correct description of the geometrical transformation represented by $\mathbf{A}$ was usually given although reflection in the line $y=x$ was the most frequent incorrect answer.

Most students scored the method mark in part **(b)(ii)** but some then gave the incorrect value $\sqrt{2}$ for k. Part **(b)(iii)** proved to be more of a challenge. A significant minority of students could not make any real progress. Most realised that the matrices $\mathbf{A}$ and $\mathbf{B}$ needed to be multiplied but the product was not always linked with the matrix for $\mathbf{P}$, $\begin{bmatrix}-1\\ 2\end{bmatrix}$, in a correct manner. Some better approaches just made the mistake of using $\mathbf{BA}$ instead of $\mathbf{AB}$. For the final mark the examiners wanted the coordinates of the image of $\mathbf{P}$ to be written in coordinate form rather than left as a matrix.

Question 7

This question, which tested reducing a relation to a linear law, was generally answered well. In part **(a)** almost all students applied laws of logarithms, although some students failed to then clearly show the relationship was linear for Y and X. In part **(b)**, students generally showed a good understanding of the methods required, although a minority mixed up Y and y in finding the value for a.

Question 8

This question was another good source of marks. A large majority of students correctly multiplied out the bracket, split the sum into three relevant separate sums and applied the formulae from the formulae booklet correctly. Better students then took out the relevant common factors and factorised the resulting quadratic correctly to reach the correct answer. Those students who expanded the brackets to reach a quartic in n were slightly less successful, but to their credit many did manage to reach the correct answer albeit in a more time consuming manner. A common mistake amongst the weakest students, which resulted in no marks being scored for part **(a)**, was to initially write the given left-hand side as $\sum 2r\left(\sum 2r^2 - \sum 3r - \sum 1\right)$ before using the formulae booklet.

In part **(b)** most students scored both marks, but some lost the accuracy mark because they did not show sufficient detail in their working to indicate that 'Hence' had been applied. A more serious error, which resulted in the loss of both marks, was to use $\sum_{r=1}^{20} \ldots\ldots - \sum_{r=1}^{11} \ldots\ldots$.

Question 9

This final question was again answered correctly by the majority of students. Most students were able to find the correct x-coordinates for A and B, some by considering a translation of the 'basic' ellipse $\frac{x^2}{4} + y^2 = 1$. In part **(b)(i)** most students showed sufficient care in reaching the printed equation, but it was also surprising to see some final answers which contained sign errors and did not match the printed answer. Most students used the discriminant in a correct manner although a significant minority gave two values for m, not noting the given information in the first line of the question for **(b)** that m was positive. Less able students generally made little progress with the final part of the question, but most other students obtained the correct coordinates for P.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website: http://www.aqa.org.uk/over/stat.html

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion