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General Certificate of Education (A-level)
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Mathematics MFP2

(Specification 6360)

Further Pure 2

Report on the Examination

General

The paper proved to be more demanding than recent papers. This was partly due to candidates not properly understanding the terminology in some of the questions but also to a lack of algebraic skills. The overall result seemed to suggest that candidates at the higher end scored lower marks whilst the lower achievers were able to find sufficient questions to work through to match their ability.

Question 1

In part (a) the sketch of $y = \sinh x$ was generally accurate, although some sketches were drawn with asymptotes parallel to the y-axis whilst others displayed coordinates which were multiples of π along the x-axis. The sketch of $y = \operatorname{sech} x$ was also quite well done apart from a few which had no asymptote.

Part (b) was well done with candidates using either a quadratic in e^{2x} or the formula for $\sinh^{-1}x$ with $x = 2$ from the formulae booklet. A noticeable number of candidates thought that if $e^{4x} = 4e^{2x} + 1$, then $\ln e^{4x} = \ln 4e^{2x} + \ln 1$.

Question 2

Whilst part (a) was drawn correctly by almost all candidates, the reverse was true in part (b). In this part virtually all candidates drew their circle touching $\mathrm{Im}(z)= 0$ instead of the $\mathrm{Re}(z) = 0$, clearly not understanding the statement $\mathrm{Re}(z) = 0$. This caused a significant loss of marks, especially as the answer to part (b)(iii), the least value of $\arg z_1$, became trivial if a candidate's circle did not touch $\mathrm{Re}(z) = 0$. Those candidates whose circle did not touch $\mathrm{Im}(z) = 0$, usually drew their circle through the origin, and this also precluded them from any viable attempt at part (b)(iii).

Question 3

Overall, responses to this question were good and there were many completely correct or nearly correct solutions. Part (a) was usually correct, although lack of intermediate working made it difficult to decide whether a candidate really saw what to do, or merely wrote down the printed answer.

In part (b) the commonest errors were to either think that $\sqrt{(1 + 1/\sin^2 2x)}$ was equal to $1 + 1/\sin 2x$, or to lose the $2x$ in the process of simplification and end up with $\coth x$ instead of $\coth 2x$. Many candidates arriving at $\int \coth 2x\,dx$ were able to perform the integration correctly, although a few lost the factor ½.

Question 4

Responses to this question were mixed. There were some excellent answers with candidates displaying clear knowledge and presentation of the method of induction, but there were also some very muddled answers in which sequences were mixed with series, and these solutions showed candidates trying to add u_k to u_{k+1}. There was also some poor algebra in the substitution for u_k in the formula for u_{k+1} with expressions such as $4\times 3^{k+1}$ being written as 12^{k+1}.

Question 5

Although this question could be answered by a variety of methods, most candidates chose to clear fractions and equate real and imaginary parts, thus being able to score some marks for the question. However, many solutions either petered out at this point or continued with incorrect or unjustified assumptions, not realising that, for instance, $\cos(p\pi/8)$ was equal to

$\sin(\pi/2 - p\pi/8)$; a simple step which, when spotted, almost invariably led to a completely correct solution. Whichever method a candidate used it was not possible to obtain complete credit without the introduction of $\pi/2$ at some stage.

Question 6

It was surprising to see a number of candidates unable to do the algebra of part (a) correctly, and this did mean that it was not possible to score full marks on part (b). If a substitution was used in part (b), it was often $u = x - 1$, rather than $u = \sqrt{2}(x - 1)$, which meant that candidates lost a $\sqrt{2}$ in their solution. However there were a good number of completely correct solutions, many of which came from the direct integration of the integrand with no substitution.

Question 7

This question proved to be the most popular and probably the question on which candidates could secure the highest marks. Parts (a) and (b) were well done, as was part (c)(i). If an error occurred in part(c)(i), it was usually either the cube of 3i written down as -9i in the case where a candidate had substituted 3i for z in the cubic equation, or an error of sign in equating *r* to the product of the roots in the case when the roots of the cubic were used to find *r*. Solutions to part (c)(ii)were also pleasing, with many candidates showing that they needed to consider $\beta + \gamma$ as well as $\beta\gamma$ to show that β and γ were the roots of the quadratic equation. However a few thought that it was sufficient to show that one or other of $\beta + \gamma$ or $\beta\gamma$ satisfied the quadratic equation to establish the result. In part (c)(iii) many solutions were spoilt by errors of sign. For instance candidates who arrived at $\beta^2 = 4$, often just assumed that β was equal to 2.

Question 8

Responses to this question were extremely poor and very few candidates were able to make any headway at all after part (a). Very few candidates seemed to understand what linear factors were – most merely wrote down the roots of z^5 in some other form. This in turn meant that virtually no one was able to answer part (c). There were not many serious attempts at part (d) in spite of the fact that it could be done by assuming the result in part (c), although some candidates were able to pick up the odd mark.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website. UMS conversion calculator www.aqa.org.uk/umsconversion