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Mathematics MFP2

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Further Pure 2

Report on the Examination

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General

Most candidates found this paper accessible and were able to show what they had learned, and indeed some candidates excelled. However, it needs to be re-emphasised that where printed answers are given, candidates must show sufficient working to reach that printed answer or they cannot be awarded full marks. Presentation was fair, but some candidates tended to be sloppy in their responses.

Question 1

The most satisfactory solutions came from candidates who were careful with their drawings and who used the same scale on both their axes. In part (a)(i), marks were generally lost by candidates either misplotting the centre of the circle, or by failing to realise that the circle touched the Real axis. In part (a)(ii), a number of candidates drew their half line from the origin and even when it did start at the point $(0, -2)$, it failed to pass through the point of contact of the circle with the Real axis. Part (b) was not particularly well done as many candidates shaded a region within the circle or on occasions marked just the end points of the chord rather the full chord of the circle.

Question 2

The bookwork in part (a) was generally well done, and errors if they did occur were almost always when candidates thought that, for instance, $\mathrm{e}^x\mathrm{e}^y$ was e^{xy}. In part (b)(i), those candidates who took the hint given in part (a) were more successful than those who converted the given equation into exponential form, the latter being unable to handle expressions such as $\mathrm{e}^{x-\ln 2}$. Part (b) was usually correct.

Question 3

Not all candidates were confident in their use of factorials, but most managed part (a). In part (b), however, although candidates understood the method of differences, quite a number failed to reach the final answer. It was common to see $0!$ written down as zero whilst others abbreviated their working, writing $n! + (n + 1)!$ as $(n + 2)\mathrm{n}!$ without any intermediate step. As the answer was provided, this solution did not secure full marks.

Question 4

Apart from the weakest candidates, most scored full marks in parts (a)(i), (ii) and (iii), although in part (a)(iii) there was some confusion between roots and factors. Some candidates took the hint in part (a)(iii) in order to complete part (a)(iv) successfully, but others who tried to multiply out $(\alpha+\beta+\gamma)^3$ usually ended up in a morass of algebra. The same applied to part (b). Those candidates who were able to extend the result of part (a)(iii) to part (b) produced quick neat solutions. Some candidates also showed ingenuity in part (b) by using other methods which involved more algebra but managed to reach the correct results in the end. However, the solutions of the majority of candidates using longer algebraic methods usually petered out when uncertainty came as to how to handle their various expansions.

Question 5

Provided candidates were able to differentiate correctly either by expressing $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x and y or in terms of x only, they were pretty much successful in part (a). However, candidates were less successful in part (b). Some failed to substitute for $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ in terms of θ

and so made virtually no progress; others reached $\int \cosh^2\theta \, d\theta$ but were unable to perform the integral. Of those who realised that $\cosh^2\theta$ needed to be expressed in terms of $\cosh 2\theta$, some made a sign error in the double angle formula. However, most of those candidates who managed to correctly integrate were unable to evaluate $\sinh 2(\sinh^{-1} 3)$ and merely wrote down the printed answer, which of course was not acceptable. Few candidates thought of expressing $\sinh 2\theta$ in terms of $\sinh\theta$ and $\cosh\theta$.

Question 6

Virtually all candidates completed part (a) successfully. However, in part (b), candidates generally were divided into three classes. There were those who produced a first class proof by induction. Then there were those who would have produced a good solution had their algebra not gone askew in the algebraic part of their proof. This was often due to not recognising the hint given in part (a). Finally, there were those who knew the mechanics of a proof by induction, but without a true understanding of the principles involved. To give an example of this, it was quite common to see the sum to k terms of the series added to the $(k + 1)$th term without any reference to what the sum of those two terms represented. Explanations generally were poor in this category.

Question 7

Generally candidates were well drilled in the book work of this question and consequently part (a) was a good source of marks for all, although in part (a)(ii) some solutions lacked intermediate steps between an expression for $\tan 5\theta = \sin 5\theta / \cos 5\theta$ and the printed answer. Responses to part (b) were not always very convincing although most realised it was an application of the result of part (a)(ii). The roots in part (b) were nearly always given as $\tan(r\pi/5)$ $r = 1, 2, 3, 4$, and this generally hindered progress in part (c) with candidates not realising that $\tan(4\pi/5)$, for instance, was equal to $-\tan(\pi/5)$. Only a handful of candidates rejected the $-\sqrt{5}$ when taking the square root in the final part.

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