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General Certificate of Education

Mathematics 6360

MFP2 Further Pure 2

Report on the Examination

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General

Whilst, as always, there were some excellent responses to this paper, there did seem to be, more than usual, scripts in which it was evident that candidates had not thoroughly mastered the principles lying behind the questions set. Presentation was good overall and has improved over recent years.

Question 1

Part (a) was generally well done apart from a few candidates who were unable to square $\frac{1}{2}\left(e^{x}-e^{-x}\right)$ successfully.

Parts (b)(i) and (b)(ii) likewise were well done although $\pm\frac{1}{2}\pi$ did appear on the x-axis of some sketches in part (b)(i). However in part (b)(iii), those candidates using the logarithmic formula for $\cosh^{-1}x$ from the formulae booklet arrived at a single value of x, namely $\ln 2$, but failed to realise that the sketch in part (b)(ii) was intended to give them a hint that $-\ln 2$ was also a solution of the equation. On the other hand, candidates who used the exponential form of either $\cosh x$ or $\cosh^2 x$ automatically produced both answers provided their working was correct, but some of these candidates were unable to handle the algebra leading to a quadratic equation in either e^{x} or e^{2x}.

Question 2

This question was well done overall and many candidates scored all of the eight available marks. Those candidates using mathematical instruments, ie ruler and compasses, produced superior solutions. Errors, when they did occur, were either the misplotting of the centre of the circle, or more commonly, the misplotting of the line. The commonest mistakes were either to draw the line through the point (0, 2) or more frequently through (0, –1). If serious errors were made in the plotting of the line, loss of marks in the shading were almost inevitable.

Question 3

This question provided a good source of marks for many candidates. The commonest error in part(a) was to write $\alpha\beta\gamma$ as -16, overlooking the fact that the coefficient of x^3 was not unity and, of course, leading to an incorrect value for γ. This error perpetuated in part (a)(ii) with $\alpha+\beta+\gamma$ written as p or $-p$ and the same for q.

Parts (b)(i) and (b)(ii) were generally well done, although it should be stated that when answers are printed, candidates are expected to provide sufficient detail to show clearly how their answers are arrived at. Part (b)(iii) was also quite well done and it was pleasing to note that in some cases where candidates had not arrived at $\gamma=-\frac{1}{2}$, they went back to part (a)(ii) to identify their error. Just occasionally in part (b)(iii), some candidates made blatent errors in their attempt to convert $4^n\cos\frac{n\pi}{3}+4^n\cos\frac{n\pi}{3}$ into $2^{2n+1}\cos\frac{n\pi}{3}$.

Question 4

Although a good number of candidates answered part (a) correctly, quite a few stalled at the handling of $\sinh^2 2t$ either by misquoting a formula for the double angle or by using longwinded algebraic methods in which they lost direction. Consequently these candidates were unable to score full marks in part (b)(i).

Part (b)(ii) proved to be beyond the abilities of the majority of candidates. The usual attempts were either to express replace $\cosh^2 t$ by $1+\sinh^2 t$ or to express $\cosh^2 t$ in terms of $\cosh 2t$, thereby making no progress. Few thought of using a simple substitution.

Question 5

This question proved to be quite discriminating. Either candidates realised what they were asked to do and scored full marks, or the notation puzzled them and they were unable to proceed beyond part (a)(ii), thinking that the answer to this part should be 48 rather than 42. Some of the weaker candidates, whilst realising what to do, failed to take out common factors in their algebraic manipulation in parts (a)(iii) and (b) with the result that correct answers were written down after incorrect algebra.

Question 6

In part (a), whilst $\frac{\mathrm{d}t}{\mathrm{d}\theta}$ was expressed correctly, the manipulation required to obtain the integral in terms of t was frequently faulty. Also in part (b), whilst many candidates were able to write down the correct definite integral $\frac{1}{3}\tan^{-1}\frac{t}{3}$, full marks were not awarded unless it was clear how the answer $\frac{\pi}{18}$ was arrived at, as this answer was given in the question.

Question 7

Candidates generally had difficulty in using the recurrence relationship in their proof by induction, so that responses to this question were rather poor. Proper detail is essential in the proof by induction using a sequence and a sequence relationship so that relatively few candidates scored full marks for part (a).

Very few candidates indeed were successful in part (b). Only a handful of candidates recognised that a Geometric Progression was involved. If they did, they usually went on to obtain a correct solution. It should perhaps be added that one method of providing an excellent solution was to rewrite $u_{k+1} = 2u_k + 1$ as $u_{k+1} - u_k = u_k + 1$ and then to use the method of differences to sum the series; but this method of solution was extremely rare.

Question 8

Whilst part (a) was generally well done, relatively few candidates expressed the other roots in terms of ω, but rather gave them in the form $r\mathrm{e}^{\mathrm{i}\theta}$.

Few, also, were able to complete part (b). The relation $1+\omega+\omega^2 = 0$ appeared with regularity.

Part (c) was poorly answered. Although correct answers were written down as they were given in the question, few responses were convincing and as has already been stated earlier, if answers are given, it is the responsibility of the candidates to supply sufficient working to convince the examiner that they understand the methods involved.

Mark Ranges and Award of Grades

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