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General Certificate of Education

Mathematics 6360

MFP1 Further Pure 1

Report on the Examination

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General

There were many excellent performances from the candidates on this paper, and only a relatively small number of weak ones.

Some candidates appeared to use calculators to obtain answers to questions for which the examiners needed to see the working. This could cost a fair number of marks over the whole paper. For example, candidates are expected to show their working for solving quadratic equations, with real or non-real roots, and in Question 6 the word 'Hence' should have alerted candidates to the need to show the use of the result of part (a) in finding the answer to part (b).

Question 1

This opening question gave almost all the candidates the opportunity to score a high number of marks. Even when careless errors were made, for example the omission of the plus-or-minus symbol in one or both sections of part (a), there was much correct work for the examiners to reward. The expansion of the cube of a binomial expression in part (b)(i) seemed to be tackled more confidently than in the past. Almost all the candidates used $\mathrm{i}^2 = -1$ in part (b)(ii), though some were unsure how to deal with i^3.

Question 2

Like Question 1, this question was very productive for the majority of candidates, who showed a good grasp of matrices and transformations. A strange error in part (a)(i) was a failure to simplify the expression $\frac{2\sqrt{3}}{2}$, though on this occasion the error was condoned. The most common mistake in part (a)(ii) was to multiply the two matrices the wrong way round. Only one mark was lost by this as long as the candidate made no other errors and was able to interpret the resulting product matrix as a transformation in part (b)(iii). Occasionally a candidate misinterpreted the 2θ occurring in the formula booklet for reflections, and gave the mirror line as $y = x\tan 60°$ instead of $y = x\tan 15°$.

Question 3

It was pleasing to note that almost all candidates were aware that the sum of the roots was −2 and not +2, and that they were able to tackle the sum of the squares of the roots correctly in part (b).

Part (c) was not so well answered. Relatively few candidates saw the short method based on the use of $\left(\alpha^2 + \beta^2\right)^2$. Of those who used the expansion of $\left(\alpha + \beta\right)^4$, many found the correct expansion but still had difficulty arranging the terms so that the appropriate substitutions could be made.

Question 4

Part (a) of this question was well answered, most candidates being familiar with the equation $y = ax^b$ and the technique needed to convert it into linear form. Some candidates seemed less happy with part (b), but most managed to show enough knowledge to score well here. Errors often arose from confusion between the intercept 1 on the vertical axis and the corresponding value of y, which required the taking of an antilogarithm.

Question 5

Most candidates scored well here, picking up marks in all three parts of the question. Those who failed to obtain full marks in part (a) were usually candidates who gave $y = 1$ instead of

$y = 0$ as the equation of the horizontal asymptote. The sketch was usually reasonable but some candidates showed a stationary point, usually at or near the origin, despite the helpful information given in the question. There were many correct attempts at solving the inequality in part (c), though some answers bore no relation to the candidate's graph.

Question 6

The simple request in part (a)(i) seemed to have the desired effect of setting the candidates along the right road in part (a)(ii). As usual many candidates struggled with the algebra but made reasonable progress. They could not hope to reach the printed answer legitimately if they equated $\sum 1$ to 1 rather than to n. Very few, even among the strongest candidates, achieved anything worthwhile in part (b), most using $n = 200$ instead of $n = 100$ at the top end. No credit was given for simply writing down the correct answer without any working, as the question required the candidates to use the formula previously established rather than summing the numbers directly on a calculator.

Question 7

The trigonometric equation in part (a) was more straightforward than usual and was correctly and concisely answered by a good number of candidates. Some earned two marks by finding a correct particular solution and introducing a term $n\pi$ (or $2n\pi$), but a common mistake was to use the formula $n\pi + (-1)^n \alpha$ with α equated to the particular solution rather than to 0.

Part (b)(i) was usually answered adequately. The best candidates gave more than four decimal places, showing that the two numbers were different, before rounding them both to four decimal places. The examiners on this occasion tolerated a more casual approach. There was an encouraging response to the differentiation from first principles called for in parts (b)(ii) and (b)(iii). No credit could be given in part (b)(iii) to those who simply wrote down the answer, as by doing so they were not showing any knowledge of the required technique. Strictly speaking the candidates should have used the phrase 'as h tends to zero' or 'as $h \to 0$', but the examiners allowed the mark for 'when h equals zero' or the equating of h to 0, even though zero is the one value of h for which the chord referred to in part (b)(ii) does not exist.

Question 8

Part (a) of this question was generally well answered apart from the omission of the plus-or-minus symbol by a sizeable minority of candidates. The wording of the question should have made it very clear that there would be more than one point of intersection.

In part (b) many candidates sketched an ellipse instead of a hyperbola. Those who realised that it should be a hyperbola often lost a mark by showing too much curvature in the parts where the curve should be approaching its asymptotes.

Most candidates gave an appropriate answer (in the light of their graph) to part (c). No credit was given here to those who had drawn an incorrect curve, such as an ellipse, which just happened to have a vertical tangent at its intersection with the positive x-axis.

It was good to see that, no doubt helped by the printed answer, the majority of candidates coped successfully with the clearing of fractions needed in part (d)(i). Some candidates seemed to ignore the instruction to solve the equation in part (d)(ii) and went straight on to the statement that the line must be a tangent to the curve. Others mentioned the equal roots of the equation but failed to mention any relationship between the line and the curve.

Mark Ranges and Award of Grades

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