GCE

Edexcel GCE

AEA Mathematics (9801)

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Summer 2006

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Examiners' Report

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Introduction

The candidature for this paper was mixed. As in previous years, many of the candidates were not prepared for a paper of this type and their performance was disappointing. About 20 of the marks were gained easily, so most candidates earned most of these. However, there seemed to be an even greater frequency of basic arithmetic and algebraic errors. It is sometimes difficult to understand the strategy being used by schools to enter candidates for this examination. Many seem not to meet the design intentions of being in the top third of the A grade range.

The mean mark was slightly lower than in the 2005 paper. The number achieving the Merit level was very disappointing. The best of the candidates displayed some very good work and those gaining a Distinction showed a good grasp of the mathematical techniques involved and an ability to develop logical arguments, carry through extended pieces of algebra and work persistently to complete questions.

The six "S" marks (for style and appropriate explanations within the solution) were for the highest S marks obtained on a candidate's best three questions. Q1 had just one S mark available. Q2 to Q7 each had up to 2 S marks. Regrettably these marks were awarded infrequently as complete, efficient solutions to whole questions were all too rare. The single "T" mark was for a good attempt at all 7 questions, with good presentation and explanations.

Question 1

Nearly all candidates were able to write down the binomial expansion. There were the inevitable sign errors however. It was extremely surprising that so many candidates who had correctly answered part (a) were then unable to spot the connection with the sequence given in (b). Often candidates were seeking a link which involved a non-constant a. Even many of those who identified y with $x/(1 + x)$ were unable to simplify their expression to the required form. Attempts at part (c) were few and far between. Many simply stated $|x| < 1$. There were very few complete, convincing solutions to this part.

Question 2

Many candidates seemed to be put off by the appearance of the given equation. Again surprisingly many failed to recognize the common factor altogether and others simply cancelled the factor and then ignored it. Those who started with the given equation and failed to factorise usually became immersed in a mass of trigonometry and made no progress. Those who did deal with the factor usually obtained at least three of the available marks and many correctly identified all four solutions for this part. Very many candidates tackled the "other" equation by squaring. Often this led to one of the answers though rarely both. However as is usually the case, approaches which involved squaring led to spurious answers. Hardly any students seemed to be aware of this and checked their values. Consequently several incorrect answers were often given. The final accuracy mark was then withheld, as were possible S marks. Candidates at this level should be aware that methods which avoid squaring are likely to prove more effective and are less likely to lead to incorrect answers.

Question 3

The response to this question was mixed. Many were well prepared for work involving the theory of logarithms but others not. The first part was usually answered well, often using the change of base formula rather than the printed suggestion of using z. In part (b) many failed to give convincing reasons for rejecting the answer $y = x$ which should have resulted from $\log_x y=\pm 1$. In the final part, many realized that $y=1/x$ still. However relatively few were able to give a fully convincing argument for the removal of logs to arrive at the equation $x^4 - x^2 -1 =0$. Those who did get that far were often able to produce surd forms for x and y. However again some solutions lacked conviction about the sign patterns of the answers.

Question 4

The bookwork necessary to answer the first part was often not known. Many candidates simply implicitly differentiated the equation of the circle to arrive at a form for dy/dx in terms of x and y. Very few progressed from there. Those who substituted mx for y and used the $b^2=4ac$ approach were often successful, though algebraic/arithmetic slips were too frequent, which was disappointing as the answer was printed on the paper. In part (b), many candidates did not spot the factors for the two m values. They resorted to the quadratic formula and perhaps not surprisingly often failed to get to the simplified form for the values of m. The most popular approach then was to insert $y = -\frac{2}{3}x$ into the equation of the circle. Often simplification of their resulting equation produced errors. Surprisingly few seemed to realise that their equation should have repeated roots.

Part (c) of the problem required insight into the relationship of the position of the two circles and the two points (-4, 7) and (4,-7). Only a small number of candidates saw this, perhaps because so few drew a reasonable diagram. Some did so and gained these two marks immediately but others effectively attempted to repeat the algebra from part (b) and rarely were able to work it right through to get a correct point for P or Q. This approach involved a lot of work for two marks.

Question 5

Most of the candidates made good progress on parts (a) and (b) – many scoring all 7 marks. Again however there were large numbers of silly slips in solving two (usually correct) equations for μ and λ in part (a). This is very disappointing in candidates at this level. Part (b) was sometimes answered by the vector product approach, though generally the standard scalar product method was used. Part (c) was more searching but there were some good attempts from those who realized they first needed to form the vector **AB**. However some attempts to form **AB** had an expression in terms of just λ or just μ. Some used the efficient method of equating their vector to α (2, 1, 2) and then using the fact that the **i** component equals the **k** component etc. Others used a scalar product approach successfully. Some stated that **AB** = (2, 1, 2) rather than some multiple of it and were then able to make no further progress.

Question 6

This was the question in which many candidates earned their highest marks. It was also the one for which most S marks were gained. Virtually all candidates scored the first mark. Differentiation was generally good in part (b) and many candidates scored all 5 of these marks. A common error was to state that $\ln x=1$. There were also many good attempts at part (c). Nearly all recognized the need to take the difference of two areas. Those who sought to find the area of the triangle by forming the equation of the line and then integrating usually came unstuck in a mass of algebra and they rarely obtained the correct value. Fortunately most simply used half the base x height! Integration of y was usually well done. Similar numbers of candidates used direct integration by parts ($x\sin(\ln x)$ etc.) as used the substitution $u=\ln x$, resulting in $\int e^u \sin u \, du$. Many were able to complete the two cycles of parts and obtain the correct answer.

Question 7

There were mixed responses to this question. Many candidates made very little progress and quite a number just carried out the differentiation in part (d). Reasonable diagrams to help with part (a) were rarely seen. Often terms were used without either a diagram or an explanation, leaving it to the examiner to interpret what the candidate was trying to do. The most successful approach was to consider two similar triangles POB and PO_2B_2 and forming $\sin \alpha$ for each. Many were then unable to formulate the geometric sequence for the total area of the circles, so there were even fewer correct answers in the required simplified form. It was disappointing that so many attempts were dimensionally incorrect.

Part (c) proved to be difficult. Few dealt with the major arc of circle C_1. Answers to part (e) proved to be even more elusive. Many equated the derivative to zero and seemed happy to state that the least value occurred when $\cos\alpha = 4/\pi$. Some better efforts arrived at this point, realised that this had no solution and then tried to show that S was either a decreasing or an increasing function in the interval $[\pi/6, \pi/4]$. There were very few complete solutions to this part. It seems that even the best candidates for this paper are unaware that maxima and minima are local events firstly and only sometimes global maxima/minima.

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