Version : 1.0 0107

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MFP3 Further Pure 3

Report on the Examination

2007 examination - January series

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Set and published by the Assessment and Qualifications Alliance.

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General

Presentation of work was generally good and most candidates completed their solution to a question at a first attempt, with relatively few scripts containing attempts at parts of the same question at different stages in the answer booklet.

Although excellent scripts were seen, there was some evidence that integration from the A2 core units was not always understood.

Candidates usually answered the questions in numerical order and appeared to have sufficient time to attempt all the seven questions.

Too many candidates had not been reminded to complete the boxes on the front cover to indicate the numbers of the questions that they had answered.

Teachers may wish to emphasise the following points (some of which have appeared in previous reports) to their students in preparation for future examinations in this unit:

- Just listing values in a well-labelled table to solve a differential equation numerically eliminates the possible awarding of method marks if the values are incorrect. Candidates would be well advised to indicate, by showing the relevant formulae and the substitutions into them, how the values in the table have been obtained.

- The final answer for the general solution of the second order differential equation in Question 5 should be of the form $y = \mathrm{f}(x)$, where $\mathrm{f}(x)$ contains two arbitrary constants.

- Where a method is specified in a question and the phrase "or otherwise" does not appear, candidates are expected to use the given method in their solution. For example, Question 6(a)(ii) required candidates to use Maclaurin's theorem rather than the binomial theorem.

Question 1

This question proved to be a good source of marks to all those candidates who showed sufficient working. There was some evidence of misreads, the most common one being "$\ln(1 + x^2 + y^2)$" for $\mathrm{f}(x, y)$; for those candidates who explicitly showed this misread, the mark loss was minimal.

Question 2

Although many candidates scored marks for using $r\sin\theta = y$ and $r = \sqrt{x^2 + y^2}$, a significant number failed to eliminate r correctly. Those who rearranged the equation to $r = 4 + y$ before squaring generally went on to present a fully correct solution.

Question 3

The vast majority of candidates answered part (a) correctly and also used it to write the left-hand side of the differential equation as an exact derivative. However, finding the resulting integral, $\int 3x^2(x^3+1)^{\frac{1}{2}}\,\mathrm{d}x$, caused problems for a majority of candidates. It was disappointing to see so many failing to spot this integrand as the derivative of $\frac{2}{3}\left(x^3+1\right)^{\frac{3}{2}}$ with some resorting to writing $\left(x^3+1\right)^{\frac{1}{2}}$ as $\left(x^{\frac{3}{2}}+1\right)$. Subsequent credit, for method, was given to those candidates who introduced a constant of integration and found its value by applying the given boundary conditions.

Question 4

A significant minority did not attempt part (a), or used the limit e rather than 0 in their explanations of why the definite integral was improper. Using integration by parts in part (b) proved to be more of a problem for candidates than expected. Although a higher proportion of candidates showed the limiting process than in previous sessions, this topic still remains a section of the specification which is generally not fully understood.

Question 5

This question, on finding the general solution of a second order differential equation, was a good source of marks for many candidates. Some candidates failed to write their final answer in the form $y = \mathrm{f}(x)$, but a more common error was not finding/stating "2" as part of the particular integral.

Question 6

The vast majority of candidates answered both parts of part (a) correctly. Those who failed to use Maclaurin's theorem in part (a)(ii) were heavily penalised. Most candidates obtained the printed result in part (b), although others frequently failed to include all the terms in their working. Generally answers to part (c) were correct, although some solutions did not have the correct denominator for the x^3 term. In part (d), weaker candidates just replaced x by 0 and gave the wrong answer "0/0 = 1". In answering part (d), candidates were expected to show the division of terms by x^2 in the numerator and denominator so that the limiting value can be justifiably stated.

Question 7

Most candidates showed that they understood how to find the area of the region but some lost accuracy marks by writing the wrong expansion for $\left(6+4\cos\theta\right)^2$ or making sign errors in the subsequent integration. Candidates found parts (b) and (c) much more of a challenge. In part (b), although many gave the correct values of r at P and Q, many then assumed that angle PQO was 90º to find the length of PQ, which they then used to 'prove' that angle PQO was 90º. Although some excellent solutions were seen for part (c), based either on the cosine rule for triangle POS or on the coordinates of P and S, the majority of candidates failed to present a full method or incorrectly assumed that PS was horizontal.

Mark Ranges and Award of Grades

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