Version 1.0

General Certificate of Education (A-level)
June 2012

Mathematics MPC3

(Specification 6360)

Pure Core 3

Report on the Examination

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Set and published by the Assessment and Qualifications Alliance.

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General

The paper was accessible to the majority of the students with many questions having fully correct responses and few questions not attempted. Very few low marks were seen and the majority of students scored well.

There were one or two questions where marks were often lost through poor notation.

Where there is a specified degree of accuracy in the question this must be adhered to in the answer, as otherwise marks may be lost. Also, students should understand that if a numerical answer is to be to a particular degree of accuracy, the previous working must, where possible, be to a greater degree of accuracy.

Some questions specify a particular form of answer and full marks will only be obtained if the final answer is in this form. It is expected that numerical or algebraic fractions or expressions should be simplified for the final mark.

Proofs of given answers must be fully correct to earn the marks, which includes correct notation and accurate use of brackets throughout. It is expected that proofs be completed in the right direction; students who do not like fractions and multiply through expressions are changing the question and need to explain what they are doing very carefully if they are to avoid losing marks.

Question 1

This was well answered by the majority of students. Many fully correct responses were seen. The major error was from students who worked in degrees, but they usually worked to the correct degree of accuracy and hence earned the initial B mark for their mid-ordinates and the special case mark for their final answer.

Students who worked to two decimal places (rounded or truncated) were liable to lose the last accuracy mark, but often lost more through not showing enough working.

Question 2

This was well done with many students obtaining full marks.

In part (a), the majority of students used $4\ln x - \sqrt{x} = 0$ and evaluated it correctly for $x = 0.5$ and $x = 1.5$. There are still many students who then write 'change of sign therefore a root' without clarification of where the root lies and who therefore lose the A mark. Less successful were the students who tried the LHS-RHS approach on $4\ln x = \sqrt{x}$. Although correct numerical values were seen earning the method mark, the final accuracy mark was often not earned.

Parts (b) and (c) were well answered by the majority of students. When students failed to score full marks, it was usually due to poor notation.

Part (d) was well answered by the majority of students. The main error was the incorrect labelling of the axes.

Question 3

This question was in general a good source of marks for the majority of students. The main cause of loss of marks was a common desire to use an approximate numerical value for e.

Question 4

Part (a) was answered very well by many of the students, the main error being $v = 6e^{6x}$ instead of $\frac{1}{6}e^{6x}$. The other error was in the final answer, where $\frac{1}{6} \times \frac{1}{6} = \frac{1}{12}$ was a common sight.

Again many correct responses were seen in part (b), but this was the first question where many students started to lose marks. Many could not set up the initial formula for the volume, with the major error being the omission of dx. A significant number of students also failed to see the connection with part (a) and started again often getting different results to their previous response. The other main error was the substitution of the limits with xe^{6x} often being evaluated as $\frac{1}{6}$ when $x=0$ was substituted.

Question 5

Although this question was well answered very few students scored full marks. The majority of students scored full marks in parts (a) and (b), although there was a common mistake in part (b) of $\frac{20}{x} = 25 - 5$. Even the better students failed to obtain both marks in part (c)(ii), with few scripts giving a justification of why there was only one solution and rejecting $x = -3$.

Question 6

In this question, students tended to do very well or very badly.

It was good to see that many students were able to complete this integration correctly. However there were many blank scripts, and the majority of students obtained only the B mark for a correct answer for $\frac{du}{dx}$. Some students were able to make slight progress, and where M1 was obtained, many did manage to produce some form of ln function, although many made a sign error and obtained $\ln u - \frac{2}{u}$. There were also many fully correct solutions seen.

Question 7

There were many high marks on this question, although only a minority of students were able to answer part (b) correct.

Students answered part (a) well, with the majority giving a correct modulus graph. The main error was incorrect curvature in the outside branches $x > 3$ and $x < -2$.

In part (b), some students gave an identical response to the modulus graph in part (a), but the most common result was a correct plot for $x \geq 0$ but then the LHS of the curve was reflected in the y-axis to produce a sketch in the first and fourth quadrants.

There were many fully correct solutions to parts (c) and (d). The main errors were the use of the word transformation rather than translation and also the scale factor for the stretch stated as 2 in the x-axis rather than ½ in the y-axis. The common errors in part (d) were (0,5) and (–1,20)

Question 8

This question was poorly answered.

In part (a), although many students achieved full marks, some found the combining of two fractions beyond them. For many students, an initial step was replacing $1+\cos\theta$ with $\sin\theta$ or attempting to multiply through by $1+\cos\theta$, thus obtaining expressions such as $1+\frac{1+\cos\theta}{1-\cos\theta}=32$.

Despite the majority of students finding part (b) of this question difficult, full marks were occasionally seen. Students who were unsuccessful in part (a) were able to attempt this part using the result given. Most students earned the first method mark, but for many this was all they achieved since they only worked with $\sin\theta = +¼$ and then only worked to 2dp which resulted in just 2 solutions. For the final two B marks, the solution $x = 0.17$ was often missing, and 2.00 was often written as 1.99.

Question 9

Part (a) proved to be a good source of marks, although a significant number of students lost a mark through poor notation, such as $\cos y^2$ or no $\frac{\mathrm{d}x}{\mathrm{d}y}$

Although many earned full marks in part (b), many other proofs were inadequate. Students were expected to use the identity $\tan^2 y + 1 = \sec^2 y$ and to show the expansion of $(x - 1)^2$ clearly. Too many fudged their working, wrote $\tan y + 1 = \sec y$ or only proved the known trig identity.

The result in part (c) was easily derived from the previous two parts, but there were many blanks here and many confused statements about inverse functions which were often taken as $\frac{1}{\tan y}$. Students who used the formula book appropriately generally earned the mark.

There were many fully correct solutions to part (d)(i). However it was distressing at this stage to see some horrendous algebra, with terms inverted in ways that were invalid and worthless.

Only the more able students were able to make progress on the last two parts of the question. Many students differentiated their quadratic instead of the expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$. Some students earned the method mark in the final part, but few completed the whole answer, as their final explanation often had an element missing.

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