# Examiners' Report

# Summer 2014

Pearson Edexcel GCE in Core Mathematics C3R (6665/01R)

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Summer 2014
Publications Code UA038462

# Mathematics Unit Core Mathematics 3

# Specification 6665/01R

## General Introduction

This paper was found to be accessible by most students. It contained a mixture of straightforward questions that tested the student's ability to perform routine tasks, as well as some more challenging and unstructured questions that tested the most able students.

Overall the level of algebra was pleasing, although there are many examples of students not using brackets correctly.

When an answer is given it is important to show all stages of the calculation. It is also useful to quote a formula before using it. Examples of this are when using the product and quotient rule (Qu 4) and using trigonometrical identities (Qu4(i) and Qu3).

## Comments on Individual Questions:

### Question 1

The vast majority could obtain the fully simplified answer accurately and efficiently. However there were a few students who failed to factorise the $4x^2 - 9$ term, so could not complete their solution, and some who used more terms in the denominator than necessary, resulting in quadratic or cubic numerators. Some of these did proceed to a complete solution, but most made errors in the process. A frequent transcription error was 2 instead of 3 in the numerator of the first term. Only occasionally did students use partial fractions on the final term.

### Question 2

Q02(a) was generally well done, with accurate differentiation and manipulation of the given expression. Some students failed to recognise that, as a proof, there was an expectation to set $\frac{dy}{dx} = 0$

In Q02(b) the graph of $y = x^3$ was often correct, although some students drew a straight line, and others showed a cubic with two turning points. The exponential graph was less successful, with some students showing a reflection of the correct graph. Some accurate sketches were seen, but a correct asymptote was rare – often given as $x = -2$ instead of $y = -2$

Those students who had graphs with one point of intersection generally answered Q02(c) correctly, although there were also references to graphs crossing axes, and to one-to-one mappings.

Q02(d) was nearly always successful and mostly given to the accuracy asked for by the question.

In Q02(e) most students obtained the $x$ coordinate, although many did a lot of extra work, either by continuing the iteration or by looking for a change of sign of the function. However many either forgot to find a $y$ coordinate, or substituted into an incorrect function finding an incorrect $y$ value.

### Question 3

Q03(i)(a) was a question that was generally done well, with most students knowing the trigonometrical identities for for $\tan x, \cot x$ and $\operatorname{cosec} x$. A frequent error in Q03(a) was the omission of $\operatorname{cosec} x$ from the original equation, but those who started with the correct form could usually follow an appropriate process, with some making minor arithmetical/algebraic errors.

In Q03(i)(b) nearly all could solve their quadratic, and most gave two values for $x$. There were very few answers given in degrees.

Q03(ii) was usually successfully attempted, although some students who worked from both sides of the required identity did not give an adequate conclusion to complete their work. One of the most common errors was to obtain $\lambda = \frac{1}{2}$, as they had difficulty with the $\frac{1}{2}$ in the denominator.

## Question 4

In Q04(i) many students wrote down $\frac{dy}{dx}$ correctly. Some did it implicitly, and a few used $\frac{1}{\cos^2 2y}$ and quotient rule. The most common errors seen were $\frac{dy}{dx} = 2\sec^2 2y \tan 2y$ and $\frac{dy}{dx} = 4\sec 2y \tan 2y$

Most then went on to find $\frac{dy}{dx}$ by inverting their result, often not until after expressing $\frac{dy}{dx}$ in terms of $x$.

A number used a triangle with ratios as expressions of '*x*' to reach their final expression. Some manipulated the given answer, but there were many completely correct solutions. It was important that students used the identity $1+\tan^2 2y = \sec^2 2y$ and not $1+\tan^2 x = \sec^2 x$ in proving their result.

Q04(ii) was well completed. Students know the product rule really well but all should be advised to write it down first before using it. The derivative of $\ln 2x$ was also often correct, although $\frac{1}{2x}$ was frequently seen. The substitution of $\frac{e}{2}$ was often correct, but a number of students made algebraic errors in manipulating the resulting expression..

In Q04(iii) most students differentiated correctly, but could not simplify the numerator to gain the final mark. Most used the quotient rule although those who used the product rule found the expression easier to simplify. There were a lot of basic algebraic errors shown in the attempt to reach an expression of the right form. Again it must be stressed that writing down the quotient rule formula would have resulted in more marks for students making errors in applying the method.

## Question 5

Nearly all students drew a V shaped graph in Q05(a), and most were in the right position with coordinates correctly labelled. Generally marks were lost for not labelling one of the intersections.

In Q05(b) and Q05(c) most students retained inequalities throughout their working, frequently having problems when the *x* term was negative. Many only used one inequality and hence only achieved half of the required region. Those who had sketched a graph were most likely to pick the correct regions in Q05(b) and some clearly changed a correct inequality because they did not understand which region was required. Those who found the critical values by squaring often failed to consider whether they had introduced extra solutions.

In part Q05(c) it was noticeable that many students reversed the sign of the wrong expression, so obtained an incorrect inequality. Many students did not realise that $x > \frac{3}{4}$

And $x < \frac{3}{4}$ meant that $\frac{3}{4}$ was excluded from the solution set.

## Question 6

Most students could find the inverse function correctly, although a few differentiated. However a lot of students gave an incorrect range for $f(x)$, and often an incorrect domain for $f^{-1}$.

Many students misunderstood Q06(c) and used $\ln(4x^2)$. They usually proceeded with correct log and exponential work, but obtained an incorrect answer. Very few students who started this part correctly could simplify $\sqrt[6]{8}$ to obtain $\sqrt{2}$.

Q06(d) and Q06(e) were moderately successful, although many students failed to square both the 2 and the $x$ when simplifying the expression. Many then lost marks in Q06(e) because of incorrect solutions to Q06(d). A few managed to restart from $e^{2\ln 2x} = 2k^2$ and solve correctly.

## Question 7

The majority of students could complete Q07(a), with only a few giving answers in degrees.

A very common error in Q07(b) was to forget the intersection of the graph with the $y$ axis; many found at least one correct intersection with the $x$ axis.

Q07(c) was probably the least successful part of the question. Although a good number of students could write down the maximum and minimum easily, some of those who had a correct value for the maximum then gave either $-18.5$ or 12 as the minimum. Some students found this part challenging, often using values of $H$ when $t = 0$ and $t = 52$.

Q07(d) many students successfully reached one or more correct values for $\frac{2\pi t}{52}$ but then made calculator errors in reaching their value for $t$. Many students showed very little working at this stage, so it was sometimes unclear how much of the work was accurate.

There were still a number of students who did not realise that Q07(a) should be used in solving Q07(c) and Q07(d).

**Grade Boundaries**

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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