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Examiners' Report

January 2010

GCE

Core Mathematics C1 (6663)

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Introduction

This paper gave average candidates a fair opportunity to demonstrate their ability. While most were able to score marks on the earlier questions, the last two questions often proved challenging. Most candidates were able to complete the paper within the allotted time, sometimes by sensibly resisting the temptation to spend too long pursuing unfruitful methods.
In Q1 and Q4, there was clear evidence of weakness in differentiation and integration of terms involving fractional powers.
Standards of presentation varied considerably. Although many candidates managed to set out their working clearly and concisely, some penalised themselves by producing work that was difficult to interpret. All working, rough or otherwise, should be shown in the space allocated for each question and candidates should be reminded that full marks will not usually be scored where there is insufficient working to make methods clear to the examiner.
As mentioned in previous reports, it is good practice for candidates to quote a formula first before beginning to substitute values. This can sometimes earn a method mark that might otherwise be lost.

Report on individual questions

Question 1

Many candidates differentiated correctly, scoring full marks. The most common mistake was to give $\frac{1}{3}x^{-\frac{1}{3}}$ as the derivative of $x^{\frac{1}{3}}$. Just a few candidates integrated or included $+C$ in their answer.

Question 2

This question was answered very well, with many candidates scoring full marks. Mistakes in part (a) were usually from incorrect squaring of the $\sqrt{5}$ term, sign errors or errors in collecting the terms. In part (b), the method for rationalising the denominator was well known and most candidates, whether using their answer to part (a) or not, proceeded to a solution. A common mistake, however, was to divide only one of the terms in the numerator by 4.

Question 3

In part (a), many candidates did not know how to find the gradient of the given straight line, giving answers such as 3 or -3 (the coefficient of x) rather than rearranging the equation into the form $y = mx + c$. A few gave the answer $-\frac{3x}{5}$ instead of $-\frac{3}{5}$. A less efficient method, using the coordinates of two points on the line, was occasionally seen.
Those who were unsuccessful in part (a) were still able to score method marks in part (b), although a few found the equation of a parallel (instead of perpendicular) line.

Question 4

In this question the main problem for candidates was the integration of $x\sqrt{x}$, for which a common result was $\frac{x^2}{2} \times \frac{2x^{\frac{3}{2}}}{3}$. Those who replaced $x\sqrt{x}$ by $x^{\frac{3}{2}}$ generally made good progress, although the fractional indices tended to cause problems. Some differentiated instead of integrating. Most candidates used the given point (4, 35) in an attempt to find the value of the integration constant, but mistakes in calculation were very common. A significant minority of candidates failed to include the integration constant or failed to use the value of *y* in their working, and for those the last three marks in the question were unavailable.

Question 5

Many candidates scored full marks for this standard question on simultaneous equations. Mistakes were usually in signs or in combining terms, leading to a loss of accuracy rather than method marks, but an exception to this was the squaring of the equation $y - 3x + 2 = 0$ to give $y^2 - 9x^2 + 4 = 0$. A few candidates, having found solutions for *x*, failed to find *y* values. It was disappointing to see many candidates resorting to the quadratic formula when factorisation was possible.

Question 6

This was a successful question for many candidates, although for some the required division by *x* in part (a) proved too difficult. Sometimes the numerator was multiplied by *x*, or x^{-1} was added to the numerator. Occasionally the numerator and denominator were differentiated separately.

In part (b), most candidates substituted *x* = 2 into their $\frac{\mathrm{d}y}{\mathrm{d}x}$, but in finding the equation of the tangent numerical mistakes were common and there was sometimes confusion between the value of $\frac{\mathrm{d}y}{\mathrm{d}x}$ and the value of *y*.

Question 7

Most candidates interpreted the context of this question very well and it was common for full marks to be scored by those who were sufficiently competent in arithmetic series methods. Answers to parts (a) and (b) were usually correct, with most candidates opting to use the appropriate formulae and just a few resorting to writing out lists of numbers. In part (c), it was pleasing that many candidates were able to form a correct equation in *A*. Disappointing, however, were the common arithmetical mistakes such as $4100 \div 20 = 25$. Trial and improvement methods in part (c) were occasionally seen, but were almost always incomplete or incorrect.

Question 8

There were many good solutions to all three parts of this question. Although many candidates were able to give the coordinates of the transformed maximum points correctly, some did not understand the effect of the transformation on the asymptote. This was particularly true in part (b), where it was common to think that the asymptote *y* = 1 was unchanged in the transformation $y = 4\mathrm{f}(x)$. Almost all candidates had some success in producing sketches of the correct general shape in each part, but it was often apparent that the concept of an asymptote was not fully understood.

Question 9

The parts of this question could be tackled independently of each other and most candidates were able to pick up marks in one or more of the parts. In part (a), it was disappointing that so many failed to give a complete factorisation, commonly leaving the answer as $x(x^2 - 4)$. Sketches of the cubic graph in part (b) were often very good, even when the link between parts (a) and (b) was not appreciated.

A common misconception in part (c) was that the gradient of *AB* could be found by differentiating the equation of the curve and evaluating at either $x = 3$ or $x = -1$. Apart from this, numerical slips frequently spoiled solutions.

A significant number of candidates failed to attempt part (d), but those that did were often successful in obtaining the correct length of *AB*.

Question 10

This was a demanding question on which few candidates scored full marks. In part (a), many found the algebra challenging and their attempts to complete the square often led to mistakes such as $x^2 + 4kx = (x + 2k)^2 - 4k$.

Rather than using the result of part (a) to answer part (b), the vast majority used the discriminant of the given equation. Numerical and algebraic errors were extremely common at this stage, and even those who obtained the correct condition $4k^2 - 11k - 3 < 0$ were often unable to solve this inequality to find the required set of values for k.

The sketch in part (c) could have been done independently of the rest of the question, so it was disappointing to see so many poor attempts. Methods were too often overcomplicated, with many candidates wasting time by unnecessarily solving the equation with $k = 1$. Where a sketch was eventually seen, common mistakes were to have the curve touching the x-axis or to have the minimum on the y-axis.

Grade Boundaries

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

Module	80	70	60	50	40
6663 Core Mathematics C1	63	54	46	38	30
6664 Core Mathematics C2	54	47	40	33	27
6665 Core Mathematics C3	59	52	45	39	33
6666 Core Mathematics C4	61	53	46	39	32
6667 Further Pure Mathematics FP1	64	56	49	42	35
6674 Further Pure Mathematics FP1 (legacy)	62	54	46	39	32
6675 Further Pure Mathematics FP2 (legacy)	52	46	40	35	30
6676 Further Pure Mathematics FP3 (legacy)	59	52	45	38	32
6677 Mechanics M1	61	53	45	38	31
6678 Mechanics M2	53	46	39	33	27
6679 Mechanics M3	57	51	45	40	35
6683 Statistics S1	65	58	51	45	39
6684 Statistics S2	65	57	50	43	36
6689 Decision Maths D1	67	61	55	49	44

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