Examiners' Report/
Principal Examiner Feedback

Summer 2013

GCE Core Mathematics C2 (6664)
Paper 01R

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Core Mathematics C2 (6664R)

Introduction

The standard of presentation of answers was high and the candidates had been well prepared for this examination. Some very good work was seen and the overall standard was high.

Report on Individual Questions

Question 1

The vast majority of candidates could differentiate the given function correctly, though a small number got x^{-1} rather than x^{-3}. Almost all candidates set the derivative equal to zero and found x, but a minority concluded $x = \pm 2$, ignoring the domain $x > 0$.
A small number forgot to find the y coordinate. Some candidates continued to find the second derivative here although this was unnecessary extra work.

Question 2

In part (a) almost all achieved the first mark for 0.8572. The value 0.8571 was seen rarely, as was 0.857. These answers did not get this mark.
In part (b) the main error was in calculating the strip width; $\frac{1}{12}$ 1/12 coming from doing the calculation $(1.5 - 1) \div 6$.

The common bracketing error, with brackets omitted, appeared relatively frequently. This usually led to errors in the calculation. There were occasional, but rare, errors with extra values repeated in the innermost bracket, or 0 included as the first value. There were some who tried to integrate to produce an answer (but got nowhere) and others who split it up into several integrals to attempt to evaluate, again with little success.
Usually, however, this question was answered correctly.

Question 3

This question was done well and the majority of candidates gained full marks. The method used was equally divided between candidates working with the expression given and those taking out a factor of 2 at the start. Although answers using the second approach were more likely to have errors, most candidates could work accurately with this method. The common error of applying the power of a bracket to the x but not to the $-\frac{1}{2}$ was only seen occasionally. The most common error seen was where candidates used $\frac{1}{2}x$ instead of $-\frac{1}{2}x$. Some candidates gave every term of the expansion, and not just the ones required by the question, which would cost them time in an examination.

Question 4

Most candidates used the remainder theorem in part (a). They found f(3) and f(–1) correctly with only a few failing to set these equal to the remainders. $3^3 = 9$ was a relatively common error. Few mistakes were made solving the simultaneous equations.
A few attempted algebraic division as an alternative method, obtaining awkward equations and sometimes making errors, though even this method was usually done correctly.

Provided the values found in (a) were reasonable, factorisation into (quadratic x linear) was generally done well. Many could do this by inspection, some used algebraic division (again, correctly if their coefficients were correct) and synthetic division was quite common, though this latter often led to an incorrect final factorisation as there was confusion over the difference between factorising out $(x + \frac{2}{3})$ and $(3x + 2)$.

Some candidates stopped at (quadratic × linear) without attempting to find the linear factors and some thought they had to show that $(3x + 2)$ was a factor and then often forgot to go on to factorise the cubic at all.

Question 5

Part (a) caused the greatest variety of responses. The most common correct approach was to write the terms as ratios of each other (as in the second line of the mark scheme).This mostly led to the correct answer, with any marks lost being due to slips rather than to errors in the method. Another approach was a multi layered substitution, by squaring the middle term and dividing by the first term and then putting that equal to the third term leading to $4p\left(\frac{3p+15}{4p}\right)^2 = 5p + 20$ which then required more careful algebraic work. The geometric mean method was rarely seen.
Some students also chose to take out the 3 as a common factor on the middle term and the 5 as a common factor of the 3rd term and then manipulated as above. A sizeable minority attempted it incorrectly and then concluded with the final statement and 'hence proved', perhaps hoping that their errors would not be noticed.

In part (b) most were able to solve the quadratic by factorisation and quite a lot by formula, but many lost the second mark for not rejecting the second solution clearly. This was a printed answer. A small number did it by verification and gained one of the two marks, as they had not shown that 5 was the only value which p could take.

There were no difficulties finding the common ratio in part (c) and it was rare to see the value given as $\frac{2}{3}$ instead of $\frac{3}{2}$ (usually a common error).

The formula for the sum of a geometric series was well applied in part (d) and usually gave the correct answer. A few used $n = 9$ or $n = 20$ or put $a = 5$ leading to errors and some did not give their answer to the nearest integer.

Question 6

This question was well answered by most candidates. In part (a), almost all candidates used the addition rule of logs to separate the terms and were able then to write the given expression in terms of *a*. Candidates who tried to change base introduced extra complications. There were some weaker candidates who did not know the log laws well. Some did not know how to deal with the 9 or 81 and some simply replaced *x* with *a* giving common incorrect answers of $9a$ and $\frac{a^5}{81}$.

In part (b), again, most candidates used the subtraction law correctly and spotted that the power law was the next step; almost all achieved the correct answer. In parts (a) and (b), almost all candidates used the first method, "way 1" on the mark scheme.

Unusually, part (c) was answered by some candidates who had not been able to answer parts (a) and (b). Most answered part (c) using the first method on the scheme, although it was disappointing how many achieved the value for *a*, without going on to find a value for *x*. Those who used the alternative method tended to be less successful, making errors in 'undoing' the log and in multiplying and dividing by powers of 3 correctly. Those using method 2 sometimes gave the "extra false solution" of –2.498 losing the last mark.

Question 7

Almost all candidates correctly obtained the values –4 and 2 in part (a).

In part (b) most candidates knew they had to integrate to find the area, and most did so correctly, with only a few differentiating and only a few mistakes in the integration. They generally used the limits correctly, though a surprising number split from –4 to 0 and from 0 to 2. It was quite common to leave the final answer as 24. Arithmetic with fractions was invariably well executed. Those who found the rectangle area separately usually did this correctly. Many candidates subtracted the functions before integrating and this often led to the predictable errors of incorrect subtraction, or of obtaining a negative area after subtraction the wrong way round. Some did realise that the area must be positive, but the reason for the sign change was not always explained.

Question 8

In part (a) most used the cosine rule correctly. A number of solutions were given in degrees and then changed to radians. A value for cos θ was needed as an intermediate step to showing the printed answer, that θ was 0.865.

In part (b) a majority used the correct formulae for both the areas of triangles *ABC* and sector *ABD*. Some attempted the triangle area by using base x height divided by 2 so had to work out the height first. The area of the sector formula was not always correct; sometimes the half was lost and sometimes the arc length formula was used instead. Asked to find the amount of grass seed, 670g was most common response although a few gave 680g. Both of these answers received the mark and the units were not required for the mark. Rare errors were students who divided by 50 to get their final answer. Most multiplied, as required. Some left their final answer rounded to the nearest whole number (not the nearest 10).

Question 9

The majority of candidates were able to make a good attempt at this question and many gained full marks. Where candidates were less successful, part (a) was less well done that part (b).

Several candidates did not realise that they needed to obtain sin $(2\theta - 30\ ) = -\frac{0}{6}$ to start this question. Some candidates expanded the bracket in (a) and others solved to find θ as –3.4 but then made no further progress. Occasionally candidates who had correct values for $(2\theta - 30)$ made the common error of dividing by 2 before adding 30. Of those who only found one of the two solutions, it was most common for them to find 176.6, often not using the method on the mark scheme, but obtaining the –3.4 before using the sine graph or a CAST diagram.

In part (b) candidates regularly obtained the correct quadratic but there were some errors is factorising and solving, with cos $x = \frac{2}{3}$ and $\frac{1}{3}$ being the most common incorrect answer. A few candidates gave just one value of x as 70.5 without calculating the second value, whilst a few gave extra answers of $180 - x$ and $180 + x$, or of $270 + x$ and $270 - x$. It was interestingly very rare for candidates to work in radians in this question.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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