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GCE Core Mathematics C1 (6663) Paper 1

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Introduction

The paper appeared to be of about the right standard and length. The first 4 questions proved very accessible but some of the later questions (especially question 10) were more discriminating.

Comments on individual questions

Question 1

This question was answered very well with many candidates scoring 5 or 6 marks. In part (a) a few struggled with the fractional power and some included $+c$. Simplifying the second term in part (b) was the usual place where candidates lost a mark, $\frac{6x^{\frac{3}{2}}}{\frac{3}{2}}$ was often obtained but not simplified correctly. A few lost a mark for failing to include $+c$ in part (b). Some candidates are in the habit of writing fractions on a single line such as $\frac{1}{5}$. This is not encouraged as expressions like $\frac{1}{5x^5}$ are not clear and candidates themselves often misread this as $\frac{1}{5x^5}$.

Question 2

Most candidates answered this question very well, part (a) in particular was often correct. The most common error here was to write $\sqrt{32}+\sqrt{18}=\sqrt{50}=5\sqrt{2}$ whilst a few found $4\sqrt{2}$ and $3\sqrt{2}$ but couldn't add them together correctly.

In part (b) the majority started well but some failed to use their answer to part (a) and made errors in multiplying out and simplifying $\left(\sqrt{32}+\sqrt{18}\right)\left(3-\sqrt{2}\right)$. Those who used their answer from part (a) usually fared much better but a minority expanded the numerator $7\sqrt{2}\left(3-\sqrt{2}\right)$ to get 4 terms, treating the $7\sqrt{2}$ as though it were $\left(7+\sqrt{2}\right)$. The denominator was usually simplified to 7 although 5 and even 1 were sometimes seen. Sadly a number who arrived at $\frac{21\sqrt{2}-14}{7}$ were unable to cancel down correctly to reach the required form.

Question 3

Part (a) was answered very well and most candidates secured both marks. There were the usual arithmetic slips leading to expressions like $3x > 20$ or $x > 5$ and there were a few candidates who thought that division by 5 meant the inequality should be reversed.

In part (b) most produced a quadratic equation with 3 terms and proceeded to solve and the correct critical values were usually obtained although 2 and 6 or -6 and 2 were sometimes seen. Some stopped at this stage and made no attempt to identify the appropriate regions. There were a number of sketches seen and these usually helped candidates to write down the correct inequalities but some lost the final mark for writing their answer as $-2 > x > 6$ or "$x < -2$ and $x > 6$".

Question 4

Most candidates answered this question well. Few failed to write down $a + 5$ or $a(1) + 5$ in part (a) and the minimal evidence of $a(a + 5) + 5$ almost always preceded the answer in part (b). A small minority of candidates still do not understand the notation in this question and their answers often contained terms in x.
Some candidates had difficulties with part (c). The correct equation was usually identified but sometimes it was not reduced to a 3 term quadratic or the method of solution was incorrect. A few attempted to square root both sides and it was not uncommon to see $a + 5a = \sqrt{36}$. Some candidates obtained $a = 4$ by trial but credit will only be given for a complete solution leading to both answers.

Question 5

Most could start part (a) by attempting to form a suitable equation but slips in simplifying the equation of the line ($y = \frac{5}{2}x + 4$ was common) often meant that the correct equation was not obtained. Those who did have a correct quadratic usually used the discriminant (sometimes as part of the quadratic formula) to complete the question. A sizeable number though simply tried to factorise and concluded that since the equation did not factorise therefore there were no roots or C and L do not intersect.

The candidates usually fared better in part (b) and there were many excellent sketches scoring full marks. Weaker candidates had the parabola the wrong way up and it was not uncommon to see the line crossing the curve despite the information given in part (a). Very few lost marks for their line or curve stopping on the axes although some thought that if they drew their line stopping before it crossed the curve that would satisfy the information in part (a). Some candidates lost a mark for failing to indicate the coordinates $(-0.8, 0)$ where the line crossed the x-axis.

Question 6

Most answered part (a) correctly and the usual approach was to re-arrange the equation into the form $y = mx + c$ although some found the coordinates of *A* and *B* and used the gradient formula and a few differentiated. There were still some candidates giving the answer as 2 (the coefficient of x in the original equation) and the occasional $\frac{2}{3}x$ was also seen.

The perpendicular gradient rule was well known and used effectively in part (b) and there were many correct answers seen although sometimes these were rearranged incorrectly leading to errors in part (c). The typical errors in part (b) were incorrect coordinates for *B*, (0, 12) was fairly common, or slips with minus signs.

Most attempted to use $\frac{1}{2}AC \times OB$ to find the area of the triangle and this was the most successful approach. Many found the coordinates of A correctly but the fractions (and sometimes previous errors) caused problems for some in finding the coordinates of C. Some tried to use $\frac{1}{2}AB \times BC$ but simplifying the surds (especially $\sqrt{\frac{208}{9}}$ for *BC*) defeated a number using this method. There were a number of attempts using a determinant approach many of which were successful.

Question 7

Most candidates knew they had to integrate here and this was usually carried out correctly but some omitted the + C and simply substituted x = 1 into the integrated expression. Those who did include a constant of integration invariably went on to substitute x = 2 but sometimes they equated their expression to 0 rather than 10. Arithmetic slips were the most common cause of lost marks but the follow through on the final mark restricted the loss to 1 mark for many.

Question 8

Although full marks for this question were rare most were able to gain some marks.

Part (a) was answered very well with only occasional errors in multiplying out being seen.

In part (b) most drew a cubic curve and many realised that it touched the x-axis at (0, 0) and cut the axis at $x = -2$. Some failed to realise that the repeated root meant that there should be a turning point at the origin and drew a curve which crossed the x-axis at 3 places. In part (c) most candidates were able to substitute their x values into their derivative and find the gradient of the curve at the required points. Some failed to identify the connection with part (a) and simply tried to find the gradient between two points. The final part proved challenging but a few excellent sketches were seen. Many did not identify the connection with part (b) and those who did sometimes translated vertically as well as horizontally so that the new curve touched the x-axis at a maximum not a minimum. Finding the coordinates of the points of intersection in terms of k proved too difficult for most with the y-intercept proving particularly troublesome.

Question 9

There were few mistakes in part (a) with nearly 90% of candidates scoring the two marks. A few tried listing the terms and some failed to show sufficient working by simply preceding the printed answer with $10(P + 9T)$ and giving no indication that a correct arithmetic series had been identified and used. Most were able to apply the sum formula to scheme 2 correctly in part (b) however many were careless or omitted one or more brackets so that when they attempted to multiply out their expression they frequently failed to multiply the $9T$ by 5 or the 1800 by 2. Part (c) caused the most problems with many candidates using S_{10} instead of u_{10} and gaining no marks. There were however many fully correct solutions to this question and nearly a quarter of the candidates gained full marks.

Question 10

This was a substantial question to end the paper and a number of candidates made little attempt beyond part (a). Part (c) proved quite challenging but there were some clear and succinct solutions seen.
Some stumbled at the first stage obtaining x = 2 or even 1 instead of $\frac{1}{2}$ to the solution of $2-\frac{1}{x}=0$ but most scored the mark for part (a).
The key to part (b) was to differentiate to find the gradient of the curve and most attempts did try this but a number had $-x^{-2}$. Some however tried to establish the result without differentiation and this invariably involved inappropriate use of the printed answer. Those who did differentiate correctly sometimes struggled to evaluate $\left(\frac{1}{2}\right)^{-2}$ correctly. A correct "show that" then required clear use of the perpendicular gradient rule and the use of their answer to part (a) to form the equation of the normal. There were a good number of fully correct solutions to this part but plenty of cases where multiple slips were made to arrive at the correct equation.

Most candidates set up a correct equation at the start of part (c) but simplifying this to a correct quadratic equation proved too challenging for many. Those who did arrive at $2x^2+15x-8=0$ or $8y^2-17y=0$ were usually able to proceed to find the correct coordinates of B but there were sometimes slips here in evaluating $2-\frac{1}{-8}$ for example. There were a few candidates who used novel alternative approaches to part (c) such as substituting xy for $2x-1$ from the equation of the curve into the equation of the normal to obtain the simple equation $8y + xy = 0$ from whence the two intersections y = 0 and $x=-8$ were obtained.

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