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Examiners' Report

Summer 2014

Pearson Edexcel GCE in Core Mathematics C1 (6663/01)

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Mathematics Unit Core Mathematics 1

Specification 6663/01

General Introduction

In general there was a very wide range of mathematical ability displayed.

When fractions were multiplied together it was very common for no cancellation to be attempted before multiplication. The resulting numerators and denominators after multiplication were very large (often wrong) and the subsequent cancellation of the final fraction usually failed.

There were some excellent attempts at the paper resulting in full marks in many questions.

Report on Individual Questions

Question 1

Most students achieved full marks on this question. A very few differentiated instead of integrating. Common errors were:

- not simplifying the coefficient of x^2
- omitting the plus C
- leaving the integral sign in the final answer

Question 2

Q02(a) was correctly answered by almost all students, however, many students failed to use their answer to solve Q02(b)

In Q02(b) poor bracketing and understanding of the laws of indices were the main reasons for an incorrect final answer. Many students are not clear in the way they write fractions and answers are often ambiguous leaving examiners uncertain whether the answer is $\frac{1}{4}x^2$ or $\frac{1}{4x^2}$. The negative power created problems for many; for example, $\frac{1}{(2x)^2}$ was often rewritten as $4x^{-2}$. The responses were mixed with fairly equal numbers failing to apply the power to the 32 and failing to achieve x^{-2}. Common incorrect answers were $\frac{32}{x^2}$, $\frac{1}{32x^2}$, $\frac{1}{4}x^2$ and $4x^{-2}$.

Question 3

In Q03(a) most students scored full marks; though a small number changed the direction of the inequality. Other errors were mistakes in the rearranging (ending up with $2x > 10$ or $4x > -4$)

In Q03(b) most students correctly rearranged the inequality and got the first two marks for the critical values $x = -3$ and $x = 12$ by factorising and solving correctly. Only a few students erroneously gave $x = -12$ and $x = 3$. Some students used the quadratic formula to find these values, and mistakes substituting were made here. A large number made the mistake of simply leaving $x \le -3$ and $x \le 12$ as their answer, whilst some of those who realised that they needed the inside region did enough to gain the method mark, but not the accuracy mark as a result of incorrect notation. Some students picked the inside region correctly but wrote $-3 < x < 12$ with strict inequalities.

In Q03(c) the mark was gained only if students had worked correctly through the rest of the problem. As a result this was the least commonly gained mark and relied on accurate work and good understanding. Students generally realised the required method and often used a number line to correctly identify the region following their previous work, though many missed the subtlety of the "strictly greater than" for the $\frac{5}{2}$.

Question 4

In Q04(a) most students achieved -1 for x or wrote (-1, 0). Sometimes the -1 was found in the body of the question text.

In Q04(b) many graphs were well drawn – most students realised that it was a cubic graph and drew the correct shape. Negative cubic curves were quite common and there were also a few quadratic and hyperbolic graphs. Where the cubic was correct the commonest error was a curve crossing at (0,0) and turning at (2,0). Cubic curves crossing the x axis 3 times were also quite common. A few students produced cubic graphs with a single point of inflexion at the origin.

Q04(c) appeared to be the least well-answered part of the question. Several students wrote down the correct number of solutions but did not give a reason. Others wrongly gave a reason related to the number of times the graph crossed the x-axis instead of to the number of times the two curves crossed. Several students also tried to solve the resulting equation. There was some confusion between the words “intersection” and “intercept”.

Question 5

This question was answered very well. Q05(a) was usually correct with a good method shown. The main mistake was students simply substituting 1 into the formula to get the correct answer 2 fortuitously, which scored no marks. Generally when students made this mistake in Q05(a), they then went on to find the third and fourth terms by substituting “3” and “4” into the formula in Q05(b).

The majority of students obtained full marks in Q05(b) and most applied the correct method. A small number of students used a wrong a_1 from Q05(a) and there were quite a few $a_4 = 160$ where they had neglected to subtract the 3. A significant number of students wrongly used the arithmetic sum, using $a = 2$ and $d = 5$ with $n = 4$. Also some evaluated the first four terms but failed to add them up.

Question 6

Q06(a) was done well by virtually all the students. The correct form with $c = 4$ was expressed almost universally, with $c = 16$ seen occasionally by those who were unsuccessful.

In Q06(b) there were some for whom placing surd in a context seemed to prevent them from starting. Many mistakes arose with the multiplying out of the $(1+\sqrt{5})(1-\sqrt{5})$ in the denominator to get $1-5=4$ instead of -4. The numerator was expanded much more successfully. Those who had managed to obtain the correct numerator and denominator then typically simplified correctly but quite a few only divided one of the terms in the numerator by the 4 or -4. The alternative method of $(p+q\sqrt{5})(1+\sqrt{5})$ was successfully used by a minority and a few students achieved the correct answer either by inspection or using Trial and Improvement. Some errors in sign occurred at the final stage, $\sqrt{5}-5$ being the main error here, which went undetected by students, despite producing a negative width.

Question 7

A very high proportion of students scored full marks in Q07(a). Most expanded the brackets correctly and then differentiated with only a small minority using the chain rule. Of those students who did not score full marks this was mainly because of an incorrect expansion of the brackets or an incorrect method for differentiation without expanding. Frequently the $2x$ was squared to $2x^2$ or there were often sign errors. Occasionally the constant of 1 was squared to 2 and there were a surprising number of misreads with the original expression often being written as $(1+2x)$.

Q07(b) was completed reasonably well by most students. Of those who did not score full marks, most did not manage to achieve the expression in the necessary correct form of $\frac{x^3}{2}+3x^{-\frac{3}{2}}$. The most common error was to multiply the numerator by $2x^{-2}$ rather than $\frac{1}{2}x^{-2}$ and some added or subtracted $2x^{-2}$ creating a third term Even those who divided both terms by $2x^2$ made errors to obtain eg $2x^2$ for the first term or $3x^{-\frac{1}{2}}$ for the second. Most who achieved $-\frac{3}{2}$ as a power correctly differentiated it to $-\frac{5}{2}$. Common errors were due to the misconception that the numerator and denominator could be differentiated separately. There were quite a number of students who, having done the necessary work to change the expression into a suitable form for differentiation, then completely failed to do the differentiation. A few students attempted to treat the expression as a quotient and differentiate it directly. This approach had mixed success with the necessary formula often misquoted or misapplied.

Question 8

This question discriminated but provided access for all students. Q08(a) was completed well by the majority of students. Most used the correct formula of $a+(n-1)d$ with a correct combination of *a, n* and *d*. Some used a list and a small group worked backwards, usually correctly, to find $n=8$ and related that to 2007. Some who got a wrong answer of, for example, 210 just left it and did not try to correct their mistake.

Q08(b) was again completed well by the majority of students. The majority quoted and used the correct formula with most errors coming either in their arithmetic or using $n=13$ instead of $n=14$. A number could not multiply 7 and 430 to a correct value. Again in certain cases lists were seen, some of those with a correct total.

Q08(c) was seen to be challenging. Of those who had an idea of the overall method, common mistakes included taking $d=+20$ instead of $d=-20$, multiplying the wrong side of the equation by 3 or omitting the 3 altogether, and a large number of arithmetical errors. Some tried to use the sum to n terms formula, and some just put "$=n$" on one side of their formula. Even so, a majority of students achieved $n=10$ and most of those who did went on to relate this to 2009 and achieve full marks in this part of the question.

Question 9

Q09(a) was well answered with the majority of students correctly identifying $-\frac{2}{3}$ as the gradient of line one and using $m_1 \times m_2 = -1$ to find the gradient of line two. Some students did not divide the constant term by three when rearranging the equation into the form $y = mx + c$ and this led to problems in Q09(b). A number of students did not rearrange the original equation for line one and it was quite common to see the gradient of the original equation given as -2, although most knew to use the negative reciprocal to get the perpendicular gradient. Another common error was to substitute a point other than the origin (usually *B*) into their line equation, leading to an incorrect answer with a non-zero constant and making Q09(b) more difficult.

Q09(b) proved to be quite challenging for some students and a number of students failed to attempt the question. The majority, however, realised what was required. Most students realised that they had to find the coordinates of *C* and knew to use simultaneous equations to find the intersection of the two lines. However many arithmetic errors frequently ensued due to poor manipulation of fractions and an inability to simplify: many students made their subsequent calculations more difficult by failing to realise that, for example, $\frac{52}{13} = 4$, although many did get the correct coordinates of *C*, including some who made no further progress.

Some students used the y coordinate of *B* as 26 or 13 rather than $\frac{26}{3}$.

Many missed the simplicity of the triangle in question and embarked on the more complicated methods given as alternatives in the mark scheme. Those who tried to work with *OC* and *BC* almost always made errors manipulating surds and many were unable to simplify their final answer to a fraction. Those using the easier method often used the y-coordinate (6) instead of the x-coordinate (4) in the half base x height. Also in finding *B* many students found where line one intercepts the *x* axis and as a result tried to find the area of the incorrect triangle. Some forgot the $\frac{1}{2}$ in the area of a triangle formula.

Question 10

In Q10(a) the first three marks were obtained by most students, but simplifying the fractional coefficients often proved to be a challenge, in particular $\frac{3}{8} \div 3$ which often became $\frac{9}{8}$, and dividing by $\frac{1}{2}$ in the second term also caused problems.
Many students failed to go on and find c. Those that did often made arithmetical mistakes and so did not get the correct answer of 53. Those that did manage to achieve c = 53 failed to get the final mark as they did not simplify their coefficients, $\frac{3}{24}$ being seen frequently in the final answer or simplified incorrectly.

In Q10(b) some students substituted (4, 25) into their f(x) rather than f ′(x) which resulted in no marks for this part. Most however did substitute into the correct f ′(x). Many errors were made in the calculation and a significant minority did not achieve the correct gradient. Most were able to continue to find the gradient of the normal and then use (4, 25) to write down an equation of the normal with a few using $y = mx + c$ to find c. A minority tried to find the equation of the tangent. A large number of students did not read this question properly with regard to integer coefficients being required, giving their final answer as $y + 0.5x - 27 = 0$. There were common mistakes made when re-arranging from $y = \frac{1}{2}x + 27$ to the form of the equation required.

Question 11

In Q11(a) the discriminant was found correctly by most students. There were some arithmetic errors, and a few included a square root with the $b^2 - 4ac$ or used the whole quadratic formula. A few confused discriminant with derivative and differentiated.

Q11(b) proved a significantly tougher challenge and although a good percentage of students achieved full marks, there were frequent errors. Most students seemed to know that completing the square was required, however many struggled to deal with the coefficient of x^2 not being unity. Bracketing errors were common and a large minority could not even get as far as $2(x+2)^2 + k$.

Q11(c) was again done with varying success. Most students opted to either use differentiation or set $2x^2 + 8x + 3 = 4x + c$. Those students who used differentiation were more likely to achieve a full solution that was fully correct though there were many who did not realise that they needed to set the gradient of the curve equal to the gradient of the line. Commonly it was equated either to zero or the constant in the gradient function was erroneously believed to be the required value of c. Those who set $2x^2 + 8x + 3 = 4x + c$ fared less well, with many students not knowing what to do after they had rearranged their equation to collect together the x terms.

Grade Boundaries

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

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