Examiners' Report/
Principal Examiner Feedback

Summer 2013

GCE Core Mathematics C1 (6663)
Paper 01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2013
Publications Code UA035657

Core Mathematics C1 (6663)

Introduction

This paper proved a good test of candidates' knowledge and understanding of C1 material. There were plenty of easily accessible marks available for candidates who were competent in topics such as the manipulation of surds, differentiation, integration, recurrence relations, arithmetic series, transformations of curves and inequalities. A typical E grade candidate, therefore, had enough opportunity to gain marks across the majority of questions. At the other end of the scale, there was sufficient material, particularly in later questions, to stretch and challenge the most able candidates.

While standards of algebraic manipulation were generally good, some weakness in this area was seen in questions 5(a) and 9(a). Work on indices was sometimes problematical and a significant minority of candidates in question 2 incorrectly wrote $\frac{3}{\sqrt{x}}$ as $3x^{\frac{1}{2}}$ and many candidates were unable to deal with the work on indices in 3(b). There were a surprising number of errors in the arithmetic when calculating the value of the constant in 9(c).

Report on individual questions

Question 1

Full marks were scored by the majority of candidates. Wrong methods involved the use of an incorrect multiplier; for example (√5 – 1)/(√5 – 1), (√5 – 1)/(√5 + 1) and (7 – √5)/√5 + 1) were all seen. There were also problems in calculating the denominator (6 was a common answer). Some candidates failed to understand how to cancel through the 4 from the denominator, cancelling only one term in the numerator; e.g. (12 + 8√5)/4 became 3 + 8√5 or 12 + 2√5. Errors were also seen in multiplying out the numerator and not all candidates found four terms. Arithmetical errors led to 7 + 5 = 11 or 13 and 7√5 + √5 = 6√5.

Question 2

This provided a good source of marks for many candidates although there were a significant number of cases where a loss of marks could have been avoided. The most common errors were the omission of +*c*, writing $\frac{3}{\sqrt{x}}$ as $3x^{\frac{1}{2}}$ to give $\frac{3x^{\frac{3}{2}}}{\frac{3}{2}}$ when integrated and also some cases where 3 was divided by $\frac{1}{2}$ incorrectly.

Question 3

On the whole part (a) was well answered, with almost all candidates going straight to $2^5 = 32$. A few attempted 8^5 first, but even when this was evaluated correctly, further progress was rare. Some candidates evaluated 2^5 incorrectly, usually reaching either 64 or 10.

In part (b), failure to apply the power to both elements of the numerator was common. The majority of candidates could score the first mark for 2^3 or $x^{\frac{3}{2}}$ but it was relatively rare to see both correct. Most of these candidates then continued to both divide their coefficients and subtract their powers of x thereby gaining the next mark but as relatively few got the numerator correct, the final mark evaded many.

Common errors in the numerator were $8x^{\frac{7}{2}}$ leading to a final answer of $2x^{\frac{3}{2}}$ and $8x^{\frac{1}{8}}$ leading to a final answer of $2x^{-\frac{15}{8}}$. Some candidates wrote the fraction as $8x^{\frac{3}{2}}(4x^{-2})$ and proceeded to multiply 8 by 4, forgetting that the 4 should also have a power of -1.

Question 4

In part (a), most candidates came up with $6k$, but quite a few stopped at $k(4 + 2)$ or $4k + 2k$ but scored the mark for the unsimplified form. Common incorrect answers were $8k$ and $4k + 2$. Some candidates used 2 instead of 4 as the first value.

Generally part (b) was answered well. The most common error here was to restart using $a_1 = 2$. Several candidates found the correct sum of terms, but equated to zero instead of 2. A surprising number of candidates achieved the correct 3TQ, factorised this correctly, but failed to solve it correctly. A common incorrect answer here was $+\frac{1}{3}$. Attempts to apply an Arithmetic Progression sum formula were seen but were less common than in previous series.

Question 5

There were a surprising number of incorrect responses to part (a), although the majority of candidates scored both marks. Some failed to expand the brackets correctly, while others were unable to deal with collecting the like terms together (mainly as a result of the negative x term). Candidates also showed confusion about when to change the direction of the inequality, some changing the direction when multiplying by a positive number and others not changing the direction when multiplying by a negative number. Some changed from an inequality to an equality and $x = -1$ was a common incorrect answer.

In part (b) the majority of candidates correctly factorised the quadratic, but some solved this incorrectly to achieve answers of $+3$, $-\frac{1}{3}$ and even 1 or -1. Some candidates wrote out the solutions using inequalities, e.g. $3x - 1 < 0$ and $x + 3 < 0$. Some candidates failed to give the correct inequalities after finding the two correct values for x. Some candidates gave their answers as two separate inequalities (without using 'and') and quite a few gave their final answer as $-3 < x > \frac{1}{3}$. A significant number of candidates identified the solution as the 'outside' region.

Question 6

In part (a) most candidates used a correct method to find the gradient of L_1. The equation of L_1 was usually found by using $y = mx + c$ or $y - y_1 = m(x - x_1)$. This was done well by the majority of candidates although there were sometimes errors in substitution and candidates should be encouraged to quote formulae before using them. Some did not convert their equation to the required form with integer coefficients. Some incorrect answers were due to failures in dealing correctly with the signs or by not multiply each term by 4 (or 12).

In solving the simultaneous equations in part (b), a variety of methods were seen with varying degrees of success. Those using substitution often made errors in the arithmetic and/or algebra. Those candidates using elimination were generally more successful. Some candidates equated the = 0 forms of the straight lines to form another equation in x and y. A common incorrect method was to substitute values into the equations, e.g. $x = 0$ or $y = 0$ or points given in part (a).

Question 7

In part (a), those who knew the formula and how to apply it usually achieved $N = 21$, although poor manipulation sometimes led to $N = 19$. Some candidates relied on a listing method.

Many did not appreciate the demand in part (b) and simply used $n = 52$ in a sum formula. Others found the sum of the first 21 terms then treated the other 31 terms as the sum of an AP with $a = 600$ and $d = 600$. In a few cases an inconsistent value of k was used. 600×31 sometimes caused problems on this non-calculator paper with long multiplication methods employed.

Question 8

In part (a) nearly all candidates produced a horizontal translation in the right direction with the required coordinates marked on the graph. Errors mainly consisted of translating horizontally in the wrong direction or attempting $f(x) + 2$.

In part (b) a large number of candidates successfully wrote down $y = (x + 5)^2(x + 1)$; however it was quite common to see $y = (x + 1)^2(x – 3)$. Some candidates chose to expand $f(x)$ correctly as $x^3 + 5x^2 + 3x – 9$ but then incorrectly deduced $f(x + 2) = x^3 + 5x^2 + 3x –7$.

In part (c), most knew to substitute $x = 0$ in their answer to (b). Some used the original equation, writing $f(2) = (2 + 3)^2(2 – 1)$. Common errors or misconceptions included, putting $y = 0$ giving (–5, 0) and (–1, 0), expanding the brackets incorrectly before substituting and evaluating $(0 + 5)^2(0 + 1)$ as $25 + 1 = 26$.

Question 9

Many candidates were successful in achieving the three marks in part (a) but there were also a significant number of errors in expanding the bracket. There were common slips in signs for both the middle term and the x^2 term and some candidates expanded $(3 – x^2)^2$ as $9 – x^4$ or $9 + x^4$. Even with correct expansions of the numerator there were also errors in the simplification. A common error was to obtain $–6x$ for the middle term instead of –6.

Almost all candidates could gain the method mark for part (b), with most of these candidates also gaining the accuracy mark. Many of those candidates who didn't achieve this mark usually had an extra term (either from incorrect differentiation of a constant term or from having an incorrect term in the original expansion). A minority of the candidates used integration rather than differentiation.

In part (c) most candidates knew to substitute their values of x and $f(x)$ into their equation, although some used +3 instead of –3. Some failed to gain the mark as they didn't use a $+c$ term or try to find a constant term and some equated their derivative to 0 (instead of 10). Those who had a correct equation and substituted the correct values commonly made mistakes on evaluating the $–9x^{-1}$ (often arriving at +27) or $\frac{x^3}{3}$ while most errors came from an incorrect + or − sign somewhere in their equation. Almost all candidates who found a value of c wrote out their final answer at the end. Frequent miscopying of –6 to +6 caused loss of marks in both parts (b) and (c).

Question 10

In part (a), full marks were achieved by virtually all candidates. Most tried the substitution for $y = 1 - 2x$ in the second equation, with only a very few making a mistake with signs, resulting in $-8kx$.

In part (b), most candidates quoted and used the condition $b^2 - 4ac = 0$ but often no brackets were used in the subsequent substitution resulting in $8k^2$ rather than $64k^2$. Common incorrect answers for k were $\frac{1}{2}$ (from an incorrect start) or as 16 (from a correct start). Solving the quadratic in k by completing the square was attempted by some candidates.

Few candidates got $k = \frac{1}{16}$ and so most candidates could achieve at most one mark in part (c). Even those that used $k = \frac{1}{16}$ frequently made mistakes in the substitution and subsequent solving of the equation in x. Many also restarted with the two original equations and gave themselves the task of eliminating y again, making it a slightly more difficult solution. After finding the wrong value of k, they were left with an equation which would not factorise. Many still obtained a method mark by attempting to use the formula or complete the square. Having obtained a quadratic with fractional coefficients, most candidates multiplied through by a common denominator as they found it easier to solve with integer coefficients.

Question 11

In part (a), while almost all candidates correctly used $y = 0$ in the equation of the curve, a small number were unable to rearrange the equation correctly to find x, with $-\frac{4}{3}$ being the most common error.

In part (b) many gave just one asymptote and others omitted this part of the question altogether. A common error was $y = 0$ and $x = 4$ (or $x = -\frac{3}{4}$). Some candidates substituted $x = 0$ into the equation and used this to conclude that $y = 4$ was an asymptote, but it was often unclear as to whether these candidates were stating $x = 0$ as an asymptote, or as the value of x they were using to find the horizontal asymptote.
Finding the gradient of the curve in part (c) caused problems. Many candidates attempted to find the gradient using the co-ordinates of two points. Others thought that the gradient of $y = \frac{3}{x}$ was 3, interpreting the equation as a straight line despite the graph of the curve being given. A number of candidates found $\frac{dy}{dx}$ correctly but then used $x = -\frac{3}{4}$ to calculate the gradient instead of the x-coordinate of P. Unfortunately, some candidates who obtained the correct gradient then found the equation of the tangent instead of the normal. There were a few candidates who did not use the perpendicular gradient rule correctly. Many candidates use $y = mx + c$ to obtain the equation of the line rather than $y - y_1 = m(x - x_1)$.

In part (d) most candidates knew how to find the points of intersection of their line with the co-ordinate axes and were able to attempt to find the length of the line using Pythagoras' theorem, although a few used incorrect formulae such as $\sqrt{(x_1 + x_2)^2 + (y_1 + y_2)^2}$ or $\sqrt{(x_1 - x_2)^2 - (y_1 - y_2)^2}$. There were some mistakes in arithmetic, e.g. 16 + 144 = 150. Those obtaining the correct equation in (c) usually went on to obtain full marks in part (d).

Grade Boundaries

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

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning