Examiners' Report

January 2010

GCE

Core Mathematics C2 (6664)

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH

A PEARSON COMPANY

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Examiners' Report that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

http://www.edexcel.com/Aboutus/contact-us/

January 2010

Publications Code US022706

Core Mathematics Unit C2
Specification 6664

Introduction

This paper contained just nine questions, but covered the specification well and tested knowledge of the material. Most candidates tried each question and there were some very good answers from the stronger candidates. Others, however, may have been short of time as they had spent too long on repeated attempts at Q2 and Q3, or had used long methods on the last part of Q8. There was evidence that a sizeable group of candidates have some difficulty in thinking through problems or tackling questions that were not necessarily framed in ways that they were used to seeing. (Q4(a), Q7(d), Q8(c) and Q8(e)). Many do not seem to look at the structure of questions before starting to answer. One particular failing is demonstrated by a tendency to expend large amounts of time and effort on questions worth very few marks.

Numeric and algebraic slips were common, Basic skills with signs, fractions, powers and logs need more practice. (Q3, Q5, Q6(b), Q7(d), Q8(c) and Q8(e), Q9(a)). Frequently there was a lack of clarity in the solutions to questions requiring explanation. Presentation of work varied considerably. While some candidates produced neat precise answers others made multiple attempts, which were unclear and difficult to follow. Candidates making second attempts at questions on later pages are advised to make clear reference to this on the page where they began their solution.

Report on individual questions

Question 1

This binomial expansion was answered well, with a majority of the candidates scoring three or four marks. The binomial coefficients were usually correct, though a few used ${}^5C_r$ instead of ${}^6C_r$ .Those using the $(a+b)^n$ formula were the most accurate. The majority of errors with that method being with +/- signs: using x instead of -x, $(-x)^2$ becoming $-x^2$, not simplifying 1458(-x) to -1458x or leaving as +(-1458x). Attempts to take out the 3 to use the $(1 + x)^n$ expansion were generally less successful with candidates not raising 3 to a power or not dividing the x term by 3. There were a number of marks lost by slips such as miscopying 729 as 792 or 726, or neglecting the x in the second term.

Question 2

(a) Most candidates correctly substituted $1-\sin^2 x$ for $\cos^2 x$, but some lost the accuracy mark through incorrect manipulation of their equation or failure to put "equals zero".

(b) Most factorised or used the formula correctly and earned the first two marks. The most common errors again involved wrong signs. Most candidates correctly obtained the two answers 30 and 150 degrees. Some however gave the second angle as 210, others as 330 and another significant group gave three answers. Those who had made sign errors were able to get a follow through mark for giving a second angle consistent with their first.

Question 3

(a) Most who used the remainder theorem correctly used $f(\frac{1}{2})$ and equated it to –5, then used f(-2) and equated it to zero. They then solved simultaneous equations. There were a number of errors simplifying fractions and dealing with negative numbers and so a significant minority of the candidates scored the three method marks but lost all three accuracy marks. Some candidates forgot to equate their first expression to –5 and some wrote expressions not equations. There were also a number of errors rearranging terms and dealing with fractions. A small minority thought that $a(½)^2$ became $¼a^2$. It was obvious from the multiple efforts and crossings-out that a number of candidates were unhappy with their a and b values, but were often unable to resolve their problems.
Those who used long division very rarely got as far as a correct remainder. They usually made little progress, and penalised themselves by the excessive time taken to do the complicated algebra required.

(b) Most candidates attempted this part of the question, even after limited success in part (a). It was common for those candidates who found fractional values for a or b to multiply f(x) by a denominator to create integer coefficients here. Division by (x + 2) was generally done well using "long division" or synthetic division and candidates who had achieved full marks in part (a) normally went on to achieve full marks in (b), with the common error being failing to factorise their quadratic expression correctly. A significant group stopped at the quadratic factor and so lost the final two marks.

Candidates completing this question successfully were careful and accurate candidates and the question proved discriminating. A number of candidates made several attempts, sometimes achieving success on the third try.

Question 4

(a) This was a discriminating question, as the method required two stages of solution. Candidates could either find the angle *ACB* using a correct form of the sine rule, then use angles of a triangle, or they could first find the length *AC*, then use the sine rule. Finding length *AC* was complicated (requiring a correct cosine rule and use of a quadratic formula) and the former method was easier. Weaker candidates tried to use Pythagoras, despite the triangle not being right angled, or used the sine rule wrongly and manipulated their answer to give the printed solution. Others assumed the printed answer and attempted verification, but this sometimes resulted in circular arguments and frequently the verification was not conclusive due to the angle being given correct to 3sf. This verification method could earn a maximum of 2 out of 4 marks. Some candidates converted in and out of degrees, often successfully.

(b) Good candidates found the area of the triangle *ABC* and the area of the sector *BCD* and added these to give a correct answer. Weak candidates assumed that the emblem was a sector of radius 9 cm and angle 0.6 radians. Some made errors in their use of formulae and included pi erroneously, or neglected the ½ factor. A few used the wrong angle in their formulae or indeed used the wrong formula, confusing arc length or area of a segment with area of a sector.

Question 5

(a) Generally, both marks were scored easily with most candidates writing $x^2 = 64$ and x=8. Some included the -8 value as well, indicating that they were not always reading the finer details of the questions. However, quite a few attempts proceeded to $2^x = 64$ leading to the most common incorrect answer seen of x=6. A small group squared 64. Very few students attempted to change base in this part of the question.

(b) Most candidates scored the first M mark by expressing 2 $\log_2(x - 1)$ as $\log_2 (x - 1)^2$ but many then failed to gain any further marks. It was not uncommon for scripts to proceed from $\log_2(11\text{-}6x) = \log_2(x\text{-}1)^2 + 3$ to $(11\text{-}6x) = (x\text{-}1)^2 + 3$, resulting in the loss of all further available marks.

A significant number of candidates seem to be completely confused over the basic log rules. Working such as $\log_2 (11\text{-}6x) = \log_2 11/\log_2 6x$ following $\log_2 (11 - 6x) = \log_2 11 - \log_2 6x$ was seen on many scripts. Most candidates who were able to achieve the correct quadratic equation were able to solve it successfully, generally by factorisation, although some chose to apply the quadratic formula. There were a good number of completely correct solutions but the $x = -¼$ was invariably left in, with very few candidates appreciating the need to reject it. Fortunately they were not penalised this time.

Question 6

(a) This was an easy introduction into this question and most candidates showed that 18000×0.8^3 = 9216. Some did this in one step, which was sufficient, while others multiplied by 0.8 three times and gave the intermediate answers of 14400, 11520 and finally 9216

(b) Although a majority of candidates found n = 13, it was rare to see a well set out, completely correct method of solution. Many considered ar^{n-1} instead of ar^n in their working. The log work was usually good, but use of inequalities usually led to errors, as it was rare for students to appreciate that the inequality had to change when dividing by log 0.8, a negative number. Trial and improvement methods were allowed, but required evidence that n = 13 and n = 14 had been evaluated and compared with 1000.

(c) This part was usually understood and the method was executed correctly. Some did not give their answers to the nearest penny as asked in the question.

(d) Most attempted this using the sum of a GP as required. The answer was usually correct although some made errors evaluating their fraction. A few very weak candidates reverted to A.Ps for this part of the question.

Question 7

This question was accessible to all students and the later part differentiated between weak and strong candidates.

(a) This part of the question was generally well done with most candidates gaining both marks.

(b) Candidates had great difficulty showing that (5,4) lies on *C*. It was common to see numerical work, then 4=4 or 0=0 followed by no conclusion. The expectation is to see :
$x = 5$, so $y = 5^2 – 5.5 + 4$ i.e. y = 4 So (5,4) lies on the curve.

(c) A large proportion of the candidates gained full marks in this part of the question, showing that they understand the symbolisation for integration. Many included a constant of integration and some even proceeded to find a value for it via substitution, usually using the coordinate *N*. (Such constants were ignored.) There were very few candidates that mistakenly differentiated.

(d) There were a number of ways to find the shaded area. The easiest method was to evaluate the integral between $x = 4$ and $x = 5$. This represents an area of a region below the curve, which together with *R* makes up a triangle, with base of length 4 and height 4. So the area of *R* could then be found by subtraction. Unfortunately the area of the triangle when calculated was more likely to be :
½ × 3 × 4 or ½ × 5 × 4 rather than the correct ½ × 4 × 4.

Some chose to find the equation of the line *LN* and integrate, but unfortunately the limits were regularly incorrect, most commonly given as 4 and 1. There were a fair number of completely correct solutions seen but also many cases of arithmetic errors in the evaluation of integrals. Many students felt they needed to subtract a line and a curve without really considering the nature of the shapes involved in this question. Few successfully applied the alternative approaches stated on the scheme.

Question 8

(a) and (b) Most candidates obtained the first three marks for giving the centre and the radius of the circle, but some gave the centre as (-2, 1) and a few failed to find the square root of 169/4 and gave 42.25 as the radius.

(c) Diagrams and use of geometry helped some candidates to find the coordinates of *A* and *B* quickly and easily. Others used algebraic methods and frequently made sign errors. A common mistake was to put $y = 0$ in the equation of the circle. This was not relevant to this question.

(d) Use of the cosine rule on triangle *ANB* was a neat method to show this result. Others divided triangle *ANB* into two right angled triangles and obtained an angle from which *ANB* could be calculated.

(e) This part was frequently omitted and there were some long methods of solution produced by candidates. It was quite common to see candidates obtain equations of lines, coordinates of *P* and use coordinate geometry to solve this part even though there were only two marks available for this. Simple trigonometry was quicker and less likely to lead to error. 6.5 × tan *ANP* gave the answer directly.

Question 9

(a) A pleasing majority of the candidates were able to differentiate these fractional powers correctly, but a sizeable group left the constant term on the end. They then put the derivative equal to zero. Solving the equation which resulted caused more problems as the equation contained various fractional powers. Some tried squaring to clear away the fractional powers, but often did not deal well with the square roots afterwards. There were many who expressed $6x^{-1/2} = 1/(6x^{1/2})$ and tended to get in a muddle after that. Those who took out a factor $x^{1/2}$ usually ended with $x = 0$ as well as $x = 4$ and if it was not discounted, they lost an accuracy mark. Those who obtained the solution $x = 4$ sometimes neglected to complete their solution by finding the corresponding y value. Some weaker candidates did not differentiate at all in part (a), with some integrating, and others substituting various values into y.

(b) The second derivative was usually correct and those who had made a slip earlier by failing to differentiate 10, usually differentiated it correctly this time!

(c) Candidates needed to have the correct second derivative to gain this mark. As the derivative was clearly negative this mark was for just stating that the turning point was a maximum.

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

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Email publications@linneydirect.com

Order Code US022706 January 2010

For more information on Edexcel qualifications, please visit www.edexcel.com/quals

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: One90 High Holborn, London, WC1V 7BH