edexcel

Examiners' Report/
Principal Examiner Feedback

January 2013

International GCSE
Further Pure Maths
Paper 2 (4PM0-02)

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. 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 for our BTEC qualifications.
Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson.
Their contact details can be found on this link: www.edexcel.com/teachingservices.

You can also use our online Ask the Expert service at www.edexcel.com/ask. You will need an Edexcel username and password to access this service.

Pearson: helping people progress, everywhere
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

January 2013
Publications Code UG034505

International GCSE Further Pure Maths
Paper 4PM0 02

Candidates found paper 1 considerably harder than paper 2. The responses, or lack of them, which were seen for question 1 of paper 2 suggested that many candidates are still not taught this topic. Many candidates are still not aware that when the range for answers for angles includes π, the answers are required to be in radians. Some candidates seem unable to abide by rounding instructions given in questions and others use rounded answers in further calculations which leads to inaccurate final answers.

It is good practice to quote formulae before using them. In almost all cases, a correct formula with values then substituted for the variables can gain the method mark even if an error is made on substitution. Without the general formula on the page, an error on substitution means the method mark is lost and this can have serious consequences for the following work.

Some candidates have calculators which can solve quadratic equations simply by entering the coefficients in the correct manner. Whilst this is generally an acceptable way to solve an equation which is correct, it is inadvisable in an examination as there is no supporting working to be shown. If the answers are not correct (and an incorrect equation cannot yield correct answers) any method marks available cannot be awarded.

There were still cases of candidates who needed extra space for a question using surplus space intended for a different question and not clearly indicating this had been done. This is a very risky practice; an extra sheet of paper should be requested instead.

Question 1

Many candidates failed to score any marks on this question. Few could select an appropriate right angled triangle and then use the appropriate trigonometric ratio. Those who did make some sense of what was being asked mostly knew to work in radians, with only a few working in degrees.

Part (b) was more successful as candidates could see a clear strategy for finding the area of the sector and subtracting the area of the circle. Most knew the formulae needed but more than half only worked with the θ they found in part (a), rather than 2θ. This was a rare case where showing and using the general formula was not always sufficient to gain the method mark. Failing to double the answer from part (a) implied that only half the angle of the sector was required.

Question 2

Most candidates were able to prove part (a) but some candidates gained only the first method mark.

A significant number of candidates found it difficult to answer part (b), especially part b (ii). Some candidates used calculator answers of sin 15^{o} and cos 15^{o}, then simplified their result to obtain the required answer.

Question 3

In part (a) many candidates handled the powers of $3x^2$ and the factorial numerators very well in the expansion. However, there were a considerable number of mistakes made when working with the fractions.

Not many candidates omitted part (b) entirely, as has been the case in previous years. The main error here was in handling the negative sign, with many retaining it inside the square root. When candidates rewrote the expression as a product in part (c) most worked efficiently and scored 2 or 3 marks. Others wasted time by redoing the expansion from part (a). Part (d) was well answered, and even if the answer to part (c) was incorrect, candidates knew how to equate the relevant parts of the expansion to find the value of k.

Question 4

Part (a) was very well done by most candidates. The product rule was correctly applied in almost all responses, with only one or two incorrect differentials of sin5x to either $-\sin 5x$ or cos5x. There were candidates who tried to differentiate each component directly with no work suggesting they knew the product rule and so gained no marks.

Part (b) was similar, with only a few candidates unable to apply the quotient rule. The quotient rule was correctly applied in almost all responses with only occasional errors of sign, although a large number of candidates, having gained the available marks, continued to try to simplify their answer and made basic algebraic errors.

Question 5

Part (a) was very successful, with only a small number of candidates not able to attempt it. They knew to rewrite the expression writing $A = B$ and then used the Pythagorean identity to obtain the desired result.

In part (b), most candidates gained the mark but some failed to appreciate what was required and left this part blank. Many of this latter group then used a correct identity in part (c). Some rushed to the conclusion that $k = 2$ without any working.

Candidates knew the correct integral to use in part (c) to find the volume of revolution. However, many failed to make the connection with the earlier work to put this expression into an integrable form; candidates at this level should be aware that $9\sin^2 2x$ cannot be integrated without some initial manipulation.

Question 6
Part (a) was completed correctly by many candidates, usually by finding an expression for *A* including *h*, and then substituting for *h* from the volume relationship.

The need to differentiate in part (b) and equate the answer to 0 was well understood, although there were a noticeable number of errors in differentiating. Some of the responses did not go on to use the second differential or any other method to justify the minimum area, and a smaller number made errors in the differentiation, often with first term. Many failed to gain the final accuracy mark in part (b) as they did not give a proper conclusion to their justification of the minimum. Having been told in the question that they were dealing with a minimum value it is essential to state that $\frac{\mathrm{d}A}{\mathrm{d}x} > 0$ and so the area was a minimum.

Part (c) was generally done well, including by those who had made earlier errors, although some candidates substituted their value of *x* into the differential not the expression for *A*.

Question 7
Again, a very successful question. In part (a) most found the gradient using the 2 points and then substituted into $y - y_1 = m(x - x_1)$ or $y = mx + c$, using a point (sometimes the mid-point of *AB*) to find *c*. Candidates were accurate and careful.

Part (b) caused some problems as there were many attempts which did not follow through to a conclusive proof. Many found the 2 gradients, but didn't link these to the same coordinate. Some set the 2 equations equal and found the single root but didn't give a satisfactory conclusion.

Part (c) was successful for the vast majority of candidates; however, time was wasted by those who repeated their work from part (b).

It was pleasing to see how succinctly candidates dealt with part (d). They manipulated the gradient and used appropriate coordinates from part (c) to find the equation of the normal.

Question 8

Very few candidates scored all the marks available on this question. However the great majority did complete part (a) fully correctly. Those who wrote down a vector equation and then substituted values were the most successful, except in the rare instance where the equation was incorrect, eg $\overrightarrow{AB} = \overrightarrow{OA} + \overrightarrow{OB}$. The ratio in (iii) was used correctly by the majority of candidates.

Part (b) was much more problematic. Only a small minority wrote down a vector equation, with most starting by trying to find an equation for $\overrightarrow{PX}$ or $\overrightarrow{MX}$ in terms of $\overrightarrow{PM}$. Failure to do so frequently ended the attempt at the rest of the question, although a small minority decided to assume $\overrightarrow{MX}$ was equal to $\overrightarrow{PM}$. Of those who did write down an equation, the equation $\overrightarrow{OX} + \overrightarrow{MX} = \overrightarrow{OX}$ was seen most often. Those who correctly used parameters for an appropriate equation containing $\overrightarrow{OX}$ were then able to find the right answer, with very few errors seen at this stage.

Part (c) was usually not attempted or resulted in no marks. Very few candidates got as far as linking the areas of *AOM* and *AOB*, and even fewer connected *OMB* and *OMX*, usually due to a lack of a value for $\overrightarrow{OX}$. Those candidates who scored any marks usually gained all three. Many candidates who tried to answer part (c) assumed that as the question was about the ratio of areas of two triangles these triangles must be similar.

Question 9

A few candidates dealt with this as an arithmetic series question and so scored no marks. Parts (a) and (b) were done well. However, problems arose from part (c) onwards, with candidates unsure of which common ratio to use. Those who tested the two values for *r* from part (a) were successful at selecting the appropriate one and proceeded to a correct conclusion. The formula used was mostly correct and candidates knew which of their values to substitute into it.

Many candidates omitted parts (d) and (e) altogether.

Finally, in part (f), candidates knew how to find the sum to infinity but didn't have a ratio of the appropriate size to progress. However, those who used the correct ratio proceeded to use the correct sum to infinity and sum of n terms formulae and used these in an inequality. Candidates seemed confident solving the inequality using logs correctly. Unfortunately there were many candidates who then rounded their answer up to 6 after all that hard work.

Question 10

The great majority of responses to this question were fully correct. It was very rare to see an error in part (a) or (b), other than of the basic arithmetic kind.

In part (c) almost all candidates understood that they were required to change the base of one of the logs and then solve a quadratic equation. Marks were only very occasionally lost in getting to the correct quadratic, and even more rarely in getting the correct answers from the log equations.

Grade Boundaries

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

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

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com
Order Code UG034505 January 2013

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

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