Examiners' Report/
Principal Examiner Feedback

Summer 2013

International GCSE Further Pure Mathematics (4PM0) Paper 1

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Question 1

This question was generally answered well by the vast majority of students. A good number chose to work in degrees, and some of them lost marks by premature rounding in part (a) which then lost the final mark in part (b). Some students used an incorrect formula at the start of the question, but recovered in part (b) to score the M mark by using a correct formula for sector length. Many responses were seen here with full marks.

Question 2

Question 2 was well answered with many scoring full marks. There were very few who expanded the brackets as $3x^2 + 3$. Most identified the inside region for the critical values and an error seen was to use the word "or" or a comma to connect the 2 separate inequalities rather than the word "and". Correct solutions were given as $-3 < x < \frac{2}{3}$.

Question 3

This question was generally well answered. Students who found the correct asymptotes generally went on to a complete correct solution for full marks. Some knew that they needed to substitute $(1, 0)$ and $(0, d)$ into the equation of the curve, and gained two method marks. Students who could not find the two asymptotes were unable to gain full marks in part (b) because it relied on a correct value for *a*.

Question 4

Most students knew how to attempt this question but a few made errors in expanding the brackets of $6(1 - \cos^2 x)$ so that $\cos^2 x + \cos x - 2$ was a common error seen. Many only gave a solution of 60° and not – 60°, and many often gave extra solutions that they thought were in range such as 48.2° and/or – 48.2°. Extra solutions out of range were not penalised.

Question 5

There were a great many fully correct solutions to this question, and very few indeed could not make at least some progress towards the final answer. The students who did not score full marks generally found the value for *h*, and then went on to differentiate $V = 4h^3$ correctly, but then were unsure of what to do next. There were some innovative solutions which included differentiating $h = \frac{V^3}{4}$ to successfully arrive at the correct solution. Another solution shown was done by finding the correct solution by integrating $\frac{\mathrm{d}V}{\mathrm{d}t} = 36$, hence finding an equation connecting *h* and *t* which were then differentiated.

Question 6

This question was generally well answered considering it was the first totally algebraic question on the paper. Most got part (a)(i) correct, and (a)(ii) correct as $(-p)^2 - 2$ which was allowed, but some then gave $(-p)^2 = p$ and used this in part (a)(iii). Many found part (a)(iii) challenging with expressions such as $(\alpha+\beta)^3 = \alpha^3 + \beta^3 + 3\alpha\beta$ or $\alpha^3 + \beta^3 = (\alpha+\beta)(\alpha^2 - 2\alpha\beta + \beta^2)$ which were allowed for the first mark. Some assumed that $(\alpha+\beta)^3 = \alpha^3 + \beta^3$. Answers of $(-p)^3 + 3p$ and even $-p((-p)^2 - 2 - 1)$ were occasionally seen and allowed for full marks as simplification was not required. Part (b) was not as well answered as part (a) with many forgetting to put their quadratic equation = 0 and the other error seen was to put the coefficient of the *x* term in the quadratic as the sum of the roots rather than minus the sum of the roots.

Question 7

Part (a) was answered well, with the vast majority of students remembering the formulae and how to use them correctly. Part (b) was again answered well with virtually every student who had the correct formulae in (a) managing to equate them successfully and show that $d = -\frac{4}{7}a$. In part (c) most students chose to show that $t_{176} = S_{21} = -99a$, to score full marks. Unfortunately, quite a few who equated $t_{176} = S_{21}$ and found $d = -\frac{4}{7}a$ did not refer back to the proof in part (b) and then lost the final A mark. Part (d) was not answered as successfully, with quite a few less responses achieving $r = 34$, due mainly to simple arithmetical errors, or by not being able to eliminate the variable *a* from their $t_r = S_{21}$

Question 8

Most students got part (a) and part (c) correct. In part (b) the common error seen was to fail to integrate the "15", but most knew what to do but made arithmetic mistakes. In part (d) the common error seen was to find the area above the line and below the curve but to forget to subtract their answer from their answer to part (b). Many did not identify a complete expression for the area in part (d) and so scored no marks.

Question 9

Part (a) was answered well although some students used decimals and therefore lost the A mark. Centres are advised to explain to students what is meant and required by the word 'exact' in a question. Quite a few used the sine rule when simple trigonometric ratios were all that was needed in the whole of this question.

Part (b) was also answered well with just a few losing marks because they used a rounded decimal in part (a). Again, a great many used the sine rule.

Part (c) was where misunderstanding of the actual lines and triangle in the question began. Students would achieve the rounded answer of 11.1 cm, but then went on to use this rounded value in parts (d) and (e) and subsequently lost marks through rounding errors. Centres should make it clear to students that even though a rounded value may be asked for in part of a question, where that question uses that value later on, they should use the full calculator display or at least 4/5 decimal places to avoid the risk of losing a mark.

Part (d) was found to be challenging, with all but the most able students achieving the 4 available marks. Some found the length BD for 2 marks, but many used the incorrect triangle and lost the final two marks.

Part (e) was quite well answered although some students thought that the shape was a pyramid rather than a prism and used $\frac{1}{3}\times$ base $\times$ $3\sqrt{3}$, losing the final two marks. Many correct methods to find the volume lost the final mark because of using a rounded value for the length of BF.

Question 10

Part (a) was well answered. Most knew how to differentiate but often did not get all four terms correct. It was very rare for the method for finding the equation of the line to be incorrect.

Part(b) was found to be challenging but most realised there were three solutions but some tried to solve $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$ rather than $\frac{\mathrm{d}y}{\mathrm{d}x} = 1$. Many assumed a gradient of 1 in part (c) even though it did not come from their values of P and Q. In part (d) many discussed the coordinates rather than the gradients of the lines. Those who attempted part (e) usually scored well with the methods correct but with some arithmetic mistakes. Those who used $\frac{1}{2}bc\sin A$ in part (f) did a lot more work than was necessary, and they often did not get an exact answer of 32.

Question 11

Part (a) was well answered. In part (b), it was clear that some students did not know what collinear meant and could not offer an adequate explanation for the award of the A mark, although many wrote just enough to earn both marks in this part. Many students wrote the correct ratio in part (c) for $AB:BC$ as $2:3$, but some left this as a fraction. There were many errors seen in part (d) with the common misconception that D was the midpoint of AC, the word ‘produced’ not being always understood. Some had $CD = 2AC$ rather than $CD = \frac{1}{2}AC$. Centres should encourage students to draw a clear diagram for these questions to help candidates come to their solutions.

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

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