Examiners' Report

January 2015

Pearson Edexcel International Advanced Level in Further Pure Mathematics F1 (WFM01/01)

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January 2015
Publications Code IA040563

Further Pure Mathematics Unit F1
Specification WFM01

Introduction

The questions on the whole were well answered with many fully correct answers. Candidates found the paper very accessible and standard methods were well known and accurately applied.

The standard of presentation was generally good with solutions showing logical steps making the work easy to follow. However, there were some instances of candidates not showing sufficient work to justify their answers. Candidates are advised to show all working so that examiners are clear that the correct methods are being applied. The questions that proved most challenging were question 6, question 7(a) and question 8.

Report on individual questions

Question 1

Almost all candidates knew that the complex conjugate was also a root and usually went on to use the conjugate pair to identify a quadratic factor. It was very common to then see algebraic long division to establish the other quadratic factor although some candidates compared coefficients or used inspection. Those candidates who had got this far then usually completed successfully to find the two real roots.

A significant number of candidates successfully used the factor theorem to identify the two real roots and having already stated the complex conjugate, produced an efficient solution to the problem. In some cases, candidates found one of the real roots using the factor theorem and then used long division to identify a cubic factor which they then worked on to find the other real root. In general this question was well answered and many candidates gained full marks.

Question 2

In part (a) the majority of candidates knew to find f(2) and f(3) although some struggled to deal with the third term. Conclusions were often sound but a significant number of candidates failed to conclude fully. As a minimum, candidates are expected to conclude, "sign change therefore root" but some failed to refer to the sign change and in some cases made no conclusion at all.

In part (b) the Newton-Raphson procedure was clearly a well-rehearsed topic and many could gain full marks although quite a few candidates were unable to differentiate the third term correctly. A significant number of candidates differentiated the first 3 terms successfully but then left in the + 2. Working for the Newton-Raphson was usually sufficient for examiners to see clearly what the candidates were doing but some showed minimal working. It should be noted that stating $3-\frac{f(3)}{f'(3)}$ followed by an incorrect answer meant that examiners were unable to tell if f(3) and/or f'(3) were actually being used. Some candidates used interval bisection and some candidates unnecessarily performed a second iteration of the Newton-Raphson procedure.

Question 3

The majority substituted for correctly for z* and expanded or expanded and then substituted. However, it is worth noting that a significant number of candidates did not know what was meant by z*. The requirement to then compare real imaginary parts was well known although some candidates did not know how to proceed and tried various rearrangements of the equation in x and y. Candidates who correctly compared real and imaginary parts usually went on to correctly identify the correct values of x and y. A significant number of candidates who had scored the first 4 marks then lost the final mark by not giving the negative value of y.

Question 4

Part (a) was a good source of marks for many candidates with very few not using calculus appropriately. In part (b) some candidates had difficulty in obtaining an equation in one variable. Of those who did, many could solve their equation and could often score the 5 marks available although a significant number obtained 18 rather than -18 for the y coordinate of Q. In part (c), most candidates could identify the focus and then made an attempt at the area of PQS. A very common approach was the 'determinant' method and this was used well. Some candidates assumed PSQ was a right angle and although this was true, some justification was needed to achieve full marks for the area.

Question 5

In part (a) most candidates could state the sum and product although the sign error on the sum was seen occasionally. A significant number of candidates found the roots explicitly and then attempted the sum and product. This approach here, and with the rest of the question, was met with varying degrees of success. In part (b), the correct identity was almost invariably used although some persisted with their explicit roots. In part (c), most candidates chose to find the sum and product of the new roots although there were some algebraic slips such as $4 \times 4\beta = 4\alpha\beta$. Some candidates clearly spent a significant amount of time expanding $\left(x-(4-)\right)\left(x-(4-)\right)$ before making any numerical substitution. Those who found the new sum and product numerically first, usually made better progress. The three main errors in establishing the required quadratic were, using +(sum of roots) rather than –(sum of roots), the omission of the "= 0" and not giving the coefficients as integers.

Question 6

In (i)(a) relatively few candidates could identify the transformation as a stretch and often described it as an enlargement. Despite this, those candidates could sometimes gain the second mark with the correct scale factor and direction given. For (i)(b), candidates often identified a rotation but sometimes failed to give the centre and/or gave a wrong angle or direction. In part (i)(c), the vast majority of candidates multiplied the matrices in the correct order and did so accurately.

In part (ii), candidates could almost always produce the determinant correctly and there were various methods used to establish that it was non-zero. Most chose to calculate the discriminant and could produce a convincing argument although there were some cases where candidates were not aware of the significance of its sign. Other methods involved completing the square and less frequently, using calculus to identify the minimum value of det(**M**).

Question 7

Many candidates could at least make a start at part (a) and used the appropriate sums correctly. The next part of the method required algebraic manipulation and comparing coefficients and candidates had various degrees of success. With correct equations, candidates could often go on and identify the correct values for a and b but there were a significant number of algebraic errors in producing the two equations in a and b. Part (b) was met with far more success and the majority of candidates could obtain the required value of 2978.

Question 8

In part (i) many candidates failed to initially show that the formula is true for both $n = 1$ and $n = 2$, thus losing the first B mark. The remainder of the work was often of good quality and the majority of the candidates knew how to approach the required algebra and could score four of the six available marks for this part. Conclusions were often incomplete and sometimes missing completely.

Many candidates found part (ii) more challenging. A significant minority failed to initially show that the result is true for $n = 2$, again thus losing the first B mark. Most attempted to find an expression for $f(k+1)$ or $f(k+1) - f(k)$, but many were unable to then obtain their expression in terms of $f(k)$ and thus lost the final 4 marks

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