Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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Paper 22 Further Pure Mathematics 2

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Introduction

It appears that some candidates were not fully prepared to sit this paper as there were many blank scripts where candidates did not attempt the question. There were some demanding questions and some accessible questions with blank scripts.

Report on Individual Questions

Question 1

(i)
Part (a) the majority of candidates were able to identify the identity element.
Part (b) many candidates did not many to find the inverse of $b \circ c$, mistaking thinking that $b \circ c = e$ instead of *a.* Candidates who did find $b \circ c = a$ correctly found the inverse.
Part (c) Candidates where able to explain why the set of 4 elements cannot be a subgroup of *G*, The majority said that it does not satisfy Lagrange's Theorem, with some showing that closure fails as e.g. $a \circ a = d$ is not in the set.
Part (d) To show that the set $\{b, d, f\}$ is a subgroup of G candidates needed to find the Cayley table and concluded that it is closed, *b* and *f* are inverses and *d* is the identity, so the subset is a subgroup. Many candidates only showed the result for a few products so not able to prove closure and gained only 1 mark.

(ii)
This part was found very demanding by the majority of candidates, with many making no attempt. A few candidates scored a method mark for using the relation $yx = xy^5$ once on $y^3xy^3x^2$ but made no further progress. There were only 2 candidates who managed to successfully that $y^3xy^3x^2$ is the identity.

Question 2

Candidates found this question demanding with many scoring no marks, again many did not attempt this question.

Part (a) candidates who did attempt this question managed to correctly write $5x+6y\left(\text{mod } 21\right)$

Part (b) candidates needed to use the fact that $x+y=43$ and the answer to (a) to form and solve simultaneous equations. Some candidates incorrectly thought that $5x+6y=43$. Soe candidates stopped there but those who used $5x+6y=21N$ went on to successfully find the values of x and y.

Question 3

There were a few blank attempts, but many candidates found this question accessible and scored full marks.

Part (a) Candidates who deduced that the eigenvalues are −3 and 8 then found the characteristic equation to successfully show that $k=-6$. A few candidates found the characteristic equation but did not but did not deduce the eigenvalues.

Part (b) It was pleasing that of the few candidates who attempted part (a) did go on to successfully use $k=-6$ and found the eigenvectors and matrix **P**. There was the occasional sign slip but those that attempted this part did so successfully.

Question 4

Candidates found this question demanding with unfortunately many scoring no marks.

Part (a) it was interesting to see many candidates draw circles which were the imaginary axis was not a tangent, as stated in the question, scoring no mark. Some candidates did manage to draw a circle with the imaginary axis as a tangent but drew with the centre in the second quadrant, scoring one mark. Only a few candidates scored both marks for the centre in the first quadrant. The correct position of the circle was needed to successfully answer part (c) so many candidates found this question demanding.

Part (b) only one candidate was able to explain why the value of a is 3.

Part (c) candidates needed to have a circle in the correct position so not many candidates were able to score any marks in this part. Finding the centre and radius of the circle was the starting point with a few candidates manging to score some marks. Finding the correct angle then proved more difficult.

Question 5

Candidates found part (b) solving the recurrence relation accessible but struggled to gain all the mars for explaining the recurrence relation. There were again some blank scripts.

Part (a) Candidates needed to explain two out of three; initially there is one square so $u_1 = 1$; each square replaced by 5 smaller squares, so $u_{n+1} = 5u_n$; one of the squares is then removed. To score the final mark candidates needed to explain all three and state $u_{n+1} = 5u_n - 1$ which some didn't.

Part (b) Most candidates solved the auxiliary equation and stated the correct complementary function. They knew the form for the particular solution and found it correctly. Some lost the final mark as they gave their answer as $u_{n+1} = \frac{3}{20} \times 5^n + \frac{1}{4}$ instead of $u_n = \frac{3}{20} \times 5^n + \frac{1}{4}$.

Part (c) Only a handful of candidates scored any marks as to score the method mark they needed to find u_8 and multiply by 25×3^{-k} or 25×9^{-k} where k is 7, 8 or 9, some forgot the 25 or 9^{-k}. Only four candidates score any marks.

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