Examiners' Report

Principal Examiner Feedback

Summer 2019

Pearson Edexcel GCE AS Mathematics In Further Pure Mathematics (8FM0_22)

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. 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. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. 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

Summer 2019
Publications Code 8FM0_22_1906_ER

Introduction

The entry for this paper was very small. The paper was generally accessible for all candidates and there were plenty of opportunities for a typical E grade candidate to gain some marks across all questions.

In summary, the first part of each question was a good source of marks for the average candidate, mainly testing standard ideas and techniques, whereas questions 1(b), 3(c), and 5(c) were discriminating at the higher grades. Question 2(ii) proved to be the most challenging question on the paper, no candidates scored full marks.

This is the second year of this specification and it was clear that candidates still need to work on how they answer questions which require explanations and justifications. When giving a conclusion they need to make sure that they refer back to the context of the question. They need to justify why they are drawing the appropriate conclusion e.g. comparing values.

Question 1

This question was generally done well by candidates who were well prepared for this exam

Part (a) was done well by the majority of candidates, with a few candidates losing a mark due to not forming an equation, missing = 0.

Part (b) the question stated 'Hence' requiring candidates to use their answer to part (a) and the Cayley-Hamilton Theorem. A few candidates found $\mathbf{A}^{-1}$ and then tried to express in terms of **A** and **I**, gaining no marks. Some candidates did not fully apply the Cayley Hamilton Theorem writing $\mathbf{A}^2 - 5\mathbf{A} + 2 = 0$ instead of $\mathbf{A}^2 - 5\mathbf{A} + 2\mathbf{I} = 0$. Candidates who use the theorem correctly went on to achieve the correct result.

Question 2

Most candidates were able to attempt parts (a) and (b) however no candidates scored full marks for part (c)

Part (a) The majority of candidates were able to find at least one correct value for *a* and with a few gave all three correct values.

Part (b) The majority of candidates scored no marks in this part; many did not know how to start the question of square rooted both sides. A handful of candidates scored the first mark for realising that $x^2 - 1$ is divisible by *p*. The crux of the proof is that ***p* is prime** so that either $x - 1$ is divisible by *p* or $x + 1$ is divisible by *p*. This is the rigours element of the proof which was missed.

Part (c) the majority of candidates where able to apply a divisibility test for 11. For the final mark candidates where expected to refer back to the context of the question when giving their conclusion, £13 940 220 is not divisible by 11 therefore, it is **not is it possible** to share this **money equally** between the 11 **charities**

Question 3

Part (a) the majority of candidates knew that was required however a few candidates made errors in the algebra. The demand of the questions was that candidates needed to showed that *C* is a circle, this required the candidate to draw the conclusion that the equation that they produce is that of a circle for the final mark.

Part (b) demanded that the candidates used the answer to part (a), finding the distance of *z* to the centre of the circle and comparing it with the radius. Candidates who substituted z into the inequality gained no marks. The question tested whether candidates can make connections between the parts of the question. A few candidates who made the connection incorrectly thought that the inequality was not satisfied.

Part (c) Candidates are advised to indicate key coordinates on any diagrams, such as the centre of the circle and the starting coordinate of the half-line. The majority of candidates drew a circle, some put the centre of their circle in the first quadrant instead of the fourth. Again, many candidates knew to draw a half-life but lost marks as they did not indicate the coordinate where it started. Those candidates who in part (b) who thought the inequality was not satisfied shade the incorrect area outside the circle instead on inside.

Question 4

The majority of candidates where able to have a good attempt at this question on groups.

Part (a) Most of the candidates were able to prove at least of the two statements. A few did not start from the left-hand side so did not achieve the printed statement e.g.
$p*p*p*p=s*s=r$ instead of $p*q=p*p*p*p=s*s=r$

Part (b) All the candidates were able to fill in some elements in the Cayley table, with most completing the first row and column using the identity element and the given results. Many then stopped at this point and did not complete the table.

Part (c) This required candidates to make reference to Lagrange's theorem, the order of a subgroup must be a factor of the order of the group. They needed to say that as 3 is not a factor of 5 the candidate's statement is incorrect. Again, candidates need to refer to the demand of the question, comment on the validity of the statement. Some candidates did not refer to the statement in their conclusion.

Question 5

Part (a) when answering this part candidates needed to refer to the context of the question, e.g. not just saying 500 is added, but £500 is added each year.

Part (b) Only a few candidates were able to give a correct assumption for the model. Just saying that the interest does not change is insufficient, it is the interest **rate** that needs to remain the same. Candidates who said no money was removed from the account scored the mark.

Part (c) A minority of candidates did not know how to solve the recurrence relation and scored no further marks for this question. Those candidates who did know how to solve the recurrence relation did so very successfully by in splitting into CF + PS.

Part (d) needed candidates to use the answer to part (c) find the 7^{th} term, which many did successfully who had an answer to part(c). With the conclusion candidates needed to compare

the 7^{th} term with £4 500 and comment on whether Jim will have enough money. Some candidates did not show the comparison and hence did not justify their conclusion.

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom