Examiners' Report
Principal Examiner Feedback

October 2020

Pearson Edexcel Advanced Subsidiary
In Further Mathematics (8FM0/01)
Paper 1: Core Pure Mathematics

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Question 1
Very few students achieved full marks on this question. Many did not make any valid attempt for the full question.
Part (a) the majority of candidates score full marks
Part (b) the majority of candidates eliminated on variable to find two equation however many made arithmetic errors leading to inconsistent planes. These candidates did correctly go on to identify that would mean the planes form a prism but unfortunately this was not a B1ft.
Part (c) Most students did mention "planes" in their geometric description which is an improvement on last year.

Question 2
Part (a) on the whole was answered very well. Occasionally some students did not leave to 4sf as requested and a few surprising blank responses.
Part (b) was not as successful but still had good success overall. It often saw students using a mixture of the main scheme and the alternative. Few went for the most efficient direct root to the answer. Those that did were nearly always successful whilst those that used the alternative method often ended up with sign errors.
Of those students who didn't come up with a full method in (b) they nearly always managed to find the correct modulus.
$z_1 + z_2 = 1$ was an error that appeared a few times.

Question 3
Many candidates ended up at the given answer but from incorrect working. The most error was with the integration $\int r^2 + x^2 \ \mathrm{d}x = \frac{1}{3}r^3 + \frac{1}{3}x^3$. Another error seen was multiplying their answer by 4 to get to what they knew they needed.
Other incorrect responses involved trying to integrate πr^2.
A surprising number of responses were blank for question that should be very familiar.

Question 4
It was pleasing to see that the large majority of candidates attempted at least parts of this question.
Part (a) was answered correctly by most candidates. Only a very small handful omitted $\mathbf{r} =$ a couple didn't find direction vectors at all and others made an arithmetic error in one of the direction vectors.
Part (b) (i) and (ii) were not so successful. The large majority attempted the main scheme though just under half failed to show the vector was perpendicular to both direction vectors. A small number of candidates attempted alternate 1 or 2 method, all being successful in gaining the method mark but not having a conclusion lost them the accuracy mark.
Part (c) was answered very well though some failed to gain the A mark through loss of $\mathbf{r} =$
Part (d) was answered very well with the majority of candidates commenting on how washing would make the line not straight or that the lawn would not be flat.
Part (e) was very poorly answered, especially considering the formula is in the formula book! Many did not even attempt this part and of those that did most attempted it incorrectly, some not using the normal vector, others using an incorrect formula and the majority trying to solve as though it were the shortest distance between a point and a line.
Part (f) was again surprisingly not answered correctly by all that could, though this again should be a familiar question. Over half did achieve this mark whilst those that didn't often did not conclude with others not attempting.

Question 5
Very well answered on the whole.

Candidates spotted that n can be factorised out but many did not spot that $(n+1)$ can be factorised out of $\frac{1}{4}n^2(n+1)^2+3\times\frac{1}{6}n(n+1)(2n+1)+2\times\frac{n}{2}(n+1)$
These candidates lost marks as they went from $\frac{1}{4}n\left(n^3+6n^2+11n+6\right)$ to $\frac{1}{4}n(n+1)(n+2)(n+3)$ without method. This is a show questions and so and some factorising was required.
Candidates need to look at the given answer for clues to which terms to factorise out.
Part (b) was also answered well though some got to the quartic and struggled to/didn't attempt to solve, whilst others made arithmetic errors, often not all terms were multiplied by the 4.
Candidates are expected to use their calculator to solve quartic equations.

Question 6
(i) Part (a) - candidates that used the fact that for a matrix to be a self-inverse then $\mathbf{AA} = \mathbf{I}$ and were very successful. However, the majority attempted $\mathbf{A}^{-1}=\mathbf{A}$ this did have some success but very often not. Often the two equations pulled out were not from the different diagonals meaning no marks awarded. Other incorrect methods seen were setting the determinant = 0 and using $\mathbf{AA}^{-1}=\mathbf{I}$ which does not lead to any equations.
(i) Part (b) This was largely not attempted though those that were successful with part (a) were often successful. A common error was to use *x* and m*x* + c but then not fully complete the method.

Section (ii) on the whole was much better answered
Part (a) - only a small number failed to find the area of the object, those that did were often successful with this part with all candidates correctly discarding $p=-\frac{5}{3}$. The error that occurred was a sign error in solving.
Part (b) - very high success rate
Part (c) - Due to the follow through marks available full marks where achieved on this part by nearly all who answered it. Very rarely the order of the matrices was incorrect.

Question 7
A small number of blank responses but most managed to attempt this question. About half correctly identified the 3rd and 4th root whilst the other half incorrectly used $-2\pm 3\mathrm{i}$, this meant 110100 was a common mark trait along with full marks
Finding quadratic equations for each pair of roots and the then multiplying to find the quartic equation was the most successful approach. Candidates who attempted to use the roots of a polynomial often made sign slips.

Question 8
The large majority of candidates achieved the first 3 marks but then struggled to get $\mathrm{f}(k+1)$ in the required form to show that it is divisible by 7. Those that did mostly used the main scheme or alternate 1 and generally went on to conclude with good success, only a few did not get the if/then conveyed in their conclusion.

Question 9
On the whole this question was very successful for those that attempted it.

Part (a) was answered very well with the main error coming from their product being ⅓ only a couple used c and $-d$ in place of $\frac{c}{a}$ and $-\frac{d}{a}$

Part (b) the alternate method was the most popular and the most effective. Those that didn't achieve full marks were either due to not manipulating their equation into a cubic or omitting = 0 The main scheme did have some success but most made errors in their new pair some or used $\frac{b}{a}$ and $\frac{d}{a}$ in place of $-\frac{b}{a}$ and $-\frac{d}{a}$

<u>Question 10</u>

There were only a couple of fully correct responses to this question.

Many candidates achieved the first 3 marks for find the equation of each loci and attempt to solve simultaneously. Many then failed to use the discriminant or rearranging for x^2 and setting > 0 many just tried to solve the quadratic in terms of r. Only a small minority realised to find the upper limit of r, though those that did all where success. Candidates that did pick up the second method mark, regardless of which method used, nearly always went on to achieve the accuracy for one correct limit, those that didn't used $-\frac{3}{2}\sqrt{2} < r < \frac{3}{2}\sqrt{2}$

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