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Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel GCE
In Further Mathematics (8FM0)
Paper 21 Further Pure Mathematics 1

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Question 1

Part (a) The majority of candidates achieved 4.5°C, although some did not include the units.

There were some who answered 12°, just looking at the function

$S = 12 - \frac{15}{2}\cos x^{\circ} - \frac{27}{10}\sin x^{\circ}$ and not substituting in $x = 0$

Part (b) Nearly all candidates could start this section correctly; there were just a few sign errors in the formulae. Most, knew how to reach a common denominator, although more sign errors appeared during the manipulation. However the correct expression was frequently achieved.

Part (c) Most candidates started correctly by multiplying up, obtaining a 3 term quadratic, but there were some careless errors – notably $100 + 10t = ...$ The majority then solved their 3 term quadratic, most of them remembered that they needed to proceed from $t = ...$ to $x = ...$ Several candidates rejected the negative value of *t,* saying the number of days must be positive. Some also answered in radians, candidates need to look at the expression to identify the degrees symbol.

There were some very good responses, picking out the second value confidently, and others who were rather more laborious in the process. There were frequent errors in the order of operations, ranging from implying $\tan x = 2\tan\left(\frac{x}{2}\right)$, to doubling the value of $\frac{x}{2}$ <u>before</u> adding 180 etc to obtain further values.

Question 2

Many candidates obtained the correct value for *h,* but values of 25, 0.5, $\frac{1}{6}$ also appeared quite frequently. Most understood the method, although some confused values of *t* for values of *H* in the formulae. There were frequent sign slips in the working, often giving <u>increasing</u> values for the depth; if candidates had realised after the first iteration that this must be wrong they might have corrected it early in the process.

Most candidates remembered to give the units for their final answer. Many had some combination of a table and other working, which was not always easy to decipher.

Question 3

Part (a) It was common to see incorrect vectors calculated for $\overrightarrow{AB}$ and $\overrightarrow{AD}$, using $\overrightarrow{AB}$ and $\overrightarrow{AE}$ so several vector products were formed from the wrong vectors. Position vectors were only occasionally used. There were a lot of sign slips in forming the vector product.

Part (b) Many knew how to form the triple scalar product, but several gave result as a vector, then tried to find the modulus to obtain a volume. Those who had used incorrect vectors in (a) could sometimes achieve the correct volume here if they used the determinant approach.

Factors of $\frac{1}{6}$ or ½ sometimes appeared in their expression for the product, resulting in an incorrect quadratic being solved.

There were not many candidates who used both +9 and – 9 for the volume, so most achieved only 2 of the four possible answers.

Question 4

The majority of candidates attempted to solve by multiplying up, although many algebraic errors arose, particularly in ensuring that they multiplied by squared terms throughout. Those who succeeded in forming a correct inequality this way sometimes proceeded to multiply out all their brackets, forming a polynomial in x^4 or x^6. Some candidates multiplied out the brackets and then used their calculator to solve and only gained two mark. Those who followed the instruction that calculator technology was not acceptable, and kept their terms as fully factorised as possible, were able to factorise the resulting expression correctly. Candidates who moved onto one side and then used a common denominator where able to factorise their numerator correctly.

Some candidates ignored the $x = 0$ as one of their critical values.

In the final answer, some candidates realised that $x = 0$ and $x = 2$ were not included in the range, but many made errors in the > or ≥ signs. A few candidates did not use set notation correctly, most often by using the intersection rather than union sign.

Question 5

Nearly all candidates could show the equation of the tangent in part (a) successfully

Part (b) many had the correct approach but there were frequent sign or other algebraic errors; for example $y = -tx$ then $yt - \frac{y}{-t} = 4t^2 \Rightarrow yt^2 + y = 4t^2$ others could not make *x* the subject.

Most candidates had difficulty with part (c). Several made no attempt; it was difficult to know whether they had run out of time or just didn't know how to tackle it.

Of those who attempted this part, the most common misconception was the implicit assumption that Q was on the parabola, as they tried to fit the parametric coords of Q to the form of the original parabola.

Some found an efficient way to eliminate t and form the required equation, but many tried to solve it by substituting the coordinates of Q into the given form of the equation. This could lead to a reasonably simple solution if they simplified their equation as much as possible, but many multiplied out every bracket in sight and formed an expression which was too complicated to deal with. Another common error seen in this method was when they formed a fractional expression in t, A and B, then equated the numerators and the denominators separately.

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