Questions matter

AS

Further Mathematics

7366/1 Paper 1

Report on the Examination

7366
June 2024

Version: 1.0

General

Many students demonstrated a good knowledge of most topics. They produced well-structured solutions and provided good reasoning, as necessary. Some areas for improvement for a minority of students include the following:

- When sketching a graph, draw a continuous curve rather than multiple short arcs, sometimes referred to as 'feathering.'
- Draw straight lines with a ruler to avoid ambiguity.
- Draw the vinculum in fractions long enough so that the numerator and denominator are unambiguous, including any negative signs.
- Make correct use of equals (=) and implies ($\Rightarrow$).
- Write an unambiguous conclusion to all proof or 'show that' questions.

Question 1

The majority of students correctly identified the required expression. A significant minority selected $1-\sinh^2 x$.

Question 2

The majority of students identified the correct expression, with a small number opting for $2\pi\int_0^5 (2x+3)^2 \, dx$ instead.

Question 3

Two thirds of students correctly identified the determinant of $\mathbf{A}^{-1}$. Others opted for $-\frac{1}{2}$ or 2.

Question 4

The vast majority of students correctly identified the required equation.

Question 5

Parts (a) and (b) were well answered. A common incorrect answer to part (a) was the vector $\begin{bmatrix} 6 \\ -4 \\ 10 \end{bmatrix}$ from multiplying the **i**, **j** and **k** components.

The majority of students correctly calculated the angle between the vectors in part (c). Many of the attempts to use the vector product instead of the scalar product were unsuccessful.

Question 6

Part (a) was well answered.

In part (b) the majority of students could find the positive solution of the equation, but less than half found both solutions.

Question 7

Most students were able to find the exact mean value of f. Common errors included multiplying by $\frac{1}{2}$ when integrating, instead of dividing by it. A significant minority did not divide by (7– 4).

Question 8

Part (a)(i) was very well answered, but only two thirds could fully justify that zz^* is real in part (a)(ii). Common incorrect expansions included $x^2 - y^2$ and $x^2 + y$.

In part (b)(i), the majority of students correctly found the value of the complex number w.

Part (b)(ii) was well answered, although many employed a longer method rather than using their expansion from part (a).

Question 9

In part (a), most students demonstrated a good knowledge of algebraic fractions, but many were unable to construct a mathematical argument. It was not uncommon for students to just provide clues instead. Arrows were often used ambiguously and equals signs and implies signs were frequently used incorrectly. Some unnecessarily expanded $(r + 1)(r + 2)$ and then refactorised at the end.

In part (b), most students clearly demonstrated the required result using the method of differences.

Most students made reasonable progress in part (c), but a common error was to substitute 1001 instead of 1000.

Question 10

Parts (a) and (b)(i) were well answered.

In part (b)(ii) the majority of students used the graphs to solve the inequality, rather than algebra, and most identified at least one correct range of values. Less than half deduced the full solution. It was not uncommon for solutions to include $\frac{5}{3}$. A common error was to include $x \leq 2$.

Question 11

This question was reasonably well answered. The vast majority could multiply the matrices to obtain at least two correct elements, but a significant minority were unable to calculate all four elements and leave them in a simplified form.

Question 12

The vast majority of students understood what was required of them in this question. However, only half were able to correctly demonstrate that if $5^k - 2^k$ is divisible by 3, then so is $5^{k+1} - 2^{k+1}$. The use of functions often led to errors, particularly when subtracting $f(k+1) - f(k)$. Some students introduced extra variables in their proof without defining them, and only a minority of students could correctly explain how their working had demonstrated that $5^n - 2^n$ is divisible by 3 for all $n \in \mathbb{N}$.

Question 13

In part (a), most students identified the transformation as a translation, but only half could describe it correctly. A common error was to give the translation vector as $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

In part (b), only half were able to find the correct function in x with methods evenly split between those who substituted $(x+1)$ into the given equation and those who considered the sums and products of roots. Those who opted for the latter method tended to be less successful.

Question 14

The majority of students understood that the image in part (a) could be found by multiplying the matrix by the position vector of the given point. Common errors included an incorrect coordinate, or an answer left as a position vector rather than in coordinate form.

Part (b) was reasonably well answered with the majority of students forming two correct equations in x and y. Only a third of students could use their equations to show and conclude the required result.

A variety of methods was employed in part (c), but it was not well answered with less than half making good progress. Some students successfully found the images of two points on the line L_1 and then simply determined the equation of the line L_2 which passes through the two image points.

Question 15

Part (a) was well answered. Most errors were due to incorrect use of brackets.

Parts (b) and (c) were not well answered. Many students did not realise that the substitution is only valid if $3x \leq 1$.

In part (c), more than half did not make any useful progress. Most substituted $-\frac{1}{6}$ into the left-hand side of the expansion but not into the right-hand side.

Question 16

Most students could make some progress in part (a), but only half were able to obtain the required result.

Part (b) was reasonably well answered, with the vast majority sketching an ellipse centred on the origin.

Question 17

Part (a) was well answered. A common error in part (a)(i) was to give the value of a as 5**i**.

Three quarters of students correctly used Pythagoras to find the length of *OP* in part (b)(i).

The remainder of part (b) was less well answered, with a significant number of non-attempts. More than half of students obtained an expression for a correct angle in part (b)(ii), but less than half obtained the correct value of k.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.