



A-level

Further Mathematics

7367/1 Paper 1

Report on the Examination

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Overall

The questions in this paper covered a wide range of topics at a wide range of levels. As such, the vast majority of students were able to attempt all questions whilst only a few were able to complete all of them.

Question 1

Almost 90% of students gave the correct answer, with the most common error being $\frac{1}{5}$.

Question 2

Almost 90% of students gave the correct answer.

Question 3

Over 90% of students gave the correct answer.

Question 4

A third of students did not recall this standard limit and gave an incorrect answer, usually the 4th option.

Question 5

Part (a) was very well done indeed. Most of the errors occurred in part (b) where some students left their answer in the form $\mathbf{r} \cdot \begin{bmatrix} -2 \\ 1 \\ 2 \end{bmatrix} = 1$ or $\mathbf{r} = \begin{bmatrix} 5 \\ 3 \\ 4 \end{bmatrix} + \lambda \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix} + \mu \begin{bmatrix} 7 \\ 2 \\ 6 \end{bmatrix}$, perhaps because they did not know what ‘Cartesian’ meant. A very few students wrote the Cartesian equation of a line, eg $\frac{x-3}{-2} = \frac{y+4}{1} = \frac{z-5}{2}$.

Question 6

Whilst almost all students scored at least 1 mark, only 20% scored all 4. Common mistakes were showing that $u_2 = 4$ rather than $u_1 = 1$ and starting the inductive process with $u_{k+1} = u_k + 3(k+1)$ rather than $u_{k+1} = u_k + 3k$. Many students lost the final mark because their conclusion contained no statement of the result being proved, ie “for all integers $n \geq 1$, $u_n = \frac{3}{2}n^2 - \frac{3}{2}n + 1$ ”.

Question 7

Three-quarters of students obtained full marks with marks being lost typically for minor errors.

Question 8

Three-quarters of students obtained full marks and over 90% obtained at least 3 marks.

Question 9

Many more students followed the instructions in part (a) than did in the equivalent question last year. However, a sizeable number still started at the answer, $\sinh p = r$ despite the clear instruction about the required starting point.

Part (b) was completed extremely well by nearly all the students. However, those who chose to start with the exponential forms of $\sinh x$ and $\cosh x$ got no further than halfway as this resulted in decimal forms that could not be put into the required logarithmic form.

Question 10

Many students found it difficult to present a clear argument to show the required result, beginning from the definitions of z and w given in the question. This was made more difficult for some by the simplicity with which zw could be found on a calculator. Students needed to link $\frac{5\pi}{12}$ to the arguments of z and w .

They also had to multiply the given expressions to obtain zw in surd form, which could be done on a calculator.

Question 11

Part (a) was done very well.

“Hence” in part (b) means use the previous result, but many students used integration by parts and gained no credit. The first mark was accessible to all. Only the stronger responses showed knowledge of how to approach the integration of $\frac{x^2}{1+x^2}$ and these usually went on to score full marks. A few dropped the last mark as they forgot the “+c”.

Question 12

Some students squeezed their 3×3 matrices and 3D vectors, with multiple terms in each element, onto one line which sometimes made them illegible.

Part (a) was extremely well done. Virtually every student stated the value of 0.70079... before rounding to the given answer of 0.701. Some students found the image of the general point on L_1 before deducing the direction vector of L_2 rather than using the more efficient method shown in the mark scheme.

The understanding of the topic in part (b) has improved greatly since the introduction of the specification. The majority of students made good attempts at this part. The main method and the alternative described in the mark scheme were equal in popularity and success.

Question 13

Part (a) was generally well done, though a number of students lost the third mark as they forgot the “ $\cos 3\theta =$ ” at the end or did not start from a statement of de Moivre’s theorem, $\cos 3\theta + i\sin 3\theta = (\cos \theta + i\sin \theta)^3$.

Part (b) was quickly dispatched using work from part (a).

The tricky trigonometric manipulation involved in part (c) was a discriminator for students aiming at the higher grades.

Question 14

A few students got stuck on integrating $\int \sinh^3 x \cosh x \, dx$ but most were successful in using one of several methods to integrate it.

Question 15

Some students were able to shine in this question, getting full marks in it. Some got to $\int t^2 \sqrt{1+t^3} \, dt$ before not knowing how to proceed, and others stopped at $\int \sqrt{t^4 + t^7} \, dt$.

Question 16

Forgetting to include “Area =” lost many students the second mark in part (a).

Only a few students managed to score full marks in part (b). A common slip was writing $(2 + \tan \theta)^2 = 4 + 2\tan \theta + \tan^2 \theta$. Many students struggled with integrating $\tan^2 \theta$.

Question 17

This was the toughest question on the paper with only a fifth of students gaining full marks. Many students were unsure how to attempt the question. Others struggled integrating $\int \sinh^2 \theta \, d\theta$ whilst others didn't show convincing working that led from the upper limit to $\sqrt{15}$ in the final answer.

Question 18

Responses to questions like part (a) have improved significantly since the introduction of the specification. The main error was to forget the weight.

Those who forgot the weight fared poorly in part (b)(i).

Even if they left the first two parts blank, everyone was able to attempt part (b)(ii) which was done very well indeed.

Part (c) was the least successfully answered question in the paper. Students failed to consider the model in part (b) and made general comments about the system.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.