2004 Assessment Report

2004   Further Mathematics: GA 2: Written examination 1

GENERAL COMMENTS

Overall, the majority of Further Mathematics students appeared to be well prepared for examination 1 in 2004, with the average mark for the Core section and each of the modules exceeding 50% for the first time. The number of students who sat the Further Mathematics examination 1 in 2004 was 21 216, an increase of 609 over the 20 607 who sat in 2003.

SPECIFIC INFORMATION

The tables below indicate the number of students who chose each option (please note that percentages have been rounded). The correct answer is indicated by shading.

Core

Question	A %	B %	C %	D %	E %	No Answer %
1	2	94	2	0	3	0
2	3	80	5	5	7	0
3	9	4	58	21	8	1
4	4	30	1	62	3	0
5	11	14	54	8	12	1
6	0	0	97	1	0	0
7	13	10	7	4	67	0
8	72	12	8	6	3	0
9	8	39	38	11	4	0
10	13	41	18	14	13	1
11	9	32	14	4	41	0
12	31	54	9	3	2	0
13	4	22	13	58	3	0

While the Core section was generally well done, students performed particularly poorly on Questions 9 and 12.

Question 9 required students to find the value of the coefficient of determination given the correlation coefficient of $r = -0.9260$. Only 38% of students obtained the correct response, which was 0.8575 (option C). The majority of students (77%) realised that the coefficient of determination is given by r^2; however, 39% arrived at the **incorrect** solution (–0.8575, option B) because of an apparent inability to correctly square a negative number using a calculator. This error may have been averted if students realised that the square of a negative number is positive.

The use of graphics calculators is assumed in Further Mathematics examinations. Examiners expect that students will know how to use the technology at a level sufficient to enable them to perform all the basic arithmetic operations required in the course.

Question 12, which had a 31% success rate, required students to interpret a time series plot displaying the changing price of shares in two companies over a period of time. The price for each share showed an increasing trend over the time period considered. However, the prices of the shares increased at different rates, so that the **difference** in price between the two shares showed a decreasing trend. Students needed to recognise this from the graph to obtain the correct response. The majority of students (54%) gave the **incorrect** response 'increasing trend'.

Number patterns and applications

Question	A %	B %	C %	D %	E %	No Answer %
1	10	6	78	2	4	0
2	72	7	14	4	2	0
3	13	55	15	8	9	1
4	4	14	19	55	7	0
5	1	1	3	94	1	0
6	12	19	10	7	51	1

7	29	15	15	39	2	1
8	7	12	13	33	35	1
9	31	21	19	19	9	1

This module was well done with the exception of Questions 7 and 8, on difference equations, and Question 9, which involved the use of proportional reasoning.

In Question 7, students were given the rule defining a difference equation and the value of the second term of the sequence generated by this equation, and were asked to generate the fourth term. Only 39% of students were able to perform this relatively routine task. While this could have been done with the aid of technology, it was best treated as a pencil and paper exercise as follows:

$$w_{n+1} = 4w_n + 2 \qquad\qquad w_2 = 10$$
$$\therefore \quad w_3 = 4 \times 10 + 2 = 42$$
$$\therefore \quad w_4 = 4 \times 42 + 2 = 170$$

Question 8 was also poorly done, with a 35% success rate. The key to answering this question was to recognise that the difference equation generated an arithmetic sequence. The rule for the nth term of an arithmetic sequence can be used to generate an expression for the nth term of the sequence. The pattern of incorrect responses suggests that the majority of students lacked the skills necessary to answer this question.

Question 9 was a routine ratio and proportion problem; however, the 21% success rate suggests that most students had difficulty with this type of question. Again, the pattern of incorrect responses suggests that the majority of students lacked the skills necessary to answer this question.

Geometry and trigonometry

	A	B	C	D	E	No Answer
Question	%	%	%	%	%	%
1	2	3	9	11	75	0
2	26	51	6	7	9	0
3	1	4	83	8	4	0
4	2	5	3	25	64	0
5	5	57	6	31	1	0
6	3	15	70	8	5	0
7	46	14	15	15	10	1
8	7	9	26	52	5	0
9	58	17	13	7	5	1

This module was also well done, with the exception of Question 5, which involved the scaling up of an area. While 31% of students correctly used a scaling factor of 36 to give the answer 25 920 cm^2 (option D), 57% incorrectly used a linear scaling factor of 6 to arrive at an answer of 4320 cm^2 (option B). In an almost identical question in 2003, students also failed to recognise that the required scaling factor depended on the dimension of the quantity being scaled. This point should be reinforced to students studying this module.

Graphs and relations

	A	B	C	D	E	No Answer
Question	%	%	%	%	%	%
1	17	2	5	68	8	0
2	3	63	14	11	9	0
3	14	12	11	12	50	1
4	24	15	59	1	2	0
5	8	4	11	61	16	0
6	22	8	9	15	45	1
7	9	14	58	8	10	1
8	21	35	12	16	16	0
9	34	33	10	10	12	1

This module was well done, with the exception of Questions 8 and 9.

While only 35% of students gave the correct response (option B) for Question 8, it would appear that a lack of care in checking **all** of the inequalities that defined the shaded region was the significant contributor to students responding incorrectly.

Question 9, with a success rate of 34%, was also a challenging question. The key to answering this question was to recognise that, in the linear plot, the co-ordinates (8, 1) represented the values of x^3 and y respectively not x and y. This is known to be conceptually difficult for many students, so the low percentage of incorrect responses was not unexpected.

Business and related mathematics

Question	A %	B %	C %	D %	E %	No Answer %
1	4	90	1	1	3	0
2	10	5	4	9	72	0
3	3	22	6	2	66	0
4	3	9	3	83	2	0
5	32	11	34	15	8	1
6	15	49	15	12	9	1
7	29	7	13	46	4	1
8	49	23	8	16	3	0
9	15	8	8	43	25	1

Again, this module was generally well done. Students had the most difficulty with Questions 5 and 7.

Question 5 required the calculation of a flat rate of interest. While 34% of students gave the correct response (option C), another 32% gave option A. This suggests that these students understood what was required to calculate a flat rate of interest, but that they had failed to take into account the $500 paid as a deposit at all stages in the calculation.

Question 7 asked students to determine the amount of interest earned **during** the third year of an investment. Only 29% of students gave the correct response (option A). The key word in this question was 'during', which was clearly not recognised by the 46% of students who determined the total amount of interest earned **after** three years.

Networks and decision mathematics

Question	A %	B %	C %	D %	E %	No Answer %
1	8	83	2	1	5	0
2	40	4	7	4	44	1
3	3	5	75	9	7	0
4	26	24	6	23	21	1
5	17	64	9	8	2	0
6	58	14	4	6	17	0
7	19	3	5	29	43	0
8	6	19	9	63	2	0
9	26	19	15	34	5	0

This module was also well done, with students having the most difficulty with Questions 4 and 9.

In Question 4, the distribution of student responses suggested that many students could do no more than guess the answer. Only 26% gave the correct response. It would appear that while students are skilled at analysing a given network, they are not so practiced in generating the networks from the situations they represent, which is an equally important skill.

Question 9, with a success rate of 34%, also proved to be difficult for students. One reason for the difficulty may have been the need for students to construct an appropriate network diagram to help them organise and make sense of the information presented.