LEAVING CERTIFICATE EXAMINATION 1978

SAMPLE PAPER (Second Draft)

Mathematics - Ordinary Level - Paper II (300 marks)

N.B Draft paper for discussion and comments.

Attempt Question 1 and Four other questions

1. (i) Find the modulus of $3 + 4i$ and write down four other complex numbers that have the same modulus.

(ii) If $f = \{(2, -3), (1, 0), (0,3)\}$ and $g = \{(1,0), (0,2), (-3,2)\}$, write down the set of couples of $f \circ g$.

(iii) If f is the function $x \to 2 - 3x$, find the value of k for which $f(0) = k f^{-1}(0)$.

(iv) A composite index number is constructed by taking the weighted average of five other index numbers with assigned weights as follows:-

Index Numbers	112	120	100	128	110
Assigned Weights	1	2	2	1	2

Calculate the composite index number.

(v) Find the next term of the geometric sequence 27, -18, 12, ...

(vi) Find the solution set of the inequality $x^2 - x \leq 12$, $x \in \mathbb{R}$.

(vii) Find the coefficient of x^3 in the expansion of $(2 - x)^8$.

(viii) Find the slope of the tangent to the curve $y = 2x^2 - x - 2$ at the point on the curve where $x = 1$.

(ix) Write down the quadratic equation whose roots are 0 and 4.

(x) Write the number 0.0415 in scientific notation.

(100 marks)

2. Find the roots of the equation $x^2 - 6x + 13 = 0$, and illustrate them on the Argand diagram. Also find the sum and the product of the roots.

(40 marks)

3. (a) Factorise $x^3 - 7x + 6$.

(b) Solve the simultaneous equations:-

$$2x - 3y + z = -2$$
$$5x - y + 2z = 3$$
$$3x + 2y - z = 11.$$

(40 marks)

4. Draw the graph of the function

$f: A \to R : x \to x^3 - 12x + 6$,

where $A = \{ x \mid -4 \leq x \leq 4 \}$.

Find from your graph

(i) the values of x for which $f(x) = 0$,

(ii) the domain of x for which $f(x)$ is decreasing.

Use your graph to solve the inequality $x^3 - 12x \geq 0$.

(50 marks)

5. In a study of a particular wild plant on a farm, 100 regions of equal size were selected and the number of wild plants found in each region was counted. The data is illustrated in the following table:-

No. of Plants	0	1	2	3	4	5
No. of Regions	10	25	30	25	10	0

Calculate the mean number of plants per region and calculate, also, correct to two decimal places, the standard deviation from the mean.

(50 marks)

6. (a) Find the least number of years it will take £500 to amount to £760 at 15% per annum, compound interest.

(b) The nth term of a sequence is $(n - 1)(n - 2)(n - 3)$. Prove that the sequence is not arithmetic. The sum of the first n terms of a sequence is $n^2 + 5n + 7$. Find the nth term and hence prove that the sequence is arithmetic. Find, also, the first term and the common difference.

7. A factory makes two types of selection boxes, Christmas and Yule. In a month it produces x boxes of Christmas and y of Yule. At least 300 of the Christmas boxes and at least 200 of the Yule are needed in the month and in that time not more than 1000 are needed in all. Write down three inequalities satisfying these conditions.

If the profit on a Christmas box is 50p and that on a Yule box is £1, how many boxes of each kind should be made in the month to obtain the maximum profit.

(50 marks)

8. (a) Differentiate $2 + 3x + x^2$ with respect to x from first principles.

If $y = (2 + 3x + x^2)^4$, find $\frac{dy}{dx}$ and find the value of $\frac{dy}{dx}$ when $x = -2$.

(b) Differentiate the function $f: x \to \frac{5 + x^2}{2 - x}$, $x \neq 2$.

Verify that $(-1, 2)$ and $(5, -10)$ are respectively a local minimum point and a local maximum point of f.

(50 marks)