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Stone Arranging 2

JOI-kun has N go stones. The stones are numbered from 1 to N . The color of each stone is an integer between 1 and 10^9 , inclusive. In the beginning, the color of Stone i ($1 \leq i \leq N$) is A_i .

From now, JOI-kun will perform N operations. He will put the stones on the table in a line. The operation i ($1 \leq i \leq N$) will be performed as follows:

1. JOI-kun will put Stone i on the immediate right of Stone $i - 1$. However, when $i = 1$, JOI-kun will put Stone 1 on the table.
2. If there is a stone among Stones $1, 2, \dots, i - 1$ whose current color is the same as Stone i , let j be the maximum index of such stones, and JOI-kun will paint all of Stones $j + 1, j + 2, \dots, i - 1$ with the color A_i .

In order to confirm whether the operations are correctly performed, JOI-kun wants to know in advance the colors of the stones after all the operations are performed.

Given information of the go stones, write a program which determines the colors of the stones after the N operations are performed.

Input

Read the following data from the standard input.

N
 A_1
 A_2
 \vdots
 A_N

Output

Write N lines to the standard output. The i -th line ($1 \leq i \leq N$) should contain the color of Stone i after the N operations are performed.



Constraints

- $1 \leq N \leq 200\,000$.
- $1 \leq A_i \leq 10^9$ ($1 \leq i \leq N$).
- Given values are all integers.

Subtasks

1. (25 points) $N \leq 2\,000$.
2. (35 points) $A_i \leq 2$ ($1 \leq i \leq N$).
3. (40 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
6	1
1	1
2	1
1	2
2	2
3	2
2	



The operations are performed as in the following table.

Operation	The colors of the stones on the table	Explanation
1	1	Stone 1 is put on the table.
2	1, 2	Stone 2 is put on the immediate right of Stone 1.
3	1, 2, 1	Stone 3 is put on the immediate right of Stone 2.
	1, 1, 1	Stone 2 is painted in color 1.
4	1, 1, 1, 2	Stone 4 is put on the immediate right of Stone 3.
5	1, 1, 1, 2, 3	Stone 5 is put on the immediate right of Stone 4.
6	1, 1, 1, 2, 3, 2	Stone 6 is put on the immediate right of Stone 5.
	1, 1, 1, 2, 2, 2	Stone 5 is painted in color 2.

Finally, the colors of Stones 1, 2, 3, 4, 5, 6 will be 1, 1, 1, 2, 2, 2, respectively.

This sample input satisfies the constraints of Subtasks 1, 3.

Sample Input 2	Sample Output 2
10	1
1	1
1	1
2	1
2	1
1	1
2	1
2	1
1	1
1	2
2	

This sample input satisfies the constraints of all the subtasks.