

Problem B. Tarzan Jumps

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 256 mebibytes

In a forest near Almaty, there are N trees arranged in a row, numbered from 1 through N from left to right. Tree number i has height H_i .

In one jump, Tarzan can move from the top of tree i to the top of tree j ($i < j$) if all the trees between them are either strictly lower or strictly higher than both trees i and j . In particular, he can jump from tree i to tree $i + 1$. More formally, the jump is possible if at least one of the following conditions holds:

- $j = i + 1$,
- for all k ($i < k < j$): $H_i > H_k$ and $H_j > H_k$,
- for all k ($i < k < j$): $H_i < H_k$ and $H_j < H_k$.

Tarzan is currently standing on tree 1, and he wants to reach tree N . Tarzan's ICPC teammate, Abay, can help him. Specifically, he can perform the following change any number of times: choose a number i ($1 \leq i \leq n$), an integer x ($0 \leq x \leq 10^{18}$), and set $H_i = x$.

For each k from 1 to N , find the least number of changes that Abay must perform so that Tarzan could get to tree N in no more than k jumps.

Input

The first line contains a single integer t , the number of test cases ($1 \leq t \leq 150\,000$). The description of test cases follows.

The first line of each test case contains an integer N , the number of trees ($2 \leq N \leq 300\,000$).

The second line of each test case contains N integers $H_1, H_2, \dots, H_N$ ($1 \leq H_i \leq 10^9$).

It is guaranteed that the sum of N over all test cases does not exceed 300 000.

Output

For each test case, print N integers: for each k from 1 to N , print the least number of changes that Abay must perform so that Tarzan could get from tree 1 to tree N in no more than k jumps.

Example

<i>standard input</i>	<i>standard output</i>
2	1 0 0
3	0 0
2 2 4	
2	
1 1	

Note

In the first test case, for $k = 1$, Abay can change the height of tree 1 to 3, and Tarzan will be able to jump to the last tree. For $k = 2$ and $k = 3$, Tarzan can reach the last tree without any changes.