



Inverse RMQ

by gorbunovdv

Problem

Submissions

Leaderboard

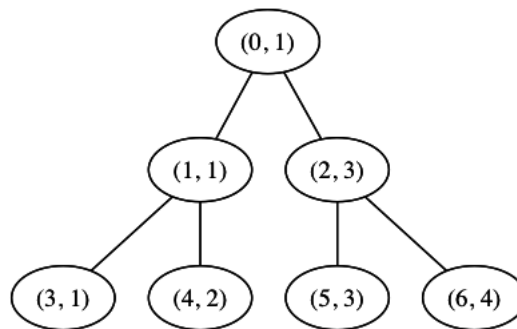
Discussions

Editorial

Range Minimum Query is a well-known problem: given an array of distinct integers with size $n = 2^k$ and m queries, find the minimum element on subsegment $[L_i, R_i]$.

One of the most efficient and famous solutions to this problem is a *segment tree*. A segment tree is a full binary tree with $2 \cdot n - 1$ nodes where the leaves contain the values of the original array and each non-leaf node contains the minimum value of its entire subtree.

Usually, a segment tree is represented as an array of integers with $2 \cdot n - 1$ elements. The left child of the i^{th} node is in the $(2 \cdot i + 1)^{\text{th}}$ cell, and the right child is in the $(2 \cdot i + 2)^{\text{th}}$ cell. For example, $A = [1, 1, 3, 1, 2, 3, 4]$ represents the following segment tree where the first number in a node describes the array index, i , in A and the second number denotes the value stored at index i (which corresponds to the minimum value in that node's subtree):



You've just used n distinct integers to construct your first segment tree and saved it as an array, A , of $2 \cdot n - 1$ values. Unfortunately, some evil guy came and either shuffled or altered the elements in your array. Can you use the altered data to restore the original array? If no, print NO on a new line; otherwise, print two lines where the first line contains the word YES and the second line contains $2 \cdot n - 1$ space-separated integers denoting the array's original values. If there are several possible original arrays, print the **lexicographically** smallest one.

Input Format

The first line contains a single integer, n , denoting the size of the array.

The second line contains $2 \cdot n - 1$ space-separated integers denoting the shuffled values of the segment tree.

Constraints

- $1 \leq n \leq 2^{18}$
- n is a power of two.
- Each value in the segment tree is between -10^9 and 10^9 .

Output Format

Print NO if this array could not be constructed by shuffling some segment tree. Otherwise, print YES on the first line, and $2 \cdot n - 1$ space-separated integers describing the respective values of the original array on the second line. If there are several possible answers, print the lexicographically smallest one.

Sample Input 0

```
4
3 1 3 1 2 4 1
```

Sample Output 0

```
YES
1 1 3 1 2 3 4
```

Explanation 0

This is the same segment tree shown in the *Problem Statement* above.

Sample Input 1

```
2
1 1 1
```

Sample Output 1

```
NO
```

Explanation 1

A segment tree with three nodes would consist of a root, a left child, and a right child. Because all three numbers in this array are the same and the leaves of the segment tree must be n distinct integers, it's not possible to reconstruct the original array.

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Max Score: 60



Difficulty: Hard

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Java 7  

```
1 import java.io.*;
2 import java.util.*;
3 import java.text.*;
4 import java.math.*;
5 import java.util.regex.*;
6
7 public class Solution {
8
9     public static void main(String[] args) {
10         /* Enter your code here. Read input from STDIN. Print output to STDOUT. Your class should be named Solution. */
11     }
12 }
```

Line: 1 Col: 1

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