Codeforces Round #245 (Div. 1)

A. Xor-tree

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Iahub is very proud of his recent discovery, propagating trees. Right now, he invented a new tree, called xor-tree. After this new revolutionary discovery, he invented a game for kids which uses xor-trees.

The game is played on a tree having n nodes, numbered from 1 to n. Each node i has an initial value $init_i$, which is either 0 or 1. The root of the tree is node 1.

One can perform several (possibly, zero) operations on the tree during the game. The only available type of operation is to pick a node x. Right after someone has picked node x, the value of node x flips, the values of sons of x remain the same, the values of sons of sons of x flips, the values of sons of sons of sons of x remain the same and so on.

The goal of the game is to get each node i to have value $goal_i$, which can also be only 0 or 1. You need to reach the goal of the game by using minimum number of operations.

Input

The first line contains an integer n ($1 \le n \le 10^5$). Each of the next $n - 1$ lines contains two integers u_i and v_i ($1 \le u_i, v_i \le n$; $u_i \ne v_i$) meaning there is an edge between nodes u_i and v_i.

The next line contains n integer numbers, the i-th of them corresponds to $init_i$ ($init_i$ is either 0 or 1). The following line also contains n integer numbers, the i-th number corresponds to $goal_i$ ($goal_i$ is either 0 or 1).

Output

In the first line output an integer number cnt, representing the minimal number of operations you perform. Each of the next cnt lines should contain an integer x_i, representing that you pick a node x_i.

Sample test(s)

input

```
10
2 1
3 1
4 2
5 1
6 2
7 5
8 6
9 8
10 5
1 0 1 1 0 1 0 1 0 1
1 0 1 0 0 1 1 1 0 1
```

output

```
2
4
7
```

B. Working out

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Summer is coming! It's time for Iahub and Iahubina to work out, as they both want to look hot at the beach. The gym where they go is a matrix a with n lines and m columns. Let number $a[i][j]$ represents the calories burned by performing workout at the cell of gym in the i-th line and the j-th column.

Iahub starts with workout located at line 1 and column 1. He needs to finish with workout $a[n][m]$. After finishing workout $a[i][j]$, he can go to workout $a[i+1][j]$ or $a[i][j+1]$. Similarly, Iahubina starts with workout $a[n][1]$ and she needs to finish with workout $a[1][m]$. After finishing workout from cell $a[i][j]$, she goes to either $a[i][j+1]$ or $a[i-1][j]$.

There is one additional condition for their training. They have to meet in exactly one cell of gym. At that cell, none of them will work out. They will talk about fast exponentiation (pretty odd small talk) and then both of them will move to the next workout.

If a workout was done by either Iahub or Iahubina, it counts as total gain. Please plan a workout for Iahub and Iahubina such as total gain to be as big as possible. Note, that Iahub and Iahubina can perform workouts with different speed, so the number of cells that they use to reach meet cell may differs.

Input

The first line of the input contains two integers n and m ($3 \le n, m \le 1000$). Each of the next n lines contains m integers: j-th number from i-th line denotes element $a[i][j]$ ($0 \le a[i][j] \le 10^5$).

Output

The output contains a single number — the maximum total gain possible.

Sample test(s)

input
3 3 100 100 100 100 1 100 100 100 100
output
800

Note

Iahub will choose exercises $a[1][1] \to a[1][2] \to a[2][2] \to a[3][2] \to a[3][3]$. Iahubina will choose exercises $a[3][1] \to a[2][1] \to a[2][2] \to a[2][3] \to a[1][3]$.

C. Guess the Tree

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Iahub and Iahubina went to a picnic in a forest full of trees. Less than 5 minutes passed before Iahub remembered of trees from programming. Moreover, he invented a new problem and Iahubina has to solve it, otherwise Iahub won't give her the food.

Iahub asks Iahubina: can you build a rooted tree, such that

- each internal node (a node with at least one son) has at least two sons;
- node i has c_i nodes in its subtree?

Iahubina has to guess the tree. Being a smart girl, she realized that it's possible no tree can follow Iahub's restrictions. In this way, Iahub will eat all the food. You need to help Iahubina: determine if there's at least one tree following Iahub's restrictions. **The required tree must contain n nodes**.

Input

The first line of the input contains integer n ($1 \le n \le 24$). Next line contains n positive integers: the i-th number represents c_i ($1 \le c_i \le n$).

Output

Output on the first line "YES" (without quotes) if there exist at least one tree following Iahub's restrictions, otherwise output "NO" (without quotes).

Sample test(s)

input
4 1 1 1 4
output
YES

input
5 1 1 5 2 1
output
NO

D. Tricky Function

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Iahub and Sorin are the best competitive programmers in their town. However, they can't both qualify to an important contest. The selection will be made with the help of a single problem. Blatnatalag, a friend of Iahub, managed to get hold of the problem before the contest. Because he wants to make sure Iahub will be the one qualified, he tells Iahub the following task.

You're given an (1-based) array a with n elements. Let's define function $f(i, j)$ $(1 \le i, j \le n)$ as $(i - j)^2 + g(i, j)^2$. Function g is calculated by the following pseudo-code:

```
int g(int i, int j) {
    int sum = 0;
    for (int k = min(i, j) + 1; k <= max(i, j); k = k + 1)
        sum = sum + a[k];
    return sum;
}
```

Find a value $min_{i \neq j} f(i, j)$.

Probably by now Iahub already figured out the solution to this problem. Can you?

Input

The first line of input contains a single integer n $(2 \le n \le 100000)$. Next line contains n integers $a[1], a[2], ..., a[n]$ $(-10^4 \le a[i] \le 10^4)$.

Output

Output a single integer — the value of $min_{i \neq j} f(i, j)$.

Sample test(s)

input
4 1 0 0 -1
output
1

input
2 1 -1
output
2

E. Points and Segments

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Iahub isn't well prepared on geometry problems, but he heard that this year there will be a lot of geometry problems on the IOI selection camp. Scared, Iahub locked himself in the basement and started thinking of new problems of this kind. One of them is the following.

Iahub wants to draw n distinct segments $[l_i, r_i]$ on the OX axis. He can draw each segment with either red or blue. The drawing is good if and only if the following requirement is met: for each point x of the OX axis consider all the segments that contains point x; suppose, that r_x red segments and b_x blue segments contain point x; for each point x inequality $|r_x - b_x| \leq 1$ must be satisfied.

A segment $[l, r]$ contains a point x if and only if $l \leq x \leq r$.

Iahub gives you the starting and ending points of all the segments. You have to find any good drawing for him.

Input

The first line of input contains integer n ($1 \leq n \leq 10^5$) — the number of segments. The i-th of the next n lines contains two integers l_i and r_i ($0 \leq l_i \leq r_i \leq 10^9$) — the borders of the i-th segment.

It's guaranteed that all the segments are distinct.

Output

If there is no good drawing for a given test, output a single integer -1. Otherwise output n integers; each integer must be 0 or 1. The i-th number denotes the color of the i-th segment (0 is red and 1 is blue).

If there are multiple good drawings you can output any of them.

Sample test(s)

input
2 0 2 2 3
output
0 1

input
6 1 5 1 3 3 5 2 10 11 11 12 12
output
0 1 0 1 0 0