A. Lie or Truth

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

Vasya has a sequence of cubes and exactly one integer is written on each cube. Vasya exhibited all his cubes in a row. So the sequence of numbers written on the cubes in the order from the left to the right equals to $a_1, a_2, ..., a_n$.

While Vasya was walking, his little brother Stepan played with Vasya's cubes and changed their order, so now the sequence of numbers written on the cubes became equal to $b_1, b_2, ..., b_n$.

Stepan said that he swapped only cubes which where on the positions between l and r, inclusive, and did not remove or add any other cubes (i. e. he said that he reordered cubes between positions l and r, inclusive, in some way).

Your task is to determine if it is possible that Stepan said the truth, or it is guaranteed that Stepan deceived his brother.

Input

The first line contains three integers n, l, r ($1 \le n \le 10^5, 1 \le l \le r \le n$) — the number of Vasya's cubes and the positions told by Stepan.

The second line contains the sequence $a_1, a_2, ..., a_n$ ($1 \le a_i \le n$) — the sequence of integers written on cubes in the Vasya's order.

The third line contains the sequence $b_1, b_2, ..., b_n$ ($1 \le b_i \le n$) — the sequence of integers written on cubes after Stepan rearranged their order.

It is guaranteed that Stepan did not remove or add other cubes, he only rearranged Vasya's cubes.

Output

Print "LIE" (without quotes) if it is guaranteed that Stepan deceived his brother. In the other case, print "TRUTH" (without quotes).

Examples

input
5 2 4 3 4 2 3 1 3 2 3 4 1
output
TRUTH

input
3 1 2 1 2 3 3 1 2
output
LIE

input
4 2 4 1 1 1 1 1 1 1 1
output
TRUTH

Note

In the first example there is a situation when Stepan said the truth. Initially the sequence of integers on the cubes was equal to `[3, 4, 2, 3, 1]`. Stepan could at first swap cubes on positions 2 and 3 (after that the sequence of integers on cubes became equal to `[3, 2, 4, 3, 1]`), and then swap cubes in positions 3 and 4 (after that the sequence of integers on cubes became equal to `[3, 2, 3, 4, 1]`).

In the second example it is not possible that Stepan said truth because he said that he swapped cubes only between positions 1 and 2, but we can see that it is guaranteed that he changed the position of the cube which was on the position 3 at first. So it is guaranteed that Stepan deceived his brother.

In the third example for any values l and r there is a situation when Stepan said the truth.

B. Composing Of String

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

Stepan has a set of n strings. Also, he has a favorite string s.

Stepan wants to do the following. He will take some strings of his set and write them down one after another. It is possible that he will take some strings more than once, and will not take some of them at all.

Your task is to determine the minimum number of strings in the set which Stepan needs to take and write so that the string s appears as a subsequence in the resulting written down string.

For example, in the string "abcd" strings "ad", "acd", "abcd" appear as subsequences, and strings "ba", "abdc" don't appear as subsequences.

Input

The first line contains the integer n ($1 \le n \le 50$) — the number of strings in Stepan's set.

The next n lines contain n non-empty strings consisting of lowercase letters of the English alphabet. The length of each of these strings does not exceed 50 symbols. It is possible that some strings from Stepan's set are the same.

The next line contains the non-empty string s, consisting of lowercase letters of the English alphabet — Stepan's favorite string. The length of this string doesn't exceed 2500 symbols.

Output

Print the minimum number of strings which Stepan should take from the set and write them down one after another so that the string s appears as a subsequence in the resulting written down string. Each string from the set should be counted as many times as Stepan takes it from the set.

If the answer doesn't exsist, print -1.

Examples

input
3 a aa a aaa
output
2

input
4 ab aab aa bb baaab
output
3

input
2 aaa bbb aaacbbb
output
-1

Note

In the first test, Stepan can take, for example, the third and the second strings from the set, write them down, and get exactly his favorite string.

In the second example Stepan can take, for example, the second, the third and again the second strings from the set and write them down. Then he will get a string "aabaaaab", in which his favorite string "baaab" is a subsequence.

In the third test Stepan can not get his favorite string, because it contains the letter "c", which is not presented in any of the strings in the set.

C. Repairing Of String

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

Stepan had a favorite string s which consisted of the lowercase letters of the Latin alphabet.

After graduation, he decided to remember it, but it was a long time ago, so he can't now remember it. But Stepan remembers some information about the string, namely the sequence of integers $c_1, c_2, ..., c_n$, where n equals the length of the string s, and c_i equals the number of substrings in the string s with the length i, consisting of the **same** letters. The substring is a sequence of consecutive characters in the string s.

For example, if the Stepan's favorite string is equal to "tttesst", the sequence c looks like: $c = [7, 3, 1, 0, 0, 0, 0]$.

Stepan asks you to help to repair his favorite string s according to the given sequence $c_1, c_2, ..., c_n$.

Input

The first line contains the integer n ($1 \le n \le 2000$) — the length of the Stepan's favorite string.

The second line contains the sequence of integers $c_1, c_2, ..., c_n$ ($0 \le c_i \le 2000$), where c_i equals the number of substrings of the string s with the length i, consisting of the same letters.

It is guaranteed that the input data is such that the answer always exists.

Output

Print the repaired Stepan's favorite string. If there are several answers, it is allowed to print any of them. The string should contain only lowercase letters of the English alphabet.

Examples

input
6 6 3 1 0 0 0
output
kkrrrq

input
4 4 0 0 0
output
abcd

Note

In the first test Stepan's favorite string, for example, can be the string "kkrrrq", because it contains 6 substrings with the length 1, consisting of identical letters (they begin in positions 1, 2, 3, 4, 5 and 6), 3 substrings with the length 2, consisting of identical letters (they begin in positions 1, 3 and 4), and 1 substring with the length 3, consisting of identical letters (it begins in the position 3).

Problem D Buoys

Input file:	input.txt
Output file:	output.txt
Time limit:	1 second
Memory limit:	256 megabytes

The swimming area of Berhattan's city beach is marked out with n buoys. The buoys form a straight line. When the buoys were being put into the water, nobody cared to observe the same distance between each pair of adjacent buoys.

Now the beach keeper wants the distance between any two adjacent buoys to be the same. He plans to shift some or all of the buoys without changing their respective order. To facilitate the task, he wants the total length of all shifts to be as small as possible.

Given coordinates of the buoys, you should find the minimum possible length of all shifts, as well as new coordinates of the buoys.

Input

The first line of input contains a single integer n ($2 \le n \le 400$), n — the number of buoys. The second line contains buoys' integer coordinates $x_1, x_2, \ldots, x_n$ ($-10000 \le x_i \le 10000$). No two given buoys will share the same place. The coordinates are given in strictly increasing order.

Output

To the first line print a real number t — the minimum possible total length of required shifts. Output this value with at least 4 digits after the decimal point.

To the second line print n numbers — new coordinates of the buoys. The new coordinates should be printed in strictly increasing order with at least 7 digits after the decimal point. If there are several optimal ways to shift the buoys, you may output any of them.

Examples

input.txt
4 -2 2 6 9
output.txt
1.0000 -2.0000000000 1.6666666667 5.3333333333 9.0000000000

Note

All buoys are located on the Ox axis. You may move buoys only along the Ox axis.

Problem E "North-East"

Input file:	input.txt
Output file:	output.txt
Time limit:	2 seconds
Memory limit:	256 megabytes

The popular music band of international fame "North-East" is coming to Berland! This news has spread all over the country, so numerous fans are now ready to rush and buy all the tickets!

At present the fans still don't know in which cities the band plans to give concerts. The only thing is known at the moment is that the band will visit several cities, and as their name says, they will strictly move north and east when going to the next city. In other words when the band moves from city i to city j, city j is always located northward and eastward of the city i.

It's also known that the tour is planned in such a way that the maximum possible number of cities will be visited. The musicians refuse to reveal other details. As you know, fans always get ready for the arrival of their idols, so they would appreciate any single detail about possible movements of their favorite musicians.

Your task is to help the fans and find two lists of cities — A and B. The first list A should contain the cities, which the band might visit during the tour. The second list B should contain the cities, which the band will have to visit for sure during the tour.

Input

The first line of input contains a single integer n ($1 \le n \le 10^5$) — amount of cities in the country. The following n lines contain coordinates of the cities. Each line contains a pair of integers x_i, y_i ($-10^6 \le x_i, y_i \le 10^6$) — the coordinates of the i-th city. Ox axis is directed west-to-east, and Oy axis — south-to-north. No two given cities will be located at the same point.

Output

Print the required list A to the first line of output and B to the second line. Each list should start with the amount of cities in it, followed by the indices of cities in increasing order. Cities are numbered from 1 to n.

Examples

input.txt	output.txt
5 3 2 1 1 5 5 2 3 4 4	5 1 2 3 4 5 3 2 3 5
5 1 1 10 10 5 6 10 1 6 5	4 1 2 3 5 2 1 2

Problem F Oil Wells

Input file:	input.txt
Output file:	output.txt
Time limit:	2 seconds
Memory limit:	256 megabytes

These are tough times for Berland nowadays. State property is being sold piece by piece, and even state oil company "BerOil" hasn't escaped the common lot.

A well-known entrepreneur Tapochkin decided to buy a piece of "BerOil"'s land. Tapochkin is very smart, so he wants to buy a piece of land that will contain all of the company's oil wells within its area or on its border. He has already bought a fence building machine that will move along the border of Tapochkin's new land and build a high fence! There is only one problem — the machine is defective.

Normally, the machine can move in any of the four directions: "north", "east", "south" and "west". Now, when it's broken, the situation is a bit different. Before the engine is turned on, the driver divides these four directions into two groups — two perpendicular directions in each group (e.g. "north" and "east" in one group, "south" and "west" in the other group). Then for some time the machine moves using only directions from the first group, after that — only directions from the second group. It's the driver who determines the moment of switching from one group to the other one.

The company's territory is split into equal squares by a system of roads. Half of the roads go in "north-south" direction, the other half — in "east-west" direction. The company has a vast territory that can be regarded as infinite. The roads form a square grid, each square of the grid has a side length equal to 1 km. Oil wells are located on the crossroads and their size is negligible, so they can be considered points.

Cartesian coordinate system can be applied to the company's territory, so that Ox axis is directed west-to-east, and Oy axis — south-to-north. Unit of length — 1 km. Initial position of the machine and coordinates of the oil wells are known. Find the area of the smallest possible piece of land that the machine can fence around, leaving all the oil wells inside the fenced area or on its border. Also, find the sequence of machine's movements. The border of Tapochkin's piece of land should be a closed non-degenerate polyline that doesn't cross or touch itself.

Input

The first line of input contains three integers n, x_0 and y_0 ($1 \le n \le 400, -400 \le x_0, y_0 \le 400$), where n — amount of oil wells, (x_0, y_0) — initial position of the fence building machine. The following n lines contain coordinates of the wells x_i, y_i ($-400 \le x_i, y_i \le 400$). No two wells have identical coordinates.

Output

Print the only number `-1` to the output, if there is no solution. Otherwise print the area of Tapochkin's land in square kilometers to the first line, and the path of the fence building machine — to the second. The path of the machine is a sequence of characters "`W`", "`N`", "`E`" and "`S`", standing for movements one kilometer "west", "north", "east" or "south" correspondingly. You are allowed to print the path in any direction of driving — clockwise or counterclockwise, as it doesn't really change the closed polyline which the path represents. It there is more than one answer, you may print any of them.

Examples

input.txt	output.txt
3 4 2 5 6 7 2 9 4	13 NENNNEEEESSWWSSWWW
2 1 -2 -1 2 1 -2	5 NWNNNWSSSSEE
1 1 2 1 2	1 ESWN