Codeforces Round #394 (Div. 2)

A. Dasha and Stairs

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

On her way to programming school tiger Dasha faced her first test — a huge staircase!

The steps were numbered from one to infinity. As we know, tigers are very fond of all striped things, it is possible that it has something to do with their color. So on some interval of her way she calculated two values — the number of steps with even and odd numbers.

You need to check whether there is an interval of steps from the l-th to the r-th $(1 \le l \le r)$, for which values that Dasha has found are correct.

Input
In the only line you are given two integers a, b $(0 \le a, b \le 100)$ — the number of even and odd steps, accordingly.

Output
In the only line print "YES", if the interval of steps described above exists, and "NO" otherwise.

Examples

input
2 3
output
YES

input
3 1
output
NO

Note
In the first example one of suitable intervals is from 1 to 5. The interval contains two even steps — 2 and 4, and three odd: 1, 3 and 5.

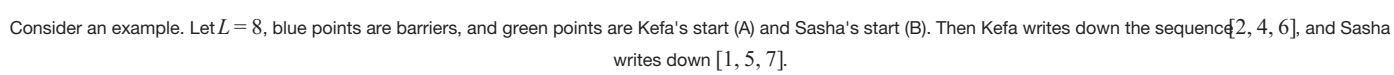
B. Dasha and friends

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

Running with barriers on the circle track is very popular in the country where Dasha lives, so no wonder that on her way to classes she saw the following situation:

The track is the circle with length L, in distinct points of which there are n barriers. Athlete always run the track in counterclockwise direction if you look on him from above. All barriers are located at integer distance from each other along the track.

Her friends the parrot Kefa and the leopard Sasha participated in competitions and each of them ran one lap. Each of the friends started from some integral point on the track. Both friends wrote the distance from their start along the track to each of the n barriers. Thus, each of them wrote n integers in the ascending order, each of them was between 0 and $L - 1$, inclusively.



Consider an example. Let $L = 8$, blue points are barriers, and green points are Kefa's start (A) and Sasha's start (B). Then Kefa writes down the sequence $[2, 4, 6]$, and Sasha writes down $[1, 5, 7]$.

There are several tracks in the country, all of them have same length and same number of barriers, but the positions of the barriers can differ among different tracks. Now Dasha is interested if it is possible that Kefa and Sasha ran the same track or they participated on different tracks.

Write the program which will check that Kefa's and Sasha's tracks coincide (it means that one can be obtained from the other by changing the start position). Note that they always run the track in one direction — counterclockwise, if you look on a track from above.

Input

The first line contains two integers n and L ($1 \le n \le 50$, $n \le L \le 100$) — the number of barriers on a track and its length.

The second line contains n distinct integers in the ascending order — the distance from Kefa's start to each barrier in the order of its appearance. All integers are in the range from 0 to $L - 1$ inclusively.

The second line contains n distinct integers in the ascending order — the distance from Sasha's start to each barrier in the order of its overcoming. All integers are in the range from 0 to $L - 1$ inclusively.

Output

Print "YES" (without quotes), if Kefa and Sasha ran the coinciding tracks (it means that the position of all barriers coincides, if they start running from the same points on the track). Otherwise print "NO" (without quotes).

Examples

input
3 8 2 4 6 1 5 7
output
YES

input
4 9 2 3 5 8 0 1 3 6
output
YES

input
2 4 1 3 1 2
output
NO

Note

The first test is analyzed in the statement.

C. Dasha and Password

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

After overcoming the stairs Dasha came to classes. She needed to write a password to begin her classes. The password is a string of length n which satisfies the following requirements:

- There is at least one digit in the string,
- There is at least one lowercase (small) letter of the Latin alphabet in the string,
- There is at least one of three listed symbols in the string: '#', '*', '&'.

Considering that these are programming classes it is not easy to write the password.

For each character of the password we have a fixed string of length m, on each of these n strings there is a pointer on some character. The i-th character displayed on the screen is the pointed character in the i-th string. Initially, all pointers are on characters with indexes 1 in the corresponding strings (all positions are numbered starting from one).

During one operation Dasha can move a pointer in one string one character to the left or to the right. Strings are cyclic, it means that when we move the pointer which is on the character with index 1 to the left, it moves to the character with the index m, and when we move it to the right from the position m it moves to the position 1.

You need to determine the minimum number of operations necessary to make the string displayed on the screen a valid password.

Input

The first line contains two integers n, m $(3 \le n \le 50, 1 \le m \le 50)$ — the length of the password and the length of strings which are assigned to password symbols.

Each of the next n lines contains the string which is assigned to the i-th symbol of the password string. Its length is m, it consists of digits, lowercase English letters, and characters '#', '*' or '&'.

You have such input data that you can always get a valid password.

Output

Print one integer — the minimum number of operations which is necessary to make the string, which is displayed on the screen, a valid password.

Examples

input
3 4 1**2 a3*0 c4**
output
1

input
5 5 #*&#* *a1c& &q2w* #a3c# *&#*&
output
3

Note

In the first test it is necessary to move the pointer of the third string to one left to get the optimal answer.

In the second test one of possible algorithms will be:

- to move the pointer of the second symbol once to the right.
- to move the pointer of the third symbol twice to the right.

D. Dasha and Very Difficult Problem

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

Dasha logged into the system and began to solve problems. One of them is as follows:

Given two sequences a and b of length n each you need to write a sequence c of length n, the i-th element of which is calculated as follows: $c_i = b_i - a_i$.

About sequences a and b we know that their elements are in the range from l to r. More formally, elements satisfy the following conditions: $l \le a_i \le r$ and $l \le b_i \le r$. About sequence c we know that all its elements are distinct.

Dasha wrote a solution to that problem quickly, but checking her work on the standard test was not so easy. Due to an error in the test system only the sequence a and the *compressed sequence* of the sequence c were known from that test.

Let's give the definition to a *compressed sequence*. A *compressed sequence* of sequence c of length n is a sequence p of length n, so that p_i equals to the number of integers which are less than or equal to c_i in the sequence c. For example, for the sequence $c = [250, 200, 300, 100, 50]$ the compressed sequence will be $p = [4, 3, 5, 2, 1]$. Pay attention that in c all integers are distinct. Consequently, the *compressed sequence* contains all integers from 1 to n inclusively.

Help Dasha to find any sequence b for which the calculated *compressed sequence* of sequence c is correct.

Input

The first line contains three integers n, l, r ($1 \le n \le 10^5, 1 \le l \le r \le 10^9$) — the length of the sequence and boundaries of the segment where the elements of sequences a and b are.

The next line contains n integers $a_1, a_2, ..., a_n$ ($l \le a_i \le r$) — the elements of the sequence a.

The next line contains n distinct integers $p_1, p_2, ..., p_n$ ($1 \le p_i \le n$) — the *compressed sequence* of the sequence c.

Output

If there is no the suitable sequence b, then in the only line print "-1".

Otherwise, in the only line print n integers — the elements of any suitable sequence b.

Examples

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

input
4 2 9 3 4 8 9 3 2 1 4
output
2 2 2 9

input
6 1 5 1 1 1 1 1 1 2 3 5 4 1 6
output
-1

Note

Sequence b which was found in the second sample is suitable, because calculated sequence $c = [2 - 3, 2 - 4, 2 - 8, 9 - 9] = [-1, -2, -6, 0]$ (note that $c_i = b_i - a_i$) has compressed sequence equals to $p = [3, 2, 1, 4]$.

E. Dasha and Puzzle

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

Dasha decided to have a rest after solving the problem. She had been ready to start her favourite activity — origami, but remembered the puzzle that she could not solve.

The tree is a non-oriented connected graph without cycles. In particular, there always are $n - 1$ edges in a tree with n vertices.

The puzzle is to position the vertices at the points of the Cartesian plane with integral coordinates, so that the segments between the vertices connected by edges are parallel to the coordinate axes. Also, the intersection of segments is allowed only at their ends. Distinct vertices should be placed at different points.

Help Dasha to find any suitable way to position the tree vertices on the plane.

It is guaranteed that if it is possible to position the tree vertices on the plane without violating the condition which is given above, then you can do it by using points with integral coordinates which don't exceed 10^{18} in absolute value.

Input

The first line contains single integer n $(1 \le n \le 30)$ — the number of vertices in the tree.

Each of next $n - 1$ lines contains two integers u_i, v_i $(1 \le u_i, v_i \le n)$ that mean that the i-th edge of the tree connects vertices u_i and v_i.

It is guaranteed that the described graph is a tree.

Output

If the puzzle doesn't have a solution then in the only line print "NO".

Otherwise, the first line should contain "YES". The next n lines should contain the pair of integers x_i, y_i $(|x_i|, |y_i| \le 10^{18})$ — the coordinates of the point which corresponds to the i-th vertex of the tree.

If there are several solutions, print any of them.

Examples

input

```
7
1 2
1 3
2 4
2 5
3 6
3 7
```

output

```
YES
0 0
1 0
0 1
2 0
1 -1
-1 1
0 2
```

input

```
6
1 2
2 3
2 4
2 5
2 6
```

output

```
NO
```

input

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

output

```
YES
3 3
4 3
5 3
6 3
```

Note
In the first sample one of the possible positions of tree is:

F. Dasha and Photos

time limit per test: 4 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Dasha decided to have a rest after solving the problem D and began to look photos from previous competitions.

Let's call photos as the matrix with the size $n \times m$, which consists of lowercase English letters.

Some k photos especially interested her, because they can be received from photo-template by painting a rectangular area in a certain color. Let's call such photos special.

More formally the i-th special photo is received from the photo-template by replacing all characters on some rectangle with upper left corner of the cell with coordinates (a_i, b_i) and lower right corner in the cell with coordinates (c_i, d_i) to the symbol e_i.

Dasha asks you to find the special photo so that the total distance from it to all other special photos is minimum. And calculate this distance.

Determine the distance between two photos as the sum of distances between all corresponding letters. The distance between two letters is the difference module of their positions in the alphabet. For example, the distance between letters 'h' and 'm' equals $|8 - 13| = 5$, because the letter 'h' is the 8-th in the alphabet, the letter 'm' is the 13-th.

Input

The first line contains three integers n, m, k $(1 \le n, m \le 10^3, 1 \le k \le 3 \cdot 10^5)$ — the number of strings in the photo-template, the number of columns and the number of special photos which are interesting for Dasha.

The next n lines contains the string with m length which consists of little Latin characters — the description of the photo-template.

Each of the next k lines contains the description of the special photo in the following format, "$a_i\ b_i\ c_i\ d_i\ e_i$" $(1 \le a_i \le c_i \le n, 1 \le b_i \le d_i \le m)$, where (a_i, b_i) — is the coordinate of the upper left corner of the rectangle, (c_i, d_i) — is the description of the lower right corner, and e_i — is the little Latin letter which replaces the photo-template in the described rectangle.

Output

In the only line print the minimum total distance from the found special photo to all other special photos.

Examples

input
3 3 2 aaa aaa aaa 1 1 2 2 b 2 2 3 3 c
output
10

input
5 5 3 abcde eabcd deabc cdeab bcdea 1 1 3 4 f 1 2 3 3 e 1 3 3 4 i
output
59

Note

In the first example the photos are following:

```
bba    aaa
bba    acc
aaa    acc
```

The distance between them is 10.