Codeforces Round #435 (Div. 2)

A. Mahmoud and Ehab and the MEX

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

Dr. Evil kidnapped Mahmoud and Ehab in the evil land because of their performance in the Evil Olympiad in Informatics (EOI). He decided to give them some problems to let them go.

Dr. Evil is interested in sets, He has a set of n integers. Dr. Evil calls a set of integers *evil* if the *MEX* of it is exactly x. the *MEX* of a set of integers is the minimum non-negative integer that doesn't exist in it. For example, the *MEX* of the set $\{0, 2, 4\}$ is 1 and the *MEX* of the set $\{1, 2, 3\}$ is 0 .

Dr. Evil is going to make his set *evil*. To do this he can perform some operations. During each operation he can add some non-negative integer to his set or erase some element from it. What is the minimal number of operations Dr. Evil has to perform to make his set *evil*?

Input

The first line contains two integers n and x ($1 \le n \le 100$, $0 \le x \le 100$) — the size of the set Dr. Evil owns, and the desired *MEX*.

The second line contains n distinct non-negative integers not exceeding 100 that represent the set.

Output

The only line should contain one integer — the minimal number of operations Dr. Evil should perform.

Examples

input
5 3 0 4 5 6 7
output
2

input
1 0 0
output
1

input
5 0 1 2 3 4 5
output
0

Note

For the first test case Dr. Evil should add 1 and 2 to the set performing 2 operations.

For the second test case Dr. Evil should erase 0 from the set. After that, the set becomes empty, so the *MEX* of it is 0.

In the third test case the set is already *evil*.

B. Mahmoud and Ehab and the bipartiteness

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

Mahmoud and Ehab continue their adventures! As everybody in the evil land knows, Dr. Evil likes bipartite graphs, especially trees.

A tree is a connected acyclic graph. A bipartite graph is a graph, whose vertices can be partitioned into 2 sets in such a way, that for each edge (u, v) that belongs to the graph, u and v belong to different sets. You can find more formal definitions of a tree and a bipartite graph in the notes section below.

Dr. Evil gave Mahmoud and Ehab a tree consisting of n nodes and asked them to add edges to it in such a way, that the graph is still bipartite. Besides, after adding these edges the graph should be simple (doesn't contain loops or multiple edges). What is the maximum number of edges they can add?

A loop is an edge, which connects a node with itself. Graph doesn't contain multiple edges when for each pair of nodes there is no more than one edge between them. **A cycle and a loop aren't the same** .

Input

The first line of input contains an integer n — the number of nodes in the tree ($1 \le n \le 10^5$).

The next n - 1 lines contain integers u and v ($1 \le u, v \le n, u \ne v$) — the description of the edges of the tree.

It's guaranteed that the given graph is a tree.

Output

Output one integer — the maximum number of edges that Mahmoud and Ehab can add to the tree while fulfilling the conditions.

Examples

input
3 1 2 1 3
output
0

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

Note

Tree definition: https://en.wikipedia.org/wiki/Tree_(graph_theory)

Bipartite graph definition: https://en.wikipedia.org/wiki/Bipartite_graph

In the first test case the only edge that can be added in such a way, that graph won't contain loops or multiple edges is $(2, 3)$, but adding this edge will make the graph non-bipartite so the answer is 0.

In the second test case Mahmoud and Ehab can add edges $(1, 4)$ and $(2, 5)$.

C. Mahmoud and Ehab and the xor

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

Mahmoud and Ehab are on the third stage of their adventures now. As you know, Dr. Evil likes sets. This time he won't show them any set from his large collection, but will ask them to create a new set to replenish his beautiful collection of sets.

Dr. Evil has his favorite evil integer x. He asks Mahmoud and Ehab to find a set of n distinct non-negative integers such the bitwise-xor sum of the integers in it is exactly x. Dr. Evil doesn't like big numbers, so any number in the set shouldn't be greater than 10^6.

Input

The only line contains two integers n and x ($1 \le n \le 10^5$, $0 \le x \le 10^5$) — the number of elements in the set and the desired bitwise-xor, respectively.

Output

If there is no such set, print "NO" (without quotes).

Otherwise, on the first line print "YES" (without quotes) and on the second line print n distinct integers, denoting the elements in the set is any order. If there are multiple solutions you can print any of them.

Examples

input
5 5
output
YES 1 2 4 5 7

input
3 6
output
YES 1 2 5

Note

You can read more about the bitwise-xor operation here: https://en.wikipedia.org/wiki/Bitwise_operation#XOR

For the first sample $1 \oplus 2 \oplus 4 \oplus 5 \oplus 7 = 5$.

For the second sample $1 \oplus 2 \oplus 5 = 6$.

D. Mahmoud and Ehab and the binary string

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

Mahmoud and Ehab are in the fourth stage now.

Dr. Evil has a hidden binary string of length n. He guarantees that there is at least one '0' symbol and at least one '1' symbol in it. Now he wants Mahmoud and Ehab to find a position of any '0' symbol and any '1' symbol. In order to do this, Mahmoud and Ehab can ask Dr. Evil up to 15 questions. They tell Dr. Evil some binary string of length n, and Dr. Evil tells the Hamming distance between these two strings. Hamming distance between 2 binary strings of the same length is the number of positions in which they have different symbols. You can find the definition of Hamming distance in the notes section below.

Help Mahmoud and Ehab find these two positions.

You will get *Wrong Answer* verdict if

- Your queries doesn't satisfy interaction protocol described below.
- You ask strictly more than 15 questions and your program terminated after exceeding queries limit. Please note, that you can do up to 15 ask queries and one answer query.
- Your final answer is not correct.

You will get *Idleness Limit Exceeded* if you don't print anything or if you forget to flush the output, including for the final answer (more info about flushing output below).
If you exceed the maximum number of queries, You should terminate with 0, In this case you'll get Wrong Answer, If you don't terminate you may receive any verdict because you'll be reading from a closed stream .

Input

The first line of input will contain a single integer n ($2 \le n \le 1000$) — the length of the hidden binary string.

Output

To print the final answer, print "! pos0 pos1" (without quotes), where $pos0$ and $pos1$ are positions of some '0' and some '1' in the string (the string is 1-indexed). **Don't forget to flush the output after printing the answer!**

Interaction

To ask a question use the format "? s" (without quotes), where s is a query string. **Don't forget to flush the output after printing a query!**

After each query you can read a single integer from standard input — the Hamming distance between the hidden string and the query string.

To flush the output you can use:-

- fflush(stdout) in C++;
- System.out.flush() in Java;
- stdout.flush() in Python;
- flush(output) in Pascal;
- See the documentation for other languages .

Hacking.

To hack someone just print one binary string with length up to 1000, containing at least one '0' and at least one '1'.

Example

input
3 2 1 3 2 1 0
output
? 000 ? 001 ? 010 ? 011 ? 100 ? 101 ! 2 1

Note

Hamming distance definition: https://en.wikipedia.org/wiki/Hamming_distance

In the first test case the hidden binary string is 1**0**1, The first query is 0**0**0, so the Hamming distance is 2. In the second query the hidden string is still 1**01** and query is 0**01**, so the Hamming distance is 1.

After some queries you find that symbol at position 2 is '0' and symbol at position 1 is '1', so you print "! 2 1".

E. Mahmoud and Ehab and the function

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

Dr. Evil is interested in math and functions, so he gave Mahmoud and Ehab array a of length n and array b of length m. He introduced a function $f(j)$ which is defined for integers j, which satisfy $0 \le j \le m - n$. Suppose, $c_i = a_i - b_{i+j}$. Then $f(j) = |c_1 - c_2 + c_3 - c_4 \dots c_n|$. More formally, $f(j) = |\sum_{i=1}^{n} (-1)^{i-1} * (a_i - b_{i+j})|$.

Dr. Evil wants Mahmoud and Ehab to calculate the minimum value of this function over all valid j. They found it a bit easy, so Dr. Evil made their task harder. He will give them q update queries. During each update they should add an integer x_i to all elements in a in range $[l_i;r_i]$ i.e. they should add x_i to $a_{l_i}, a_{l_i+1}, \dots, a_{r_i}$ and then they should calculate the minimum value of $f(j)$ for all valid j.

Please help Mahmoud and Ehab.

Input

The first line contains three integers n, m and q ($1 \le n \le m \le 10^5$, $1 \le q \le 10^5$) — number of elements in a, number of elements in b and number of queries, respectively.

The second line contains n integers $a_1, a_2, \dots, a_n$. ($-10^9 \le a_i \le 10^9$) — elements of a.

The third line contains m integers $b_1, b_2, \dots, b_m$. ($-10^9 \le b_i \le 10^9$) — elements of b.

Then q lines follow describing the queries. Each of them contains three integers l_i r_i x_i ($1 \le l_i \le r_i \le n$, $-10^9 \le x \le 10^9$) — range to be updated and added value.

Output

The first line should contain the minimum value of the function f before any update.

Then output q lines, the i-th of them should contain the minimum value of the function f after performing the i-th update .

Example

input
5 6 3 1 2 3 4 5 1 2 3 4 5 6 1 1 10 1 1 -9 1 5 -1
output
0 9 0 0

Note

For the first example before any updates it's optimal to choose $j = 0$, $f(0) = |(1 - 1) - (2 - 2) + (3 - 3) - (4 - 4) + (5 - 5)| = |0| = 0$.

After the first update a becomes $\{11, 2, 3, 4, 5\}$ and it's optimal to choose $j = 1$, $f(1) = |(11 - 2) - (2 - 3) + (3 - 4) - (4 - 5) + (5 - 6) = |9| = 9$.

After the second update a becomes $\{2, 2, 3, 4, 5\}$ and it's optimal to choose $j = 1$, $f(1) = |(2 - 2) - (2 - 3) + (3 - 4) - (4 - 5) + (5 - 6)| = |0| = 0$.

After the third update a becomes $\{1, 1, 2, 3, 4\}$ and it's optimal to choose $j = 0$, $f(0) = |(1 - 1) - (1 - 2) + (2 - 3) - (3 - 4) + (4 - 5)| = |0| = 0$.

F. Mahmoud and Ehab and the final stage

time limit per test: 5 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Mahmoud and Ehab solved Dr. Evil's questions so he gave them the password of the door of the evil land. When they tried to open the door using it, the door gave them a final question to solve before they leave (yes, the door is digital, Dr. Evil is modern). If they don't solve it, all the work will be useless and they won't leave the evil land forever. Will you help them?

Mahmoud and Ehab are given n strings $s_1, s_2, \ldots, s_n$ numbered from 1 to n and q queries, Each query has one of the following forms:

- $1\ a\ b\ (1 \le a \le b \le n)$, For all the intervals $[l;r]$ where $(a \le l \le r \le b)$ find the maximum value of this expression: $(r - l + 1) * LCP(s_l, s_{l+1}, \ldots, s_{r-1}, s_r)$ where $LCP(str_1, str_2, str_3, \ldots)$ is the length of the longest common prefix of the strings $str_1, str_2, str_3, \ldots$.
- $2\ x\ y\ (1 \le x \le n)$ where y is a string, consisting of lowercase English letters. Change the string at position x to y.

Input

The first line of input contains 2 integers n and q $(1 \le n \le 10^5, 1 \le q \le 10^5)$ – The number of strings and the number of queries, respectively.

The second line contains n strings str_i consisting of lowercase English letters.

The next q lines describe the queries and may have one of the 2 forms:

- $1\ a\ b\ (1 \le a \le b \le n)$.
- $2\ x\ y\ (1 \le x \le n)$, where y is a string consisting of lowercase English letters.

the total length of all strings in input won't exceed 10^5

Output

For each query of first type output its answer in a new line.

Example

input
5 9 mahmoud mahmoudbadawy drmahmoud drevil mahmoud 1 1 5 1 1 2 1 2 3 2 3 mahmoud 2 4 mahmoud 2 2 mahmouu 1 1 5 1 2 3 1 1 1
output
14 14 13 30 12 7