Codeforces Round #567 (Div. 2)

A. Chunga-Changa

time limit per test: 1 second
memory limit per test: 512 megabytes
input: standard input
output: standard output

Soon after the Chunga-Changa island was discovered, it started to acquire some forms of civilization and even market economy. A new currency arose, colloquially called "chizhik". One has to pay in chizhiks to buy a coconut now.

Sasha and Masha are about to buy some coconuts which are sold at price z chizhiks per coconut. Sasha has x chizhiks, Masha has y chizhiks. Each girl will buy as many coconuts as she can using only her money. This way each girl will buy an integer non-negative number of coconuts.

The girls discussed their plans and found that the total number of coconuts they buy can increase (or decrease) if one of them gives several chizhiks to the other girl. The chizhiks can't be split in parts, so the girls can only exchange with integer number of chizhiks.

Consider the following example. Suppose Sasha has 5 chizhiks, Masha has 4 chizhiks, and the price for one coconut be 3 chizhiks. If the girls don't exchange with chizhiks, they will buy $1 + 1 = 2$ coconuts. However, if, for example, Masha gives Sasha one chizhik, then Sasha will have 6 chizhiks, Masha will have 3 chizhiks, and the girls will buy $2 + 1 = 3$ coconuts.

It is not that easy to live on the island now, so Sasha and Mash want to exchange with chizhiks in such a way that they will buy the maximum possible number of coconuts. Nobody wants to have a debt, so among all possible ways to buy the maximum possible number of coconuts find such a way that minimizes the number of chizhiks one girl gives to the other (it is not important who will be the person giving the chizhiks).

Input

The first line contains three integers x, y and z ($0 \le x, y \le 10^{18}$, $1 \le z \le 10^{18}$) — the number of chizhics Sasha has, the number of chizhics Masha has and the price of a coconut.

Output

Print two integers: the maximum possible number of coconuts the girls can buy and the minimum number of chizhiks one girl has to give to the other.

Examples

input
5 4 3
output
3 1

input
6 8 2
output
7 0

Note

The first example is described in the statement. In the second example the optimal solution is to dot exchange any chizhiks. The girls will buy $3 + 4 = 7$ coconuts.

B. Split a Number

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Dima worked all day and wrote down on a long paper strip his favorite number n consisting of l digits. Unfortunately, the strip turned out to be so long that it didn't fit in the Dima's bookshelf.

To solve the issue, Dima decided to split the strip into two non-empty parts so that each of them contains a **positive** integer without leading zeros. After that he will compute the sum of the two integers and write it down on a new strip.

Dima wants the resulting integer to be as small as possible, because it increases the chances that the sum will fit it in the bookshelf. Help Dima decide what is the minimum sum he can obtain.

Input

The first line contains a single integer l ($2 \le l \le 100\,000$) — the length of the Dima's favorite number.

The second line contains the positive integer n initially written on the strip: the Dima's favorite number.

The integer n consists of exactly l digits and it does not contain leading zeros. Dima guarantees, that there is at least one valid way to split the strip.

Output
Print a single integer — the smallest number Dima can obtain.

Examples

input
7 1234567
output
1801

input
3 101
output
11

Note
In the first example Dima can split the number 1234567 into integers 1234 and 567. Their sum is 1801.

In the second example Dima can split the number 101 into integers 10 and 1. Their sum is 11. Note that it is impossible to split the strip into "1" and "01" since the numbers can't start with zeros.

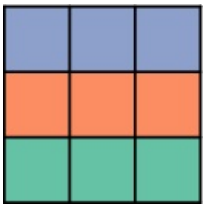
C. Flag

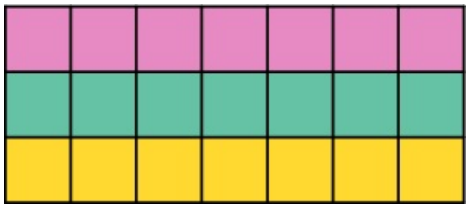
time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Innokenty works at a flea market and sells some ~~random stuff~~ rare items. Recently he found an old rectangular blanket. It turned out that the blanket is split in $n \cdot m$ colored pieces that form a rectangle with n rows and m columns.

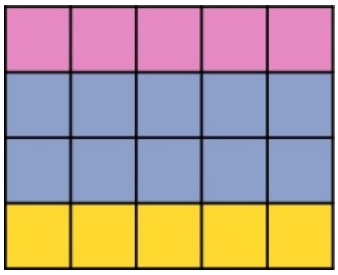
The colored pieces attracted Innokenty's attention so he immediately came up with the following business plan. If he cuts out a subrectangle consisting of three colored stripes, he can sell it as a flag of some country. Innokenty decided that a subrectangle is similar enough to a flag of some country if it consists of three stripes of **equal** heights placed one above another, where each stripe consists of cells of equal color. Of course, the color of the top stripe must be different from the color of the middle stripe; and the color of the middle stripe must be different from the color of the bottom stripe.

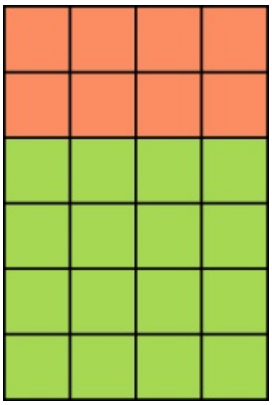
Innokenty has not yet decided what part he will cut out, but he is sure that the flag's boundaries should go along grid lines. Also, Innokenty won't rotate the blanket. Please help Innokenty and count the number of different subrectangles Innokenty can cut out and sell as a flag. Two subrectangles located in different places but forming the same flag are still considered different.

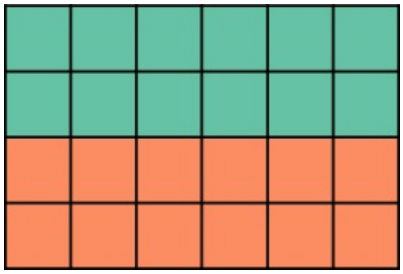


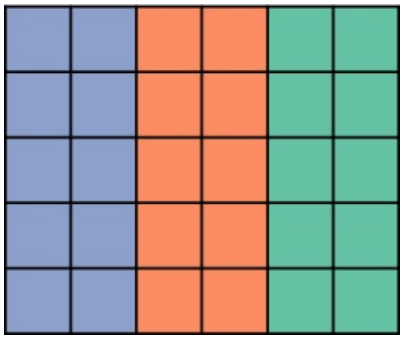


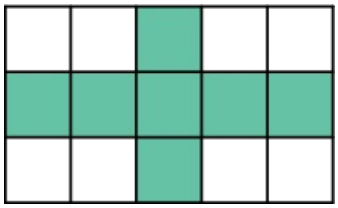
These subrectangles are flags.

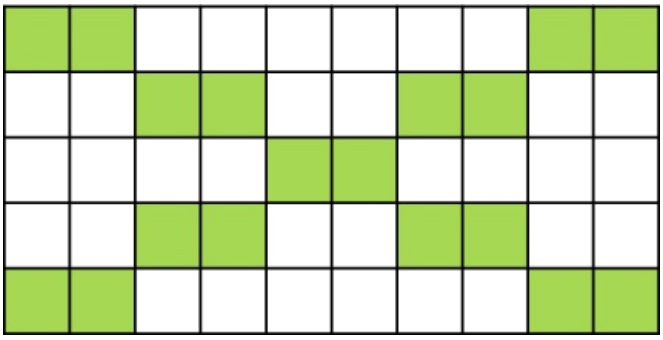












These subrectangles are not flags.

Input

The first line contains two integers n and m ($1 \le n, m \le 1\,000$) — the number of rows and the number of columns on the blanket.

Each of the next n lines contains m lowercase English letters from 'a' to 'z' and describes a row of the blanket. Equal letters correspond to equal colors, different letters correspond to different colors.

Output

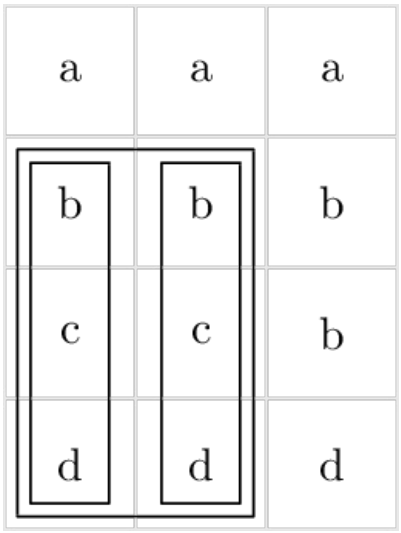
In the only line print the number of subrectangles which form valid flags.

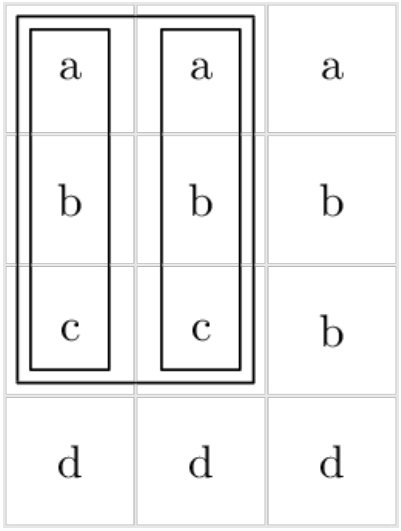
Examples

input
4 3 aaa bbb ccb ddd
output
6

input
6 1 a a b b c c
output
1

Note





The selected subrectangles are flags in the first example.

D. Irrigation

time limit per test: 2.5 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Misha was interested in water delivery from childhood. That's why his mother sent him to the annual Innovative Olympiad in Irrigation (IOI). Pupils from all Berland compete there demonstrating their skills in watering. It is extremely expensive to host such an olympiad, so after the first n olympiads the organizers introduced the following rule of the host city selection.

The host cities of the olympiads are selected in the following way. There are m cities in Berland wishing to host the olympiad, they are numbered from 1 to m. The host city of each next olympiad is determined as the city that hosted the olympiad the **smallest** number of times before. If there are several such cities, the city with the **smallest** index is selected among them.

Misha's mother is interested where the olympiad will be held in some specific years. The only information she knows is the above selection rule and the host cities of the first n olympiads. Help her and if you succeed, she will ask Misha to avoid flooding your house.

Input

The first line contains three integers n, m and q ($1 \le n, m, q \le 500\,000$) — the number of olympiads before the rule was introduced, the number of cities in Berland wishing to host the olympiad, and the number of years Misha's mother is interested in, respectively.

The next line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le m$), where a_i denotes the city which hosted the olympiad in the i-th year. Note that before the rule was introduced the host city was chosen arbitrarily.

Each of the next q lines contains an integer k_i ($n + 1 \le k_i \le 10^{18}$) — the year number Misha's mother is interested in host city in.

Output

Print q integers. The i-th of them should be the city the olympiad will be hosted in the year k_i.

Examples

input
6 4 10 3 1 1 1 2 2 7 8 9 10 11 12 13 14 15 16
output
4 3 4 2 3 4 1 2 3 4

input
4 5 4 4 4 5 1 15 9 13 6

output
5 3 3 3

Note

In the first example Misha's mother is interested in the first 10 years after the rule was introduced. The host cities these years are 4, 3, 4, 2, 3, 4, 1, 2, 3, 4.

In the second example the host cities after the new city is introduced are 2, **3**, 1, 2, **3**, 5, 1, 2, **3**, 4, **5**, 1.

E1. A Story of One Country (Easy)

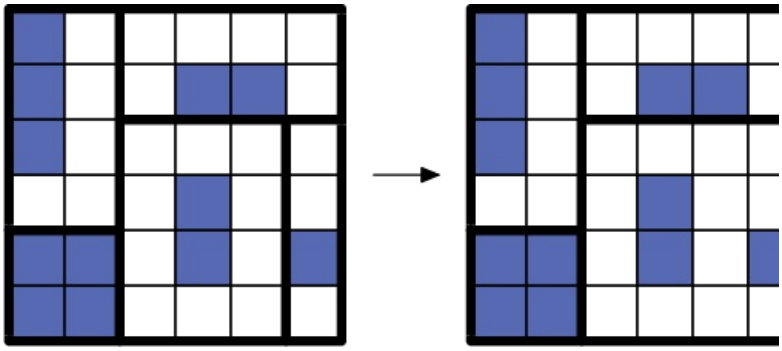
time limit per test: 4 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

This problem differs from the next problem only in constraints.

Petya decided to visit Byteland during the summer holidays. It turned out that the history of this country is quite unusual.

Initially, there were n different countries on the land that is now Berland. Each country had its own territory that was represented as a rectangle on the map. The sides of the rectangle were parallel to the axes, and the corners were located at points with integer coordinates. Territories of no two countries intersected, but it was possible that some territories touched each other. As time passed, sometimes two countries merged into one. It only happened if the union of their territories was also a rectangle. In the end only one country remained — Byteland.

Initially, each country had a rectangular castle inside its territory. Its sides were parallel to the axes and its corners had integer coordinates. Some castles might touch the border of the corresponding country and sides or other castles. Miraculously, after all the unions the castles are still intact. Unfortunately, their locations are the only information we have to restore the initial territories of the countries.



The possible formation of Byteland. The castles are shown in blue.

Petya wonders why no information about the initial countries remained. He suspected that the whole story is a fake. You were recommended to him as a smart person. Please check whether or not there exists a possible set of initial territories that could make the story true.

Input

The first line contains a single integer n ($1 \le n \le 1000$) — the number of countries and castles.

Each of the next n lines contains four integers a_i, b_i, c_i, d_i ($0 \le a_i < c_i \le 10^9$, $0 \le b_i < d_i \le 10^9$) — the coordinates of the i-th castle, where (a_i, b_i) are the coordinates of the lower left corner and (c_i, d_i) are the coordinates of the upper right corner.

It is guaranteed, that no two castles intersect, however, they may touch.

Output

If there exists a possible set of territories that satisfies the story, print "YES", otherwise print "NO".

You can print each letter in any case (upper or lower).

Examples

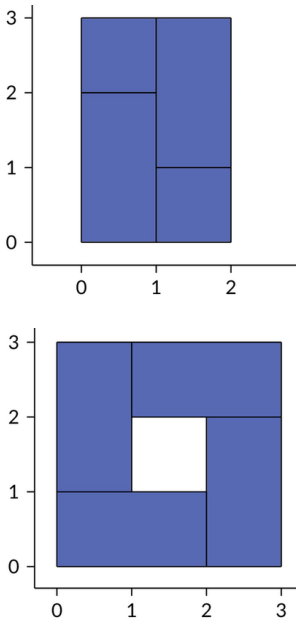
input
4 0 0 1 2 0 2 1 3 1 0 2 1

1 1 2 3
output
YES

input
4 0 0 2 1 1 2 3 3 2 0 3 2 0 1 1 3
output
NO

Note

The castles in the first and second examples are shown on the pictures below.



E2. A Story of One Country (Hard)

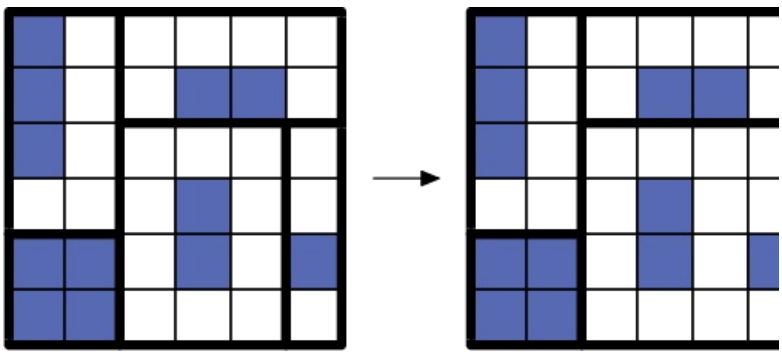
time limit per test: 4 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

This problem differs from the previous problem only in constraints.

Petya decided to visit Byteland during the summer holidays. It turned out that the history of this country is quite unusual.

Initially, there were n different countries on the land that is now Berland. Each country had its own territory that was represented as a rectangle on the map. The sides of the rectangle were parallel to the axes, and the corners were located at points with integer coordinates. Territories of no two countries intersected, but it was possible that some territories touched each other. As time passed, sometimes two countries merged into one. It only happened if the union of their territories was also a rectangle. In the end only one country remained — Byteland.

Initially, each country had a rectangular castle inside its territory. Its sides were parallel to the axes and its corners had integer coordinates. Some castles might touch the border of the corresponding country and sides or other castles. Miraculously, after all the unions the castles are still intact. Unfortunately, their locations are the only information we have to restore the initial territories of the countries.



The possible formation of Byteland. The castles are shown in blue.

Petya wonders why no information about the initial countries remained. He suspected that the whole story is a fake. You were recommended to him as a smart person. Please check whether or not there exists a possible set of initial territories that could make

the story true.

Input

The first line contains a single integer n ($1 \le n \le 100\,000$) — the number of countries and castles.

Each of the next n lines contains four integers a_i, b_i, c_i, d_i ($0 \le a_i < c_i \le 10^9$, $0 \le b_i < d_i \le 10^9$) — the coordinates of the i-th castle, where (a_i, b_i) are the coordinates of the lower left corner and (c_i, d_i) are the coordinates of the upper right corner.

It is guaranteed that no two castles intersect, however, they may touch.

Output

If there exists a possible set of territories that satisfies the story, print "YES", otherwise print "NO".

You can print each letter in any case (upper or lower).

Examples

input
4 0 0 1 2 0 2 1 3 1 0 2 1 1 1 2 3
output
YES

input
4 0 0 2 1 1 2 3 3 2 0 3 2 0 1 1 3
output
NO

Note

The castles in the first and second examples are shown on the pictures below.