Codeforces Round #367 (Div. 2)

A. Beru-taxi

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

Vasiliy lives at point (a, b) of the coordinate plane. He is hurrying up to work so he wants to get out of his house as soon as possible. New app suggested n available Beru-taxi nearby. The i-th taxi is located at point (x_i, y_i) and moves with a speed v_i.

Consider that each of n drivers will move directly to Vasiliy and with a maximum possible speed. Compute the minimum time when Vasiliy will get in any of Beru-taxi cars.

Input

The first line of the input contains two integers a and b ($-100 \le a, b \le 100$) — coordinates of Vasiliy's home.

The second line contains a single integer n ($1 \le n \le 1000$) — the number of available Beru-taxi cars nearby.

The i-th of the following n lines contains three integers x_i, y_i and v_i ($-100 \le x_i, y_i \le 100$, $1 \le v_i \le 100$) — the coordinates of the i-th car and its speed.

It's allowed that several cars are located at the same point. Also, cars may be located at exactly the same point where Vasiliy lives.

Output

Print a single real value — the minimum time Vasiliy needs to get in any of the Beru-taxi cars. You answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if .

Examples

input

```
0 0
2
2 0 1
0 2 2
```

output

```
1.00000000000000000000
```

input

```
1 3
3
3 3 2
-2 3 6
-2 7 10
```

output

```
0.50000000000000000000
```

Note

In the first sample, first taxi will get to Vasiliy in time 2, and second will do this in time 1, therefore 1 is the answer.

In the second sample, cars 2 and 3 will arrive simultaneously.

B. Interesting drink

Vasiliy likes to rest after a hard work, so you may often meet him in some bar nearby. As all programmers do, he loves the famous drink "Beecola", which can be bought in n different shops in the city. It's known that the price of one bottle in the shop i is equal to x_i coins.

Vasiliy plans to buy his favorite drink for q consecutive days. He knows, that on the i-th day he will be able to spent m_i coins. Now, for each of the days he want to know in how many different shops he can buy a bottle of "Beecola".

Input

The first line of the input contains a single integer n ($1 \leq n \leq 100\,000$) — the number of shops in the city that sell Vasiliy's favourite drink.

The second line contains n integers x_i ($1 \leq x_i \leq 100\,000$) — prices of the bottles of the drink in the i-th shop.

The third line contains a single integer q ($1 \leq q \leq 100\,000$) — the number of days Vasiliy plans to buy the drink.

Then follow q lines each containing one integer m_i ($1 \leq m_i \leq 10^9$) — the number of coins Vasiliy can spent on the i-th day.

Output

Print q integers. The i-th of them should be equal to the number of shops where Vasiliy will be able to buy a bottle of the drink on the i-th day.

Example

input
5
3 10 8 6 11
4
1
10
3
11

output
0
4
1
5

Note

On the first day, Vasiliy won't be able to buy a drink in any of the shops.

On the second day, Vasiliy can buy a drink in the shops 1, 2, 3 and 4.

On the third day, Vasiliy can buy a drink only in the shop number 1.

Finally, on the last day Vasiliy can buy a drink in any shop.

C. Hard problem

Vasiliy is fond of solving different tasks. Today he found one he wasn't able to solve himself, so he asks you to help.

Vasiliy is given n strings consisting of lowercase English letters. He wants them to be sorted in lexicographical order (as in the dictionary), but he is not allowed to swap any of them. The only operation he is allowed to do is to reverse any of them (first character becomes last, second becomes one before last and so on).

To reverse the i-th string Vasiliy has to spent c_i units of energy. He is interested in the minimum amount of energy he has to spent in order to have strings sorted in lexicographical order.

String A is lexicographically smaller than string B if it is shorter than B ($|A| < |B|$) and is its prefix, or if none of them is a prefix of the other and at the first position where they differ character in A is smaller than the character in B.

For the purpose of this problem, two equal strings nearby do not break the condition of sequence being sorted lexicographically.

Input

The first line of the input contains a single integer n ($2 \leq n \leq 100\,000$) — the number of strings.

The second line contains n integers c_i ($0 \leq c_i \leq 10^9$), the i-th of them is equal to the amount of energy Vasiliy has to spent in order to reverse the i-th string.

Then follow n lines, each containing a string consisting of lowercase English letters. The total length of these strings doesn't exceed $100\,000$.

Output

If it is impossible to reverse some of the strings such that they will be located in lexicographical order, print - 1. Otherwise, print the minimum total amount of energy Vasiliy has to spent.

Examples

input
2 1 2 ba ac
output
1

input
3 1 3 1 aa ba ac
output
1

input
2 5 5 bbb aaa
output
- 1

input
2 3 3 aaa aa
output
- 1

Note

In the second sample one has to reverse string 2 or string 3. To amount of energy required to reverse the string 3 is smaller.

In the third sample, both strings do not change after reverse and they go in the wrong order, so the answer is - 1.

In the fourth sample, both strings consists of characters 'a' only, but in the sorted order string "aa" should go before string "aaa", thus the answer is

D. Vasiliy's Multiset

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Author has gone out of the stories about Vasiliy, so here is just a formal task description.

You are given q queries and a multiset A, initially containing only integer 0. There are three types of queries:

1. "+ x" — add integer x to multiset A.
2. "- x" — erase one occurrence of integer x from multiset A. It's guaranteed that at least one x is present in the multiset A before this query.
3. "? x" — you are given integer x and need to compute the value , i.e. the maximum value of bitwise exclusive OR (also know as XOR) of integer x and some integer y from the multiset A.

Multiset is a set, where equal elements are allowed.

Input

The first line of the input contains a single integer q ($1 \le q \le 200\,000$) — the number of queries Vasiliy has to perform.

Each of the following q lines of the input contains one of three characters '+', '-' or '?' and an integer x_i ($1 \le x_i \le 10^9$). It's guaranteed that there is at least one query of the third type.

Note, that the integer 0 will always be present in the set A.

Output

For each query of the type '?' print one integer — the maximum value of bitwise exclusive OR (XOR) of integer x_i and some integer from the multiset A.

Example

input
```
10
+ 8
+ 9
+ 11
+ 6
+ 1
? 3
- 8
? 3
? 8
? 11
```

output
```
11
10
14
13
```

Note

After first five operations multiset A contains integers 0, 8, 9, 11, 6 and 1.

The answer for the sixth query is integer — maximum among integers , , , and .

E. Working routine

time limit per test: 2.5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vasiliy finally got to work, where there is a huge amount of tasks waiting for him. Vasiliy is given a matrix consisting of n rows and m columns and q tasks. Each task is to swap two submatrices of the given matrix.

For each task Vasiliy knows six integers a_i, b_i, c_i, d_i, h_i, w_i, where a_i is the index of the row where the top-left corner of the first rectangle is located, b_i is the index of its column, c_i is the index of the row of the top-left corner of the second rectangle, d_i is the index of its column, h_i is the height of the rectangle and w_i is its width.

It's guaranteed that two rectangles in one query do not overlap and do not touch, that is, no cell belongs to both rectangles, and no two cells belonging to different rectangles **share a side**. However, rectangles are allowed to share an angle.

Vasiliy wants to know how the matrix will look like after all tasks are performed.

Input

The first line of the input contains three integers n, m and q ($2 \le n, m \le 1000$, $1 \le q \le 10\,000$) — the number of rows and columns in matrix, and the number of tasks Vasiliy has to perform.

Then follow n lines containing m integers $v_{i,j}$ ($1 \le v_{i,j} \le 10^9$) each — initial values of the cells of the matrix.

Each of the following q lines contains six integers a_i, b_i, c_i, d_i, h_i, w_i ($1 \le a_i, c_i, h_i \le n$, $1 \le b_i, d_i, w_i \le m$).

Output

Print n lines containing m integers each — the resulting matrix.

Examples

input

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

output

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

input

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

output

```
2 2
1 1
2 2
1 1
```