Codeforces Round #292 (Div. 1)

A. Drazil and Factorial

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

Drazil is playing a math game with Varda.

Let's define $F(x)$ for positive integer x as a product of factorials of its digits. For example, $F(135) = 1! * 3! * 5! = 720$.

First, they choose a decimal number a consisting of n digits that contains at least one digit larger than 1. This number may possibly start with leading zeroes. Then they should find maximum positive number x satisfying following two conditions:

1. x doesn't contain neither digit 0 nor digit 1.

2. $F(x) = F(a)$.

Help friends find such number.

Input

The first line contains an integer n ($1 \le n \le 15$) — the number of digits in a.

The second line contains n digits of a. There is at least one digit in a that is larger than 1. Number a may possibly contain leading zeroes.

Output

Output a maximum possible integer satisfying the conditions above. There should be no zeroes and ones in this number decimal representation.

Sample test(s)

input
4 1234
output
33222

input
3 555
output
555

Note

In the first case, $F(1234) = 1! * 2! * 3! * 4! = 288 = F(33222)$

B. Drazil and Tiles

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

Drazil created a following problem about putting 1×2 tiles into an $n \times m$ grid:

"There is a grid with some cells that are empty and some cells that are occupied. You should use 1×2 tiles to cover all empty cells and no two tiles should cover each other. And you should print a solution about how to do it."

But Drazil doesn't like to write special checking program for this task. His friend, Varda advised him: "how about asking contestant only to print the solution *when it exists and it is unique*? Otherwise contestant may print 'Not unique' ".

Drazil found that the constraints for this task may be much larger than for the original task!

Can you solve this new problem?

Note that you should print 'Not unique' either when there exists no solution or when there exists several different solutions for the original task.

Input

The first line contains two integers n and m ($1 \le n, m \le 2000$).

The following n lines describe the grid rows. Character '.' denotes an empty cell, and the character '*' denotes a cell that is occupied.

Output

If there is no solution or the solution is not unique, you should print the string "Not unique".

Otherwise you should print how to cover all empty cells with 1×2 tiles. Use characters "<>" to denote horizontal tiles and characters "^v" to denote vertical tiles. Refer to the sample test for the output format example.

Sample test(s)

input
3 3 ... .*. ...
output
Not unique

input
4 4 ..** *... *.** ....
output
<>** *^<> *v** <><>

input
2 4 *..* ....
output
<> <><>

input
1 1 .
output
Not unique

input
1 1 *
output
*

Note
In the first case, there are indeed two solutions:

```
<>^
^*v
v<>
```
and

```
^<>
v*^
<>v
```
so the answer is "`Not unique`".

C. Drazil and Park

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

Drazil is a monkey. He lives in a circular park. There are n trees around the park. The distance between the i-th tree and $(i+1)$-st trees is d_i, the distance between the n-th tree and the first tree is d_n. The height of the i-th tree is h_i.

Drazil starts each day with the *morning run*. The morning run consists of the following steps:

- Drazil chooses two different trees
- He starts with climbing up the first tree
- Then he climbs down the first tree, runs around the park (in one of two possible directions) to the second tree, and climbs on it
- Then he finally climbs down the second tree.

But there are always children playing around some consecutive trees. Drazil can't stand children, so he can't choose the trees close to children. He even can't stay close to those trees.

If the two trees Drazil chooses are x-th and y-th, we can estimate the energy the *morning run* takes to him as $2(h_x + h_y) + dist(x, y)$. Since there are children on exactly one of two arcs connecting x and y, the distance $dist(x, y)$ between trees x and y is uniquely defined.

Now, you know that on the i-th day children play between a_i-th tree and b_i-th tree. More formally, if $a_i \le b_i$, children play around the trees with indices from range $[a_i, b_i]$, otherwise they play around the trees with indices from $[a_i, n] \cup [1, b_i]$.

Please help Drazil to determine which two trees he should choose in order to consume the most energy (since he wants to become fit and cool-looking monkey) and report the resulting amount of energy for each day.

Input

The first line contains two integer n and m ($3 \le n \le 10^5$, $1 \le m \le 10^5$), denoting number of trees and number of days, respectively.

The second line contains n integers $d_1, d_2, ..., d_n$ ($1 \le d_i \le 10^9$), the distances between consecutive trees.

The third line contains n integers $h_1, h_2, ..., h_n$ ($1 \le h_i \le 10^9$), the heights of trees.

Each of following m lines contains two integers a_i and b_i ($1 \le a_i, b_i \le n$) describing each new day. There are always at least two different trees Drazil can choose that are not affected by children.

Output

For each day print the answer in a separate line.

Sample test(s)

input

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

output

```
12
16
18
```

input

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

output

```
17
22
11
```

D. Drazil and Morning Exercise

time limit per test: 3.5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Drazil and Varda are the earthworm couple. They want to find a good place to bring up their children. They found a good ground containing nature hole. The hole contains many rooms, some pairs of rooms are connected by small tunnels such that earthworm can move between them.

Let's consider rooms and small tunnels as the vertices and edges in a graph. This graph is a *tree*. In the other words, any pair of vertices has an unique path between them.

Each room that is *leaf* in the graph is connected with a ground by a vertical tunnel. Here, *leaf* is a vertex that has only one outgoing edge in the graph.

Each room is large enough only to fit one earthworm living in it. Earthworm can't live in a tunnel.

Drazil and Varda have a plan to educate their children. They want all their children to do morning exercises immediately after getting up!

When the morning is coming, all earthworm children get up in the same time, then each of them chooses the **farthest** path to the ground for gathering with others (these children are lazy, so they all want to do exercises as late as possible).

Drazil and Varda want the difference between the time first earthworm child arrives outside and the time the last earthworm child arrives outside to be not larger than l (otherwise children will spread around the ground and it will be hard to keep them exercising together).

Also, The rooms that are occupied by their children should form a *connected* set. In the other words, for any two rooms that are occupied with earthworm children, all rooms that lie on the path between them should be occupied with earthworm children too.

How many children Drazil and Varda may have at most in order to satisfy all conditions above? Drazil and Varda want to know the answer for many different choices of l.

(Drazil and Varda don't live in the hole with their children)

Input

The first line contains one integer n denoting how many rooms there are in the hole ($2 \le n \le 10^5$).

Then there are n - 1 lines following. Each of these lines contains three integers x, y, v ($1 \le x, y \le n$, $1 \le v \le 10^6$) denoting there is a small tunnel between room x and room y that takes time v to pass.

Suppose that the time for an earthworm to get out to the ground from any leaf room is the same.

The next line contains an integer q ($1 \le q \le 50$), denoting the number of different value of l you need to process.

The last line contains q numbers, each number denoting a value of l ($1 \le l \le 10^{11}$).

Output

You should print q lines. Each line should contain one integer denoting the answer for a corresponding value of l.

Sample test(s)

input

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

output

```
1
3
3
3
5
```

input

```
12
5 9 3
2 1 7
11 7 2
6 5 5
2 5 3
6 7 2
1 4 4
8 5 7
1 3 8
11 12 3
10 8 2
10
13 14 14 13 13 4 6 7 2 1
```

output

```
10
10
10
10
10
3
3
5
2
1
```

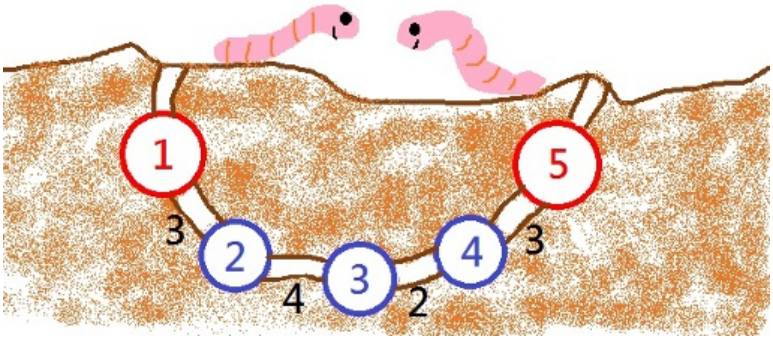
Note

For the first sample the hole looks like the following. Rooms 1 and 5 are leaves, so they contain a vertical tunnel connecting them to the ground. The lengths of farthest path from rooms $1-5$ to the ground are $12, 9, 7, 9, 12$ respectively.

If l = 1, we may only choose any single room.

If l = 2..4, we may choose rooms 2, 3, and 4 as the answer.

If l = 5, we may choose all rooms.



E. Drazil and His Happy Friends

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

Drazil has many friends. Some of them are happy and some of them are unhappy. Drazil wants to make all his friends become happy. So he invented the following plan.

There are n boys and m girls among his friends. Let's number them from 0 to $n - 1$ and 0 to $m - 1$ separately. In i-th day, Drazil invites $(i \bmod n)$-th boy and $(i \bmod m)$-th girl to have dinner together (as Drazil is programmer, i starts from 0). If one of those two people is happy, the other one will also become happy. Otherwise, those two people remain in their states. Once a person becomes happy (or if it is happy originally), he stays happy forever.

Drazil wants to know on which day all his friends become happy or to determine if they won't become all happy at all.

Input

The first line contains two integer n and m ($1 \le n, m \le 10^9$).

The second line contains integer b ($0 \le b \le min(n, 10^5)$), denoting the number of happy boys among friends of Drazil, and then follow b distinct integers $x_1, x_2, ..., x_b$ ($0 \le x_i < n$), denoting the list of indices of happy boys.

The third line conatins integer g ($0 \le g \le min(m, 10^5)$), denoting the number of happy girls among friends of Drazil, and then follow g distinct integers $y_1, y_2, ... , y_g$ ($0 \le y_j < m$), denoting the list of indices of happy girls.

It is guaranteed that there is at least one person that is unhappy among his friends.

Output

Print the number of the first day that all friends of Drazil become happy. If this day won't come at all, you print -1.

Sample test(s)

input
2 3 0 1 0
output
4

input
2 4 1 0 1 2
output
-1

input
2 3 1 0 1 1
output
2

input
99999 100000 2 514 415 2 50216 61205
output
4970100515

Note

By $i \bmod k$ we define the remainder of integer division of i by k.

In first sample case:

- On the 0-th day, Drazil invites 0-th boy and 0-th girl. Because 0-th girl is happy at the beginning, 0-th boy become happy at this day.
- On the 1-st day, Drazil invites 1-st boy and 1-st girl. They are both unhappy, so nothing changes at this day.
- On the 2-nd day, Drazil invites 0-th boy and 2-nd girl. Because 0-th boy is already happy he makes 2-nd girl become happy at this day.
- On the 3-rd day, Drazil invites 1-st boy and 0-th girl. 0-th girl is happy, so she makes 1-st boy happy.
- On the 4-th day, Drazil invites 0-th boy and 1-st girl. 0-th boy is happy, so he makes the 1-st girl happy. So, all friends become happy at this moment.