Codeforces Round #305 (Div. 1)

A. Mike and Frog

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

Mike has a frog and a flower. His frog is named Xaniar and his flower is named Abol. Initially(at time 0), height of Xaniar is h_1 and height of Abol is h_2. Each second, Mike waters Abol and Xaniar.

So, if height of Xaniar is h_1 and height of Abol is h_2, after one second height of Xaniar will become $(x_1 h_1 + y_1) \bmod m$ and height of Abol will become $(x_2 h_2 + y_2) \bmod m$ where x_1, y_1, x_2 and y_2 are some integer numbers and $a \bmod b$ denotes the remainder of a modulo b.

Mike is a competitive programmer fan. He wants to know the minimum time it takes until height of Xania is a_1 and height of Abol is a_2.

Mike has asked you for your help. Calculate the minimum time or say it will never happen.

Input

The first line of input contains integer m ($2 \le m \le 10^6$).

The second line of input contains integers h_1 and a_1 ($0 \le h_1, a_1 < m$).

The third line of input contains integers x_1 and y_1 ($0 \le x_1, y_1 < m$).

The fourth line of input contains integers h_2 and a_2 ($0 \le h_2, a_2 < m$).

The fifth line of input contains integers x_2 and y_2 ($0 \le x_2, y_2 < m$).

It is guaranteed that $h_1 \neq a_1$ and $h_2 \neq a_2$.

Output

Print the minimum number of seconds until Xaniar reaches height a_1 and Abol reaches height a_2 or print -1 otherwise.

Examples

input
5 4 2 1 1 0 1 2 3
output
3

input
1023 1 2 1 0 1 2 1 1
output
-1

Note

In the first sample, heights sequences are following:

Xaniar: $4 \to 0 \to 1 \to 2$

Abol: $0 \to 3 \to 4 \to 1$

B. Mike and Feet

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

Mike is the president of country What-The-Fatherland. There are n bears living in this country besides Mike. All of them are standing in a line and they are numbered from 1 to n from left to right. i-th bear is exactly a_i feet high.

A group of bears is a non-empty contiguous segment of the line. The *size* of a group is the number of bears in that group. The *strength* of a group is the minimum height of the bear in that group.

Mike is a curious to know for each x such that $1 \le x \le n$ the maximum strength among all groups of size x.

Input

The first line of input contains integer n ($1 \le n \le 2 \times 10^5$), the number of bears.

The second line contains n integers separated by space, $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$), heights of bears.

Output

Print n integers in one line. For each x from 1 to n, print the maximum strength among all groups of size x.

Examples

input
10 1 2 3 4 5 4 3 2 1 6
output
6 4 4 3 3 2 2 1 1 1

C. Mike and Foam

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

Mike is a bartender at Rico's bar. At Rico's, they put beer glasses in a special shelf. There are n kinds of beer at Rico's numbered from 1 to n. i-th kind of beer has a_i milliliters of foam on it.

Maxim is Mike's boss. Today he told Mike to perform q queries. Initially the shelf is empty. In each request, Maxim gives him a number x. If beer number x is already in the shelf, then Mike should remove it from the shelf, otherwise he should put it in the shelf.

After each query, Mike should tell him the score of the shelf. Bears are geeks. So they think that the score of a shelf is the number of pairs (i, j) of glasses in the shelf such that $i < j$ and $\gcd(a_i, a_j) = 1$ where $\gcd(a, b)$ is the greatest common divisor of numbers a and b.

Mike is tired. So he asked you to help him in performing these requests.

Input

The first line of input contains numbers n and q ($1 \le n, q \le 2 \times 10^5$), the number of different kinds of beer and number of queries.

The next line contains n space separated integers, $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 5 \times 10^5$), the height of foam in top of each kind of beer.

The next q lines contain the queries. Each query consists of a single integer integer x ($1 \le x \le n$), the index of a beer that should be added or removed from the shelf.

Output

For each query, print the answer for that query in one line.

Examples

input
5 6 1 2 3 4 6 1 2 3 4 5 1

output
0 1 3 5 6 2

D. Mike and Fish

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

As everyone knows, bears love fish. But Mike is a strange bear; He hates fish! The even more strange thing about him is he has an infinite number of blue and red fish.

He has marked n distinct points in the plane. i-th point is point (x_i, y_i). He wants to put exactly one fish in each of these points such that the difference between the number of red fish and the blue fish on each horizontal or vertical line is at most 1.

He can't find a way to perform that! Please help him.

Input

The first line of input contains integer n ($1 \le n \le 2 \times 10^5$).

The next n lines contain the information about the points, i-th line contains two integers x_i and y_i ($1 \le x_i, y_i \le 2 \times 10^5$), the i-th point coordinates.

It is guaranteed that there is at least one valid answer.

Output

Print the answer as a sequence of n characters 'r' (for red) or 'b' (for blue) where i-th character denotes the color of the fish in the i-th point.

Examples

input
4 1 1 1 2 2 1 2 2
output
brrb

input
3 1 1 1 2 2 1
output
brr

E. Mike and Friends

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

What-The-Fatherland is a strange country! All phone numbers there are strings consisting of lowercase English letters. What is double strange that a phone number can be associated with several bears!

In that country there is a rock band called CF consisting of n bears (including Mike) numbered from 1 to n.

Phone number of i-th member of CF is s_i. May 17th is a holiday named Phone Calls day. In the last Phone Calls day, everyone called all the numbers that are substrings of his/her number (one may call some number several times). In particular, everyone called himself (that was really strange country).

Denote as $call(i, j)$ the number of times that i-th member of CF called the j-th member of CF.

The geek Mike has q questions that he wants to ask you. In each question he gives you numbers l, r and k and you should tell him the number

$\sum_{i=l}^{r} call(i, k)$

Input

The first line of input contains integers n and q ($1 \le n \le 2 \times 10^5$ and $1 \le q \le 5 \times 10^5$).

The next n lines contain the phone numbers, i-th line contains a string s_i consisting of lowercase English letters ($1 \le \sum_{i=1}^{n} |s_i| \le 2 \times 10^5$).

The next q lines contain the information about the questions, each of them contains integers l, r and k ($1 \le l \le r \le n$ and $1 \le k \le n$).

Output

Print the answer for each question in a separate line.

Examples

input
5 5 a ab abab ababab b 1 5 1 3 5 1 1 5 2 1 5 3 1 4 5

output
7 5 6 3 6