Problem A. Farmer

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You are given three numbers n, k and x. Construct an array A with the following properties:

- A contains exactly n elements.
- All elements of A are positive integers smaller than 10^6.
- There are **exactly** k pairs of indices (i, j) such that: $1 \le i < j \le n$ and $|A_i - A_j| \ge x$.

Input

Single line of input contains three numbers n $(1 \le n \le 1000)$, k $(0 \le k \le \frac{n \cdot (n-1)}{2})$, x $(2 \le x \le 1000)$.

Output

In single line of output print n integers, elements of array A. In case there is no array with needed properties, print -1

Examples

standard input	standard output
3 2 5	1 8 2

Problem B. MST Camera

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

On a recent team contest your team was the best, and therefore won the best award. A camera. But it's not an ordinary camera, manufacturer of the camera, the famous "MST" company claims that this camera has unique capability. If you use it to picture some set of undirected edges of some graph, it is capable of calculating wheter it is possible to form a tree with these edges, and even better, if edges are weighted it is capable of finding a tree with minimum possible sum of weights of edges.

Your task is to check whether your camera works or not. You have a matrix with R rows and C columns, as well as the number N - the number of nodes in the graph. In every field of the matrix, you have one undirected edge of the graph. You should answer on Q queries, where each query is some submatrix of the original matrix. Answer to that query is the sum of weights of edges of minimum spanning tree, formed with edges in the given submatrix.

Formally, in field which is in row i and column j ($1 \le i \le R$, $1 \le j \le C$), you have three numbers $U_{i,j}$, $V_{i,j}$ and $W_{i,j}$, which means that in the field (i,j), there is an edge between node $U_{i,j}$ and $V_{i,j}$, with weight $W_{i,j}$. After that you have Q queries. Each query is described by four numbers X_1, Y_1, X_2, Y_2 ($1 \le X_1 \le X_2 \le R$, $1 \le Y_1 \le Y_2 \le C$), where (X_1, Y_1) is the upper left corner of the given submatrix, and (X_2, Y_2) is the bottom right corner of the submatrix. For each query consider graph with all N nodes and edges from the given submatrix. If there exists minimum spanning tree, you should print the sum of weights of tree edges. If spanning tree doesn't exist, you should print "-1" (quotes for clarity). For each query, condition: $\frac{2}{3} \le \frac{X_2-X_1+1}{Y_2-Y_1+1} \le \frac{3}{2}$ holds.

Input

In first line, there are numbers N, R, C and Q ($2 \le N \le 40$, $1 \le R, C \le 250$, $1 \le Q \le 200000$).

R rows follow and in each of them $3C$ numbers. In ith row the numbers are: $U_{i,1}$, $V_{i,1}$, $W_{i,1}$, $U_{i,2}$, $V_{i,2}$, $W_{i,2}$,...,$U_{i,C}$, $V_{i,C}$, $W_{i,C}$ ($0 \le W_{i,j} \le 65535$, for each $1 \le j \le C$).

Q rows follow and in each of them 4 numbers - X_1, Y_1, X_2 and Y_2.

Output

Print Q rows, in ith row answer to the ith query.

Examples

standard input	standard output
4 3 4 3 1 2 1 1 2 2 1 2 3 1 2 100 2 3 2 2 3 3 2 3 1 2 3 101 3 4 3 3 4 1 3 4 2 3 4 102 1 1 3 4 1 2 3 3 3 4 3 4	3 4 -1

Problem C. Winning Ballot

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Loznica is a city in Serbia, famous by history, culture, pleasant weather... and lottery! Lottery in Loznica is held with following rules:

- Ballot contains combination of N natural numbers, smaller than 10^{18} will be picked.
- In this lottery, numbers can repeat and order of them is important.

Aljoha, the hero of our story, using some obscure utilities, managed to find out some information about the next winning ballot. Let the future combination be L_i, $1 \leq i \leq N$. Aloha managed to find out an array containing $N-1$ numbers, in which the ith number A_i represents the largest number which divides both L_i and L_{i+1}.

Now Aljoha wants to bet, and for that noble goal he needs help. Print one combination which satisfies the constraints or -1, if that kind of combination doesn't exist. If there are more combinations that satisfy given constraints, print any of them. Note that only combinations in which all numbers are strictly smaller than 10^{18} are valid.

Input

First line contains number N ($1 \leq N \leq 10^5$), length of combination.

Second line contains $N-1$ numbers not greater than 10^9, describing the information that Aljoha found out.

Output

Print N numbers, strictly less than 10^{18}, describing some combination which satisfies the constraints or -1 if there is no such combination.

Examples

standard input	standard output
4 3 4 10	3 12 20 10
4 3 4 6	-1

Problem D. JAG Strikes Back

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	128 mebibytes

JAG is the new revolutionary game of the company $BEST$. In this game players play T rounds and in each round they have a map of N territories. Exactly $N-1$ pairs of these territories have common border. This map is connected, that is, for every two territories u and v, you can walk from u to v, possibly by crossing some other territories. Players are choosing territories in turns, until all territories are chosen. There are two rules:

- Moves can't be skipped.
- Player can't choose territory already chosen by him or the other player.

We define distance between two territories u and v as the smallest possible number of borders, that you have to cross on some path from u to v. First player's goal is to minimize the distance between two furthest territories chosen by him. Second player's goal is to maximize that distance. Print the distance between two furthest territories chosen by the first player, if both players play in the optimal way.

Input

In the first line of input is the number of rounds T. Description of T rounds follows.

For each round, in the first line, there is the number N ($3 \leq N \leq 10^5$), representing the number of territories. In the following $N-1$ lines there are two numbers u and v, representing pair of territories having common border. It is guaranteed that you can walk from any territory to any other territory by crossing some borders.

It is guaranteed that the sum of N over all of the rounds doesn't exceed 200000.

Output

Print T lines, in ith of them the distance between two furthest territories of the first player, if both players play in the optimal way.

Example

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

Problem E. My Number

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Taaaamara is big fan of the Serbian quiz “Slagalica”. Her favourite game in the quiz is “My Number”. In this game you get a set of integers S and one target number T. You can use use each element from S at most once and some mathematical operations to build a valid mathematical expression equal to T. For example, if you have $S = 2, 5, 2, 15, 10$ and $T = 38$, one valid expression can be: $2 * (15 + 5) - 2$.

Today, Taaaamara is playing one modification of this game:

- She has an array A with n integers, all elements in A are target numbers.
- She needs to find an array B with k elements (elements in B don't have to be different), all elements in B should be integers in range $[1, 10^8]$.
- She wants to build one valid mathematical expression for each of the target numbers A_i using only elements from B. In case some element appears x times in B, you can use that element at most x times for each of the expressions.
- She can use the following binary operators: $'+'$ (addition), $'-'$ (substraction),$'*'$ (multiplication), **Divison is not allowed**. She can use brackets too.
- The length of array B (k) is not fixed, but as everybody knows Taaaamara is smart girl, so she wants to find an array B with length not bigger than 12 ($k \leq 12$).

Can you help her?

Input

First line of input contains number n ($1 \leq n \leq 124$). Second line of input contains n integers, array A ($1 \leq A_i \leq 10^8$).

Output

In the first line of output print number $k \leq 12$, the length of array B. In the second line of output print k integers, elements of array B. Each of next n lines contains one valid mathematical expression, in the i-th line, the value of the expression should be equal to A_i. Expressions should be in the following format:

- Each expression has at most 1000 characters.
- For the addition of two numbers you can use character ‘`+`’ (ascii value 43).
- For the substraction of two numbers you can use character ‘`-`’ (ascii value 45).
- For the multiplication of two numbers you can use character ‘`*`’ (ascii value 42).
- for brackets use characters ‘`(`’ (ascii value 40) and ‘`)`’ (ascii value 41).
- **It is not allowed to use operators ‘+’ and ‘−’ as unary operators**. For example expressions $-5 + 3$ and $5 - -3$ are not valid.
- Besides the characters listed above you can only use numbers from B and space charactes ‘ ’ (ascii value 32). Special formatting of the output is not needed (see example).

Examples

standard input	standard output
6 30 13 15 5 3 21	3 2 5 3 2*5*3 5*3- 2 5 *3 (5) 5 -2 3* (5+2)

Problem F. Knocking Down

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

John doesn't know how to drive a car. However he keeps going to driving license tests. For that purpose, he goes to a local farm, where N flags are placed on the ground, ith of them on location (x_i, y_i). John's goal is to drive around and knock down as little flags as possible.

John's archenemy - the Instructor, thinks that John will knock down too many flags and cause mayhem. He has decided to fix one point of John's car using his ancient staff, and thus force John's car to only rotate around that fixed point.

Formally, you have number of flags, their location and four numbers X, Y, A and B, describing a rectangle, where (X, Y) is the upper left corner of the rectangle, A is the width and B is the height of the rectangle (that rectangle represents John's car). Your goal is to fix one point of that rectangle, in such way, that when the rectangle rotates around it's fixed point as little as possible flags will be knocked down. We consider flag knocked down if it will be inside or on the edge of the rectangle at some point during the rotation. Print the number of flags that will be knocked down.

Input

In first line there is a natural number N ($1 \le N \le 10^5$), representing the number of flags.

In the second line, there are four integers X, Y, A and B ($-10^7 \le X, Y \le 10^7$), ($2 \le A, B \le 10^7$, A **and** B **are even**), describing John's car.

In the following N lines, there are two integers x_i and y_i ($1 \le x_i, y_i \le 10^7$), describing locations of the flags.

Output

In only line of output, print the number K - the number of flags that will be knocked down, when the location of fixed point is chosen in an optimal way.

Examples

standard input	standard output
5 -12 8 20 12 9 1 -9 -9 3 12 13 -4 -5 13	2

Problem G. Rats

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

You are given an infinite line covered with a periodically repeating string A (there are infinitely many concatenated copies of the string A in the line). **The line doesn't have a beginning or an end.** You are given a set S with M strings. You need to build new string B as concatanation of strings from S. String B must satisfy the following conditions:

- After covering a new empty infinite line with infinitely many concatenations of the string B, the line should be identical with string A.
- In case there are several valid strings B or several valid constructions of the string B, you should choose B and its construction which minimize number of strings used from S.

You can use the same string from S several times, but every time you count it as new string. You can concatenate all strings in any order, but you are not allowed to change the order of letters in the string. In case there is no proper way to build some string B, print -1.

Input

- The first line contains string A ($1 \le |A| \le 500$).
- The second line contains the integer M ($1 \le M \le 10^5$), number of strings in set S.
- Each of next M lines contains one string from S, i-th line contains string L_i ($1 \le |L_i| \le |A|$). Sum of lengths of strings from set S is smaller than 10^6 ($\sum_{i=1}^{M} |L_i| \le 10^6$).

Output

Print one integer — minimum number of string instances from S needed to build string B.

Example

standard input	standard output
baabaa 3 a b c	3

Note

You can use one string "b" and two strings "a", to build $B =$ "aba":

...*baabaabaabaa*...

.....*abaabaabaaba*...

Problem H. Coins

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	128 mebibytes

You are given an $N \times N$ matrix and in exactly N of its cells there is a single coin. You are going to play a game on this matrix where in one turn you can take a coin and move it to any adjacent cell. Two cells are adjacent if they share a side. However, during these moves, no two coins may occupy the same cell at the same time. Your goal is to make every row and column contain exactly one coin in as few moves as possible. Determine the minimum number of moves required.

Input

In the first line of input is the number N ($N \leq 200000$): the number of rows, columns and coins.

In the $(i+1)$-th line are two integers r_i and c_i, denoting the initial row and column of the i-th coin. It is guaranteed that all pairs (r_i, c_i) are different.

Output

Print a single integer: the minimum number of moves required to win at the game.

Example

standard input	standard output
3 2 1 2 2 2 3	2

Problem I. Marbles

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	128 mebibytes

You are given a track of length L. On it there are N marbles at positions $A_1, A_2 \cdots, A_N$ and N switches at positions $B_1, B_2, \cdots, B_N$, both of negligably small size. In the beginning, you direct each marble left or right and they all start moving at the constant speed of 1 in the given direction. When two marbles collide, they bounce off each other elastically, meaning that they continue moving in opposite directions at the same speed. If a marble collides with the beginning or end of the track it bounces off with the same speed in the opposite direction. Keep in mind that it takes exactly one second for a marble at position i to travel to the position $i+1$ or $i+1$, and it also takes exactly one second to travel from 1 back to 1 while changing directions, or to travel from L back to L while changing directions. The goal is to have a marble on top of every switch. You need to find the minimum amount of time needed to achieve this.

Input

In the first line of input you are given L ($L \le 10^9$) and N ($N \le 3000$)

In the second line of input you are given $A_1, A_2 \cdots, A_N$, the initial positions of the marbles. All A_i are guaranteed to be distinct, and $1 \le A_i \le L$.

In the second line of input you are given $B_1, B_2 \cdots, B_N$, the initial positions of the marbles. All B_i are guaranteed to be distinct, and $1 \le B_i \le L$.

Output

Print one integer: the minimum amount of time to have a marble on top of every switch.

Example

standard input	standard output
4 2 2 4 1 4	1

Problem J. Notebook

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	128 mebibytes

Ivan is writing down numbers in his notebook. In the beginning he has a set of integers S written down. Afterwards, he may write down new numbers in his notebook, by using the following operations:

- If he has the number x written, he may write down $2x$.
- If he has the number x written, and x is divisible by 2, he may write down $\frac{x}{2}$.
- If he has the **distinct** numbers x and y written, he may write down $x \text{xor} y$.

Denote by $f(S)$ the minimal number Ivan can write down in his notebook for the starting set S.

You are given an array of length N and Q queries where you have to perfortm one of the following operations:

- Change the value of the $a[x]$ to y.
- Find the value of $f(\{a[L], a[L+1], \cdots, a[R]\})$.

Input

In the first line of input is the numbers N ($N \leq 100000$): the length of the array.

In the second line of input is N integers $a[1], a[2], \cdots, a[N]$ ($0 < a[i] < 2^{62}$), the elements of a.

In the thirst line of input is the number Q ($Q \leq 100000$): the number of queries.

The following Q lines describe the queires. A query can either be of the format "$1xy$" meaning set $a[x]$ ($1 \leq x \leq N$) to y ($0 < y < 2^62$), or of the format "$2lr$" meaning find the value of $f(\{a[L], a[L+1], \cdots, a[R]\})$ ($1 \leq L \leq R \leq N$).

Output

For every query of type two print the value of $f(\{a[L], a[L+1], \cdots, a[R]\})$ in a single line.

Example

standard input	standard output
3 3 5 15 3 2 1 3 1 2 11 2 1 2	3 1

Problem K. Aunts

Input file:	*standard input*
Output file:	*standard output*
Time limit:	6 seconds
Memory limit:	128 mebibytes

The organizing comittee of this contest is made from a bunch of slackers who's rather do anything than prepare a contest. As a result of this, N of them reported that they have to bring some medicine to their aunt, so that they can get away without doing anything. All of their aunts live within a $A \times B$ matrix. They all report their absence to Dzoni, who takes a note of the cell that their aunt's house is located as well as the altitude it's located in. Dzoni doesn't know the actual altitudes, but he knows that in every two adjacent cells in the matrix, the absolute difference of their altitudes is **exaclty** 1. Having this in mind, after every claim made by a member of the organizing comittee he tries to reconstruct all the altitudes, meaning that he will check if its possible to assign each cell with an altitude so that all of the reports are true. If after some report, Dzoni is unable to reconstruct the altitudes (and since it's Dzoni, if it's possible, he'll be able to do it), it's obvious that the organizing comittee member that just made the report said something really stupid. Your job is to find the member who said something really stupid.

Input

In the first line of the input there are three integers N, A and B denoting the number of comittee members ($N \leq 10^5$), the number of rows and the number of columns of the matrix ($A, B \leq 10^9$).

In each of the following N lines, there are three integers R_i, C_i and H_i denoting the row, column ($R_i \leq A, C_i \leq B$) and altitude ($1 \leq H_i \leq 10^8$) of the i-th organizing comittee's alleged aunt's house.

Output

In the first and only line write the index of the comittee member who said something really stupid (comittee members are indexed from 1). If such a member doesn't exist, print "bravo komisijo" (meaning "congratulations, ogranizing comittee" in Serbian) without the quotation marks.

Example

standard input	standard output
4 3 5 1 2 1 2 1 3 2 5 21 2 2 8	3

Problem L. Wise man

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

Dzoni, a wise man from Serbia, knows the answers for all of the world's questions except one ?! Can you solve this question for him:

On the first day you are given a number A. Every following day, your number A will be changed in following way: $A = (A + biggestDigit(A))\ mod\ M$. Can you predict the number at the N-th day?

The function $biggestDigit(A)$ returns the digit with the biggest value in the number A. For example: $biggestDigit(172) = 7$.

Input

The single line of input contains three numbers, A $(1 \le A < M)$, M $(1 \le M \le 10^{18})$ and N $(1 \le N \le 10^{18})$.

Output

In the single line, print the value of A at the N-th day.

Examples

standard input	standard output
2014 2015 1	2014
14 25 115	16