ADA Homework 4

Deadline: July 11, 2018

**The problems of this assignment are chosen from codeforces and the titles are hyperlinked.*

1 Preparing Olympiad

You have n problems. You have estimated the difficulty of the i-th one as integer c_i. Now you want to prepare a problemset for a contest, using some of the problems you've made.

A problemset for the contest must consist of at least two problems. You think that the total difficulty of the problems of the contest must be at least l and at most r. Also, you think that the difference between difficulties of the easiest and the hardest of the chosen problems must be at least x.

Find the number of ways to choose a problemset for the contest.

Input

The first line contains four integers n, l, r, x ($1 \leq n \leq 15$, $1 \leq l \leq r \leq 10^9$, $1 \leq x \leq 10^6$) — the number of problems you have, the minimum and maximum value of total difficulty of the problemset and the minimum difference in difficulty between the hardest problem in the pack and the easiest one, respectively.

The second line contains n integers $c_1, c_2, ..., c_n$ ($1 \leq c_i \leq 10^6$) — the difficulty of each problem.

Output

Print the number of ways to choose a suitable problemset for the contest.

Examples

input
3 5 6 1 1 2 3
output
2

input
4 40 50 10 10 20 30 25
output
2

input
5 25 35 10 10 10 20 10 20
output
6

Note

In the first example two sets are suitable, one consisting of the second and third problem, another one consisting of all three problems.

In the second example, two sets of problems are suitable — the set of problems with difficulties 10 and 30 as well as the set of problems with difficulties 20 and 30.

In the third example any set consisting of one problem of difficulty 10 and one problem of difficulty 20 is suitable.

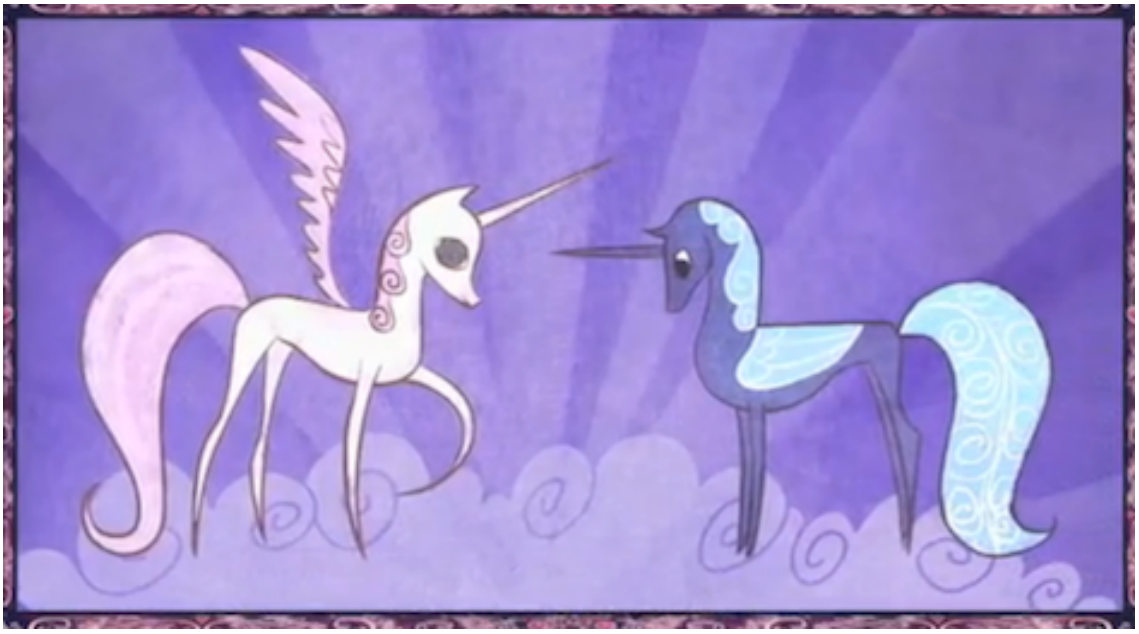
2 Little Pony and Summer Sun Celebration

Twilight Sparkle learnt that the evil Nightmare Moon would return during the upcoming Summer Sun Celebration after one thousand years of imprisonment on the moon. She tried to warn her mentor Princess Celestia, but the princess ignored her and sent her to Ponyville to check on the preparations for the celebration. Twilight Sparkle wanted to track the path of Nightmare Moon. Unfortunately, she didn't know the exact path. What she knew is the parity of the number of times that each place Nightmare Moon visited. Can you help Twilight Sparkle to restore any path that is consistent with this information?

Ponyville can be represented as an undirected graph (vertices are places, edges are roads between places) without self-loops and multi-edges. The path can start and end at any place (also it can be empty). Each place can be visited multiple times. The path must not visit more than $4n$ places.

Input

The first line contains two integers n and m ($2 \leq n \leq 10^5$; $0 \leq m \leq 10^5$) — the number of



places and the number of roads in Ponyville. Each of the following m lines contains two integers u_i, v_i ($1 \le u_i, v_i \le n$; $ui \ne vi$), these integers describe a road between places u_i and v_i.

The next line contains n integers: $x_1, x_2, ..., x_n$ ($0 \le x_i \le 1$) — the parity of the number of times that each place must be visited. If $x_i = 0$, then the i-th place must be visited even number of times, else it must be visited odd number of times.

Output

Output the number of visited places k in the first line ($0 \le k \le 4n$). Then output k integers — the numbers of places in the order of path. If $x_i = 0$, then the i-th place must appear in the path even number of times, else i-th place must appear in the path odd number of times. Note, that given road system has no self-loops, therefore any two neighbouring places in the path must be distinct.

If there is no required path, output -1. If there multiple possible paths, you can output any of them.

Examples

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

input
5 7 1 2 1 3 1 4 1 5 3 4 3 5 4 5 0 1 0 1 0
output
10 2 1 3 4 5 4 5 4 3 1

input
2 0 0 0
output
0

3 Freelancer's Dreams

Mikhail the Freelancer dreams of two things: to become a cool programmer and to buy a flat in Moscow. To become a cool programmer, he needs at least p experience points, and a desired

flat in Moscow costs q dollars. Mikhail is determined to follow his dreams and registered at a freelance site.

He has suggestions to work on n distinct projects. Mikhail has already evaluated that the participation in the i-th project will increase his experience by a_i per day and bring b_i dollars per day. As freelance work implies flexible working hours, Mikhail is free to stop working on one project at any time and start working on another project. Doing so, he receives the respective share of experience and money. Mikhail is only trying to become a cool programmer, so he is able to work only on one project at any moment of time.

Find the real value, equal to the minimum number of days Mikhail needs to make his dream come true.

For example, suppose Mikhail is suggested to work on three projects and $a_1 = 6, b_1 = 2, a_2 = 1, b_2 = 3, a_3 = 2, b_3 = 6$. Also, $p = 20$ and $q = 20$. In order to achieve his aims Mikhail has to work for 2.5 days on both first and third projects. Indeed, $a_1 \cdot 2.5 + a_2 \cdot 0 + a_3 \cdot 2.5 = 6 \cdot 2.5 + 1 \cdot 0 + 2 \cdot 2.5 = 20$ and $b_1 \cdot 2.5 + b_2 \cdot 0 + b_3 \cdot 2.5 = 2 \cdot 2.5 + 3 \cdot 0 + 6 \cdot 2.5 = 20$.

Input

The first line of the input contains three integers n, p and q ($1 \le n \le 100000, 1 \le p, q \le 1000000$) — the number of projects and the required number of experience and money.

Each of the next n lines contains two integers a_i and b_i ($1 \le ai, bi \le 1000000$) — the daily increase in experience and daily income for working on the i-th project.

Output

Print a real value — the minimum number of days Mikhail needs to get the required amount of experience and money. Your 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 $\frac{|a-b|}{max(1,b)} \le 10^{-6}$.

Examples

input
3 20 20 6 2 1 3 2 6
output
5.000000000000000

input
4 1 1 2 3 3 2 2 3 3 2
output
0.400000000000000

Note

First sample corresponds to the example in the problem statement.

4 Red and Black Tree

You have a weighted tree, consisting of n vertices. Each vertex is either painted black or is painted red. A red and black tree is called beautiful, if for any its vertex we can find a black vertex at distance at most x.

The distance between two nodes is the shortest path between them.

You have a red and black tree. Your task is to make it beautiful in the minimum number of color swap operations. In one color swap operation, you can choose two vertices of different colors and paint each of them the other color. In other words, if you choose a red vertex p and a black vertex q, then in one operation you are allowed to paint p black and paint q red.

Print the minimum number of required actions.

Input

The first line contains two integers n and x ($2 \leq n \leq 500$; $1 \leq x \leq 10^9$). The next line contains n integers, each of them is either a zero or one. If the i-th number equals 1, then vertex i of the tree is black, otherwise vertex i is red. Next $n - 1$ lines contain the tree edges. The j-th line contains integers u_j v_j w_j ($1 \leq u_j, v_j \leq n$; $u_j \neq v_j$; $1 \leq w_j \leq 10^9$) which means that the tree has an edge of weight w_j between vertices v_j and u_j.

Assume that the tree vertices are numbered from 1 to n.

Output

Print a single integer — the minimum number of required swap operations.

If it is impossible to get a beautiful tree at any number of operations, print -1.

Examples

input
3 2 1 0 0 1 2 2 2 3 2
output
1

input
4 2 0 1 0 0 1 2 2 2 3 2 3 4 2
output
-1