Codeforces Round #383 (Div. 2)

A. Arpa's hard exam and Mehrdad's naive cheat

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

There exists an island called Arpa's land, some beautiful girls live there, as ugly ones do.

Mehrdad wants to become minister of Arpa's land. Arpa has prepared an exam. Exam has only one question, given n, print the last digit of 1378^n.

Mehrdad has become quite confused and wants you to help him. Please help, although it's a naive cheat.

Input
The single line of input contains one integer n ($0 \le n \le 10^9$).

Output
Print single integer — the last digit of 1378^n.

Examples

input
1
output
8

input
2
output
4

Note
In the first example, last digit of $1378^1 = 1378$ is 8.

In the second example, last digit of $1378^2 = 1378 \cdot 1378 = 1898884$ is 4.

B. Arpa's obvious problem and Mehrdad's terrible solution

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

There are some beautiful girls in Arpa's land as mentioned before.

Once Arpa came up with an obvious problem:

Given an array and a number x, count the number of pairs of indices i, j $(1 \le i < j \le n)$ such that , where is bitwise `xor` operation (see notes for explanation).

Immediately, Mehrdad discovered a terrible solution that nobody trusted. Now Arpa needs your help to implement the solution to that problem.

Input

First line contains two integers n and x $(1 \le n \le 10^5, 0 \le x \le 10^5)$ — the number of elements in the array and the integer x.

Second line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 10^5)$ — the elements of the array.

Output

Print a single integer: the answer to the problem.

Examples

input
2 3 1 2
output
1

input
6 1 5 1 2 3 4 1
output
2

Note

In the first sample there is only one pair of $i = 1$ and $j = 2$. so the answer is 1.

In the second sample the only two pairs are $i = 3, j = 4$ (since) and $i = 1, j = 5$ (since).

A bitwise `xor` takes two bit integers of equal length and performs the logical `xor` operation on each pair of corresponding bits. The result in each position is 1 if only the first bit is 1 or only the second bit is 1, but will be 0 if both are 0 or both are 1. You can read more about bitwise `xor` operation here: https://en.wikipedia.org/wiki/Bitwise_operation#XOR.

C. Arpa's loud Owf and Mehrdad's evil plan

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

As you have noticed, there are lovely girls in Arpa's land.

People in Arpa's land are numbered from 1 to n. Everyone has exactly one crush, i-th person's crush is person with the number $crush_i$.

Someday Arpa shouted *Owf* loudly from the top of the palace and a funny game started in Arpa's land. The rules are as follows.

The game consists of rounds. Assume person x wants to start a round, he calls $crush_x$ and says: "Oww...wwf" (the letter `w` is repeated t times) and cuts off the phone immediately. If $t > 1$ then $crush_x$ calls $crush_{crush_x}$ and says: "Oww...wwf" (the letter `w` is repeated $t - 1$ times) and cuts off the phone immediately. The round continues until some person receives an "Owf" ($t = 1$). This person is called the *Joon-Joon* of the round. There can't be two rounds at the same time.

Mehrdad has an evil plan to make the game more funny, he wants to find smallest t ($t \geq 1$) such that for each person x, if x starts some round and y becomes the Joon-Joon of the round, then by starting from y, x would become the Joon-Joon of the round. Find such t for Mehrdad if it's possible.

Some strange fact in Arpa's land is that someone can be himself's crush (i.e. $crush_i = i$).

Input

The first line of input contains integer n ($1 \leq n \leq 100$) — the number of people in Arpa's land.

The second line contains n integers, i-th of them is $crush_i$ ($1 \leq crush_i \leq n$) — the number of i-th person's crush.

Output

If there is no t satisfying the condition, print `-1`. Otherwise print such smallest t.

Examples

input
4 2 3 1 4
output
3

input
4 4 4 4 4
output
-1

input
4 2 1 4 3
output
1

Note

In the first sample suppose $t = 3$.

If the first person starts some round:

The first person calls the second person and says "Owwwf", then the second person calls the third person and says "Owwf", then the third person calls the first person and says "Owf", so the first person becomes Joon-Joon of the round. So the condition is satisfied if x is 1.

The process is similar for the second and the third person.

If the fourth person starts some round:

The fourth person calls himself and says "Owwwf", then he calls himself again and says "Owwf", then he calls himself for another time and says "Owf", so the fourth person becomes Joon-Joon of the round. So the condition is satisfied when x is 4.

In the last example if the first person starts a round, then the second person becomes the Joon-Joon, and vice versa.

D. Arpa's weak amphitheater and Mehrdad's valuable Hoses

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

Just to remind, girls in Arpa's land are really nice.

Mehrdad wants to invite some Hoses to the palace for a dancing party. Each Hos has some weight w_i and some beauty b_i. Also each Hos may have some friends. Hoses are divided in some friendship groups. Two Hoses x and y are in the same friendship group if and only if there is a sequence of Hoses $a_1, a_2, ..., a_k$ such that a_i and a_{i+1} are friends for each $1 \le i < k$, and $a_1 = x$ and $a_k = y$.

Arpa allowed to use the amphitheater of palace to Mehrdad for this party. Arpa's amphitheater can hold at most w weight on it.

Mehrdad is so greedy that he wants to invite some Hoses such that sum of their weights is not greater than w and sum of their beauties is as large as possible. Along with that, from each friendship group he can either invite all Hoses, or no more than one. Otherwise, some Hoses will be hurt. Find for Mehrdad the maximum possible total beauty of Hoses he can invite so that no one gets hurt and the total weight doesn't exceed w.

Input

The first line contains integers n, m and w ($1 \le n \le 1000$, , $1 \le w \le 1000$) — the number of Hoses, the number of pair of friends and the maximum total weight of those who are invited.

The second line contains n integers $w_1, w_2, ..., w_n$ ($1 \le w_i \le 1000$) — the weights of the Hoses.

The third line contains n integers $b_1, b_2, ..., b_n$ ($1 \le b_i \le 10^6$) — the beauties of the Hoses.

The next m lines contain pairs of friends, the i-th of them contains two integers x_i and y_i ($1 \le x_i, y_i \le n, x_i \ne y_i$), meaning that Hoses x_i and y_i are friends. Note that friendship is bidirectional. All pairs (x_i, y_i) are distinct.

Output

Print the maximum possible total beauty of Hoses Mehrdad can invite so that no one gets hurt and the total weight doesn't exceed w.

Examples

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

input
4 2 11 2 4 6 6 6 4 2 1 1 2 2 3
output
7

Note

In the first sample there are two friendship groups: Hoses $\{1, 2\}$ and Hos $\{3\}$. The best way is to choose all of Hoses in the first group, sum of their weights is equal to 5 and sum of their beauty is 6.

In the second sample there are two friendship groups: Hoses $\{1, 2, 3\}$ and Hos $\{4\}$. Mehrdad can't invite all the Hoses from the first group because their total weight is $12 > 11$, thus the best way is to choose the first Hos from the first group and the only one from the second group. The total weight will be 8, and the total beauty will be 7.

E. Arpa's overnight party and Mehrdad's silent entering

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

Note that girls in Arpa's land are really attractive.

Arpa loves overnight parties. In the middle of one of these parties Mehrdad suddenly appeared. He saw n pairs of friends sitting around a table. i-th pair consisted of a boy, sitting on the a_i-th chair, and his girlfriend, sitting on the b_i-th chair. The chairs were numbered 1 through $2n$ in clockwise direction. There was exactly one person sitting on each chair.

There were two types of food: Kooft and Zahre-mar. Now Mehrdad wonders, was there any way to serve food for the guests such that:

- Each person had exactly one type of food,
- No boy had the same type of food as his girlfriend,
- Among any three guests sitting on consecutive chairs, there was two of them who had different type of food. Note that chairs $2n$ and 1 are considered consecutive.

Find the answer for the Mehrdad question. If it was possible, find some arrangement of food types that satisfies the conditions.

Input

The first line contains an integer n ($1 \leq n \leq 10^5$) — the number of pairs of guests.

The i-th of the next n lines contains a pair of integers a_i and b_i ($1 \leq a_i, b_i \leq 2n$) — the number of chair on which the boy in the i-th pair was sitting and the number of chair on which his girlfriend was sitting. It's guaranteed that there was exactly one person sitting on each chair.

Output

If there is no solution, print `-1`.

Otherwise print n lines, the i-th of them should contain two integers which represent the type of food for the i-th pair. The first integer in the line is the type of food the boy had, and the second integer is the type of food the girl had. If someone had Kooft, print 1, otherwise print 2.

If there are multiple solutions, print any of them.

Example

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