A tale never loses in the telling

When we tell a piece of news to someone and that person tells it to someone else, there are always differences in the transmitted information. The content can change a lot or very slightly, depending on the accuracy of the intermediate individual. That is why someone can hear quite different versions of the same facts.

Let the *interference degree* of a person be the degree of inexactness with which the person reproduces information. Now, suppose that a piece of information travels across $m + 1$ distinct individuals, $p_0, p_1, \ldots, p_m$, whose interference degrees are $i_0, i_1, \ldots, i_m$, respectively. So, the source of the information is person p_0, who tells it to p_1, then p_1 tells it to p_2, then p_2 tells it to p_3, and so on. The *noise* in the information, which somehow quantifies its extent of inexactness, is defined as follows (where N is a positive number, called the *noise parameter*). When the information reaches p_1, the noise is 0. When the information reaches p_2, the noise is i_1. When the information reaches p_3, the noise is $i_1 N + i_2$. In the general case, when the information reaches p_m (for every $m \geq 2$), the noise is:

$$i_1 \, N^{m-2} + i_2 \, N^{m-3} + \cdots + i_{m-2} \, N^1 + i_{m-1} \, N^0 \, .$$

Task

Given a set of people, their interference degrees and their friendship relations, two distinct individuals (s and t) and a noise parameter, the goal is to compute the minimum possible noise (W) in a piece of information whose source is s when it reaches target t. Since noise values can be very large numbers, your program should write the value of W modulo 2^{45}.

You may assume that all pieces of information whose source is s always reach target t.

Input

The first line has four integers: P, which is the number of people; s, which is the source of the piece of information; t, which is the target person; and N, which is the noise parameter. Individuals are identified by integers, ranging from 0 to $P - 1$. Notice that $s \neq t$.

The following P lines contain each a single integer. The first of these lines has the interference degree i_0 of person 0, the second one has the interference degree i_1 of person 1, and so on. So, the last of these lines has the interference degree i_{P-1} of person $P - 1$.

The next line contains a single integer, R, which is the number of friendship pairs. Each of the following R lines specifies a different friendship pair. It has two distinct integers, x and y, representing that persons x and y tell news to each other.

Constraints

$2 \leq P < 10\,000$	(Number of people)
$P < N \leq 10\,000$	(Noise parameter)
$1 \leq i_k \leq P$	(Interference degree of person k, for $k = 0, 1, \ldots, P-1$)
$1 \leq R \leq 50\,000$	(Number of friendship pairs)

Output

A single line with the minimum possible noise of a piece of information whose source is s when it reaches target t, modulo 2^{45}.

Sample Input

```
7 1 5 10
5
3
2
7
3
2
1
8
1 0
0 2
6 5
6 2
2 5
1 4
5 3
3 4
```

Sample Output

```
37
```