Problem A. Parallel universe traversal

Input file: `portal.inp`
Output file: `portal.out`
Time limit: 3 seconds
Memory limit: 1024 megabytes

According to the parallel universe assumption, whenever you are facing some selections, you actually pick all of them, and multiple parallel universes are formed.

Zamira, a gifted scientist, successfully creates a machine that can create portals between some parallel universes. Initially, there are n parallel universes and m portals connecting between some universes such that there are no cycles.

Zamira wants to create a new portal to connect universe u and universe v. But since the machine is very unstable, it will create a portal randomly. More specifically, denote U as the set of universes that are reachable from u, and V as the set of universes that are reachable from v. The machine will create a portal connecting two universes $a \in U$ and $b \in V$ randomly. But opening a portal randomly is very dangerous; the danger index of opening is the longest single path of the newly created component.

Zamira has Q assumptions of the form uv, asking you to calculate the expected danger index if she uses the machine to create a portal between u and v. Since she is not very good at risk assessing, she asks her bestfriend, you, to do it for her.

Please not that the assumptions do not add any edges.

Input

- First line contains three integers representing n, m, Q ($1 \leq m < n \leq 10^6; 1 \leq Q \leq 10^5$).
- The next m lines, the i-th line contains two integers u_i, v_i meaning that initially there is a portal connecting between universe u_i and universe v_i.
- The next Q lines, each line contains two integers u, v representing an assumption.

Output

Consists of Q lines, the i-th line contains the expected danger index of the i assumption.

Suppose that the expected danger index is $E = \frac{P}{Q}$ where $\frac{P}{Q}$ is a reduced fraction. You have to output $P \times Q^{-1} \mod 10^9 + 7$.

In case u and v are initially connected, output -1.

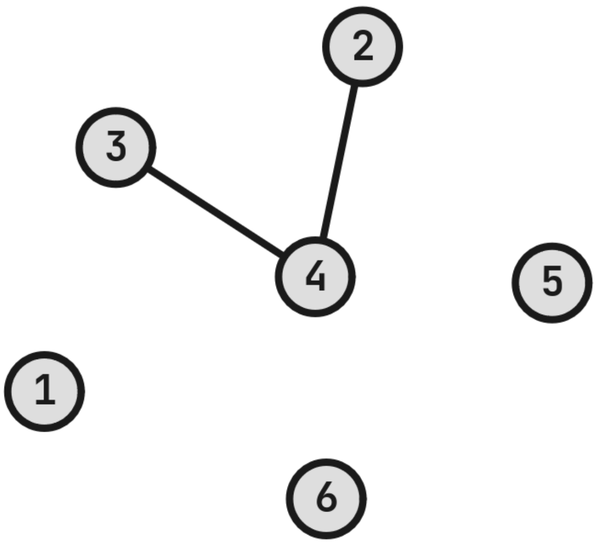
Scoring

No.	Add. constraints	Points	Req. groups
1	$n, m, Q \leq 100$	20%	—
2	$n \times (n-1) = m \times (m+1)$	5%	—
3	$\forall 1 \leq i \leq m, \lvert u_i - v_i \rvert \leq 1$	30%	—
4	—	45%	$1, 2, 3$

Example

portal.inp	portal.out
6 2 4 3 4 4 2 4 2 4 1 2 5 1 6	-1 666666674 666666674 1

Note



This is the graph representing the universes and portals in the example. In the second assumption, the expected danger index is the average of three cases: edge $1-4$, $1-3$, $1-2$. Thus the answer is $E = \frac{2+3+2}{3} = \frac{7}{3}$, which is $E \equiv 666666674 \mod 10^9 + 7$.

Problem B. Ant moving

Input file:	`ant.inp`
Output file:	`ant.out`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

There are n ants on the number line. Some ants move to the right; some others move to the left. Given the ants initial position and the moving direction, count the number of collisions, providing that after two ants collide with each other, they both turn and move in the opposite direction.

You think this problem is too easy? So does the problem setter. Because of that, he has decided to give you a more complex problem.

There are n ants on the number line. The ith ant, initially standing at position x_i and having the speed of v_i, moves to the right with the probability of $\frac{p_i}{100}$ and moves to the left with the probability of $\frac{100-p_i}{100}$. Please note that the moving direction of each ant is chosen only **once** at the starting time, and every ant will persist in moving the same direction afterward. You have to calculate the expected time of the first collision. In case there are no collisions, consider the time of the first collision as 0.

Input

- The first line contains a single integer n ($1 \le n \le 10^5$).
- The next n lines, each line contains three integers x_i, v_i, p_i ($|x_i| \le 10^9; 1 \le v_i \le 10^6; 0 \le p_i \le 100$). It is guaranteed that x_i is distinct and sorted in increasing order.

Output

One single number representing the expected time of the first collision.

Suppose that the answer is $E = \frac{P}{Q}$ where $\frac{P}{Q}$ is a reduced fraction. You have to answer $P \times Q^{-1} \mod 10^9+7$.

Scoring

No.	Add. constraints	Points	Req. groups
1	$n \le 15$	20%	—
2	$p_i \in \{0, 100\}$	10%	—
3	$n \le 1000$	30%	1
4	—	40%	1, 2, 3

Example

ant.inp	ant.out

`2`
`7 10 50`
`9 4 50`
	`119047620`

Note

In the above sample:

- There is a 25% chance that two ants will move away from each other, making the time to the first collision 0.
- There is a 50% chance that the two ants will move in the same direction, making the time to the first collision $\frac{|7-9|}{|10-4|} = \frac{1}{3}$.

- There is a 50% chance that the two ants will move toward each other, making the time to the first collision $\frac{|7-9|}{|10+4|} = \frac{1}{7}$.

The expected time of the first collision is $E = 25\% \times 0 + 50\% \times \frac{1}{3} + 25\% \times \frac{1}{7} = \frac{17}{84}$.
And we can also prove that $E = \frac{17}{84} \equiv 119047620 \mod 10^9 + 7$.

Problem C. A true gambler

Input file:	`walk.inp`
Output file:	`walk.out`
Time limit:	1 second
Memory limit:	256 megabytes

Hue city consists of n places and $n-1$ roads connecting these places together so that from one place you can go to any other place.

Kotoha is initially at place numbered S. He wants to move from place S to place T. But since he's a true gambler, he has a gambler's way of moving. More specifically, suppose that he is standing at place x, he will pick a place that is adjacent to x uniformly at random and move to that place. If he moves to place T, then he will stop the process of moving.

For each place $1 \le i \le n$, Kotoha wants you to calculate the number of expected times he has entered that place in the process of moving from S to T.

Please note that standing at S initially counts as 1 time entering place S.

Input

- The first line contains three integers n, S, T $(1 \le S, T \le n \le 10^5)$.
- The next $n-1$ lines, the i-th line contains two integers u_i, v_i representing a road connecting place u_i and place v_i.

Output

Contains n numbers, the i-th number representing the number of expected times Kotoha enters place i.

Suppose that the number of expected moves is $x = \frac{P}{Q}$ where $\frac{P}{Q}$ is a reduced fraction. You have to output $P \times Q^{-1} \mod 10^9+7$.

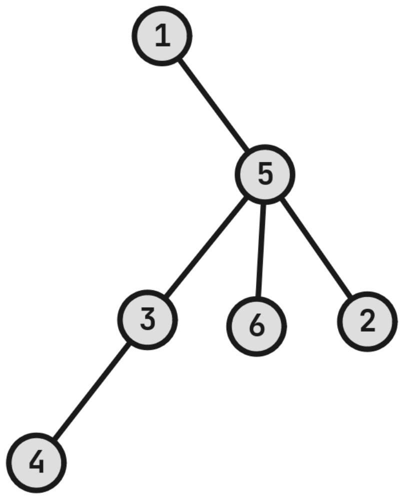
Scoring

No.	Add. constraints	Points	Req. groups
1	$n \le 100$	25%	—
2	$\lvert u_i - v_i \rvert \le 1, S = 1, T = n$	25%	—
3	$\lvert u_i - v_i \rvert \le 1$	25%	2
4	—	25%	1, 2, 3

Examples

walk.inp	walk.out
3 1 2 2 3 2 1	1 1 0
6 2 4 1 5 2 5 3 4 3 5 5 6	2 3 2 1 8 2

Note



This is the graph for the second sample test. There will be no explanation for the sample test because the act of explanation will give out the solution for this problem.