ADA Lab 2 (Section A)

A. Elegant Card Sequence

1 second, 256 megabytes

There are N cards arranged in a row. Each of these cards has a colour on both faces, where colours are denoted by positive integers. $Card_i$ has the colors A_i and B_i on either of its side, respectively.

You can flip over cards so the i^{th} card has either side (A_i or B_i) on top. However, you cannot reorder the cards. For instance, arrangements $[A_1, B_2, A_3], [B_1, A_2, A_3], [B_1, B_2, B_3]$ are possible, but $[B_2, A_3, A_1]$ is not a valid arrangement.

A card sequence is called *elegant* if no two cards showing the same colour are adjacent. For instance, $[1, 2], [3, 4, 3, 7], [11, 13, 10]$ are elegant sequences, but $[2, 2], [4, 3, 3, 7]$ are not.

How many ways are there to arrange the cards in such a way?

Input

The first line contains a single integer N $(1 \leq N \leq 2 * 10^5)$ - the number of cards.

N lines follow. The i^{th} line consists of 2 space-separated integers A_i, B_i $(1 \leq A_i, B_i \leq 10^9)$

Output

Print the number of possible elegant sequences. Since the answer might be large, compute it modulo 998244353.

input
```
3
1 2
4 2
3 4
```
output
```
4
```

input
```
4
1 5
2 6
3 7
4 8
```
output
```
16
```

In the first sample case, The possible arrangements are:

$[A_1, A_2, A_3] = [1, 4, 3]$

$[A_1, B_2, A_3] = [1, 2, 3]$

$[B_1, A_2, A_3] = [2, 4, 3]$

$[A_1, B_2, B_3] = [1, 2, 4]$

In the second sample case, All 2^4 flips give elegant sequences.

B. Easter Hunt

2 seconds, 1024 megabytes

Easter is just 355 days away, and Temi is hard at work designing an Easter egg hunt.

The hunt will be organized in a field, which can be denoted as a tree with N vertices, numbered $1, 2, \ldots, N$. For each i $(1 \leq i \leq N-1)$, the i-th edge connects Vertex u_i and v_i.

Temi has decided that for each vertex of the tree, either an easter egg will be placed or the node will remain empty. To keep the hunt interesting, they are not allowed to place eggs on two adjacent vertices (that is, vertices connected directly via an edge).

Find the number of ways in which the eggs can be placed. Since the number can be large, compute it modulo $10^9 + 7$.

Input

The first line contains a single integer N $(1 \leq N \leq 10^5)$, the number of nodes in the tree.

$N - 1$ lines follow. The i-th such lines contains 2 space-separated integers u_i and v_i $(1 \leq u_i, v_i \leq N)$.

It is guaranteed that the input graph forms a tree.

Output

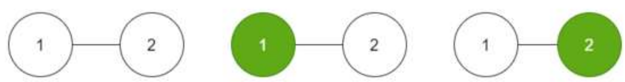
Print the number of ways in which the eggs can be placed, modulo $10^9 + 7$.

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

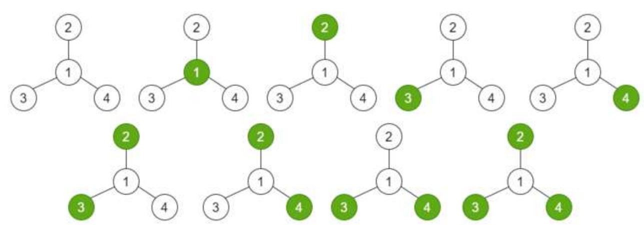
input
```
4
1 2
1 3
1 4
```
output
```
9
```

input
```
10
1 2
1 3
1 4
2 5
2 6
3 7
3 8
4 9
4 10
```
output
```
189
```

In the first test, the 3 possible arrangements are as follows:



In the second test, the 9 possible arrangements are as follows:



In both the diagrams, white vertices denote vertices without an easter egg placed, and coloured vertices denote vertices having an easter egg placed.

C. The Curse Of The Baboon

1.0 s, 256 megabytes

$"Gone\ are\ the\ days\ldots\ When\ the\ world\ knew\ Mr.Kong.\ Now\ hail\ to\ King\ Kong!"$

The vast empire of King Kong now touches the ends of this planet. His kingdom consists of N cities and M undirected roads.

Alas, the great baboon Mr.Wise cursed King Kong such that for any road i $(1 \leq i \leq M)$ that connects cities U_i and V_i, if the queen travels via this road at monkey time t, she'd take $\frac{Y_i}{(t+1)} + X_i$ amount of monkey time to reach city V_i. (NOTE: division here represents integer division). Now the Queen plans to leave the summer capital (city 1) at monkey time 0 or any number of integer monkey time units later such that for any city she visits while going on her journey to the winter capital (city N), she can stay in that city for an integer monkey time units. You being her trusted algorythm expert is tasked with finding this minimum time. If the Queen cannot reach the city N print -1.

Input

First line of input consists of N and M $(2 \leq N \leq 10^5, 0 \leq M \leq 10^5)$. The next M lines contain the description of the undirected roads. The $i^{th}(1 \leq i \leq M)$ line consists of $U_i, V_i, X_i, Y_i (1 \leq U_i, V_i \leq N, 0 \leq X_i, Y_i \leq 10^9)$.

Output

Print the minimum time possible according to the problem statement.

input

```
2 3
1 2 2 3
1 2 2 1
1 1 1 1
```

output

```
3
```

input

```
6 9
1 1 0 0
1 3 1 2
1 5 2 3
5 2 16 5
2 6 1 10
3 4 3 4
3 5 3 10
5 6 1 100
4 2 0 110
```

output

```
20
```