SHOPEE CODE LEAGUE 2020

Shopee Programming Contest #2

Competition Details

The competition starts **from 1pm (GMT+7) / 2pm (GMT+8) to 4:15pm (GMT+7) / 5:15pm (GMT+8).** The **countdown will begin at 1pm (GMT+7) / 2PM (GMT+8) and you will have 3 hours 15min to submit your codes.**

Duration: 3 Hours 15 Minutes (Additional 15 minutes is given for your team to familiarise with the competition platform)

Highest Mountain

Problem Statement

Victor is assigned a task for planning quarterly team outings in Shopee. He is trying to organize an outdoor activity to climb the highest mountain among a mountain range. However, it is difficult to tell which mountain is the highest in the mountain range from a distance. Help Victor to identify the highest mountain given the height of the mountains.

In order to climb a mountain, the mountain needs to either increase or decrease consistently by 1 and has at least one side to be able to be seen connected to the ground. Given that 1 is ground level, “2324” is not a valid mountain to be climbed, while “1234” and “4321” are valid mountains with height of 4.

Find the height of the highest climbable mountain.

Input

The first line will specify the N number of mountain ranges

Subsequent N sets will have length L and a series of numbers separated by space representing the height (H)

Height: 1 <= H <= 1000

Length: 1 <= L <= 1000

Output

Integer specifying the height (H) of the highest mountain and index (I) of the peak. If there are multiple mountains with the same height, return the leftmost mountain.
If the height or index is not available, return -1. Return the result for each case with format “Case #{N}: H I”

Sample Explanation

1 2 3 2 3 4 2 3 2 5
3 has a way to enter from the ground while 4 and 5 doesn't.
The highest mountain will be "1 2 3" with the height of 3 because a mountain can only be either increase or decrease consistently by 1 and not both. When it increase from 1 to 3, it cannot decrease to 2 again.
3 2 3 2 3 **4 3 2 1** 4
4 has a way to enter from the ground and it is decreasing consistently by 1.
2 3 4 5 6
There is no way to enter from the ground.
1 2 4 5
The mountain is unable to jump from 2 to 4.

Sample Input

6

10
1 2 3 2 3 4 2 3 2 5

10
3 2 3 2 3 4 3 2 1 4

5
1 1 1 1 1

10
10 9 8 7 6 5 4 3 2 1

1
5

1
1

Sample Output

Case #1: 3 2
Case #2: 4 5
Case #3: 1 0
Case #4: 10 0
Case #5: -1 -1
Case #6: 1 0

Shopee Logistics

Problem Statement

We have a lot of interesting tasks at Shopee. One of them is a logistics problem. In this problem we need to deliver goods from the hub to the final customer. But before that we can move goods between the hubs. Shopee has a giant network of hubs but in this task will be used the network with **N** hubs and **N - 1** routes between hubs. Each hub is reachable from any other hub.

One of the problems of logistics is to optimise network. Before optimising we need to do some research and find some routes with problems. For example, find the largest path and make a route between two hubs the most distant. We are calling it “The longest path”.

In this task we are asking you to find the second longest path in the Shopee network. Don’t need to output the path! We need only the length!

Input

Input starts with an integer **N (5 ≤ N ≤ 105)**, denoting the number of hubs. Next **N - 1** lines contain three values: two hubs and the route length between them. **Li ≤ 105**.

Output

Print one line. The length of the second longest path.

Sample Explanation

The longest path will be 1->2->5: (8). The second longest path will be 1->2->4. (7)

Sample Input

```
5
1 2 5
2 3 1
2 4 2
2 5 3
```

Sample Output
7

Connectivity

Problem Statement

In Shopee Data Center, there are many switches and some of the switches are interconnected to form a network. Sometimes, we add a new connection to the network and if we find that there is some issue, we may remove the last added connections. You will need to solve a similar problem.

You are given an empty network with **N** switches (numbered 1 to N) and no connections between switches. You will also face **Q** scenarios in chronological order. Each scenario can be any of the following:

PUSH u v : You have to add a new connection between switches u and v. ($u \neq v$, $1 <= u, v <= N$). Note that there can be multiple connections between the same pair of switches.

POP : From all the connections currently present in the network, remove the one that was added most recently. There will be at least one connection in the network when this scenario is given.

Also, after performing the operation in each scenario, print the number of connected components formed by the switches in this network.

Input

The first line of test case begins with integer Q ($1 <= Q <= 5 * 105$) and N ($1 <= N <= 5 * 105$) indicating the number of scenarions and number of switches in the network. Next, Q lines will each contain a scenario as described above.

Output

For each query, you will need to print the answer in a separate line.

Sample Input

```
12 5
PUSH 1 2
PUSH 2 3
PUSH 1 4
POP
PUSH 1 3
PUSH 4 5
PUSH 1 4
POP
POP
POP
POP
POP
```

Sample Output

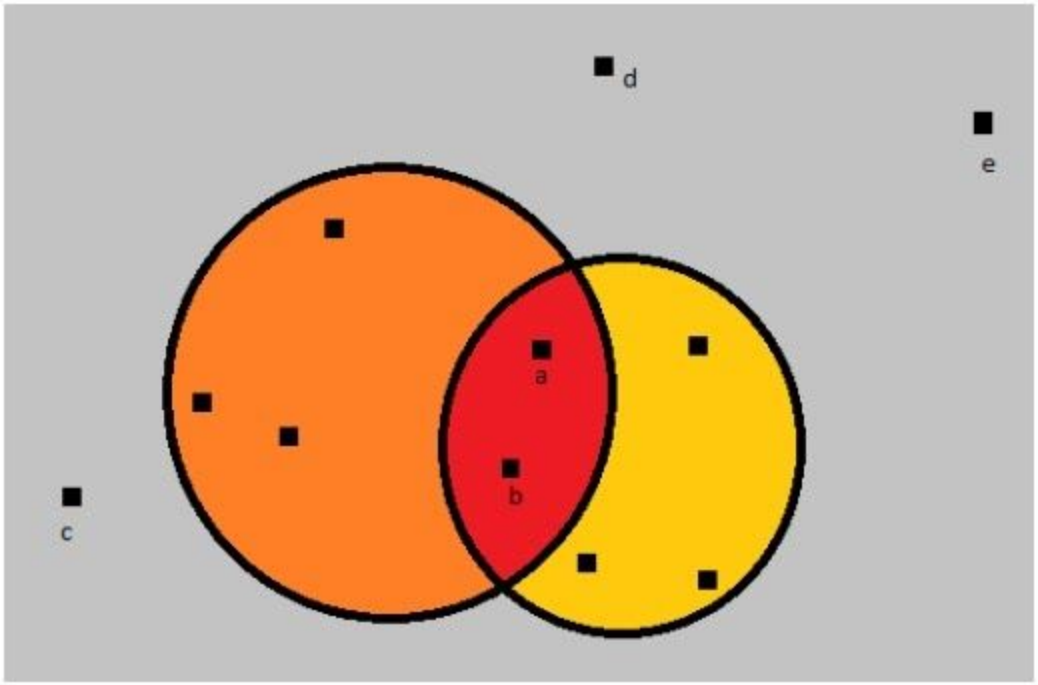
```
4
3
2
3
3
2
1
2
3
3
4
5
```

Wifi Network

Problem Statement

As we all know Shopee is one of the fastest-growing e-commerce in the world. Shopee has a large number of engineers to develop and maintain the platform. So it's expected it’s internal office network is very complex and only one master WiFi network hub has already failed to support the network stability and bandwidth. Now Shopee has decided to get master WiFi network hubs from two different companies namely **GeoFi** and **AirFi**. However now there is another big problem, these two networking device manufacturing companies have a long history of rivalry. They developed their network technology in such a way that these two networks cancel each other. Meaning, if an engineer is inside the network range of both **GeoFi** and **AirFi** network hubs, he/she will not get any signal from either of these two network hubs (see the picture).

As installing networking devices without very complex calculation can bring networking blackout at different locations on the office floor, shopee IT-center decided to install only one **GeoFi** network hub on the office floor. The same rule goes for the **AirFi** network hub. Each hub has a range **R** and they cover a circular area of radius **R** centering the position of the network hub. Shopee IT-center wishes every engineer should get the WiFi signal from one of the two new network hubs. Now Shopee IT-center wants your help to get the answer to the following question. Given the coordinates of each of the engineers, coordinates of the **GeoFi** network hub **Cg** and **AirFi** network hub **Ca**, the range of these network hubs **Rg(GeoFi)** and **Ra(AirFi)** can you find the number of engineers that will not get any network services?



In the picture above the two points (a,b) in the intersected area do not get any WiFi signal. Also the three points(c,d,e) outside the area of the circles do not have any WiFi signal.

Input

There will be only one test case. The test case begins with an integer **N (1 ≤ N ≤ 105)**, the number of engineers in the office.
Each of the next N lines will have two integers **x, y (0 ≤ x,y ≤ 108)** representing the coordinates of the engineers.
The next line contains four integers **Xg**, **Yg** representing **Cg**, and **Xa**, **Ya** representing **Ca**.
The next line contains an integer number **Q (1 ≤ Q ≤ 105)**, representing the number of queries. Each of the next **Q** lines will have two integers **Rg, Ra (0 ≤ Rg, Ra ≤ 108)**.

Output

For each query (given value of **Rg, Ra**), print the number of engineers that will not get any WiFi signal.

Sample Input

```
11
2 3
3 6
5 5
6 10
9 7
8 5
9 4
11 3
12 6
11 12
14 10
6 7 10 5
5
4 3
3 3
9 3
8 3
3 2
```

Sample Output

```
5
6
5
6
7
```

Number Tree

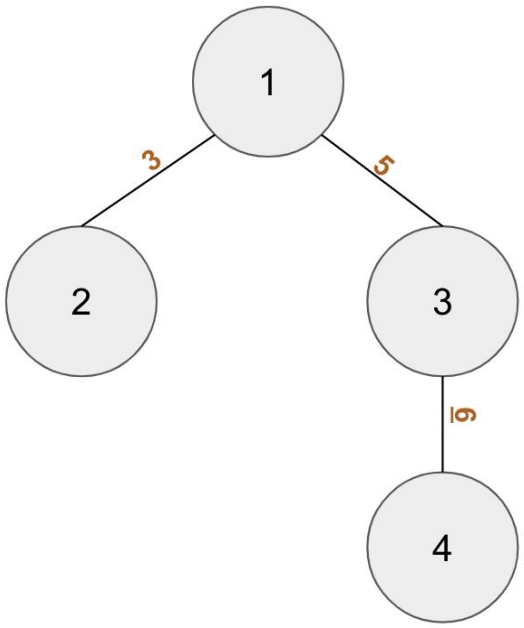
Problem Statement

Your colleague Alice came up with an interesting puzzle, and discussed with you to find out the solution together.

The puzzle is in the form of an undirected tree graph with **N** nodes, with the following characteristics:

- Each nodes are given a number from 1 to **N**
- Each edges have a single digit integer written in it

An example of this trree would be the following picture:



The value of a path was defined as the concatenation of the number written in the edges of the path, starting from the node with lower number. For example, in the example above, the value from node 2 to node 3 is 35, and value from node 2 to node 4 is 356. Then, the puzzle is calculating the sum of value from each possible path in the tree.

Can you write a program to solve this puzzle?

Input

The first line contains 1 integer **N** (1 ≤ **N** ≤ 100,000), denoting the number of nodes.
The next **N**-1 line contains **U**i **V**i **C**i (1 ≤ **U**i, **V**i ≤ **N**, 0 ≤ **C**i ≤ 9), denoting an edge between node **U**i and node **V**i which has number **C**i written in it. It is guaranteed that the given graph is a tree graph.

Output

One line containing a single integer, the answer of this puzzle. Since this number can be very large, output its value modulo 109+7.

Sample Explanation

The tree corresponds to the tree given in the description.
Below are all the possible values:

1. From node 1 to node 2 = 3
2. From node 1 to node 3 = 5
3. From node 1 to node 4 = 56
4. From node 2 to node 3 = 35
5. From node 2 to node 4 = 356
6. From node 3 to node 4 = 6

The sum of all of them is 461.

Sample Input

```
4
1 2 3
1 3 5
3 4 6
```

Sample Output

```
461
```