Water Temple

As you know by now, Lea has always been a great adventurer, always at the ready to explore the unknown. Again, she booked a trip to Templonia, to find another forgotten temple with relics of the past. After months of searching, she found the legendary "Water Temple" - a temple to honor the water spirits, built by a long forgotten people. As she explores the entrance levels, she notices that the temple continues for many levels below ground. Luckily, she even found a map that shows her how many rooms there are and how to get to each one.

There is just a slight problem - the lower levels are all filled with water. The ancient priests must have tried to preserve the water spirits holy sanctum. So to explore all of the rooms, Lea has to drain some of the water first. Otherwise, she would not get to see the marvelous artifacts hidden in the deeper layers of the temple.

Upon closer inspection of the map, she found that several of the rooms are marked as "control rooms" that can be used to drain some of the water out of the temple. They even carry small numbers that tell Lea just how much water can be drained at this specific room. She also found out the lowest point of every hallway, so she knows how much water to drain until she can go through the hallways and enter the room they lead to. Since the temple seems to be connected by some elaborate pipe system, the water inside the temple has the same level everywhere.
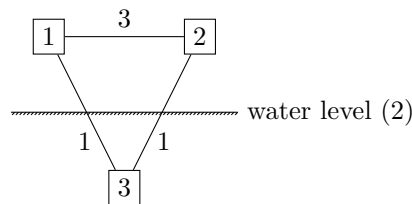

Figure 1: Sample 1, case 2

Of course Lea wants to explore all the fascinating rooms in the temple, so can you tell her if she can lower the water level enough so that every room is reachable?

Input

The first line of the input contains an integer t. t test cases follow, each of them separated by a blank line.

Each test case starts with a single line containing four space-separated integers n, m, k and l, where n is the amount of rooms in the water temple, numbered from 1 to n, and m is the amount of hallways connecting the rooms, k is the amount of rooms that are control rooms and l is the initial water level. m lines follow describing the hallways: the i-th line contains three space-separated integers a_i, b_i and l_i, describing a hallway from room a_i to b_i. To use this hallway, the water level must have been drained to at least water level l_i. You can assume that a room is drained of water as soon as there is at least one hallway to it that is usable. k lines follow describing the control rooms: the i-th line contains two space-separated integers a_i, d_i specifying that room a_i is a control room. If Lea reaches room a_i and operates the machinery there, she can drain the water throughout the whole temple to any level between the current water level and d_i (inclusively).

Output

For each test case, print a line containing "Case #i: r" where i is its number, starting at 1, and r is the maximum water level that can be left inside the temple so that every room is reachable from the entrance (room 1). Print "Case #i: `impossible`" if Lea cannot lower the water level enough so that every room is reachable. Each line of the output should end with a line break.

Sample explanation

In the first sample, in the first case, the initial water level is 2. This means Lea can use the hallways from room 1 to 2 and from 2 to 3, but not the hallway from 1 to 3 (the water level would have to be lowered to 1 to use it). There are no control rooms, but luckily, Lea can already reach all rooms, so the answer is the inital water level.

In the second case, Lea can only use the hallway from 1 to 2, but has no way to lower the water level any further. Thus she cannot explore the temple fully.

In the third case, Lea can use the hallway from 1 to 2. There, she can lower the water level to 0. However, she only lowers it to 1. Then she can go back to the entrance and use the hallway from 1 to 3 to reach the final room.

Constraints

- $1 \leq t \leq 20$

- $1 \leq n \leq 10^4$

- $0 \leq m \leq 10^6$

- $0 \leq k \leq n$

- $0 \leq l \leq 10^4$

- $1 \leq a_i, b_i \leq n$ for all $1 \leq i \leq n$

- $0 \leq d_i \leq 10^4$

- The temple is connected, i.e. there is a water level so that every room is reachable from the entrance.

- The controls rooms given are unique, i.e. every room is mentioned at most once.

Sample Input 1

```
3
3 3 0 2
1 2 3
1 3 1
2 3 3

3 3 0 2
1 2 3
1 3 1
2 3 1

3 3 1 2
1 2 2
1 3 1
2 3 0
2 0
```

Sample Output 1

```
Case #1: 2
Case #2: impossible
Case #3: 1
```

Sample Input 2

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

2 3 0 3
2 1 3
2 2 9
1 2 9

4 5 1 8
3 4 8
1 2 9
2 3 0
1 4 10
1 4 6
1 1

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

9 10 0 7
9 8 7
4 3 4
1 3 0
1 4 5
2 9 7
1 7 6
3 2 9
3 2 3
2 5 6
4 6 6
```

Sample Output 2

```
Case #1: 1
Case #2: 3
Case #3: 8
Case #4: 6
Case #5: impossible
```