

DSA - Sec B Lab 6

A. Kone in Labyrinth

1 second, 256 megabytes

After successfully escaping from Egyptian mummies, Kone is called upon by Mr. Melon Tusk to explore Martian labyrinths. Kone is given with the blueprints of the largest Martian labyrinth called Oompa Loompa. The labyrinth consists of a number of rooms connected by two way tunnels. Mr Tusk wants to drive his favourite car Masla in the labyrinth and tasks Kone with making each tunnel one-way while ensuring that any room is reachable from any other room. Help Kone in this quest or report that the task is not possible.

Input

- first line contains  $1 \leq V \leq 10^5$  the number of rooms in the labyrinth and  $1 \leq E \leq 2 * 10^5$ , the number of tunnels.
- next  $E$  lines contain two integers  $1 \leq x, y \leq V$  describing the connectivity between rooms  $x$  and  $y$  (both-ways)

Output

print "YES" if possible or "NO" if not.

input
4 4 2 3 4 2 4 1 1 2
output
NO

input
4 4 2 1 2 3 1 4 4 3
output
YES

In test case-1, no combination allows for a one-way tunnel labyrinth where each room is reachable from every other room, hence "NO"

In test case-2, the answer is "YES" and one possible solution can be 1->2; 2->3; 3->4; 4->1

B. Hide & Seek

3 seconds, 256 megabytes

Rohu and Ishu, long-time friends from the vibrant city of Zythera, want to play Hide and Seek. Zythera is made up of N houses, including the majestic King's Mansion with address 1. All houses are connected by roads, ensuring a unique path between any two houses.

In this game, Ishu runs and hides in a particular house, let's call it X. Rohu, starting from his own house, let's call it Y, must try to find Ishu. If Rohu reaches house X, then he is certain to find Ishu. Rohu has two options during his search: he can either move towards the King's Mansion and stop when he reaches it, or he can choose any path away from the Mansion until he reaches the last house on that path.

Now, imagine there are Q queries, and you must determine if it's possible for Rohu to find Ishu based on these queries. Each query can be of two types:

- **towards X Y:** Rohu moves towards the King's Mansion.
- **away X Y:** Rohu moves away from the King's Mansion.

Your task is to evaluate each query and determine if Rohu will be able to find Ishu or not.

Constraints:

- $1 \leq N \leq 10^5$
- $1 \leq A, B \leq N$
- $1 \leq Q \leq 5 \times 10^5$
- $1 \leq X, Y \leq N$

Input

The first line of the input contains a single integer N, total number of houses in the city.

Next N-1 lines contain two space separated integers A and B denoting a road between the houses at address A and B.

Next line contains a single integer Q denoting the number of queries. Following Q lines contain three space separated integers representing each query as explained above.

Output

For each query, print a single line containing "YES" if Rohu can find Ishu or "NO" otherwise.

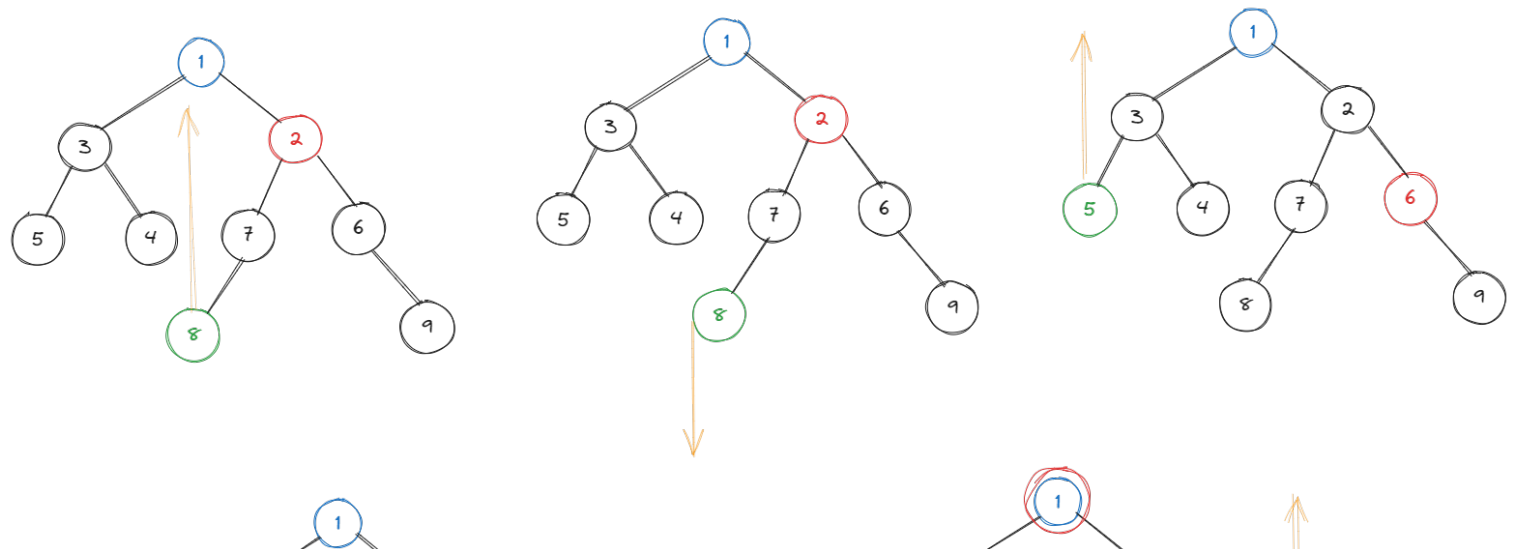
input
9 1 2 1 3 2 6 2 7 6 9 7 8 3 4 3 5 5 towards 2 8 away 2 8 away 6 5 towards 6 5 away 9 1
output
YES NO NO NO YES

Explanation of testcase-1:

Blue circle : location of king

Red Circle: location of Ishu

Green Circle: location of rohu





For query 1: towards 2 8  
if rohu starts towards king location then he will surely find Ishu.

C. Course Completion

2 seconds, 512 megabytes

Rohu is a student who needs to complete a total of  $n$  courses in order to graduate. Each course is identified by a unique integer from  $1$  to  $n$ . However, some courses have prerequisites, which must be completed before taking the course. Rohu wants to know whether it is possible for him to complete all the courses and graduate.

You are given the total number of courses  $n$  and a list of prerequisites. Each prerequisite is represented by a pair of integers  $(a, b)$ , indicating that course  $a$  must be completed before taking course  $b$ . Your task is to determine whether Rohu can complete all the courses, considering the given prerequisites.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Input

- The first line contains two integers  $n$  and  $m$  separated by a space, representing the total number of courses and the number of prerequisites, respectively.
- The following  $m$  lines each contain two integers  $a$  and  $b$  separated by a space, denoting a prerequisite relationship that course  $a$  must be completed before taking course  $b$ .

Output

output a single line containing "Yes" if it is possible for Rohu to complete all the courses, or "No" otherwise.

input
5 4 1 2 2 3 3 4 4 5
output
Yes

input
6 6 1 2 1 3 2 4 3 5 5 6 6 3
output
No

### D. Kone v/s Lawrence

1 second, 256 megabytes

They may have graduated, but Kone and Lawrence remain kids at heart. They decide to square off in a game of paintball and need to build a team. They have a group consisting  $n$  children and they want to form their own teams out of them. However, these children have  $m$  friendships among them and to increase competitiveness, Lawrence and Kone decide to divide the children such that no team has children who are friends. Help them in this task.

**Input**

- first line consists of two integers  $1 \leq n \leq 10^5$  and  $1 \leq m \leq 2 * 10^5$  the number of children and friendships respectively
- the next  $m$  lines consist of two integers  $1 \leq x, y \leq n$  indicating that children  $x$  and  $y$  are friends

**Output**

Print "YES" if such an arrangement is possible, else "NO"

input
5 3 1 2 1 3 4 5
output
YES

input
6 5 1 2 1 3 4 5 5 6 6 4
output
NO

In given test case, children 1-4 are on one team and 2-3-5 on the other while satisfying the given condition