

## F. Conquering

**Time Limit:** 1 second

**Points:** 100

Aurelian is looking to conquer the lands of Zenobia. Zenobia is made up of  $n$  regions, connected by  $m$  one-way roads such that there is no way to travel from any region back to itself via a sequence of roads. Each region is either friendly, enemy, or neutral.

At each of the friendly regions, Aurelian may deploy some number of friendly soldiers. Aurelian can then freely direct friendly soldiers along the roads.

Each enemy region has a certain number of enemy soldiers stationed there. In order for Aurelian to conquer an enemy region, there must be strictly more friendly soldiers than enemy soldiers at that region. Note that these soldiers may come from multiple different adjacent regions, and they will only commence battle once they have enough numbers to win. Once the battle is won, the enemy soldiers in that region are converted to friendly soldiers, which Aurelian can direct.

Help Aurelian determine the minimum number of total soldiers that he needs to deploy so that it is possible to conquer every enemy region. If it is impossible to do so, output  $-1$ .

### Input

The first line of input consists of two space-separated integers  $n$  and  $m$ , representing the number of regions and the number of one-way roads respectively.

Next will follow  $m$  lines, the  $i$ th of which will contain two space-separated integers  $u_i$  and  $v_i$ , meaning there is a one-way road from region  $u_i$  to region  $v_i$ .

Finally there will be  $n$  lines, the  $j$ th of which will contain information about the  $j$ th region. Each line will begin with a single character  $t_j$  which will be either F, E or N, indicating that the region is either friendly, enemy or neutral respectively. Furthermore, if the region is enemy, then there will be an extra integer  $a_j$  on that line denoting the number of enemy soldiers in that region.

### Constraints

All input will satisfy the following constraints:

- $2 \leq n \leq 500$
- $1 \leq m \leq 500$
- For all  $1 \leq i \leq m$ :
  - $1 \leq u_i, v_i \leq n$
  - $u_i \neq v_i$

- There is no way to travel from any region back to itself via a sequence of roads.
- For all  $1 \leq j \leq n$ :
  - $t_j$  will either be F, E or N.
  - $1 \leq a_j \leq 1,000,000$  for all  $j$  where  $t_j$  is E.
- There is at least one friendly region, and at least one enemy region.

## Output

Output a single integer, the minimum number of soldiers that Aurelian needs to deploy such that they can conquer every enemy region. If it is impossible to do so, output -1.

## Subtasks

**F1 (10 points):** There are exactly  $n - 1$  roads, the  $i$ th of which will be from region  $i$  to region  $i + 1$ .

**F2 (20 points):** There are exactly  $n - 1$  roads, such that every region contains exactly one incoming edge, except for region 1, which contains none. In other words, the regions form a tree with all edges directed away from region 1.

**F3 (70 points):** no restrictions.

## Sample Input 1

```
5 4
1 2
2 3
3 4
4 5
F
E 1
E 2
F
E 5
```

## Sample Output 1

```
3
```

## Sample Input 2

```
8 7
1 2
1 3
1 4
```

3 5  
3 6  
4 7  
6 8  
F  
N  
E 3  
E 3  
E 2  
E 3  
E 5  
E 4

### Sample Output 2

8

### Sample Input 3

8 7  
1 2  
1 3  
2 4  
3 4  
3 5  
4 6  
7 8  
F  
E 2  
E 8  
E 6  
E 12  
E 10  
F  
E 1

### Sample Output 3

14

### Sample Input 4

5 4  
1 2  
2 3  
3 4

4 5  
E 1  
F  
N  
N  
F

## Sample Output 4

-1

## Explanations

In sample 1, Aurelian can send 2 soldiers from region 1 and 1 soldier from region 4. He then directs them as follows:

- Move 2 soldiers from region 1 to 2, gaining 1 soldier.
- Move 3 soldiers from region 2 to 3, gaining 2 soldiers.
- Move 5 soldiers from region 3 to 4.
- Move 6 soldiers from region 4 to 5, thus conquering all enemy lands.

In sample 2, Aurelian can send 8 soldiers to region 1. He then directs them as follows:

- Move 4 soldiers from region 1 to 3, gaining 3 soldiers.
- Move 3 soldiers from region 3 to 5, gaining 2 soldiers.
- Move 4 soldiers from region 3 to 6, gaining 3 soldiers.
- Move 5 soldiers from region 6 to 8, gaining 4 soldiers.
- Move 4 soldiers from region 1 to 4, gaining 3 soldiers.
- Move 7 soldiers from region 3 to 7, gaining 5 soldiers.

In sample 3, Aurelian can send 12 soldiers to region 1, and 2 soldiers to region 7. He then directs them as follows:

- Move 9 soldiers from region 1 to 3, gaining 8 soldiers.
- Move 3 soldiers from region 1 to 2, gaining 2 soldiers.
- Move 13 soldiers from region 3 to 5, gaining 12 soldiers.
- Move 4 soldiers from region 3 to 4. The soldiers wait for enough numbers before attacking.
- Move 5 soldiers from region 2 to 4, gaining 6 soldiers.
- Move 15 soldiers from region 4 to 6, gaining 10 soldiers.
- Move 2 soldiers from 7 to 8, gaining 1 soldier.

In sample 4, no matter how many soldiers Aurelian sends, he can never attack the enemy at region 1.