CS 124 Problem Set 3

Due: Wednesday, March 04, 2015 11:59 pm EST (**deadline passed**)

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Problems

[Problem A - Game](#)

Problem A

In the year 2124, the Singularity has arrived and advanced machines have taken over most labor-intensive jobs. However, it appears the advanced machines have developed a language that the best computer scientists have yet to decipher. Therefore, direct communication with them is nearly impossible.

Instead, with the additional time, the inhabitants of Earth have come up with a rather interesting game. The game involves two main actors: a "person" and a "corporation". A "corporation" is simply a group of "person"s (people, if you're a grammar Nazi) who've decided to share in the earnings from the game. The game occurs under the supervision of Global Earthlings Incorporated 124.

The game is played with N people, each labeled from 0...N-1. At the start, each person has a score of 1. The game begins with each person creating a corporation whose only member is the founder. The rest consists of a sequence of M rounds, each played between two existing people.

Each round between people must have a winning person. The winner belongs to the "winning corporation", and the loser to the "losing corporation". If the round occurs between two people belonging to different corporations, then it leads to the following actions, which occur in order:
1. Each member in the winning corporation increases his score by the value of the losing corporation. The value of a corporation is defined as the maximum score of any of its members.
2. The winning corporation absorbs the losing corporation. More precisely, the members of the losing corporation become members of the winning corporation.

If the people belong to the same corporation, nothing changes.

At any point during the game, a person can decide to contribute to the fund used for the upkeep of the advanced machines. The amount that person contributes is equal to his or her score at that point in the game. The score of a person is unaffected by his/her contribution. A person can contribute multiple times, but only a total of L contributions will occur.

Your goal is to find the total sum of contributions made during a single game.

CONSTRAINTS and TIME LIMITS
For all test cases:
N ≤ M + L ≤ 30N for (2x for Java, 5x for Python)

For test cases worth a total of 20 points:
5 ≤ N ≤ 100

```
200ms per test case

For test cases worth a total of 20 points:
5 ≤ N ≤ 1000
400ms per test case

For test cases worth a total of 20 points:
5 ≤ N ≤ 10000
750ms per test case

For test cases worth a total of 40 points:
5 ≤ N ≤ 35000
3300ms per test case
```

INPUT FORMAT
First a line containing N, M, and L. N is the total number of people playing
the game, M is the total number of rounds that occur during the game,
and L is the total number of contributions made.

The above is followed by a sequence of M + L lines. M of the lines contain
two-integers. For each such line, the first integer is the winning person, and
the second integer the losing person. L of the lines contain a single integer, i,
meaning that person i has made a contribution at that point in the game. The lines
are in temporal order of the rounds.

OUTPUT FORMAT
Print a single integer corresponding to the sum total of contributions.

SAMPLE INPUT
```
4 5 3
1 3
1 0
1 1
2 1
3
0
3 1
2
```

SAMPLE OUTPUT
```
7
```

DETAILS
A round takes place between person 1 and 3, with one as the winner. His score
increases by 1 (1:2, 3:1). The second round is between 1 and 0, with 1 the
winner. Therefore the score of both 1 and 3 increases by 1 (1:3, 3:2, 0:1).
The next round is between 1 and someone in the same corporation, so nothing
happens. The next round is between 2 and 1, with 2 the winner. 1 belongs to
the {1,3,0} corporation, whose value is 3 giving the state (1:3,3:2,0:1,2:4).
At this point, 3 and 0 decide to donate $2 and $1 respectively (their scores).
The final round is between 3 and 1, who belong to the same corporation, so
nothing happens. Then 2 decides to donate $4.

The contributions therefore total to $2 + $1 + $4 = $7.

SAMPLE INPUT
```
5 4 2
1 2
1
3 0
```

```
0 3
4
0 4
```

SAMPLE OUTPUT
3

DETAILS
After the first round, we have (1:2,2:1), at which point 1 donates $2. After
the next two rounds, we have (1:2,2:1,3:2,0:1,4:1), at which point 4 donates $1.
After all of the rounds, we have the final state (3:3, 0:2, 4:1, 1:2, 2:1).
The contributions therefore total to $2 + $1 = $3.

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Based on the "Ultra Cool Programming Contest Control Centre" v1.7b by Sonny Chan
Modified for CS 124 by Neal Wu, with design help from Martin Camacho

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