REDUNDANCY

With your newfound VC funding (which, honestly, is more than you think your idea merits), you can finally deploy the Enemy-o-matic nationwide.

You plan to operate in $N$ cities, and now need to build servers in some subset of the cities. To minimize latency, transmissions can only be sent over special fiber-optic cables, which are **one-way** connections between cities. There are $M$ such cables, where the $i$'th cable connects city $a_i$ to city $b_i$. One city can *transmit* to another if there exists a sequence of cables from the first to the second.

A server in city $P$ is able to *communicate* with city $Q$ if $P$ can transmit to $Q$ and $Q$ can transmit to $P$. To meet your uptime SLAs (goals), you decide to ensure that each city has **exactly two** servers it can communicate with.

As a final condition, there must be one *main* server that can transmit to all other servers, so you can push software updates to the entire system.

For each city $j$, you've discussed with the local government, and for a cost of $c_j$, they can build you **exactly one** server in city $j$ with *quality* $d_j$. After allocating your VC funding among servers, recruiting, and especially snacks and offsites, you've determined that the budget for servers is $B$.

With the above restrictions, you wish to build servers to **maximize the sum of the qualities** of the servers built. Find this maximal sum, or report that satisfying all conditions is impossible.

## Input

The first line contains three space-separated integers, $N$, $M$, and $B$.

The next $M$ lines list the fiber-optic cables. The $i$'th of these contains two space-separated integers $a_i, b_i$ indicating a fiber-optic cable from $a_i$ to $b_i$. These will satisfy $1 \leq a_i, b_i \leq N$.

The next $N$ lines contain the server specifications for each city. The $j$'th of these contains two space-separated integers $c_j, d_j$ indicating a server can be built with cost $c_j$ and quality $d_j$. These will satisfy $1 \leq c_j \leq B$ and $1 \leq d_j \leq 10^5$.

## Output

Output the maximal sum of server qualities such that each city has exactly two servers to communicate with, there exists a main server, and the total cost does not exceed the budget. If the conditions cannot be simultaneously satisfied, output the string "Impossible".

## Constraints

In all test cases, $1 \leq N, M, B \leq 10^5$. Beyond the sample input, the tests are divided into batches with additional constraints. Time limits below are for C/C++; Ocaml gets 2x, Java 3x, and Python 10x.

- 16 points satisfy $N \leq 10$, $c_j = d_j = 1$ for all $1 \leq j \leq N$, and $B = N$. TL: 100ms.
- 35 points satisfy $c_j = d_j = 1$ for all $1 \leq j \leq N$ and $B = N$. TL: 300ms.
- 49 points satisfy $N \cdot B \leq 5 \cdot 10^6$. TL: 500ms. **Note that a solution to this batch may not solve every batch of test cases, because it has an extra constraint and isn't fully**

**general.**

## Sample explanation

For the first sample, build servers in cities 2, 3, 4, and 5. The main server can be in city 2. The total cost is $4 + 3 + 2 + 1 = 10$, and the total quality is $7 + 2 + 1 + 4 = 14$.

For the second sample, even if every server is built, city 2 can only communicate with the server in city 2, which doesn't meet your redundancy goals.

View submissions (https://cs124.seas.harvard.edu/problem/REDUNDANCY/code-submission)

Test cases

| Input | Output | Points | Timeout |
|---|---|---|---|
| `5 6 10`<br>`1 2`<br>`2 3`<br>`3 1` | `14` | 0 | 100 ms |
| `2 1 100`<br>`1 2`<br>`4 92`<br>`38 5` | `Impossible` | 0 | 100 ms |
| *Hidden* | *Hidden* | 4 | 100 ms |
| *Hidden* | *Hidden* | 4 | 100 ms |
| *Hidden* | *Hidden* | 4 | 100 ms |
| *Hidden* | *Hidden* | 4 | 100 ms |
| *Hidden* | *Hidden* | 7 | 300 ms |
| *Hidden* | *Hidden* | 7 | 300 ms |
| *Hidden* | *Hidden* | 7 | 300 ms |
| *Hidden* | *Hidden* | 7 | 300 ms |
| *Hidden* | *Hidden* | 7 | 300 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |

| Input | Output | Points | Timeout |
|---|---|---|---|
| *Hidden* | *Hidden* | 7 | 500 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |
| *Hidden* | *Hidden* | 7 | 500 ms |

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