F - Add One Edge 3

Editorial (/contests/abc401/tasks/abc401_f/editorial)

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

Problem Statement

You are given two trees: tree 1 with N_1 vertices numbered 1 to N_1, and tree 2 with N_2 vertices numbered 1 to N_2. The i-th edge of tree 1 connects vertices $u_{1,i}$ and $v_{1,i}$ bidirectionally, and the i-th edge of tree 2 connects vertices $u_{2,i}$ and $v_{2,i}$ bidirectionally.

One can add a bidirectional edge between vertex i of tree 1 and vertex j of tree 2 to obtain a single tree. Let $f(i, j)$ be the diameter of this tree.

Find $\displaystyle\sum_{i=1}^{N_1}\sum_{j=1}^{N_2} f(i, j)$.

Here, the distance between two vertices of a tree is the minimum number of edges that must be used to move between them, and the diameter of a tree is the maximum distance between two vertices.

Constraints

- $1 \leq N_1, N_2 \leq 2 \times 10^5$
- $1 \leq u_{1,i}, v_{1,i} \leq N_1$
- $1 \leq u_{2,i}, v_{2,i} \leq N_2$
- Both given graphs are trees.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{aligned}
&N_1 \\
&u_{1,1} \quad v_{1,1} \\
&\vdots \\
&u_{1,N_1-1} \quad v_{1,N_1-1} \\
&N_2 \\
&u_{2,1} \quad v_{2,1} \\
&\vdots \\
&u_{2,N_2-1} \quad v_{2,N_2-1}
\end{aligned}
$$

Output

Print the answer.

Sample Input 1 Copy

Copy

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

Sample Output 1 Copy

Copy

```
39
```

For example, one can connect vertex 2 of tree 1 and vertex 3 of tree 2 to obtain a tree of diameter 5. Thus, $f(2,3)$ is 5.

The sum of $f(i,j)$ is 39.

Sample Input 2 Copy

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```
7
5 6
1 3
5 7
4 5
1 6
1 2
5
5 3
2 4
2 3
5 1
```

Sample Output 2 Copy

```
267
```
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