

Contest Duration: 2025-12-27(Sat) 23:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20251227T2100&p1=248>) - 2025-12-28(Sun) 00:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20251227T2240&p1=248>) (local time) (100 minutes)

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## F - Sum of Mex

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 525 points

### Problem Statement

You are given a tree  $T$  with  $N$  vertices. The vertices are numbered from 0 to  $N - 1$ , and the  $i$ -th edge ( $1 \leq i \leq N - 1$ ) bidirectionally connects vertices  $u_i$  and  $v_i$ . (Note that vertex numbers are 0-indexed and edge numbers are 1-indexed.)

For a pair of integers  $(i, j)$  where  $0 \leq i, j < N$ , define  $f(i, j)$  as follows:

- The vertex number of the vertex with the smallest number among the vertices **not included** in the path from vertex  $i$  to vertex  $j$  in tree  $T$ .
  - Here, if the path from vertex  $i$  to vertex  $j$  includes all vertices from vertex 0 to vertex  $N - 1$ , let  $f(i, j) = N$ .

Note that the path from vertex  $i$  to vertex  $j$  in tree  $T$  includes vertices  $i$  and  $j$ .

Find the value of  $\sum_{0 \leq i \leq j < N} f(i, j)$ .

### Constraints

- $2 \leq N \leq 2 \times 10^5$
- $0 \leq u_i < v_i < N$
- The graph given in the input is a tree.
- All input values are integers.

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## Input

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

```
N  
u1 v1  
u2 v2  
⋮  
uN-1 vN-1
```

## Output

Output the value of  $\sum_{0 \leq i \leq j < N} f(i, j)$ .

### Sample Input 1

Copy

```
2  
0 1
```

Copy

### Sample Output 1

Copy

```
3
```

Copy

We have  $f(0, 0) = 1$ ,  $f(0, 1) = 2$ ,  $f(1, 1) = 0$ . Thus, output  $1 + 2 + 0 = 3$ .

### Sample Input 2

Copy

```
5  
0 1  
0 2  
2 3  
2 4
```

Copy

### Sample Output 2

Copy

```
16
```

Copy

## Sample Input 3

Copy

```
7
1 4
2 6
0 5
0 3
2 5
1 5
```

Copy

## Sample Output 3

Copy

```
16
```

Copy

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/#telegram)

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