Problem C. Kruskal (MST): Really Special Subtree

OS Linux

Given an undirected weighted connected graph, find the Really Special SubTree in it. The Really Special SubTree is defined as a subgraph consisting of all the nodes in the graph and:

- There is only one exclusive path from a node to every other node.
- The subgraph is of minimum overall weight (sum of all edges) among all such subgraphs.
- No cycles are formed

To create the Really Special SubTree, always pick the edge with smallest weight. Determine if including it will create a cycle. If so, ignore the edge. If there are edges of equal weight available:

- Choose the edge that minimizes the sum $u + v + wt$ where u and v are vertices and wt is the edge weight.
- If there is still a collision, choose any of them.

Print the overall weight of the tree formed using the rules.

For example, given the following edges:

```
u       v       wt
1       2       2
2       3       3
3       1       5
```

First choose $1 \rightarrow 2$ at weight 2. Next choose $2 \rightarrow 3$ at weight 3. All nodes are connected without cycles for a total weight of $3 + 2 = 5$.

Function Description

Complete the $kruskals$ function in the editor below. It should return an integer that represents the total weight of the subtree formed.

kruskals has the following parameters:

- *g_nodes*: an integer that represents the number of nodes in the tree
- *g_from*: an array of integers that represent beginning edge node numbers
- *g_to*: an array of integers that represent ending edge node numbers
- *g_weight*: an array of integers that represent the weights of each edge

Input Format

The first line has two space-separated integers g_nodes and g_edges, the number of nodes and edges in the graph.

The next g_edges lines each consist of three space-separated integers g_from, g_to and g_weight, where g_from and g_to denote the two nodes between which the **undirected** edge exists and g_weight denotes the weight of that edge.

Constraints

- $2 \leq g\_nodes \leq 3000$
- $1 \leq g\_edges \leq \frac{N*(N-1)}{2}$
- $1 \leq g\_from, g\_to \leq N$
- $0 \leq g\_weight \leq 10^5$

**Note: ** If there are edges between the same pair of nodes with different weights, they are to be considered as is, like multiple edges.

Output Format

Print a single integer denoting the total weight of the Really Special SubTree.

Sample 1

Input	Output
4 6 1 2 5 1 3 3 4 1 6 2 4 7 3 2 4 3 4 5	12

The graph given in the test case is shown above.

Applying Kruskal's algorithm, all of the edges are sorted in ascending order of weight.

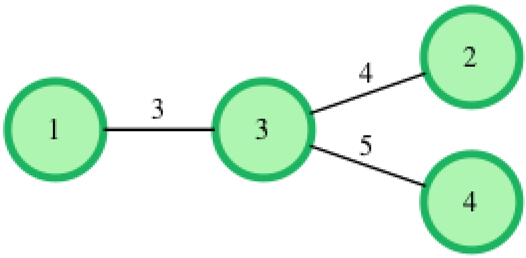
After sorting, the edge choices are available as :

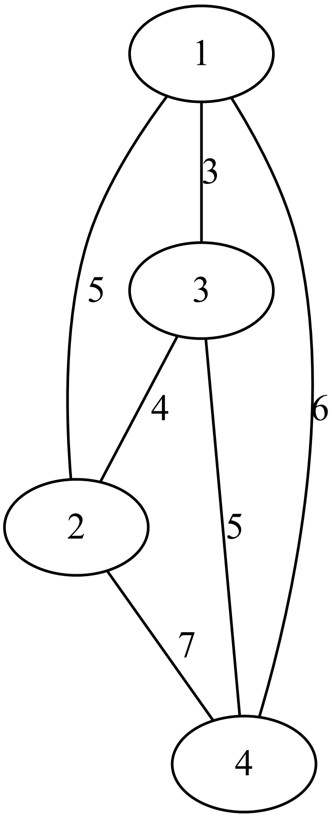
$1 \rightarrow 3 (w=3), 2 \rightarrow 3 (w=4), 1 \rightarrow 2 (w=4), 3 \rightarrow 4 (w=5), 1 \rightarrow 4 (w=6)$ and $2 \rightarrow 4 (w=7)$

Select $1 \rightarrow 3 (w=3) because it has the lowest weight without creating a cycle Select 2$ \rightarrow 3 (w=4)$ because it has the lowest weight without creating a cycle

The edge $1 \rightarrow 2 (w=4)$ would form a cycle, so it is ignored

Select $3 \rightarrow 4 (w=5)$ to finish the MST yielding a total weight of $3+4+5=12$





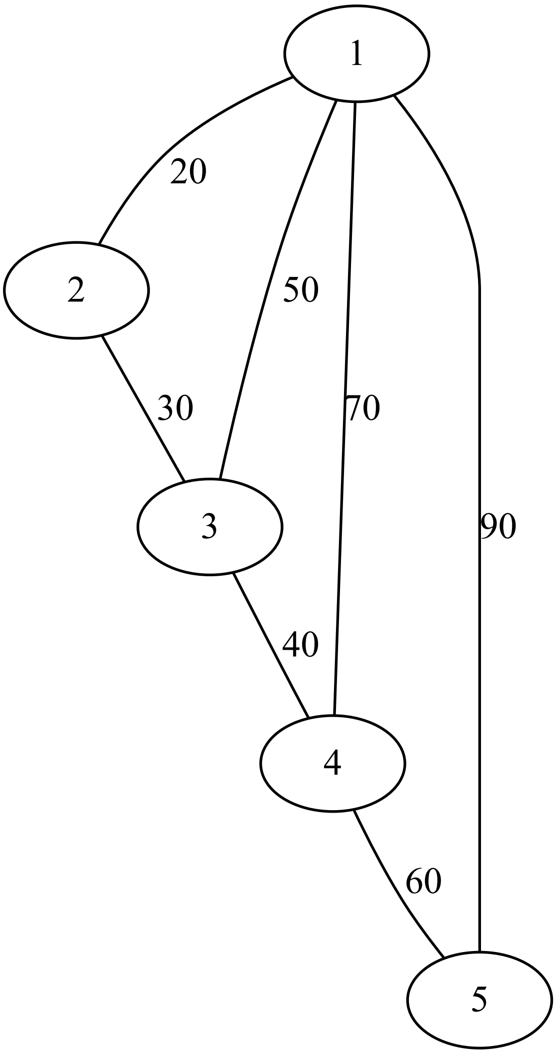
Undirected Weighed Graph: g

Sample 2

Input	Output

`5 7`
`1 2 20`
`1 3 50`
`1 4 70`
`1 5 90`
`2 3 30`
`3 4 40`
`4 5 60`
	`150`

Given the graph above, select edges $1 \to 2, 2 \to 3, 3 \to 4, 4 \to 5$ with weights $20 + 30 + 40 + 60 = 150$.



Undirected Weighed Graph: g