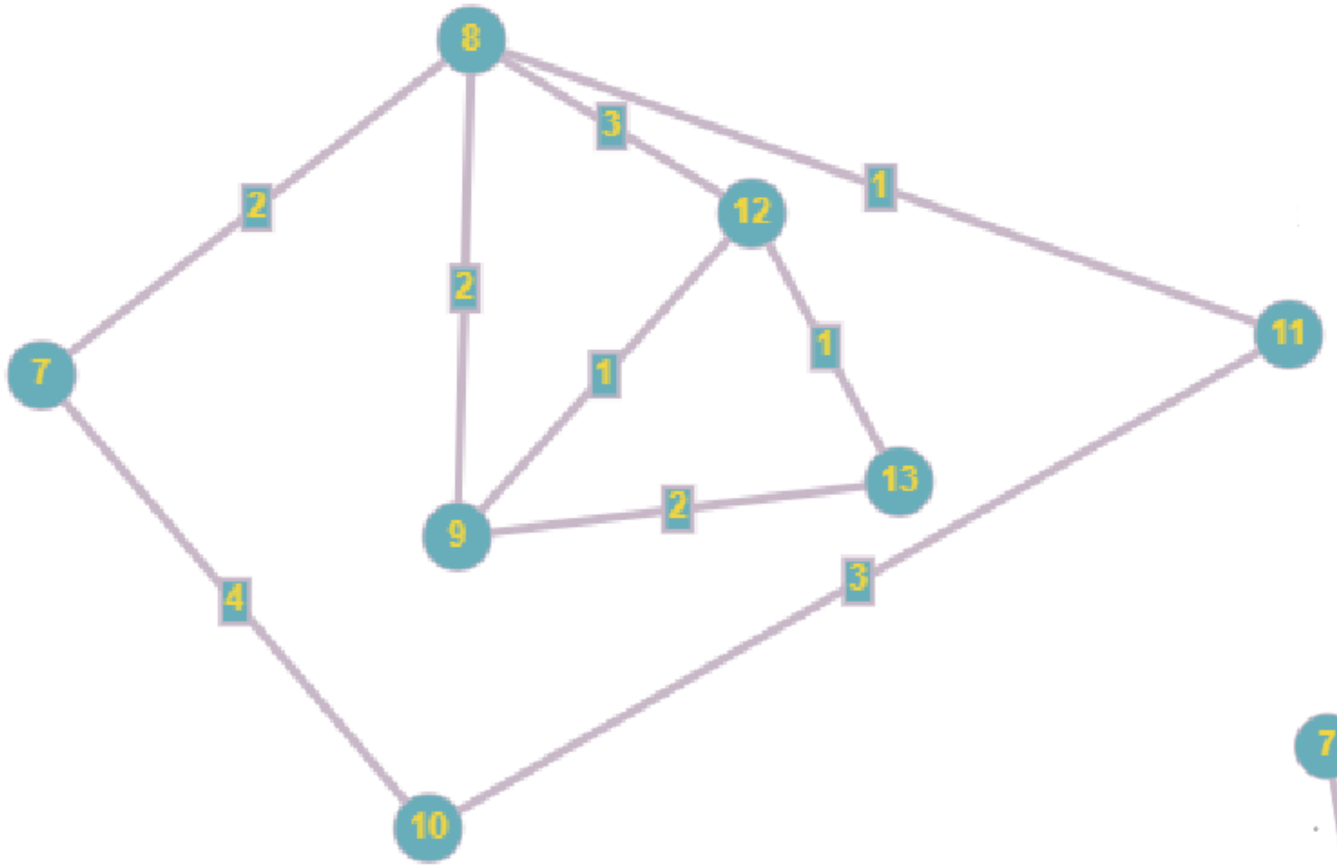
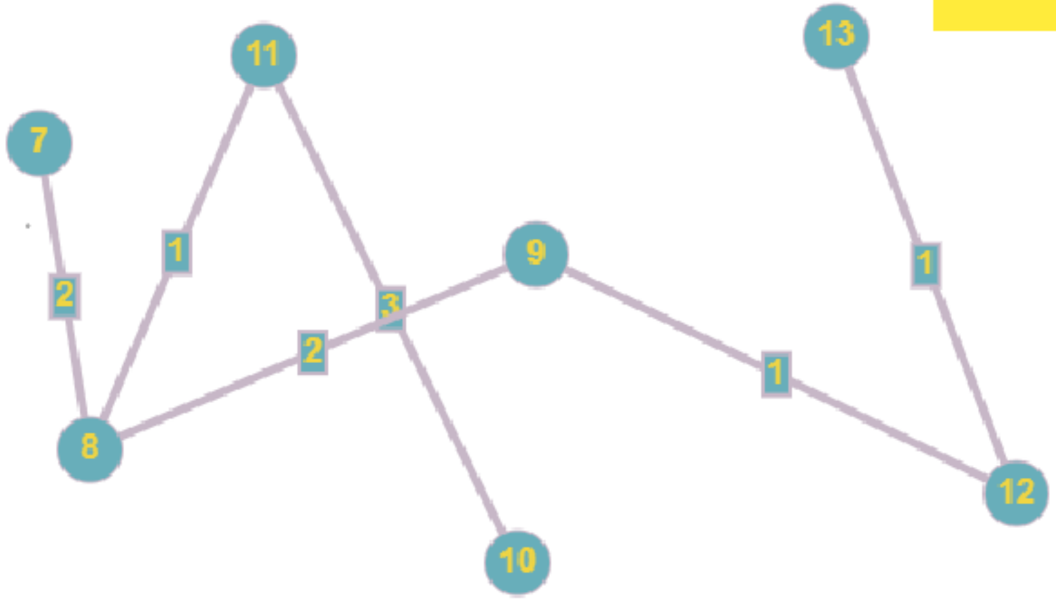


Original Graph

You will be given a source node. Here, consider 11 as the source node

Minimum Spanning Tree



1. List all the nodes and find the source node.

2. The source node will have a cost of 0 while all other nodes have a cost of ∞

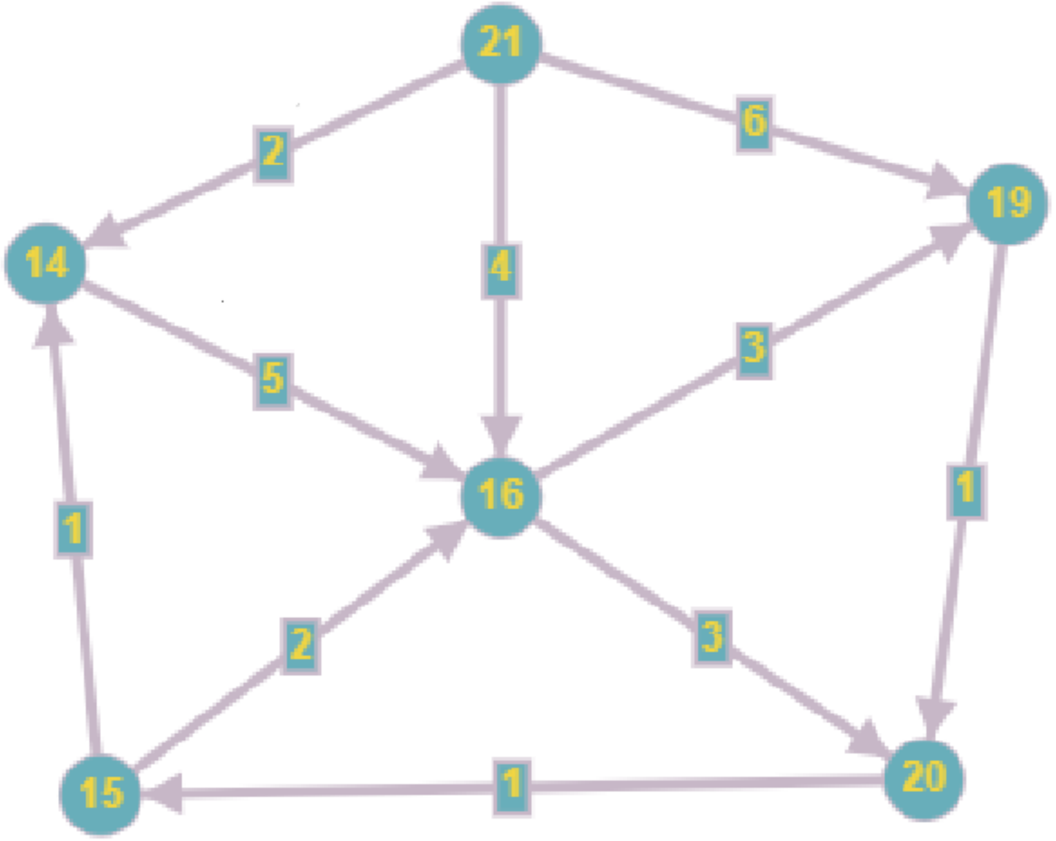
3. We start from a node and consider all adjacent edges. We checked if the adjacent edges had a lesser value than the initial value. If value is lesser and the dest. is unchecked, update.

4. Look for the node with the least cost after finishing the initial steps. Then repeat Step 3 with that node.

5. Repeat steps 3 and 4 until all the nodes are checked.

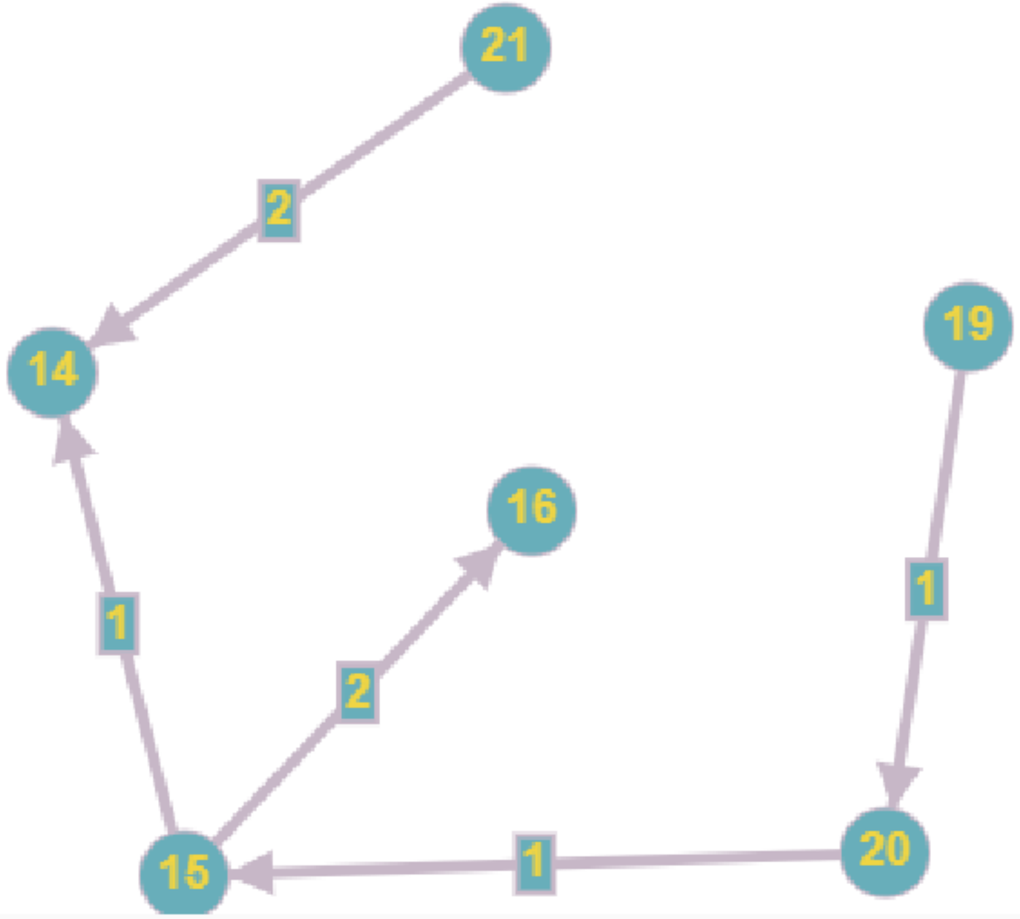
Node	Value/Cost	Parent	Checked
7	∞/2	8	Yes
8	∞/1	11	Yes
9	∞/2	8	Yes
10	∞/3	11	Yes
11	0	Nill	Yes
12	∞/3/1	8/9	Yes
13	∞/2/1	9/12	Yes

The cost of the MST = 2+1+2+3+0+1+1 = 10



This is a directed graph. You have to find out the MST from this graph using both Prim's and Kruskal's Algo. You must use 21 as the source. Compare the sum of the MSTs.

Kruskal's Algo

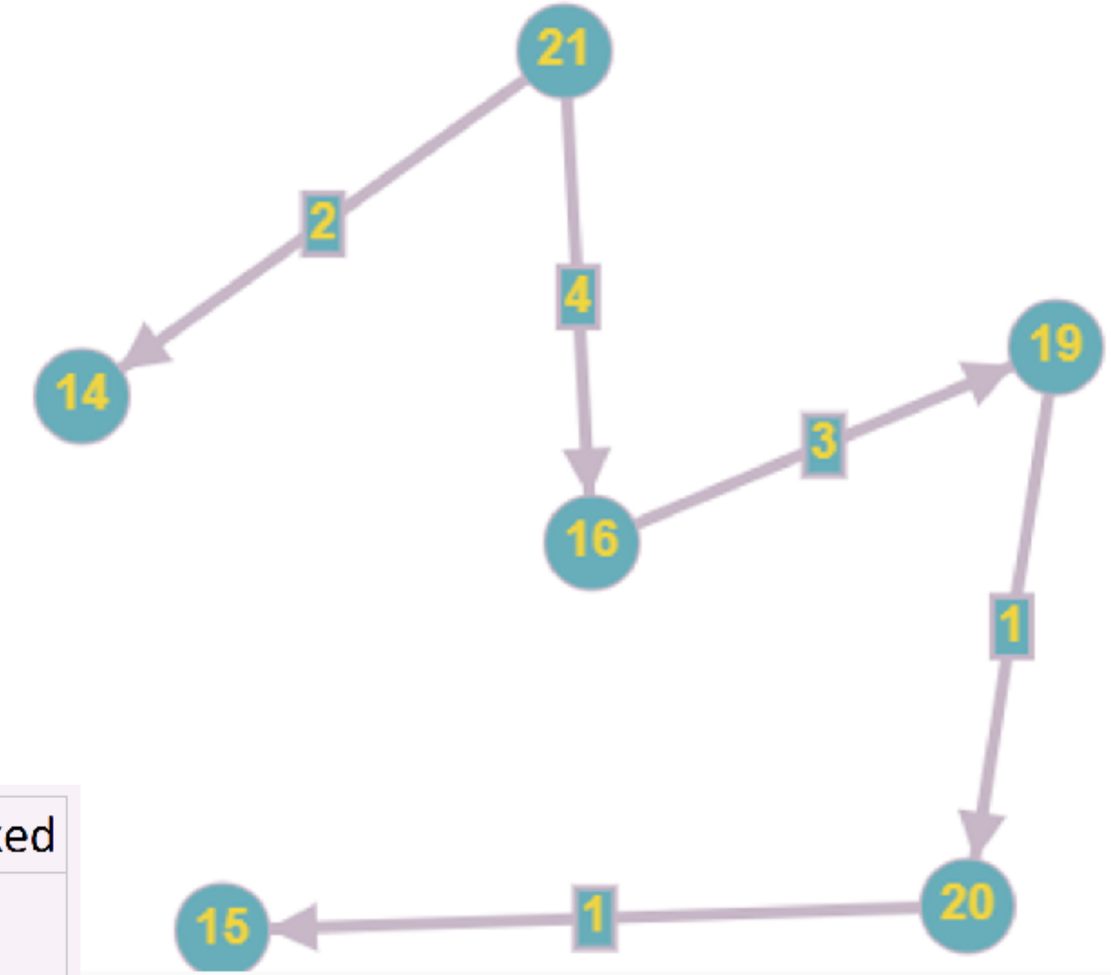


Sum of the MST = 7

Kruskal's Algorithm

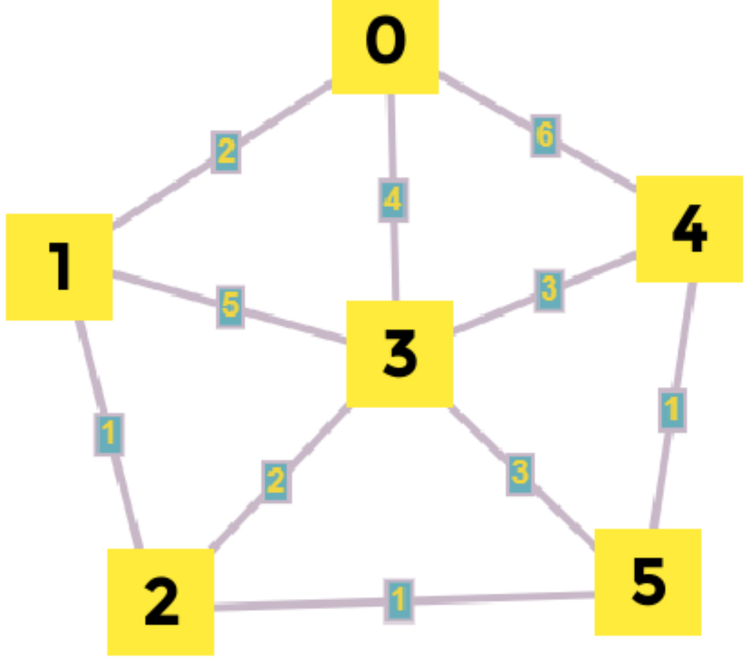
15 - 14 (1)
20 - 15 (1)
19 - 20 (1)
15 - 16 (2)
21 - 14 (2)
16 - 20 (3)
16 - 19 (3)
21 - 16 (4)
14 - 16 (5)
21 - 19 (6)

Prim's Algo (Is not working for a Directed Graph)



Node	Cost	Parent	Checked
14	∞/2/1	21/15	Yes
15	∞/1	20	No
16	∞/4/2	21/15	Yes
19	∞/6/3	21/16	Yes
20	∞/3/1	16/19	Yes
21	0	Nill	Yes

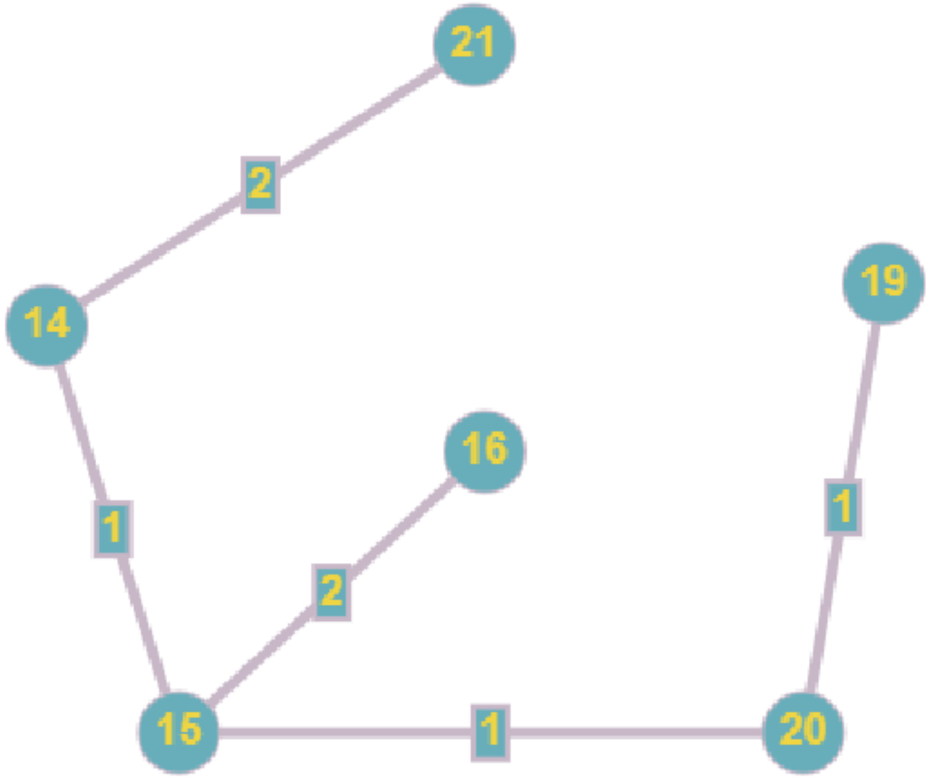
Cost of the SPANNING TREE = 11



Node	Cost	Parent	Checked
1	∞/2	21	Yes
2	∞/1	14	Yes
3	∞/4/2	21/15	Yes
4	∞/6/1	21/20	Yes
5	∞/1	15	Yes
0	0	Nill	Yes

Considering the previous graph as Undirected, Prim's Algo ->

Cost of the MST = 7



Prim's algorithm to compute an MST

MST-PRIM(G, w, r)

```
 1  for each u ∈ V[G]
 2        do key[u] ← ∞
 3           π[u] ← NIL
 4  key[r] ← 0
 5  Q ← V[G]
 6  while Q ≠ ∅
 7        do u ← EXTRACT-MIN(Q)
 8           for each v ∈ Adj[u]
 9                 do if v ∈ Q and w(u, v) < key[v]
10                       then π[v] ← u
11                            key[v] ← w(u, v)
```

Running time

$O(V \lg V + E \lg V) = O(E \lg V)$