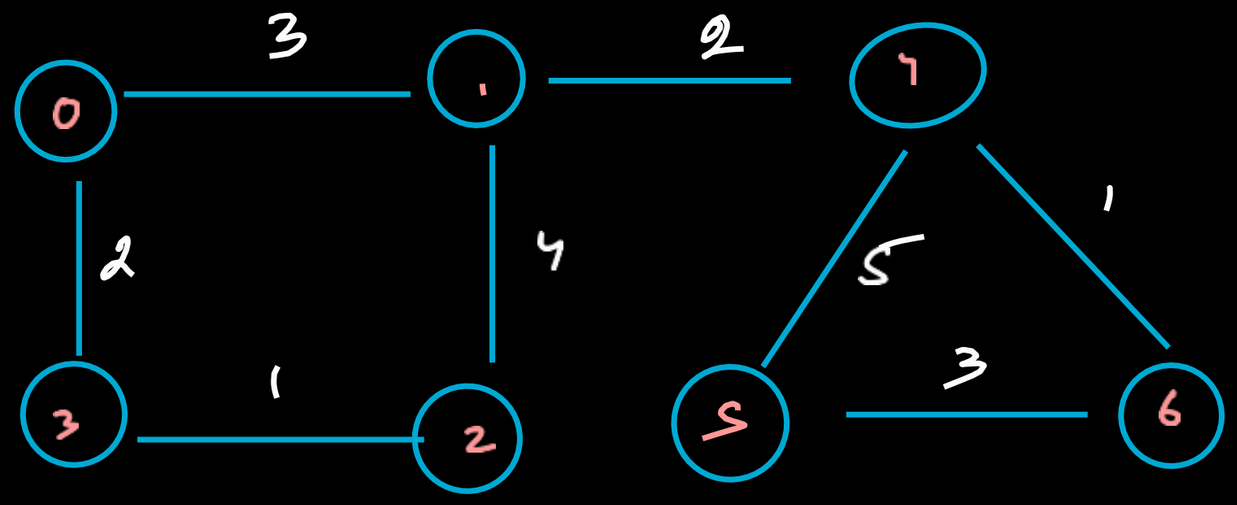
Graphs 08
Graphs (Part 5)



$G = [V, E]$

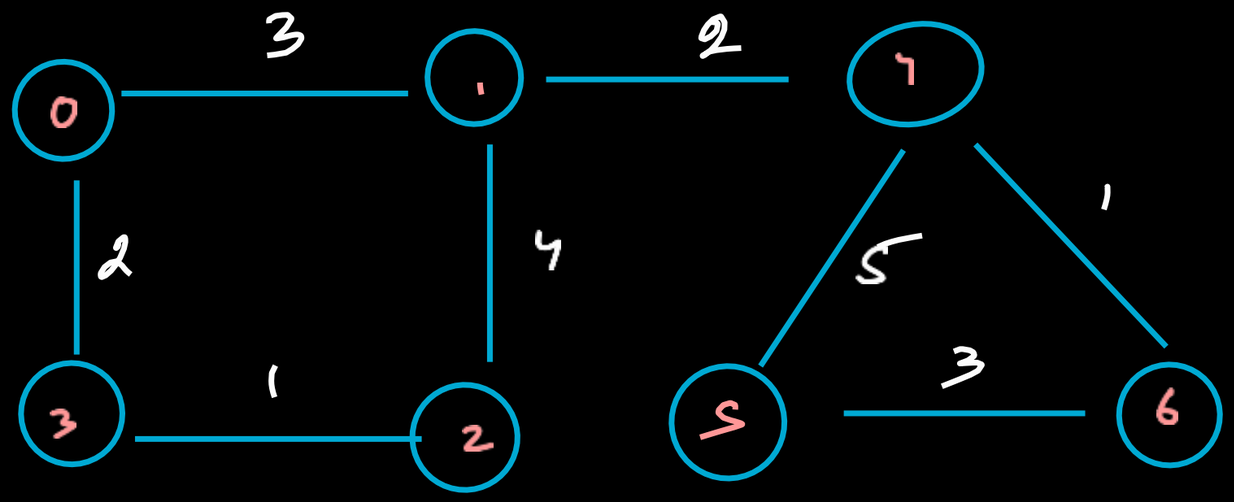
→ undirected

↳ weighted

↳ connected

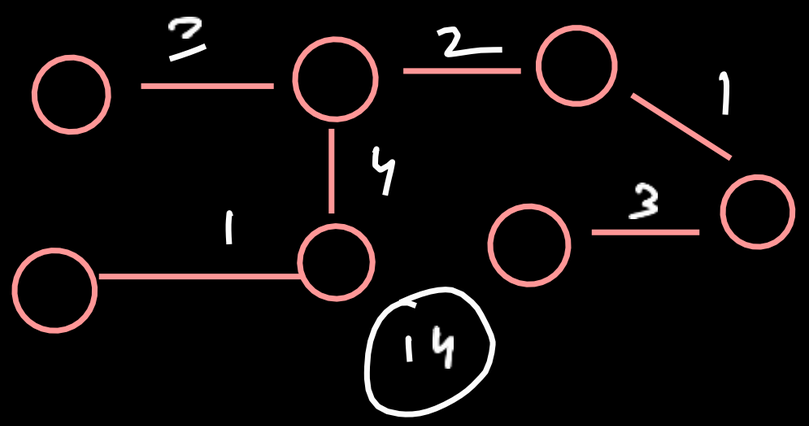
Special SubTree] → Tree → no cycles

↳ subgraph → it contains all the vertices

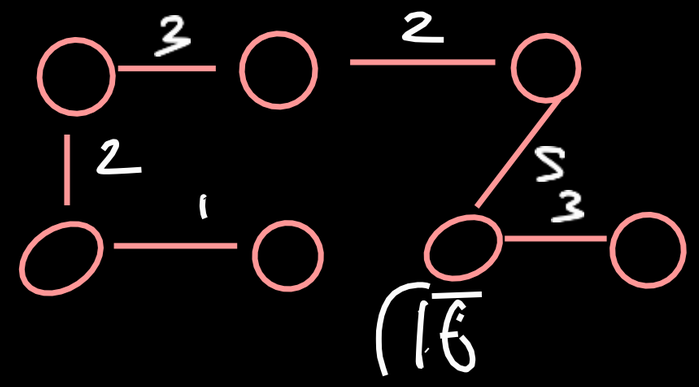


min sum

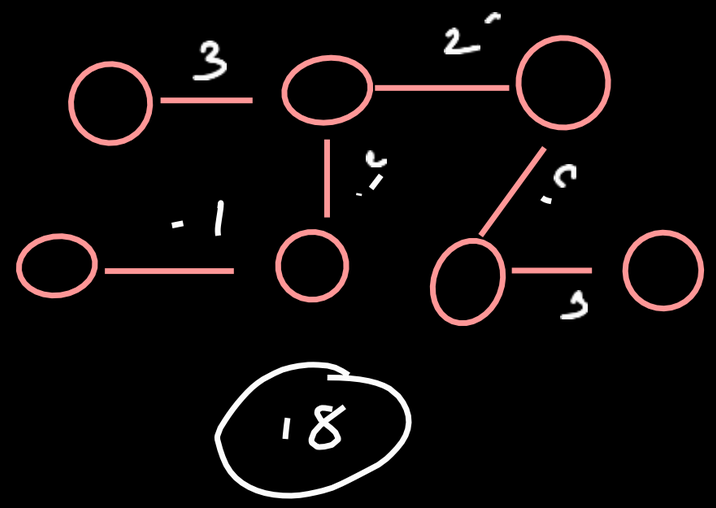
SCn-1



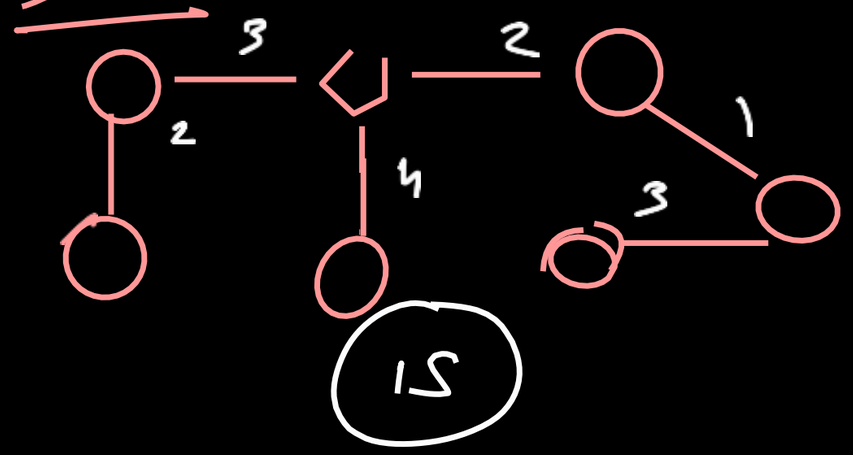
SCn-2



SCn-3



SCn-4



MST (Minimum Spanning Tree)

- Tree → no cycles
- includes all the nodes of graph
- → Sum of the edge wts is min

Spanning tree → graph has no cycles

Subgraph has all vertices but min no. of edges unable to keep it connected

greedy

Algorithms to Solve MST

- Kruskals
- Prims

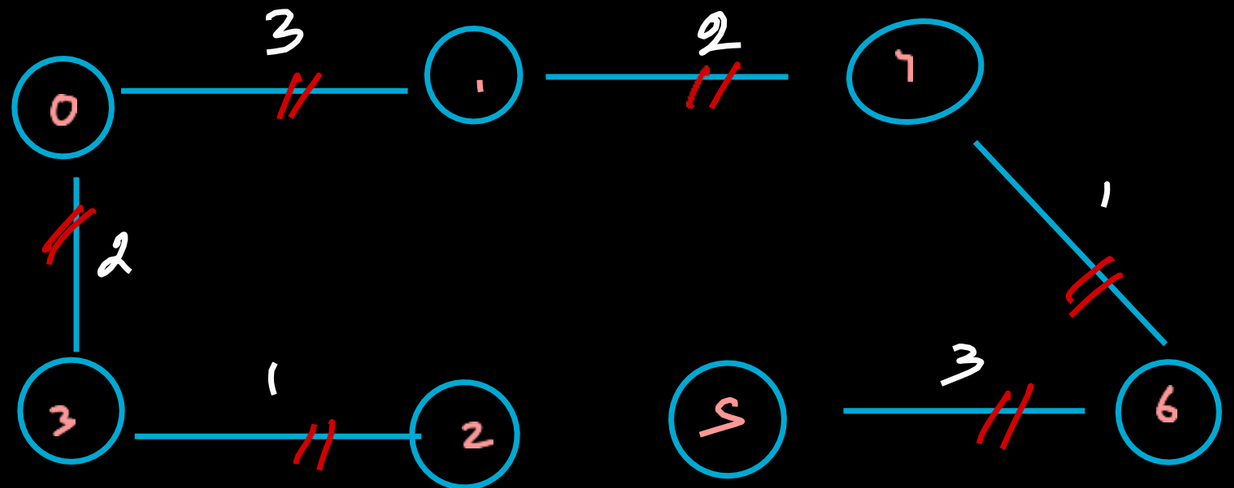
↳ overall the only choice we need to make is on the edges. Some edges will be picked Some won't:

KRUSKAL'S

↳ One by one keep a picky edges with min weight.

↳ if choosing an edge forms a cycle avoid it, else use it.

- → edge list → Sort by wt. } → CORMEN
- → DSU

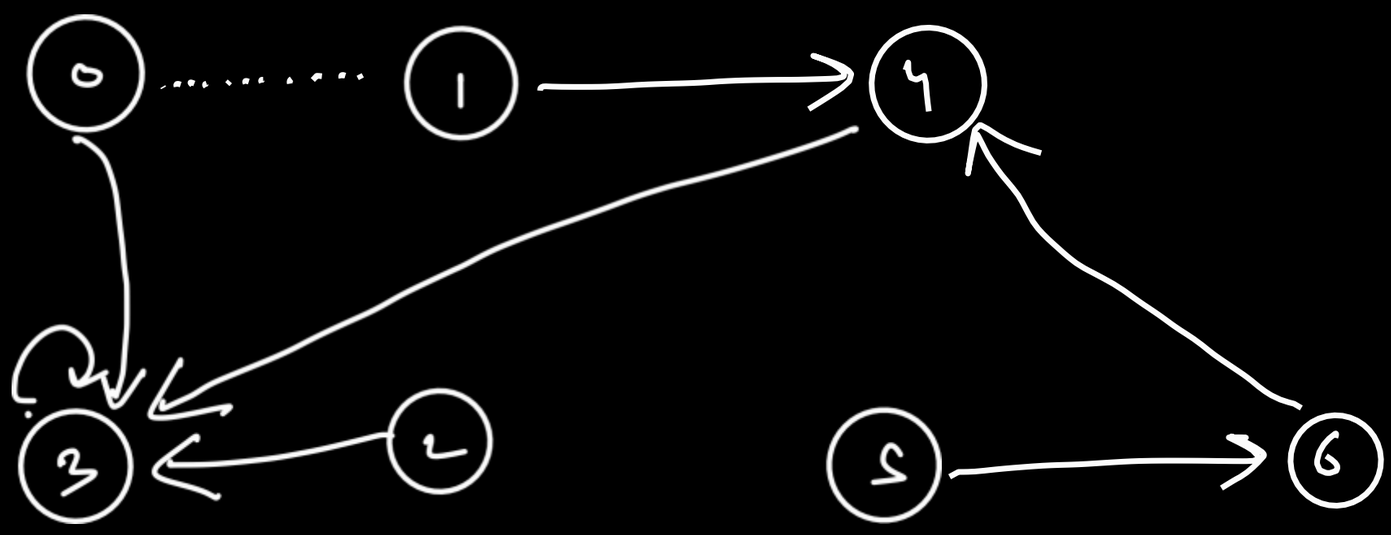


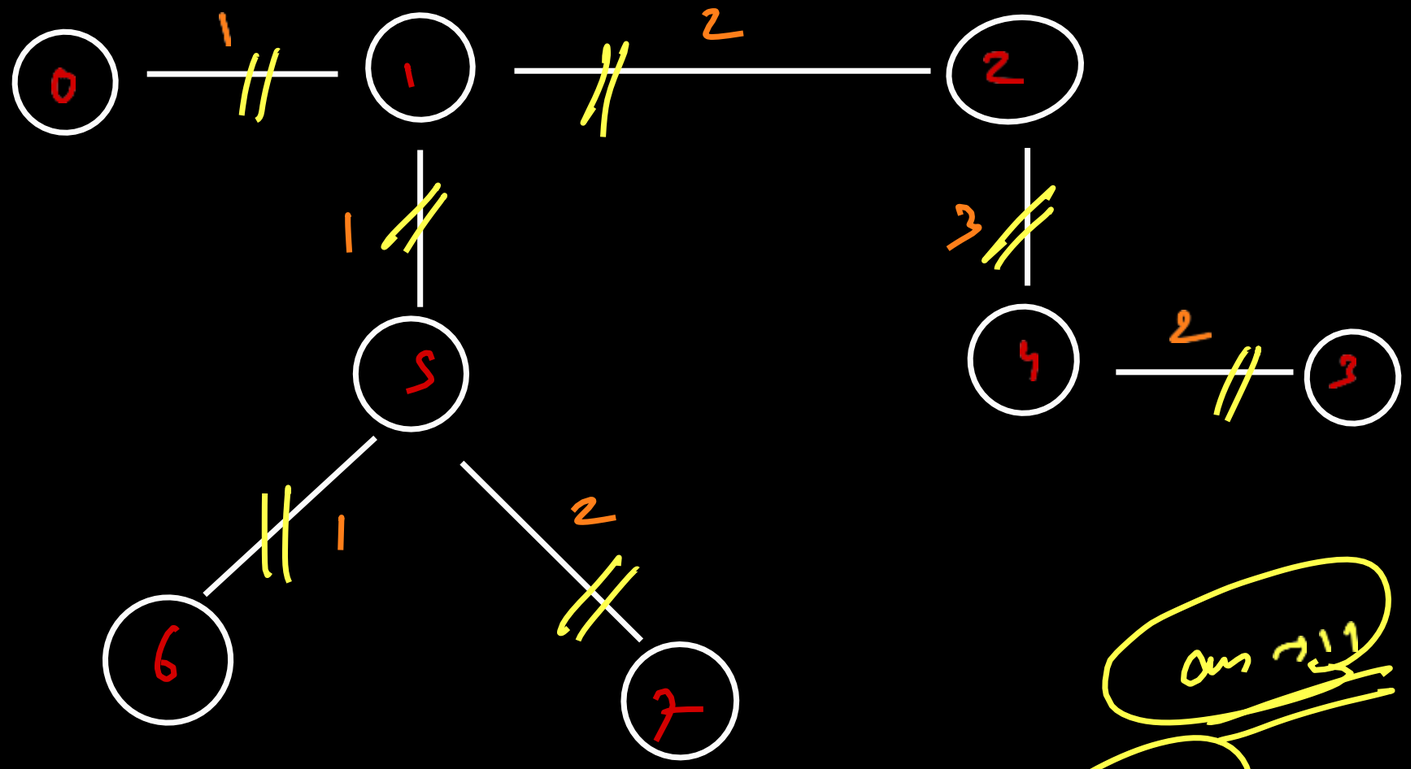
{ [3,2], [4,6], [0,3], [1,4], [0,1], [5,6], [1,2], [4,5] }

→ sort

12

ans = 0 + 1 + 1 + 2 + 2 + 3 + 3





Sorted edge list

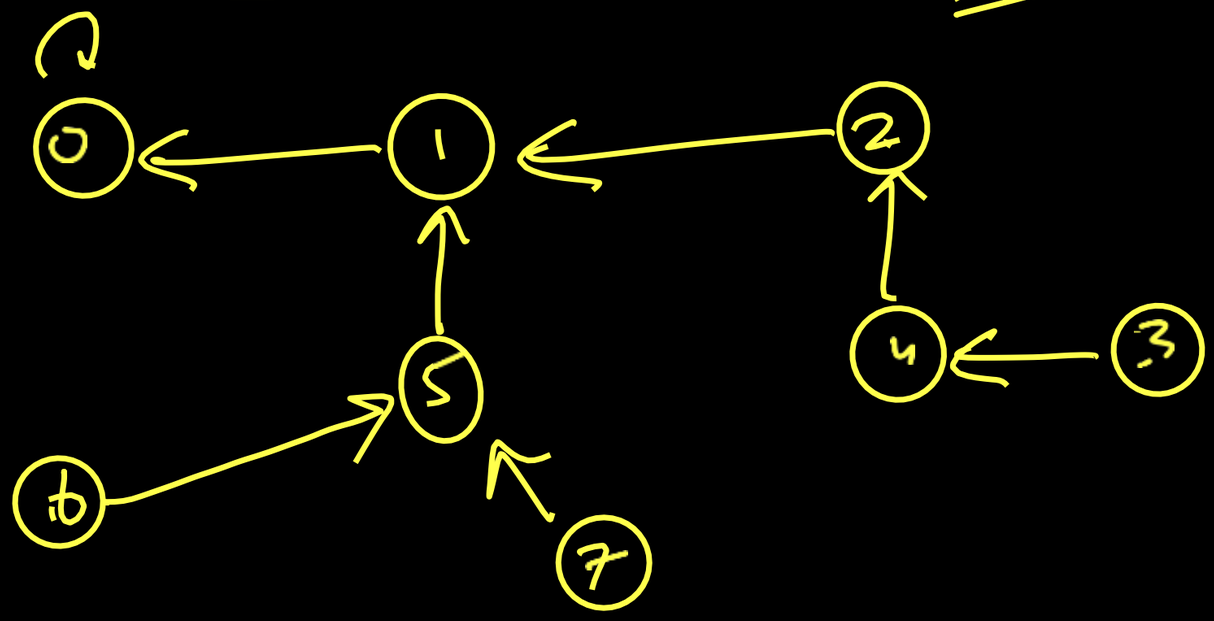
- (0,1)
- (1,3)
- (5,6)
- (1,2)
- (3,4)
- (5,7)
- ~~(0,6)~~
- (2,4)
- ~~(6,7)~~
- ~~(2,3)~~

→ (5,4) ~~X~~

~~(4,7)~~

ans = 11

1+1+1 + 2+2 +2 +3



↳ Greedy choice → choosy smallest edge wt which donot form cycle.

↙

✓ $\varepsilon_1 \to w_1$

$\varepsilon_2 \to w_2$

$x \cap w_1 < x \cap w_2$

✓✓ $\varepsilon_1 \not\to$ cycle

↳ MST → (x)

$x + w_1 < x + w_2$

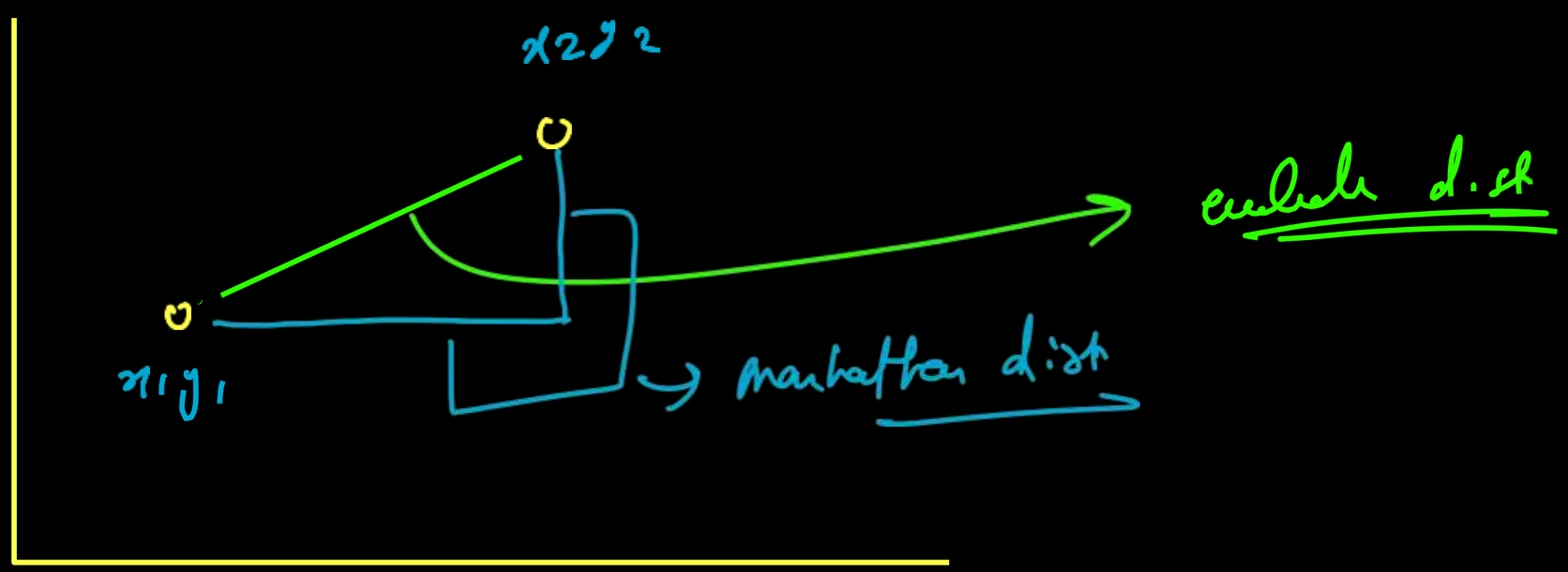
↓

$\varepsilon_1 \to$ cycle

(x_1, y_1) (x_2, y_2)

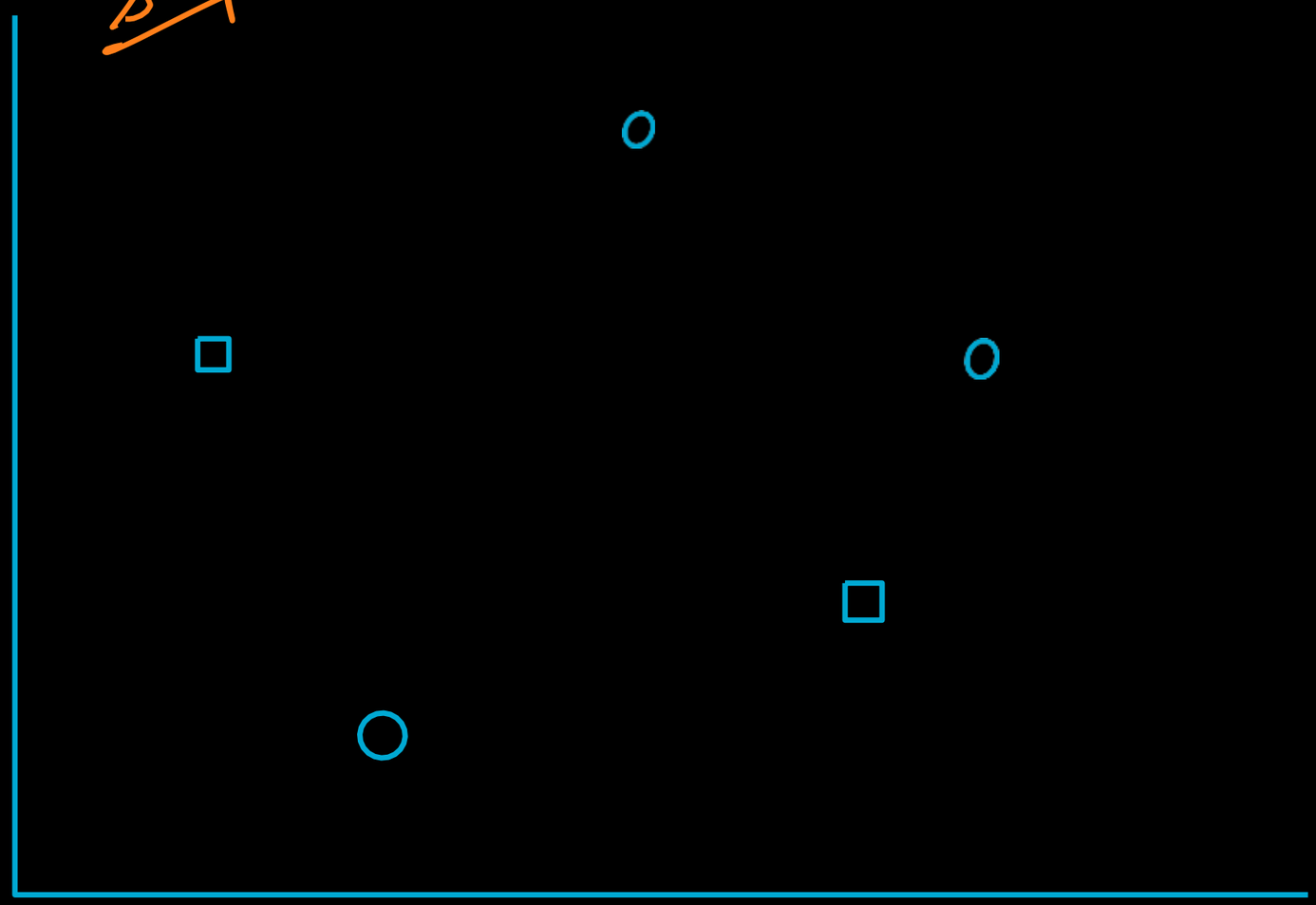
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ → euclidean dist

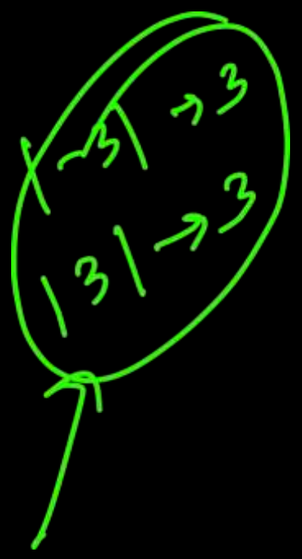
Manhattan → $|x_2 - x_1| + |y_2 - y_1|$

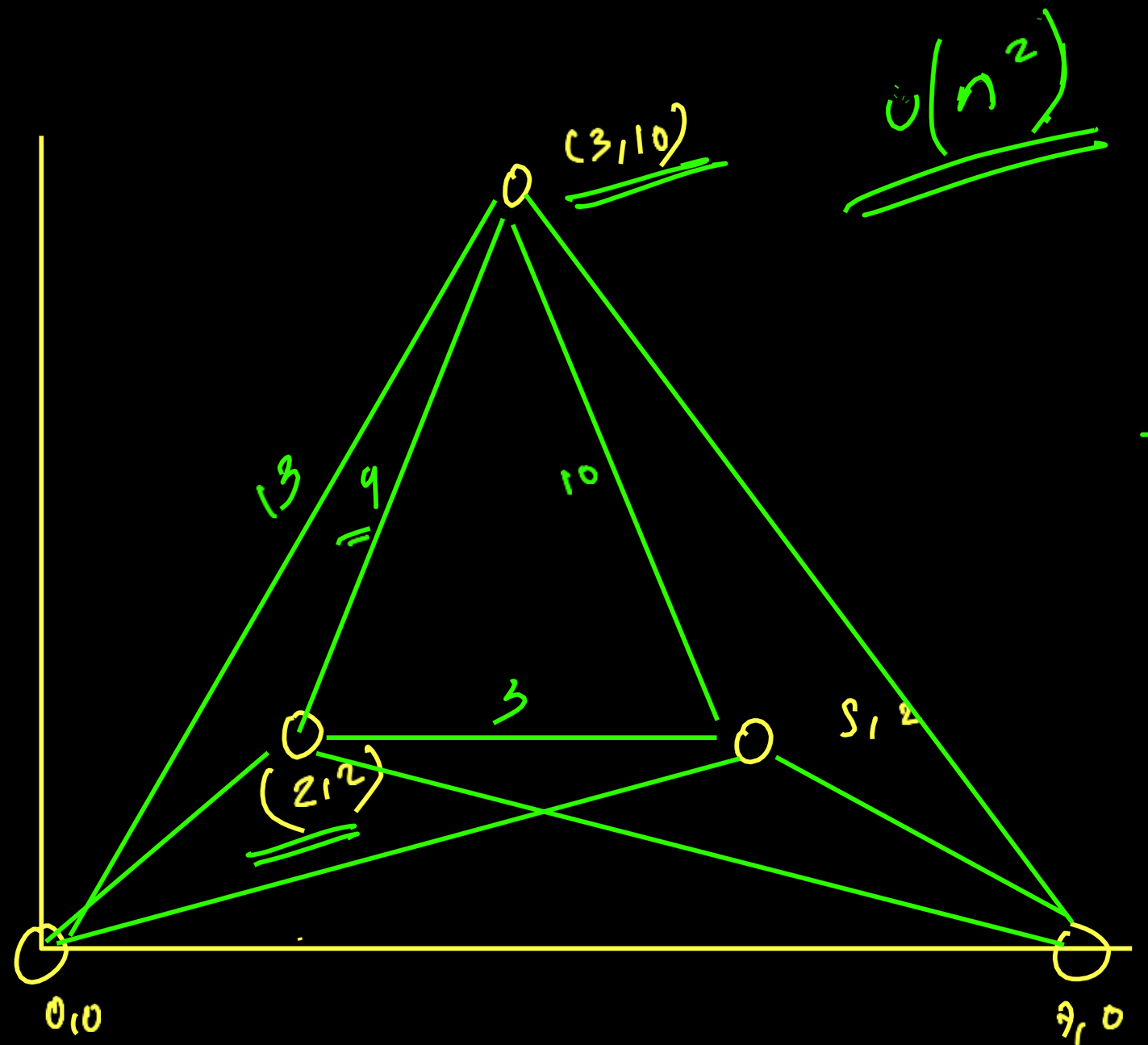


Simple path → MST

Total → E edges







$O(n^2)$

→ graph

→ MST (Kruskal's)

(3,10) , (2,2)

↳ |3-2| + |10-2|

↓

|1| + |8|

→ 1+8 → 9

PW SKILLS

THANK YOU