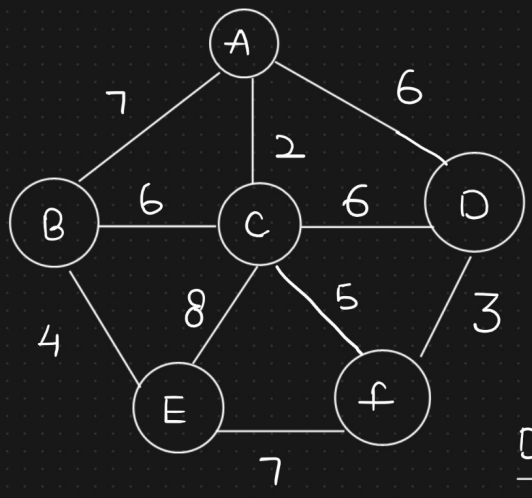
Prim's Algorithm → MST

↳ Adjacent vertex



Build minheap

↳ O(v)

Decrease key operation

↳ log E

A	B	C	D	E	f	
0	∞	∞	∞	∞	∞	
N	N	N	N	N	N	
	7	2	6	∞	∞	→ 3+
	A	A	A	N	N	3 log E
	6		6	8	5	→ 5+
	C		C	C	C	4 log E
	6		3	7		→
	C		f	f		
	6			7		→
	C			f		
				4		→
				B		

log V

log V

log V

log V

log V

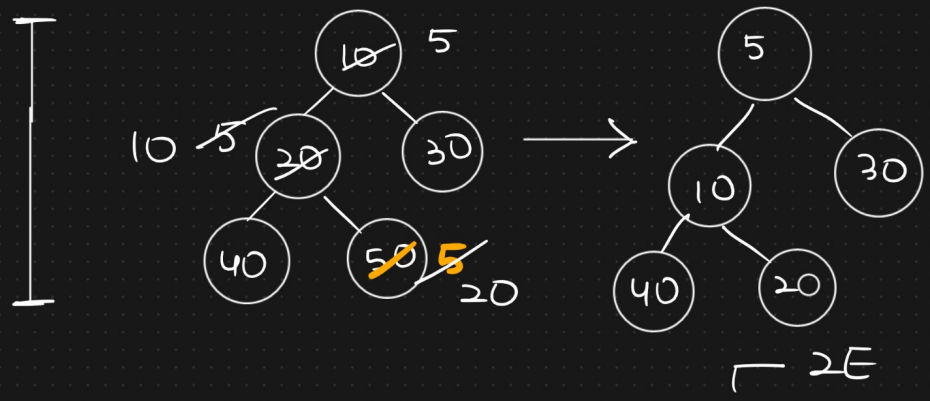
2E ↑ adjacency list

(adjacent) + E log E

Time complexity → V + V log V + 2E + E log E

⇒ (V + E) log V

O(logn)

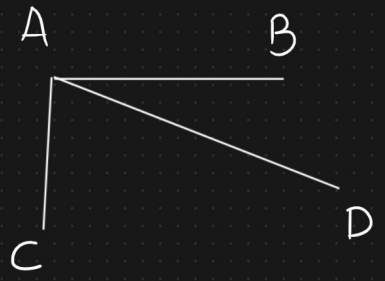


2E

Graph — Adjacency List

Graph — Adjacency Matrix

$\hookrightarrow V^2$

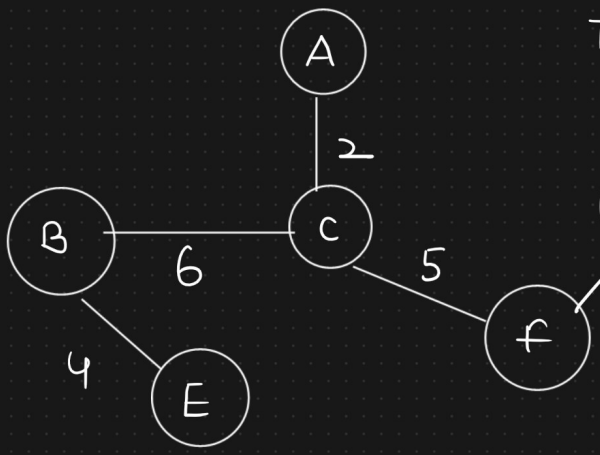


	A	B	C	D
A	0	1	1	1
B	1	0	0	0
C	1	0	0	0
D	1	0	0	0

VxV

4x4

Sum of degree = 2E



Total cost of MST using Prim's algo =

6 + 2 + 5 + 3 + 4

= 20

Adjacency Matrix

$$TC = V + V\log V + V^2 + E\log E$$

$$\boxed{TC = V^2 + E\log E}$$

- $V \rightarrow$ Build of minheap
- $V\log V \rightarrow$ Deletion of all the vertex
- $V^2/2E \rightarrow$ adjacent
- $E\log E \rightarrow$ Decrease key operation