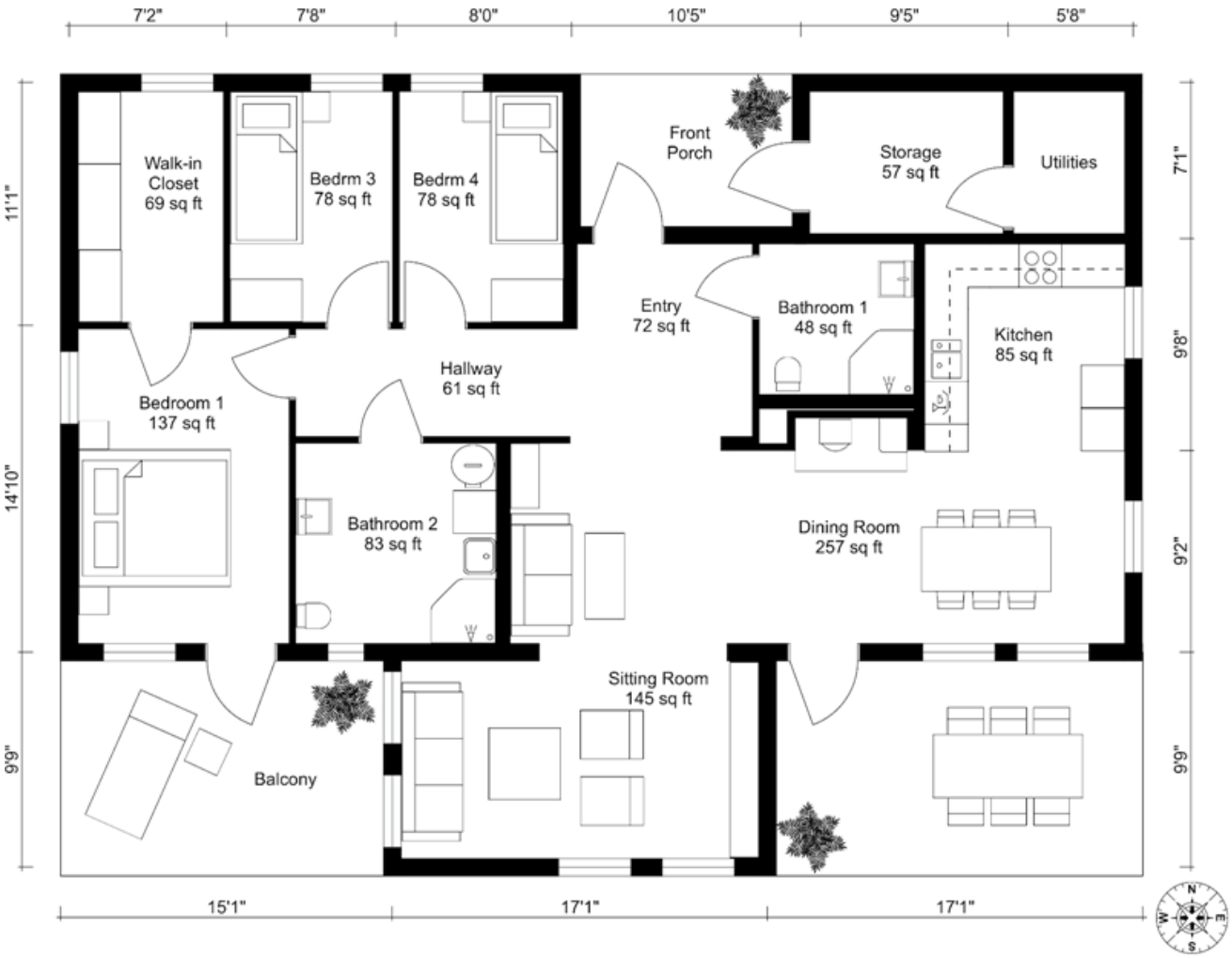
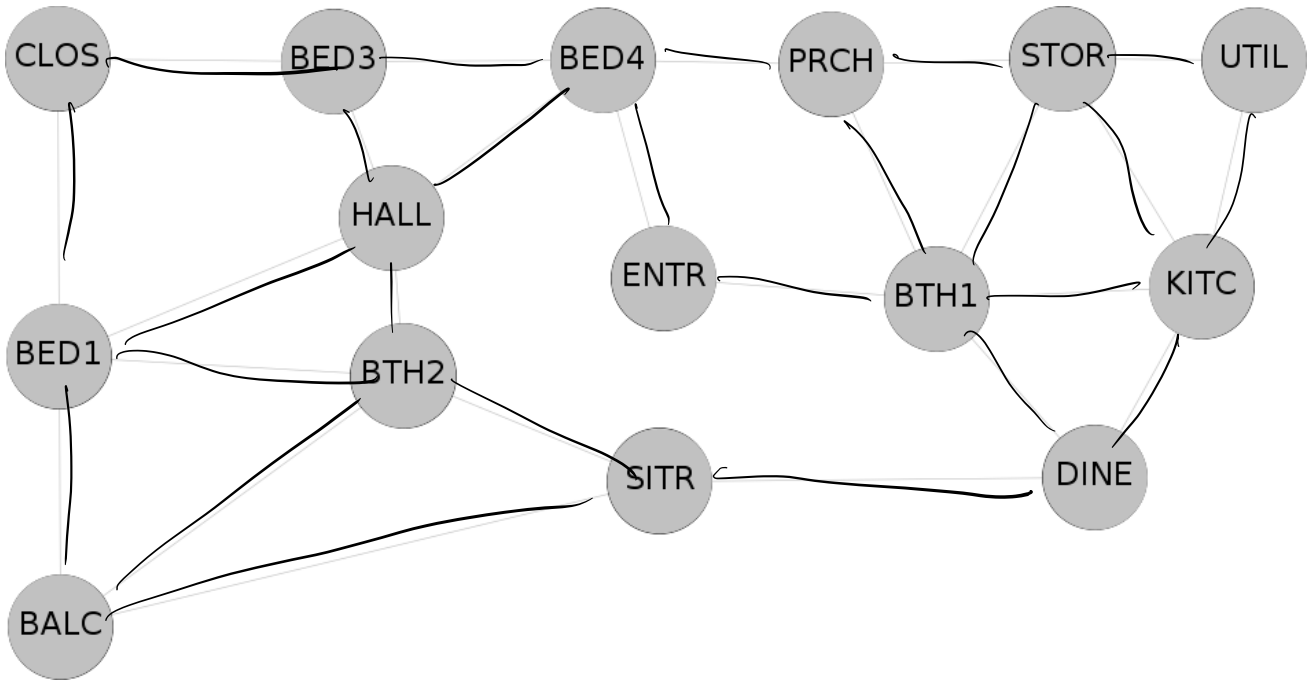
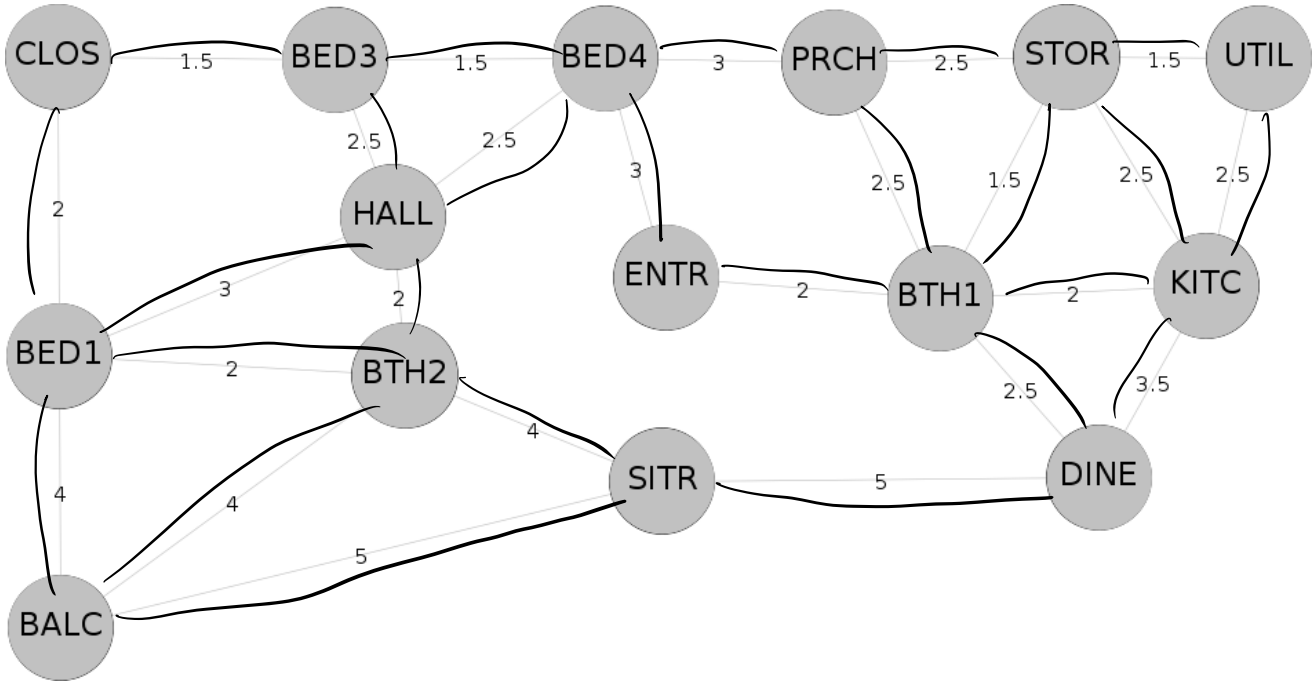
New Apartment...



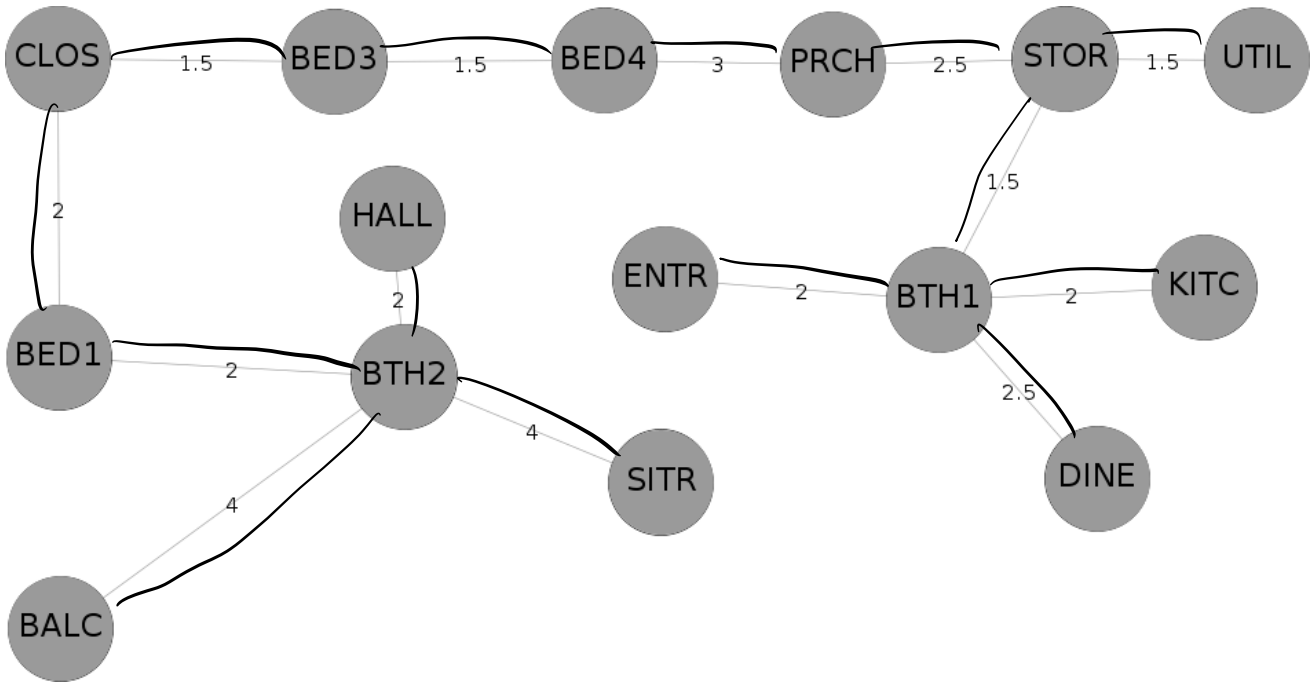
Wireability Graph



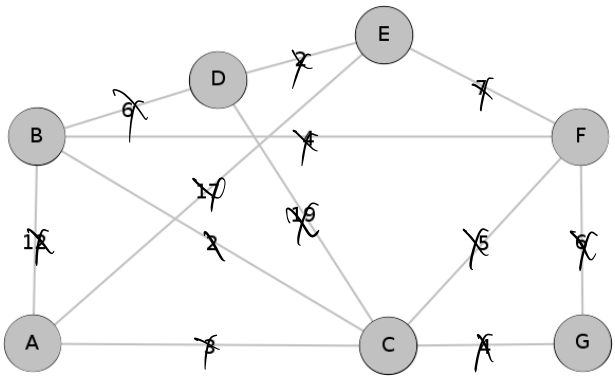
"Cost" of Wiring



Minimum Spanning Tree

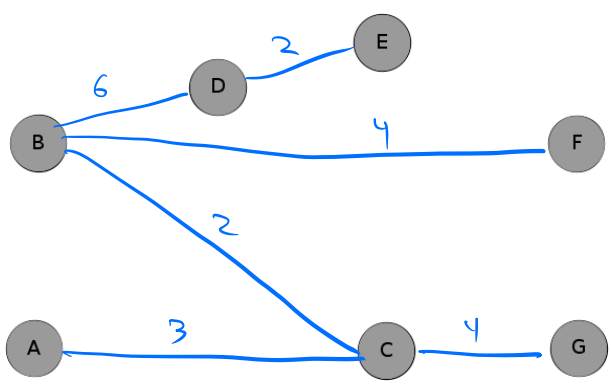


MST: Kruskal's Algorithm (1956)

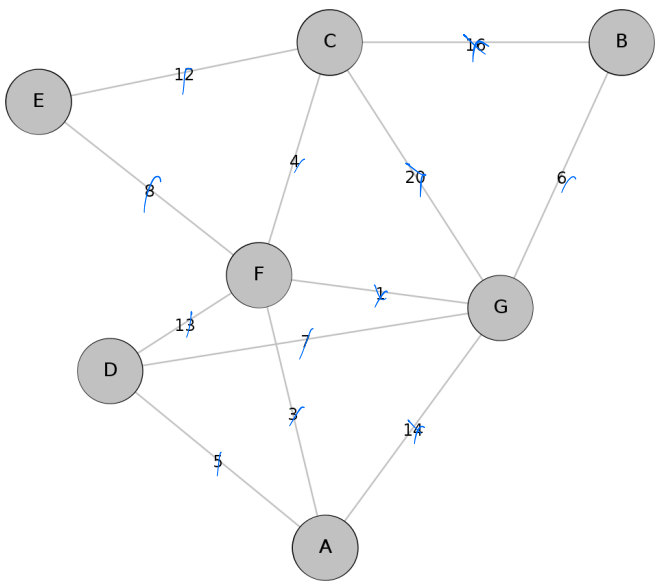


- Draw the graph without any edges (so just the vertices).
- Sort all the edges, by weight, in ascending order.
- While there are edges left and we don't yet have an MST…
  - Select the smallest edge
  - Check if adding this edge to the graph would create a cycle
  - If no cycle, then add the edge to the graph
  - Repeat for the next smallest edge

BC, DE, AC, CG, BF, CF, FG, BD, EF, BA, AE, DC
2 2 3 4 4 5 6 6 7 12 17 19



Your turn...



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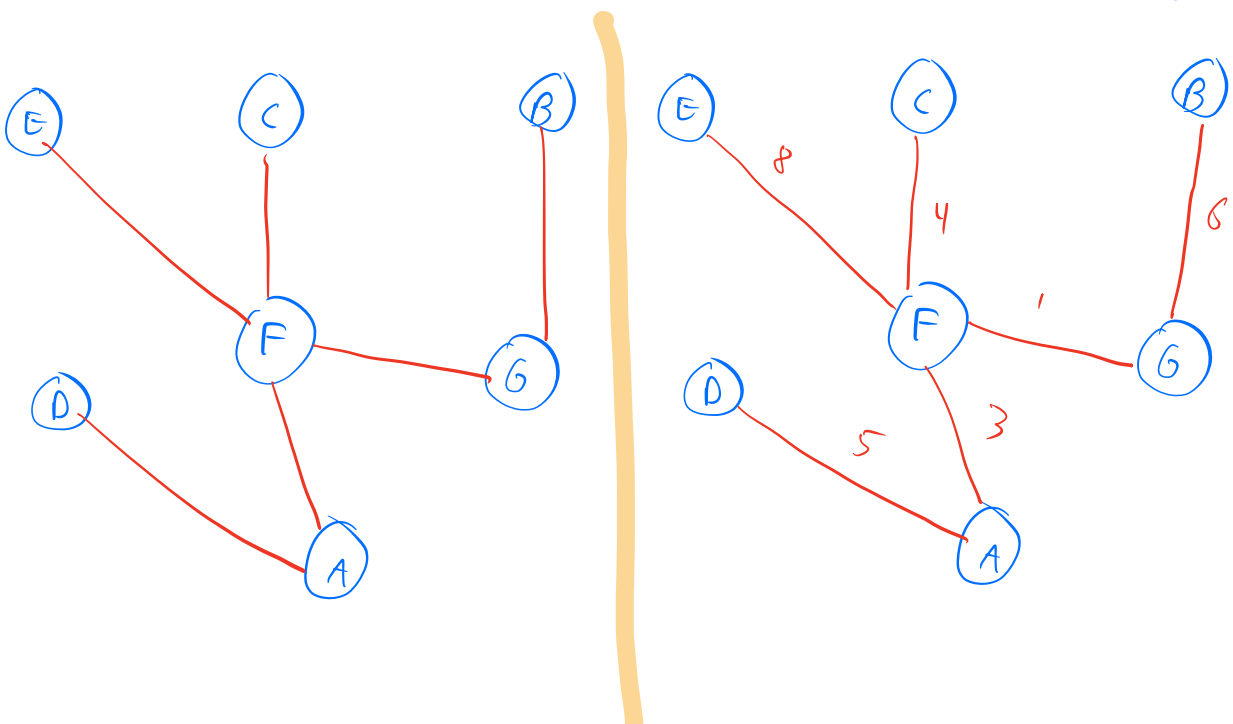
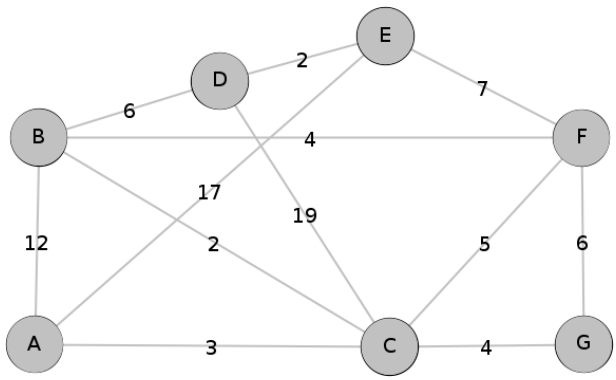
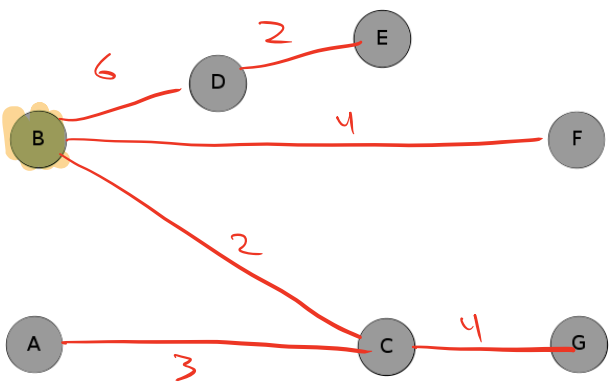
  - Repeat for the next smallest edge

FG, FA, CF, DA, GB, DG, EF, EC, DF, AG, CB, CG
1 3 4 5 6 7 8 12 13 14 16 20



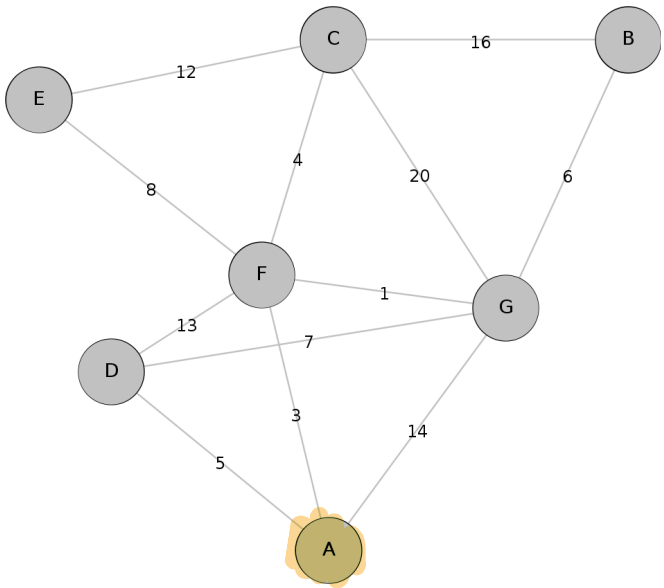
MST: Prim's Algorithm (1957)



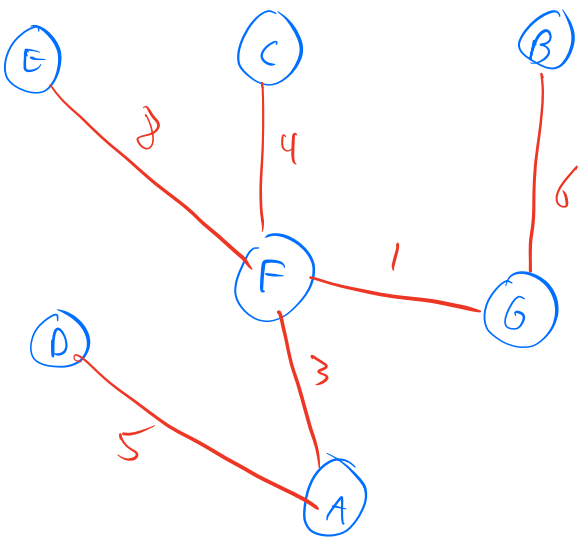


- Draw the graph without any edges (so just the vertices).
- Choosing an arbitrary vertex, add its smallest edge.
- While we don't yet have an MST…
  - Add the edge with the shortest distance from vertices in the MST to a vertex that is not yet in the MST.

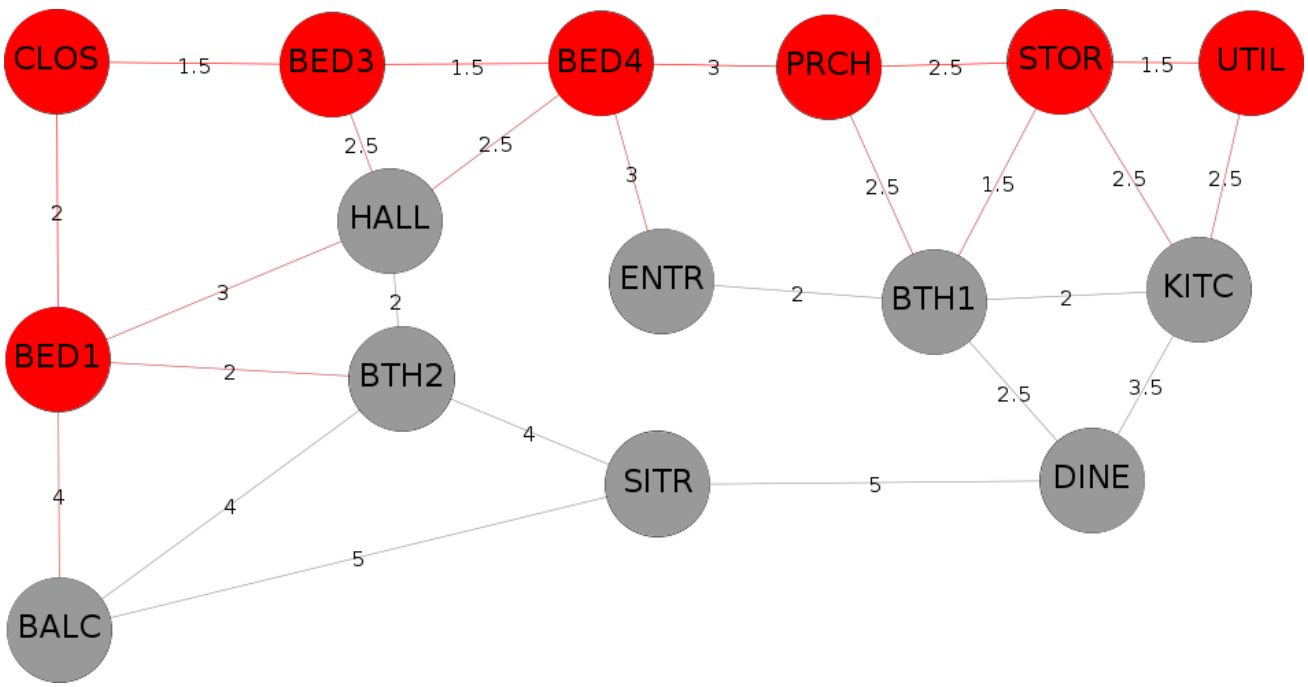
Your Turn...



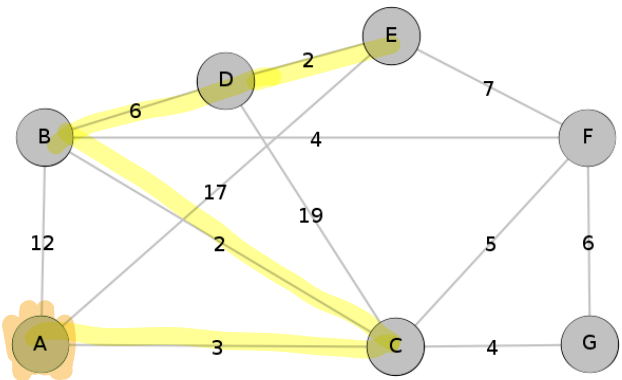
- Draw the graph without any edges (so just the vertices).
- Choosing an arbitrary vertex, add its smallest edge.
- While we don't yet have an MST…
  - Add the edge with the shortest distance from vertices in the MST to a vertex that is not yet in the MST.



Shortest - Path



Dijkstra's Algorithm



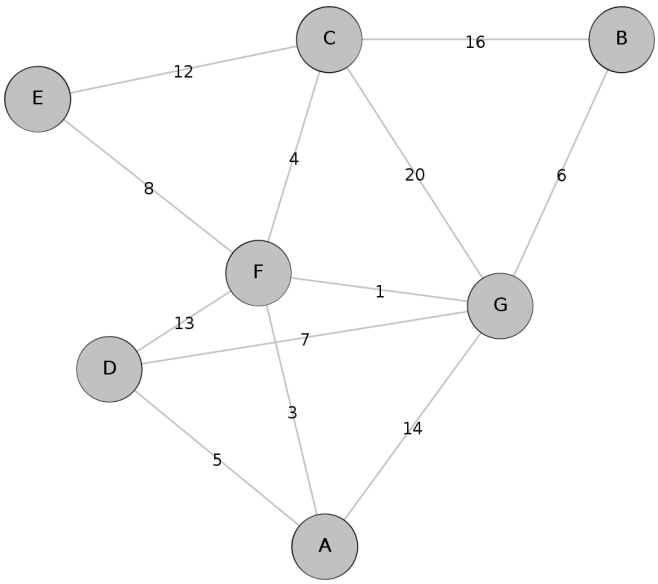
Work

Node	Cost	Prev
A	0	
B	~~∞~~ 12 ~~7~~ 5	~~A~~ C
C	~~∞~~ 3	A
D	~~∞~~ ~~22~~ 11	~~C~~ B
E	~~∞~~ ~~17~~ ~~15~~ 13	~~A~~ ~~F~~ D
F	~~∞~~ 8	C
G	~~∞~~ 7	C

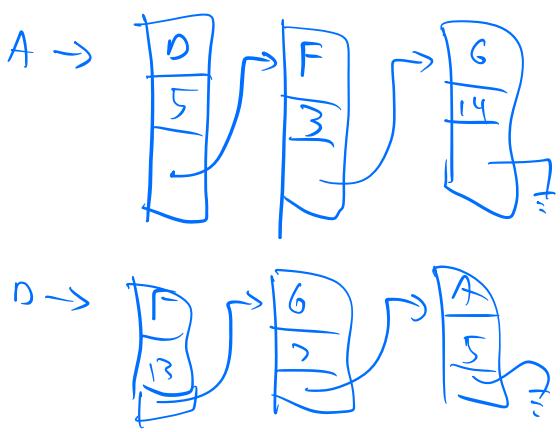
Done

Node	Cost	Prev
A	0	
C	3	A
B	5	C
G	7	C
F	8	C
D	11	B
E	13	D

Your Turn...



Adjacency Matrix

	A	B	C	D	E	F	G
A							
B							
C				12			
D					13		
E		12					
F			13				
G							

Adjacency List