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Graph

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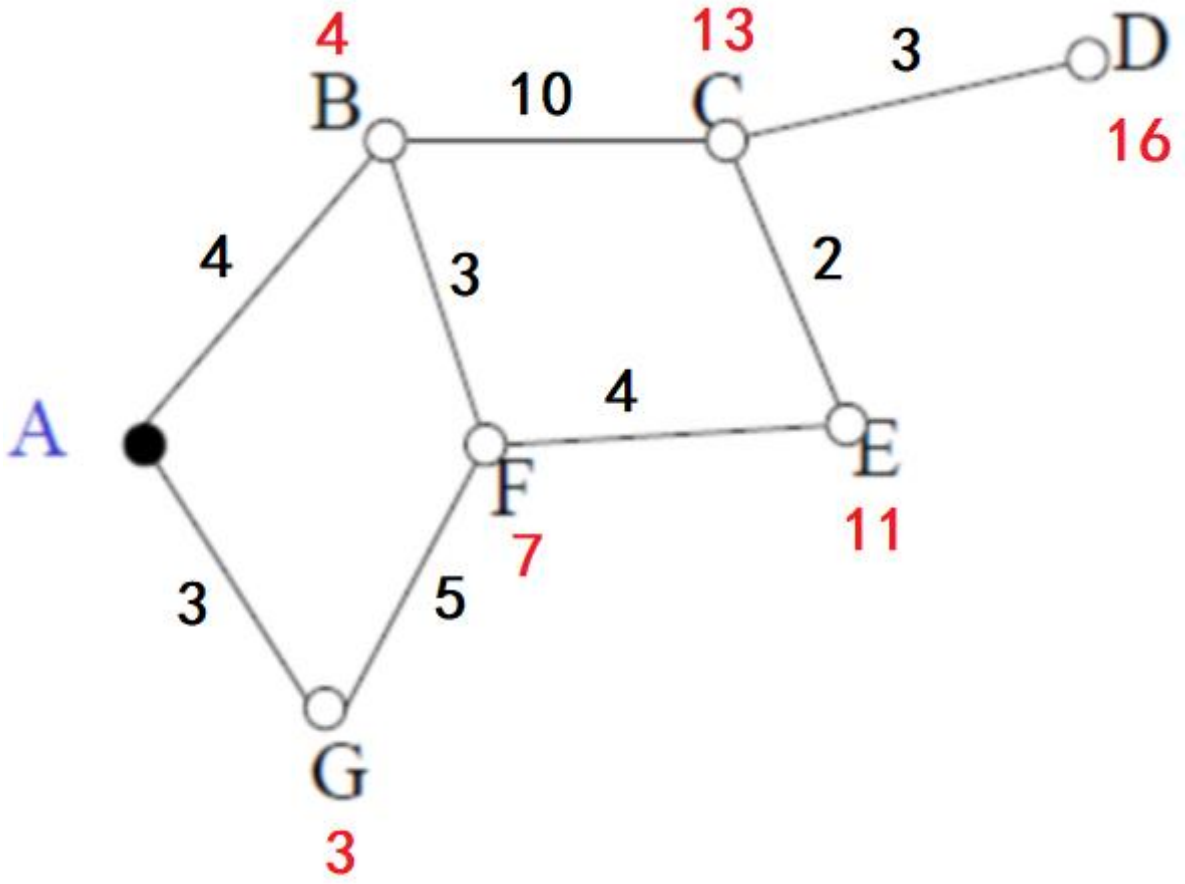
Edited by Heshan Du

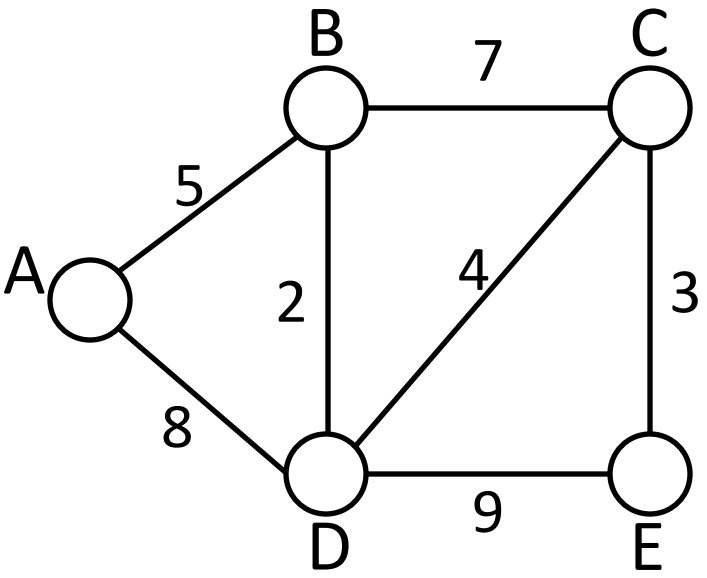
Example of Dijkstra's algorihm

Find the shortest distance using Dijkstra's algorithm for the following graph, starting from A.



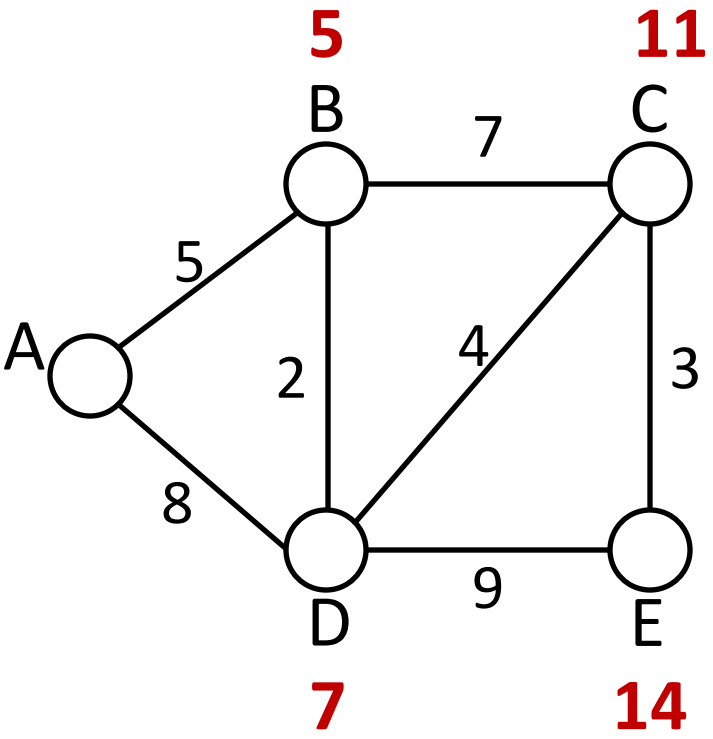
Exercise 1

Find the shortest distance using Dijkstra's algorithm for the following graph, starting from A.



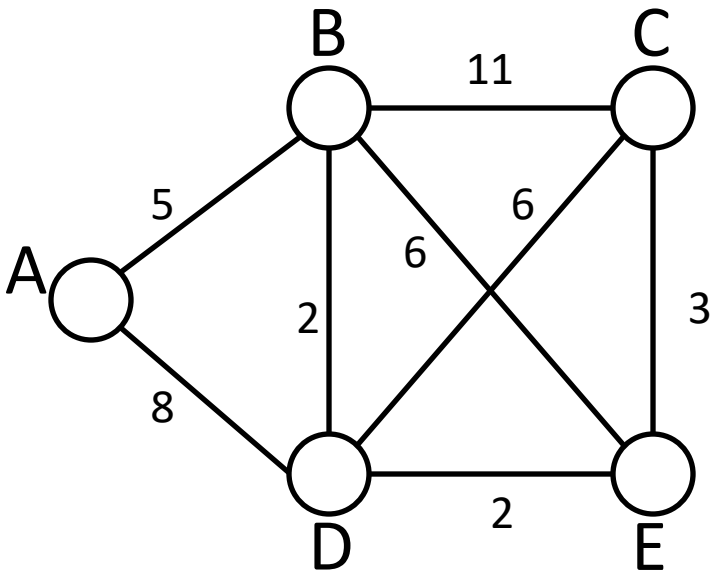
Exercise 1: Answer

Find the shortest distance using Dijkstra's algorithm for the following graph, starting from A.



Exercise 2

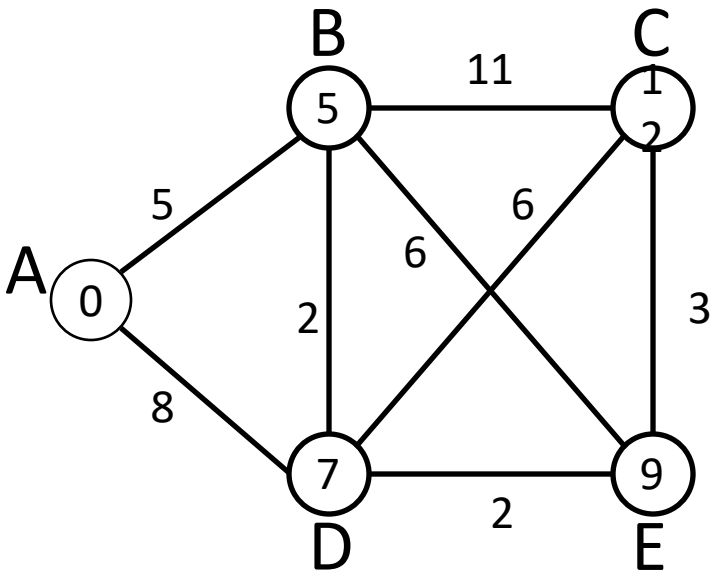
Find the shortest distances and the shortest path for the following graph.



0. (A,0,{}), (B,inf,{}), (C,inf,{}), (D,inf,{}), (E,inf,{}), **PQ = {A,B,C,D,E}.**

Exercise 2 - answer

Find the shortest distances and the shortest path for the following graph.

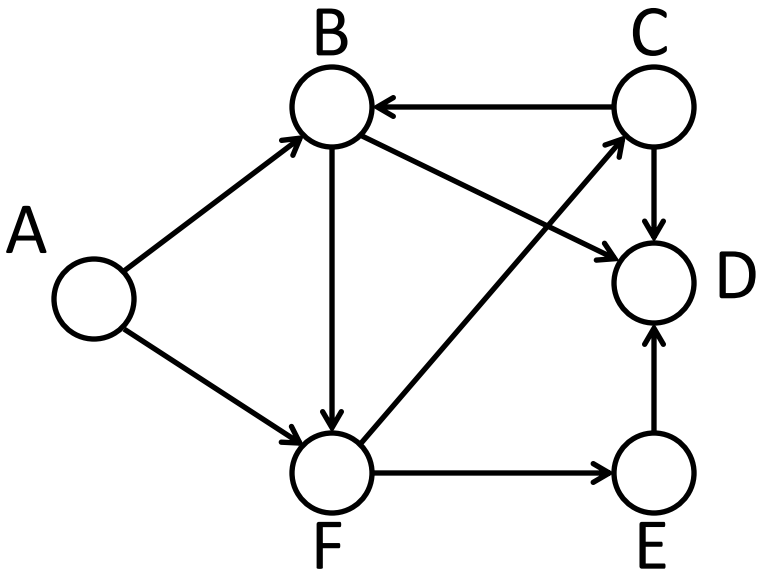


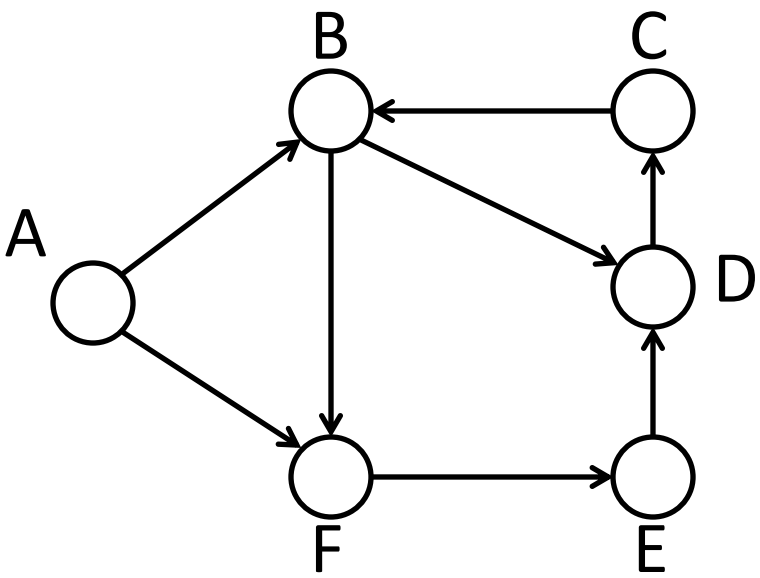
0. (A,0,{}), (B,inf,{}), (C,inf,{}), (D,inf,{}), (E,inf,{}), **PQ = {A,B,C,D,E}.**
1. (A,0,{A}), (B,5,{A}), (C,inf,{}), (D,8,{A}), (E,inf,{}), **PQ = {B,D,C,E}.**
2. (A,0,{A}), (B,5,{A,B}), (C,16,{A,B}), (D,7,{A,B}), (E,11,{A,B}), **PQ = {D,E,C}.**
3. (A,0,{A}), (B,5,{A,B}), (C,13,{A,B,D}), (D,7,{A,B,D}), (E,9,{A,B,D}), **PQ = {E,C}.**
4. (A,0,{A}), (B,5,{A,B}), (C,12,{A,B,D,E}), (D,7,{A,B,D}), (E,9,{A,B,D,E}), **PQ = {C}.**
5. (A,0,{A}), (B,5,{A,B}), (C,12,{A,B,D,E,C}), (D,7,{A,B,D}), (E,9,{A,B,D,E}), **PQ = {}.**

Exercise 3

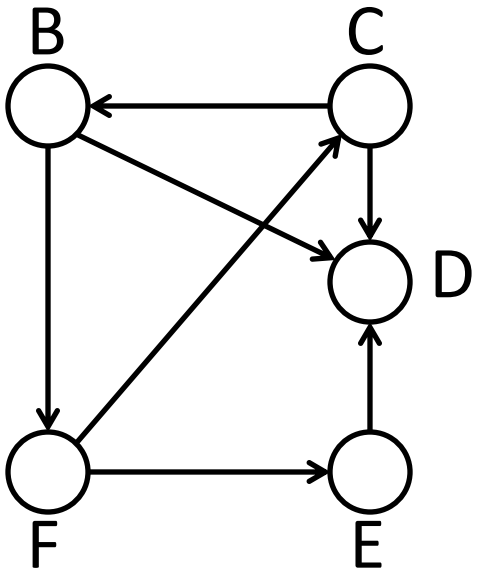
拓扑排序只能在 **有向无环图（DAG）** 上成功完成。如果在拓扑排序的过程中，剩下的节点都还有入度（即没有入度为 0 的节点可选），就说明存在一个环。因此：**无法完成拓扑排序 图中有环**。

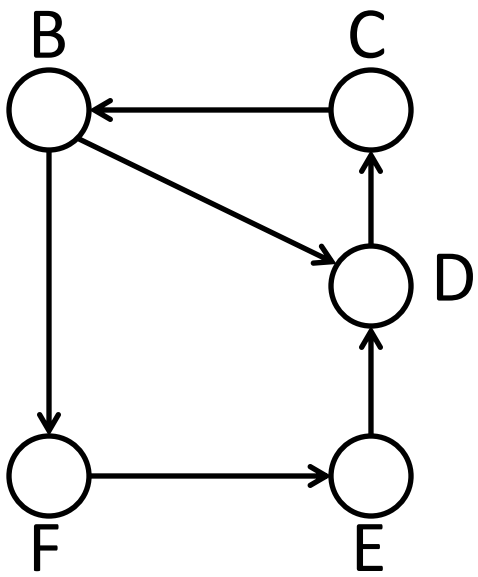
Use topological sort to detect cycle





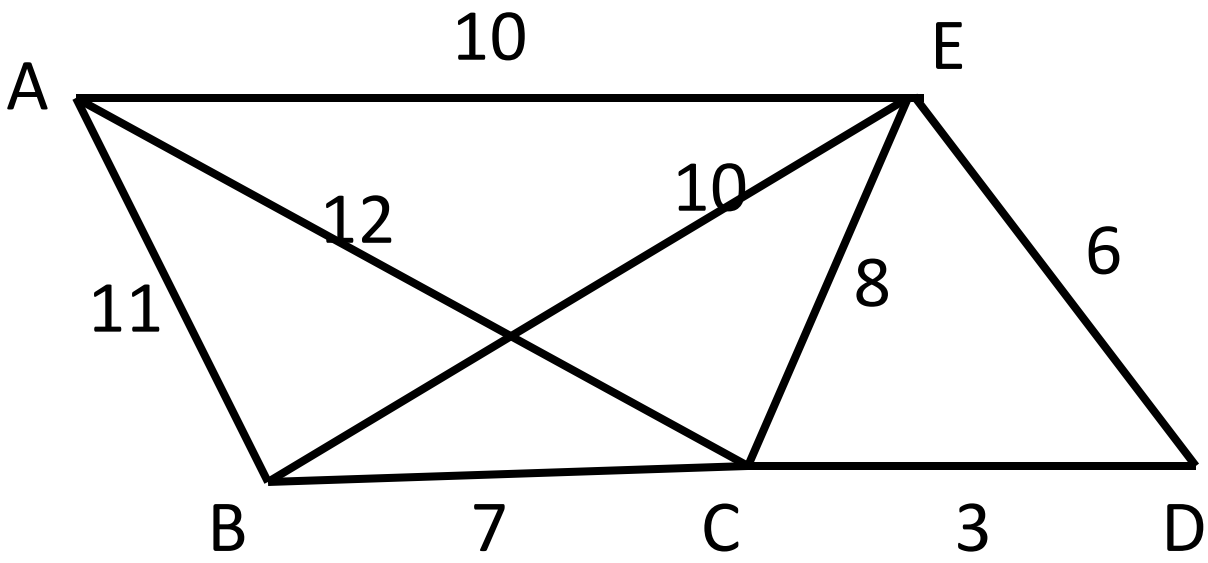
Exercise 3 - answer





Exercise 4

Find the minimum spanning tree



Exercise 4 - answer

Find the minimum spanning tree

初始化：已选点集：{A}可选边（从 A 出发）：A-B(11), A-C(12), A-E(10)选择最小边 **A-E (10)**
第一步：已选点集：{A, E}可选边：A-B(11), A-C(12), E-B(10), E-C(8), E-D(6)最小边：**E-D (6)**
第二步：已选点集：{A, E, D}可选边：A-B(11), A-C(12), E-B(10), E-C(8), D-C(3)最小边：**D-C (3)**
第三步：已选点集：{A, E, D, C}可选边：A-B(11), A-C(12), E-B(10), B-C(7), C-B(7)最小边：**C-B (7)**
第四步：已选点集：{A, B, C, D, E}，所有点都已覆盖完成！
最小生成树边：A-E (10)E-D (6)D-C (3)C-B (7)
总权重：
10 + 6 + 3 + 7 = 26