Graph Theory: Kruskal's Algorithm

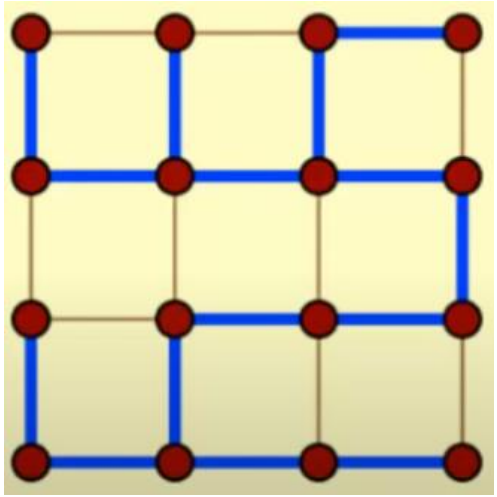
Objectives

- Determine a minimum cost spanning tree using Kruskal's algorithm.

Spanning Tree

A spanning tree is a connected graph using all vertices in which there are no circuits.

In other words, there is a path from any vertex to any other vertex, but no circuits.



Minimum Cost Spanning Tree

The **minimum cost spanning tree** is the spanning tree with the smallest total edge weight.

A **nearest neighbor** style approach doesn't make as much sense here since we don't need a circuit, so instead we will take an approach similar to **sorted edges**.

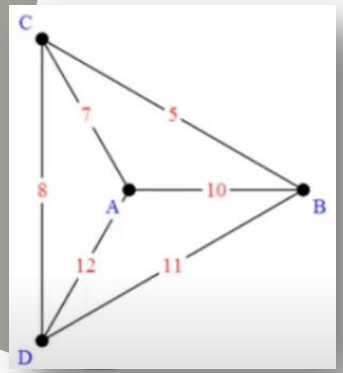
Kruskal's Algorithm

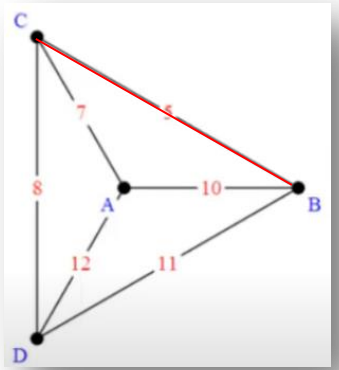
1. Select the cheapest unused edge in the graph.
2. Repeat step 1, adding the cheapest unused edge, unless:
    a) adding the edge would create a circuit
3. Repeat until a spanning tree is formed.

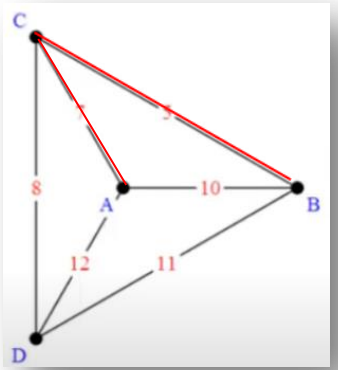
This algorithm is efficient and optimal. It always works.

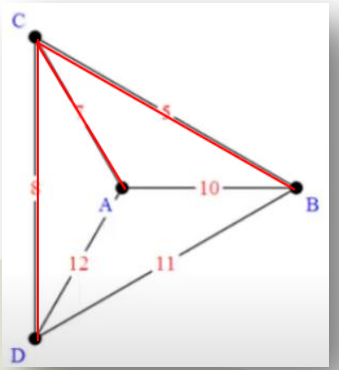
Example:

Find the minimum cost spanning tree on the graph below using Kruskal's algorithm. Which of the edges below are included in the minimum cost tree? What is the minimum cost?









5 + 7 + 8 = 20

The minimum cost spanning tree is 20.

THANK YOU FOR LISTENING