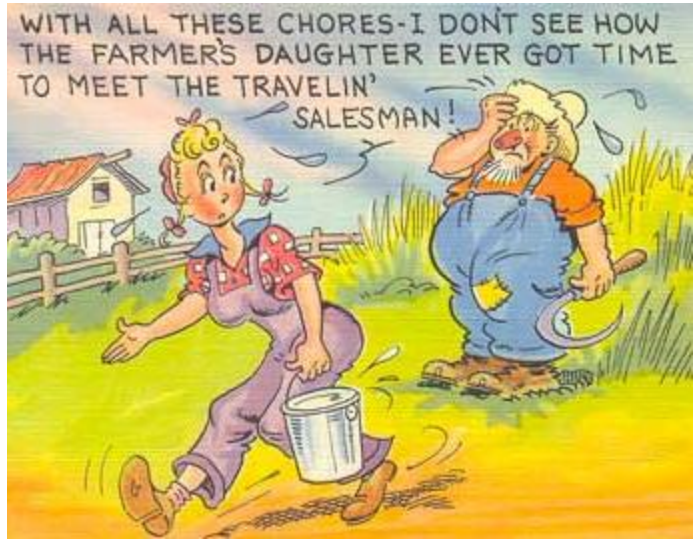
Traveling Salesman Problem:

It's the problem of finding a Hamilton circuit in a complete weighted graph that has the smallest weight. Such a Hamilton circuit is called an optimal solution of the problem.



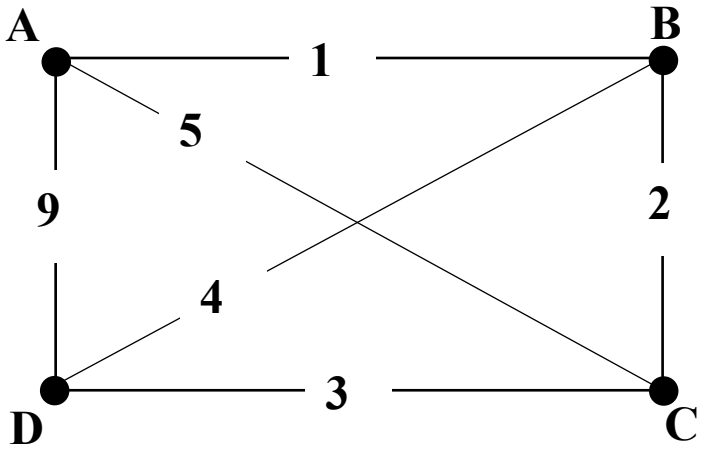
Brute Force Method:

1. List all the Hamilton circuits.

2. Determine the weight of each of the listed Hamilton circuits.

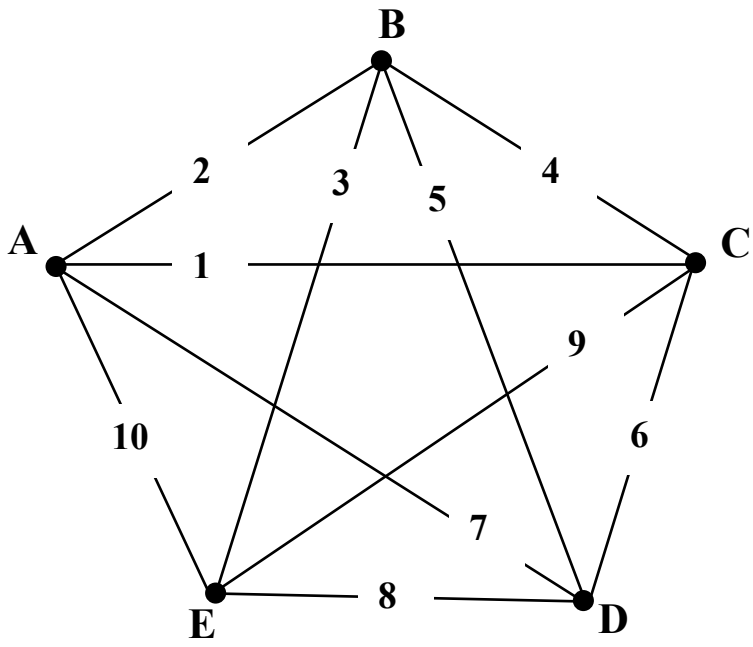
3. Hamilton circuits with the minimum weight are optimal solutions.

Examples:

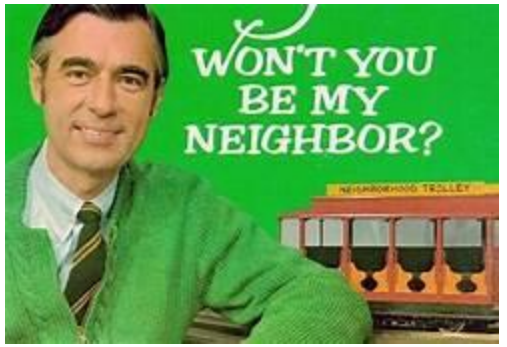


Hamilton circuit	Weight
A,B,C,D,A	15
A,B,D,C,A	13
A,C,B,D,A	
A,C,D,B,A	
A,D,B,C,A	
A,D,C,B,A	

Hamilton Circuit	Weight
A,B,C,D,E,A	30
A,B,C,E,D,A	30
A,B,D,C,E,A	32
A,B,D,E,C,A	25
A,B,E,C,D,A	27
A,B,E,D,C,A	20
A,C,B,D,E,A	28
A,C,B,E,D,A	23
A,C,D,B,E,A	25
A,C,D,E,B,A	20
A,C,E,B,D,A	25
A,C,E,D,B,A	25
A,D,B,C,E,A	35
A,D,B,E,C,A	25
A,D,C,B,E,A	30
A,D,C,E,B,A	27
A,D,E,B,C,A	23
A,D,E,C,B,A	
A,E,B,C,D,A	
A,E,B,D,C,A	
A,E,C,B,D,A	
A,E,C,D,B,A	
A,E,D,B,C,A	
A,E,D,C,B,A	



There is a method for producing approximate optimal solutions called the *Nearest Neighbor Method.*

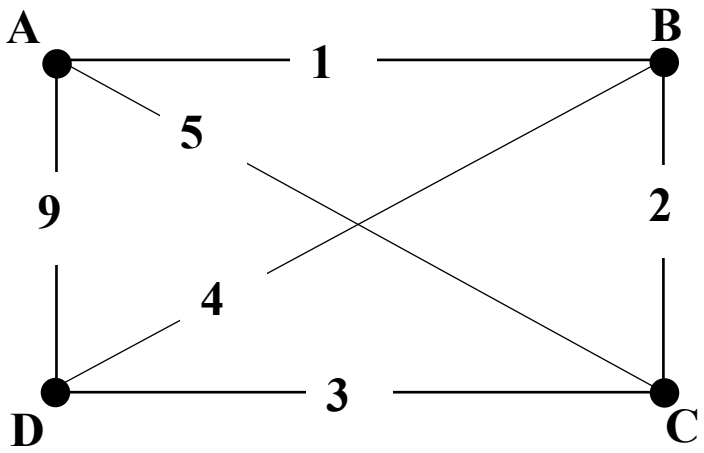


1. Choose a starting vertex.

2. Choose the edge with the smallest weight.

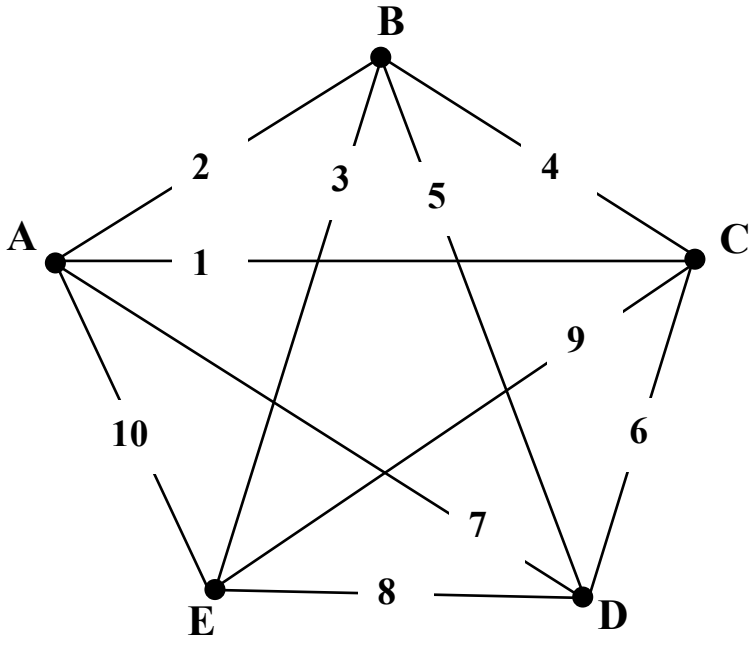
3. From the next vertex, choose the edge with the smallest weight that doesn't lead to a previously visited vertex.

4. Continue until all vertices are visited exactly once, and you've returned to the starting vertex.



Find a Nearest Neighbor approximate optimal solution starting at the given vertex.

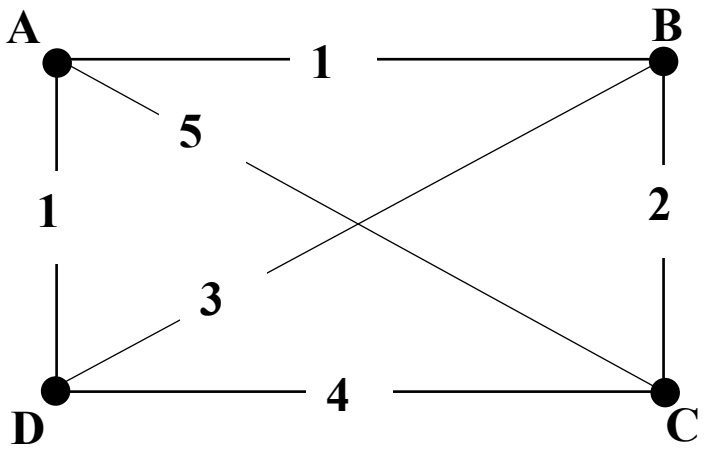
Starting vertex	Nearest Neighbor solution
A	
B	



Find a Nearest Neighbor approximate optimal solution starting at the given vertex.

Starting vertex	Nearest Neighbor solution
A	
D	

If there is tie between/among two or more edge weights, then the Nearest Neighbor Method won't produce a unique Hamilton circuit. Produce each one of the circuits and choose the circuit(s) with the smallest weight.



Starting vertex	Nearest Neighbor solution
A	