

1. You are given an undirected graph  $G = (V, E)$  with unit edge weights and nodes  $u, v \in V$ . Design an algorithm that outputs the number of distinct shortest paths between  $u$  and  $v$ .
2. Give an algorithm for finding the *maximum spanning tree* of a given weighted graph. Maximum spanning tree is a spanning tree of maximum total weight.
3. You are given a weighted directed graph  $G = (V, E)$  along with a specific node  $s \in V$  and a tree  $T = (V, E'), E' \subseteq E$ . Give an algorithm that checks whether  $T$  is a shortest-path tree for  $G$ .