CSL 356: Analysis and Design of Algorithms
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1. Discuss Homework-2 problems.

2. (*Diameter of a Tree*) Given a graph $G = (V, E)$, the diameter of G is defined to be the maximum distance between any pair of vertices in G. The distance between two vertices being the length of the shortest path between these vertices. Design an algorithm to find the diameter of a given Tree.

3. (*Vertex cover of a Tree*) A vertex cover of a graph is a subset of vertices that includes at least one endpoint of every edge. Design an algorithm to find the size of the smallest vertex cover of a given *tree* $T = (V, E)$. Recall, a tree is a connected graph without cycles. Discuss running time of your algorithm.

4. You are given an ordered sequence of n cities, and the distances between every pair of cities. You must partition the cities into two subsequences (not necessarily contiguous) such that person A visits all cities in the first subsequence (in order), person B visits all cities in the second subsequence (in order), and such that the sum of the total distances travelled by A and B is minimized. Assume that person A and person B start initially at the first city in their respective subsequences.

5. Ms. X wants to visit some shoe stores out of the n stores in the city $S_1, ..., S_n$. Mr. Y has to drive Ms. X around. He has to pick her up from her house and drop her back to her house. For each store S_i, there is a value $v(i)$ that denotes the satisfaction that Ms. X gets on visiting the store S_i. Mr. Y on the other hand, is concerned about the driving cost. For each pair of stores S_i, S_j there is an associated driving cost $d(i, j)$ that denotes the cost Mr. Y has to incur when driving between S_i and S_j. The driving cost from Ms. X's house to a store S_j is denoted by $d(0, j)$. You have to find a tour of a subset of stores starting and ending at Ms. X's house, that maximizes the total satisfaction of Ms. X minus the total driving cost incurred by Mr. Y.

6. You are given a rectangular piece of cloth with dimensions $X \times Y$, where X and Y are positive integers, and a list of n products that can be made using the cloth. For each product $i \in [1, n]$ you know that a rectangle of cloth of dimensions $a_i \times b_i$ is needed and that the final selling price of the product is c_i. Assume the a_i, b_i, and c_i are all positive integers. You have a machine that can cut any rectangular piece of cloth into two pieces either horizontally or vertically. Design an algorithm that determines the best return on the $X \times Y$ piece of cloth, that is, a strategy for cutting the cloth so that the products made from the resulting pieces give the maximum sum of selling prices. You are free to make as many copies of a given product as you wish, or none if desired.