

Computer Science 241

In-Class Exercise: Practice Problems

For each of the problems below, write an **English** description of how you'd solve the problem. Specify any data structures used, and feel free to rely on algorithms, operations, etc. covered in this class. If you finish describing your approach to all of the problems, write out pseudocode for your solution.

0. **Example Problem:** Given a directed graph, design an algorithm to find out whether there is a route between two nodes.

Example Solution: Given a source and a destination node, run a depth-first search starting from the first one. Each time a node is visited, check whether it matches the destination node and return true if so. Return false if the DFS finishes.

1. Given a sorted (increasing order) array with unique integer elements, write an algorithm to create a binary search tree with the minimum possible height.

2. You have a text file with 1 million URLs. How would you detect duplicate URLs?

3. You are given a list of projects and a list of dependencies (which is a list of pairs of projects, where the second project is dependent on the first project). All of a project's dependencies must be built before the project is. Find a build order that will allow the projects to be built. If there's no valid order, return an error.

Example:

Input:

projects: a, b, c, d, e, f

dependencies: (a, d), (f, b), (b, d), (f, a), (d, c)

Output: f, e, a, b, d, c

4. (1 pt) Implement a function to check if a given binary tree is a valid binary search tree.