Problem Set 9

Data Structures and Algorithms, Fall 2019

Due: November 21, in class.

From CLRS

Exercise 22.1-3, 22.1-5, 22.1-6, 22.2-3, 22.2-6, 22.2-7, 22.3-2, 22.3-4, 22.3-10, 22.4-2, 22.4-5.

Additional Problem One

The infamous Mongolian puzzle-warrior Vidrach Itky Leda invented the following puzzle. The puzzle consists of an $n \times n$ grid of squares, where each square is labeled with a positive integer, and two tokens, one red and the other blue. The tokens always lie on distinct squares of the grid. The tokens start in the top left and bottom right corners of the grid; the goal of the puzzle is to swap the tokens.

In a single turn, you may move either token up, right, down, or left *by a distance determined by the **other** token*. For example, if the red token is on a square labeled 3 , then you may move the blue token 3 steps up, 3 steps left, 3 steps right, or 3 steps down. However, you may not move either token off the grid, and at the end of a move the two tokens cannot lie on the same square.

Describe and analyze an efficient algorithm that either returns the minimum number of moves required to solve a given Vidrach Itky Leda puzzle, or correctly reports that the puzzle has no solution. For example, given the puzzle below, your algorithm would return the number 5.