CS 5720 Design and Analysis of Algorithms
Homework #6

Submission requirements:

- Submit your work in PDF format to the appropriate assignment on Canvas.

- **5% extra credit** if your writeup is *typed.*

Assignment:

1. Read Example 3 in Section 8.1 of the textbook, "Coin-collecting Problem." Then look at problem 8.1.5, which asks "How would you modify the dynamic programming algorithm for the coin-collecting problem if some cells on the board are inaccessible for the robot?"

    (a) Explain, in words, how this algorithm is different from the ordinary one in the book.

    (b) Write pseudocode for this modified algorithm. The algorithm should have two inputs: $C[1..n, 1..m]$ that encodes the locations of the coins, and $B[1..n, 1..m]$ that encodes the locations of the inaccessible squares on the board. Your algorithm should return the maximum number of coins that the robot can pick up. Note that the robot has to start in the upper-left, and finish in the lower-right – so the location of the barriers might make it impossible for the robot to solve the problem!

    (c) Use your algorithm to solve the following problem instances (O's are coins, and X's are inaccessible places).

    Grid 1:

	X		O		
			O	X	
X		X	O		O
		O		O	
	O			X	
O				X	

    Grid 2:

			O		
				O	X
X		X	O	X	O
			O		O
	X			X	
O				X	

    Grid 3:

O	O	O	O	O	O
O	O	O	X	X	X
O	O	O	X	O	O
X	X	X	X	O	O
O	X	O	O	X	O
O	O	O	O	X	O

    As part of each answer, fill out two grids like Figure 8.3(b)-(c) in the textbook, showing the maximum number of coins collectible up to each of the squares on the board and showing the optimal paths.