Assignment 5 （answer）
279/377
winter 2022

1. **For Optimal Binary Search Tree example, give the pseudo-code to constructing the optimal binary search tree from the root table. (see text book page 403 Exercises 15.5-1 for output format)**

2. **Following are some questions in leetcode.com. For each of the following question, answer the following questions:**

a. Analyze subproblem structure and give the recursive relationship between problem and its subproblems

b. Does this problem have overlapping subproblems? Explain.

c. Design and implement a DP algorithm and create a successful submission in leetcode.com (use your favorite language). Also paste your code in your answer document.

d. If you are using bottom up algorithm, then give an example to fill a bottom up tabular form.

2.1 (leetcode question 322. Coin Change)
(might use the idea of Rod Cutting problem)

2.2 (leetcode question 64).

Given a *m* x *n* grid filled with non-negative numbers, find a path from top left position to bottom right position such that the sum of all numbers along its path is minimum.

Note: You can only move down or right.

Example:

Input:
[
  [1, 2, 5, 4, 10],
  [8, 9, 6, 2, 1],
  [5, 5, 7, 11, 1],
  [6, 4, 5, 9, 2],
  [9, 8, 4, 9, 3]
]

Output: 21
Path is:
  [1, 2, 5, 4, 10]
  [8, 9, 6, 2, 1]
  [5, 5, 7, 11, 1]
  [6, 4, 5, 9, 2]
  [9, 8, 4, 9, 3]

2.3 (leedcode question 416).
Use dynamic programming technique to design and implement an algorithm to check a list of positive integers to see if the list can be partitioned into two subsets such that the sums of numbers in the two subsets are equal.

You program only need to return true or false.

For example.

given: {4, 6, 11, 7, 1, 5}
can be partitioned into: {4, 7, 5, 1} and {6, 11}, both sum = 17
the program should return true.

given: {1, 2, 4}
the program should return false.

(hint: given set S, you can check if there is a subset Sk that SUM(Sk) == SUM(S)/2)

2.4 (leedcode question 55. Jump Game)

2.5. Given an integer representing money amount, one problem is to use minimum number of coins (with given values) to make up this value (assuming there is unlimited number of coins). For example, given $14, and coin system {1, 5, 10, 15, 20}, it can be changed into {10, 1,1,1,1} (one 10 and four 1s)

Do you think if this problem can be solved by Greedy Algorithm? If not, give a counter example.

2.6. Given a time table of railway trains, design an algorithm to find the minimum number of platforms so that all the trains can be accommodated.

Example of time table:

Trains	Arrival	Departure
A	9am	9:30am
B	9:15am	1:00pm
C	10:30am	11:00pm
D	10:45am	11:45am