LEBANESE AMERICAN UNIVERSITY School of Arts and Science

Department of Computer Science and Mathematics

CSC 310: Algorithms and Data Structures

Lab9

**Use dynamic programing to solve the following problems. Your solution will not count if you write a code that is not efficient enough.**

**Problem 1**

Given two Strings, find the length of a longest common subsequence (LCS) between them. A subsequence is a sequence that appears in the same relative order, but not necessarily contiguous. For example, “abc”, “abg”, “bdf”, “aeg”, “acefg”,.. etc. are subsequences of “abcdefg”. Moreover, a longest common subsequence of input strings “ABCDGH” and “AEDFHR” is “ADH” which is of length 3.

**Input:** scan the two strings.

**Output:** print the length of the longest common subsequence.

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| **Sample Input** | **Sample Output** |
| AGGTAB  GXTXAYB | 4 |

**Problem 2**

Given an array of n positive integers. Write a program that finds the sum of a Maximum-Sum Increasing Subsequence of the given array: the integers in the subsequence are sorted in increasing order and their sum is the maximum among all the possible increasing subsequences. For example, if the input is {1, 7, 2, 3, 15, 4, 5}, then the output should be 23 (1 + 2 + 3 + 15), if the input array is {3, 4, 5, 8}, then the output should be 20 (3 + 4 + 5 + 8) and if the input array is {8, 6, 3, 4}, the output should be 8.

**Input:** scan the size and number of positive integers of an array.

**Output:** print the sum of maximum sum subsequence of the given array

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| **Sample Input** | **Sample Output** |
| 7  1 50 3 4 49 6 7 | 57 |

**Problem 3**

Given two names s1 and s2, you are asked to find the minimum number of operations required to convert s1 into s2 using (any or a combination of) the following operations (with have equal costs):

***1.Insert***

***2.Remove***

***3.Replace***

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| **Sample Input** | **Sample Output** |
| **jana naja** | 2 |
| **cut ct** | 1 |
| **friday friyay** | 1 |

**Problems 4 and 5 are homework, to be submitted on Sharif judge by Monday midnight.**

**Problem 4**

Given ***n*** cents and an array of coins, you need to print the number of possible ways you can return the change of ***n***.

**Input:** Your program will be tested against multiple test cases. Each test case consists of two integers ***n***, ***m***, followed by ***m*** integers that represent the available coins.

**Output:** For each test case, print all the possible ways you can return a change for ***n***.

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| Sample Input | Sample Output |
| 10  4  1 3 4 5 | 12 |
| 7  3  1 2 4 | 6 |

**Problem 5**

Shikri went to visit a friend in Beijing. He booked a flight to Chengdu, being the cheapest at that time. Upon his arrival he realized Beijing is very far and he has to either pay for another flight or take a cheap bus line! Shikri doesn't mind spending a long time on the road as long as

he minimizes the cost (he has enough dried figs, which were supposed to be his friend's gift from Lebanon!)

The cheap bus line has an unusual ticket-pricing policy. A passenger pays a cost of ***pi*** if the bus stops ***i-1*** times before the passenger gets off. He is allowed to pay ***pi*** and get off after ***i*** stops then pay ***pj*** and continue and so on until destination is reached. Assuming the list of prices (per trip length) is given, write a most time-efficient algorithm that helps Shikri and the cheapest way to Beijing.

**Input:** The input will be ***n*** which is the size of the prices array, then followed by ***m*** elements that represent the array of prices.

**Output:** Your output should return the minimum price Shikri will pay.

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| Sample Input | Sample Output |
| 3  5 6 10 | 10 |
| 7  4 6 8 15 18 20 21 | 20 |