

Algorithms Laboratory (CS29203)

Assignment 4: Dynamic Programming

Department of CSE, IIT Kharagpur

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Question-1

After the Autumn semester, you've got one month semester break, and this time you plan not to go home and stay in the hostel to actually enjoy the campus life without worrying about (brutal) assignments and deadlines. Among several of your plans, you have one plan to watch a series of movies. Since the campus network is not allowing you to download from *Torrent* websites, you plan to do it by using some proxy network. You have found 2 good websites for downloading the latest movies in HD quality, but the download size is pretty big. Since you are using a proxy server, the download has the following restrictions. *First*, the 2 websites have maximum download limits (in GB) per day. *Second*, you can download from only one website on any given day. *Third*, you can download from the second website only if you haven't downloaded anything from any of the two websites on the previous day (there is no such restriction for the first website though). Now your goal is to maximize the amount of download (in GB) within the whole time period.

For example, consider the following scenario on the restriction of the download size from the two websites per day for a given number of days:

Day	Maximum download size (in GB) of website-1	Maximum download size (in GB) of website-2
1	5	8
2	3	4
3	4	3
4	6	5
5	3	10

So the maximum amount that you can download in the span of 5 days is 25 GB as follows:

- Day 1: Download from second website: 8 GB
- Day 2: Download from first website: 3 GB
- Day 3: Download from first website: 4 GB
- Day 4: Don't download anything
- Day 5: Download from second website: 10 GB

Your task is to write a program to solve this problem (*you must use the idea of Dynamic Programming*).

Example:

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Enter the number of days: 7
Enter the download size restrictions of the first website (in GB): 6, 2, 11, 7, 15, 7, 9
Enter the download size restrictions of the second website (in GB): 19, 2, 10, 4, 5, 12, 6
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Maximum possible download size is 70 GB
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Question-2

In this question, you will do a variation of the Longest Common Subsequence (LCS) problem. You have to find the length of the Shortest Common Supersequence (SCS) of 2 strings. The SCS is finding the shortest supersequence Z of given sequences X and Y such that both X and Y are subsequences of Z. In general, subsequences are not required to occupy consecutive positions within the original string. For example, consider the two following sequences, X: ABCBDAB, Y: BDCABA. Then the length of the SCS is 9, and the SCS are ABCBDCABA, ABDCABDAB, and ABDCBDABA. Similarly, let X = AGGTAB, Y = GXTXAYB. Then the length of the SCS is 9, and the SCS is AGGXTXAYB.

Your task is to write a program to solve the problem using Dynamic Programming. Your program should take the 2 strings as input, and compute the length and the SCS characters as output. *Hint: use LCS to find the SCS.*

Example:

Enter the first string: ABCBDAB

Enter the first string: BDCABA

The SCS length is 9

SCS string is: ABDCABDAB