CS69201: Computing Lab-1
Assignment 6 (Part 2) - Linear Programming
August 28, 2024
Time - 60 minutes

========== Instructions==========

1. In the case of user input assume only valid values will be passed as input.
2. You will use Python for this assignment.
3. Regarding Submission: For each question create a separate python file. -> <rollno>_Q1.py, <rollno>_Q2.py …so on. Create a zip file of all these python files in the name <rollno>_A6_LP2.zip and submit it to Moodle. For example, if your roll number is 24CS60R15, then your file name will be 24CS60R15_Q1.py, 24CS60R15_Q2.py and your zip file name will be 24CS60R15_A6_LP2.zip.
4. Inputs should be taken from a file (as mentioned in each question) **and outputs should be printed to a file named output.txt.**
5. **For each question, boilerplate code is provided, use it accordingly. But you need to strictly follow the output format. Failing would lead to a penalty.**

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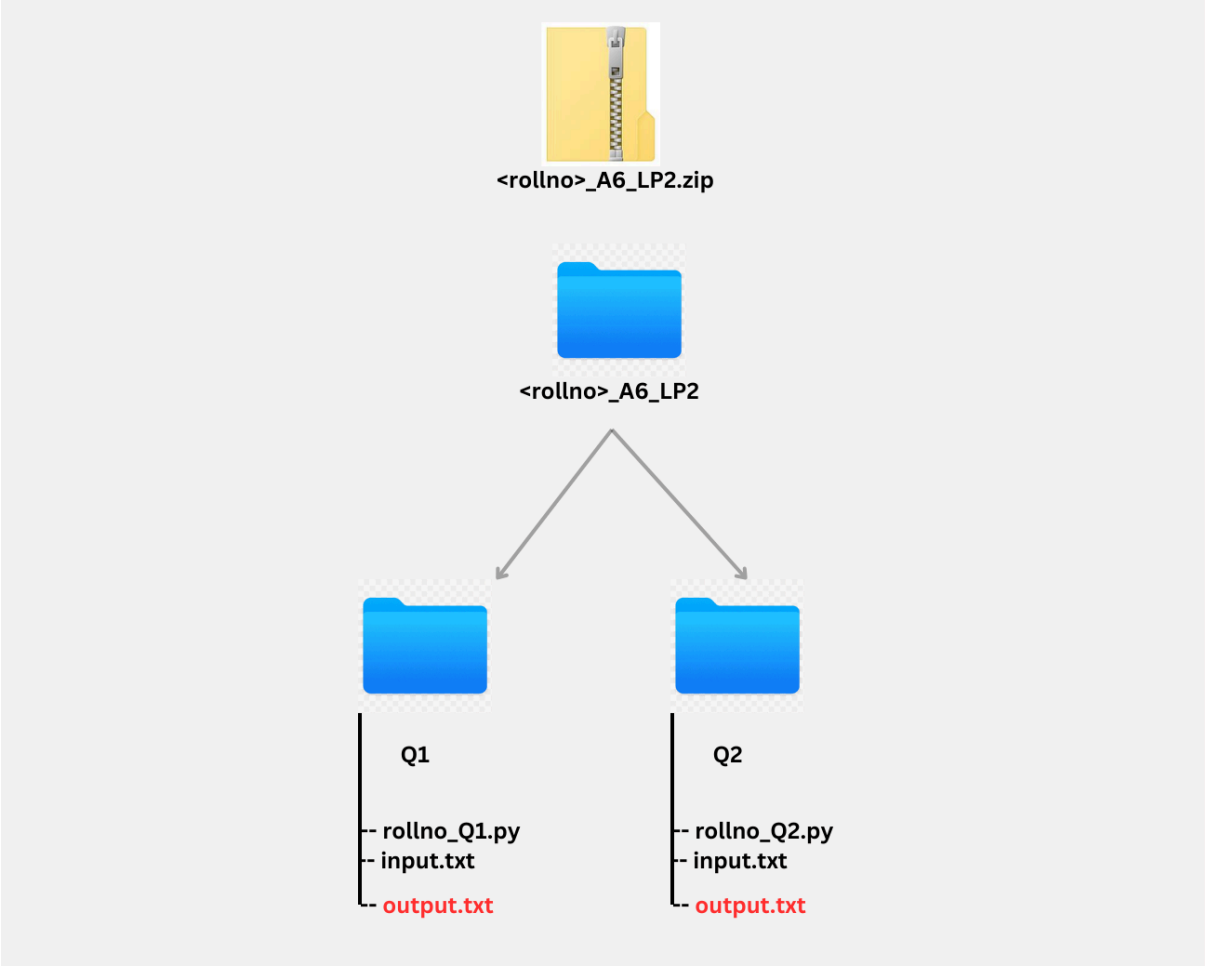

Question-1

You are a daring treasure hunter, embarking on an adventure in a mysterious cave rumoured to be filled with valuable items. As you navigate the labyrinthine passages, you encounter a variety of treasures, each with its own unique value and weight. However, your exploration is limited by the maximum weight your knapsack can carry.

Your goal is to maximize the total value of the treasures you can collect without exceeding the weight limit of your knapsack. You can take fractions of items if necessary. Display the maximum total value and the fraction of each item taken

Sample Input
w=100
n=6
value=[60,100,120,240,300,180]
weight=[10,20,30,40,50,25]

Sample output
part taken of 1 item -> 0.00
part taken of 2 item -> 0.00
part taken of 3 item -> 0.00
part taken of 4 item -> 0.62
part taken of 5 item -> 1.00
part taken of 6 item -> 1.00
Maximum value of treasures that can be carried: 630.00

Content of the output.txt [Sequence must be correct]
0.00
0.00
0.00
0.62
1.00
1.00
630.00

Question-2

You are the owner of ABC & Son's Sweet Company and have decided to manufacture some special sweet gift boxes for a well-known festival in West Bengal. For your simplicity, assume that each sweet is a "Sandesh" (rectangle of dimensions x and y). You have k types of sweets {S1, S2, ...,Sk} with their market price {C1, C2, ...,Ck} respectively available in your company, but you cannot place more than one sweet of the same kind in a box, also not on top of one another . You have a box B of dimensions (m,n). You have to maximize the price of the sweet box under the given situations described below.

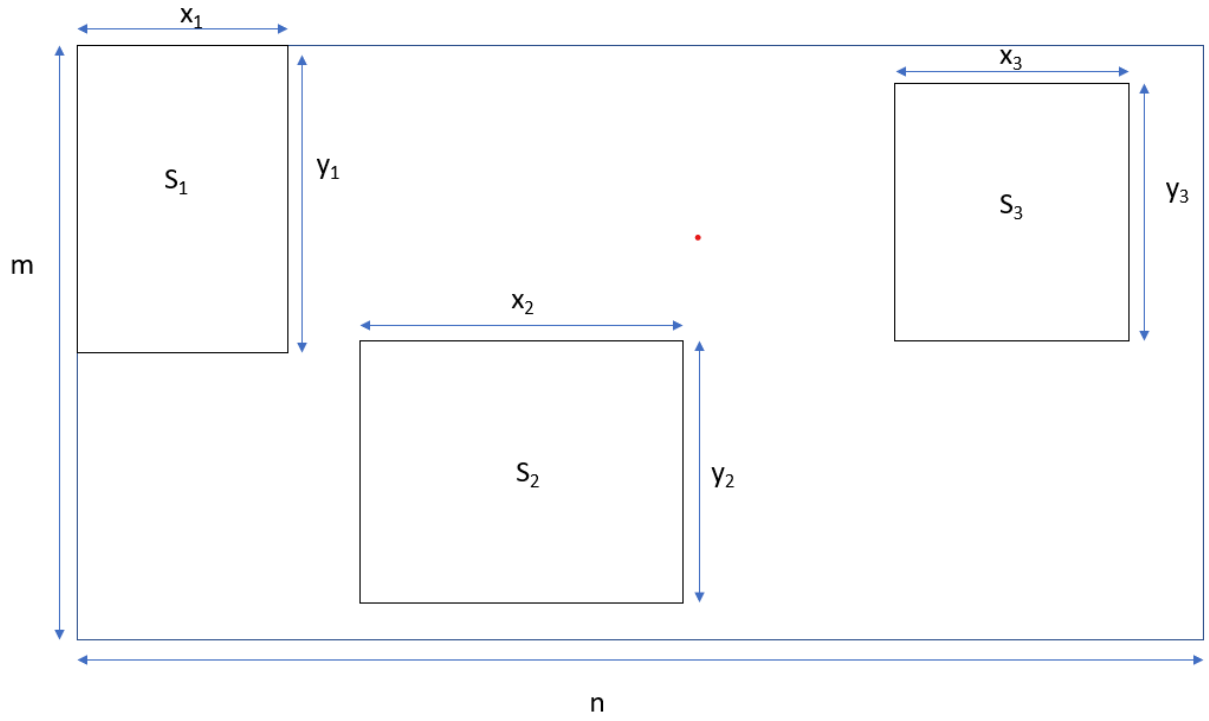

Figure 1

Now, Consider you can add a fractional part λ (λ<=1) of a sweet that can be placed in the box with cost proportional to the size.
Example:- If you take a sweet S with market cost C with λ = 0.8, then the new the market cost of that sweet becomes 0.8*C.

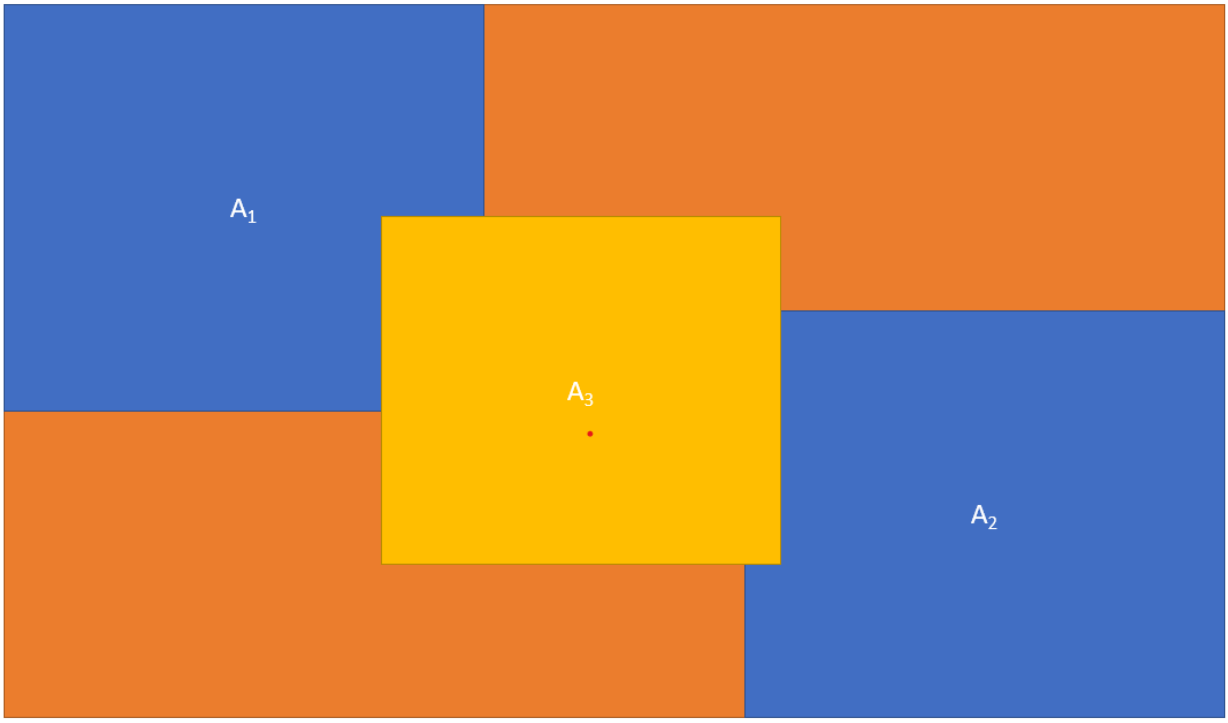

Figure 2

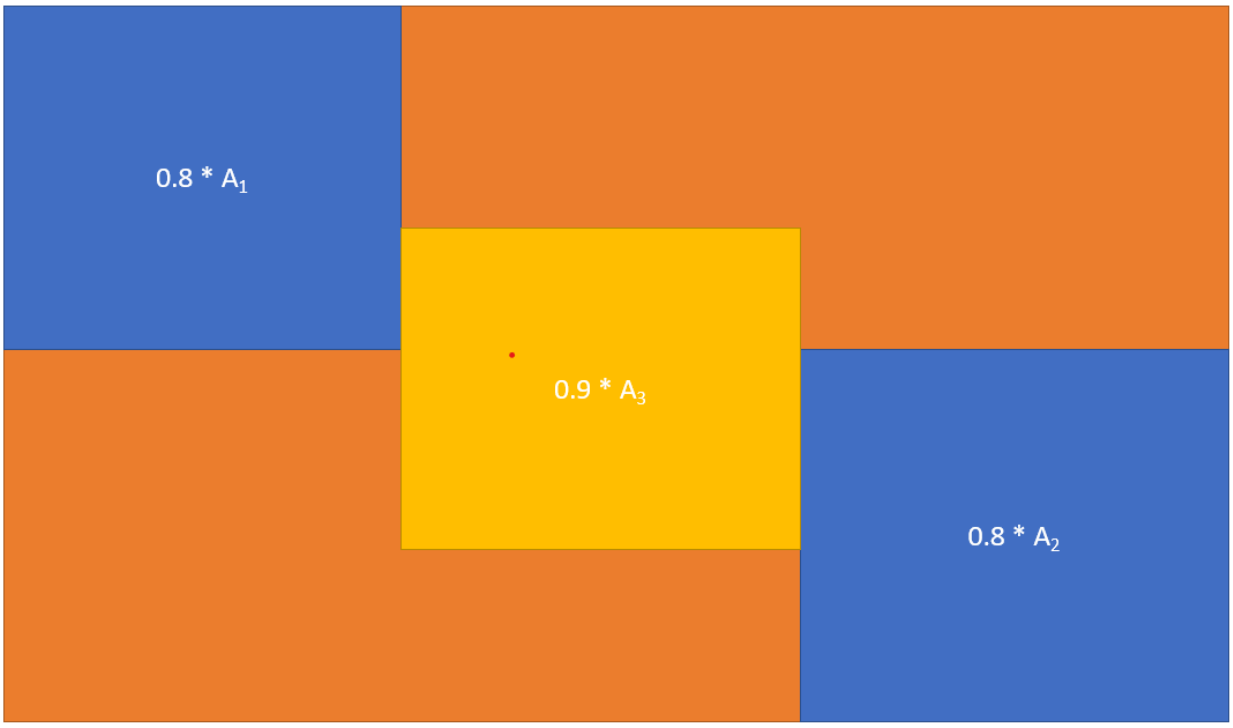

Figure 3

Input Format:

- The first line contains the number of sweets ‘k’.
- The second line contains two space-separated numbers the dimensions of the box ‘m’, and ’n’.
- The third line contains `k` space-separated numbers denoting the length ‘x’ of each sweet.
- The fourth line contains `k` space-separated numbers denoting the width ‘y’ of each sweet.
- The fifth line contains `k` space-separated numbers denoting the market cost {C1, C2, ...,Ck} of each sweet.

Output: Display the maximum cost of the box and size of each sweet used

Sample Input:
3
3 4
1 2 1
2 4 8
10 15 6

Sample Output:
Size of sweet 1: 2
Size of sweet 2: 8
Size of sweet 3: 2
Maximum cost: 26.5

Content of the output.txt [Sequence must be correct]
2
8
2
26.5