MSSC 6000 - Homework 2

Henri Medeiros Dos Reis

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Solution 1. .

(a)
```
s = 0
sort L1
sort L2 in reversal order
for i from 1 through size of L1
    s += L1[i] * L2[i]
```

(b) Yes, I believe this algorithm is optimal, since the lists are ordered in a way such that the smallest item in L1 is multiplied with with largest item L2, the sum will be minimized. Because any other order would increase the product, which would increase the sum.

Solution 2. Only code

Solution 3. .

(a)
```
sort tasks by their deadline and profit
tasks_done = []
timer = 0
profit = 0
loop through each task
    if we can complete before the deadline
        do the task
        profit += task profit
        timer += task duration
        record this task in tasks_done
    else
        skip this task
return tasks_done, profit
```

(b)

$$\begin{bmatrix} Job & 1 & 2 & 3 & 4 & 5 & 6 \\ Duration & 1 & 1 & 5 & 4 & 3 & 2 \\ Deadline & 1 & 3 & 9 & 4 & 3 & 6 \\ Profit & 1 & 1 & 4 & 3 & 3 & 2 \end{bmatrix}$$

Then my algorithm would work in the following way:

```
sorted job: [1,5,2,4,6,3]
tasks_done = []
timer = 0
profit = 0
consider job 1, (timer+duration)<=deadline? Yes!
    do job 1
    profit += 1
    timer +=1
    tasks done = [1]
consider job 5, (timer+duration)<=deadline? No!
    skip
consider job 2, (timer+duration)<=deadline? Yes!
    do job 2
    profit += 1
    timer += 1
    tasks done = [1,2]
consider job 4, (timer+duration)<=deadline? No!
    skip
consider job 6, (timer+duration)<=deadline? Yes!
    do job 6
    profit += 2
    timer += 2
    tasks done = [1,2,6]
consider job 3, (timer+duration)<=deadline? Yes!
    do job 3
    profit += 4
    timer += 5
    tasks done = [1,2,6,3]
return [1,2,6,3],8
```

(c) Flight scheduling, if we treat each flight as a job, where the flight duration is the duration, the deadline is the arrival time and profit is the price of tickets times the number of tickets bought minus price to perform the flight. Then the goal is to maximize profit. Some extra constraints that need to be considered are the number of airplanes available, crew availability and gate availability at airports.

Solution 4. .

(a)

```
revenue = 0
get the number of consoles we can sell
sort people by how much they are willing to pay and wait
   time
loop through the customers
    if we have enough consoles
        sell one
        record this customer
        revenue += amount paid
    else
        done
return revenue, list of customers
```