CS 301 HW 4

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1- a)

$$\text{MaximumSubseqSum}(i) = \begin{cases} 0 & \text{if } i < 0 \\ a_i & \text{if } i = 0 \text{ and } a_i > 0 \\ 0 & \text{if } i = 0 \text{ and } a_i \leq 0 \\ \max(\text{MaximumSubSeqSum}(i-1), \text{MaximumSubSeqSum}(i-2) + a_i) & \end{cases}$$

b) Since, MaximumSubSeqSum(k) is the answer of sequence with last index k.
We need to find the answer at 4^{th} index.
Start with 0^{th} index:

index 0 = $MSS(0) = 1 \Rightarrow$

1				

index 1 = $MSS(1) = \max(MSS(0), MSS(-1) + a_1)$

$= \max(1, 0 + -3) = 1 \Rightarrow$

1	1			

index 2 = $MSS(2) = \max(MSS(1), MSS(0) + a_2)$

$= \max(1, 1 + 4) = 5 \Rightarrow$

1	1	5		

index 3 = $MSS(3) = \max(MSS(2), MSS(1) + a_3)$

$= \max(5, 1 + 5) = 6 \Rightarrow$

1	1	5	6	

index 4 = $MSS(4) = \max(MSS(3), MSS(2) + a_4)$

$= \max(6, 5 + 2) = 7 \Rightarrow$

1	1	5	6	7

this is the final solution

2) a) • First of all we need to check all items' value / weight ratio.

• After that point, we need to sort them to find more optimal item to put it to truck.

• After sorting by descending order in terms of value/weight ratio. Put the highest one to the truck as whole.

• If the next highest item can not be put due to weight limit, put its fraction to the truck.

number of items

greedyFractional (W, itemArray, n) {

weight capacity

item of Array that consist weight and value information of items

sortItems (itemArray);

Sort items by the value/weight ratio

for (i = 0 ; i < n ; i++) {

if (weight of items in truck + weight of itemArray[i] <= W)

put Item to the truck

increase the weight of items in truck.

increase value of truck

else

find the remaining weight in truck

put the fraction of itemArray [i] to track

increase value of truck

}

return value of truck;

}

b) • Sorting the items takes O(n logn) Because it is comparison based.

• Iterating over whole items takes O(n)

At the end algorithm take O(nlogn)

c) 1- First find value/weight ratio. (W = 5)

Item	Weight	Value	Value/Weight Ratio
1	2	12	6
2	1	10	10
3	3	20	6.6
4	2	15	7.5

2- Sort them in descending order according to ratio:

Item 2 > Item 4 > Item 3 > Item 1

		Total W	Total V
3-	Put Item 2	(W = 1	V = 10)
	Put Item 4	(W = 3	V = 25)
	Put Item 3's $\frac{1}{3}$	(W = 5	V = 31.6)

$\underline{W}$ $\underline{V}$

$\left(3.\frac{1}{3} = 1 \quad \frac{20}{3} = 6.6\right)$

Total Value that we can optimally carry is 31.6 and what we are paid is $\boxed{31.6 \times 0{,}1\%}$