PW SKILLS

Fractional Knapsack

objects	x_1	x_2	x_3	x_4	x_5	x_6	x_7
Profit	25	75	100	50	45	90	30
Weight	5	10	12	4	7	9	3
① P/w	5	7.5	8.3	25	6.4	10	10

Maximum capacity constraint
- $n = 7$
- $M = 37$

Maximum Profit

Optimization Problem

totalWeight $\leq M$ (objects)

② Sort (P/w) Decreasing Order

Objects	x_4	x_6	x_7	x_3	x_2	x_5	x_1
Profit	50	90	30	100	75	45	25
Weight	4	9	3	12	10	7	5
P/w	25	10	10	8.3	7.5	6.4	5
x	1	1	1	1	9/10	-	-

M

Net Weight = 37 - 4

= 33

totalProfit = 0 + 50

= 50

Netweight = 33 - 9

= 24

totalProfit = 50 + 90

= 140

Netweight = 24 - 3

= 21

totalProfit = 140 + 30

= 170

Netweight = 21 - 12

= 9

totalProfit = 170 + 100

= 270

Netweight = $9 - \frac{9}{10} * 10$

= 0

totalProfit = $270 + \frac{9}{10} * 75$

= 337.5

Fractional Knapsack Algorithm

1) for (i=0 to n-1) {
   find p_i/w_i } ——— O(n

2) Sort the data in decreasing order p_i/w_i O(n log n)

MergeSort Pre-defined function

3) for(i=0 to n-1){
   if (netWeight == 0) {
   decreasing capacity &
   increasing profit
   }
   return profit
} O(n)

Time complexity

$\Rightarrow n + n\log n + n$

$\Rightarrow O(n \log n)$

Space complexity = O(1)