

## Greedy Method.

①\* Find the optimal sol<sup>n</sup> for the knapsack instance  $n=7$ ,  $m=15$ , and  $p_1$  to  $p_7$  are 10, 5, 15, 7, 6, 18, 3 and their weights are 2, 3, 5, 7, 1, 4, 1.

→  $m$  = knapsack Capacity.

$P$  = profit

$w$  = weights.

$M=15$

$P = \{10, 5, 15, 7, 6, 18, 3\}$

$w = \{2, 3, 5, 7, 1, 4, 1\}$

$i_1 \quad i_2 \quad i_3 \quad i_4 \quad i_5 \quad i_6 \quad i_7$

$\frac{P_i}{w_i} = \frac{10}{2}, \frac{5}{3}, \frac{15}{5}, \frac{7}{7}, \frac{6}{1}, \frac{18}{4}, \frac{3}{1}$

$\frac{P_i}{w_i} = 5, 1.66, 3, 1, 6, 4.5, 3$

Arrange them in decreasing order of their  $P_i/w_i$  ratio.

$\frac{P_i}{w_i} = 6 \quad 5.453 \quad 3 \quad 1.66 \quad 1$   
 $i_5 \quad i_1 \quad i_6 \quad i_3 \quad i_7 \quad i_2 \quad i_4$

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items (X)

$w_i x_i$

$P_i = P + P_i x_i$

$\{i_1, i_2, i_3, i_4, i_5, i_6, i_7\} \quad 15-1$   
 $\{0, 0, 0, 0, 1, 0, 0\} = 14$

~~6~~ = 6

$\{1, 0, 0, 0, 1, 0, 0\} \quad 14-2$   
 $= 12$

$6+10=16$

$\{1, 0, 0, 0, 1, 1, 0\} \quad 12-4=8$

$16+18=34$

$\{1, 0, 1, 0, 1, 1, 0\} \quad 8-5=3$

$34+15=49$

$\{1, 0, 1, 1, 0, 1, 1\} \quad 3-1=2$

$49+3=52$

$\{1, 1, 1, 0, 1, 1, 1\} \quad 2-2=0$

$52 + \frac{2 \times 3}{3}$

$= 52 + 10$

$= 52 + 33$

Profit = 55.3

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②.  $S = \{a, b, c, d, e, f, g\}$ .

Be a collection of object with profit weight one values are follows.

$$A = 12, 4 \quad E = 14, 3$$

$$B = 10, 6 \quad F = 7, 1$$

$$C = 8, 5 \quad G = 9, 6$$

$$D = 11, 7$$

what is the optimal solution to the fractional knapsack problem foras.

assume the knapsack capacity has the weight is 18 what is the complexity of this method.

$$\rightarrow W = 15$$

$$p = \{12, 10, 8, 11, 14, 7, 9\}$$

$$w = \{4, 6, 5, 7, 3, 1, 6\}$$

$$a \quad b \quad c \quad d \quad e \quad f \quad g$$

$$\frac{p}{w} = \frac{12}{4}, \frac{10}{6}, \frac{8}{5}, \frac{11}{7}, \frac{14}{3}, \frac{7}{1}, \frac{9}{6}$$

$$= 3, 1.66, 1.6, 1.57, 4.6, 7, 1.5$$

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Arrange them in decreasing order of their  $p_i/w_i$  ratio.

$$\frac{p_i}{w_i} = \begin{matrix} 7 & 4.6 & 3 & 1.66 & 1.6 & 1.57 & 1.5 \\ f & e & a & b & c & d & g \end{matrix}$$

items ( $x_i$ )	$w_i x_i$	$p_i = p + p_i x_i$
$\{0, 1, 0, 0, 0, 0, 0\}$	18 - 1	7
$\{0, 0, 0, 0, 0, 1, 0\}$	= 17	

$$\{0, 0, 0, 0, 1, 1, 0\} \quad 17 - 3 = 14 \quad 7 + 14 = 21$$

$$\{1, 0, 0, 0, 1, 1, 0\} = 14 - 4 = 10 \quad 21 + 12 = 33$$

$$\{1, 1, 0, 0, 1, 1, 0\} = 10 - 6 = 4 \quad 33 + 10 = 43$$

$$\{1, 1, 1, 0, 1, 1, 0\} = 4 - \frac{4}{5} = 0 \quad 43 + \frac{4}{5} \times 8$$

$$= 43 + \frac{32}{5}$$

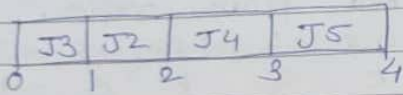
$$= 43 + 6.4$$

$$\text{Profit} = 49.4$$

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## \* Job Sequencing Problem

①



$$\text{profit} = 40 + 60 + 100 + 80 = 280$$

Job sequence = { J3, J2, J4, J5 }

jobs	J1	J2	J3	J4	J5
Deadlines	2	2	1	3	4
profits	20	60	40	100	80

Maximum deadline = 4

Arrange job in decreasing order of their profit

Jobs	J4	J5	J2	J3	J1 <sup>x</sup>
Deadlines	3	4	2	1	2
profit	100	80	60	40	20

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② Given the jobs & deadline associated profits as shown

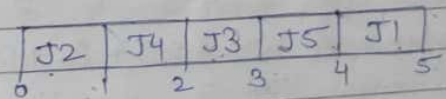
Jobs	J1	J2	J3	J4	J5	J6
Deadlines	5	3	3	2	4	2
Profits	200	180	190	300	120	100

Write the optimal schedule that gives the maximum profit if all the jobs completed in a optimal schedule and what is the maximum earned profit?

→ Maximum deadline = 5

Arrange the job in decreasing order of their profit.

Jobs	J4	J1	J3	J2	J5	J6
Deadlines	2	5	3	3	4	2
profit	300	200	190	180	120	100



$$\text{profit} = 180 + 300 + 190 + 120 + 200 = 990$$

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- 1) optimal schedule =  $\{J_2, J_4, J_3, J_5, J_1\}$
- 2) maximum profit = 990
- 3) all the jobs completed in optimal schedule :- NO

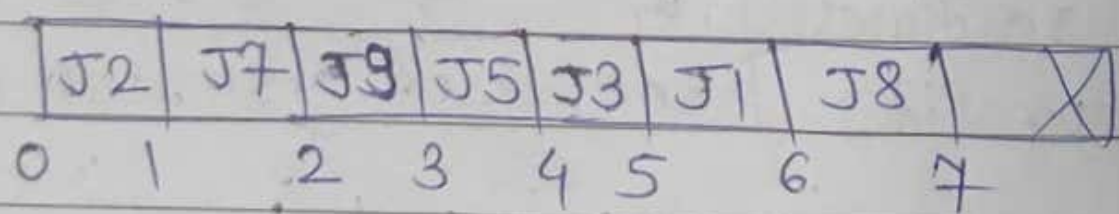
③

Job	J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	J <sub>5</sub>	J <sub>6</sub>	J <sub>7</sub>	J <sub>8</sub>	J <sub>9</sub>
Deadline	7	2	5	3	4	5	2	7	3
profit	15	20	30	18	18	10	23	16	25

→ maximum deadline = 7

Arrange Job in decreasing order of their profit

Jobs	J <sub>3</sub>	J <sub>9</sub>	J <sub>7</sub>	J <sub>2</sub>	J <sub>4</sub>	J <sub>5</sub>	J <sub>8</sub>	J <sub>1</sub>	J <sub>6</sub>
Deadline	5	3	2	2	3	4	7	7	5
profit	30	25	23	20	18	18	16	15	10



$$\text{profit} = 20 + 23 + 25 + 18 + 30 + 15 + 10 = 147$$

Job sequence =  $\{J_2, J_7, J_9, J_5, J_3, J_1, J_8\}$