capacity = 10

Item	weight	Profit
1	3	30
2	4	45
3	2	25
4	3	36

$$V[i,j] = \begin{cases} 0 & \text{if } i=0 \text{ or } j=0 \\ V[i-1,j] & \text{if } w_i > j \\ \max\{V[i-1,j],\ V[i-1,j-w_i]+P_i\} & \text{if } w_i \le j \end{cases}$$

m →

n ↓	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	30	30	30	30	30	30	30	30
2	0	0	0	30	45	45	45	75	75	75	75
3	0	0	25	25	25	55	70	75	75	100	100
4	0	0	25	36	36	61	70	75	91	106	111

Step 1 -

When $i=1$, $w_1=3$, $P_1=30$

$j=1$ $V[1,1] = V[0,1] = 0$

$j=2$ $V[1,2] = \max\{V[0,2], V[0,3]+30\} = 0$

$j=3$ $V[1,3] = \max\{V[0,3], V[0,0]+30\} = 30$

$j=4$ $V[1,4] = \max\{V[0,4], V[0,1]+30\} = 30$

$j=5$ $V[1,5] = \max\{V[0,5], V[0,2]+30\} = 30$

$j=6$ $V[1,6] = \max\{V[0,6], V[0,3]+30\} = 30$

$j=7$ $V[1,7] = \max\{V[0,7], V[0,4]+30\} = 30$

$j=8$ $V[1,8] = \max\{V[0,8], V[0,5]+30\} = 30$

$j=9$ $V[1,9] = \max\{V[0,9], V[0,6]+30\} = 30$

$j=10$ $V[1,10] = \max\{V[0,10], V[0,7]+30\} = 30$

Step 2 -

When $i=2$, $w_2=4$, $P_2=45$

$j=1$ $V[2,1] = V[1,1] = 0$

$j=2$ $V[2,2] = V[1,2] = 0$

$j=3$ $V[2,3] = V[1,3] = 30$

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j=4 $V[2,4] = \max\{V[1,4], V[1,0]+45\} = 45$

j=5 $V[2,5] = \max\{V[1,5], V[1,1]+45\} = 45$

j=6 $V[2,6] = \max\{V[1,6], V[1,2]+45\} = 45$

j=7 $V[2,7] = \max\{V[1,7], V[1,3]+45\} = 75$

j=8 $V[2,8] = \max\{V[1,8], V[1,4]+45\} = 75$

j=9 $V[2,9] = \max\{V[1,9], V[1,5]+45\} = 75$

j=10 $V[2,10] = \max\{V[1,10], V[1,6]+45\} = 75$

Step 3 : when $i=3$, $W_3 = 2$, $P_3 = 25$

j=1 $V[3,1] = V[2,1] = 0$

j=2 $V[3,2] = \max\{V[2,2], V[2,0]+25\} = 25$

3 $V[3,3] = \max\{V[2,3], V[2,1]+25\} = 25$

4 $V[3,4] = \max\{V[2,4], V[2,2]+25\} = 25$

5 $V[3,5] = \max\{V[2,5], V[2,3]+25\} = 45$

6 $V[3,6] = \max\{V[2,6], V[2,4]+25\} = 70$

7 $V[3,7] = \max\{V[2,7], V[2,5]+25\} = 75$

8 $V[3,8] = \max\{V[2,8], V[2,6]+25\} = 75$

9 $V[3,9] = \max\{V[2,9], V[2,7]+25\} = 100$

10 $V[3,10] = \max\{V[2,10], V[2,8]+25\} = 100$

Step 4 : when $i=4$, $W_4 = 3$, $P_4 = 36$

j=1 $V[4,1] = V[3,1] = 0$

$V[4,2] = V[3,2] = 25$

$V[4,3] = \max\{V[3,3], V[3,0]+36\} = 36$

$V[4,4] = \max\{V[3,4], V[3,1]+36\} = 36$

$V[4,5] = \max\{V[3,5], V[3,2]+36\} = 61$

$V[4,6] = \max\{V[3,6], V[3,3]+36\} = 70$

$V[4,7] = \max\{V[3,7], V[3,4]+36\} = 75$

$V[4,8] = \max\{V[3,8], V[3,5]+36\} = 91$

$V[4,9] = \max\{V[3,9], V[3,6]+36\} = 106$

$V[4,10] = \max\{V[3,10], V[3,7]+36\} = 111$

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optimal sol^n is $v[n, m] = v[4, 10]$

$= \underline{111}$

If ith object has been selected then $v[i, j] \neq v[i-1, j]$

- 4^{th} object is selected as max profit is only in 4^{th} row
- So 111 - Project = 111 - 36 = 75
  So $v[3, 7] = v[2, 7] = 75$
  so 3rd obj is not selected
- $v[2, 7] \neq v[1, 7]$
  $75 \neq 30$
  so 2nd obj is selected
- so $75 - P_2 = 75 - 45 = 30$
  $v[1, 3] \neq v[0, 3]$
  $30 \neq 0$
  so 1st obj is selected

$$\{ x_1 \; x_2 \; x_3 \; x_4 \}$$
$$\{ 1 \quad 1 \quad 0 \quad 1 \}$$

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