

# 0-1 Knapsack Problem

(Dynamic Programming)

$n=4$ ,  $W=8$ ,  $W_i = \{3, 4, 6, 5\}$   
 (knapsack capacity)  $P_i = \{2, 3, 1, 4\}$

$c$	$i \backslash W$	0	1	2	3	4	5	6	7	8	
$P_i$	$W_i$	0	0	0	0	0	0	0	0	0	
2 ✓ 3 $\Rightarrow 1$		0	0	0	2	2	2	2	2	2	$6-4=2$ $2-2=0$
3 ✗ 4 $\Rightarrow 2$		0	0	0	2	3	3	3	5	5	
4 ✓ 5 $\Rightarrow 3$		0	0	0	2	3	4	4	5	6	
1 ✗ 6 $\Rightarrow 4$		0	0	0	2	3	4	4	5	6	Max. profit

$$c[i, w] = \max(c[i-1, w - w[i]] + P[i], c[i-1, w])$$

$$\begin{aligned}
 c[2, 7] &= \max(c[2-1, 7-4] + 3, c[2-1, 7]) \\
 &= \max(c[1, 3] + 3, c[1, 7]) \\
 &= \max(2 + 3, 2) = \max(5, 2) = 5
 \end{aligned}$$

