



The Knapsack Problem

An Example

Design and Analysis
of Algorithms I

Example (n=4, W=6)

Initialization:

$A[0, x] = 0$ for all x

Main loop:

for $i = 1$ to n
 for $x = 0$ to w
 $A[i, x] :=$
 $\max\{A[i-1, x],$
 $A[i-1, x-w_i] + v_i\}$

Example:

$W = 6$

$v_1 = 3, w_1 = 4$

$v_2 = 2, w_2 = 3$

$v_3 = 4, w_3 = 2$

$v_4 = 4, w_4 = 3$

2-D Array A

6	0	3	3	7	8
5	0	3	3	6	8
4	0	3	3	4	4
3	0	0	2	4	4
2	0	0	0	4	4
1	0	0	0	0	0
$x = 0$	0	0	0	0	0
$i =$	0	1	2	3	4

optimal
value = 8

optimal
solution
 $= \left\{ \begin{matrix} \text{item} \\ 3, 4 \end{matrix} \right\}$