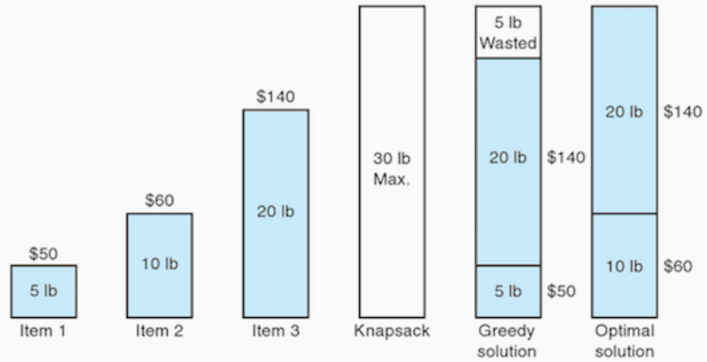

Figure 4.13 • A greedy solution and an optimal solution to the 0-1 Knapsack problem.

• Example 4.9 Suppose we have the items in Figure 4.13 and $W = 30$. First we determine which entries are needed in each row.

Determine entries needed in row 3:
We need

$$P[3][W] = P[3][30].$$

Determine entries needed in row 2:
To compute $P[3][30]$, we need

$$P[3-1][30] = P[2][30] \qquad \text{and} \qquad P[3-1][30-w_3] = P[2][10].$$

Determine entries needed in row 1:
To compute $P[2][30]$, we need

$$P[2-1][30] = P[1][30] \qquad \text{and} \qquad P[2-1][30-w_2] = P[1][20].$$

To compute $P[2][10]$, we need

$$P[2-1][10] = P[1][10] \qquad \text{and} \qquad P[2-1][10-w_2] = P[1][0].$$

Next we do the computations.

Compute row 1:

$$P[1][w] = \begin{cases} maximum\,(P[0][w], \$50 + P[0][w-5]) & \text{if } w_1 = 5 \le w \\ P[0][w] & \text{if } w_1 = 5 > w, \end{cases}$$
$$= \begin{cases} \$50 & \text{if } w_1 = 5 \le w \\ \$50 & \text{if } w_1 = 5 > w. \end{cases}$$

Therefore,

$$\begin{aligned} P[1][0] &= \$0 \\ P[1][10] &= \$50 \\ P[1][20] &= \$50 \\ P[1][30] &= \$50. \end{aligned}$$

Compute row 2:

$$P[2][10] = \begin{cases} maximum(P[1][10], \$60 + P[1][0]) & \text{if } w_2 = 10 \le 10 \\ P[1][10] & \text{if } w_2 = 10 > 10 \end{cases}$$
$$= \$60.$$

$$P[2][30] = \begin{cases} maximum(P[1][30], \$60 + P[1][20]) & \text{if } w_2 = 10 \le 30 \\ P[1][30] & \text{if } w_2 = 10 > 30 \end{cases}$$
$$= \$60 + \$50 = \$110.$$

Compute row 3:

$$P[3][30] = \begin{cases} maximum(P[2][30], \$140 + P[2][10]) & \text{if } w_3 = 20 \le 30 \\ P[2][30] & \text{if } w_3 = 20 > 30 \end{cases}$$
$$= \$140 + \$60 = \$200.$$