1. Let $F[i, X]$ be the value of the most valuable combination of items of weight at most X from items $1, 2, \ldots, i$. The optimal solution to obtain value $F[i, X]$ either (1) includes item i (if it fits) and an optimal solution using items $1, 2, \ldots, i-1$ with knapsack capacity $X - w_i$, or (2) excludes item i and is an optimal solution using items $1, 2, \ldots, i-1$ with knapsack capacity X.

$$F[i, X] = \begin{cases} \max\{F[i-1, X-w_i] + v_i, F[i-1, X]\} & \text{if } w_i \le X \\ F[i-1, X] & \text{otherwise} \end{cases}$$

$F[0, X] = 0$ for integers X between 0 and W. $F[i, 0] = 0$ for integers i between 0 and n.

Knapsack($v_1, \ldots, v_n$, $w_1, \ldots, w_n$, W)
    for $X := 0$ to W $F[0, X] := 0$
    for $i := 0$ to n $F[i, 0] := 0$
    for $i := 1$ to n
        for $X := 0$ to W
            $F[i, X] := F[i-1, X]$
            if $w_i \le X$ and $F[i, X] < F[i-1, X-w_i] + v_i$ then
                $F[i, X] := F[i-1, X-w_i] + v_i$
    X := W
    for $i := n$ to 1
        if $F[i, X] > F[i-1, X]$ then
            print i
            $X := X - w_i$

2. For $i \le j$, let $A[i, j]$ be the length of a longest palindromic subsequence of $X[i \ldots j]$. If $X[i] = X[j]$ then such a palindromic subsequence is $X[i]$ followed by a longest palindromic subsequence of $X[i+1 \ldots j-1]$ followed by $X[j]$. If $X[i] \neq X[j]$ then such a palindromic subsequence is either a longest palindromic subsequence of $X[i+1 \ldots j]$ or of $X[i \ldots j-1]$ since both $X[i]$ and $X[j]$ cannot contribute. For $i < j$,

$$A[i, j] = \begin{cases} A[i+1, j-1] + 2 & \text{if } X[i] = X[j] \\ \max\{A[i+1, j], A[i, j-1]\} & \text{otherwise} \end{cases}$$

$A[i, i] = 1$ for all i between 1 and n. $A[i, i-1] = 0$ for all i between 2 and n.

PalindromicSubseq($X[1 \ldots n]$)
    for $i := 1$ to n $A[i, i] := 1$
    for $i := 2$ to n $A[i, i-1] := 0$
    for $d := 1$ to $n-1$
        for $i := 1$ to $n-d$
            $j := i + d$
            if $X[i] = X[j]$ then $A[i, j] := A[i+1, j-1] + 2$
            else $A[i, j] := \max\{A[i+1, j], A[i, j-1]\}$
    return $A[1, n]$