HW #4 Solution.

① $D(i,j) = \min \{ 1 + D(i-1,j),\ 1 + D(i,j-1),\ \text{diff}(i,j) + D(i-1,j-1) \}$

where $\text{diff}(i,j) = \begin{cases} 1 & \text{if } x[i] \neq y[j] \\ 0 & \text{otherwise.} \end{cases}$

for $i = 0, 1, \ldots, m$
  $D(i,0) = i$

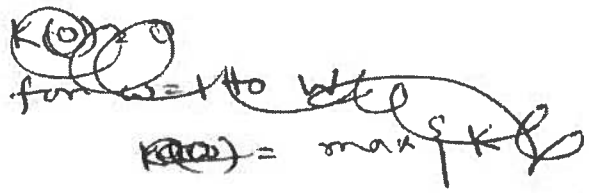
for $j = 0, 1, 2, \ldots n$
  $D(0,j) = j$

for $i = 1, 2, \ldots, m$
  for $j = 1, 2, \ldots, n$
    $D(i,j) = \min \{ D(i-1,j)+1,\ D(i,j-1)+1,\ D(i-1,j-1) + \text{diff}(i,j) \}$

return $D(m,n)$

Runningtime $\Theta(mn)$.

② $K(w) = \max_{i:\, w_i \leq w} \{ K(w - w_i) + v_i \}$



$K(0) = 0$

for $w = 1$ to W

  $K(w) = 0$

  for $i = 1$ to n

    if $w_i \leq w$

      $K(w) = \max\{ K(w), K(w - w_i) + v_i \}$

Return $K(W)$

Running time $\Theta(nW)$.

(3) $R(j) = \max\{ R(j-1), R(prev[j]) + p[j] \}$

where $R(j-1)$ means don't place a billboard at $x[j]$

and $R(prev[j]) + p[j]$ means place billboard at $x[j]$.

$R[0] = 0$

for $j = 1$ to n

  $R[j] = \max\{ R(j-1), R(prev[j]) + p[j] \}$

Return $R(n)$

Running time $\Theta(n)$.