1. **Exercises 15.3-5**

   Suppose that in the rod-cutting problem of Section 15.1, we also had limit l_i on the number of pieces of length i that we are allowed to produce, for $i = 1, 2, \ldots, n$. Show that the optimal-substructure property described in Section 15.1 no longer holds.

2. **Exercises 15.5-2**

   Determine the cost and structure of an optimal binary search tree for a set of $n = 7$ keys with the following probabilities:

i	0	1	2	3	4	5	6	7
p_i		0.04	0.06	0.08	0.02	0.10	0.12	0.14
q_i	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05

3. **Problems 15-5: *Edit distance***

   Given two sequences $x[1..m]$ and $y[1..n]$ and set of transformation-operation costs, the edit distance from x to y is the cost of the least expensive operation sequence that transforms x to y. Describe a dynamic-programming algorithm that finds the edit distance from $x[1..m]$ to $y[1..n]$ and prints an optimal operation sequence. Analyze the running time and space requirements of your algorithm.

   - transformation-operations
     - **Insert** a character into x
     - **Delete** a character from x
     - **Replace** a character from x by another character
     - **Twiddle** two adjacent characters from x

4. **Find out all LCS of《BADBCBA》and《ABACDBC》**

5. **An algorithm to solve the LCS problem of two strings *X* and *Y* has space complexity *O*(|*X*||*Y*|) typically.**

   a. Design an algorithm to find the length of LCS of two string X and Y just using only $2 \cdot \min(|X|, |Y|)$ cells for working space.

   b. Design an algorithm to find the length of LCS of two string X and Y just using only $1+\min(|X|, |Y|)$ cells for working space.

6. ***String Alignment***

   Let σ be an alphabet set, β denote the blank character in σ, and a measure function F: $\sigma \times \sigma \rightarrow$ R. Where F is defined as followings, for any x

and y in σ, F(x, y)<0 if x$\neq$y and F(x, y)>0 if x=y; whereas F(β, β)=-∞. Given X and Y be two strings of σ*, let X' and Y' denote two new strings made by inserting some β into X and Y respectively. The similarity of X and Y is defined by measuring the maximal value of $\sum_{a_i \epsilon X, b_i \epsilon Y} F(a_i, b_i)$among all possible X' and Y'.

a. Design an algorithm to find the similarity of X and Y.
b. Design an algorithm that describe where the blank characters are inserted to get the similarity.

7. Exercises 15.4-2

Give pseudocode to reconstruct an LCS from the completed c table and the original sequences $X = \langle x_1, x_2, \ldots, x_m \rangle$ and $Y = \langle y_1, y_2, \ldots, y_n \rangle$ in $O(m + n)$ time,without using the b table.