Homework #4 (Due: April 24)

1. What is dynamic programming? How does it compare with dive and conquer strategy? What steps would you take to evaluate whether dynamic programming may be the best way to solve a given problem? Does the implementation method matter after you figure out recurrence relation of a dynamic programming? Explain why or why not.

2. Solve the following using dynamic programming (show all the intermediate steps as needed)

A. 0-1 Knapsack problem:

Objects	1	2	3	4	5	6
Weights	7	8	10	12	15	16
Profits:	14	15	18	18	20	20

Capacity of the sack is 35

B. 15.5-2 from the text book (page 363)

C. Solve the matrix chain product for the instance of 12 x 5, 5 x 8, 8 x 2, 2 x 10. State the minimum number of scalar multiplications and the corresponding parenthesization.

D. Find the longest subsequences of the following sequences: gacatcgctc, acgagtaac

E.
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	0.06	0.10	0.12	0.1
q_i	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05

F. Repeat E with the following distribution (assume that q is 0 for all i)

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($p\_1 = 0.11$, $p\_2= 0.12$, $p\_3= 0.14$, $p\_4= 0.13$, $p\_5= 0.16$, $p\_6= 0.18$, $p\_7= 0.16$)