Dynamic Programming

Coin Change, Binomial Coefficient, 0/1 Knapsack problem, OBST

1	You are planning a hiking trip and want to pack your knapsack with the following items: • Tent: Weight = 4 kg, Value = 150 • Sleeping Bag: Weight = 3 kg, Value = 120 • Water Bottle: Weight = 1 kg, Value = 50 • Food Pack: Weight = 2 kg, Value = 70 Assume the knapsack has a maximum weight capacity of 6 kg. Determine the maximum total value of items you can pack for your trip.
2	Consider the following set of items: • Item 1: Weight = 1, Value = 1 • Item 2: Weight = 2, Value = 6 • Item 3: Weight = 5, Value = 18 • Item 4: Weight = 6, Value = 22 • Item 5: Weight = 7, Value = 28 Assume the knapsack has a maximum weight capacity of 11. Determine the maximum value that can be obtained.
3	You have a set of keys with their frequencies as follows: • Keys: **[A, B, C, D, E]** • Frequencies: **[3, 1, 4, 2, 5]** Construct the optimal binary search tree and calculate the minimum cost.
4	Given a set of keys **[1, 2, 3, 4, 5]** with frequencies **[2, 1, 3, 2, 4]**, update the frequency of key **3** to **5**. Recalculate the minimum cost and the structure of the optimal binary search tree.
5	You have a set of coins with denominations **[1, 3, 4, 7]**. Find the minimum number of coins required to make change for a given amount **n = 10**.
6	You are given a set of coins with denominations **[1, 2, 5, 10]**, and you have a limited number of each type of coin as follows: • 1-coin: 5 available • 2-coin: 3 available • 5-coin: 2 available • 10-coin: 1 available You want to make change for a target amount **n = 15**. Determine the number of ways to make change using the available coins.
7	In a class of 10 students, how many different ways are there to choose a group of 4 students for a project?
8	In a chess tournament, there are 10 players. How many different pairs of players can play against each other in the first round?