CS3230
Tutorial 8

1. Give an argument to show why dynamic programming algorithm gives optimal solution for coin changing problem.

2. Build a table to show how the dynamic programming algorithm will work for finding the optimal algorithm for following matrix multiplication.

   $M_1 \times M_2 \times M_3 \times M_4 \times M_5$, where

   M_1 is a matrix of size 6×6

   M_2 is a matrix of size 6×3

   M_3 is a matrix of size 3×4

   M_4 is a matrix of size 4×4

   M_5 is a matrix of size 4×8

3. Give a counterexample to show that the following conjecture is false:

   To minimize the number of scalar multiplications of the product $M_1 \times M_2 \times \ldots \times M_n$, it should be grouped as

   $$(M_1 \times M_2 \times \ldots M_k) \times (M_{k+1} \times \ldots \times M_n),$$

   where M_k has minimum number of columns.

4. Modify the algorithm given in the class to show how the order of matrix multiplication can be obtained along with the optimal number of multiplications needed.

5. Give a dynamic programming algorithm to compute a^n given the following formula:

   $a^0 = 1$

   $a^n = a^{n/2} * a^{n/2}$ if n is even.

   $a^{n+1} = a^{n/2} * a^{n/2} * a$ if n is odd.