Assignment – 6

(1) There are $n(1 \leq n \leq 50)$ runners participating in a race. Assume all runners are completing the race. How many outcomes of this race can be possible in the following two scenarios.

- Tie between runners is not possible.
- Tie between runners is possible.

(2) Let we have n matrices $A_1, A_2, \ldots, A_n$. The size of matrix A_i is $p_{i-1} \times p_i$. The size of the matrices is stored in an array $p[0, 1, \ldots, n]$ of size $n+1$. The size of matrix A_i is $p_{i-1} \times p_i$ which is basically $p[i-1] \times p[i]$ when accessing the size from the array. Perform the following –

- Implement the brute force recursive algorithm to find the minimum cost to multiply matrices $A_1 \ldots A_n$. In your code, count the total number of sub-problems. Also, count how many times you are solving each sub-problem.
- Implement the recursive algorithm (which stores the solution to each sub-problem) to find the minimum cost to multiply matrices $A_1 \ldots A_n$. In your code, count the total number of sub-problems. Also, count how many times you are solving (basically accessing the solution) each sub-problem.
- Implement the iterative approach to find the minimum cost to multiply matrices $A_1 \ldots A_n$.

(3) Given two square matrices of size $n \times n$ where $n = 2^{2k}$ and $k \geq 2$. Write a program to multiply these square matrices using divide-and-conquer such that you divide a matrix in 16 sub-matrices.