Assignment 2
Matrix Chain Multiplication

Linear Algebra and Random Processes (CS6015)
Input/Output Specifications and Coding Description

Your program (matrix_chain_mul.c/matrix_chain_mul.cpp) written in C/C++ programming language, should read the files given under input section and generate the files specified under output section. All the files should be present at the same directory level.

1 Input

- input.txt - File containing the dimensions of the input matrices (A_i $(i = 1, 2, ..., n)$ having the dimension $p_{i-1} \times p_i$) in left to right order i.e. p_0 , p_1 ... p_n.

1.1 Input File Format

The first line of the input contains a single integer n denoting the number of matrices in the chain.
The second line contains $(n + 1)$ space-separated integers; p_0 p_1... p_n.

1.2 Sample Input

3
1 2 3 4

2 Output

- output.txt - File containing the outputs described in the problem description document.

2.1 Output File Format

This file contains seven lines.
The first line contains the optimum pairing for calculating the product $A_1A_2...A_n$ expressed by using paranthesis along with the index i of the matrix A_i and comma(,). No whitespace should be included in this line.

The second line contains one integer - the number of scalar multiplications for calculating the product by performing a sequence of multiplications from left to right.
The third line contains one integer - the number of scalar multiplications for calculating the product by performing a sequence of non-optimal pairing from left to right.
The fourth line contains one integer - the optimum number of scalar multiplications to compute the product $A_1A_2...A_n$
The fifth line contains one floating point number - the computation time for calculating the product by performing a sequence of multiplications from left to right (in seconds).
The sixth line contains one floating point number - the computation time for calculating the product by performing a sequence of non-optimal pairing from left to right (in seconds).
The last line contains one floating point number - the computation time for calculating the product using optimal pairing (in seconds).

Use random matrices of appropriate dimensions for calculating the computation time. The time elapsed can be computed using the following code snippet.

```
#include <time.h>

clock_t start, end;
double cpu_time_used;

start = clock();
... /* Code to be timed. */
end = clock();
cpu_time_used = ((double) (end - start)) / CLOCKS_PER_SEC;
```

2.2 Sample Output

$((1, 2), 3)$
18
18
18
0.948
0.948
0.948