CS 310 — Algorithms — Fall 2020
Programming Assignment #3

Due via LMS before 11pm on 22 November 2020

In this programming assignment, you are required to implemenet two algorithms for integer multiplication and analyze their performance over the number of decimal digits in the input integers.

- Brute force integer multiplication with $O(n^2)$ operations.

- Divide and conquer integer multiplication with $O(n^{1.59})$ operations.

The input consists of a single character (B or D) specifying the algorithm to use followed by two big integers of up to 10,000 digits on separate lines. For example:

```
B
123456789
987654321
```

should give the output

```
121932631112635269
```

In addition to program source code, you should submit a single plot called "plot.jpeg" with two line graphs—one for each algorithm you implement. The y-axis should show time in milliseconds and x-axis should show input size in number of decimal digits. You should have at least ten samples for your algorithms' time for 1000, 2000, 3000, . . . , 10000 decimal digits for both integers.

Implementation Guidelines

- On a Linux machine, you can use the `time` utility to find the running time of your program.

- You can generate test cases using the `bc` utility on a Linux machine for arbitrary big integers.

- You cannot use a builtin library for BigInteger.

- Since the input/output have decimal digits, it will be much easier for you to work with the algorithms in base-10. So instead of multiplying bits you multiply decimal digits.

- The grading for this assignment will focus on time complexity i.e. whether you are able to implement the algorithms in their respective time complexity or not.