CSE2025 Data Structures
PROJECT #1 (Due November 5, 2021, Friday at 17:00)

Problem:

Assume an (theoretically) infinitely large positive natural number specified in decimal number system. How can we multiply it in our computer? We look for a solution that is capable of multiplying such a number. The infinitely large numbers concerning the multiplication (i.e., the multiplicand and the result) should be shown in the original number system presented to your program.

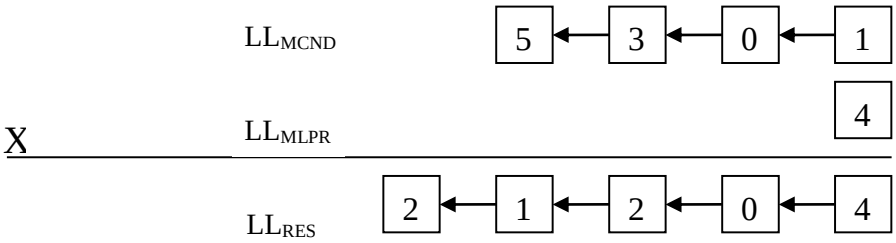
Example 1:

```
  5301858469230152002541253
                          8
x_________________________
 42414867753841216020330024
```

Example 2:

```
  5301
     4
x_____
 21204
```

The requirement that the numbers may be infinitely large implies that you cannot use standard data types to represent these numbers. Therefore, you will need a data structure that appropriately represents such large natural numbers and you will redefine the multiplication operation in terms of these data structures. A typical data structure to exploit in this case is linked lists (LLs). You may hold each number (including the result) in a LL each digit stored in a node and, while multiplying each pair of digits of multiplicand and multiplier, you may accordingly update the relevant digits in the result. We provide below how the second example is implemented.



In this project you are expected to develop an algorithm that is capable of finding a solution to the above problem and ***implement this algorithm in C that runs under***

Linux or Windows. **Do not forget that the multiplier may have more than one digit.**

The following points are given to clarify what is given and what is expected at the end of this project:

Input:

An input file containing

- the multiplicand, and
- the multiplier

Output:

An output file containing

- the multiplicand
- the multiplier and
- the result

You are responsible for demonstrating your program to me at a date to be specified and announced later. By the due date you are to **electronically submit (birol@marmara.edu.tr)**

1. the **source code of your program**
2. a **sample input file**
3. a **sample output file**
4. and a documentation in a proper word processor that contains a detailed discussion of your algorithm:

Project submission policy:

Note that projects submitted after the project's due date will not be accepted and evaluated. Please keep this in mind and **promptly start working on your projects**!

You are required to exhibit an ***individual effort*** on this project. Any potential violation of this rule will lead everyone involved to failing from this project and class and necessary disciplinary actions will be taken.

Good luck!!! ☺✓

Birol Gençyılmaz