

Hand in your solutions electronically using LearnUs.

This assignment is a completion points assignment: any reasonable attempt will receive *full* points, *even if it is incorrect*.

This is a programming assignment. Submit your source code(s), zipped as **yourStudentID.zip**. For example, if your student ID is **2023000000**, then you must zip all your source code(s) into **2023000000.zip** and submit this file. Each class should have its own **.java** file, of which the filename is the same as the class name. Do *not* include your student ID as part of the class names. You are not allowed to use any data structure libraries, including the linked lists provided by JDK.

Try to solve this problem without referring to the lecture notes. The problem description starts on the next page.

(1) (10 points) Write a program that multiplies two given nonnegative integers. Your program must internally use a singly linked list to represent nonnegative integers, where each node of the list corresponds to each digit of the integer. Use the decimal representation. For example, the integer 231 is to be represented by a linked list consisting of three nodes, each containing 2, 3, and 1 (or 1, 3, and 2).

Your program must read its input from `input.txt` in the current working directory. The input file consists of two lines, each containing a nonnegative integer. Each number does not contain unnecessary zeroes: for example, number 100 will always be represented as 100, not 0100 or 00100. You do not need to check if the input is well-formed: we will test your program only with the inputs that follow the input format.

Your program must output the product of the two input integers to `output.txt` in the current working directory. The output must not contain unnecessary zeroes. The output file consists of a single line.

Your program **must** first construct two linked lists containing the two input numbers, then perform the required calculation storing the result in a new linked list, and finally output the result. Your program is **not** allowed to use arrays or strings during the calculation, and it must **not** generate the output directly from the two operands without explicitly constructing the result linked list. Your program may use arrays for input/output purposes.

The running time of your program **must** be $O((n + m)^2)$, where n and m respectively denote the number of digits of the first and second input integers. You can assume that $n, m \leq 10,000$.

The entry point of your program must be `CPA2.main()`.

Example

`input.txt`

```
123
456
```

`output.txt`

```
56088
```