

# BIL 105E - Introduction to Scientific and Engineering Computing (C)

Spring 2014-2015

## Homework 3

**Assignment Date: 27.04.2015**

**Due Date: 08.05.2015 16:00**

**IMPORTANT: Don't use or get inspired by any lines of code from any other sources (friends, Internet, etc). Any similarity, which is beyond reasonable, will be accepted as cheating!**

C integral data types can store values up to a limit which is determined by the actual size of integral types used in implementation. For example, maximum **int** value is +32767 and **long** value is +2147483647 when 2 and 4 bytes are used to implement **int** and **long** data types, respectively.

We sometimes need to store BIG integer values produced by some functions/calculations. Factorial is an apparent example: N factorial may not fit in a single int/long for large values of N. For example,

$$25! = 15,511,210,043,330,985,984,000,000$$

One way to compute the factorial of such a number is to use an array to store the answer and partial results, using one element of the array per digit. Thus, you would store  $12! = 479,001,600$  in an array of 300 chars as:

300	.....	8	7	6	5	4	3	2	1	0
'0'	.....	'4'	'7'	'9'	'0'	'0'	'1'	'6'	'0'	'0'

and store  $13! = 6,227,020,800$  (which is obtained by multiplying the previous LARGE number,  $12! = 479,001,600$ , with 13) as

300	.....	9	8	7	6	5	4	3	2	1	0
'0'	.....	'6'	'2'	'2'	'7'	'0'	'2'	'0'	'8'	'0'	'0'

In that way, you can store factorial of large numbers (In fact, 'large' here is not so LARGE since N! increases faster than the exponential functions). By using an array of size 300, you can calculate and store N! for N = 0 ... 165.

You are asked to write a C program which calculates N! for large values of N. The user enters the value of N and the program calculates value of N!. **Each digit of the (partial) result(s) is stored in an array as shown above.** You are not allowed to use float/double variables to calculate the (partial) result(s). You can assume that, **N! will not exceed 300 digits.**

Your program should output the answer along with the last two partial results. **The partial results must be printed as right-aligned with the answer and every three digits must be separated by a comma for a better visualization.**

A sample program run will be as follows:

```
Enter N: 13
```

```
11! =   39,916,800
```

```
12! =  479,001,600
```

```
13! = 6,227,020,800
```