

CS608 Programming Assignment 5

This assignment has two parts: Part 5A and Part 5B. If you successfully complete both, you will receive 15 points. If you successfully complete only one (either one), you will receive 10 points.

Programming Assignment 5A: Linked List

The programming assignment is to add two more methods to our implementation of a linked list (see my notes): `getLastElement()` and `searchFor(x)`. The method `getLastElement()` returns (an integer) the last element of the linked list. The method `searchFor(x)` searches the linked list for the specified element `x` and returns `true` if it is found, otherwise returns `false`.

Now the programming assignment 5A:

Starting from the program in my notes, which implements a linked list of, add two more methods: `getLastElement()` and `searchFor(x)`.

A text file called **dataForLinkedList.txt** contains the following:

First line: One line of integers ending in a zero.

Second line: an integer (call it `x`)

Third line: an integer (call it `y`)

Fourth line: an integer (call it `z`)

Here is a sample data file (actual file will be different):

```
37 82 19 15 92 33 23 56 78 34 23 90 55 24 53 75 86 35 89 0
50
66
75
```

Your program reads this text file with numbers and does the following:

1. Creates a linked list with numbers from the first line. The zero at the end of the line is given to help you stop reading. Don't include 0 in the linked list.
2. Display the linked list elements
3. Display the size of the linked list

4. Searches for x (the number on the second line) and prints if the number is found in the linked list or not.
5. Print the last element of the linked list
6. Insert integer y (third line) at the beginning of the list
7. Display the linked list again
8. Insert integer z (fourth line) at the end of the linked list
9. Display the linked list elements again

All output must contain appropriate comments.

Programming Assignment 5B: Generating large factorials

The assignment 5B is to write a Java program to compute the value of $n!$

The program will query the user for an integer, n , and return the exact value of that integer's factorial, $n!$. It will then ask whether the user wishes the value of another factorial. If so, the query, return, and ask cycle is repeated (stops when the input is 0).

As you know, $n!$ is the product $1 * 2 * 3 * \dots * n$.

For small n , it is easy to compute $n!$

$$1! = 1$$

$$2! = 1 * 2 = 2$$

$$3! = 1 * 2 * 3 = 6$$

It is important to observe that $n! = (n-1)! * n$

$$\text{So } 4! = 3! * 4 = 24$$

$$5! = 4! * 5 = 120$$

$$6! = 5! * 6 = 720$$

And so on.

Factorials grow very fast. Simple calculators fail to display even $20!$ exactly. Your program must be able to display $n!$ exactly for reasonably large n .

Input: Ask the user for the value of n

Output: Display the exact value of $n!$ (with commas in the number).

General instructions:

- If your program has several classes, include all of them in the same file and name your Java file CS6085Axxxxx.java (Assignment 5A) and CS6085Bxxxxx.java (assignment 5B), where xxxxx is your last name. **DO NOT SEND ZIP files.**
- Output must include **Your name, course number, and date (use Date class)**. If any of the above items are missing, you will not receive full credit.
- Send your Java file as an email attachment to CS608Assignment@gmail.com. Include your name and assignment number in the email subject.

Note: I will run your programs and grade them. If your programs do not compile (that is, show syntax errors, you will receive 0 for the programming assignment).
