CS 1101 – Introduction to Computer Science

Spring 2022

Lab 12 – Linked Lists

Due Date: Friday, May 6, end of the day (11:59pm).

Objective: The goal of this assignment is to help you get familiar with **Linked list**.

Assignment: Create a **Book** class that represents a book in the library. This class will store the following information about a particular book:

Title - name of the book
Author- name of the author
Year published - year of publication
Next Node – a book object

Your **Book** class should include the following constructors:

- A no-arg constructor
- **Book**(String title)
- **Book**(String title, String author)
- **Book**(String title, String author, int yearPublished)

Create a **Runner** class.

- **The class will contain the main method**.
- The class should create a linked list of **Book** objects.
  - The first node should be called the ***head*** node.
  - The linked list should be of **size 10**.
- This Runner class should have the following functionalities:
  - A print method that, given the ***head*** node, prints the title and author name of every book in the library. *(This must be displayed in a table format)*
    Method header: public static void print (Book head)
  - An add method that, given the ***head*** node, adds a book object at the end of the linked list, and returns the ***head*** node. Please use Scanner to get the book's information from the user.
    Method header: public static Book add (Book head, Book toAdd)
  - A remove method that, given the ***head*** node, removes the last book from the end of the linked list, and returns ***head*** node.
    Method header: public static Book remove (Book head)

The **Runner** class should use these methods from the following menu:

```
Welcome to the book library.
Select an option:
1. Show all the books in the library
2. Add one book at the end of the linked list.
3. Remove one book from the end of the linked list.
4. Exit
```

Note: You can hardcode the information of the book objects in the **Runner** class. Thus, when your program runs for the first time, it is not necessary for the program to take Book's information from the user. However, if a user wants to add a book in the library (Menu option 2), take the information that are necessary to create a new book object. A set of sample books are **(feel free to add your own list of Books, please note that the size of the linked list at the beginning of the program should be 10)**:

```
new Book("Gulliver's Travels", "Jonathan Swift", 1726);
new Book("Don Quixote", "Miguel De Cervantes", 1615);
new Book("The Count of Monte Cristo", "Alexandre Dumas",
1845);
new Book("Charlotte's Web", "EB White", 1952);
```

Note: Please create other methods, if you need to.

Example:

***Welcome message/Option 1**

```
C:\Users\bsalvarez\Documents\CS 1101\Labs\Lab 12>java Runner
Welcome to the book library

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
1
+-------------------------------------------------------------------+
|                      -- // My Library // --                       |
+-------------------------------------------------------------------+
|Title                                          | Author            |
+-------------------------------------------------------------------+
|Gulliver's Travels                             | Jonathan Swift    |
|Don Quixote                                    | Miguel De Cervantes |
|The Count of Monte Cristo                      | Alexandre Dumas   |
|Charlotte's Web                                | EB White          |
|Whole Earth: The Many Lives of Stewart Brand   | John Markoff      |
+-------------------------------------------------------------------+



Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

***Option 2**

```
2

What is the title of the book that you would like to add?
In Search of Lost Time

What is the author?
Marcel Proust

In what year was this book published?
1913

A new book was added to the library!

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

***Now select Option 1 to confirm that the book was added**

```
1
+-------------------------------------------------------------------------+
|                      -- // My Library // --                             |
+-------------------------------------------------------------------------+
|Title                                              | Author              |
+-------------------------------------------------------------------------+
|Gulliver's Travels                                 | Jonathan Swift      |
|Don Quixote                                        | Miguel De Cervantes |
|The Count of Monte Cristo                          | Alexandre Dumas     |
|Charlotte's Web                                    | EB White            |
|Whole Earth: The Many Lives of Stewart Brand       | John Markoff        |
|In Search of Lost Time                             | Marcel Proust       |
+-------------------------------------------------------------------------+



Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

***Option 3**

The library had previously 6 books, after option 3 the library now has 5 books:

```
3
The last book from the library has been removed!
There are now 5 books in the library.

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

***Now select Option 1 to confirm that the last book was removed**

The book removed was: In Search of Lost Time

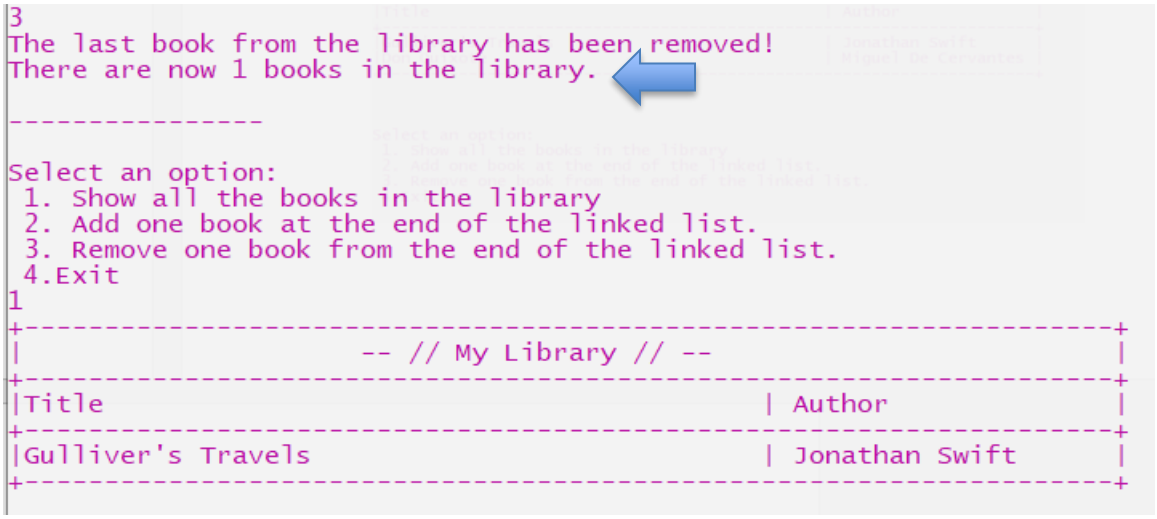
```
1
+-------------------------------------------------------------------+
|                      -- // My Library // --                       |
+-------------------------------------------------------------------+
|Title                                | Author                      |
+-------------------------------------+-----------------------------+
|Gulliver's Travels                   | Jonathan Swift              |
|Don Quixote                          | Miguel De Cervantes         |
|The Count of Monte Cristo            | Alexandre Dumas             |
|Charlotte's Web                      | EB White                    |
|Whole Earth: The Many Lives of Stewart Brand  | John Markoff       |
+-------------------------------------------------------------------+



Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

Let's continue removing the last books until we get to 2 books remaining:

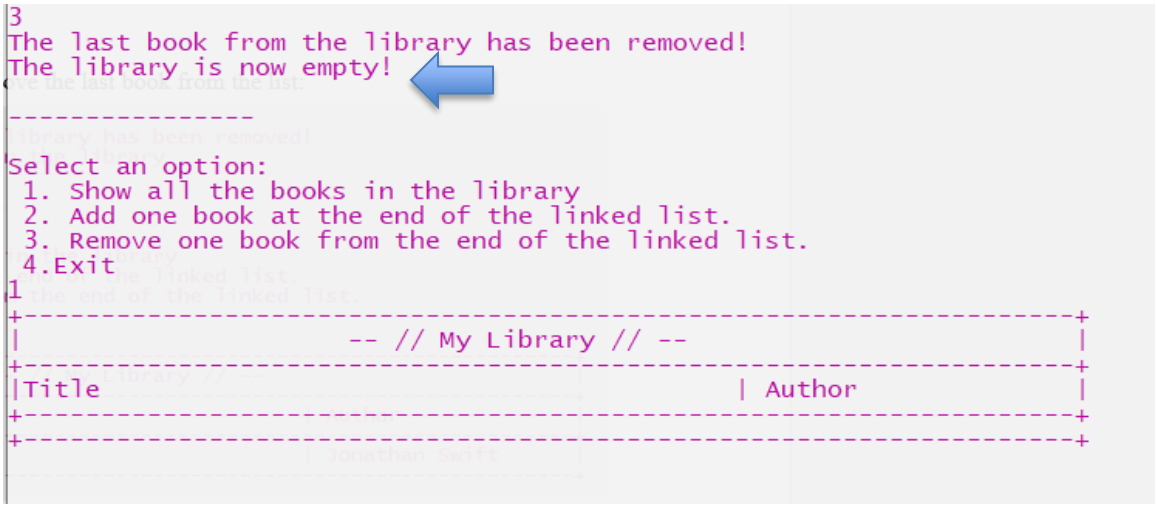
```
Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
3
The last book from the library has been removed!
There are now 4 books in the library.

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
3
The last book from the library has been removed!
There are now 3 books in the library.

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
3
The last book from the library has been removed!
There are now 2 books in the library.

----------------
```

```
1
+-------------------------------------------------------------------+
|                      -- // My Library // --                       |
+-------------------------------------------------------------------+
|Title                                | Author                      |
+-------------------------------------+-----------------------------+
|Gulliver's Travels                   | Jonathan Swift              |
|Don Quixote                          | Miguel De Cervantes         |
+-------------------------------------+-----------------------------+



Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
```

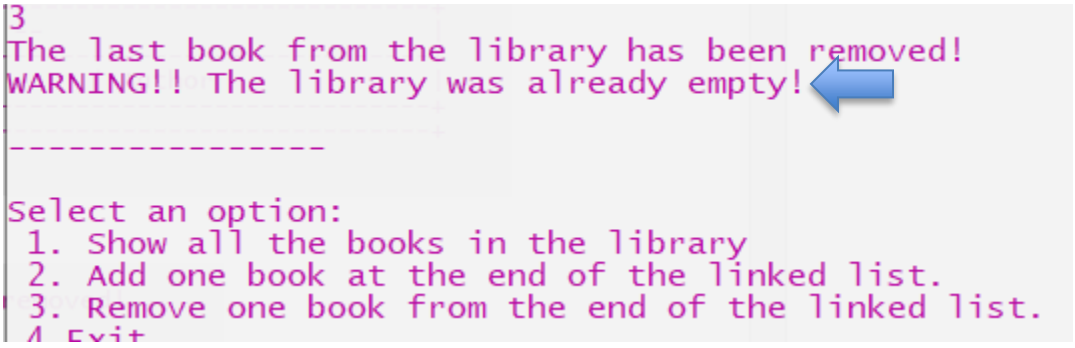
Again, select option 3 to remove the last book from the list “Don Quixote”:



Finally, select option 3 to remove the last book from the library:



Let’s try option 3 again:



Now, let's add 2 books to our empty library:

```
2

What is the title of the book that you would like to add?
CS 1101

What is the author?
Bianca A

In what year was this book published?
2022

A new book was added to the library!

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
1
+-------------------------------------------------------------------------+
|                      -- // My Library // --                             |
+-------------------------------------------------------------------------+
|Title                                          | Author                  |
+-------------------------------------------------------------------------+
|CS 1101                                        | Bianca A                |
+-------------------------------------------------------------------------+
```

```
2

What is the title of the book that you would like to add?
The Great Gatsby

What is the author?
F. Scott Fitzgerald

In what year was this book published?
1920

A new book was added to the library!

----------------

Select an option:
 1. Show all the books in the library
 2. Add one book at the end of the linked list.
 3. Remove one book from the end of the linked list.
 4.Exit
1
+-------------------------------------------------------------------------+
|                      -- // My Library // --                             |
+-------------------------------------------------------------------------+
|Title                                          | Author                  |
+-------------------------------------------------------------------------+
|CS 1101                                        | Bianca A                |
|The Great Gatsby                               | F. Scott Fitzgerald     |
+-------------------------------------------------------------------------+
```

***Option 4**

```
4
Have a good day. Bye!

C:\Users\bsalvarez\Documents\CS 1101\Labs\Lab 12>
```

Deliverables: Submit the java file in Blackboard:

(i) Book.java --- the java file of your program (optional, you can have this class in a separate java file or all in one java Runner file)
(ii) Runner_Lab 12_Lastname.java --- the java file of your program.

Grading Criteria:

- [20 points] Book Class
  - [10 points] The program uses meaningful variable names, and meaningful comments.
  - [10 points] Has the required constructors specified in the instructions.

- [80 points] Runner Class
  - [15 points] The program compiles and runs.
  - [20 points] The program generates correct output.
  - [20 points] **The program uses linked lists.**
  - [20 points] **The program uses the corresponding method headers.**
  - [5 points] The program uses meaningful variable names, and meaningful comments.

- Late submission [**-10**] points for every 24 hours after the deadline until May 8th.
- Submission after May 8th will not be accepted.

If you need clarification, ask the TA. Your TA will instruct you with further details.