UNIVERSITY of the WESTERN CAPE

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CSC211: Practical 3 [50 Marks].

DEADLINE: Friday, 24 March, 2023 @ 10:00 PM. NB: Please, no excuses for late hand-ins. Aim to submit well-ahead of the deadline.

Welcome to your third practical assignment. This practical will test your knowledge on the singly linked list data structure.
You are required to program in Java and use object-oriented programming concepts.
Do not use built-in java methods for your tasks: **write your own code.**
Save all your files in a compressed (.zip) folder with the following naming convention

StudentNumber_CSC211_Prac13.zip

Remember to include the following at the beginning of each java file:

```
/***
* Student surname
* Student first name
* Student number
* CSC211 2023 Practical 3
* File name
*/
```

(Leave a line open between the heading and your first line of code)

Scenario

Suppose you are the librarian of a small-town library and you want to create a program to help you manage your collection of books. Each book has a unique 4-digit ISBN code known as bookID, and you want to use a linked list to store and manage the books.

Please note that you are provided with template (code) files, which are *Book.java, LibrarySystem.java, Node.java*; **students are expected to use these files to aid with this question.**

Question 1. Creating the Books [10]

1. Create a class called Book with the following attributes/variables:
    a. String title – Title of the book
    b. String author – Author of the book
    c. String publisher – Publisher of the book
    d. int bookID – Unique 4 digit ISBN code of the book

2. Create the necessary methods for the above attributes/variables:
    a. get methods – Accessor method for the variable
    b. set methods – Mutator method for the variable
    c. toString method – String representation of the object

Question 2. Creating the container or the nodes **[10]**

1. Create a class called Node with the following attributes/variables:
    a. Book book – Book object that is stored inside the Node object
    b. Node nextNode – Node object that is used to reference/point to the next Node object

2. Create the necessary methods for the above attributes/variables:
    a. get methods – Accessor method for the variable
    b. set methods – Mutator method for the variable
    c. toString method – String representation of the object

Question 3. Creating the library management system **[30]**

1. Create a class called LibraryManagementSystem with the following attributes/variables:
    a. Node headNode – Contains the reference/pointer of the first Node object

Create the following methods in the LibraryManagementSystem class:

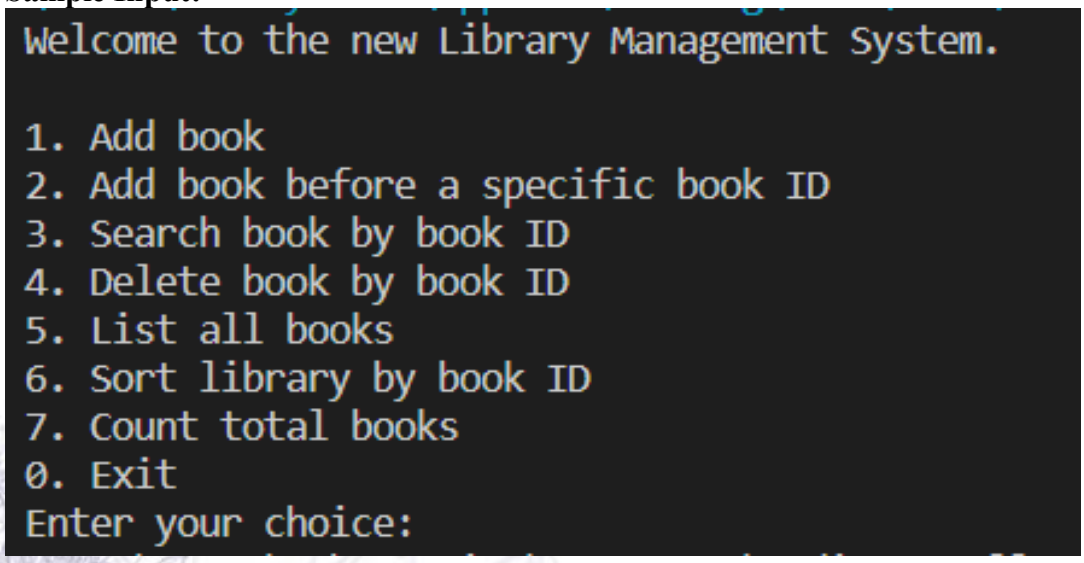
1. Implement a function **insertBook(Book newBook)** to add a book at the end of the linked list.
    a. Ask the librarian to input all the necessary book information.
    b. Use the information to create a Book object
    c. Pass through the Book object as the parameter to the function
    d. Store the Book object into the Node object
    e. "Link" the object with the rest of the linked list
2. Implement a function **insertBefore(Book newBook, int bookID)** to add a book in front of another book given its bookID.
    a. Ask the librarian to input all the necessary book information.
    b. Use the information to create a Book object
    c. Pass through the Book object and bookID as the parameter to the function
    d. Search for the matching Book object
    e. Store the Book object into the Node object
    f. "Link" the object with the rest of the linked list
3. Implement a function **searchBook(int bookID)** to search for a book by its bookID code and **return** the **book object**.
    a. Ask the librarian to input the bookID.
    b. If the book doesn't exist display an appropriate message.

4. Implement a function **deleteBook(int bookID)** to delete a book from the linked list by its bookID code.
    a. If the book doesn't exist, please display an appropriate message.
5. Implement a function **listAllBooks()** to display all the books in the linked list.
    a. If there are no books, please display an appropriate message
6. Implement a function **sortLibrary()** to sort all the books in the linked list by its bookID code ascendingly.
7. Implement a function **totalBooks()** to count the total amount of books in the linked list and **return** it.

Driver Code:

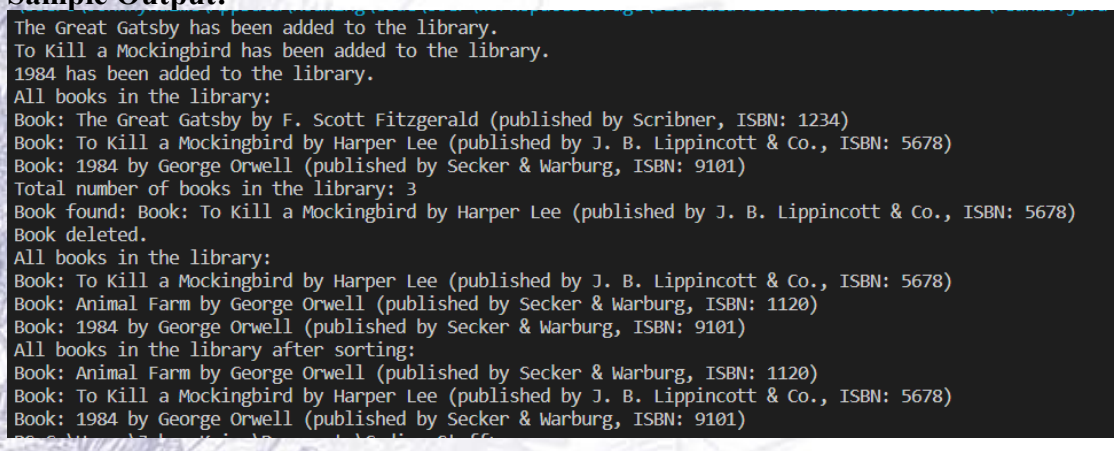
Write a main method inside the LibraryManagementSystem class, create a menu system that allows the Librarian input commands to interact with the system. **Below is the menu system that students should aim to recreate. Give an appropriate message after each action to notify the Librarian if an action was successful. Make use of the toString() to print the Book objects.**

Sample Input:



.

Sample Output:



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N.B. "link" up the remaining linked list!!, the above operations didn't cover all cases, think about what happens if the linked list is empty? What should you do to notify the Librarian?
Remember this is an OOP practical, all class variables MUST be private, use accessor and mutators to read/write them, incorrect implementation will result in mark deduction.

SUBMISSION AND GRADING

Please submit a (zipped) folder that contains your java implementation (code).

Only submit the following 3 files and nothing else:

- **Book.java**
- **Node.java**
- **LibraryManagementSystem.java**

Marks will be allocated as follows:

Question	Task & Marks	Points
Q1	Book class object Constructors, Accessor, Mutator, toString	5
Q2	Node class object Constructors, Accessor, Mutator,toString	5
Q3	LibraryManageSystem object Driver Class methods [5 marks each]	35
Other	Format, syntax and appropriate/relevant comments	5
	TOTAL (OBTAINABLE) MARKS	**50**

WARNING: ACADEMIC DISHONESTY/PLAGIARISM

We cannot over emphasize this. Please be warned that tutors and markers will run your report/solution through a plagiarism checker. Any person/group found guilty of plagiarizing will get zero for this assignment and will face the university's disciplinary unit. We do encourage you to share ideas, but we draw a careful line between that and plagiarism.

Note that any group/person that allow their work to be copied will also be guilty. So, please guide your assignment will all diligence and describe the solution in your own way as much as possible.

Best wishes!