King Saud University
College of Computer & Information Science
CSC111 – Project
All Topics
All Sections

Instructions

1- You must submit your solution using Web-CAT grading system. Web-CAT can be accessed from eclipse using the following IP address (single line):
`http://10.131.240.28:8080/Web-CAT/WebObjects/Web-CAT.woa/wa/assignments/eclipse`

2- ***Due date: Sunday January 8th at 11:59pm***

3- Make sure you use correct class name. Do not use a package (i.e., use default package).

4- You must submit from Inside College.

هذا المشروع يحتوي على الكثير من الأفكار البرمجية التي سوف تأتي في اختبار العملي النهائي والاختبار النهائي كما يمثل مراجعة شاملة لكافة المواضيع التي تمت دراستها في هذا المقرر. لذا من المهم جدا عزيزي الطالب أن تحاول أن تحل المشروع كاملا قدر الأمكان معتمدا على نفسك وزملائك المشتركين معك في المشروع فقط. من المتوقع أن يأخذ منكم المشروع ما بين ٥ ساعات إلى ٨ ساعة لإتمام حله. في حال وجدت مشكلة في فهم جزئية معينة أنت والمجموعة المشترك معها أو واجهتكم صعوبة في حل جزئية معينة فراجعوا أستاذ المادة أو المعيد.

تتكون المجموعة من طالب واحد على الاقل او طالبين على الاكثر من نفس شعبة المحاضرة.
على كل طالب في المجموعة تسليم المشروع عن طريق المصحح الآلي.

يمنع الغش منعا باتا.

Question – Expected time (3 – 8 hours)

Problem Description

You need to write a program for a system to manage the books in a library. Your system should be able to add books to a library archive, retrieve a book by ISBN, delete a book given ISBN and return the total number of books that have the same author.

The program should enable a library clerk to complete the following tasks:

- Add a book to the collection of books in the library.
- Delete a book from the collection of books in the library.
- Find the information about a book given its ISBN.
- Given author name, return the total number of books for that author.
- Print all the books.
- Print all the books with the same *genre* (type of book).
- Print all the books with the same edition

Assumptions:

- Book ISBN is unique; no two books can have the same ISBN.
- ISBN must be checked and validated using a specific formula before adding the book to the archive (see method verifyISBN).
- When adding a book, a reference code is generated to make the classifying procedure easier. A book reference code for the library is taken from the book title and the author name (see method generateReference).
- There is a counter for the number of books (see numOfBooks) that will be incremented whenever a book is added successfully and decremented when a book is deleted successfully.

Sample Run

```
**********************************************************************


*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 1
Please, enter the book details #ISBN, author, title,genre,publisher and
edition :0200
stefen
java
programming
macgrowhill
1
The book has been added.
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 3
Enter ISBN0200
0
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 4
Title :java
Author :stefen
ISBN :200 - Reference Code ST-PR
Genre :programming
publisher :macgrowhill
edition :1
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 5
Enter genre: programming
Title :java
Author :stefen
ISBN :200 - Reference Code ST-PR
Genre :programming
publisher :macgrowhill
edition :1
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 7
1
```

```
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 8
Enter edition: 1
Title :java
Author :stefen
ISBN :200 - Reference Code ST-PR
Genre :programming
publisher :macgrowhill
edition :1
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
**********************************************************************
Enter your option :> 2
Enter ISBN: 0200
The book has been deleted.
**********************************************************************
*                       Welcome to KSU Library :)
*                       ---------------------------
*      Please enter one of the following options:
*      1) Add a book
*      2) Delete a book
*      3) Find a book
*      4) List all books
*      5) List books for a given genre
*      6) Number of books for a given author
*      7) Total number of books
*      8) List books for a given edition
*      9) Exit
*
```

```
**********************************************************************
Enter your option :> 9
Thanks. Goodbye!
```

Book Class

This class represents a book and its name is `Book`. It holds a book's information.

Book
–ISBN: int –author: String –title: String –genre: String –publisher : String –edition: int –refCode : String
Book() + setters + getters public Book(ISBN: int,author: String,title: String, genre: String, publisher : String, edition: int) + printBookInfo():void +String getrefCode(): String +generateReference():void +verifyISBN(int ISBN): boolean +printBookInfo():void +equals(Book WWW):void

Here are the **attributes** of the class:

- An **int** data field named **ISBN** that holds ISBN number. Each ISBN is 4-digit integer that represents the International Standard Book Number.
- A String data field named **author** that holds author name (assume each book has a single author).
- A String data field named **title** that holds book's title.

- A String data field named **genre** that holds book's genre (type of book such as classic, romance, fiction, nonfiction, ...etc).
- An int data field named edtion that stores number of the book edition.
- An String data field name publisher, that stores name of the publisher.
- A String data field **refCode** that stores the book reference for the library**.** The book reference is taken from the book title and author name and generated using method **generateReference**() (see methods below).

The **methods** are defined as follows (all public, see UML for all methods list)):

- **Book**: A default constructor.
- **Book (ISBN, author, title, genre, edition, publisher,)**: A constructor that initializes new book with the initial values from the user.
- **Setter methods** (one for each): That sets the values for: (ISBN , author , title, genre, edition, publisher).
- **equals(Book WWW):** Equals methods will take object as argument and if the object which is passed as argument are matching with the all fields, than it will print the message: "Are equels "

  Otherwise it will print the message :" Not equals "
- **Getter Methods** (one for each): That returns the values of: ISBN, author, title, genre, edition, publisher and refCode.
- A method named **generateReference()** that generates and store a reference for the book in refCode**.** The reference is of type *String* and it is formed by taking the first two characters of the author name and the first two characters of the book genre and separates them with a dash.

  Example: author = Doyle, genre = Novels → reference code = DO-NO

  <u>Hint</u>: Use method **charAt(i)** of class String to get a character at a certain index i in a String (index starts from 0). For Example: if value of a String variable **s** is "abc" then **s.charAt(2)** will return 'c'.

- A method named **verifyISBN(int ISBN).** Given an ISBN, it returns true if the entered ISBN is correct and false otherwise. The ISBN is a 4 digit integer where the fourth digit is the *control digit* that checks if the ISBN is correct.

How to verify an ISBN?

Given ISBN = $n_1n_2n_3n_4$ the formula for checking correctness is as follows:

$$(n_1 \times 3 + n_2 \times 2 + n_3 \times 1) \bmod 4 = n_4$$

In other words: the result of this formula must be equal to the *control digit*.

Example: ISBN = 0200 is correct, while 1234 is not correct (use the formula and check!)

Hint: to get each single digit in a number, use similar idea to the one used in assignment 6, question 2.

- A method named **printBookInfo()** that prints a description for the book. It uses the following format:

```
Title:  title

Author: author

ISBN: ISBN  - Reference  Code : refCode

Genre: genre

Edition: edition

Publisher: publisher
```

Library Class

This class represents the Library. Class `Library` contains one array of objects that holds all the books information.

Library
–libraryBooks[]:Book –numOfBooks:int –MAX_SIZE: public static final integer
+ main() public Library () +printAll():void +deleteBook (int is):boolean +findBook (int is):int +printGenre(String g) : void +printBookBaseOnEdition(int edition) :void +addBook(ISBN:int,author:String,title:String,genre:String,publisher:String,edition:int): boolean +deleteBook (is : int): int +findBook (is: int): int +getNumberOfBooksByAuthor (s : String) : int +getNumberOfBooks: int +getLibraryBooks():Book[] +setNumOfBooks(s: int):void

Here are the **attributes** of the class:

- `Book[] libraryBooks`: an array of objects of type Book which holds the list of books in the library.
- `numOfBooks`: stores number of books currently in the library
- `MAX_SIZE`: a `public static final` attribute that stores the maximum number of books that the library can handle

The **methods** are defined as follows (all public)(see UML for all methods list):

- `Library`: a default constructor that creates the array and sets `numOfBooks` to zero.
- `Library`: a constructor that creates the array with the size given by the user.
- `addBook:` Adds a book to the collection of books given its ISBN, author, title, genre, edition and publisher (follow this order when implementing your method). The new book is added to the end of the list. This method *returns true* if the add operation was completed successfully, and *false* otherwise. The book is successfully added if its ISBN is correct (**Hint**: use method verifyISBN) and the book is not already added before (**Hint:** use the method findBook). (**Note**: to make things easy for you, first implement this method without these checks, then add the checks gradually. *You will get a partial grade* if your method does not do the checks).
- `deleteBook:` given an ISBN, the book with the given ISBN is deleted from the library. You should delete a book by copying the last book in the list in place of the deleted book.
- `findBook:` given a book's ISBN, returns the index of the book in the library if the book is found, otherwise it returns -1.
- `printAll:` prints all the books in the library. Nothing will be printed if there are no books. This method should use the method printBookInfo.
- `printGenre:` given a book genre *g*, prints all books in the library that belongs to the same genre *g*. Nothing will be printed if there are no books for that genre. This method should use the method printBookInfo.
- `getNumberOfBooksByAuthor:` given an author name, returns the total number of books by the same Author.
- `getNumberOfBooks:` returns the total number of books in the library.
- `printBookBaseOnEdition:` given an edition e, prints all books in library that belongs to the same edition e. Nothing will be printed if there are no books for that edition. This method should use the method printBookInfo. (list books for given edition)

Main Class

The main class is class `TestLibrary` which is the class that you are going to use to test your program. It contains `main` method, which presents a menu for the user asking him what he would like to do, as follows:

1) Add a book
2) Delete a book
3) Find a book
4) List all books
5) List books for a given genre
6) Number of books for a given author
7) Total number of books.
8) List books for a given edition
9) Exit