

Assignment 2

Deadline:	12 May 2022, 11pm
Evaluation:	40 marks (20% of your final grade)
Late Submission:	Deduct 5 marks per day late
Individual Work	You must complete this assignment by yourself (you must NOT share your code with others or use others' code)
Purpose:	Reinforce Java OOP core concepts (abstraction, encapsulation, inheritance, and polymorphism), collections framework and generics, exception handling, input and output streams, and unit testing

1. System Description (Overview of Problem)

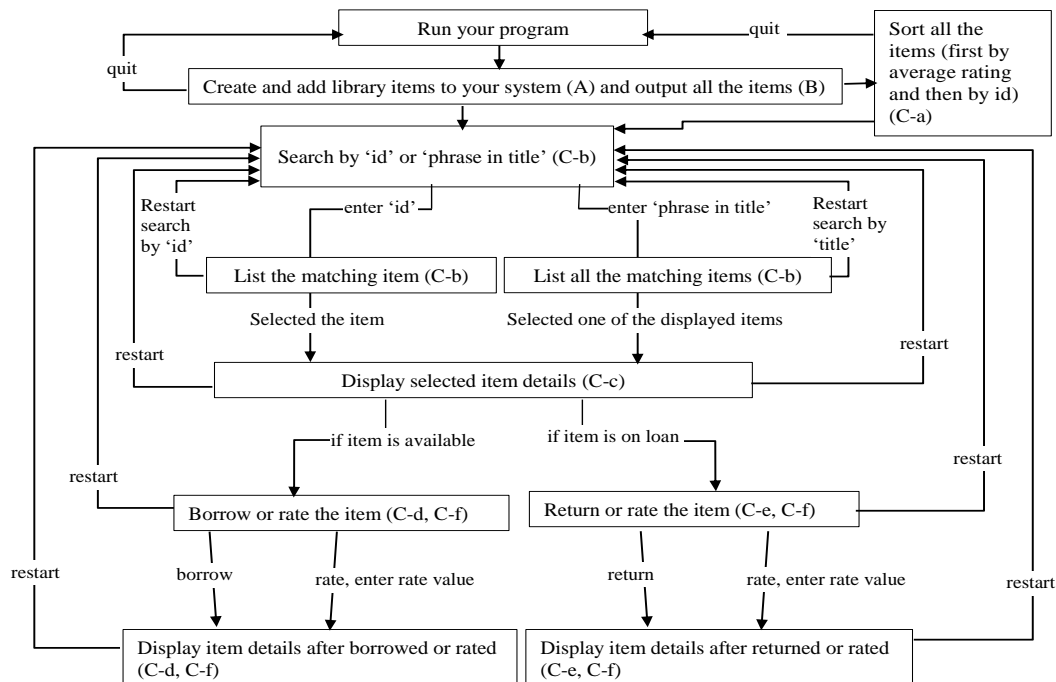
You are asked to write a program in Java to simulate a **University Library System**

Three types of items can be borrowed from the library—Books, Journals, and Movies. The library records each item's type, ID, title, year, average rating, number of reviews, and maximum borrowing time (28 days for Books, 14 days for Journals, and 7 days for Movies). Furthermore, for books, the library must record author and number of pages; for movies, it must record director; and for journals, it must record volume and number. Due dates must be recorded for all items out on loan.

2. Programming tasks to complete:

- A. Read text file library.txt (supplied); for each line in this file, create a Movie/Book/Journal object and add it to your 'library' object
- B. List all items in the library, but only display its ID, type, and title
- C. Prompt questions to allow users to do the following (refer to attached sample output at the end of this document for expected prompts and display details):
 - a. **Sort** all the items first by average rating and then by ID
 - b. **Search** items by **ID** or **phrase in title**, and list the items found
 - c. **Select** an item from search results and display its details
 - d. **Borrow** the selected item if it is available, and display new due date, or
 - e. **Return** the selected item if it is on loan, or
 - f. **Rate** the selected item and display new average rating
- D. Write JUnit test cases to check if your 'search items by ID or phrase in title' methods return correct results

3. Functions workflow (related tasks are marked as A, B, C-a, C-b, C-d, C-d, C-e, and C-f):



4. Design and Implementation Guidelines

Note: You will receive credit for correctness, completeness, no code duplication, and clear on-screen outputs. Also, the following **OOP and general software development guidelines** will be checked while marking your program:

- 1) Encapsulation design and implementation—proper use of modifiers
 - a. Private/Protected/Public
 - b. Must make use of getters and setters wherever appropriate.
- 2) Inheritance design and implementation
 - a. Reasonable class hierarchies
 - b. Proper data-fields separation in base and derived classes
 - c. Proper methods separation/overloading/overriding in base and derived classes
 - d. Proper use of base and derived class constructors
- 3) Polymorphism and implementation
 - a. Write generic code that targets the base class whenever possible
 - b. Appropriate use of overriding in derived classes to realize polymorphism
- 4) Collections framework and generics
 - a. Use ArrayList or another Java collection class to store information
 - b. Implement Comparable/Comparator Interface(s) to sort items
- 5) Exception handling
 - a. Throw exceptions when an error occurs (e.g., an invalid piece of data is entered)
 - b. Use “try/catch/finally” or “try/catch” block to handle exceptions

5. Other Specifications

You **must** follow the next five specifications when completing this assignment:

- 1) Create the method *displayInfo* to provide appropriate information as shown below. The content of *displayInfo* should be the first thing that displays onscreen

```
-----
Assignment 2 Semester 1 2022
Submitted by: Mouse, Mickey 12345678
-----
```

- 2) Place appropriate comments in your program – e.g.:


```
/** explain what the program file is doing . . . */
// explain what a part/method of the program is doing...
```
- 3) **DO NOT** add any file path for ‘library.txt’ (put it directly in your project folder when you test your code)
- 4) **DO NOT** add your own package name(s) to the beginning of your .java file
- 5) **DO NOT** use any function to clean the screen at any stage of your program

6. Submission Requirements:

- 1) Zip all your source code (.java files) and submit as a single zip file to Stream

7. Test data and sample outputs:**Task A: Input test data from library.txt file (supplied) into your system**

Movie,200,Remember The Alamo,1945,George Smith	}	Record of movie: Type, ID, title, year, director
Movie,203,Lord of the ring: the fellowship of the ring,2001,Pete Jackson		
Movie,206,Lord of the ring: the two towers,2002,Peter Jackson		
Movie,210,Going for the Touchdown,1984,Frank Madden		
Movie,211,Martian Hairdresser,1992,Debbie Gold		
Book,231,How to Make Money,1987,Phil Barton,324	}	Record of book: Type, ID, title, year, author, number of pages
Book,240,Garden Projects At Home,1998,Mary Freeman,164		
Book,202,The Haunted House Mystery,1996,Bert Morgan,53	}	Record of journal: Type, ID, title, year, volume, number
Journal,207,ACM,2009,6,8		
Journal,212,ACM,2010,5,8		
Journal,215,J of Logic,2008,23,14		
Journal,231,J of AI,2009,35,1		

Task B: List all items in the library

```

Run: Library x
"C:\Program Files\AdoptOpenJDK\jdk-11.0.6.10-hotspot\bin\java.exe" ...

-----
Assignment 2 Semester 1 2022
Submitted by: Mouse, Mickey 12345678
-----

List of all items in the library:
ID: 200      Type: Movie      Title: Remember The Alamo
ID: 203      Type: Movie      Title: Lord of the ring: the fellowship of the ring
ID: 206      Type: Movie      Title: Lord of the ring: the two towers
ID: 210      Type: Movie      Title: Going for the Touchdown
ID: 211      Type: Movie      Title: Martian Hairdresser
ID: 231      Type: Book       Title: How to Make Money
ID: 240      Type: Book       Title: Garden Projects At Home
ID: 202      Type: Book       Title: The Haunted House Mystery
ID: 207      Type: Journal   Title: ACM
ID: 212      Type: Journal   Title: ACM
ID: 215      Type: Journal   Title: J of Logic
ID: 231      Type: Journal   Title: J of AI

Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
|

```

Task C: Prompt questions to allow the user to select all the functions:

```

Run: Library
Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
$
List of all items in the library:
Average rating: 0.00      Number of reviewers: 0      ID: 200      Type: Movie      Title: Remember The Alamo
Average rating: 0.00      Number of reviewers: 0      ID: 202      Type: Book       Title: The Haunted House Mystery
Average rating: 0.00      Number of reviewers: 0      ID: 203      Type: Movie      Title: Lord of the ring: the fellows
Average rating: 0.00      Number of reviewers: 0      ID: 206      Type: Movie      Title: Lord of the ring: the two tow
Average rating: 0.00      Number of reviewers: 0      ID: 207      Type: Journal    Title: ACM
Average rating: 0.00      Number of reviewers: 0      ID: 210      Type: Movie      Title: Going for the Touchdown
Average rating: 0.00      Number of reviewers: 0      ID: 211      Type: Movie      Title: Martian Hairdresser
Average rating: 0.00      Number of reviewers: 0      ID: 212      Type: Journal    Title: ACM
Average rating: 0.00      Number of reviewers: 0      ID: 215      Type: Journal    Title: J of Logic
Average rating: 0.00      Number of reviewers: 0      ID: 231      Type: Journal    Title: J of AI
Average rating: 0.00      Number of reviewers: 0      ID: 231      Type: Book       Title: How to Make Money
Average rating: 0.00      Number of reviewers: 0      ID: 240      Type: Book       Title: Garden Projects At Home

Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
j
Enter ID to start search, or enter 'b' to go back to choose search method
202
ID: 202      Type: Book      Title: The Haunted House Mystery

Enter 'i' to search other item by ID, or enter any other key to select this item
k

Selected item is:
Type: Book
Title: The Haunted House Mystery
ID: 202
Year: 1996
Average rating: 0.0
Number of reviewers: 0
Status: available
Author: Bert Morgan
Number of pages: 53
Max number of days for borrowing: 28

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
b
This item's due data is 2022/04/22

Selected item is:
Type: Book
Title: The Haunted House Mystery
ID: 202
Year: 1996
Average rating: 0.0
Number of reviewers: 0
Status: on loan
Due date: 2022/04/22
Author: Bert Morgan
Number of pages: 53
Max number of days for borrowing: 28

Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart
r
This item is returned

```

As the initial value of 'Average rating' is 0 for all items, list is sorted by 'ID'

The initial value of 'Average rating'; number of reviewers' should be set to 0 for all items at beginning

The initial value of 'Status' should be set to 'available' for all items (none out on loan yet)

```
Run: Library ×
Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart
r
This item is returned

Selected item is:
Type: Book
Title: The Haunted House Mystery
ID: 202
Year: 1996
Average rating: 0.0
Number of reviewers: 0
Status: available
Author: Bert Morgan
Number of pages: 53
Max number of days for borrowing: 28

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
a
Please enter you rating (0 - 10)
7
This item's new average rating is 7.0

Selected item is:
Type: Book
Title: The Haunted House Mystery
ID: 202
Year: 1996
Average rating: 7.0
Number of reviewers: 1
Status: available
Author: Bert Morgan
Number of pages: 53
Max number of days for borrowing: 28

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
a
Please enter you rating (0 - 10)
8
This item's new average rating is 7.5

Selected item is:
Type: Book
Title: The Haunted House Mystery
ID: 202
Year: 1996
Average rating: 7.5
Number of reviewers: 2
Status: available
Author: Bert Morgan
Number of pages: 53
Max number of days for borrowing: 28

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
r

Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
r
```

Only one rating is available so the user entered rating value (7 in this example) equal to the 'Average rating'

'Number of reviewers' changed from 0 to 1 after item received its first rating

Multiple ratings for an item are allowed from one user, so after their second rating, 'Average rating' is: $(8+7)/2=7.5$

'Number of reviewers' changed from 1 to 2 after item's second rating

```
Run: Library X
Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
Enter phrase in title to start search, or enter 'b' to go back to chose search method
acm
* 1:
ID: 207      Type: Journal   Title: ACM

* 2:
ID: 212      Type: Journal   Title: ACM

Enter item number to select item, or enter any other key to continue searching
1

Selected item is:
Type: Journal
Title: ACM
ID: 207
Year: 2009
Average rating: 0.0
Number of reviewers: 0
Status: available
Volume: 6
Number: 8
Max number of days for borrowing: 14

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
b
This item's due data is 2022/04/08

Selected item is:
Type: Journal
Title: ACM
ID: 207
Year: 2009
Average rating: 0.0
Number of reviewers: 0
Status: on loan
Due date: 2022/04/08
Volume: 6
Number: 8
Max number of days for borrowing: 14

Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart
a
Please enter you rating (0 - 10)
6
This item's new average rating is 6.0

Selected item is:
Type: Journal
Title: ACM
ID: 207
Year: 2009
Average rating: 6.0
Number of reviewers: 1
Status: on loan
Due date: 2022/04/08
Volume: 6
Number: 8
Max number of days for borrowing: 14

Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart
r
This item is returned
```

Due date is current date + max number of days for borrowing

To calculate date in Java, you may use java library `java.util.Calendar`, `java.text.SimpleDateFormat`, etc.

The item's status changed to 'on loan' after being borrowed

```
Run: Library X
Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart
r
This item is returned

Selected item is:
Type: Journal
Title: ACM
ID: 207
Year: 2009
Average rating: 6.0
Number of reviewers: 1
Status: available
Volume: 6
Number: 8
Max number of days for borrowing: 14

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
t

Enter 'q' to quit,
or enter 's' to sort (first by average rating and then by id) and display all items,
or enter 'i' to search by ID,
or enter any other key to search by phrase in title
t
Enter phrase in title to start search, or enter 'b' to go back to chose search method
lord
* 1:
ID: 203    Type: Movie    Title: Lord of the ring: the fellowship of the ring
* 2:
ID: 206    Type: Movie    Title: Lord of the ring: the two towers

Enter item number to select item, or enter any other key to continue searching
2

Selected item is:
Type: Movie
Title: Lord of the ring: the two towers
ID: 206
Year: 2002
Average rating: 0.0
Number of reviewers: 0
Status: available
Director: Peter Jackson
Max number of days for borrowing: 7

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
a
Please enter you rating (0 - 10)
9
This item's new average rating is 9.0

Selected item is:
Type: Movie
Title: Lord of the ring: the two towers
ID: 206
Year: 2002
Average rating: 9.0
Number of reviewers: 1
Status: available
Director: Peter Jackson
Max number of days for borrowing: 7

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart
b
This item's due data is 2022/04/01
```

'Status' becomes 'available'
after an item is returned

There are two items
whose titles include
'lord' (searching
should not be case-
sensitive); see '*1'
and '*2'

Enter 'b' to borrow the item, enter 'a' to rate the item, or enter any other key to restart

b

This item's due data is 2022/04/01

Selected item is:

Type: Movie

Title: Lord of the ring: the two towers

ID: 206

Year: 2002

Average rating: 9.0

Number of reviewers: 1

Status: on loan

Due date: 2022/04/01

Director: Peter Jackson

Max number of days for borrowing: 7

Enter 'r' to return the item, enter 'a' to rate the item, or enter any other key to restart

r

Enter 'q' to quit,

or enter 's' to sort (first by average rating and then by id) and display all items,

or enter 'i' to search by ID,

or enter any other key to search by phrase in title

s

List of all items in the library:

Average rating: 9.00	Number of reviewers: 1	ID: 206	Type: Movie	Title: Lord of the ring: the two towers
Average rating: 7.50	Number of reviewers: 2	ID: 202	Type: Book	Title: The Haunted House Mystery
Average rating: 6.00	Number of reviewers: 1	ID: 207	Type: Journal	Title: ACM
Average rating: 0.00	Number of reviewers: 0	ID: 200	Type: Movie	Title: Remember The Alamo
Average rating: 0.00	Number of reviewers: 0	ID: 203	Type: Movie	Title: Lord of the ring: the fellowsh
Average rating: 0.00	Number of reviewers: 0	ID: 210	Type: Movie	Title: Going for the Touchdown
Average rating: 0.00	Number of reviewers: 0	ID: 211	Type: Movie	Title: Martian Hairdresser
Average rating: 0.00	Number of reviewers: 0	ID: 212	Type: Journal	Title: ACM
Average rating: 0.00	Number of reviewers: 0	ID: 215	Type: Journal	Title: J of Logic
Average rating: 0.00	Number of reviewers: 0	ID: 231	Type: Book	Title: How to Make Money
Average rating: 0.00	Number of reviewers: 0	ID: 231	Type: Journal	Title: J of AI
Average rating: 0.00	Number of reviewers: 0	ID: 240	Type: Book	Title: Garden Projects At Home

This round, sort first by
'average rating' and then by
'ID'

Enter 'q' to quit,

or enter 's' to sort (first by average rating and then by id) and display all items,

or enter 'i' to search by ID,

or enter any other key to search by phrase in title

q

Process finished with exit code 0