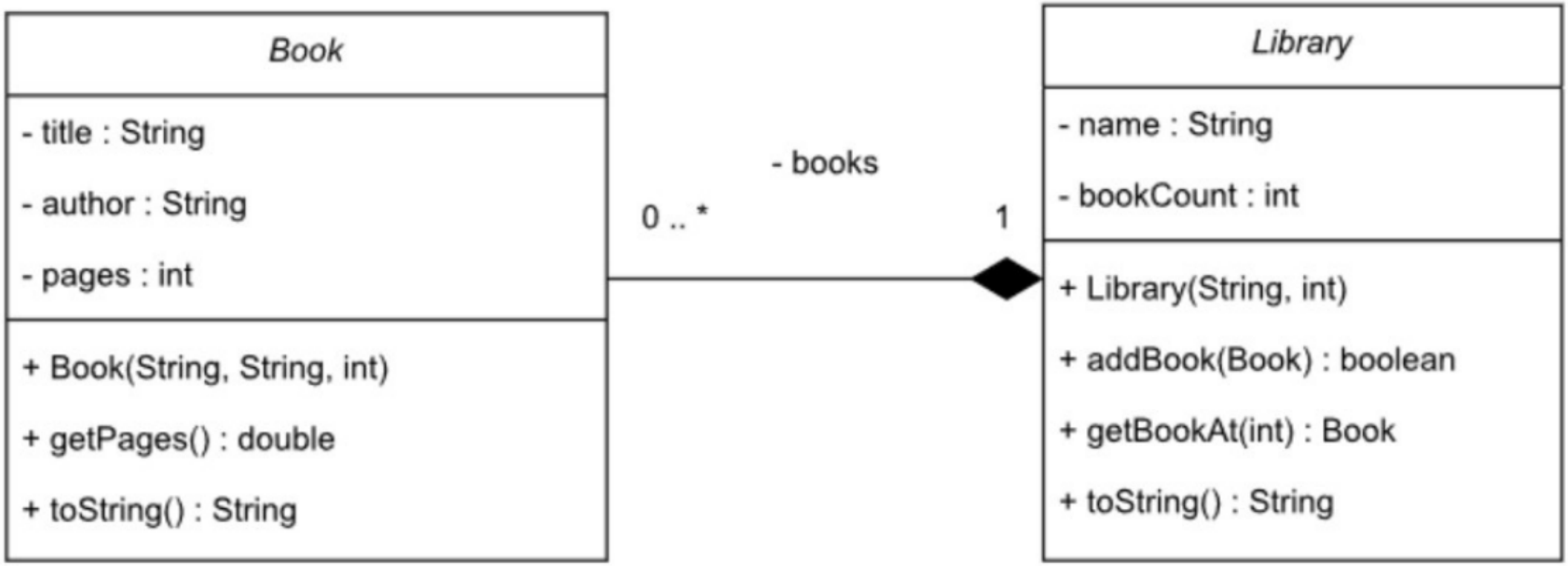
CSC 113

EXCEPTIONS 2

We want to write a program that manages digital books in a library.



Class **Book:**

- Instance Attributes:
  - ***title***: the book title
  - ***author***: the book author
  - ***pages***: the number of pages in the book

- Methods:
  - ***Book(title:String, author:String, pages:int):*** constructor
  - ***getPages():*** returns ***pages***
  - ***toString():*** returns a string representation of the book in the following format:
    - **Book title: *title*, author: *author*, pages: *pages***

Class **Library:**

- Instance Attributes:
  - ***name:*** name of the library
  - ***books:*** array of Book objects
  - ***bookCount:*** number of Book objects in ***books***

- Methods:
  - ***Library(name:String, size:int):*** constructor
    - Throws a ***NegativeArraySizeException*** when the array is created with a negative size
  - ***addBook(b:Book):*** adds ***b*** to the first available space of ***books*** array if there's space and returns true. Otherwise, returns false.
  - ***getBookAt(i:int)***: returns the book at index ***i*** in the array
    - Throws a user-defined unchecked exception ***InvalidIndexException*** when ***i*** is not valid (not between ***0*** and ***bookCount***)
  - ***toString():*** returns a string representation of the library in the following format:
    - **Library *name* (book*Count*):**
      - **Book title: *title*, author: *author*, pages: *pages***
      - **…**

Exercise 1: Write classes **`Book & Library.`**

Exercise 2: Write class **`LibraryTest`** that has a main method to test the functionalities of the classes and handle their thrown exceptions using try-catch blocks:

- Prompt the user to enter the name of the library
- Keep prompting the user to enter the size of the library until a valid size is entered. In case there's an exception (negative size), catch it and print an appropriate message (see sample run).
- Add three books to the library (see sample run)
- Keep prompting the user to enter the index of a book in the library until a valid index is entered. In case there's an exception (invalid index), catch it and print an appropriate message (see sample run).

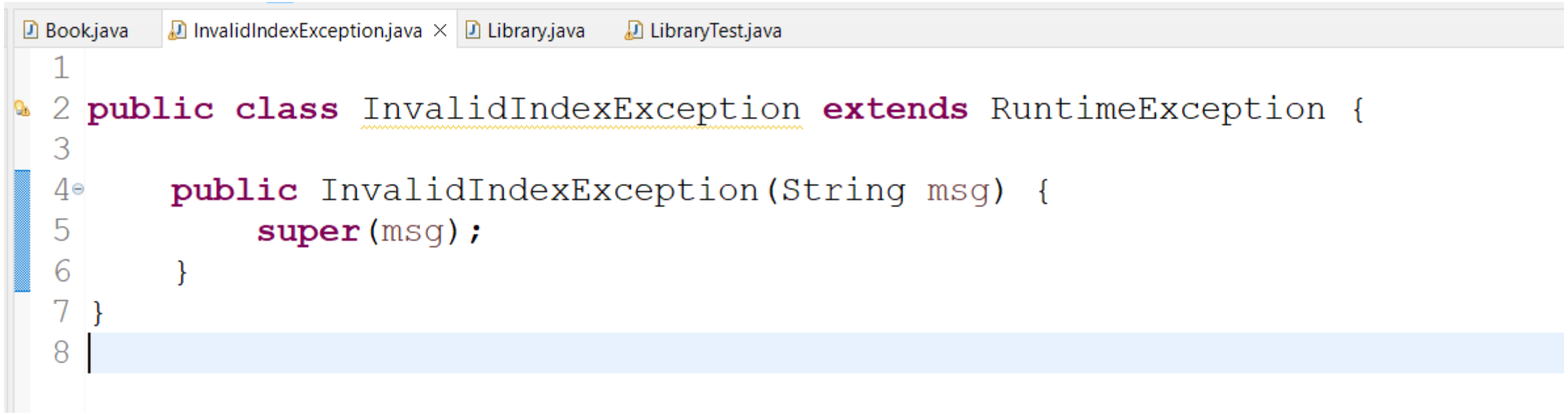
Sample run:

```
Enter the name of the library:
Philosophy↵
Enter the size of the library:
-1↵
Caught NegativeArraySizeException: Array size is negative.
Enter the size of the library:
5↵
Library Philosophy (3):
Book title: The Clouds, author: Aristophanes, pages: 194
Book title: The Republic, author: Plato, pages: 416
Book title: The Categories, author: Aristotle, pages: 48
```

```
Enter index:
-1↵
Caught InvalidIndexException: -1 is out of range.
Enter index:
4↵
Caught InvalidIndexException: 4 is out of range.
Enter index:
7↵
Caught InvalidIndexException: 7 is out of range.
Enter index:
1↵
Book title: The Republic, author: Plato, pages: 416
```

Book.java | InvalidIndexException.java | Library.java | LibraryTest.java

```java

public class Book {
    private String title;
    private String author;
    private int pages;

    public Book(String title, String author, int pages) {
        this.title = title;
        this.author = author;
        this.pages = pages;
    }

    public Book(Book b) {
        this(b.title, b.author, b.pages);
    }

    public int getPages() {
        return pages;
    }

    public String toString() {
        return "Book title: " + title + ", author: " + author + ", pages: " + pages;
    }
}
```


Book.java
InvalidIndexException.java
Library.java
LibraryTest.java
1
2 public class InvalidIndexException extends RuntimeException {
3
4 public InvalidIndexException(String msg) {
5 super(msg);
6 }
7 }
8

Book.java | InvalidIndexException.java | Library.java | LibraryTest.java

```java

public class Library {
    private String name;
    private Book[] books;
    private int bookCount;

    public Library(String name, int size) throws NegativeArraySizeException {
        if (size < 0)
            throw new NegativeArraySizeException("Array size is negative.");

        this.name = name;
        books = new Book[size];
        bookCount = 0;
    }

    public boolean addBook(Book b) {
        if (bookCount == books.length)
            return false;

        books[bookCount++] = new Book(b);
        return true;
    }

```

```
23
24      public Book getBookAt(int i) throws InvalidIndexException {
25          if (i < 0 || i >= bookCount)
26              throw new InvalidIndexException(i + " is out of range.");
27
28          return books[i];
29      }
30
31      public String toString() {
32          String s = "Library " + name + " (" + bookCount + "):";
33
34          for (int i = 0; i < bookCount; i++)
35              s += "\n" + books[i];
36
37          return s;
38      }
39  }
40
```

Book.java | InvalidIndexException.java | Library.java | LibraryTest.java

```java
import java.util.Scanner;

public class LibraryTest {

    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        Library l;

        System.out.println("Enter the name of the library: ");
        String name = input.nextLine();

        while (true) {
            System.out.println("Enter the size of the library: ");
            int size = input.nextInt();

            try {
                l = new Library(name, size);

                break;
            } catch (NegativeArraySizeException e) {
                System.err.println("Caught NegativeArraySizeException: " + e.getMessage());
                input.nextLine();
            }
        }
```

```
25          }
26
27          l.addBook(new Book("The Clouds", "Aristophanes", 194));
28          l.addBook(new Book("The Republic", "Plato", 416));
29          l.addBook(new Book("The Categories", "Aristotle", 48));
30
31          System.out.println(l);
32
33          while (true) {
34              System.out.println("Enter index: ");
35              int i = input.nextInt();
36
37              try {
38                  System.out.println(l.getBookAt(i));
39
40                  break;
41              } catch (InvalidIndexException e) {
42                  System.err.println("Caught InvalidIndexException: " + e.getMessage());
43              }
44          }
45      }
46  }
47
```

Problems Javadoc Declaration Console

<terminated> LibraryTest [Java Application] C:\Users\Mahmoud\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.8.v20230831-1047\jre\bin\javaw.exe (19 Mar 2024, 13:33:26 – 13:34:05) [pid: 42292]

```
Enter the name of the library:
KSU
Enter the size of the library:
-1
Caught NegativeArraySizeException: Array size is negative.
Enter the size of the library:
3
Library KSU (3):
Book title: The Clouds, author: Aristophanes, pages: 194
Book title: The Republic, author: Plato, pages: 416
Book title: The Categories, author: Aristotle, pages: 48
Enter index:
-1
Caught InvalidIndexException: -1 is out of range.
Enter index:
4
Caught InvalidIndexException: 4 is out of range.
Enter index:
7
Caught InvalidIndexException: 7 is out of range.
Enter index:
1
Book title: The Republic, author: Plato, pages: 416
```