

Lab: Iterators and Comparators

This document defines the lab for "[Java OOP Advanced](#)" course @ [Software University](#). Please submit your solutions (source code) of all below described problems in [Judge](#)

1. Book

Create a class **Book** from **UML diagram** below:

Book
<ul style="list-style-type: none">- title: String- year: int- authors: List<String>
<ul style="list-style-type: none">- setTitle(String)- setYear(String)- setAuthors(String...)+ getTitle(): String+ getYear(): int+ getAuthors(): List<String>

You can use only **one constructor**. There **can be no authors, one author or many authors**.

Examples

Main.java

```
public static void main(String[] args) {  
    Book bookOne = new Book("Animal Farm", 2003, "George Orwell");  
    Book bookThree = new Book("The Documents in the Case", 2002);  
    Book bookTwo = new Book("The Documents in the Case", 1930, "Dorothy Sayers", "Robert Eustace");  
  
    List<Book> books = new ArrayList<>();  
    books.add(bookOne);  
    books.add(bookTwo);  
    books.add(bookThree);  
}
```

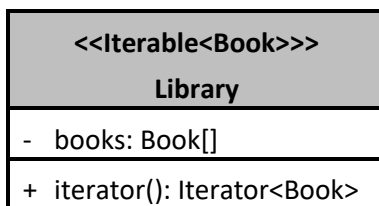
Solution

```
public Book(String title, int year, String... authors) {
    this.setTitle(title);
    this.setYear(year);
    this.setAuthors(authors);
}

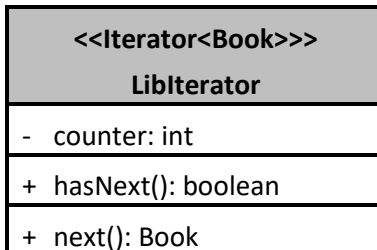
private void setAuthors(String... authors) {
    if (authors.length == 0) {
        this.authors = new ArrayList<String>();
    } else {
        this.authors = new ArrayList<>(Arrays.asList(authors));
    }
}
```

2. Library

Create a class **Library** from **UML diagram** below:



Create a **nested class LibIterator** from **UML diagram** below:



Examples

Main.java
<pre>public static void main(String[] args) { Book bookOne = new Book("Animal Farm", 2003, "George Orwell"); Book bookThree = new Book("The Documents in the Case", 2002); Book bookTwo = new Book("The Documents in the Case", 1930, "Dorothy Sayers", "Robert Eustace"); Library library = new Library<>(bookOne, bookTwo, bookThree); for (Book book: library) { System.out.println(book.getTitle()); } }</pre>

Solution

```
public class Library<Book> implements Iterable<Book> {
    private Book[] books;

    public Library(Book... books) { this.books = books; }

    @Override
    public Iterator<Book> iterator() { return new LibraryIterator(); }

    private final class LibraryIterator implements Iterator<Book> {
        private int counter = 0;

        @Override
        public boolean hasNext() {...}

        @Override
        public Book next() {...}
    }
}
```

3. Comparable Book

Expand Book by implementing **Comparable<Book>**

Book have to be **compared by title**. When title is equal, **compare** them by **year**.

Expand **Book** from **UML diagram** below:

<<Comparable<Book>>>	
Book	
- title: String	
- year: int	
- authors: List<String>	
- setTitle(String)	
- setYear(String)	
- setAuthors(String...)	
+ getTitle(): String	
+ getYear(): int	
+ getAuthors(): List<String>	
+ compareTo(Book): int	

You can use only **one constructor**. There can be **no authors**, **one author** or **many authors**.

Examples

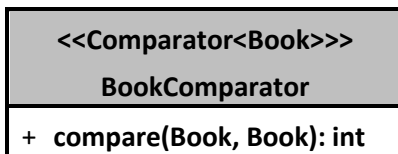
Main.java

```
public static void main(String[] args) {
    Book bookOne = new Book("Animal Farm", 2003, "George Orwell");
    Book bookThree = new Book("The Documents in the Case", 2002);
    Book bookTwo = new Book("The Documents in the Case", 1930, "Dorothy Sayers", "Robert Eustace");

    if (bookOne.compareTo(bookTwo) > 0) {
        System.out.println(String.format("%s is before %s", bookOne, bookTwo));
    } else if (bookOne.compareTo(bookTwo) < 0) {
        System.out.println(String.format("%s is before %s", bookTwo, bookOne));
    } else {
        System.out.println("Book are equal");
    }
}
```

4. Book Comparator

Create a class **BookComparator** from **UML diagram** below:



BookComparator have to **compare** two books by:

1. Book title
2. Year of publishing a book

Examples

Main.java

```
public static void main(String[] args) {
    Book bookOne = new Book("Animal Farm", 2003, "George Orwell");
    Book bookThree = new Book("The Documents in the Case", 2002);
    Book bookTwo = new Book("The Documents in the Case", 1930, "Dorothy Sayers", "Robert Eustace");

    List<Book> books = new ArrayList<>();
    books.add(bookOne);
    books.add(bookTwo);
    books.add(bookThree);

    books.sort(new BookComparator());

    for (Book : books) {
        System.out.println(book.getTitle() + book.getYear());
    }
}
```