Lab: Iterators and Comparators

Problems for exercises and homework for the "Java OOP Advanced" course @ SoftUni.

You can check your solutions here: https://judge.softuni.bg/Contests/523/Iterators-and-Comparators-Lab

1. Book

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

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

You can use only **one constructor**. Authors can be **anonymous, one or many**.

Examples

Main.java

```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

```java
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:

<<Iterable<Book>>>
Library
- books: Book[]
+ iterator(): Iterator<Book>

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

<<Iterator<Book>>>
LibIterator
- counter: int
+ hasNext(): boolean
+ next(): Book

Examples

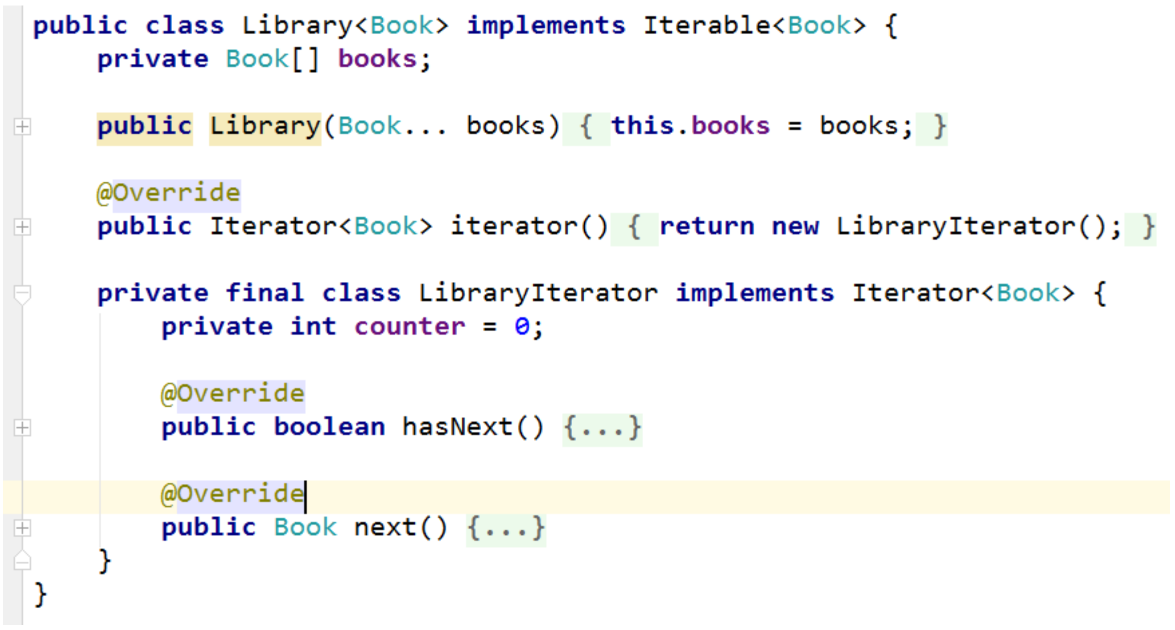
Main.java

```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");

    Library library = new Library<>(bookOne, bookTwo, bookThree);

    for (Book book : library) {
        System.out.println(book.getTitle());
    }
}
```

Solution



```java
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 name**. When name 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**. Authors can be **anonymous, one or many**.

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:

<<Comparator<Book>>> BookComparator
+ **compare(Book, Book): int**

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