# (Optional) Coding Challenge: Working with Collections in Java

**Estimated time needed:** 20 minutes

In this self-guided lab, you can complete exercises that align with what you learned in this module. Follow the instructions to write code using your knowledge to create the described apps. After you complete the lab exercises, you can validate that your code is correct by viewing the solutions provided.

## Prerequisites (optional)

You must have completed all labs in Modules 1, 2 and 3.

## Clone the challenges repo

1. Run the following command to clone the repository with the challenges and solution.

   ```
   git clone https://github.com/ibm-developer-skills-network/flgsb-oop-additional-practice.git
   ```

2. Change to `OOPs/Module 3` directory.

   ```
   cd flgsb-oop-additional-practice/OOPs/Module\ 3
   ```

3. View the directories by running the `ls` command. Each directory has one challenge in it.

   ```
   ls
   ```

# Create a simple Library Management System using ArrayLists

In this challenge, you'll create a Library Management System using Java ArrayLists. This project will help you practice essential ArrayList operations while building a practical application.

**You'll develop a system that allows users to:**

- Add books to a library collection
- View all books in the collection
- Search for books by title or author
- Check out and return books
- Sort books by different criteria
- Filter books based on availability

**This challenge reinforces the key concepts covered in the lab about ArrayLists:**

- Creating and working with ArrayLists
- Adding and removing elements
- Manipulating objects in ArrayLists
- Sorting ArrayList elements
- Filtering ArrayList data

# Solve the challenge

1. In the terminal, change to `Designing interfaces and abstract classes`.

   ```
   cd Create\ a\ simple\ Library\ Management\ using\ ArrayLists
   ```

2. Select the following button to open the Java coding challenge.

Open **Book.java** in IDE

3. Make changes in the file as per the specification.

4. Compile the Java file.

5. Set the CLASSPATH.

6. Select the button below to open the Java coding challenge.

Open **LibraryManagement.java** in IDE

7. Make changes in the file as per the specification.

8. Compile the Java file.

9. Run the class `LibraryManagement` to ensure the class is created as per instructions.

Click here for the solution

# Library Management System with HashMap

In this challenge, you'll apply your knowledge of HashMaps to create a simple Library Management System. This project will reinforce your understanding of key Java collection concepts while building a practical application.

**By completing this challenge, you'll practice:**

- Using HashMap as a collection to store book information
- Adding new books to your library collection
- Searching for books by various attributes
- Removing books from the collection
- Viewing your library catalog in sorted order

This exercise builds on the concepts from the Phonebook lab but with a different real-world application to strengthen your skills.

Your task is to build a system that manages a library's book collection. Each book will have attributes such as:

- title
- author
- genre
- publication year

Users should be able to add books, search by title or author, check out books (removing them from the collection), and view the entire catalog sorted by title or author.

# Solve the challenge

1. In the terminal, change to `Create your own class`.

```
cd Implement\ a\ Library\ Management\ Using\ a\ HashMap
```

2. Select the following button to open `LibraryManagementSystem.java`

Open **LibraryManagementSystem.java** in IDE

3. Make changes in the file based on the specifications.
4. Compile the Java file.
5. Set the CLASSPATH.
6. Run the class `LibraryManagementSystem.java` to verify that you created the class based on the specifications.

Click here for the solution

### Conclusion

Once you complete the labs, you should be comfortable with using ArrayLists and HashMaps.

## Author(s)

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