Lab 07 – Reinforcement

Task 01:

Create a Java program that manages information for multiple students.

Requirements:

Create a `Student` class with attributes:

`name` (String)
`rollNo` (int)
`marks` (array of 3 subjects)

Include:

A **constructor** to initialize data.

A **method** `calculateAverage()` to compute average marks.

A **method** `displayInfo()` to print student details and grade based on average:

Average ≥ 80 → Grade A
Average ≥ 60 → Grade B
Average ≥ 40 → Grade C
Else → Fail

In the `main()` method:

Use a **Scanner** to input data for 3 students.

Store them in an **array** of objects.

Display each student's info and grade.

Code:

```
package Task01;

public class Student {
    private String name;
    private int rollNo;
    private float[] marks = new float[3];

    // constructor
    public Student(String name, int rollNo, float[] marks){
        this.name = name;
        this.rollNo = rollNo;
        this.marks = marks;
```

```
    }

    // method to calculate average
    public float calAverage(){
        return ((marks[0] + marks[1] + marks[2])/3.0F);
    }

    // method to display info
    public void displayInfo(){
        System.out.print("Student name: " + name + " | Roll no. " + rollNo +
" | Average: " + calAverage() + " | ");
        if(calAverage() >= 80.0){
            System.out.println("Grade A");
        }
        else if(calAverage() >= 60){
            System.out.println("Grade B");
        }
        else if(calAverage() >= 40){
            System.out.println("Grade C");
        }
        else{
            System.out.println("Fail");
        }
    }

}
```

```
package Task01;
import java.util.Scanner;

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

        // array of three students
        Student[] stu = new Student[3];

        // getting input
        for(int i = 0; i < 3; i++){
            System.out.print("Enter student name: ");
            String name = sc.nextLine();
            System.out.print("Enter roll no: ");
            int rollNo = sc.nextInt();

            float[] marks = new float[3];

            for(int j = 0; j < 3; j++){
                System.out.print("Enter marks in course no. " + (j+1) + ":
");
                marks[j] = sc.nextFloat();
            }
            sc.nextLine();
            System.out.println();
```

```
            // making object
            stu[i] = new Student(name, rollNo, marks);

        }

        // displaying info
        System.out.println();
        for(int i = 0; i < 3; i++){
            stu[i].displayInfo();
        }

        sc.close();
    }
}
```

Output:

```
"C:\Program Files\Java\jdk-24\bin\java.exe" "-javaagent:C:\Program Files\Jet
Enter student name: Muhammad Hasan
Enter roll no: 101
Enter marks in course no. 1: 90
Enter marks in course no. 2: 65
Enter marks in course no. 3: 68

Enter student name: Ghafoor
Enter roll no: 404
Enter marks in course no. 1: 87
Enter marks in course no. 2: 69
Enter marks in course no. 3: 78

Enter student name: Ishtiaq
Enter roll no: 606
Enter marks in course no. 1: 34
Enter marks in course no. 2: 64
Enter marks in course no. 3: 45



Student name: Muhammad Hasan | Roll no. 101 | Average: 74.333336 | Grade B
Student name: Ghafoor | Roll no. 404 | Average: 78.0 | Grade B
Student name: Ishtiaq | Roll no. 606 | Average: 47.666668 | Grade C

Process finished with exit code 0
```

Task 02:

Write a program that models a library system showing **Aggregation** and **Association** relationships.

Requirements:

Create a `Book` class with:

`title` (String)
`author` (String)
`bookID` (int)

Create a `Library` class that **aggregates** multiple `Book` objects using an `ArrayList`.

Create a `Librarian` class that is **associated** with the `Library`.

The librarian can display all available books.

In `main()`:

Create 4 books.
Add them to the library.
Create a librarian who manages that library.
Display all books through the librarian.

Code:

```
package Task02;

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

    // constructor
    public Book(int bookId, String title, String author){
        this.bookId = bookId;
        this.title = title;
        this.author = author;
    }

    // method to display info
    public void displayInfo(){
        System.out.println("Id: " + bookId + " | Title: " + title + " |
Author: " + author);
    }


}
```

```java
package Task02;
import java.util.ArrayList;
import java.util.List;

public class Library {
    private int libNo;
    private String libName;
    private List<Book> books;

    // constructor
    public Library(int libNo, String libName){
        this.libNo = libNo;
        this.libName = libName;
        this.books = new ArrayList<>();
    }

    // method to add new books
    public void addBook(Book b){
        books.add(b);
    }

    // to display books
    public void displayInfo(){
        for(int i = 0; i < books.size(); i++){
            books.get(i).displayInfo();
        }
    }

}
```

```java
package Task02;

public class Librarian {
    private int id;
    private String name;
    private Library lib;

    // constructor
    public Librarian(int id, String name, Library lib){
        this.id = id;
        this.name = name;
        this.lib = lib;
    }

    // method to display info
    public void displayInfo(){
        lib.displayInfo();

    }

}
```

```java
package Task02;

public class Main {
    public static void main(String[] args) {
        Book b1 = new Book(101, "Good Book", "Muhammad Hasan");
        Book b2 = new Book(102, "Bad Book", "Ghafoor");
        Book b3 = new Book(103, "Excellent Book", "Osama bin Ladin");

        Library l1 = new Library(1, "First Library");
        l1.addBook(b1);
        l1.addBook(b2);
        l1.addBook(b3);

        Librarian librarian1 = new Librarian(202, "Ishtiaq", l1);

        librarian1.displayInfo();

    }
}
```

Output:

```
"C:\Program Files\Java\jdk-24\bin\java.exe" "-javaagent:C:\Program Files\Jet
Id: 101 | Title: Good Book | Author: Muhammad Hasan
Id: 102 | Title: Bad Book | Author: Ghafoor
Id: 103 | Title: Excellent Book | Author: Osama bin Ladin

Process finished with exit code 0
```