

Lab 12

Question 1

Create a class Box with attributes length, width, and height. Overload < and > to compare volumes of two boxes. Following is the main function

```
int main() {
    Box box1(4, 5, 6);
    Box box2(3, 6, 7);

    cout << "Comparing boxes:" << endl;
    box1.display();
    box2.display();

    if (box1 < box2)
        cout << "Box 1 is smaller than Box 2" << endl;
    else if (box1 > box2)
        cout << "Box 1 is larger than Box 2" << endl;
    else
        cout << "Box 1 and Box 2 have equal volume" << endl;

    return 0;
}
```

Sample Output

```
Comparing boxes:
Box(4, 5, 6) Volume: 120
Box(3, 6, 7) Volume: 126
Box 1 is smaller than Box 2
```

Question 2

Implement subscript operator overloading in a Box class to allow array-like access to the dimensions (length, width, height) of the box.

Overload the subscript operator [] for the Box class to allow access to the dimensions of the box by index:

- `box[0]` should return the length of the box.
- `box[1]` should return the width of the box.
- `box[2]` should return the height of the box.

Ensure that the subscript operator can be used both for **reading** and **modifying** the dimensions of the box.

```
int main() {
    Box box(10, 20, 30);

    cout << "Original dimensions:" << endl;
    box.display();

    cout << "\nAccessing via subscript operator:" << endl;
    cout << "Length: " << box[0] << endl;
    cout << "Width: " << box[1] << endl;
    cout << "Height: " << box[2] << endl;

    box[0] = 15;
    box[1] = 25;

    cout << "\nAfter modification:" << endl;
    box.display();

    return 0;
}
```

Complete the following class

```
class Box {
private:
    double dimensions[3]; // 0: length, 1: width, 2: height

public:

    Box(double l = 0, double w = 0, double h = 0) {
        dimensions[0] = l;
        dimensions[1] = w;
        dimensions[2] = h;
    }
}
```

Original dimensions:

Length: 10, Width: 20, Height: 30

Accessing via subscript operator:

Length: 10

Width: 20

Height: 30

After modification:

Length: 15, Width: 25, Height: 30

Question 3

Create a Book class with attributes title, author, publisher, and yearOfPublication. Implement a Library class that contains an array of Book objects, and provide functions to display all books, search a book by title, remove a book by title (Bonus), and display books published after a certain year (Bonus). Ensure that the Library class properly manages the book objects. Implement a destructor for proper cleanup if using dynamic memory allocation.

Book

```
string title;  
string author;  
string publisher;  
int yearOfPublication;
```

Library

```
Book books[5]; // Array of Book objects  
  
int currentSize;
```

Following is the main function

```
int main() {  
    // Create a library  
    Library library;
```

```

    // Adding books to the library using 4 arguments (no need to create Book objects
    separately)

    library.addBook("The Great Gatsby", "F. Scott Fitzgerald", "Scribner", 1925);

    library.addBook("1984", "George Orwell", "Secker & Warburg", 1949);

    library.addBook("To Kill a Mockingbird", "Harper Lee", "J.B. Lippincott & Co.",
    1960);

    // Display all books in the library

    library.displayAllBooks();

    // Search for a book by title

    cout << "\nSearching for '1984':\n";

    library.searchByTitle("1984");

    // Remove a book by title (Bonus)

    cout << "\nRemoving '1984' from the library:\n";

    library.removeBookByTitle("1984");

    // Display all books after removal

    cout << "\nUpdated Library:\n";

    library.displayAllBooks();

    // Display books published after a certain year (Bonus)

    cout << "\nDisplaying books published after 1950:\n";

    library.displayBooksAfterYear(1950);

    return 0;
}

```

Following is the sample output

Library Books:

Title: The Great Gatsby
Author: F. Scott Fitzgerald
Publisher: Scribner
Year of Publication: 1925

Title: 1984
Author: George Orwell
Publisher: Secker & Warburg
Year of Publication: 1949

Title: To Kill a Mockingbird
Author: Harper Lee
Publisher: J.B. Lippincott & Co.
Year of Publication: 1960

Searching for '1984':

Title: 1984
Author: George Orwell
Publisher: Secker & Warburg
Year of Publication: 1949

Removing '1984' from the library:
Book '1984' removed from the library.

Updated Library:

Library Books:

Title: The Great Gatsby
Author: F. Scott Fitzgerald
Publisher: Scribner
Year of Publication: 1925

Title: To Kill a Mockingbird
Author: Harper Lee
Publisher: J.B. Lippincott & Co.
Year of Publication: 1960

Displaying books published after 1950:

Title: To Kill a Mockingbird
Author: Harper Lee
Publisher: J.B. Lippincott & Co.
Year of Publication: 1960

Question 4

Create a class Author with the following attributes: name, birthYear, and nationality. Then create a class Book which contains the title, publicationYear, and a reference to an Author object. This represents an aggregation relationship where each book has an author, but the Author object can exist independently of the Book.

You are required to:

1. Create a method in the Book class to display the book's details along with the author's details.
2. Create a method to add a new book with the author's details.
3. Create a method in the Book class to search for a book by title and display both book and author details.
4. Implement a method to search for books published by a specific author and display their details.

```
int main() {  
  
    // Creating authors  
  
    Author* author1 = new Author("George Orwell", 1903, "British");  
  
    Author* author2 = new Author("Harper Lee", 1926, "American");  
  
  
    // Creating library  
  
    Library library;  
  
  
    // Adding books to the library  
  
    library.addBook("1984", 1949, author1);  
  
    library.addBook("Animal Farm", 1945, author1);  
  
    library.addBook("To Kill a Mockingbird", 1960, author2);  
  
  
    // Display all books
```

```
cout << "\nLibrary Books:\n";

library.displayAllBooks();


// Search for a book by title

cout << "\nSearching for '1984':\n";

library.searchByTitle("1984");


// Search for books by author

cout << "\nSearching for books by 'George Orwell':\n";

library.searchByAuthor("George Orwell");


return 0;

}
```