OBJECT-ORIENTED PROGRAMMING WITH LAMBDA AND ANONYMOUS FUNCTIONS

Objective

The objective of this practical task is to create an object-oriented program in C# that utilizes Lambda expressions and anonymous functions to perform various operations on a collection of objects. You will work with a simple collection of data and demonstrate how Lambda expressions and anonymous functions can enhance the flexibility and readability of your code.

Task Description

Imagine you are building a simple library catalogue application where you need to manage a collection of books. Each book has properties like Title, Author, Genre, and Year of Publication.

Step 1: Create a Book Class

Create a C# class named `Book` with the following properties:

- Title (string)
- Author (string)
- Genre (string)
- YearOfPublication (int)

Step 2: Create a Collection of Books

In your program's entry point (e.g., the `Main` method), create a collection (e.g., a List) of `Book` objects. Initialize the collection with a few sample books.

Step 3: Implement Lambda Expressions

1. Use Lambda expressions to perform the following tasks on your collection:

- Filter the books to find all books published after 2000.
- Find the book with the longest title.
- Find all books in a specific genre (e.g., "Mystery").
- Calculate the average publication year of all books.

Step 4: Implement Anonymous Functions

2. Implement anonymous functions to perform the following tasks on your collection:

- Sort the books by title in ascending order.
- Count the number of books written by a specific author (e.g., "J.K. Rowling").
- Find the book with the shortest title.

Step 5: Display Results

3. Write code to display the results of each operation on the console, making sure to provide clear and informative output.

Step 6: Testing and Validation

4. Test your program with different scenarios and collections of books. Ensure that the Lambda expressions and anonymous functions correctly execute the tasks and return the expected results.

Step 7: Documentation

5. Document your code by adding comments that explain the purpose of each Lambda expression and anonymous function, as well as the results they produce.

Step 8: Submission

6. Package your C# project and submit it as per the submission guidelines provided by your course instructor or organization.

Sample Code (Partial Implementation)

```
using System;
using System.Collections.Generic;
using System.Linq;

class Book
{
    public string Title { get; set; }
    public string Author { get; set; }
    public string Genre { get; set; }
    public int YearOfPublication { get; set; }
}

class Program
```

```
{
    static void Main()
    {
        // Step 2: Create a collection of books (sample data)
        List<Book> library = new List<Book>
        {
            new Book { Title = "Book A", Author = "Author X", Genre
= "Mystery", YearOfPublication = 1998 },
            new Book { Title = "Book B", Author = "Author Y", Genre
= "Fantasy", YearOfPublication = 2005 },
            new Book { Title = "Book C", Author = "Author Z", Genre
= "Mystery", YearOfPublication = 2010 },
            // Add more books here
        };

        // Step 3: Lambda expressions
        // Example 1: Find books published after 2000
        var recentBooks = library.Where(book =>
book.YearOfPublication > 2000);

        // Add more Lambda expressions here

        // Step 4: Anonymous functions
        // Example 2: Sort books by title in ascending order
        library.Sort((book1, book2) =>
book1.Title.CompareTo(book2.Title));

        // Add more anonymous functions here

        // Step 5: Display results
        // Example 1: Display recent books
        Console.WriteLine("Books published after 2000:");
        foreach (var book in recentBooks)
        {
            Console.WriteLine($"- {book.Title}
({book.YearOfPublication})");
        }

        // Add code to display results for other operations

        // Step 6: Testing and Validation
        // Test different scenarios with your collection of books

        // Step 7: Documentation
        // Add comments to explain Lambda expressions and anonymous
functions

        // Step 8: Submission
        // Package and submit your project as instructed.
    }
}
```