BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

CS F213 – Object Oriented Programming

Lab 1: Introduction to Eclipse IDE

Time:	2 hours
Objective:	Introduce students to Eclipse IDE workflow and Java programming fundamentals through hands-on practice with project setup, command-line execution, and basic programming exercises.
Concepts Covered:	Eclipse IDE basics (workspace, perspectives, project management) and Java fundamentals (classes, command-line args, loops, I/O) with practical implementation through both IDE and command prompt.
Prerequisites:	Working knowledge of Java syntax, basic programming concepts, and familiarity with command-line operations, plus installed Eclipse IDE and JDK.

Welcome to the Object-Oriented Programming laboratory! Throughout this semester, we'll journey through the fundamental concepts of OOP that form the backbone of modern software development. These labs have been carefully designed to transform you from procedural programmers into object-oriented thinkers.

Starting with basic IDE setup and progressing to advanced OOP concepts, each lab builds upon the previous ones to create a comprehensive understanding of object-oriented programming. The concepts you'll learn here – encapsulation, inheritance, polymorphism, and beyond – are not just theoretical constructs; they are essential tools used daily in professional software development.

The lab sheets are structured to serve as both practical guides and reference materials. They contain detailed explanations, examples, and exercises that you can revisit throughout your programming journey. Don't feel pressured to rush through the material; take your time to understand and experiment with the concepts. These fundamentals will be crucial not just for your lab tests, but for your entire programming career.

Let's begin our journey into the world of Object-Oriented Programming!

---

1. Eclipse Overview

Eclipse is an open-source community that builds tools and frameworks for creating general purpose application. The most popular usage of Eclipse is as a Java development environment which will be described in this article.

1.1. Why Eclipse?

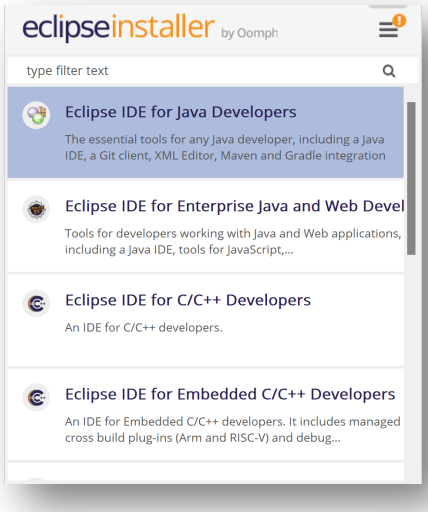
While modern IDEs like IntelliJ IDEA offer more advanced features and better user experiences, Eclipse remains a common choice in educational settings primarily due to its zero-cost availability, lower system requirements, and extensive history in academic curricula. Its relatively simpler interface can be less overwhelming for beginners focusing on Java fundamentals, and many institutions have years of teaching materials built around Eclipse. However, students are encouraged to explore other IDEs as they progress,

since familiarity with tools like IntelliJ and VS Code will be valuable in their professional careers where these IDEs are increasingly prevalent.

2. Getting Started

2.1. Installation

Download "Eclipse IDE for Java Developers" from its website and unpack it to a directory. This is sufficient for Eclipse to be used; no additional installation procedure is required. Select "Eclipse IDE for Java Developers" from the installation wizard and continue for a standard installation.



2.2. Start Eclipse

To start Eclipse, double-click on the file eclipse.exe in your installation directory. The system will prompt you for a workspace. The workspace is the place where you store your Java projects. Select a suitable (empty) directory and press Launch [See Figure-1 given below]. Don't click and check the checkbox that says, "Use this as default and do not ask again".

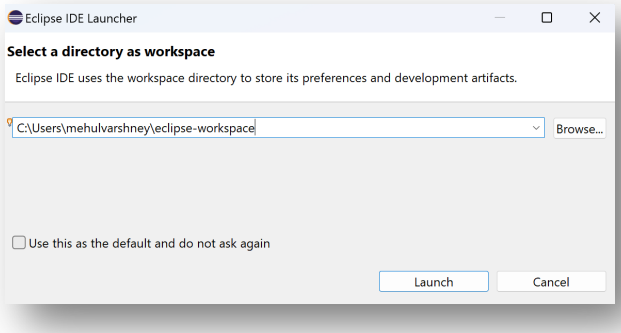


Figure-1: Workspace Launcher

Eclipse will start and show the Welcome screen [see Figure-2 given below].

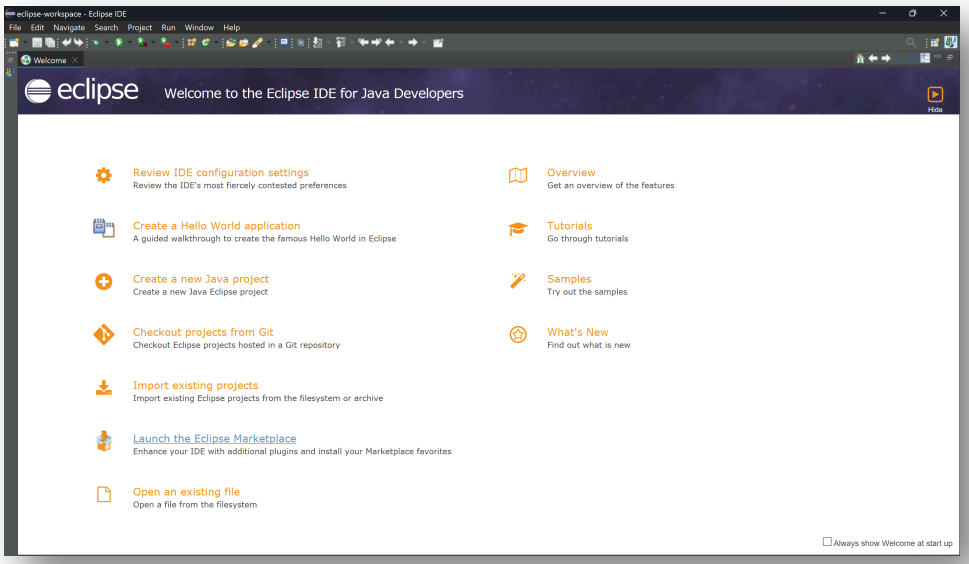


Figure-2: Eclipse Welcome Screen

Close the welcome page by pressing little (x) besides the Welcome screen.

3. Eclipse UI Overview

Eclipse provides perspectives, views and editors. Views and editors are grouped into perspectives. All projects are in a workspace.

3.1. Workspace

The workspace is the physical location (file path) you are working in. You can choose the workspace during start-up of eclipse or via the menu(File → Switch Workspace → Others).All your projects, sources files, images and other artefacts will be stored and saved in your workspace.

3.2. Perspective

A perspective is a visual container for a set of views and editors. You can change the layout within a perspective (close/open views, editors, change the size, change the position, etc.)

For Java development you usually use the "Java Perspective". You can change the layout within a perspective (close/open views, editors, change the size, change the position, etc.). Eclipse allows you to switch to another perspective via the menu (Window → Open Perspective → Other).

A common problem is that you closed a view and don't know how to re-open this view. You can reset a perspective to its original state via the menu (Window → Reset Perspective).

3.3. Views and Editors

A view is typically used to navigate a hierarchy of information or to open an editor. Changes in a view are directly applied. Editors are used to modify elements. Editors can have code completion, undo/redo, etc. To apply the changes in an editor to the underlying resources, e.g. Java source file, you usually must save.

---

4. Create your first Java program

The following will describe how to create a minimal Java program using Eclipse. It will be the classical "Hello World" program. Our program will write "Hello Eclipse!" to the console.

4.1. Create project

Select from the menu File → New → Java project. Maintain **`"oop.eclipse.ide.first"`** as the project name and press the next button [See Figure-3 below].

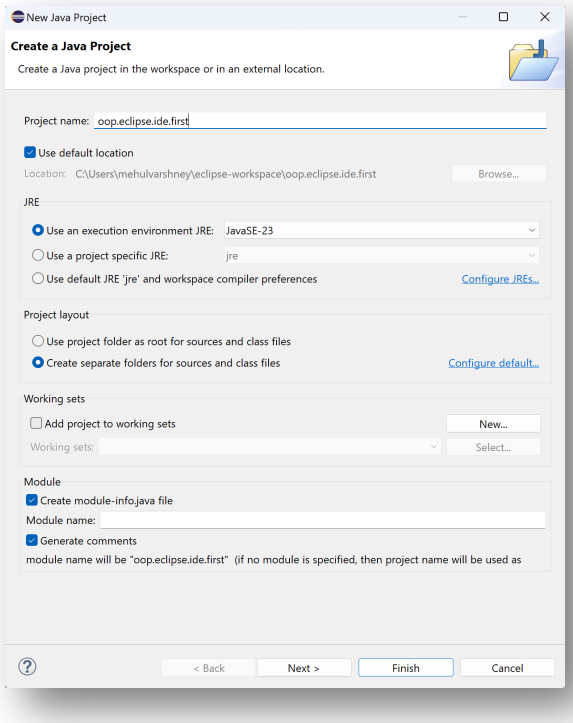


Figure-3: Create New Java Project

Click on the checkbox that says, "Create separate source and output folders". This generates all your .class files corresponding to the .java files in your workspace into a separate output folder.

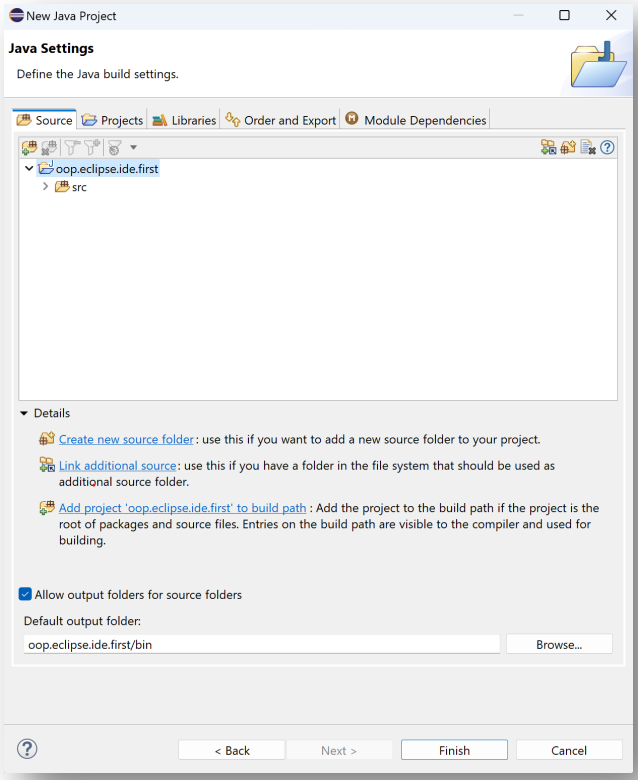


Figure-4: Allow output folders for source folders

Press finish to create the project. A new project is created and displayed as a folder. Open the folder `"oop.eclipse.ide.first"`.

4.2. Create Java class

Right click on **`src`** and select New → Class [See Figure-5 below]

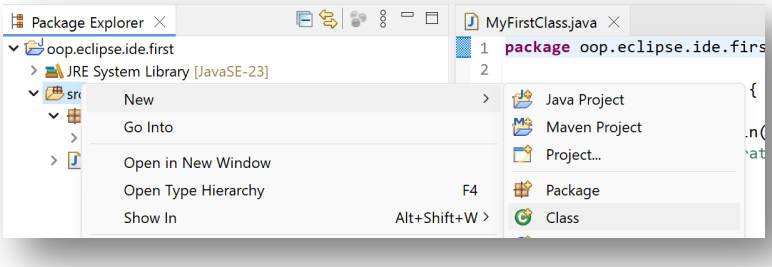


Figure-5: Create a Java class

Create **`MyFirstClass`**, select the flag **`"public static void main (String[] args)"`** [See Figure-6 below].

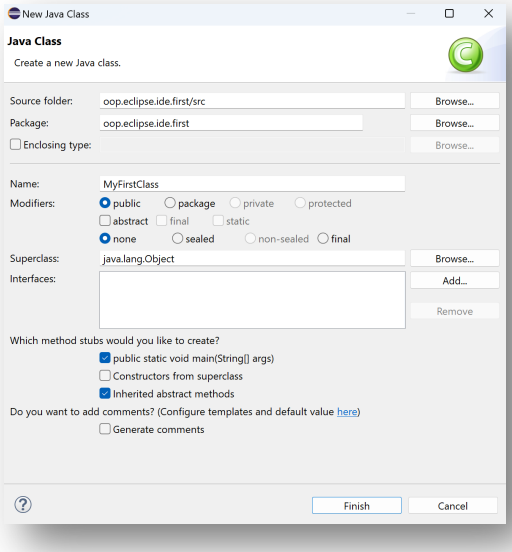


Figure-6: Specify Class Name

Maintain the following code.

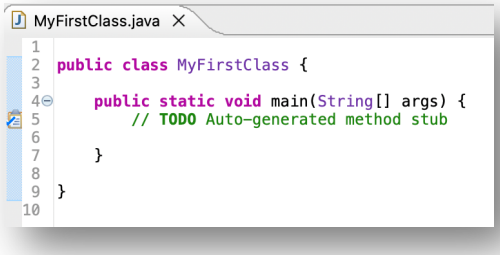


Figure-7: Your first java program

Include the following statement in the "main" method.

```
System.out.println("Hello Eclipse");
```

4.3. Run your project in Eclipse

Now run your code. Right click on your Java class and select Run-as → Java application [See Figure-8 below]. You can alternatively use the short-cut Alt+Shift+X, J. (Press key combination first, then Press J). A pop-up may open for Save and Launch, check the box next to "Always save resources before launching" and Press OK.

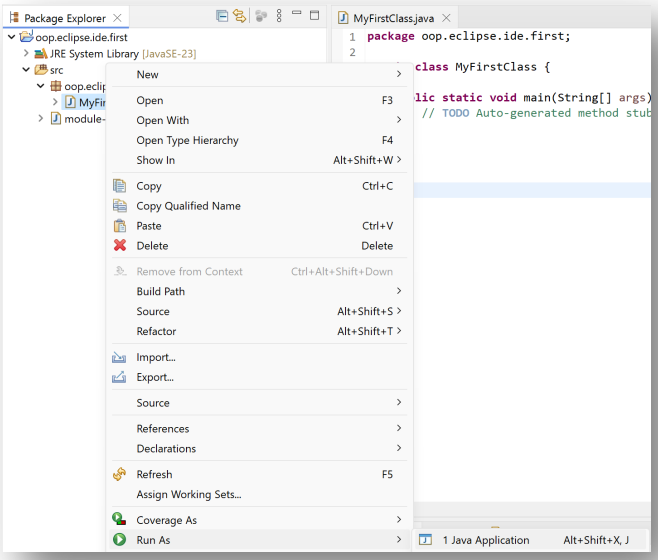


Figure-8: Run your java program

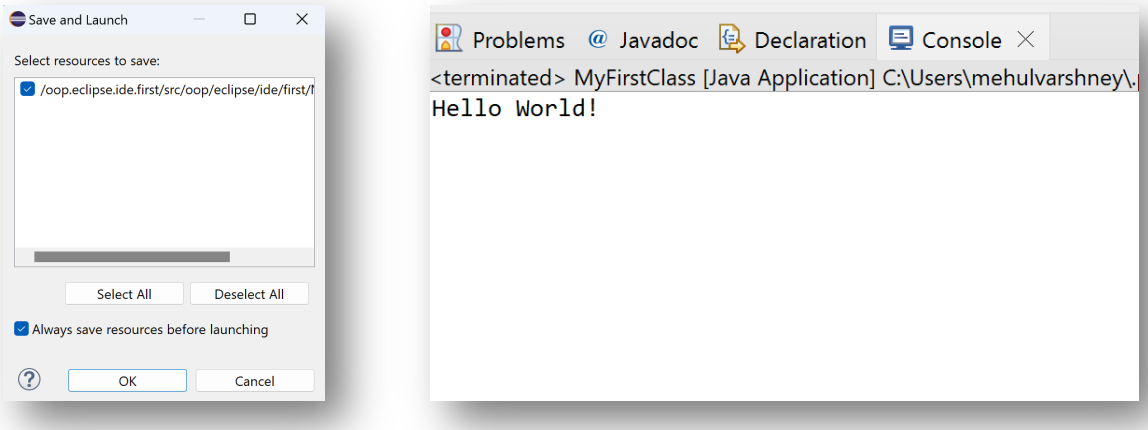


Figure-9: Finished! You should see the output in the console

5. Java Examples

Example 1(a): Compilation and Execution of Java code from command prompt.

We know that each object in java is described in terms of its states and behaviors. Also, we know that an object is an instance of a class, whereas a class is a blueprint. In this example we are going to represent a real-world Bicycle in Java code. We will create a class Bicycle which has three states, **`speed`**, **`numberOfGears`**, and **`cadence`** and it has methods to print the values of instance fields of Bicycle object.

1. Go to D Drive, create a new Text Document and name it **`Bicycle.java`**

2. Type the following code in this file and save the file:

```
/* Bicycle class */
class Bicycle {

	int speed = 100;
	int noOfGears = 5;
	int cadence = 40;

	public void printState() {
		System.out.println("Bicycle [cadence=" + cadence + ", noOfGears=" + noOfGears +
", speed=" + speed + "]");
	}

	public static void main(String[] args) {

		/* create instance of Bicycle class */
		Bicycle b1 = new Bicycle();

		/* Invoke method object b1 of type Bicycle */
		b1.printState();

	}
}
```

3. Click on Start button, search for Command Prompt and then hit the enter key.

4. Type D: on command prompt

5. Execute the following command

`D:\> javac Bicycle.java` [This command compiles the java code]

6. Execute the following command

`D:\> java Bicycle` [This command executes your java code]

Example 1(b): Compilation and Execution of Java code with Eclipse IDE

1. Create the Bicycle.java class in Eclipse IDE [follow the same guidelines that are used to create **`MyFirstClass.java`** above]. Type the same java code for Bicycle class that is described in Example 1(a).
2. Run your program in Eclipse and see the output in console window.

Example 2: Command Line Arguments (From command prompt) –

1. Go to D Drive, create a new Text Document and name it **`CommandLineArg1.java`**

2. Type the following code in this file and save the file:

```java
/* This program expects some string as command line arguments , then it simply outputs the
command line arguments to the console*/

class CommandLineArg1 {
	public static void main(String[] args) {
		for (int i = 0; i < args.length; i++) {
			System.out.println("args[" + i + "] =" + args[i]);
		}
	}
}
```

3. Execute the following command

`D:\> javac CommandLineArg1.java` [This command compiles the java code]

4. Execute the following command

`D:\> java CommandLineArg1 My First Command Line Program in Java`

This command executes your java program, the whole string "My First Command Line Program in Java", goes as command line arguments to your java program.

Example 3: Write one more program [as given below], compile and execute it from command prompt.

```java
/* This program takes 10 integer arguments as an input from command line, parse the command
line arguments to integers, finds the sum of these 10 numbers and print the sum */

class CommandLineArg2 {
	public static void main(String[] args) {
		int sum = 0;
		for (int i = 0; i < args.length; i++) {
			sum += Integer.parseInt(args[i]);
		}
		System.out.println("Sum = " + sum);
	}
}
```

Compile and execute this program as shown below:

```
D:\> javac CommandLineArg2.java

D:\> java CommandLineArg2 1 2 3 4 5 6 7 8 9 10
```

Example 4: Command Line Arguments from Eclipse IDE–

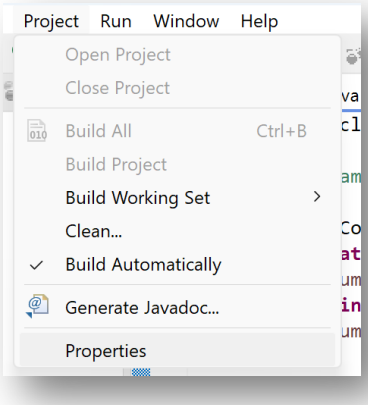
1. Create a java class file named **`CommandLineArguments`** in your workspace [Code given below].

```java
/* This program takes 10 integer arguments as an input from command line, parse the command
line arguments to integers, finds the sum of these 10 numbers and print the sum */
```

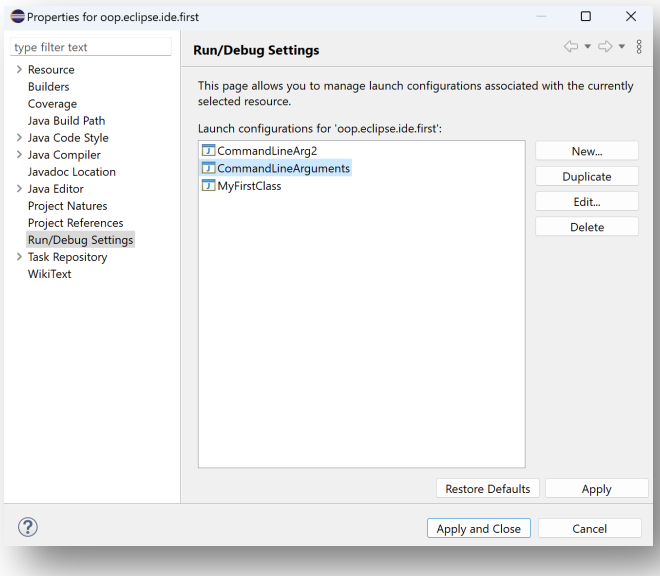
```java
public class CommandLineArguments {
	public static void main(String[] args) {
		int sum = 0;
		for (int i = 0; i < args.length; i++) {
			sum += Integer.parseInt(args[i]);
		}
		System.out.println("Sum = " + sum);
	}
}
```

2. We can give command line arguments to our program in eclipse. For passing command line arguments to your program go to (Project → Properties → Run/Debug settings) and then in the launch configuration select your java file to which you want to pass command line arguments to [See Figure below].

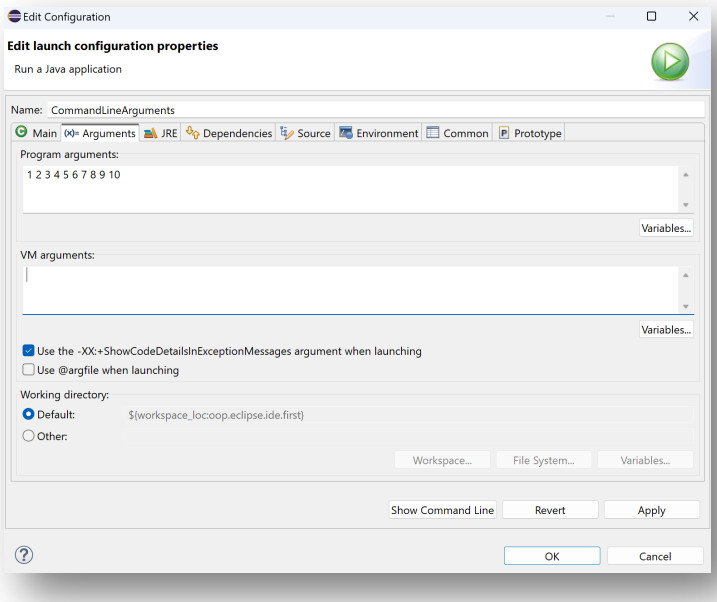
Step -1: Select Project Properties



Step - 2: In Run/Debug Settings select the file **`CommandLineArgument`** and press Edit



Step - 3: Select Arguments tab and enter 10 numbers separated by space then press OK



Run the program and watch the output in the console.

EXERCISES

1. Write a program called **`Fibonacci`** to display the first 20 Fibonacci numbers F(n), where F(n)=F(n–1)+F(n–2) and F(1)=F(2)=1. Also compute their average. [Note: the value 20 should be passed as command line arguments]

The output shall look like:

```
The first 20 Fibonacci numbers are:

1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765

The average is 885.5
```

2. Write a Java program called **`SumDigits`** to sum up the individual digits of a positive integer, given in the command line.

The output shall look like:

```
> java SumDigits 12345

The sum of digits = 1 + 2 + 3 + 4 + 5 = 15
```

3. Write a program called **HarmonicSum** to compute the sum of a harmonic series, as shown below, where n=50000. The program shall compute the sum from left-to-right as well as from the right-to-left. Obtain the difference between these two.

Hints:

```
public class HarmonicSum { // saved as "HarmonicSum.java"
      public static void main (String[] args) {
       int maxDenominator = 50000;
      double sumL2R = 0.0;    // sum from left-to-right
      double sumR2L = 0.0;    // sum from right-to-left

      // for-loop for summing from left-to-right
        for (int denominator = 1;
                  denominator <= maxDenominator;
                                        denominator++) {
                  ......
                  // Beware that int/int gives int.
      }
      // for-loop for summing from right-to-left
      ......
      // Find the difference and display
      ......
   }// end of main
}// end of HarmonicSum
```