**Exercise 1: Implementing the Singleton Pattern**

**Code:**

Logger.java

**public** **class** Logger {

**private** **static** Logger *instance*;

**private** Logger() {

System.***out***.println("Logger instance created.");

}

**public** **static** Logger getInstance() {

**if** (*instance* == **null**) {

*instance* = **new** Logger(); // create instance only once

}

**return** *instance*;

} **public** **void** log(String message) {

System.***out***.println("LOG: " + message);

}

}

Main.java

**public** **class** Main {

**public** **static** **void** main(String[] args) {

Logger logger1 = Logger.*getInstance*();

logger1.log("Application started.");

Logger logger2 = Logger.*getInstance*();

logger2.log("Still running...");

**if** (logger1 == logger2) {

System.***out***.println("Both logger instances are the same (Singleton works).");

} **else** {

System.***out***.println("Logger instances are different (Singleton failed).");

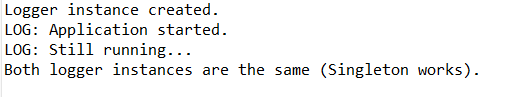
}

}

}

Run Main.java file

**Output:**



Exercise 2: Implementing the Factory Method Pattern

**Code:**

Document.java

**public** **interface** Document {

**void** open();

}

**Document Classes:**

WordDocument.java

**public** **class** WordDocument **implements** Document {

@Override

**public** **void** open() {

System.***out***.println("Opening a Word document.");

}

}

PdfDocument.java

**public** **class** PdfDocument **implements** Document {

@Override

**public** **void** open() {

System.***out***.println("Opening a PDF document.");

}

}

ExcelDocument.java

**public** **class** ExcelDocument **implements** Document {

@Override

**public** **void** open() {

System.***out***.println("Opening an Excel document.");

}

}

**Abstract Factory:**

DocumentFactory.java

public abstract class DocumentFactory {

public abstract Document createDocument();

}

**Concrete Document Classes:**

WordDocumentFactory.java

public class WordDocumentFactory extends DocumentFactory {

@Override

public Document createDocument() {

return new WordDocument();

}

}

PdfDocumentFactory.java

public class PdfDocumentFactory extends DocumentFactory {

@Override

public Document createDocument() {

return new PdfDocument();

}

}

ExcelDocumentFactory.java

public class ExcelDocumentFactory extends DocumentFactory {

@Override

public Document createDocument() {

return new ExcelDocument();

} }

**Test the Factory Method Pattern**

Main.java

public class Main {

public static void main(String[] args) {

DocumentFactory wordFactory = new WordDocumentFactory();

Document wordDoc = wordFactory.createDocument();

wordDoc.open();

DocumentFactory pdfFactory = new PdfDocumentFactory();

Document pdfDoc = pdfFactory.createDocument();

pdfDoc.open();

DocumentFactory excelFactory = new ExcelDocumentFactory();

Document excelDoc = excelFactory.createDocument();

excelDoc.open();

}

}

**Output:**

