**Exercise 1: Implementing the Singleton Pattern**

1. **Logger Singleton Class**

public class AppLogger {

private static AppLogger loggerInstance;

// Private constructor to prevent external instantiation

private AppLogger() {

System.out.println("AppLogger setup complete.");

}

// Access point to the singleton instance

public static AppLogger getLogger() {

if (loggerInstance == null) {

loggerInstance = new AppLogger();

}

return loggerInstance;

}

public void writeLog(String msg) {

System.out.println(">> Log Entry: " + msg);

}

}

**2 Main Class for Testing**

public class SingletonDemo {

public static void main(String[] args) {

AppLogger log1 = AppLogger.getLogger();

log1.writeLog("Starting the application.");

AppLogger log2 = AppLogger.getLogger();

log2.writeLog("Application running smoothly.");

if (log1 == log2) {

System.out.println("Logger is Singleton – only one instance exists.");

} else {

System.out.println("Multiple logger instances detected.");

}

}

}

**Exercise 2: Implementing the Factory Method Pattern**

**1. Document Interface**

public interface FileDocument {

void display();

}

**2. Document Types (Implementing Classes)**

public class MSWord implements FileDocument {

public void display() {

System.out.println("Word file opened.");

}

}

public class PDFFile implements FileDocument {

public void display() {

System.out.println("PDF file opened.");

}

}

public class ExcelSheet implements FileDocument {

public void display() {

System.out.println("Excel file opened.");

}

}

**3. Abstract Factory Class**

public abstract class FileFactory {

public abstract FileDocument createFile();

}

**4. Factory Implementations for Each File Type**

public class WordFactory extends FileFactory {

public FileDocument createFile() {

return new MSWord();

}

}

public class PdfFactory extends FileFactory {

public FileDocument createFile() {

return new PDFFile();

}

}

public class ExcelFactory extends FileFactory {

public FileDocument createFile() {

return new ExcelSheet();

}

}

**5. Testing Factory Implementation**

public class FactoryPatternDemo {

public static void main(String[] args) {

FileFactory wordCreator = new WordFactory();

FileDocument doc1 = wordCreator.createFile();

doc1.display();

FileFactory pdfCreator = new PdfFactory();

FileDocument doc2 = pdfCreator.createFile();

doc2.display();

FileFactory excelCreator = new ExcelFactory();

FileDocument doc3 = excelCreator.createFile();

doc3.display();

}

}