# Design Patterns and Principles

**Exercise 1: Implementing the Singleton Pattern**

**Logger.java**

public class Logger {

private static Logger instance;

private Logger() {

System.out.println("Logger Initialized");

}

public static Logger getInstance() {

if (instance == null) {

instance = new Logger();

}

return instance;

}

public void log(String message) {

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

}

}

**LoggerTest.java**

public class LoggerTest {

public static void main(String[] args) {

Logger logger1 = Logger.getInstance();

logger1.log("First message");

Logger logger2 = Logger.getInstance();

logger2.log("Second message");

if (logger1 == logger2) {

System.out.println("Only one instance of Logger exists.");

} else {

System.out.println("Multiple instances of Logger exist.");

}

}

}

**Output:**

Logger Initialized

LOG: First message

LOG: Second message

Only one instance of Logger exists.

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

**Defining document interface**

**Document.java**

public interface Document {

void open();

}

**Creating Concrete Document classes**

**WordDocument.java**

public class WordDocument implements Document {

public void open() {

System.out.println("Opening Word Document");

}

}

**PdfDocument.java**

public class PdfDocument implements Document {

public void open() {

System.out.println("Opening PDF Document");

}

}

**ExcelDocument.java**

public class ExcelDocument implements Document {

public void open() {

System.out.println("Opening Excel Document");

}

}

**Implementing The Factory Method**

**DocumentFactory.java**

public abstract class DocumentFactory {

public abstract Document createDocument();

}

**WordDocumentFactory.java**

public class WordDocumentFactory extends DocumentFactory {

public Document createDocument() {

return new WordDocument();

}

}

**PdfDocumentFactory.java**

public class PdfDocumentFactory extends DocumentFactory {

public Document createDocument() {

return new PdfDocument();

}

}

**ExcelDocumentFactory.java**

public class ExcelDocumentFactory extends DocumentFactory {

public Document createDocument() {

return new ExcelDocument();

}

}

**Test the Factory Method Implementation**

**DocumentFactoryTest.java**

public class DocumentFactoryTest {

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:**

Opening Word Document

Opening PDF Document

Opening Excel Document