# Design Patterns - Singleton and Factory (Java)

## Exercise 1: Singleton Pattern

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();  
 }  
 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("Another log message");  
  
 if (logger1 == logger2) {  
 System.out.println("Only one instance exists.");  
 } else {  
 System.out.println("Different instances exist!");  
 }  
 }  
}

### Output

Logger instance created.  
LOG: Application started  
LOG: Another log message  
Only one instance exists.

## Exercise 2: Factory Method Pattern

Document.java

public interface Document {  
 void open();  
}

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.");  
 }  
}

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();  
 }  
}

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

Opening Word document.  
Opening PDF document.  
Opening Excel document.