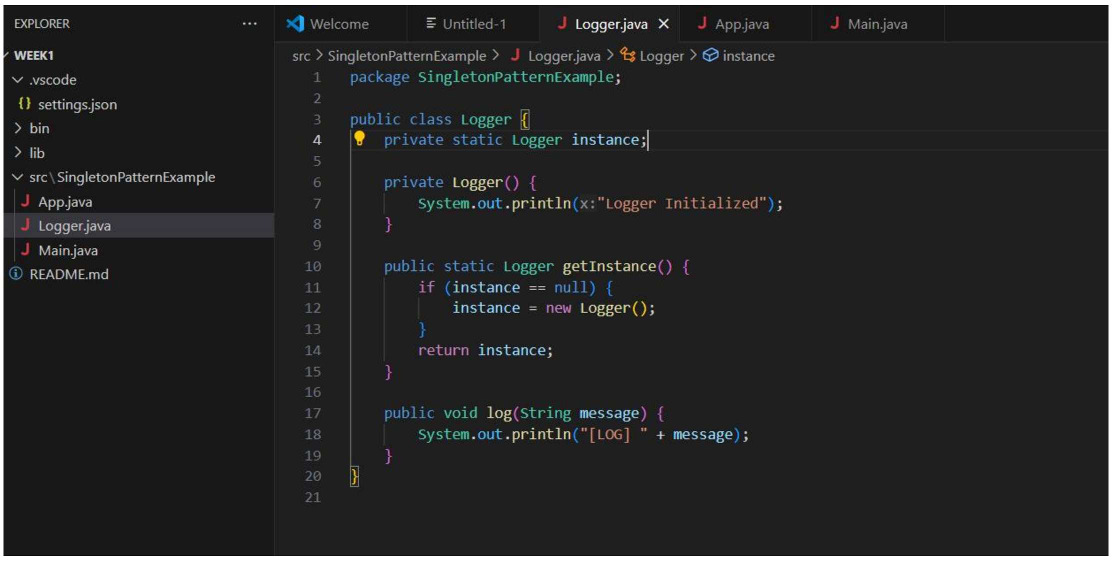
Digital Nurture 4.0 – Deep Skilling

Week 1 - Mandatory Hands - on

Hands - on : 1

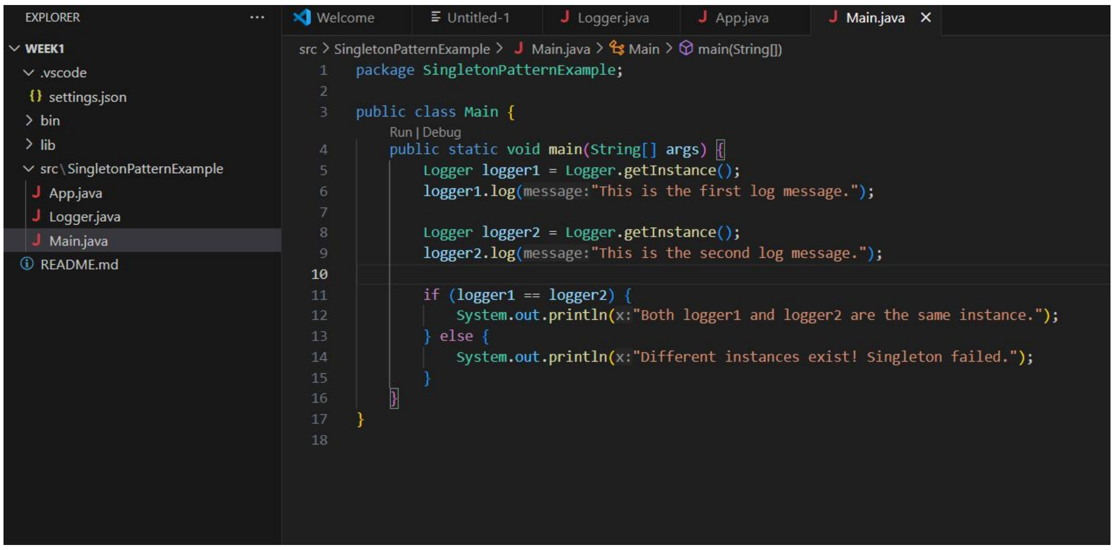
1) Implementing the Singleton Pattern

Logger.java



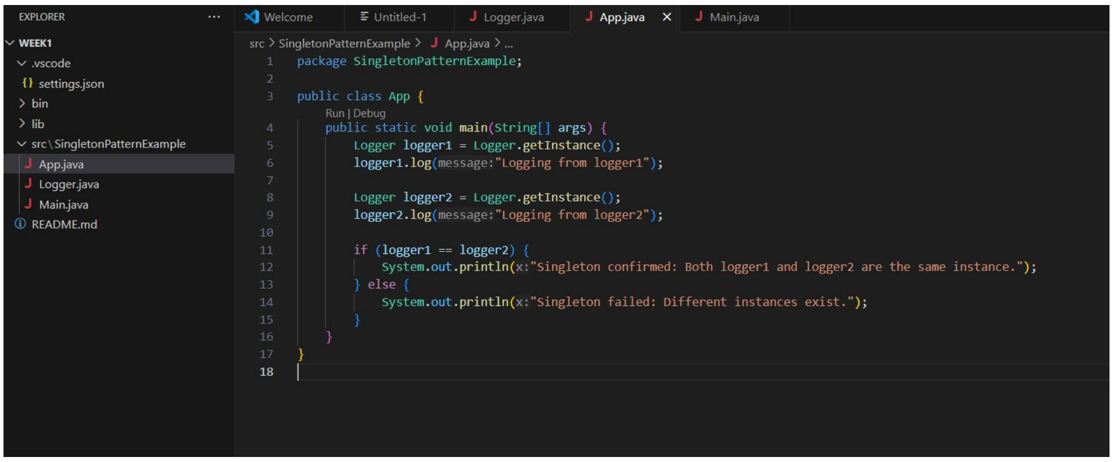
```java
package SingletonPatternExample;

public class Logger {
    private static Logger instance;

    private Logger() {
        System.out.println(x:"Logger Initialized");
    }

    public static Logger getInstance() {
        if (instance == null) {
            instance = new Logger();
        }
        return instance;
    }

    public void log(String message) {
        System.out.println("[LOG] " + message);
    }
}
```

Main.java



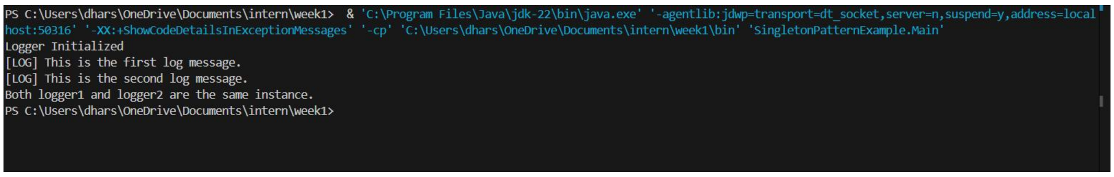
```java
package SingletonPatternExample;

public class Main {
    Run | Debug
    public static void main(String[] args) {
        Logger logger1 = Logger.getInstance();
        logger1.log(message:"This is the first log message.");

        Logger logger2 = Logger.getInstance();
        logger2.log(message:"This is the second log message.");

        if (logger1 == logger2) {
            System.out.println(x:"Both logger1 and logger2 are the same instance.");
        } else {
            System.out.println(x:"Different instances exist! Singleton failed.");
        }
    }
}
```

App.java



```java
package SingletonPatternExample;

public class App {
    Run | Debug
    public static void main(String[] args) {
        Logger logger1 = Logger.getInstance();
        logger1.log(message:"Logging from logger1");

        Logger logger2 = Logger.getInstance();
        logger2.log(message:"Logging from logger2");

        if (logger1 == logger2) {
            System.out.println(x:"Singleton confirmed: Both logger1 and logger2 are the same instance.");
        } else {
            System.out.println(x:"Singleton failed: Different instances exist.");
        }
    }
}

```

Output

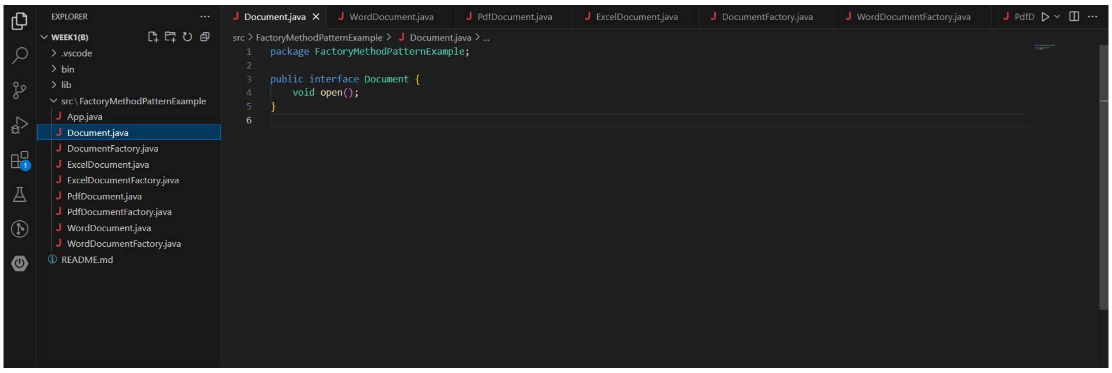


```
PS C:\Users\dhars\OneDrive\Documents\intern\week1>  & 'C:\Program Files\Java\jdk-22\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=local
host:50316' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\dhars\OneDrive\Documents\intern\week1\bin' 'SingletonPatternExample.Main'
Logger Initialized
[LOG] This is the first log message.
[LOG] This is the second log message.
Both logger1 and logger2 are the same instance.
PS C:\Users\dhars\OneDrive\Documents\intern\week1>
```

Hands - on : 2

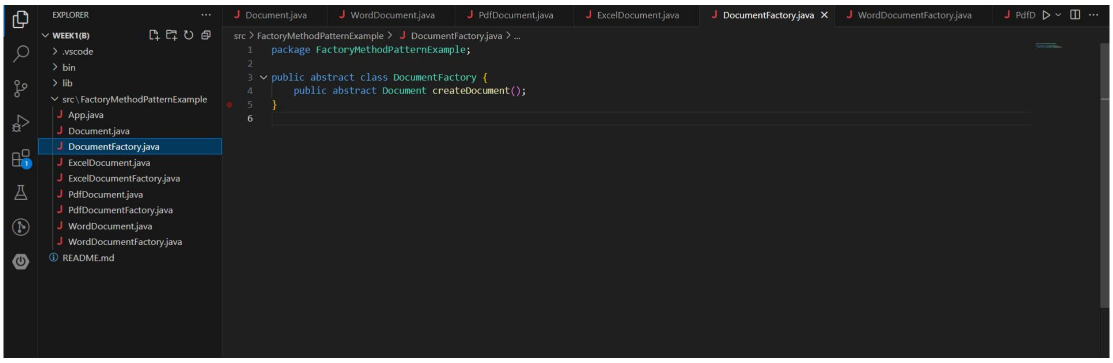
2) Implementing the Factory Method Pattern

Document.java



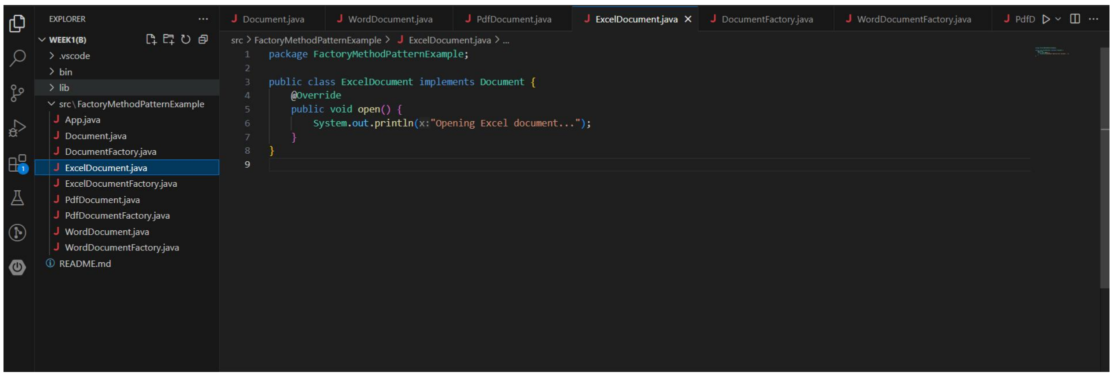
```java
package FactoryMethodPatternExample;

public interface Document {
    void open();
}
```

DocumentFactory.java


EXPLORER
WEEK1(B)
src > FactoryMethodPatternExample > DocumentFactory.java > ...

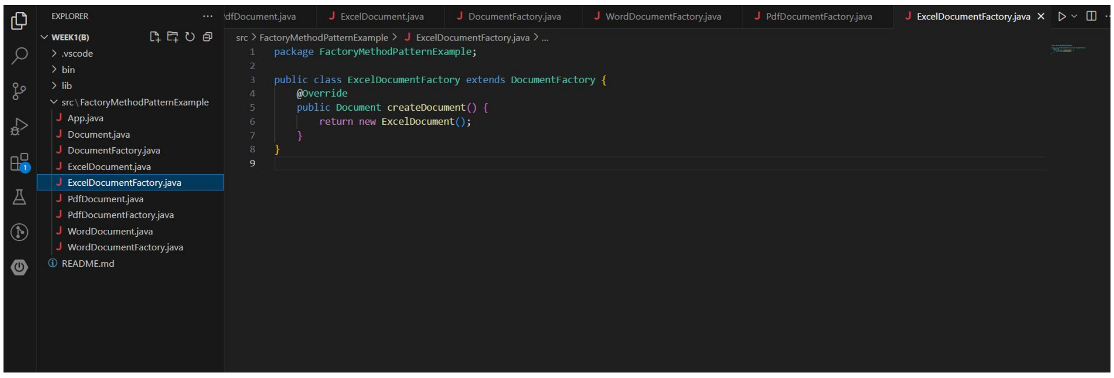
```java
package FactoryMethodPatternExample;

public abstract class DocumentFactory {
    public abstract Document createDocument();
}
```

ExcelDocument.java


EXPLORER
WEEK1(B)
src > FactoryMethodPatternExample > ExcelDocument.java > ...

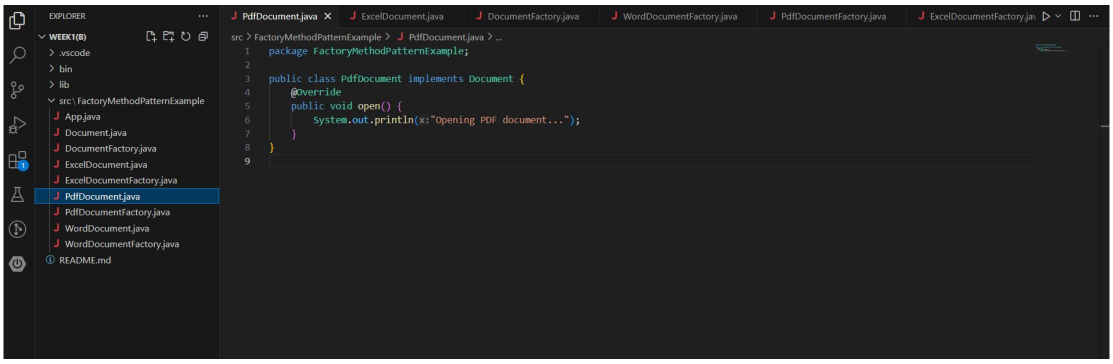
```java
package FactoryMethodPatternExample;

public class ExcelDocument implements Document {
    @Override
    public void open() {
        System.out.println(x:"Opening Excel document...");
    }
}
```

ExcelDocumentFactory.java



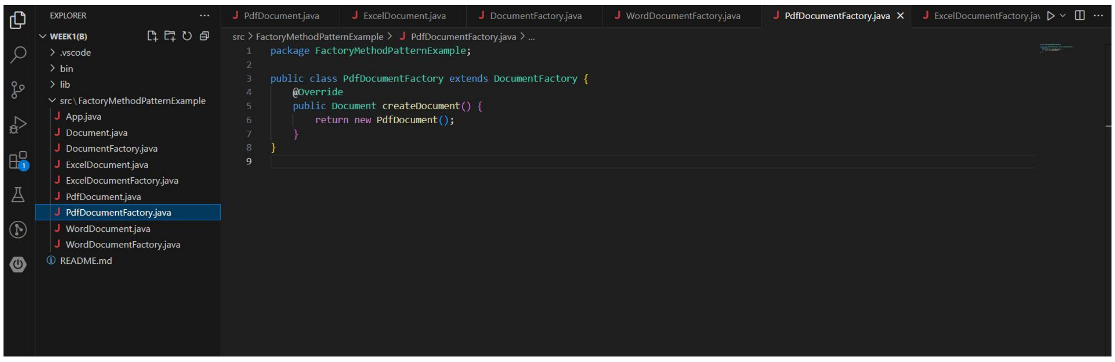
```java
package FactoryMethodPatternExample;

public class ExcelDocumentFactory extends DocumentFactory {
    @Override
    public Document createDocument() {
        return new ExcelDocument();
    }
}
```

PdfDocument.java



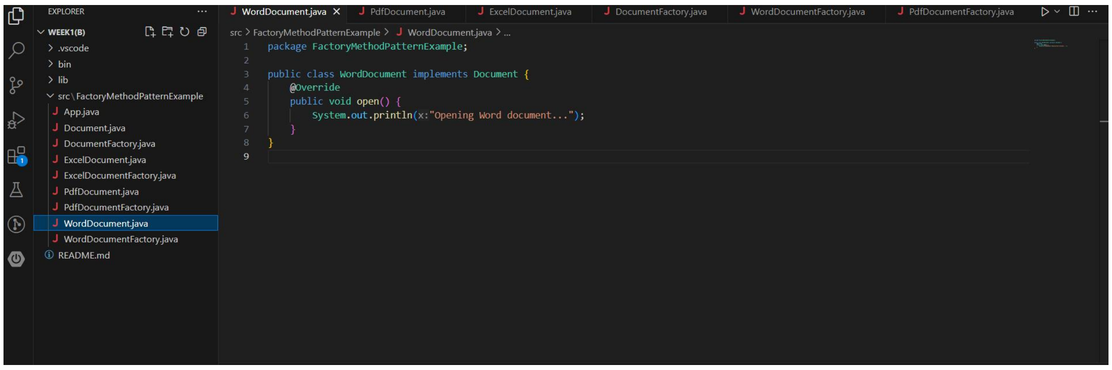
```java
package FactoryMethodPatternExample;

public class PdfDocument implements Document {
    @Override
    public void open() {
        System.out.println(x:"Opening PDF document...");
    }
}
```

pdfDocumentFactory.java



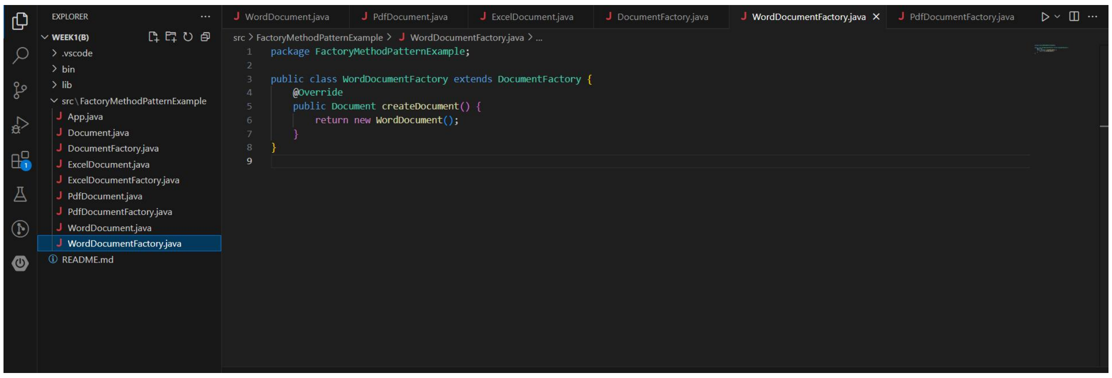
```java
package FactoryMethodPatternExample;

public class PdfDocumentFactory extends DocumentFactory {
    @Override
    public Document createDocument() {
        return new PdfDocument();
    }
}
```

WordDocument.java



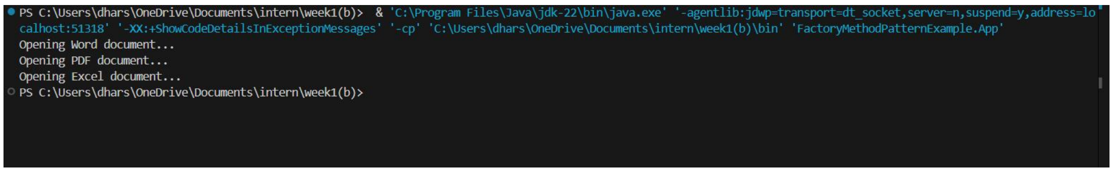
```java
package FactoryMethodPatternExample;

public class WordDocument implements Document {
    @Override
    public void open() {
        System.out.println(x:"Opening Word document...");
    }
}
```

WordDocumentFactory.java



```java
package FactoryMethodPatternExample;

public class WordDocumentFactory extends DocumentFactory {
    @Override
    public Document createDocument() {
        return new WordDocument();
    }
}
```

Output

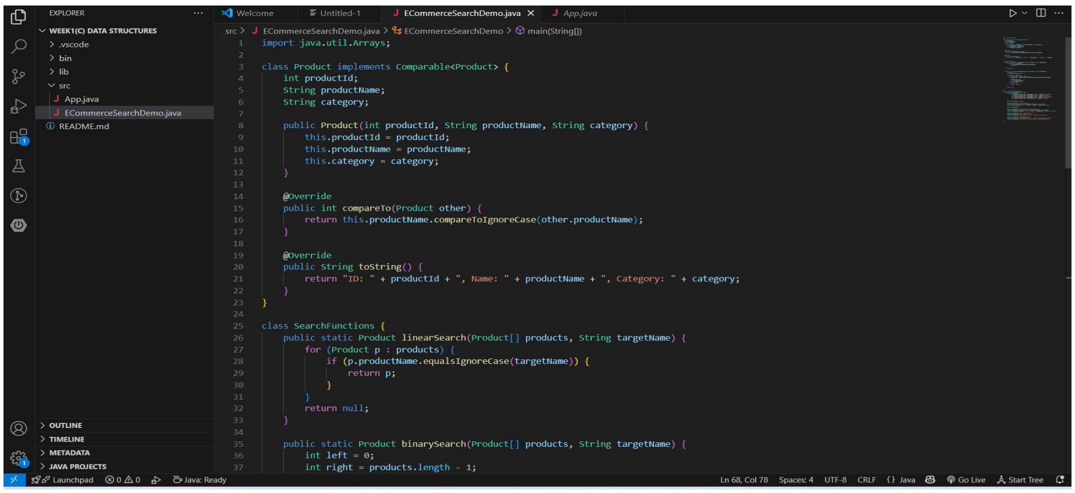


```
PS C:\Users\dhars\OneDrive\Documents\intern\week1(b)>  & 'C:\Program Files\Java\jdk-22\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=lo
calhost:51318' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\dhars\OneDrive\Documents\intern\week1(b)\bin' 'FactoryMethodPatternExample.App'
Opening Word document...
Opening PDF document...
Opening Excel document...
PS C:\Users\dhars\OneDrive\Documents\intern\week1(b)>
```

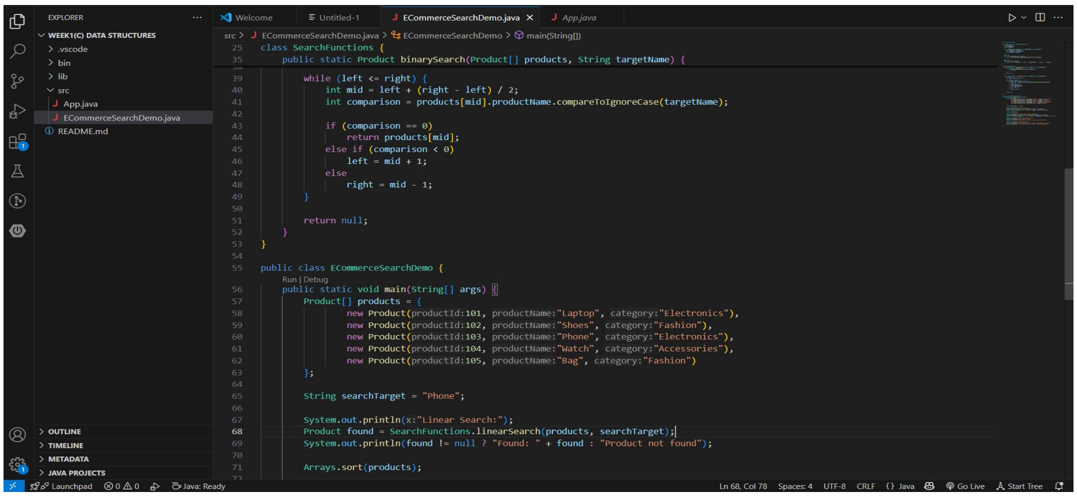
Hands - on : 3

3) E-commerce Platform Search Function

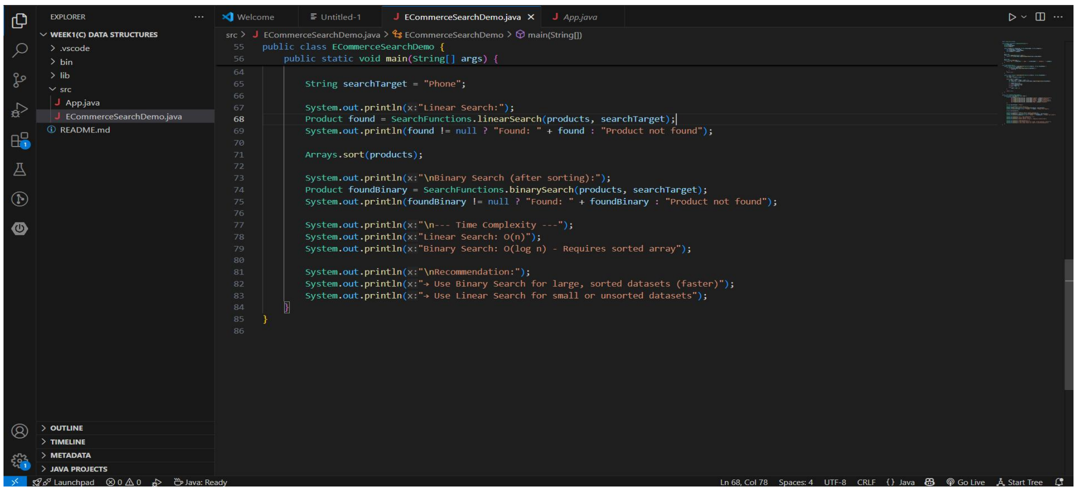
ECommerceSearchDemo.java



```java
import java.util.Arrays;

class Product implements Comparable<Product> {
    int productId;
    String productName;
    String category;

    public Product(int productId, String productName, String category) {
        this.productId = productId;
        this.productName = productName;
        this.category = category;
    }

    @Override
    public int compareTo(Product other) {
        return this.productName.compareToIgnoreCase(other.productName);
    }

    @Override
    public String toString() {
        return "ID: " + productId + ", Name: " + productName + ", Category: " + category;
    }
}

class SearchFunctions {
    public static Product linearSearch(Product[] products, String targetName) {
        for (Product p : products) {
            if (p.productName.equalsIgnoreCase(targetName)) {
                return p;
            }
        }
        return null;
    }

    public static Product binarySearch(Product[] products, String targetName) {
        int left = 0;
        int right = products.length - 1;
```

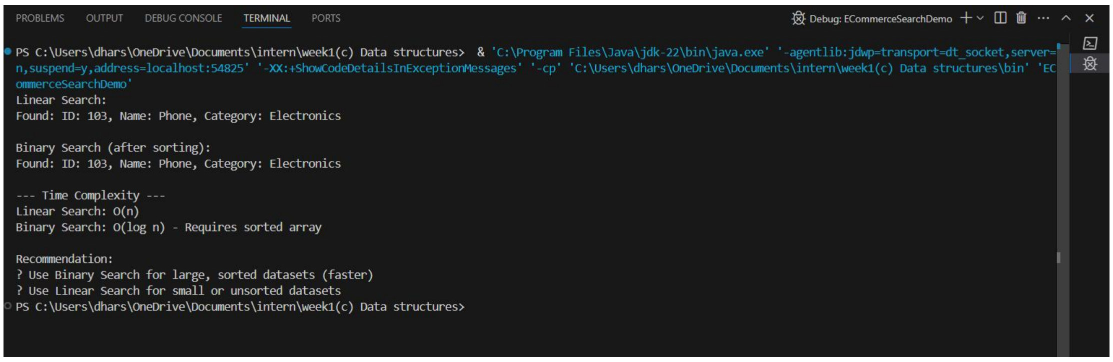


```java
class SearchFunctions {
    public static Product binarySearch(Product[] products, String targetName) {

        while (left <= right) {
            int mid = left + (right - left) / 2;
            int comparison = products[mid].productName.compareToIgnoreCase(targetName);

            if (comparison == 0)
                return products[mid];
            else if (comparison < 0)
                left = mid + 1;
            else
                right = mid - 1;
        }

        return null;
    }
}

public class ECommerceSearchDemo {
    public static void main(String[] args) {
        Product[] products = {
                new Product(productId:101, productName:"Laptop", category:"Electronics"),
                new Product(productId:102, productName:"Shoes", category:"Fashion"),
                new Product(productId:103, productName:"Phone", category:"Electronics"),
                new Product(productId:104, productName:"Watch", category:"Accessories"),
                new Product(productId:105, productName:"Bag", category:"Fashion")
        };

        String searchTarget = "Phone";

        System.out.println(x:"Linear Search:");
        Product found = SearchFunctions.linearSearch(products, searchTarget);
        System.out.println(found != null ? "Found: " + found : "Product not found");

        Arrays.sort(products);
```



```java
public class ECommerceSearchDemo {
    public static void main(String[] args) {

        String searchTarget = "Phone";

        System.out.println(x:"Linear Search:");
        Product found = SearchFunctions.linearSearch(products, searchTarget);
        System.out.println(found != null ? "Found: " + found : "Product not found");

        Arrays.sort(products);

        System.out.println(x:"\nBinary Search (after sorting):");
        Product foundBinary = SearchFunctions.binarySearch(products, searchTarget);
        System.out.println(foundBinary != null ? "Found: " + foundBinary : "Product not found");

        System.out.println(x:"\n--- Time Complexity ---");
        System.out.println(x:"Linear Search: O(n)");
        System.out.println(x:"Binary Search: O(log n) - Requires sorted array");

        System.out.println(x:"\nRecommendation:");
        System.out.println(x:"→ Use Binary Search for large, sorted datasets (faster)");
        System.out.println(x:"→ Use Linear Search for small or unsorted datasets");
    }
}
```

Output

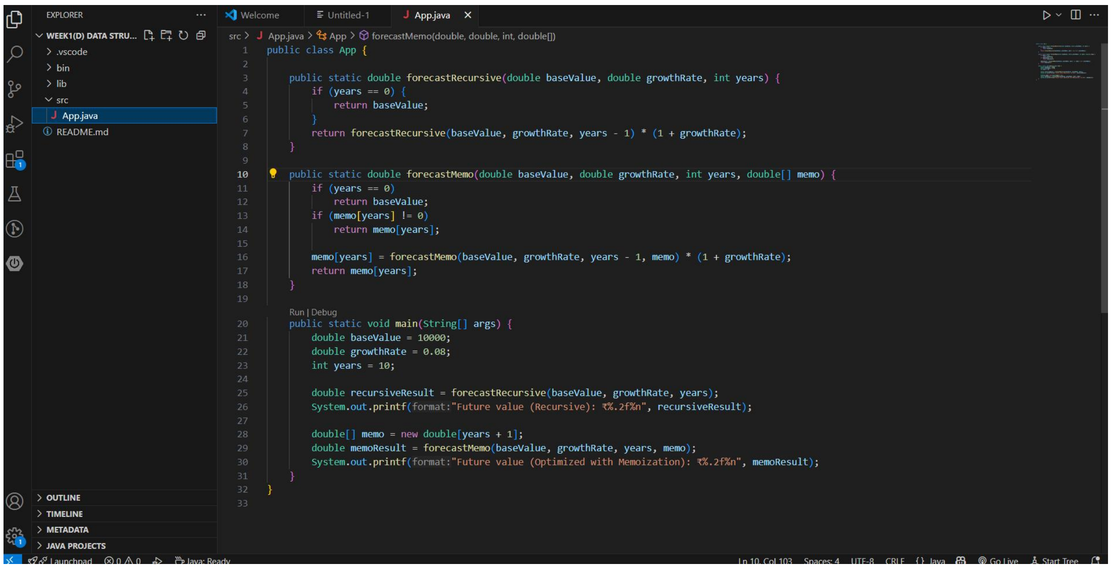


```
PS C:\Users\dhars\OneDrive\Documents\intern\week1(c) Data structures>  & 'C:\Program Files\Java\jdk-22\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54825' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\dhars\OneDrive\Documents\intern\week1(c) Data structures\bin' 'ECommerceSearchDemo'
Linear Search:
Found: ID: 103, Name: Phone, Category: Electronics

Binary Search (after sorting):
Found: ID: 103, Name: Phone, Category: Electronics

--- Time Complexity ---
Linear Search: O(n)
Binary Search: O(log n) - Requires sorted array

Recommendation:
? Use Binary Search for large, sorted datasets (faster)
? Use Linear Search for small or unsorted datasets
PS C:\Users\dhars\OneDrive\Documents\intern\week1(c) Data structures>
```

Hands - on : 4

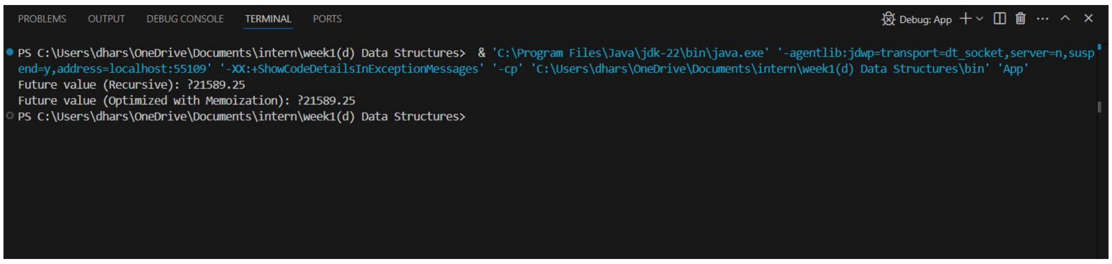
4) Financial Forecasting

App.java



```java
public class App {

    public static double forecastRecursive(double baseValue, double growthRate, int years) {
        if (years == 0) {
            return baseValue;
        }
        return forecastRecursive(baseValue, growthRate, years - 1) * (1 + growthRate);
    }

    public static double forecastMemo(double baseValue, double growthRate, int years, double[] memo) {
        if (years == 0)
            return baseValue;
        if (memo[years] != 0)
            return memo[years];

        memo[years] = forecastMemo(baseValue, growthRate, years - 1, memo) * (1 + growthRate);
        return memo[years];
    }

    public static void main(String[] args) {
        double baseValue = 10000;
        double growthRate = 0.08;
        int years = 10;

        double recursiveResult = forecastRecursive(baseValue, growthRate, years);
        System.out.printf(format:"Future value (Recursive): ₹%.2f%n", recursiveResult);

        double[] memo = new double[years + 1];
        double memoResult = forecastMemo(baseValue, growthRate, years, memo);
        System.out.printf(format:"Future value (Optimized with Memoization): ₹%.2f%n", memoResult);
    }
}
```

Output



```
PS C:\Users\dhars\OneDrive\Documents\intern\week1(d) Data Structures>  & 'C:\Program Files\Java\jdk-22\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:55109' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\dhars\OneDrive\Documents\intern\week1(d) Data Structures\bin' 'App'
Future value (Recursive): ?21589.25
Future value (Optimized with Memoization): ?21589.25
PS C:\Users\dhars\OneDrive\Documents\intern\week1(d) Data Structures>
```