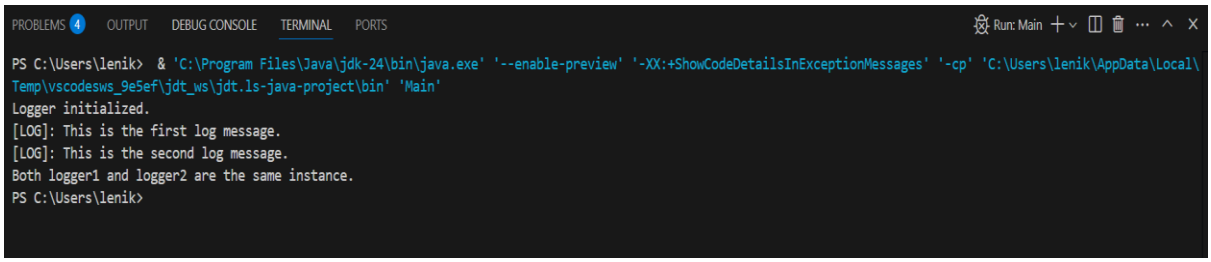
Exercise 1: Implementing the Singleton Pattern

Code:

```
public class Main {



    static 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);
        }
    }



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

```
        Logger logger1 = Logger.getInstance();
        Logger logger2 = Logger.getInstance();



        logger1.log("This is the first log message.");
        logger2.log("This is the second log message.");



        if (logger1 == logger2) {
            System.out.println("Both logger1 and logger2 are the same instance.");
        } else {
            System.out.println("Different Logger instances detected!");
        }
    }
}
```

Result:



Exercise 1: Inventory Management System

Code:

```
import java.util.HashMap;
import java.util.Map;
import java.util.Scanner;

public class InventorySystem {



   static class Product {
      int productId;
      String productName;
      int quantity;
      double price;

      Product(int productId, String productName, int quantity, double price) {
         this.productId = productId;
         this.productName = productName;
         this.quantity = quantity;
         this.price = price;
      }

      @Override
      public String toString() {
         return "ProductID: " + productId + ", Name: " + productName +
               ", Quantity: " + quantity + ", Price: $" + price;
      }
   }
```

```
static class InventoryManager {
    private Map<Integer, Product> inventory;

    public InventoryManager() {
        inventory = new HashMap<>();
    }


    public void addProduct(Product product) {
        if (inventory.containsKey(product.productId)) {
            System.out.println("Product ID already exists. Use update instead.");
        } else {
            inventory.put(product.productId, product);
            System.out.println("Product added successfully.");
        }
    }


    public void updateProduct(Product product) {
        if (inventory.containsKey(product.productId)) {
            inventory.put(product.productId, product);
            System.out.println("Product updated successfully.");
        } else {
            System.out.println("Product not found. Use add to create it.");
        }
    }


    public void deleteProduct(int productId) {
        if (inventory.remove(productId) != null) {
            System.out.println("Product deleted successfully.");
```

```
        } else {
            System.out.println("Product not found.");
        }
    }

    public void displayInventory() {
        if (inventory.isEmpty()) {
            System.out.println("Inventory is empty.");
        } else {
            for (Product product : inventory.values()) {
                System.out.println(product);
            }
        }
    }
}

public static void main(String[] args) {
    InventoryManager manager = new InventoryManager();
    Scanner scanner = new Scanner(System.in);
    int choice;

    do {
        System.out.println("\nInventory Management System");
        System.out.println("1. Add Product");
        System.out.println("2. Update Product");
        System.out.println("3. Delete Product");
        System.out.println("4. Display Inventory");
        System.out.println("5. Exit");
        System.out.print("Enter your choice: ");
```

```
choice = scanner.nextInt();


switch (choice) {
    case 1 -> {
        System.out.print("Enter Product ID: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // consume newline
        System.out.print("Enter Product Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Quantity: ");
        int qty = scanner.nextInt();
        System.out.print("Enter Price: ");
        double price = scanner.nextDouble();
        manager.addProduct(new Product(id, name, qty, price));
    }
    case 2 -> {
        System.out.print("Enter Product ID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // consume newline
        System.out.print("Enter New Product Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter New Quantity: ");
        int qty = scanner.nextInt();
        System.out.print("Enter New Price: ");
        double price = scanner.nextDouble();
        manager.updateProduct(new Product(id, name, qty, price));
    }
    case 3 -> {
        System.out.print("Enter Product ID to delete: ");
        int id = scanner.nextInt();
        manager.deleteProduct(id);
```

```
            }
            case 4 -> manager.displayInventory();
            case 5 -> System.out.println("Exiting...");
            default -> System.out.println("Invalid choice. Try again.");
          }
        } while (choice != 5);

        scanner.close();
    }
}
```

Result: