**Exercise 1: Implementing the Singleton Pattern**

**Scenario:**

You need to ensure that a logging utility class in your application has only one instance throughout the application lifecycle to ensure consistent logging.

**Steps:**

1. **Create a New Java Project:**
   * Create a new Java project named **SingletonPatternExample**.
2. **Define a Singleton Class:**
   * Create a class named Logger that has a private static instance of itself.
   * Ensure the constructor of Logger is private.
   * Provide a public static method to get the instance of the Logger class.
3. **Implement the Singleton Pattern:**
   * Write code to ensure that the Logger class follows the Singleton design pattern.
4. **Test the Singleton Implementation:**
   * Create a test class to verify that only one instance of Logger is created and used across the application.

public class SingletonPatternExample {

// Singleton Logger class

static class Logger {

// Step 1: private static instance

private static Logger instance;

// Step 2: private constructor to prevent external instantiation

private Logger() {

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

}

// Step 3: public static method to get the instance

public static Logger getInstance() {

if (instance == null) {

instance = new Logger();

}

return instance;

}

// Logging method

public void log(String message) {

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

}

}

// Main method to test the Singleton

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 instances exist (Singleton failed).");

}

}

}

**Output:**

Logger initialized

[LOG]: This is the first log message.

[LOG]: This is the second log message.

Both logger1 and logger2 are the same instance.