

Week 2, Lab Work 1: Exploring Programming Paradigms

Objectives

1. Apply the concepts of programming paradigms in solving simple problems.
2. Implement the same problem using at least two different paradigms.
3. Compare the strengths and limitations of each paradigm based on your coding experience.

Task

You will solve two problems using two different programming paradigms (e.g., Procedural, Object-Oriented).

Problem 1

Factorial Calculator: Write a program that computes the factorial of a positive integer N entered by the user.

Programming Language Chosen

- a) Procedural: Python
- b) Object-Oriented: Java

Source Code

```

1 # Title: Factorial Calculator
2 # Instruction: Write a program that computes the factorial of a positive integer N entered by the user.
3
4 def main():
5     # Checks for value error
6     while True:
7         try:
8             integer = int(input("Enter an integer: "))
9             # Allowed values N (≥ 0)
10            # Not allowed: N (< 0)
11            if integer < 0:
12                raise ValueError
13            break
14        except ValueError:
15            continue
16
17    # Prints the factorial
18    print(f"The factorial of {integer} is {factorial(integer)}.")
19
20 def factorial(N):
21     if N == 0 or N == 1:
22         return 1
23     else:
24         return N * factorial(N - 1)
25
26 if __name__ == "__main__":
27     main()

```

- a)
- b)

Main.java

```

1 // Title: Factorial Calculator
2 // Instruction: Write a program that computes the factorial of a positive integer N entered by the user.
3
4 import java.util.Scanner;
5
6 public class Main {
7
8     public static void main(String[] args) {
9         Scanner scn = new Scanner(System.in);
10        Factorial fct = new Factorial();
11
12        System.out.print("Enter an integer: ");
13        int N = scn.nextInt();
14
15        System.out.println("The factorial of " + N + " is " + fct.factorial(N) + ".");
16
17        scn.close();
18    }
19 }

```

Factorial.java

```

1 public class Factorial {
2     public int factorial(int n) {
3         if (n == 0 || n == 1) {
4             return 1;
5         } else {
6             return n * factorial(n - 1);
7         }
8     }
9 }

```

Program Outputs

```

• aus.sn50@Angelas-MacBook-Air W2-L1 % python3 factorial.py
Enter an integer: 0
The factorial of 0 is 1.
• aus.sn50@Angelas-MacBook-Air W2-L1 % python3 factorial.py
Enter an integer: 7
The factorial of 7 is 5040.
• aus.sn50@Angelas-MacBook-Air W2-L1 % python3 factorial.py
Enter an integer: 2
The factorial of 2 is 2.

```

a)

```

• aus.sn50@Angelas-MacBook-Air jv-factorial % javac Main.java
• aus.sn50@Angelas-MacBook-Air jv-factorial % java Main
Enter an integer: 0
The factorial of 0 is 1.
• aus.sn50@Angelas-MacBook-Air jv-factorial % java Main
Enter an integer: 7
The factorial of 7 is 5040.
• aus.sn50@Angelas-MacBook-Air jv-factorial % java Main
Enter an integer: 2
The factorial of 2 is 2.

```

b)

Problem 2

Sum of Integers: Write a program that computes the sum of all integers from 1 to N , where N is entered by the user.

Programming Language Chosen

- c) Procedural: Python
- d) Object-Oriented: Java

Source Code

```

1 # Title: Sum of Integers
2 # Instruction: Write a program that computes the sum of all integers from 1 to N, where N is entered by the user.
3
4 def main():
5     # Checks for value error
6     while True:
7         try:
8             integer = int(input("Enter an integer: "))
9             # Allowed values N (≥ 1)
10            # Not allowed: N (< 1)
11            if integer < 1:
12                raise ValueError
13            break
14        except ValueError:
15            continue
16
17    # Prints the factorial
18    print(f"The sum of all integers from 1 to {integer} is {sum(integer)}.")
19
20 def sum(N):
21     if N == 1:
22         return 1
23     else:
24         return N + sum(N - 1)
25
26 if __name__ == "__main__":
27     main()

```

- a)
- b)

Main.java

```

Main.java x
jv-soi > J Main.java > @ Main > @ main(String[])
1 // Title: Sum of Integers
2 // Instruction: Write a program that computes the sum of all integers from 1 to N, where N is entered by the user.
3
4 import java.util.Scanner;
5
6 public class Main {
7     public static void main(String[] args) {
8         Scanner scn = new Scanner(System.in);
9         SOI soi = new SOI();
10
11         System.out.println("Enter an integer: ");
12         int N = scn.nextInt();
13
14         System.out.println("The sum of all integers from 1 to " + N + " is " + soi.sumOfIntegers(N) + ".");
15
16         scn.close();
17     }
18 }

```

SOI.java

```

J SOI.java x
jv-soi > J SOI.java > SOI
1 public class SOI {
2     public int sumOfIntegers(int n) {
3         if (n == 1) {
4             return 1;
5         } else {
6             return n + sumOfIntegers(n - 1);
7         }
8     }
9 }

```

Personally, it's the procedural paradigm. For one, in procedural, I was merely dealing with a single file. Additionally, writing functions felt relatively simple compared to creating classes then writing methods then.

3. What challenges did you encounter while coding in each paradigm?

Nothing for the procedural paradigm. On the other hand, I have previously mentioned that I had to think beforehand of an object-oriented approach before actually writing the code for the other paradigm (OOP).

4. Based on your experience, which paradigm do you think is more flexible for solving problems like these?

My answer would be procedural paradigm.

Program Outputs

- a)
- ```

aus.sn50@Angelas-MacBook-Air W2-L1 % python3 sum.py
Enter an integer: 1
The sum of all integers from 1 to 1 is 1.
aus.sn50@Angelas-MacBook-Air W2-L1 % python3 sum.py
Enter an integer: 12
The sum of all integers from 1 to 12 is 78.
aus.sn50@Angelas-MacBook-Air W2-L1 % python3 sum.py
Enter an integer: 10
The sum of all integers from 1 to 10 is 55.

```
- b)
- ```

aus.sn50@Angelas-MacBook-Air jv-soi % javac Main.java
aus.sn50@Angelas-MacBook-Air jv-soi % java Main
Enter an integer: 1
The sum of all integers from 1 to 1 is 1.
aus.sn50@Angelas-MacBook-Air jv-soi % java Main
Enter an integer: 12
The sum of all integers from 1 to 12 is 78.
aus.sn50@Angelas-MacBook-Air jv-soi % java Main
Enter an integer: 10
The sum of all integers from 1 to 10 is 55.

```

Lab Report 1 Guide Questions

1. How did the programming paradigm influence the way you solved the problem?

In Python, I just proceeded to code like usual – like straight out putting functions/lines in one (.py) file. Meanwhile in Java, I had to think how to do it using an object-oriented approach in which I ended up creating two separate files [Main.java + Other.java → where I wrote my functions]

2. Which paradigm felt more natural or easier to implement? Why?