

## Module 4: Critical Thinking

### Looping Construct with Floating Point Numbers:

Write a program that utilizes a while-loop to read a set of five floating-point values from user input. Include code to prevent an endless loop. Ask the user to enter the values, then print the following data:

- *Total*
- *Average*
- *Maximum*
- *Minimum*
- *Interest on total at 20%*

**Pseudocode via Comments:** The following section contains the pseudocode that was used to detail the steps of the Module 4 Java application; the pseudocode was written using Java's comment functionality. A screenshot of the pseudocode written inside of the Eclipse IDE is provided.

---

```
//START
//Import Scanner class
//Set up Document

//Initialize new scanner (scr)
//Set up variables
// Data structures: double, String, boolean

// double num1;
// double num2;
// double num3;
// double num4;
// double num5;

// double max;
// double min;

// boolean startInitialLoop;
// boolean startCalculationsLoop;

// Initialize Loop Structure
//Do you want to start?
//YES - begin
//NO - terminate program

// Enter 5 floating point numbers
/*      num1 = scr.nextDouble();
...
      num5 = scr.nextDouble(); */

// Simple calculations
// Average, Sum Total, Interest @ 20%

// Question "Are you satisfied with the numbers entered?"
//If YES - startLoop = true;
//If NO - option to reenter values

// Loop begins, while (startLoop == true)
// System.out.println("Your data is being calculated...");

/* Find Max Value
while (num1 >= 0) {

    max = num1;

    if (num2 > num1) {
        max = num2;
    }
    if (num3 > num2) {
        max = num3;
    }
    if (num4 > num3) {
        max = num4;
    }
    if (num5 > num4) {
        max = num5
    }

    break;

}

*/

/* Find Min Value

while (num >= 0) {
```

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```
        if (num1 >= 0) {
            min = num1;
        }
        if (num2 < num1) {
            min = num2;
        }
        if (num3 < num2) {
            min = num3;
        }
        if (num4 < num3) {
            min = num4;
        }
        if (num5 < num4) {
            min = num5
        }

        break;
    }

    */

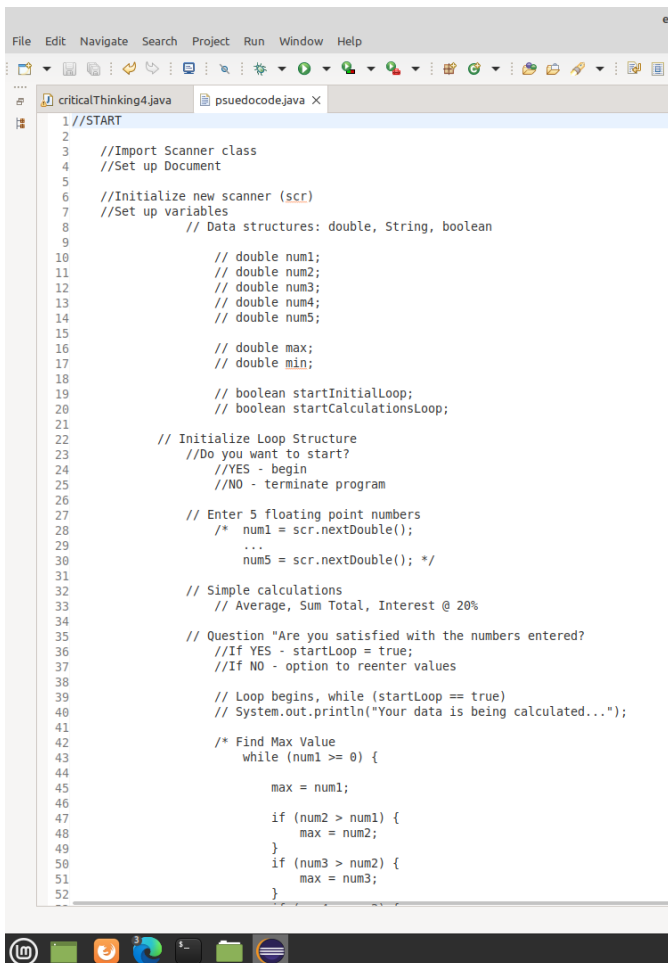
    //System.out.print("Processing complete.");
    //System.out.print("The following statistics are available: ");
    // Print output to screen

    //total (sum of numbers)
    //average
    //maximum
    //minimum
    //interest on total @ 20%

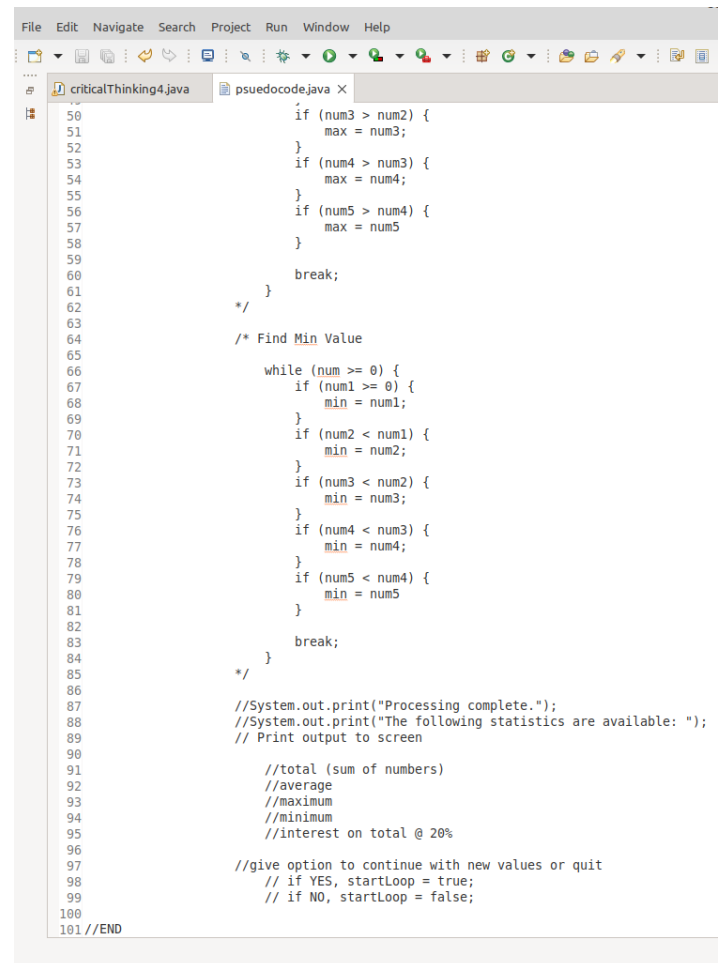
    //give option to continue with new values or quit
    // if YES, startLoop = true;
    // if NO, startLoop = false;

//END
```

### Pseudocode Screenshots:



```
1 //START
2
3 //Import Scanner class
4 //Set up Document
5
6 //Initialize new scanner (scr)
7 //Set up variables
8     // Data structures: double, String, boolean
9
10     // double num1;
11     // double num2;
12     // double num3;
13     // double num4;
14     // double num5;
15
16     // double max;
17     // double min;
18
19     // boolean startInitialLoop;
20     // boolean startCalculationsLoop;
21
22 // Initialize Loop Structure
23 //Do you want to start?
24 //YES - begin
25 //NO - terminate program
26
27 // Enter 5 floating point numbers
28 /* num1 = scr.nextDouble();
29 ...
30 num5 = scr.nextDouble(); */
31
32 // Simple calculations
33 // Average, Sum Total, Interest @ 20%
34
35 // Question "Are you satisfied with the numbers entered?
36 //If YES - startLoop = true;
37 //If NO - option to reenter values
38
39 // Loop begins, while (startLoop == true)
40 // System.out.println("Your data is being calculated...");
41
42 /* Find Max Value
43 while (num1 >= 0) {
44
45     max = num1;
46
47     if (num2 > num1) {
48         max = num2;
49     }
50     if (num3 > num2) {
51         max = num3;
52     }
53 }
```



```
50     if (num3 > num2) {
51         max = num3;
52     }
53     if (num4 > num3) {
54         max = num4;
55     }
56     if (num5 > num4) {
57         max = num5
58     }
59
60     break;
61 }
62 */
63
64 /* Find Min Value
65
66 while (num >= 0) {
67     if (num1 >= 0) {
68         min = num1;
69     }
70     if (num2 < num1) {
71         min = num2;
72     }
73     if (num3 < num2) {
74         min = num3;
75     }
76     if (num4 < num3) {
77         min = num4;
78     }
79     if (num5 < num4) {
80         min = num5
81     }
82
83     break;
84 }
85 */
86
87 //System.out.print("Processing complete.");
88 //System.out.print("The following statistics are available: ");
89 // Print output to screen
90
91 //total (sum of numbers)
92 //average
93 //maximum
94 //minimum
95 //interest on total @ 20%
96
97 //give option to continue with new values or quit
98 // if YES, startLoop = true;
99 // if NO, startLoop = false;
100
101 //END
```

## Module 4: Critical Thinking

**Source code:** This section contains the source code for Module 4's Java application. Changes were made within the source code to account for error handling functionality and errors found within the original pseudocode. Screenshots of the source code and the application being executed within the Eclipse IDE are provided.

```
//Import Scanner class
//Set up Document
import java.util.Scanner;
public class criticalThinking4 {
    public static void main(String[] args) {

        //Initialize new scanner (scr)
        Scanner scr = new Scanner(System.in);

        //Set up variables

        double num1 = 0;
        double num2 = 0;
        double num3 = 0;
        double num4 = 0;
        double num5 = 0;

        double maxNum = 0;
        double minNum = 0;

        String userResponse;

        boolean startInitialLoop = false;
        boolean startCalculationsLoop = false;

        // Initialize Loop Structure
        System.out.println("Would you like to begin?");
        userResponse = scr.next();

        if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
            startInitialLoop = true;

            while (startInitialLoop == true) {

                //BEGIN MAIN LOOP

                if (startInitialLoop == true) {
                    // Enter 5 floating point numbers
                    System.out.println("Enter 5 floating point numbers...");

                    //Error handling mechanism for non-numeric input
                    if (scr.hasNextDouble()) {
                        num1 = scr.nextDouble();
                    } else {
                        System.out.println("Invalid input. Please enter a floating point number.");
                        startInitialLoop = false;
                    }

                    if (scr.hasNextDouble()) {
                        num2 = scr.nextDouble();
                    } else {
                        System.out.println("Invalid input. Please enter a floating point number.");
                        startInitialLoop = false;
                    }

                    if (scr.hasNextDouble()) {
                        num3 = scr.nextDouble();
                    } else {
                        System.out.println("Invalid input. Please enter a floating point number.");
                        startInitialLoop = false;
                    }

                    if (scr.hasNextDouble()) {
                        num4 = scr.nextDouble();
                    } else {
                        System.out.println("Invalid input. Please enter a floating point number.");
                        startInitialLoop = false;
                    }

                    if (scr.hasNextDouble()) {
                        num5 = scr.nextDouble();

                        // Question "Are you satisfied with the numbers entered?"
                        System.out.println();
                        System.out.println("Are you satisfied with the numbers entered? Press Y for yes or N for no");

                    } else {
                        System.out.println("Invalid input. Please enter a floating point number.");
                        startInitialLoop = false;
                    }
                }

                // Calculate Average, Sum Total, Interest @ 20%
                double sumNum = (num1 + num2 + num3 + num4 + num5);
                double averageNum = ((num1 + num2 + num3 + num4 + num5) / 5);
                double interestNum = ((num1 + num2 + num3 + num4 + num5) * 0.20);

                // User response from previous question starts branches
                // YES - startCalculationsLoop = true;
                // NO - option to reenter numbers or quit will be given
                userResponse = scr.next();
                if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
                    startCalculationsLoop = true;
                }

                // MIN & MAX VALUE CALCULATIONS BEGIN
                if (startCalculationsLoop == true) {
                    System.out.println("Your data is being processed...");

                    // Find Max Value
                    while (num1 >= 0) {
```

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```
        maxNum = num1;

        if (num2 > num1) {
            maxNum = num2;
        }
        if (num3 > num2) {
            maxNum = num3;
        }
        if (num4 > num3) {
            maxNum = num4;
        }
        if (num5 > num4) {
            maxNum = num5;
        }

        break;
    }

    // Find Min Value

    while (num1 >= 0) {

        minNum = num1;

        if (num2 < num1) {
            minNum = num2;
        }
        if (num3 < num2) {
            minNum = num3;
        }
        if (num4 < num3) {
            minNum = num4;
        }
        if (num5 < num4) {
            minNum = num5;
        }

        break;
    }

    startCalculationsLoop = false;

    //Print strings for program aesthetics

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

    //Output messages
    System.out.println("Processing complete.");
    System.out.println();
    System.out.println("The following statistics are available: ");
    System.out.println();

    // Print Calculations to screen
    System.out.printf("\t Number total: %.2f\n", sumNum);
    System.out.printf("\t Number average: %.2f\n ", averageNum);
    System.out.printf("\t Max number: %.2f\n", maxNum);
    System.out.printf("\t Min number: %.2f\n ", minNum);
    System.out.printf("\t 20%% interest of number total: %.2f\n", interestNum);
    System.out.println();

}

// END OF MIN & MAX VALUE CALCULATIONS

else {

    startInitialLoop = false;
    System.out.println("No data found...");
    System.out.println();

}

//give option to continue with new values or quit
System.out.println("Would you like to enter new numbers? Press Y for yes or N for no ");
userResponse = scr.next();

// if YES, startLoop = true;
if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
    startInitialLoop = true;
} else {
    startInitialLoop = false;

    // If user responds no, option to reenter numbers or quit will be given

    //Terminate program message
    System.out.println("Ok, have a nice day.");
}

}

//END OF MAIN LOOP

}

//END OF IF-STATEMENT

else {

    //EXIT PROGRAM

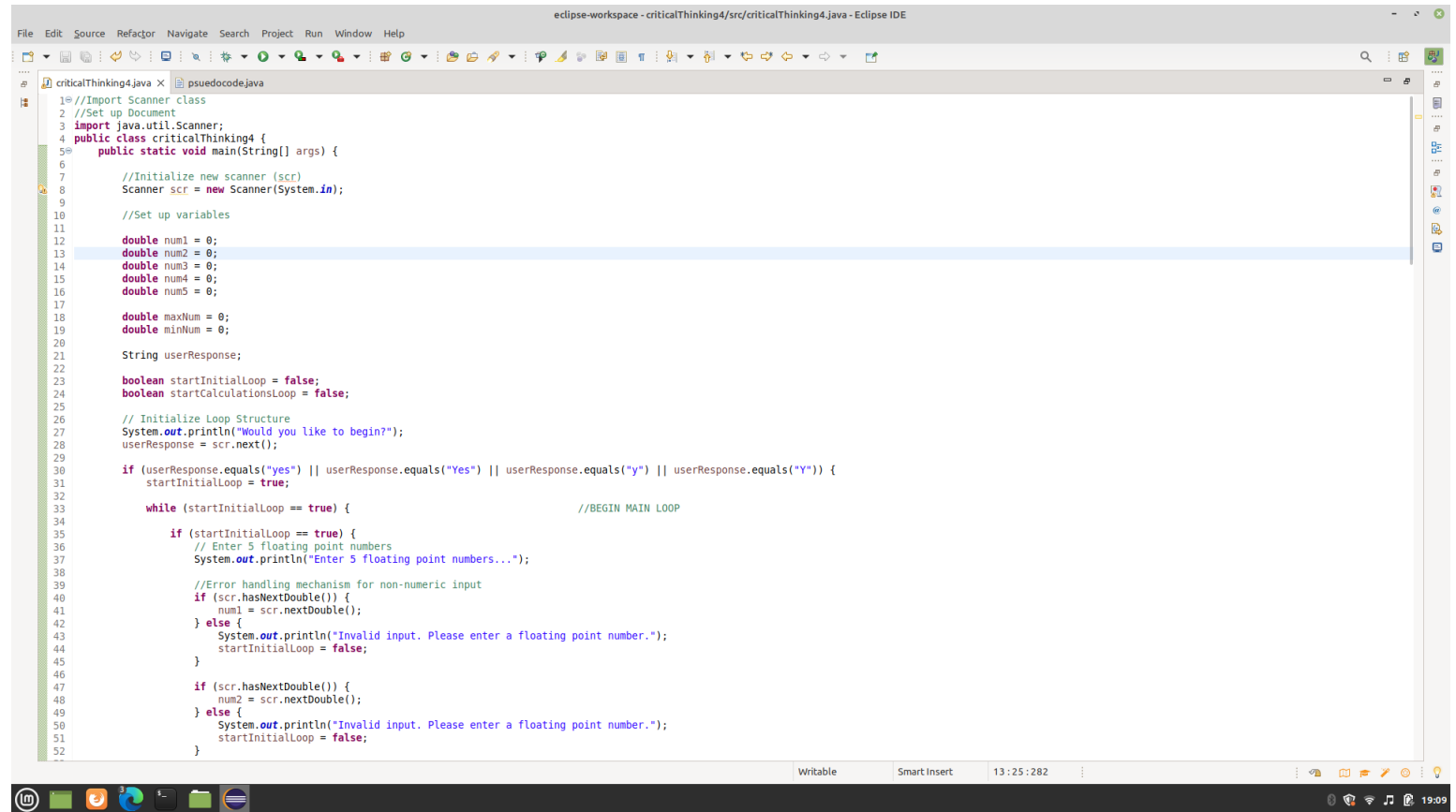
    //Terminate program message
    System.out.println("Ok, have a nice day.");

}

}
```

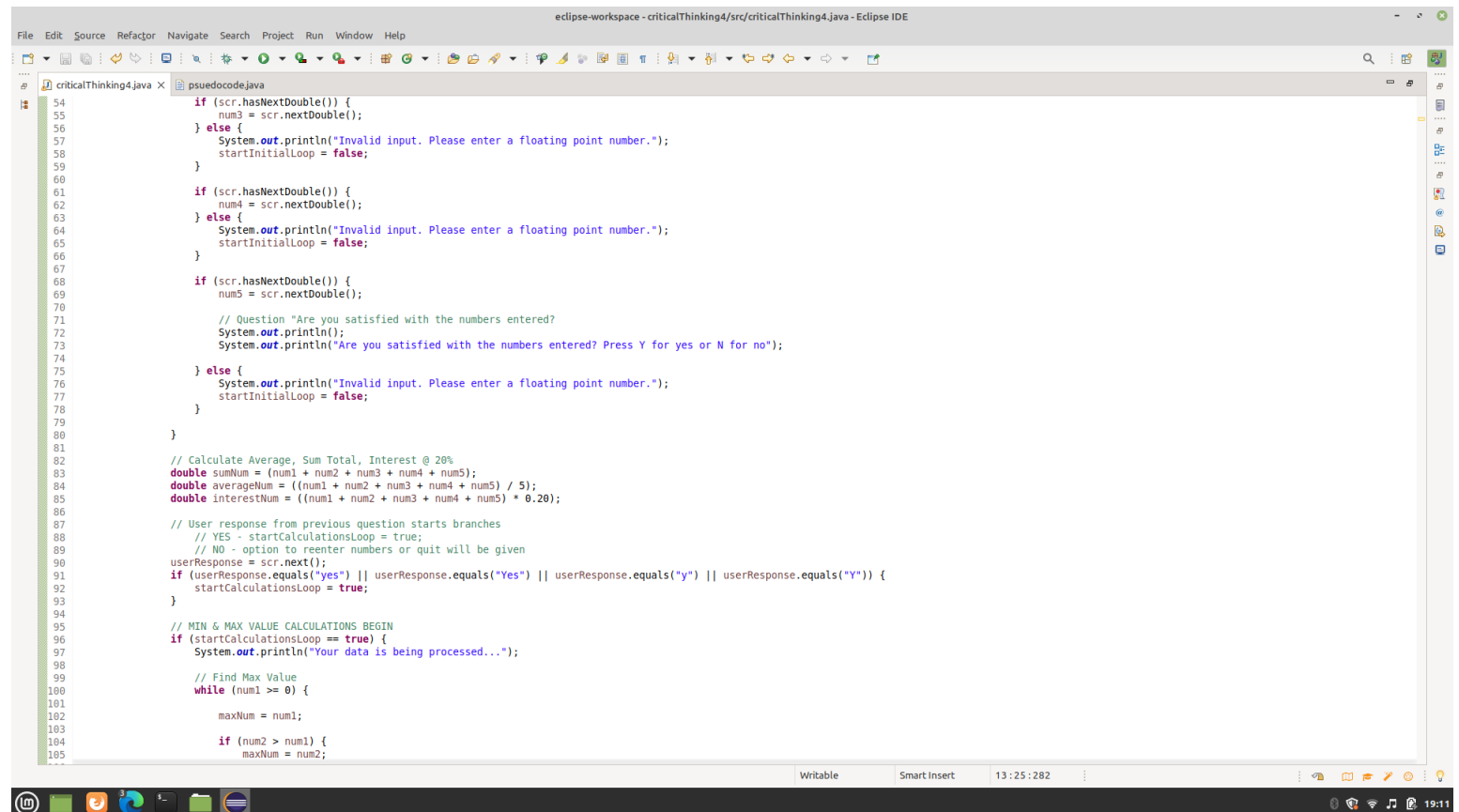
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### Source code Screenshots:



This screenshot shows the Eclipse IDE with the file `criticalThinking4.java` open. The code includes imports for `Scanner` and `System.out`, followed by the `criticalThinking4` class and its `main` method. The `main` method initializes a `Scanner` object, sets up variables for numbers, max/min values, and user response. It then enters a `while` loop that prompts the user for input and handles non-numeric input errors.

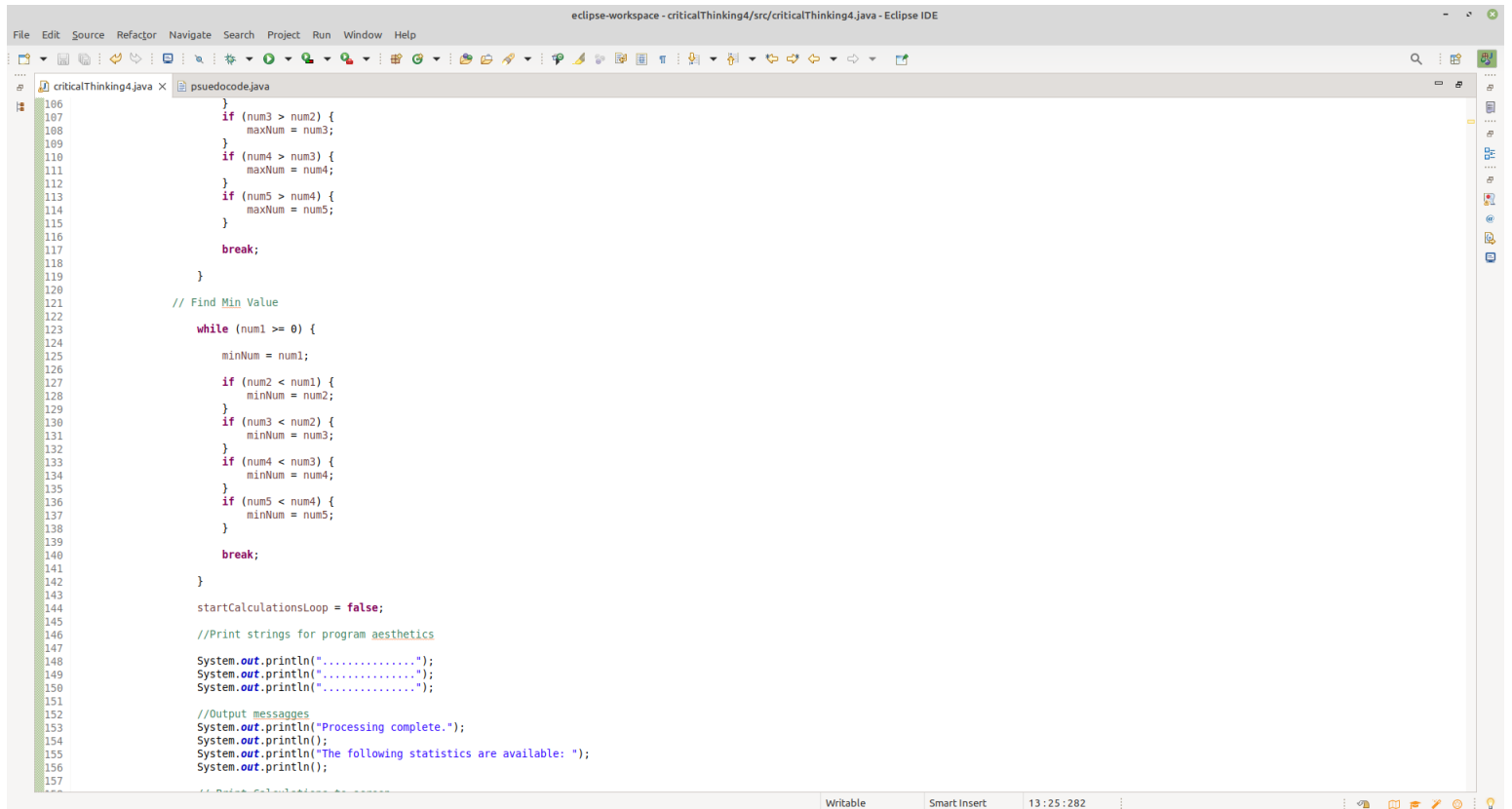
```
1 //Import Scanner class
2 //Set up Document
3 import java.util.Scanner;
4 public class criticalThinking4 {
5     public static void main(String[] args) {
6
7         //Initialize new scanner (scr)
8         Scanner scr = new Scanner(System.in);
9
10        //Set up variables
11
12        double num1 = 0;
13        double num2 = 0;
14        double num3 = 0;
15        double num4 = 0;
16        double num5 = 0;
17
18        double maxNum = 0;
19        double minNum = 0;
20
21        String userResponse;
22
23        boolean startInitialLoop = false;
24        boolean startCalculationsLoop = false;
25
26        // Initialize Loop Structure
27        System.out.println("Would you like to begin?");
28        userResponse = scr.next();
29
30        if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
31            startInitialLoop = true;
32
33            while (startInitialLoop == true) {
34                //BEGIN MAIN LOOP
35
36                if (startInitialLoop == true) {
37                    // Enter 5 floating point numbers
38                    System.out.println("Enter 5 floating point numbers...");
39
40                    //Error handling mechanism for non-numeric input
41                    if (scr.hasNextDouble()) {
42                        num1 = scr.nextDouble();
43                    } else {
44                        System.out.println("Invalid input. Please enter a floating point number.");
45                        startInitialLoop = false;
46                    }
47
48                    if (scr.hasNextDouble()) {
49                        num2 = scr.nextDouble();
50                    } else {
51                        System.out.println("Invalid input. Please enter a floating point number.");
52                        startInitialLoop = false;
53                    }
54                }
55            }
56        }
57    }
58 }
```



This screenshot shows the continuation of the `criticalThinking4.java` code in the Eclipse IDE. It includes the logic for calculating the sum, average, and interest of the five numbers, and then prompts the user for a response to either recalculate or quit. It also includes a `while` loop to find the maximum value among the five numbers.

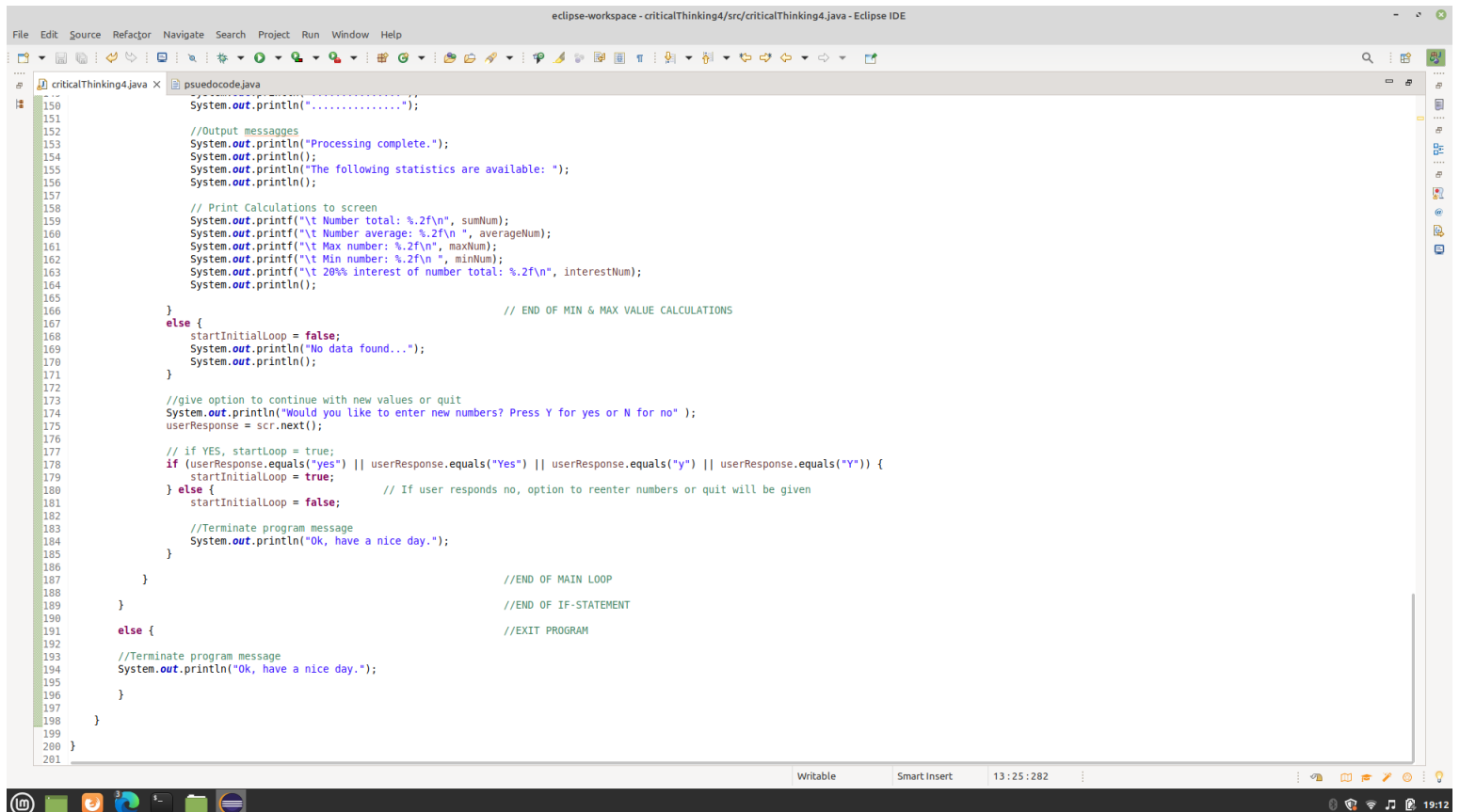
```
54         if (scr.hasNextDouble()) {
55             num3 = scr.nextDouble();
56         } else {
57             System.out.println("Invalid input. Please enter a floating point number.");
58             startInitialLoop = false;
59         }
60
61         if (scr.hasNextDouble()) {
62             num4 = scr.nextDouble();
63         } else {
64             System.out.println("Invalid input. Please enter a floating point number.");
65             startInitialLoop = false;
66         }
67
68         if (scr.hasNextDouble()) {
69             num5 = scr.nextDouble();
70
71             // Question "Are you satisfied with the numbers entered?"
72             System.out.println();
73             System.out.println("Are you satisfied with the numbers entered? Press Y for yes or N for no");
74
75         } else {
76             System.out.println("Invalid input. Please enter a floating point number.");
77             startInitialLoop = false;
78         }
79     }
80
81     // Calculate Average, Sum Total, Interest @ 20%
82     double sumNum = (num1 + num2 + num3 + num4 + num5);
83     double averageNum = ((num1 + num2 + num3 + num4 + num5) / 5);
84     double interestNum = ((num1 + num2 + num3 + num4 + num5) * 0.20);
85
86     // User response from previous question starts branches
87     // YES - startCalculationsLoop = true;
88     // NO - option to reenter numbers or quit will be given
89     userResponse = scr.next();
90     if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
91         startCalculationsLoop = true;
92     }
93
94     // MIN & MAX VALUE CALCULATIONS BEGIN
95     if (startCalculationsLoop == true) {
96         System.out.println("Your data is being processed...");
97
98         // Find Max Value
99         while (num1 >= 0) {
100             maxNum = num1;
101
102             if (num2 > num1) {
103                 maxNum = num2;
104             }
105         }
106     }
107 }
```

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The screenshot shows the Eclipse IDE with the file `criticalThinking4.java` open. The code is in the `psuedocode.java` editor. The visible code includes a loop for finding the maximum value, a loop for finding the minimum value, and some output messages. The code is as follows:

```
106     }
107     if (num3 > num2) {
108         maxNum = num3;
109     }
110     if (num4 > num3) {
111         maxNum = num4;
112     }
113     if (num5 > num4) {
114         maxNum = num5;
115     }
116
117     break;
118 }
119
120 // Find Min Value
121
122 while (num1 >= 0) {
123     minNum = num1;
124
125     if (num2 < num1) {
126         minNum = num2;
127     }
128     if (num3 < num2) {
129         minNum = num3;
130     }
131     if (num4 < num3) {
132         minNum = num4;
133     }
134     if (num5 < num4) {
135         minNum = num5;
136     }
137
138     break;
139 }
140
141 startCalculationsLoop = false;
142
143 //Print strings for program aesthetics
144 System.out.println(".....");
145 System.out.println(".....");
146 System.out.println(".....");
147
148 //Output messages
149 System.out.println("Processing complete.");
150 System.out.println();
151 System.out.println("The following statistics are available: ");
152 System.out.println();
153
```



The screenshot shows the Eclipse IDE with the file `criticalThinking4.java` open. The code is in the `psuedocode.java` editor. The visible code includes output messages, calculations, and a loop for user input. The code is as follows:

```
150 System.out.println(".....");
151
152 //Output messages
153 System.out.println("Processing complete.");
154 System.out.println();
155 System.out.println("The following statistics are available: ");
156 System.out.println();
157
158 // Print Calculations to screen
159 System.out.printf("\t Number total: %.2f\n", sumNum);
160 System.out.printf("\t Number average: %.2f\n ", averageNum);
161 System.out.printf("\t Max number: %.2f\n", maxNum);
162 System.out.printf("\t Min number: %.2f\n ", minNum);
163 System.out.printf("\t 20% interest of number total: %.2f\n", interestNum);
164 System.out.println();
165
166 // END OF MIN & MAX VALUE CALCULATIONS
167
168 else {
169     startInitialLoop = false;
170     System.out.println("No data found...");
171     System.out.println();
172 }
173
174 //give option to continue with new values or quit
175 System.out.println("Would you like to enter new numbers? Press Y for yes or N for no");
176 userResponse = scr.next();
177
178 // if YES, startLoop = true;
179 if (userResponse.equals("yes") || userResponse.equals("Yes") || userResponse.equals("y") || userResponse.equals("Y")) {
180     startInitialLoop = true;
181 } else {
182     startInitialLoop = false;
183 }
184
185 //Terminate program message
186 System.out.println("Ok, have a nice day.");
187
188 }
189
190 //END OF MAIN LOOP
191
192 //END OF IF-STATEMENT
193
194 else {
195     //EXIT PROGRAM
196
197     //Terminate program message
198     System.out.println("Ok, have a nice day.");
199 }
200 }
201
```

## Module 4: Critical Thinking

### Screenshots of the application executing

- User input error handling

```
Problems @ Javadoc Declaration Console X
criticalThinking4 [Java Application] [pid: 96546]
Would you like to begin? Press Y for yes or N for no
Y
Enter 5 floating point numbers...
12.1
e
Invalid input. Please enter a floating point number.
Invalid input. Please enter a floating point number.
Invalid input. Please enter a floating point number.
Invalid input. Please enter a floating point number.
No data found...

Would you like to enter new numbers? Press Y for yes or N for no
```

- Code execution & results

```
Problems @ Javadoc Declaration Console X
<terminated> criticalThinking4 [Java Application] /usr/lib/jvm/java-17-openjdk-amd64/bin/java (Dec 10, 2023, 7:50:55 PM – 7:51:58 PM) [pid: 96697]
Would you like to begin? Press Y for yes or N for no
Y
Enter 5 floating point numbers...
12.1
12.2
12.3
12.4
12.5

Are you satisfied with the numbers entered? Press Y for yes or N for no
N
No data found...

Would you like to enter new numbers? Press Y for yes or N for no
Y
Enter 5 floating point numbers...
12.1
12.2
12.3
12.4
12.5

Are you satisfied with the numbers entered? Press Y for yes or N for no
Y
Your data is being processed...
.....
.....
.....
Processing complete.

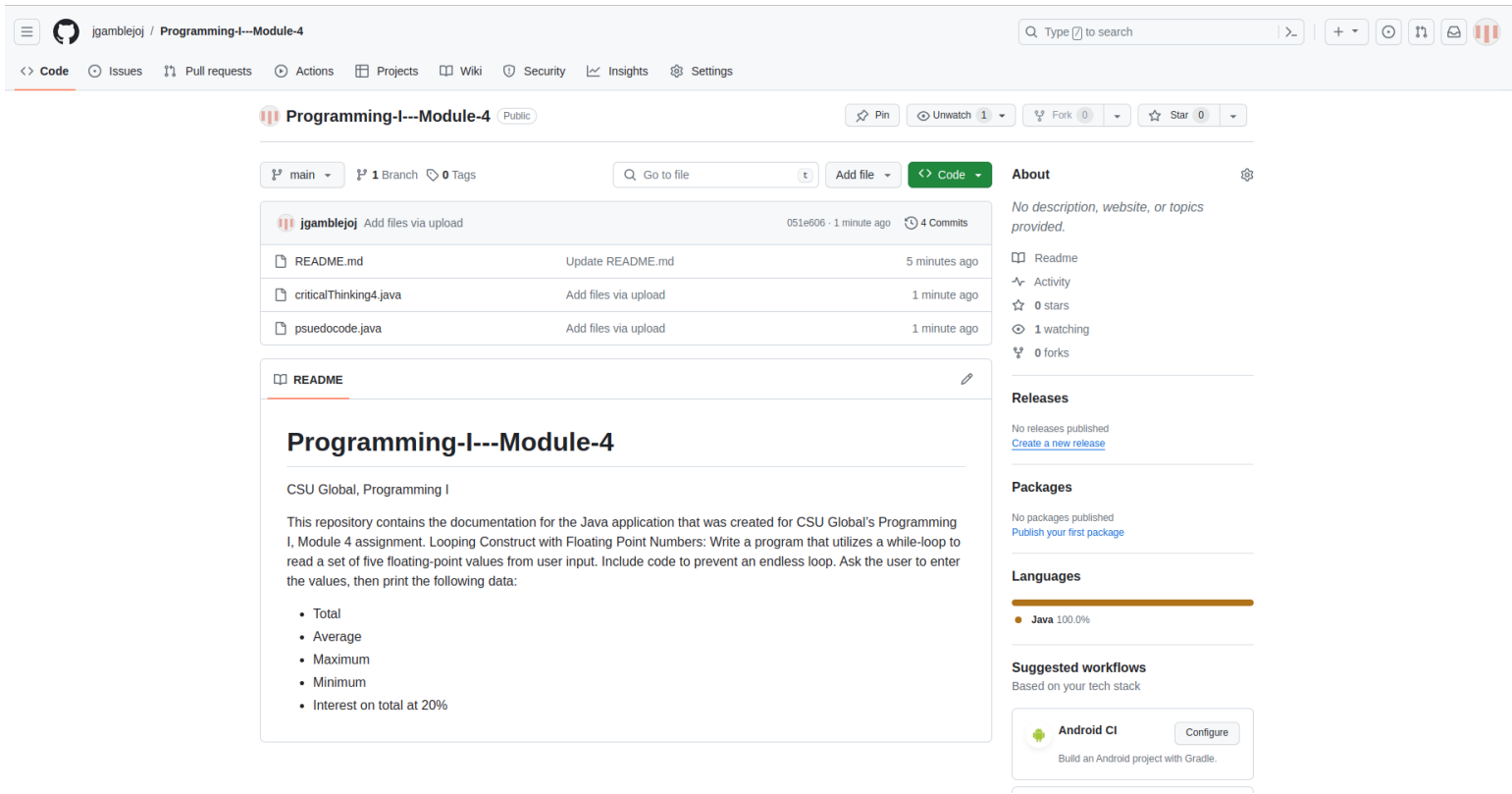
The following statistics are available:

    Number total: 61.50
    Number average: 12.30
    Max number: 12.50
    Min number: 12.10
    20% interest of number total: 12.30

Would you like to enter new numbers? Press Y for yes or N for no
N
Ok, have a nice day.
```

# Module 4: Critical Thinking

## Screenshot of Git Repository



Here is the link to the assignment’s Git repository: <https://github.com/jgamblejoj/Programming-I---Module-4>