Assignment #3 (CS210 – S24 – 10146)

# Coding #1: **Average Value of Numbers in Array** (10 Points)

## **Objective**: Develop a Java program to compute the average value of numbers present in an array.

### **Part A: A Class with Average Method**

1. Method Specification:

* calculateAverage method with an int[] numbers parameter that returns a double.

1. Implementation Details:

* Sum all elements in the array and divide by the count to get the average.
* Return 0.0 if the array is empty or has zero length.
* Implement the method without using external libraries or predefined array utility functions.

1. Unit Tests:

* Write a comprehensive set of unit tests to verify the functionality of the calculateAverage method under various scenarios including:
* Typical cases with positive and negative integers.
* Boundary conditions such as empty arrays.
* Arrays with only one number.

### **Part B: Application Entry Point**

1. A separate class with main method:

* Create a separate class that includes the main method.

1. Program Behavior:

* Continuously read sets of integers (count and then the integers) until a count of 0 is encountered.
* Parse the numbers into an array and call calculateAverage.
* Output the average value formatted to one decimal place using String.format("%.1f", average).
* If the count is 0, print the output from calculateAverage method with an empty array and terminate the program.
* *Do NOT prompt the user for inputs.*

### **Part C: Sample Input and Output**

Input:

5 10 20 30 40 50

3 100 200 300

0

Output:

30.0

200.0

0.0

Explanation:

* The first line indicates that the array has 5 numbers: 10, 20, 30, 40, 50. The average is (10 + 20 + 30 + 40 + 50) / 5 = 30.0.
* The second line has 3 numbers: 100, 200, 300. The average is (100 + 200 + 300) / 3 = 200.0.
* The count 0 indicates no elements, resulting in an output of 0.0.

### **Submission Details**

* Ensure the code is well-commented and that it compiles and runs as expected.
* Package all project files in a zip file with your name as part of the file name.

# Coding #2: **Sort Numbers from Largest to Smallest with Selection Sort** (10 points)

## **Objective**: Develop a Java program to sort an array of integers from largest to smallest using the Selection sort algorithm.

### **Part A: A Class with Sorting Method**

1. Method Specification:

* Method Name: selectionSortDescending
* Parameters:
  + int[] numbers – an array of integers to be sorted.
* Return type: void – the sorted array will be modified in-place.

1. Implementation Details:

* Implement the selection sort to sort the array in descending order (largest to smallest).
* Implement this method without using external libraries or predefined sorting functions.

1. Unit Tests:

* Write a comprehensive set of unit tests to verify the functionality of the selectionSortDescending method under various scenarios including:
  + Typical cases with positive and negative integers.
  + Boundary conditions such as empty arrays.
  + Arrays with some identical numbers.

### **Part B: Application Entry Point**

1. A separate class with main method:

* Create a separate class that includes the main method.

1. Program Behavior:

* Continuously read sets of integers (count and then the integers) until a count of 0 is encountered.
* Parse the numbers into an array and call selectionSortDescending.
* Print the sorted array on a single line for each set. Use a single whitespace character between integers and do not have trailing whitespaces.
* *Do NOT prompt user for inputs*.

### **Part C: Sample Input and Output**

Input:

5 10 7 2 15 8

4 -5 0 3 99

0

Output:

15 10 8 7 2

99 3 0 -5

0

Explanation:

* The first line of input represents an array with a count of 5, followed by integers 10 7 2 15 8. The sorted output is 15 10 8 7 2.
* The second line represents another array with a count of 4, followed by integers -5 0 3 99. The sorted output is 99 3 0 -5.
* The count 0 indicates no more elements to sort and results in terminating the program.

### **Submission Details**

* Ensure the code is well-commented and that it compiles and runs as expected.
* Package all project files in a zip file with your name as part of the file name.