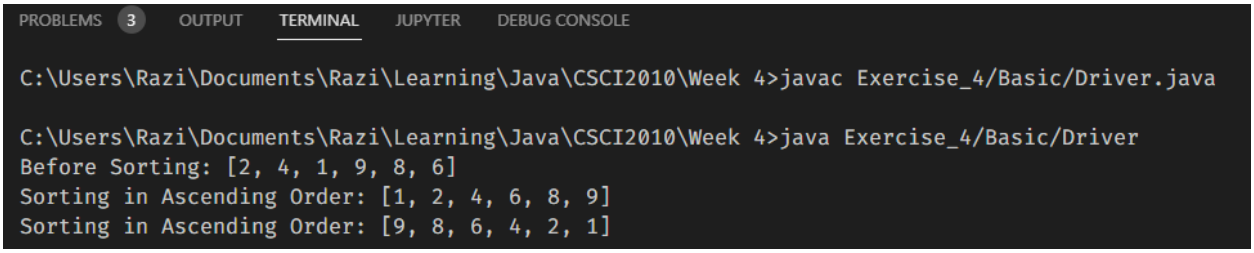
Academic Year	**2022**
Semester	☒ Fall ☐ Winter ☐ Summer
Course Code - Name	CSCI 2010U – Data Structures
Instructor	Dr. Razi Iqbal
Assessment	Exercise 4

Question 1 (Basic)

This exercise tests your knowledge of arrays in Java.

Write a Java program that creates a class `Driver` which has a `main` method that declares an array which is then passed to a function called `sortDescending(int arr[])`. This function is expected to sort the array in descending order and display it. For the purpose of this exercise, also sort the array in ascending and show it on the console along with the original array.

Below is the screenshot of the expected output of this program:



Try to run the program using commands in terminal to get more practice.

Question 2 (Intermediate)

This exercise tests your knowledge of arrays in Java.

Write a Java program that creates a class `Student` which has two instance members `String name; int age.` Create a parameterized Student constructor as `Student(String name, int age)` to initialize students.

Creates a class `Driver` which has a `main` method that declares an array of `Student` objects as below:

```
Student students[] = new Student[]
{
            new Student("Steve", 55),
            new Student("Bill", 65),
            new Student("Warren", 75),
            new Student("Elon", 45),
            new Student("John", 35),
};
```

In Driver class, create `public static Student getOldest(Student students[])` method that takes in the students array create above and finds the oldest students (student with highest age) and returns it. Finally, in the main method show the name and age of the oldest student.

Below is the expected output:

```
PROBLEMS 3   OUTPUT   TERMINAL   JUPYTER   DEBUG CONSOLE

C:\Users\Razi\Documents\Razi\Learning\Java\CSCI2010\Week 4>javac Exercise_4/Intermediate/Student.java

C:\Users\Razi\Documents\Razi\Learning\Java\CSCI2010\Week 4>javac Exercise_4/Intermediate/Driver.java

C:\Users\Razi\Documents\Razi\Learning\Java\CSCI2010\Week 4>java Exercise_4/Intermediate/Driver
Oldest Student is: Warren with age: 75
```

Try to run the program using commands in terminal to get more practice.

Question 3 (Advanced)

This exercise tests your knowledge of arrays in Java.

Write a Java program that creates a class `Driver` which has a `main` method that declares an `ArrayList` which is then passed to a function called `runningSum(ArrayList<Integer> numbers)`. This function is expected to return the running sum of the provided `ArrayList` in the form of an integer `ArrayList`. For example, if provided array is [1, 2, 3, 4], this function should return you [1, 3, 6, 10] which is the running sum of the provided array. To start with, you can create a separate `ArrayList` to hold the running sum and return that. Once you are done with this approach, improve your program to use already available `ArrayList` which is provided through the parameter to this function so that Space Complexity of this function can be reduced from `O(n)` to `O(1)`.

Below is the expected output:

```
PROBLEMS 4   OUTPUT   TERMINAL   JUPYTER   DEBUG CONSOLE

C:\Users\Razi\Documents\Razi\Learning\Java\CSCI2010\Week 4>javac Exercise_4/Advanced/Driver.java

C:\Users\Razi\Documents\Razi\Learning\Java\CSCI2010\Week 4>java Exercise_4/Advanced/Driver
Original Array: [1, 2, 3, 4]
Resultant Array: [1, 3, 6, 10]
```

Try to run the program using commands in terminal to get more practice.