

**Program 4 – Big-O, ArrayList**

100 points

**IMPORTANT**

You must write your code while **carefully following the “IT 179 Program Grading Guidelines”** described in the file **posted with Program 1**.

**Question 1 (15 points)**

1. determine how many times the `println` statement is executed in each of the following code fragments (fill out Table 1)

```
//Fragment A:  
for (int i = 0; i < n; i++)  
    for (int j = 0; j < n; j++)  
        System.out.println(i + " " + j);
```

```
//Fragment B:  
for (int i = 0; i < n; i++)  
    for (int j = 0; j < 2; j++)  
        System.out.println(i + " " + j);
```

2. Based on the determined number of times that the `println` statement is executed, write the Big-O of fragments A and B respectively (fill out Table 1).

Fragment	Number of times the <code>println</code> statement is executed	O(?)
Fragment 1		
Fragment 2		

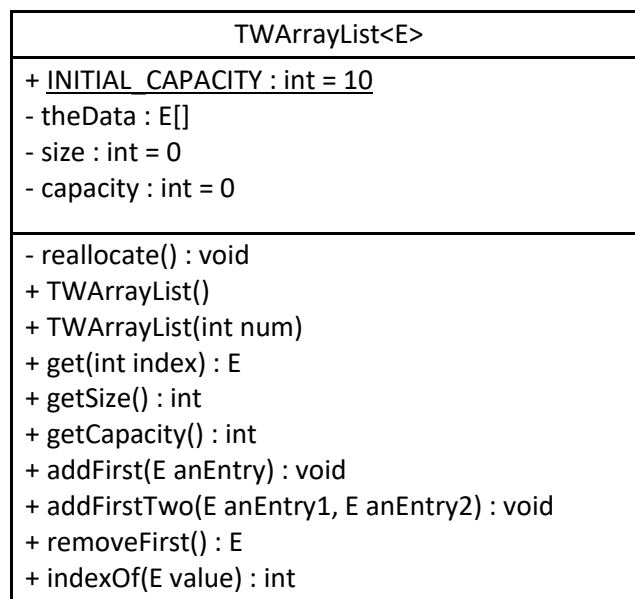
Table 1.

**Set-Up**

Create a new Java project named: **P4**. Next, inside the created Java project **P4**, create a Java package: which will be used to hold your code for question 2.

**Question 2 (85 points)****1. (70 points)**

Use the following UML diagram as a reference. Inside the Java package q02, create a class **TWArrayList<E>** and three driver testing classes TWArrayListTest1, TWArrayListTest2 and TWArrayListTest3.



The following is an explanation of the last four methods of the class TWArrayList:

<code>public void addFirst(E anEntry)</code>	<code>// Adds an item at the beginning of the array list</code>
<code>public void addFristTwo (E anEntry1, E anEntry2)</code>	<code>// Adds two items to an array list</code>

	// Item anEntry1 will be added at the first position of the array list // Item anEntry2 will be added at the second position of the array list
public E removeFirst()	// Removes the first item of an array list
public int indexOf(E value)	// Searches for value and returns the position of the first occurrence, or -1 if it is not in the list

## 2. (15 points)

Write the three driver classes:

**TWArrayListTest1:** create an array list object with constructor `TWArrayList(int num)` with the argument 1 (**1 being the initial capacity**). Then, call `addFirst(E anEntry)` method three times with arguments “sun1”, “sun2” and “sun3” respectively. Next, call `addFirstTwo(E anEntry1, E anEntry2)` with argument “sun4” and “sun5”. Then, call the `removeFirst()` method.

**TWArrayListTest2:** create an array list object with constructor `TWArrayList()`. Then, call the `addFirst(E anEntry)` method two times with arguments “sun1” and “sun2” respectively. Next, call `removeFirst()` method three times.

**TWArrayListTest3:** create an array list object with constructor `TWArrayList()`. Then call the `addFirstTwo(E anEntry1, E anEntry2)` method two times with arguments “sun1” and “sun2” in the first call, and “sun3” and “sun4” in the second call. Next, call the `indexOf(E value)` method three times with the argument “sun1”, “sun4” and “sun5” respectively.

### To Be Submitted

Please zip your Java project in a file called P4.zip and submit to ReggieNet before the due date. Your submission must contain two items:

\* **This Word file** with your answers to **question 1**.

\* The **P4.zip** file containing all four classes:

TWArrayList.java.java  
TWArrayListTest1.java  
TWArrayListTest2.java  
TWArrayListTest3.java