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 `println` 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.

TWArrayList<E>
+ INITIAL_CAPACITY : int = 10 - theData : E[] - size : int = 0 - capacity : int = 0
- reallocate() : void + TWArrayList() + TWArrayList(int num) + get(int index) : E + getSize() : int + getCapacity() : int + addFirst(E anEntry) : void + addFirstTwo(E anEntry1, E anEntry2) : void + removeFirst() : E + indexOf(E value) : int

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

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

	// 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