**Lab Assignment – 2  
Total Points: 100**

**Due Date: Jan 27 (Tuesday), 11.59 pm**

**Create a NetBeans project named lab02 and ensure it is saved to a location like desktop or your flash drive. In the project you would be doing the following:**

A ***bag*** in java is a kind of ***collection*** that doesn’t do much more than contain its items. It does not order the items in any particular order and nor does it prevent duplicates. Develop a ***java*** ***interface*** named ***Bag*** that can store a certain number of whole numbers in it. Provide the following methods in the interface.

* ***getCurrentSize( )*** that returns a count of numbers in the ***bag***
* ***isEmpty( )*** – that checks if the ***bag*** is empty
* ***add (int num)*** – adds a new number ***num*** to the ***bag***
* ***remove (int n)*** – removes the first occurrence of the number ***num*** from the bag
* ***remove( )*** – removes randomly a number from the bag
* ***clear( )*** – removes all the numbers from the bag
* ***getFrequencyOf(int num)*** – counts the number of times the number ***num*** exists in the bag
* ***contains(int num)*** – Tests whether the bag contains the number ***num***.

Design a ***java*** ***class*** called ***Scores*** that implements the ***Bag interface*** and provides implementation for all the methods inherited through the ***Bag*** interface. Do the following in the ***Scores*** class:

* Declare an instance variable ***list*** – an array of ***int*** type: This structure will hold the numbers in the bag.
* Declare another instance variable ***count*** - ***int*** type: This will provide the count of numbers currently stored in the bag. This count will increment as a new number is added to the list and decrement as a number is removed from the list
* Provide a default constructor that will initialize the instance variable list to a new array of length 50.
* Provide an overloaded constructor that will take an ***int*** value as parameter and initialize list to a new array of that length.
* Implement the ***getCurrencySize( ), isEmpty( )*** and ***Clear( )*** methods using the descriptions provided in the ***Bag*** interface
* Implement the ***add (int num)*** method using the specification provided in the ***Bag*** interface. This method should be able to add a new number to the end of the list ONLY IF the array is not full.
  + If the array list is full (when the count equals the ***length*** of the array) then, create a new bigger array - ***temp*** with double the length of list array.
  + copy the contents from list to ***temp*** array in the same order.
  + Assign the reference of ***temp*** to list and set temp to ***null***.
  + Add the new number to the end of the list.
* Implement ***getFrequencyOf( int num)*** and contains ***(int num)*** methods using the descriptions from the ***Bag*** interface
* Implement ***remove( int num)*** method that removes the first occurrence of the number ***num*** in the list array. If the number num does not exist then the method does not do anything.
  + If removal is successful and number removed is not the last number in the list, then shift the elements by one place to the left in the list.
* Implement ***remove ( )*** method that removes a random number from the list array (Use the ***Random*** class from ***java.util*** package to generate pseudorandom index).
  + After the number is removed shift the elements by one place to the left in the list.
* Implement a new method called, ***get (int i)*** that returns the number at the ***ith*** index position in the list. If the index is outside the bounds of the array, it generates an ***ArrayIndexOutOfBoundsException.***

Finally design a ***java class*** ***TestScores*** with the ***main( )*** method and do the following:

* Create an Object of Type ***Scores*** using the overloaded constructor and pass the value 100.
* Use a ***for*** loop to populate to populate the list in Scores object with random numbers between   
  1 – 1000. (Use the ***Random*** class from ***java.util*** package to generate pseudorandom numbers).
* Run a ***for*** loop to print the contents of the list array in the ***Scores*** object.
* Call the ***add( )*** method to add the number 606 to the Bag
* Print the current size of the list in the Scores object.
* Call the ***remove( )*** method to randomly remove a number from the Bag
* Get the number at the 75th index position
* Call the appropriate overloaded ***remove ()*** method to remove the first occurrence of number retrieved in the earlier step from the Bag
* Run a ***for*** loop to print the contents of the list array in the ***Scores*** object.
* Print the frequency of the number 100
* Check whether the list array in ***Scores*** object contains the number 606.

Use ***JavaDoc*** commenting styles in ***Bag*** interface and ***Score***s class. Make sure to provide a block comment at the top that provides description of the interface/class. Use single line commenting style in the ***TestScores*** class.

Next create a **UML diagram** of the ***Bag*** interface, and ***Scores*** class using MS Visio.

**Things to turn in:**

* Open a Microsoft Word document name using the following file naming convention
  + i.e. *lab02-LnameFM*
    - lab02 = assignment prefix
    - Lname = your last name
    - F = your first initial
    - M = your second initial
* Copy and Paste the source code of the ***Bag*** Interface (make sure to use   
  *Ctrl + A* to select all the source code of the program and *Ctrl + C* to copy).
* Copy and Paste the source code of the ***Scores*** class.
* Copy and Paste the source code of the client program - ***TestScores***
* Copy and paste the output of the client program
* Create a screen capture of your NetBeans IDE that includes the contents of the Output Window and paste it into your Word document below your source code.
  + To create a screen capture of your NetBeans IDE
    - Select, left-click in the NetBeansIDE
    - Use Alt-PrintScreen to place an screen capture image on the clipboard
    - Use Ctrl-V to paste the contents of the clipboard into your Word document
* Copy and paste the ***UML diagram*** of the Bag interface and Scores class
* Next, zip the Project folder.
* Finally on blackboard, submit both your Word document and project zipped file.