Homework #2

You need to implement a linked list that contains String objects. Here are the two classes with the method signatures that you need to implement. The StringLinkedBag class contains the linked list of nodes. The node objects are instances of the StringNode class:

Class StringNode:

```
public StringNode(String initialData, StringNode initialLink)
public void addNodeAfter(String item)
public String getData( )
public StringNode getLink( )
public static StringNode listCopy(StringNode source)
public static StringNode[ ] listCopyWithTail(StringNode source)
public static int listLength(StringNode head)
public static StringNode[ ] listPart(StringNode start, StringNode end)
public static StringNode listPosition(StringNode head, int position)
public static StringNode listSearch(StringNode head, String target)
public void removeNodeAfter( )
public void setData(String newData)
public void setLink(StringNode newLink)
```

Class StringLinkedBag (implements Cloneable interface)

```
public StringLinkedBag( )
public void add(String element)
public void addAll(StringLinkedBag addend)
public void addMany(String... elements)
public Object clone( )
public int countOccurrences(String target)
public String grab( )
public boolean remove(String target)
public int size( )
public static StringLinkedBag union(StringLinkedBag b1, StringLinkedBag b2)
```

You need to think about what private data members you need to define for the StringNode class. You also need to think about what private data members you need for the StringLinkedBag class.

Here is the test code that you can use to verify if your code is working correctly:

```
public class StringLinkedBagTest {

    public static void main(String args[]){

            StringLinkedBag bag = new StringLinkedBag();
```

```
            // add elements to bag
            bag.add("apple");
            bag.add("banana");
            bag.add("peach");
            bag.add("orange");

            System.out.println("Number of items in the bag = " +
bag.size());
            System.out.println("Number of apples in the bag = " +
bag.countOccurrences("apple"));

            // add contents of one bag to anther bag
            StringLinkedBag anotherBag = new StringLinkedBag();
            anotherBag.add("apple");
            anotherBag.add("watermelon");
            bag.addAll(anotherBag);

            System.out.println();
            System.out.println("Number of items in the bag = " +
bag.size());
            System.out.println("Number of apples in the bag = " +
bag.countOccurrences("apple"));

            // remove the watermelon
            bag.remove("watermelon");

            // grab a random item from the bag.
            System.out.println();
            System.out.println(bag.grab());

    }

}
```

The output should be similar. Note that the item that is grabbed from the bag can change each time you run the program:

```
Number of items in the bag = 4
Number of apples in the bag = 1

Number of items in the bag = 6
Number of apples in the bag = 2

apple
```

Notes:

A node typically has a data member that holds the data in the node and another data member pointing to the next node.

The bag class contains a list of nodes (one for each item in the bag). Given that, the bag should have a pointer to the first node in the bag. As described in the book, a data structure that uses a linked list could always count the items in the list when the client needs to know how many items there are. Or, you can also

have a data member that keeps track of the number of items. You would need to increment and decrement this counter appropriately when adding items and removing items from the bag.

You need to submit your source code in a zip file. Also, paste the output of the above test code running against your source code here:

Number of items in the bag = 4
Number of apples in the bag = 1

Number of items in the bag = 6
Number of apples in the bag = 2

apple