Practice Problems 3/28/2016

Part 1: AList

1. Given the following add method for the AList (ArrayList) class, write a test method that will thoroughly test the method.

```
// @Precondition : The array list has room for another entry
public void add(int newPosition, T newEntry) {
      checkInitialiation();
      if ((newPosition >= 1) && (newPosition <= numberOfEntries + 1)) {
            if (newPosition <= numberOfEntries) {
                  for (int i = numberOfEntries; i >= newPosition; i--)
                        list[i + 1] = list[i];
            }
            list[newPosition] = newEntry;
            numberOfEntries++;
            ensureCapacity();
      } else {
            throw new IndexOutOfBoundsException("Out of bounds");
      }
} // end add
```

2. Given the following remove method for the AList (ArrayList) class, write a test method that will thoroughly test the method.

```
// @Precondition : The array list is not empty
public T remove(int givenPosition) {
            checkInitialiation();
      if ((givenPosition >= 1) && (givenPosition <= numberOfEntries)) {
            T result = list[givenPosition];
            if (givenPosition < numberOfEntries) {
                  for (int i = givenPosition; i < numberOfEntries; i++)
                        list[i] = list[i + 1];
            }
            numberOfEntries--;
            return result;
      } else {
            throw new IndexOutOfBoundsException("Out of bounds");
} // end remove
```

3. Look at the API for ArrayList. What are the differences between the methods available for AList and for ArrayList?
https://docs.oracle.com/javase/7/docs/api/java/util/ArrayList.html

Part 2: Sentinel Nodes

1. What is a sentinel node?
a. A null node only at the beginning of a list.
b. A null node only at the end of a list.
c. A null node at the beginning and end of a list.
d. A null node anywhere in the list.

2. How would you declare a new sentinel Node<T> named front?

3. Given an empty doubly linked list with two sentinel nodes, front and back, what does the list look like?

4. Given a doubly linked list with one element, A, and two sentinel nodes, front and back, what does the list look like?

Part 3: List Efficiency

Fill out the following table for big O efficiency (worst case):

Operation	AList (array)	LList (singly linked list)	LList (singly linked list with head and tail references)	LList (doubly linked list with firstNode and lastNode reference)
add(newEntry)				
add(position, newEntry)				
toArray()				
remove(position)				
replace(position, newEntry)				
getEntry(position)				
contains(entry)				
clear()				
getLength()				
isEmpty()				