CS212 - Lab 6b

OrderedArrayList Class

When a communications site transmits a message through a packet-switching network, it does not send the message as a continuous stream of data. Instead, it divides the message into pieces, called packets. These packets are sent through the network to a receiving site, which reassembles the message. Sometimes packets are transmitted to the receiving site along different paths. As a result, they are likely to arrive out of sequence (you have probably seen this occur with long SMS messages.) In order for the receiving site to reassemble the message correctly, each packet must include the relative position of the packet within the message.

For example, if the message "A SHORT MESSAGE" is broken into packets of five characters long and prefaced with a number denoting the packet's position in the message, the result is the following set of packets.

1 A SHO
2 RT ME
3 SSAGE

No matter what order these packets arrive, a receiving site can correctly reassemble the message by placing the packets in ascending order based on their position numbers.

A. Create a new package called *lab6b* and copy the files*ArrayListADT.java, ArrayList.java, UnorderedArrayList.java* into it. *(From lab6a)*

B. **Write the code for the *OrderedArrayList* class:**

   Create a new class named **OrderdArrayList** that extends **ArrayList**.

   The methods, *add(T insertItem), indexOf(T searchItem)*, *lastIndexOf(T searchItem), contains(T searchItem), get(int index), remove(T removeItem) and remove(int index)* are defined as abstract in the ArrayList class, therefore they must be implemented in the *OrderedArrayList* class. For the *indexOf* method, write the code for a binary search.

C. Change the array-list classes to restrict the generic type, **<T>**, to **<T extends Comparable<T>>**.

D. **Create a class for a packet**:
   1. Each packet contains a position number and the rest of the line contains the characters from the message. The class header for the **Packet** class should be
      ```
      public class Packet implements Comparable<Packet>
      ```
      and the ***compareTo*** method should order the packets by the position number.

E. **In the Lab6bApp, write code to do the following:**

   1. Create an *OrderedArrayList* object.

   2. Read lines of data, from a text file (**packet.dat**) representing the packets.

3. For each line read, create a **Packet** object and add it to the *OrderedArrayList***.**

4. Remove the packets from the *OrderedArrayList* and output the message 60 characters per line. If the last word on the line cannot fit in the remaining space on the line, move it to the beginning of a new line - do not split words between lines.