CS 0445 Spring 2024
Recitation Exercise 6

Introduction:

In Assignment 2 you utilized the A2LList<T> class as the base class for your LinkedListPlus<T> and ReallyLongInt classes. With a careful look at A2LList<T> you will note that there are only 2 methods in the class that require iteration within the list:

public boolean contains(T anEntry); // return true if anEntry is found within the list
                                     // return false otherwise

private Node getNodeAt(int givenPosition); // return the Node at position i (where position 1
                     // is the front of the list). Note that this method is private

If you look at some of the public methods (ex: add(i, newEntry), remove(i), etc) you will see that these methods call getNodeAt() and don't otherwise traverse the list.

Thus, we can convert the A2LList<T> class into an exclusively recursive implementation if we convert the two methods above into recursive versions.

Details:

Consider the file A3LList.java that is provided with this exercise. Note that the file is missing the code for the methods above, but otherwise is identical to file A2LList.java from Assignment 2. In this exercise you must add the code for contains() and getNodeAt(), and it must **be entirely recursive** (i.e. no loops are allowed).

Recall from previous examples, when implementing a recursive method within a data structure, we typically have a 2nd, private method for the recursive approach, and have the public method call the private method. If you are unsure of this approach, see Recitation Exercise 5.

For both methods think carefully about what the base cases and recursive cases would be. Also think about the parameters necessary and how you will test for these cases. Note that the list is circular so you will not be able to check for null to detect the end of the list.

Once you have completed the A3LList<T> class test it with the main program below. Your output should match that in file Rec6Out.txt.

As usual, after completing this exercise, if you wish the share your solution with the rest of the class, please do so!

Note: To run the program you will need the following files:
        CS445Rec6.java (main program)
        A3LList.java (file that you must modify)