PROGRAM 12A, 12B
Sorts and Searches In Arrays
Recursive Series
AP Computer Science
Mr. Clausen

PROGRAM 12A I'm_Sort_of_Searching
(20 more points now, = 60 points total for Programs 9A, 11A, and 12A)

Continue this program from program 9A and program 11A. We will finish this exercise now in Chapter 12 with program 12A.

Your program should set up the main menu as shown below:

Main Menu for Sorts and Searches

1. Generate Random Numbers For the Original Array
2. Copy the Original Array
3. Sequential (Linear) Search
4. Binary Search (Iteration: The Array Must Be Sorted)
5. Binary Search (Using Recursion)
6. Selection Sort
7. Bubble Sort
8. Insertion Sort
9. Quick Sort
M. Merge Sort
0. Display the numbers
I. Insert a number into the Array
D. Delete a number from the Array
Q. Quit the program

Enter your Choice:

For program 12A we are implementing the choices for Binary Search (Using Recursion), Quick Sort, and Merge Sort.

After each sort, copy the duplicate array back into the original array, so that we will be sorting the same numbers each time for a better comparison of each sort.

In your menu there should be a choice for **Binary Search using recursion** (remember that a binary search assumes that the list of numbers is previously sorted). Ask the user to enter a number to search for, from 1 to the logical size of the array. Search through the array for that number. Make sure your program takes care of the case where the number is not found in the list. Also make sure to consider the case where the number occurs more than once (list the first index where the number occurs for the binary searches).

Don't forget to implement the Quick Sort and Merge Sort also.

When displaying the contents of the array **"list",** display the numbers using rows and 10 columns so that we can see more numbers on the monitor screen. You will need an "if" statement to force a new line after every 10 numbers. Format these numbers right justified with a width of 7, and make the "table" look nice.

Don't worry about classes for this program. **Write everything in one source code file named: LastNameFirstNameP12A.java. Use methods for each menu choice**. We will understand the reasons for this later (Ch 10), but start your method names with **public static** and then **void** or **int**, etc. The methods should be at the end of your program after the **}** that ends the **public static void main (String [] args)** method and before the final **}** that ends your **public class LastNameFirstNameP12A** class.

PROGRAM 12B Arithmetic_Series (20 points)

Use recursion only to generate an Arithmetic Series of the numbers from 1 to 100 with running sums of the numbers. (On line one the sum of just 1. On line two the sum of 1+2, line 3 sum of 1+2+3, line 4 the sum of 1+2+3+4, line 5 the sum of 1+2+3+4+5 etc.) Use a recursive method named SumUp to do the work. **DO NOT use iterative loops of any kind (you cannot use: for, while, or do while loops anywhere in this program)!** You will need an "if statement" to ensure the recursion has a well defined stopping state.

Print out the results in a nice table format as illustrated below.

TERM #	SUM
1	1
2	3
3	6
4	10
etc.	

Don't worry about classes for this program. **Write everything in one source code file named: LastNameFirstNameP12B.java.** We will understand the reasons for this later (Ch 10), but start your method names with **public static** and then **void** or **int**, etc. The methods should be at the end of your program after the **}** that ends the **public static void main (String [] args)** method and before the final **}** that ends your **public class LastNameFirstNameP12B** class.