CSCI 201 – Computer Science 1

Homework 7: Merging two sorted arrays
Due date: Monday March 18.

Objectives: *Learn to implement algorithms that work with multiple arrays.*
Understand the Merging algorithm.

Sometimes we need to combine the values in two sorted sequences to produce a larger sorted sequence. This process is called **Merging.**

As an example, if the first sequence (S_1)contains the numbers
```
 2 3 4 4 5 9
```
and the second sequence (S_2) contains the numbers
```
 1 4 5 8 9 11 12 13 17
```
the output sequence will contain
```
 1 2 3 4 4 4 5 5 8 9 9 11 12 13 17
```

Each sequence can be stored in an array. The strategy is as follows: Start by comparing the first items in the two input arrays. Write the smaller number to the output array, and move to the the next item in that array. This is repeated until we reach the end of any one of the input arrays; thereafter, we simply copy all the numbers from the other input array to the output array. (In the above example, we look at 2 from S_1 and 1 from S_2; since 1 is smaller, we write 1 to the output and look at the next number (4) from S_2, etc. After we examine 9, there are are no numbers left in S_1; we then copy the numbers 11, 12, 13 and 17 from S_2 to the output.)

Question 1. Write psuedocode to implement this strategy. The psuedocode should match the structure of a while loop, and will have three loops: *The first loop will run until one of the input arrays reaches its end. Following this we have an* `if` *statement that checks to see which array ended. If the first array ended, we enter a loop that copies all the remaining items from the second array to the output array. Otherwise, we enter a loop that copies all the remaining items from the first array to the output array.* (Note that since the first loop runs until the end of a sequence is reached, only one of the last two loops will execute in a given instance.)

Question 2. Write a program that does the following:

- Declares two arrays of 20 items each, and one array of 40 items

- Asks for the names of the input files and the output file.

- Calls the function `readSortedArray` (twice) to read at most 20 numbers from the each of the input files, and stores them in the two arrays of size 20.

- If both files can be successfully read, the program merges the sequences stored in the two arrays of size 20, into the array of size 40.

- Prints all the numbers in the array of size 40,to the output file, **on one line with interleaving spaces**.

What to turn in:

1. Psuedocode for Question 1.
2. Script file showing source code, compilation and all the tests. For each test, display the data files before the test and the output file after the test.
3. For the tests, we have the following possibilities: first file ends first, second file ends first, both files end together (i.e., on the same number). All these cases should be tested.