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Data Structures and Algorithms Assignment Set 2

Question 9:
Given two sorted arrays, write a function to merge the array in the sorting order

Solution Approach:
Imagine the 2 input arrays as two stacked decks of cards with numbers on them, least number at the top. Using this analogy, we can have a “rough” algorithm for merging these two sorted stacks into one sorted stack:

Step 1: Look at the top of the two stacks, pick the lower numbered card from the two tops of the two input stacks and put this card onto a 3rd card stack (which is initially empty). If one of the input stacks is empty; choose the top of the other stack and put it onto the 3rd stack.
Step 2: Repeat step 1 until both input stacks are finished.
Step 3: Notice that the 3rd stack is in the reverse order (largest numbered card on top). Reverse this 3rd stack to get final result.

Pseudocode:

```
merge(A, B) {
        //Merge A and B and return result, assuming A and  B are in ascending order.
        Create a new array C of length (length of A + length  of B)
        i = 1, j = 1, k = 1 //Tops of stacks A, B and C, assume 1-based indexes
        while i <= length of A and j <= length of B {
                //while the input stacks have cards
                if A[i] <= B[j]: C[k] = A[i], i = i + 1 /*Put top  of A on C. If input is in descending
                order, reverse this comparison*/
                else: C[k] = B[j], j = j + 1//Put top of B on C k = k + 1//Advance top of C
        }
        //Elements might remain in either A or B (not both),  and these elements >= elements
        already put on C
        if elements exist on A: append A to C
        elif elements exist on B: append B to C
        //Notice C is in the correct order already.
        return C
}
```

Code: a2q9_merge.c is a demonstration program containing implementation for the merging algorithm discussed above. This file uses a2q8_sortedness.h developed in the previous assignment for checking whether the input is sorted or not. All source code conforms to ANSI C89