CPP 程式設計題

命題者：Shen

題目名稱(中文/英文)：Merge sort implementation

主要測試觀念：Recursion

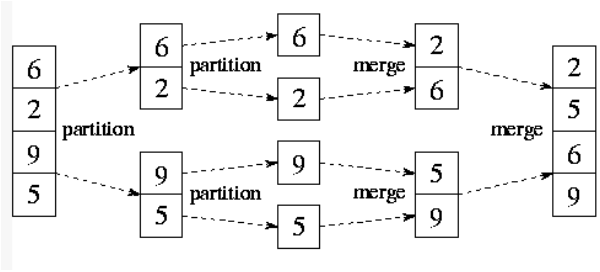
Basics	Functions
☐ C++ BASICS	☐ SEPARATE COMPILATION AND NAMESPACES
■ FLOW OF CONTROL	☐ STREAMS AND FILE I/O
■ FUNCTION BASICS	■ RECURSION
☐ PARAMETERS AND OVERLOADING	☐ INHERITANCE
☐ ARRAYS	☐ POLYMORPHISM AND VIRTUAL FUNCTIONS
☐ STRUCTURES AND CLASSES	☐ TEMPLATES
☐ CONSTRUCTORS AND OTHER TOOLS	☐ LINKED DATA STRUCTURES
☐ OPERATOR OVERLOADING, FRIENDS, AND REFERENCES	☐ EXCEPTION HANDLING
☐ STRINGS	☐ STANDARD TEMPLATE LIBRARY
☐ POINTERS AND DYNAMIC ARRAYS	☐ PATTERNS AND UML

題目說明：

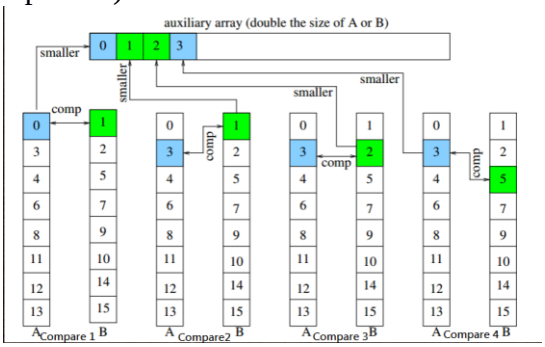
The merge sort is a kind of sorting algorithm. It is implemented using the Divide and Conquer algorithm and is specified as follows:

1. Divide (partition): The array is recursively split until there is only one element separately.
2. Conquer (merge): Start to merge two divided arrays, sort each time when you merge. (See the second picture. Each sort is comparing the first element in both array at that time. Smaller one would be added to the new sorted array, and the bigger one will remain in the original array. Continually do it until you finish sorting all elements in the two original arrays.)
3. Combine: Repeat the Conquer step until all are merged.

Process example as shown below(the first picture)：



Compare process (the second picture):



You need to implement a recursive function, ***merge_sort*** (), and other functions you will use. Note that

1. please don't modify code in ***main***() function in given main.cpp.
2. ***merge_sort*** () in main.cpp handles the recursive steps to split the original array. And after partition you should merge them all as described in the main.cpp.

輸入說明：

1. At first, please input the size of the array to be sorted. The size of the array should be smaller than 1000.
2. Then you can start to input the content of the array, which is filled with **integer numbers**.

輸出說明：

1. Show the two arrays **when you want to merge them**. Note that the arrays showed when merging them are only used to check if you are using the merge sort algorithm.
2. Show the sorting result on the screen.

IO 範例：

Sample Input	Sample Output
10 99 88 7 66 5 44 3 22 1 0	merging : 99 88 merging : 88 99 7 merging : 66 5 merging : 7 88 99 5 66 merging : 44 3 merging : 3 44 22 merging : 1 0 merging : 3 22 44 0 1 merging : 5 7 66 88 99 0 1 3 22 44 Numbers Sorted: 0 1 3 5 7 22 44 66 88 99

附屬資料：

☑解答程式：solution.cpp, main.cpp(for students)

☑測試資料：input1.txt, output1.txt, input2.txt, output2.txt, input3.txt, output3.txt

□易，僅需用到基礎程式設計語法與結構

■中，需用到多項程式設計語法與結構

□難，需用到多項程式結構或較為複雜之資料型態或結構

解題時間：45 分鐘

其他註記：