

2021 OOP/

0609 Practice

Notices :

- 1. Please notice the deadline !!!**
- 2. If you late for the deadline, you still need to hand in this homework, or you will get an F at the end of this semester !!!**

The deadline of this homework :

Deadline : **2021/06/15 (Tue) 23:59:00**

Please upload **2** files (the example for filename : A1073316_MergeSort.java) to certain place of Google Classroom. (the details of files you need to hand in is on page 3)

If you don't hand in your homework on time, you will get -1 for your total grade per day until you complete the work and hand it in.

Before you hand in your homework, please check your filename and the content of file is correct or not. If there is any problem about files, you will get zero for this homework.

Question for this Homework :

For this homework, please follow the content below, and complete the “MergeSort.java”.

Class MergeSort realizes the divide-and-conquer sorting pattern, uses the merge sort algorithm, and modified to use Comparables.

Precondition: Interval $a[\text{begin}]$ through $a[\text{end}]$ of a have elements.

Postcondition: The values in the interval have

been rearranged so that $a[\text{begin}] \leq a[\text{begin}+1] \leq \dots \leq a[\text{end}]$.

Merge Sort algorithm divides the input array into two halves, calls itself for the two halves, and then merges the two sorted halves. The join method is used for merging two halves. It means that the join(a, begin, splitPoint, end) is a key process that assumes that $a[\text{begin} \dots \text{splitPoint}]$ and $a[\text{splitPoint}+1 \dots \text{end}]$ are sorted and merges the two sorted sub-arrays into one.

You need to complete **three static methods**, sort, split and join.

In split method, you have three argument, an array of Comparable object, two int for begin and end. You need to **return an int which is the half of the sum of begin and end.**

In join method, you have four argument, an array of Comparable object, three int for begin, end and splitPoint. You may need to create a temp array of Comparable object whose size is equal to the Comparable array argument to store the sorted result. Then, merge till one side is exhausted. You need to use compareTo method in Comparable object to know which element is bigger than the other.

In sort method, you have three argument, an array of Comparable object, two int for begin and end. And you need to demonstrate the merge sort algorithm in this method.

Hint : merge sort algorithm.

e.g. sort(a, begin, end)

1. Find the middle point to divide the array into two halves : `split(a,begin,end)`
2. Call sort for first half : `sort(a, begin, splitPoint)`
3. Call sort for second half : `sort(a, splitPoint+1, end)`
4. Merge the two halves sorted in step 2 and 3 : `join(a, begin, splitPoint, end)`

1. Content of Homework

Please complete “MergeSort.java” according to the above content.

Hint : there are some parts you need to do.

- a. Class MergeSort (three static methods)

When you finish the requests above, you can compile “MergeSort Demo.java” and execute it by “java MergeSortDemo” command.

Also, you can use this command “java MergeSortDemo > YourAns.txt” to store your output into the file. And execute “vimdiff YourAns.txt MergeSortAns.txt” command to check your answer is correct or not.

```
a1073316@2021_DBMS_practice:~/OOPI$ javac MergeSortDemo.java
a1073316@2021_DBMS_practice:~/OOPI$ java MergeSortDemo
Array contents before sorting:
7.7 5.5 11.0 3.0 16.0 4.4 20.0 14.0 13.0 42.0
Sorted array values:
3.0 4.4 5.5 7.7 11.0 13.0 14.0 16.0 20.0 42.0
```

picture 1 The example of output

2. Files you need to hand in

There are two files you need to hand in :

- **StudentID(Upper)_MergeSort.java**
- **StudentID(Upper)_MergeSortDemo.java**

Any plagiarism is not allowed, if you against this rule, it will affect your grade.

If you have any question, please consult the assistants or the teacher for help.

Please be mature and gentle in the emails.