# MergeSort

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**MergeSort (Divide & Conquer)** Input: an array of unsorted numbers

Output: sorted array (increasing)

Steps: 1. divide the array into two sub-arrays 2. sort each sub-array recursively 3. merge them back

Run time: 6 **NLogN** + 6N

Implementation: It is a straight forward recursive method, which I implemented via Python v.3.

```
In [68]: import random
         import time

         #generate a list of integer with random numbers
         def generate_list_1():
             size_ = int(input("insert size of the array: "))
             list_1 = [random.randrange(0, 101, 1) for _ in range(size_ + 1)]
             print("\n","Generated array is: ", "\n", list_1, "\n")
             return list_1

         #sorting via MergeSort (Divide&Conquer) technique
         def mergesort(list_):
             if (len(list_)) > 1:
                 len_ = len(list_)
                 mid = len_//2
                 left = list_[:mid]
                 right = list_[mid:]
                 #recursive
                 mergesort(left)
                 mergesort(right)
                 i = j = k = 0
                 # Copy data to temp arrays: left[] and right[]
                 while i < len(left) and j < len(right):
                     if left[i] < right[j]:
                         list_[k] = left[i]
                         i+=1
                     else:
                         list_[k] = right[j]
                         j+=1
```

```
                    k+=1
                # Checking if any element was left
                while i < len(left):
                    list_[k] = left[i]
                    i+=1
                    k+=1
                while j < len(right):
                    list_[k] = right[j]
                    j+=1
                    k+=1
            return list_


        if __name__ == '__main__':
            start =time.time()
            print("Sorted array is: ", "\n", mergesort(generate_list_1()))
            end = time.time()
            print("time took to run the mergesort is: ", end-start)
```

```
insert size of the array: 200

 Generated array is:
 [17, 19, 78, 59, 44, 19, 91, 49, 85, 61, 84, 23, 32, 32, 3, 17, 96, 99, 67, 9, 57, 41, 13, 9,

Sorted array is:
 [1, 2, 2, 2, 3, 3, 4, 4, 6, 6, 7, 8, 9, 9, 9, 11, 11, 12, 13, 13, 14, 14, 15, 17, 17, 17, 17,
time took to run the mergesort is:  1.4646224975585938
```