Nama : Luqman Hanung Asidiq

NIM : L200180035

Kelas : B

Laporan Praktikum Algoritma dan Struktur Data

Modul 6

1. Nomor 1

1.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/1.py (3.8.2)

File Edit Format Run Options Window Help

```python
class Mahasiswa:
    keadaan = 'lapar'
    def __init__(self, nama, nim, kota, us):
        self.nama = nama
        self.nim = nim
        self.kotaTinggal = kota
        self.uangSaku = us
    def __str__(self):
        s = self.nama + ', NIM ' + str(self.nim) \
            + '. Tinggal di ' + self.kotaTinggal \
            + '. Uang saku Rp ' + str(self.uangSaku) \
            + ' perharinya.'
        return s
    def ambilNama(self):
        return self.nama
    def ambilNIM(self):
        return self.nim
    def ambilUangSaku(self):
        return self.uangSaku

def mergeSort(A):
    if len(A) > 1:
        mid = len(A) // 2
        separuhkiri = A[:mid]
        separuhkanan = A[mid:]
        mergeSort(separuhkiri)
        mergeSort(separuhkanan)
        i = 0; j = 0; k = 0
        while i < len(separuhkiri) and j < len(separuhkanan):
            if separuhkiri[i] < separuhkanan[j]:
                A[k] = separuhkiri[i]
                i += 1
            else:
                A[k] = separuhkanan[j]
                j += 1
            k += 1

        while i < len(separuhkiri):
            A[k] = separuhkiri[i]
            i += 1
            k += 1
        while j < len(separuhkanan):
            A[k] = separuhkanan[j]
            j += 1
            k += 1

def quickSort(A):
    quickSortBantu(A, 0, len(A) - 1)
```

Ln: 84 Col: 74

1.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/1.py (3.8.2)

File Edit Format Run Options Window Help

```python
            i += 1
            k += 1
        while j < len(separuhkanan):
            A[k] = separuhkanan[j]
            j += 1
            k += 1

def quickSort(A):
    quickSortBantu(A, 0, len(A) - 1)

def quickSortBantu(A, awal, akhir):
    if awal < akhir:
        titikBelah = partisi(A, awal, akhir)
        quickSortBantu(A, awal, titikBelah - 1)
        quickSortBantu(A, titikBelah + 1, akhir)
def partisi(A, awal, akhir):
    nilaiPivot = A[awal]
    penandaKiri = awal + 1
    penandaKanan = akhir
    selesai = False
    while not selesai:
        while penandaKiri <= penandaKanan and A[penandaKiri] <= nilaiPivot:
            penandaKiri = penandaKiri + 1
        while A[penandaKanan] >= nilaiPivot and penandaKanan >= penandaKiri:
            penandaKanan -= 1
        if penandaKanan < penandaKiri:
            selesai = True
        else:
            temp = A[penandaKiri]
            A[penandaKiri] = A[penandaKanan]
            A[penandaKanan] = temp
    temp = A[awal]
    A[awal] = A[penandaKiri]
    A[penandaKanan] = temp
    return penandaKanan


mahas1 = Mahasiswa("Luqman", 35, "Sukoharjo", 1290000)
mahas2 = Mahasiswa("Hanung", 36, "Klaten", 310000)
mahas3 = Mahasiswa("Arsya", 45, "Gunung Kidul", 900000)
mahas4 = Mahasiswa("Caca", 56, "Wonogiri", 300000)
mahas5 = Mahasiswa("Ifut", 78, "Rembang", 430000)
mahas6 = Mahasiswa("Bagas", 80, "Pati", 310000)

listin = [mahas1.nim, mahas2.nim, mahas3.nim, mahas4.nim, mahas5.nim, mahas6.nim]
mergeSort(listin)
print(listin)
```

Ln: 84 Col: 74

Python 3.8.2 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/1.py
[35, 36, 45, 56, 78, 80]
>>>
```

Ln: 6 Col: 4

ENG 10:48 PM

Python 3.8.2 Shell

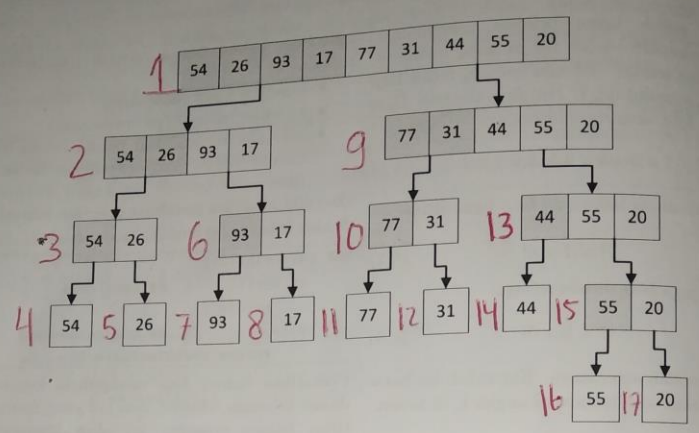
File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/1.py
[35, 36, 45, 56, 78, 80]
>>>
```

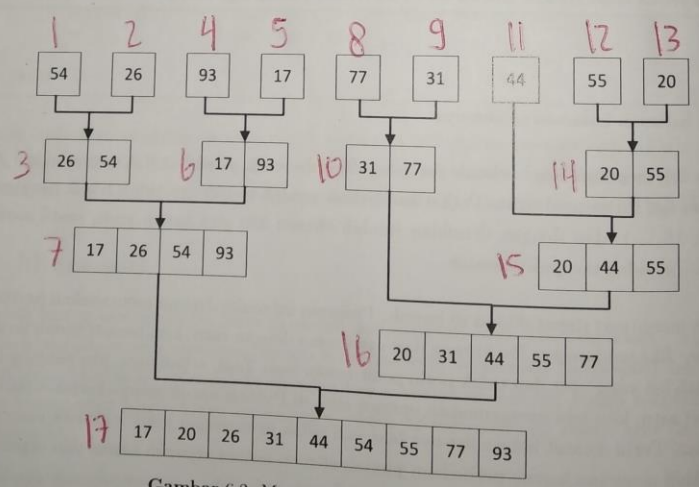
Ln: 6 Col: 4

ENG 10:48 PM

2. Nomor 2



Gambar 6.1: Membelah list sampai tiap sub-list berisi satu elemen atau kosong. Sesudah itu digabung seperti ditunjukkan di Gambar 6.2.



Gambar 6.2: Menggabungkan list satu demi satu.

3. Nomor 3

3.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/3.py (3.8.2)

File Edit Format Run Options Window Help

```python
from time import time as detak
from random import shuffle as kocok

def swap(A, p, q):
    temp = A[p]
    A[p] = A[q]
    A[q] = temp
def cariposisiterkecil(A, darisini, sampaisini):
    posisiterkecil = darisini
    for i in range(darisini + 1, sampaisini):
        if A[i] < A[posisiterkecil]:
            posisiterkecil = i
    return posisiterkecil

def bubbleSort(A):
    n = len(A)
    for i in range(n - 1):
        for j in range(n - i - 1):
            if A[j] > A[j + 1]:
                swap(A, j, j + 1)

def selectionSort(A):
    n = len(A)
    for i in range(n - 1):
        indexkecil = cariposisiterkecil(A, i, n)
        if indexkecil != i:
            swap(A, i, indexkecil)

def insertionSort(A):
    n = len(A)
    for i in range(1, n):
        nilai = A[i]
        pos = i
        while pos > 0 and nilai < A[pos - 1]:
            A[pos] = A[pos - 1]
            pos = pos - 1
        A[pos] = nilai

def mergeSort(A):
    if len(A) > 1:
        mid = len(A) // 2
        L = A[:mid]
        R = A[mid:]
        mergeSort(L)
        mergeSort(R)
        i = j = k = 0
        while i < len(L) and j < len(R):
            if L[i] < R[j]:
```

Ln: 64 Col: 24

3.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/3.py (3.8.2)

File Edit Format Run Options Window Help

```python
        while i < len(L) and j < len(R):
            if L[i] < R[j]:
                A[k] = L[i]
                i += 1
            else:
                A[k] = R[j]
                j += 1
            k += 1
        while i < len(L):
            A[k] = L[i]
            i += 1
            k += 1
        while j < len(R):
            A[k] = R[j]
            j += 1
            k += 1

def partition(A, low, high):
    i = (low - 1)
    pivot = A[high]
    for j in range(low, high):
        if A[j] <= pivot:
            i = i + 1
            A[i], A[j] = A[j], A[i]
    A[i + 1], A[high] = A[high], A[i + 1]
    return i + 1
def quickSortBantu(A, low, high):
    if low < high:
        pi = partition(A, low, high)
        quickSortBantu(A, low, pi - 1)
        quickSortBantu(A, pi + 1, high)
def quickSort(A):
    quickSortBantu(A, 0, len(A)-1)

k = [i for i in range(1, 6000)]
kocok(k)
bub = k[:]
sel = k[:]
ins = k[:]
mer = k[:]
qui = k[:]

aw = detak(); bubbleSort(bub); ak = detak(); print('bubble : %g detik' % (ak-aw))
aw = detak(); selectionSort(sel); ak = detak(); print('selection : %g detik' % (ak-aw))
aw = detak(); insertionSort(ins); ak = detak(); print('insertion : %g detik' % (ak-aw))
aw = detak(); mergeSort(mer); ak = detak(); print('merge : %g detik' % (ak-aw))
aw = detak(); quickSort(qui); ak = detak(); print('quick : %g detik' % (ak-aw))
```

Ln: 64 Col: 24

Python 3.8.2 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/3.py
bubble : 6.05752 detik
selection : 2.25907 detik
insertion : 2.64569 detik
merge : 0.0350423 detik
quick : 0.0210547 detik
>>>
```

Ln: 10 Col: 4

ENG 11:04 PM

4. Nomor 4

   a) Merge sort

No.

Date:

No 4a Merge Sort

list L = [80, 7, 24, 16, 43, 91, 35, 2, 19, 72]

80	7	24	16	43	91	35	2	19	72

Proses 1

7	80	26	24	43	91	2	35

19	72

Proses 2

7	16	24	80	2	35	43	91	19	72

Proses 3

2	7	16	24	35	43	80	91	19	72

Proses 4

2	7	16	19	24	35	43	72	80	91

b) Quick sort

No.

Date:

No. 4b Quick Sort

List L = [80, 7, 24, 16, 43, 91, 35, 2, 19, 72]

80	7	24	16	43	91	35	2	19	72

Pivot

80	7	24	16	43	91	35	2	19	72
Low									High

Pivot

72	7	24	16	43	91	35	2	19	80
Low									High

Pivot

72	7	24	16	43	91	35	2	19	80
					Low				High

Pivot

72	7	24	16	43	80	35	2	19	91
					Low				High

Pivot

72	7	24	16	43	19	35	2	80	91
					Low			High	

5. Nomor 5

5.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/5.py (3.8.2)

File Edit Format Run Options Window Help

```python
def _merge_sort(indices, the_list):
    start = indices[0]
    end = indices[1]
    half_way = (end - start) // 2 + start
    if start < half_way:
        _merge_sort((start, half_way), the_list)
    if half_way + 1 <= end and end - start != 1:
        _merge_sort((half_way + 1, end), the_list)
    sort_sub_list(the_list, indices[0], indices[1])
    return the_list

def sort_sub_list(the_list, start, end):
    orig_start = start
    initial_start_second_list = (end - start) // 2 + start + 1
    list2_first_index = initial_start_second_list
    new_list = []
    while start < initial_start_second_list and list2_first_index <= end:
        first1 = the_list[start]
        first2 = the_list[list2_first_index]
        if first1 > first2:
            new_list.append(first2)
            list2_first_index += 1
        else:
            new_list.append(first1)
            start += 1
    while start < initial_start_second_list:
        new_list.append(the_list[start])
        start += 1
    while list2_first_index <= end:
        new_list.append(the_list[list2_first_index])
        list2_first_index += 1
    for i in new_list:
        the_list[orig_start] = i
        orig_start += 1
    return the_list

def merge_sort(the_list):
    return _merge_sort((0, len(the_list) - 1), the_list)

print(merge_sort([11, 7, 9, 4, 90, 23, 2, 14, 67, 170]))
```

Ln: 40 Col: 52

Python 3.8.2 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/5.py
[2, 4, 7, 9, 11, 14, 23, 67, 90, 170]
>>>
```

Ln: 6 Col: 4

6. Nomor 6

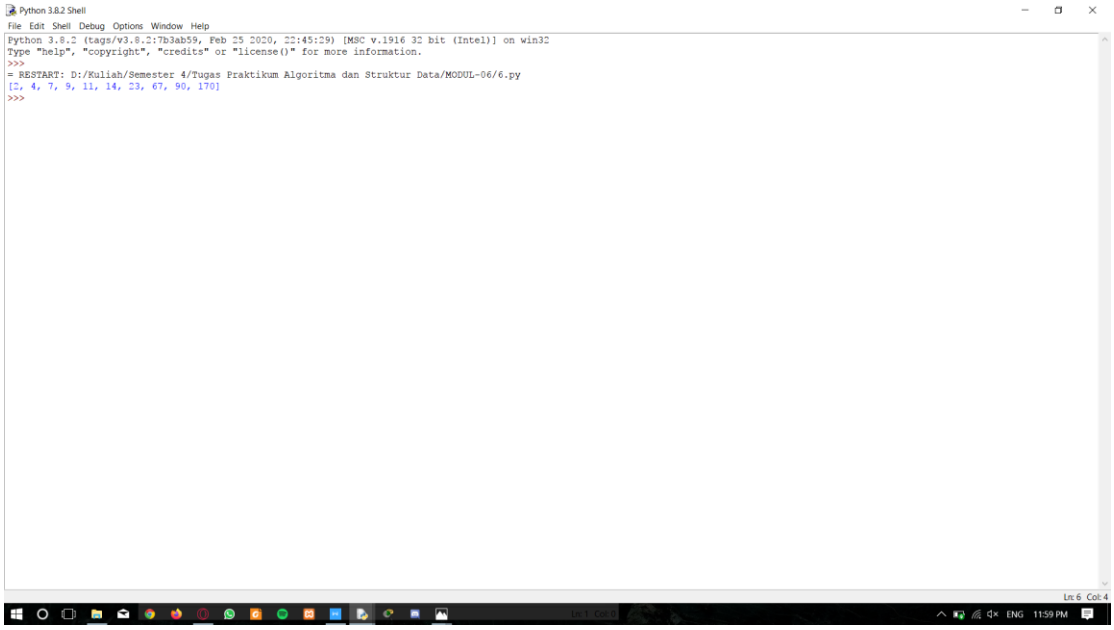
6.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/6.py (3.8.2)

File Edit Format Run Options Window Help

```python
def quickSort(S):
    quicksorthelp(S, 0, len(S))

def quicksorthelp(S, low, high):
    result = 0
    if low < high:
        pivot_location, result = Partition(S, low, high)
        result += quicksorthelp(S, low, pivot_location)
        result += quicksorthelp(S, pivot_location + 1, high)
    return result

def Partition(S, low, high):
    result = 0
    pivot, pidx = median_of_three(S, low, high)
    S[low], S[pidx] = S[pidx], S[low]
    i = low + 1
    for j in range(low + 1, high, 1):
        result += 1
        if S[j] < pivot:
            S[i], S[j] = S[j], S[i]
            i += 1
    S[low], S[i - 1] = S[i - 1], S[low]
    return i - 1, result

def median_of_three(S, low, high):
    mid = (low + high - 1) // 2
    a = S[low]
    b = S[mid]
    c = S[high - 1]
    if a <= b <= c:
        return b, mid
    if c <= b <= a:
        return b, mid
    if a <= c <= b:
        return c, high - 1
    if b <= c <= a:
        return c, high - 1
    return a, low

listin = [11, 7, 9, 4, 90, 23, 2, 14, 67, 170]

quickSort(listin)
print(listin)
```

Ln: 1 Col: 9

ENG 11:58 PM


Python 3.8.2 Shell
File Edit Shell Debug Options Window Help
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/6.py
[2, 4, 7, 9, 11, 14, 23, 67, 90, 170]
>>>
Ln: 6 Col: 4
ENG 11:59 PM

7. Nomor 7

7.py - D:\Kuliah\Semester 4\Tugas Praktikum Algoritma dan Struktur Data\MODUL-06\7.py (3.8.2)

File Edit Format Run Options Window Help

```python
from time import time as detak
from random import shuffle as kocok
import time
k = [i for i in range(1,6000)]
kocok(k)

def mergeSort(S):
    if len(S) >1:
        mid = len(S)//2
        L = S[:mid]
        R = S[mid:]
        mergeSort(L)
        mergeSort(R)
        i = j = k = 0
        while i < len(L) and j < len(R):
            if L[i] < R[j]:
                S[k] = L[i]
                i+=1
            else:
                S[k] = R[j]
                j+=1
            k+=1
        while i < len(L):
            S[k] = L[i]
            i+=1
            k+=1
        while j < len(R):
            S[k] = R[j]
            j+=1
            k+=1
def partition(S,low,high):
    i = ( low-1 )
    pivot = S[high]
    for j in range(low , high):
        if   S[j] <= pivot:
            i = i+1
            S[i],S[j] = S[j], S[i]
    S[i+1],S[high] = S[high], S[i+1]
    return ( i+1 )

def quickSort(S,low,high):
    if low < high:
        pi = partition(S,low,high)
        quickSort(S, low, pi-1)
        quickSort(S, pi+1, high)

import random
def _merge_sort(indices, the_list):
```

Ln: 1 Col: 0

ENG 12:24 AM

7.py - D:\Kuliah\Semester 4\Tugas Praktikum Algoritma dan Struktur Data\MODUL-06\7.py (3.8.2)

File Edit Format Run Options Window Help

```python
import random
def _merge_sort(indices, the_list):
    start = indices[0]
    end = indices[1]
    half_way = (end - start)//2 + start
    if start < half_way:
        _merge_sort((start, half_way), the_list)
    if half_way + 1 <= end and end - start != 1:
        _merge_sort((half_way + 1, end), the_list)

    sort_sub_list(the_list, indices[0], indices[1])

def sort_sub_list(the_list, start, end):
    orig_start = start
    initial_start_second_list = (end - start)//2 + start + 1
    list2_first_index = initial_start_second_list
    new_list = []
    while start < initial_start_second_list and list2_first_index <= end:
        first1 = the_list[start]
        first2 = the_list[list2_first_index]
        if first1 > first2:
            new_list.append(first2)
            list2_first_index += 1
        else:
            new_list.append(first1)
            start += 1
    while start < initial_start_second_list:
        new_list.append(the_list[start])
        start += 1

    while list2_first_index <= end:
        new_list.append(the_list[list2_first_index])
        list2_first_index += 1
    for i in new_list:
        the_list[orig_start] = i
        orig_start += 1

def merge_sort(the_list):
    return _merge_sort((0, len(the_list) - 1), the_list)

def quickSortMOD(L, ascending = True):
    quicksorthelp(L, 0, len(L), ascending)

def quicksorthelp(L, low, high, ascending = True):
    result = 0
    if low < high:
        pivot_location, result = Partition(L, low, high, ascending)
```

Ln: 1 Col: 0

ENG 12:25 AM

7.py - D:\Kuliah\Semester 4\Tugas Praktikum Algoritma dan Struktur Data\MODUL-06\7.py (3.8.2)

File Edit Format Run Options Window Help

```python
def quickSortMOD(L, ascending = True):
    quicksorthelp(L, 0, len(L), ascending)

def quicksorthelp(L, low, high, ascending = True):
    result = 0
    if low < high:
        pivot_location, result = Partition(L, low, high, ascending)
        result += quicksorthelp(L, low, pivot_location, ascending)
        result += quicksorthelp(L, pivot_location + 1, high, ascending)
    return result

def Partition(L, low, high, ascending = True):
    result = 0
    pivot, pidx = median_of_three(L, low, high)
    L[low], L[pidx] = L[pidx], L[low]
    i = low + 1
    for j in range(low+1, high, 1):
        result += 1
        if (ascending and L[j] < pivot) or (not ascending and L[j] > pivot):
            L[i], L[j] = L[j], L[i]
            i += 1
    L[low], L[i-1] = L[i-1], L[low]
    return i - 1, result

def median_of_three(L, low, high):
    mid = (low+high-1)//2
    a = L[low]
    b = L[mid]
    c = L[high-1]
    if a <= b <= c:
        return b, mid
    if c <= b <= a:
        return b, mid
    if a <= c <= b:
        return c, high-1
    if b <= c <= a:
        return c, high-1
    return a, low
mer = k[:]
qui = k[:]
mer2 = k[:]
qui2 = k[:]

aw=detak();mergeSort(mer);ak=detak();print('merge : %g detik' %(ak-aw));
aw=detak();quickSort(qui,0,len(qui)-1);ak=detak();print('quick : %g detik' %(ak-aw));
aw=detak();merge_sort(mer2);print('merge mod : %g detik' %(ak-aw));
aw=detak();quickSortMOD(qui2, False);print('quick mod : %g detik' %(ak-aw));
```

Ln: 133 Col: 76

Python 3.8.2 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:\Kuliah\Semester 4\Tugas Praktikum Algoritma dan Struktur Data\MODUL-06\7.py
merge : 0.0511363 detik
quick : 0.0280757 detik
merge mod : -0.00200534 detik
quick mod : -0.109291 detik
>>>
```

Ln: 9 Col: 4

8. Nomer 8

8.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/8.py (3.8.2)

File Edit Format Run Options Window Help

```python
class Node:
    def __init__(self, data):
        self.data = data
        self.next = None

class LinkedList:
    def __init__(self):
        self.head = None

    def appendList(self, data):
        node = Node(data)
        if self.head == None:
            self.head = node
        else:
            curr = self.head
            while curr.next != None:
                curr = curr.next
        curr.next = node

    def appendSorted(self, data):
        node = Node(data)
        curr = self.head
        prev = None

        while curr is not None and curr.data < data:
            prev = curr
            curr = curr.next

        if prev == None:
            self.head = node
        else:
            prev.next = node

        node.next = curr

    def printList(self):
        curr = self.head
        while curr != None:
            print("%d" % curr.data),
            curr = curr.next

    def mergeSorted(self, list1, list2):
        if list1 is None:
            return list2
        if list2 is None:
            return list1

        if list1.data < list2.data:
```

Ln: 79 Col: 0

8.py - D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/8.py (3.8.2)

File Edit Format Run Options Window Help

```python
            prev.next = node

        node.next = curr

    def printList(self):
        curr = self.head
        while curr != None:
            print("%d" % curr.data),
            curr = curr.next

    def mergeSorted(self, list1, list2):
        if list1 is None:
            return list2
        if list2 is None:
            return list1

        if list1.data < list2.data:
            temp = list1
            temp.next = self.mergeSorted(list1.next, list2)
        else:
            temp = list2
            temp.next = self.mergeSorted(list1, list2.next)
        return temp

list1 = LinkedList()
list1.appendSorted(15)
list1.appendSorted(11)
list1.appendSorted(31)
list1.appendSorted(12)
list1.appendSorted(22)

print("List 1 :"),
list1.printList()

list2 = LinkedList()
list2.appendSorted(16)
list2.appendSorted(17)
list2.appendSorted(15)

print("List 2 :"),
list2.printList()

list3 = LinkedList()
list3.head = list3.mergeSorted(list1.head, list2.head)

print("Merged List :"),
list3.printList()
```

Ln: 79 Col: 0

Python 3.8.2 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 22:45:29) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: D:/Kuliah/Semester 4/Tugas Praktikum Algoritma dan Struktur Data/MODUL-06/8.py
List 1 :
11
12
15
22
31
List 2 :
15
16
17
Merged List :
11
12
15
15
16
17
22
31
>>>
```

Ln: 24 Col: 4

ENG 12:27 AM