Nama : Bagus Zizou Satiaji

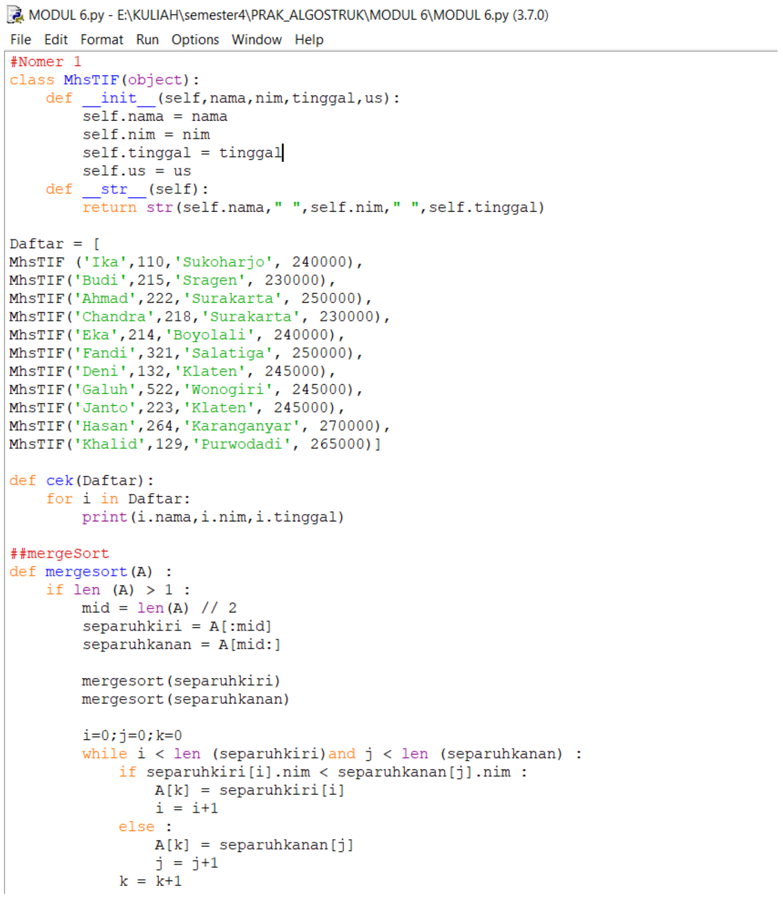
NIM : L200180212

Kelas : Praktikum Algoritma dan Struktur data H

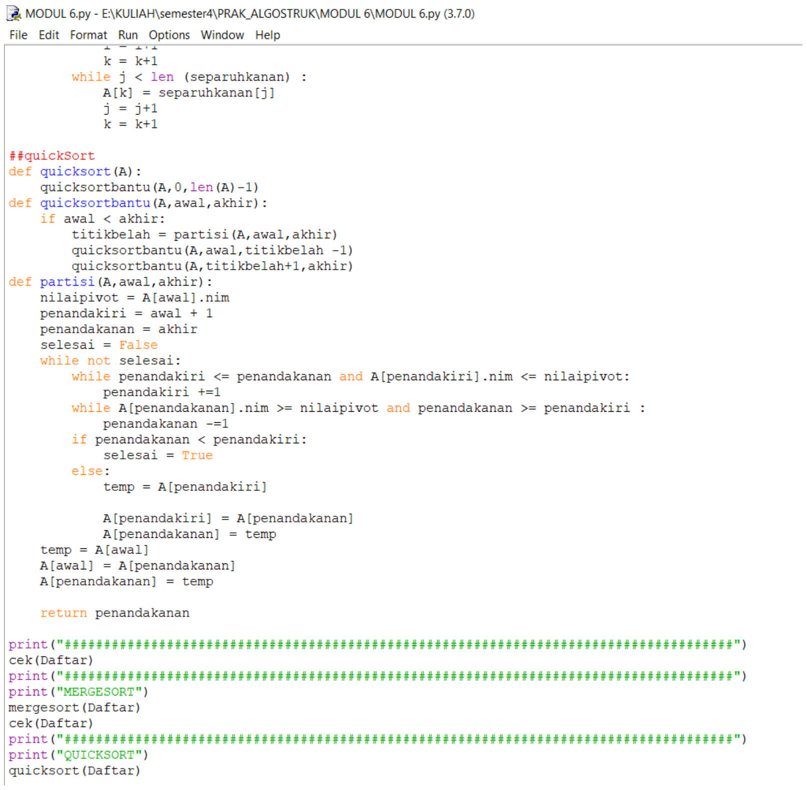
MODUL 6

Pengurutan Lanjutan

Nomer 1 dan 2

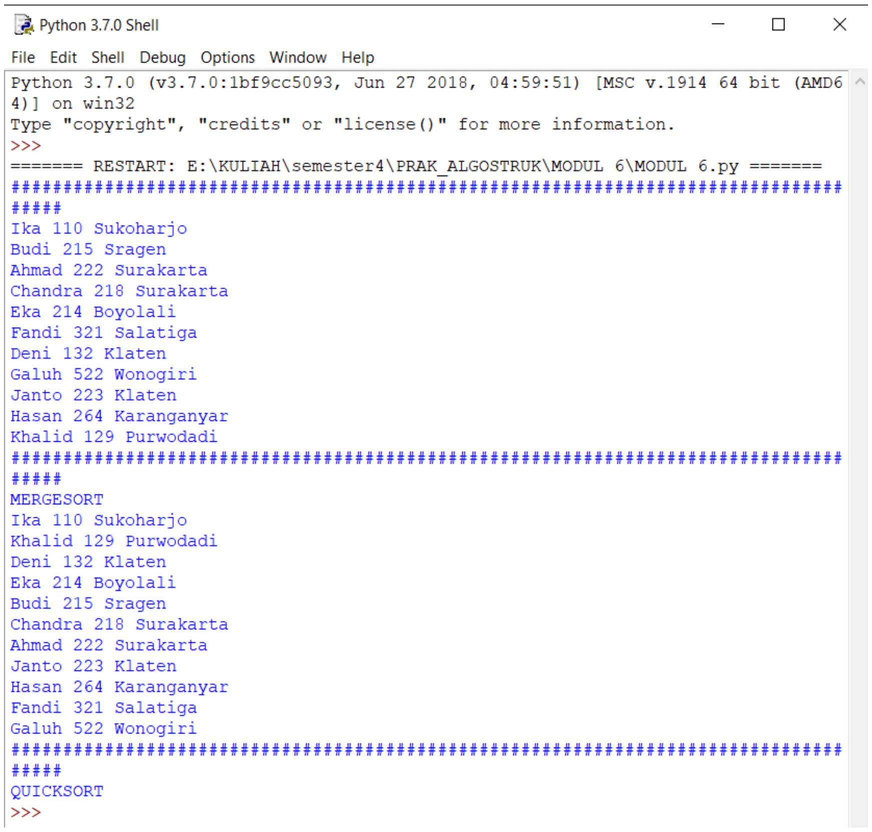

MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)
File Edit Format Run Options Window Help

```
#Nomer 1
class MhsTIF(object):
    def __init__(self,nama,nim,tinggal,us):
        self.nama = nama
        self.nim = nim
        self.tinggal = tinggal
        self.us = us
    def __str__(self):
        return str(self.nama," ",self.nim," ",self.tinggal)

Daftar = [
MhsTIF ('Ika',110,'Sukoharjo', 240000),
MhsTIF('Budi',215,'Sragen', 230000),
MhsTIF('Ahmad',222,'Surakarta', 250000),
MhsTIF('Chandra',218,'Surakarta', 230000),
MhsTIF('Eka',214,'Boyolali', 240000),
MhsTIF('Fandi',321,'Salatiga', 250000),
MhsTIF('Deni',132,'Klaten', 245000),
MhsTIF('Galuh',522,'Wonogiri', 245000),
MhsTIF('Janto',223,'Klaten', 245000),
MhsTIF('Hasan',264,'Karanganyar', 270000),
MhsTIF('Khalid',129,'Purwodadi', 265000)]

def cek(Daftar):
    for i in Daftar:
        print(i.nama,i.nim,i.tinggal)

##mergeSort
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].nim < separuhkanan[j].nim :
                A[k] = separuhkiri[i]
                i = i+1
            else :
                A[k] = separuhkanan[j]
                j = j+1
            k = k+1
```


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)

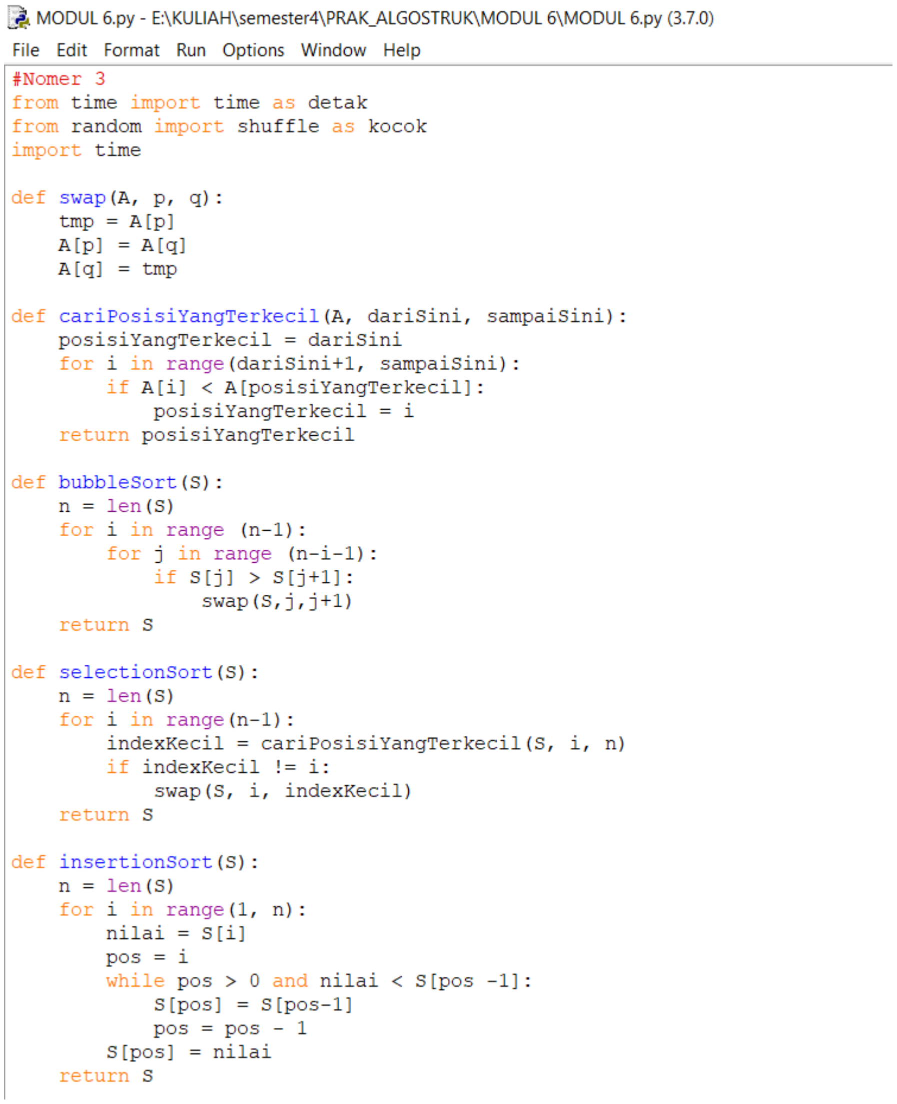
```
            k = k+1
        while j < len (separuhkanan) :
            A[k] = separuhkanan[j]
            j = j+1
            k = k+1

##quickSort
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].nim
    penandakiri = awal + 1
    penandakanan = akhir
    selesai = False
    while not selesai:
        while penandakiri <= penandakanan and A[penandakiri].nim <= nilaipivot:
            penandakiri +=1
        while A[penandakanan].nim >= 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[penandakanan]
    A[penandakanan] = temp

    return penandakanan

print("#####################################################################################")
cek(Daftar)
print("#####################################################################################")
print("MERGESORT")
mergesort(Daftar)
cek(Daftar)
print("#####################################################################################")
print("QUICKSORT")
quicksort(Daftar)
```

Hasil


Python 3.7.0 Shell

```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
################################################################################
#####
Ika 110 Sukoharjo
Budi 215 Sragen
Ahmad 222 Surakarta
Chandra 218 Surakarta
Eka 214 Boyolali
Fandi 321 Salatiga
Deni 132 Klaten
Galuh 522 Wonogiri
Janto 223 Klaten
Hasan 264 Karanganyar
Khalid 129 Purwodadi
################################################################################
#####
MERGESORT
Ika 110 Sukoharjo
Khalid 129 Purwodadi
Deni 132 Klaten
Eka 214 Boyolali
Budi 215 Sragen
Chandra 218 Surakarta
Ahmad 222 Surakarta
Janto 223 Klaten
Hasan 264 Karanganyar
Fandi 321 Salatiga
Galuh 522 Wonogiri
################################################################################
#####
QUICKSORT
>>>
```

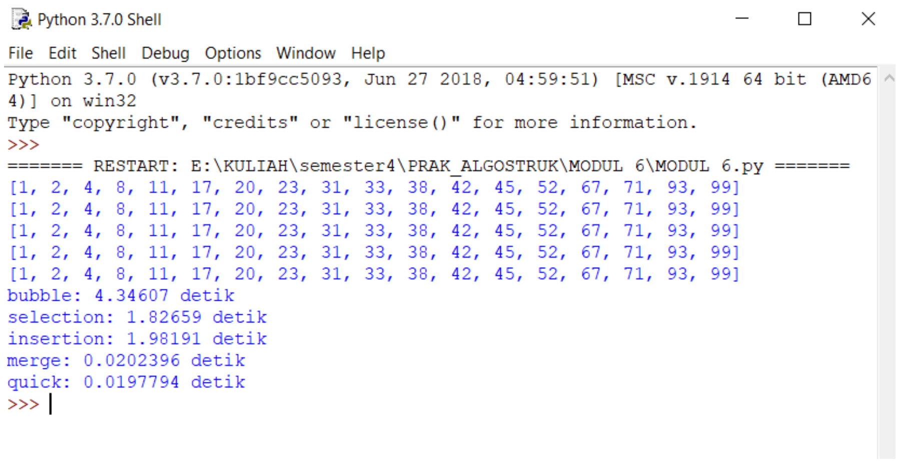
Nomer 3


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)
File Edit Format Run Options Window Help

```
#Nomer 3
from time import time as detak
from random import shuffle as kocok
import time

def swap(A, p, q):
    tmp = A[p]
    A[p] = A[q]
    A[q] = tmp

def cariPosisiYangTerkecil(A, dariSini, sampaiSini):
    posisiYangTerkecil = dariSini
    for i in range(dariSini+1, sampaiSini):
        if A[i] < A[posisiYangTerkecil]:
            posisiYangTerkecil = i
    return posisiYangTerkecil

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

def selectionSort(S):
    n = len(S)
    for i in range(n-1):
        indexKecil = cariPosisiYangTerkecil(S, i, n)
        if indexKecil != i:
            swap(S, i, indexKecil)
    return S

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

```
def mergeSort(A):
    #print("Membelah ",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 = i + 1
            else:
                A[k] = separuhkanan[j]
                j = j + 1
            k=k+1


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

        while j < len(separuhkanan):
            A[k] = separuhkanan[j]
            j = j + 1
            k=k+1
    #print("Menggabungkan ",A)

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 penandakanan >= penandakiri and A[penandakanan] >= nilaipivot:
            penandakanan = penandakanan - 1

        if penandakanan < penandakiri:
            selesai = True
        else:
            temp = A[penandakiri]
            A[penandakiri] = A[penandakanan]
            A[penandakanan] = temp

    temp = A[awal]
    A[awal] = A[penandakanan]
    A[penandakanan] = temp

    return penandakanan

def quickSortBantu(A, awal, akhir):
    if awal < akhir:
        titikBelah = partisi(A, awal, akhir)
        quickSortBantu(A, awal, titikBelah-1)
        quickSortBantu(A, titikBelah+1, akhir)

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

daftar = [2, 17, 33, 20, 67, 99, 31, 52, 38, 42, 93, 11, 23 , 45, 71, 4, 8 ,1]
print (bubbleSort(daftar))
print (selectionSort(daftar))
print (insertionSort(daftar))
mergeSort(daftar)
print (daftar)
quickSort(daftar)
print (daftar)

k = [[i] for i in range(1, 6001)]
kocok(k)
u_bub = k[:]
u_sel = k[:]
u_ins = k[:]
u_mrg = k[:]
u_qck = k[:]
aw=detak();bubbleSort(u_bub);ak=detak();print("bubble: %g detik" %(ak-aw));
aw=detak();selectionSort(u_sel);ak=detak();print("selection: %g detik" %(ak-aw));
aw=detak();insertionSort(u_ins);ak=detak();print("insertion: %g detik" %(ak-aw));
aw=detak();mergeSort(u_mrg);ak=detak();print("merge: %g detik" %(ak-aw));
aw=detak();quickSort(u_qck);ak=detak();print("quick: %g detik" %(ak-aw));
```

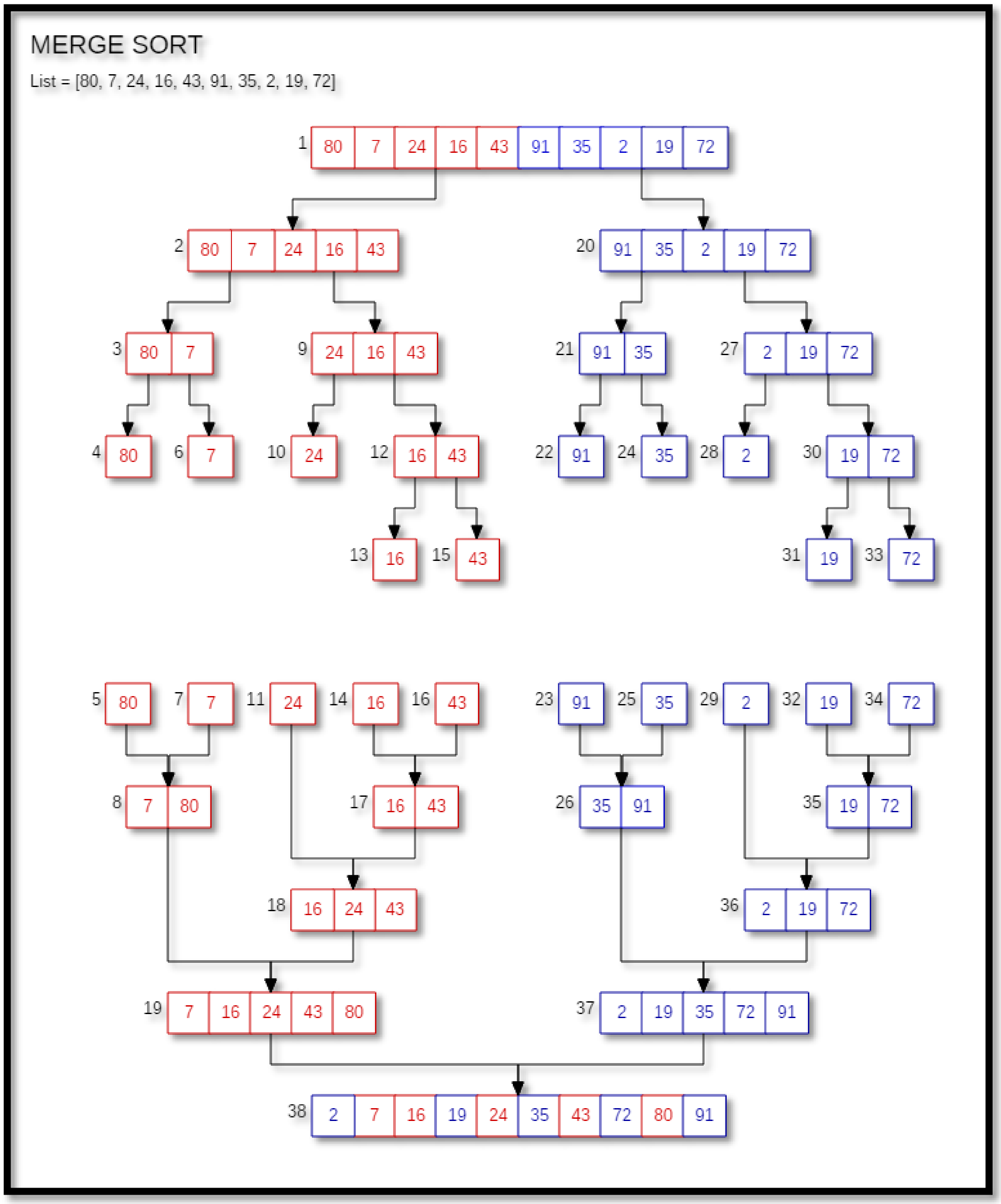
Hasil



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> 
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
[1, 2, 4, 8, 11, 17, 20, 23, 31, 33, 38, 42, 45, 52, 67, 71, 93, 99]
[1, 2, 4, 8, 11, 17, 20, 23, 31, 33, 38, 42, 45, 52, 67, 71, 93, 99]
[1, 2, 4, 8, 11, 17, 20, 23, 31, 33, 38, 42, 45, 52, 67, 71, 93, 99]
[1, 2, 4, 8, 11, 17, 20, 23, 31, 33, 38, 42, 45, 52, 67, 71, 93, 99]
[1, 2, 4, 8, 11, 17, 20, 23, 31, 33, 38, 42, 45, 52, 67, 71, 93, 99]
bubble: 4.34607 detik
selection: 1.82659 detik
insertion: 1.98191 detik
merge: 0.0202396 detik
quick: 0.0197794 detik
>>> 
```

Nomer 4

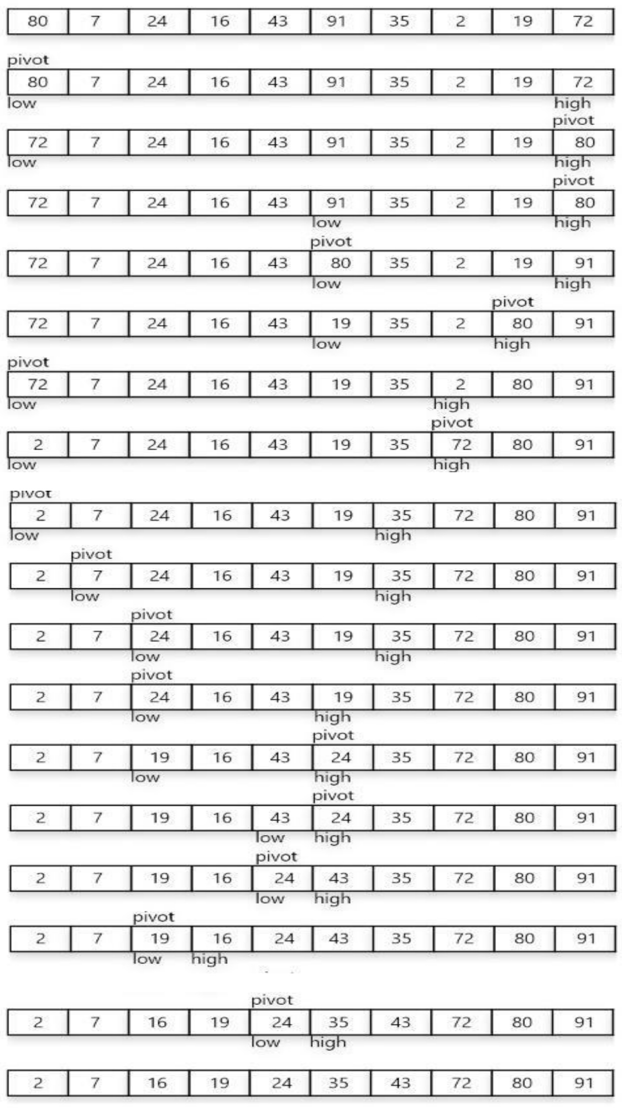
a. Merge sort



b. Quick sort

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	

pivot									
72	7	24	16	43	19	35	2	80	91
low							high		

							pivot		
2	7	24	16	43	19	35	72	80	91
low							high		

pivot									
2	7	24	16	43	19	35	72	80	91
low						high			

	pivot								
2	7	24	16	43	19	35	72	80	91
	low					high			

		pivot							
2	7	24	16	43	19	35	72	80	91
		low				high			

		pivot							
2	7	24	16	43	19	35	72	80	91
		low			high				

					pivot				
2	7	19	16	43	24	35	72	80	91
		low			high				

					pivot				
2	7	19	16	43	24	35	72	80	91
				low	high				

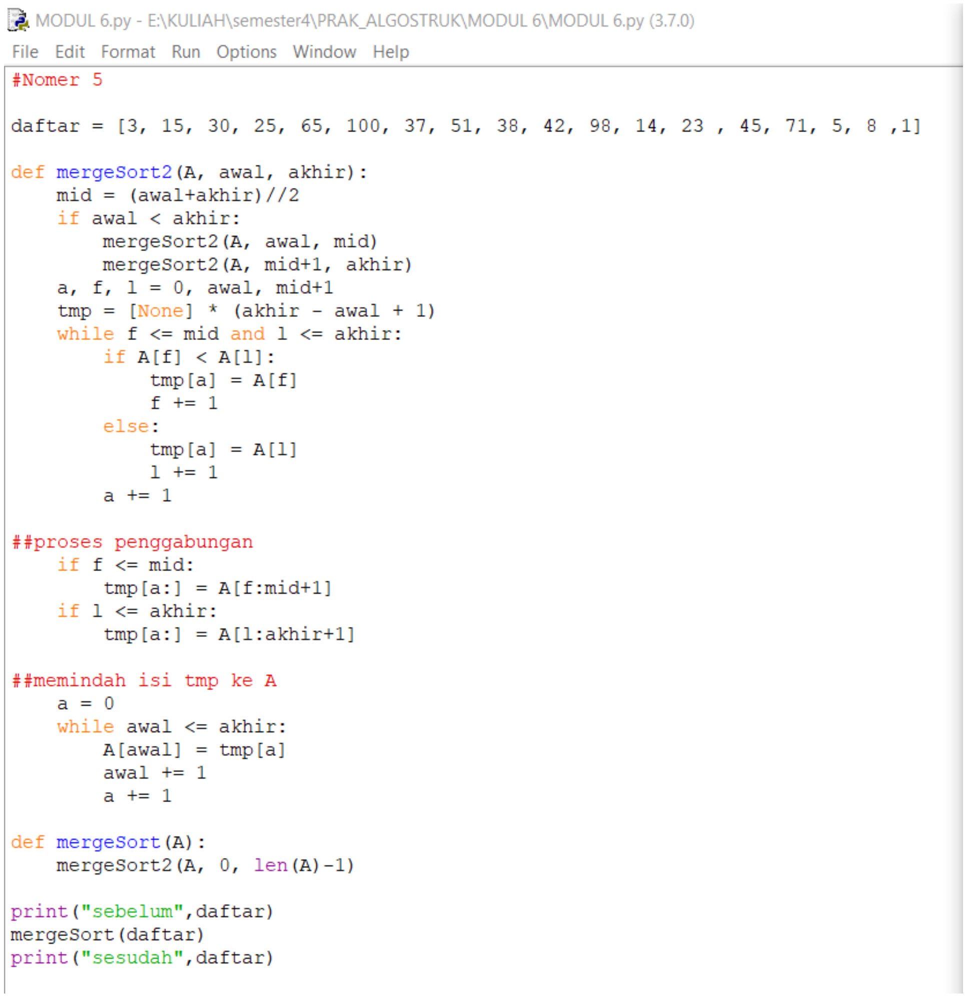
				pivot					
2	7	19	16	24	43	35	72	80	91
				low	high				

		pivot							
2	7	19	16	24	43	35	72	80	91
		low	high						

				pivot					
2	7	16	19	24	35	43	72	80	91
				low	high				

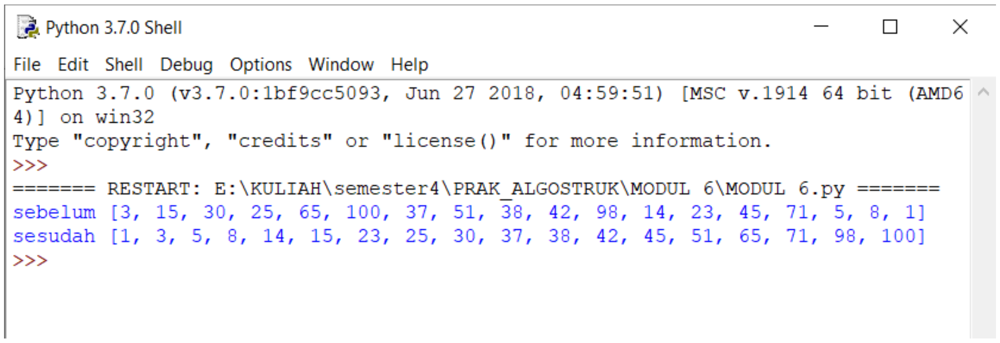
2	7	16	19	24	35	43	72	80	91

Nomer 5


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)
File Edit Format Run Options Window Help

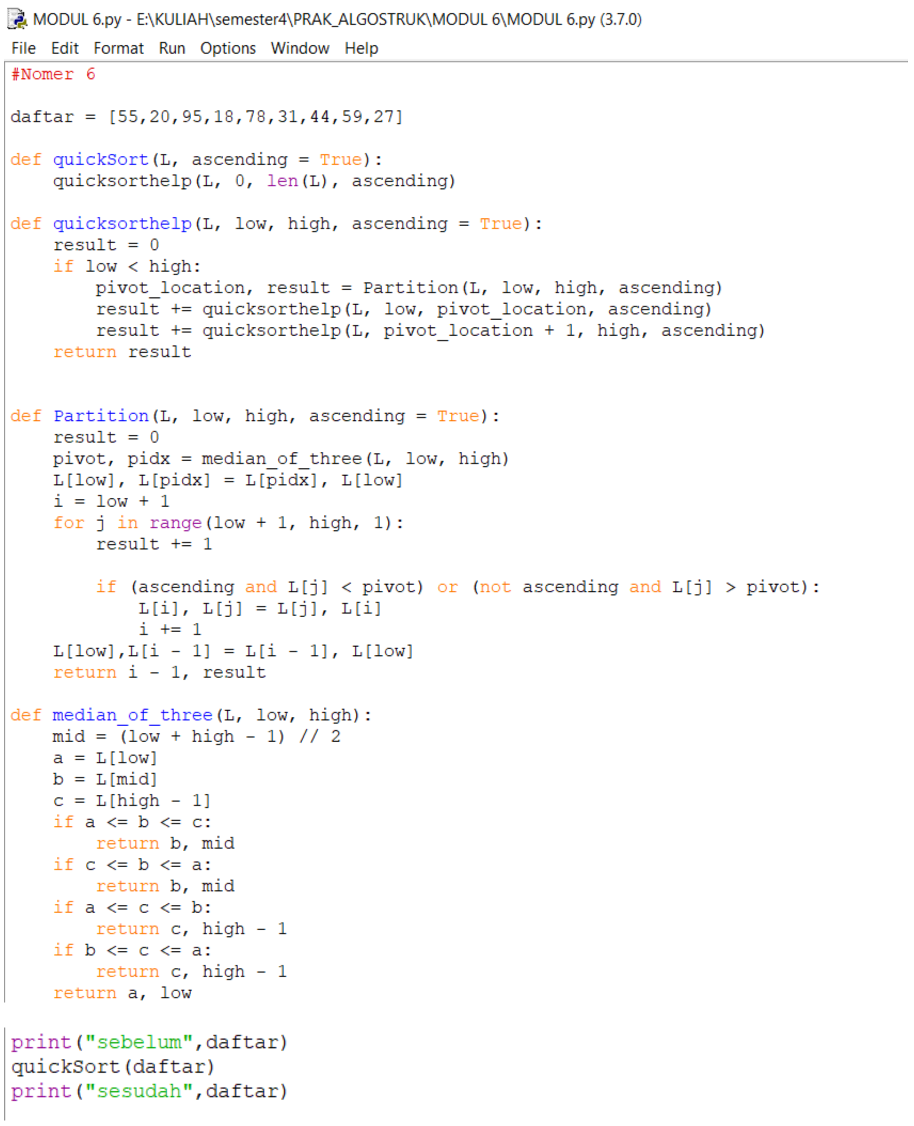
```
#Nomer 5

daftar = [3, 15, 30, 25, 65, 100, 37, 51, 38, 42, 98, 14, 23 , 45, 71, 5, 8 ,1]

def mergeSort2(A, awal, akhir):
    mid = (awal+akhir)//2
    if awal < akhir:
        mergeSort2(A, awal, mid)
        mergeSort2(A, mid+1, akhir)
    a, f, l = 0, awal, mid+1
    tmp = [None] * (akhir - awal + 1)
    while f <= mid and l <= akhir:
        if A[f] < A[l]:
            tmp[a] = A[f]
            f += 1
        else:
            tmp[a] = A[l]
            l += 1
        a += 1

##proses penggabungan
    if f <= mid:
        tmp[a:] = A[f:mid+1]
    if l <= akhir:
        tmp[a:] = A[l:akhir+1]

##memindah isi tmp ke A
    a = 0
    while awal <= akhir:
        A[awal] = tmp[a]
        awal += 1
        a += 1

def mergeSort(A):
    mergeSort2(A, 0, len(A)-1)

print("sebelum",daftar)
mergeSort(daftar)
print("sesudah",daftar)
```

Hasil



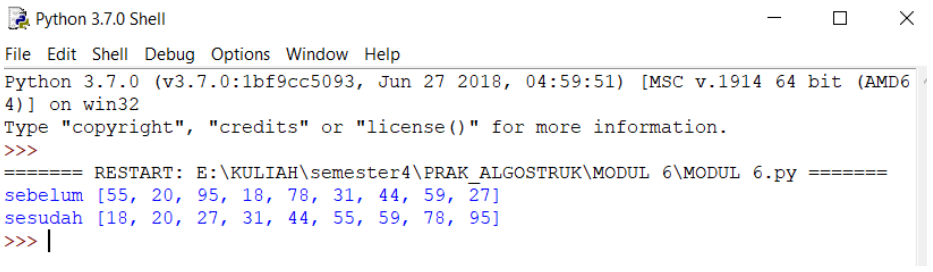
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
sebelum [3, 15, 30, 25, 65, 100, 37, 51, 38, 42, 98, 14, 23, 45, 71, 5, 8, 1]
sesudah [1, 3, 5, 8, 14, 15, 23, 25, 30, 37, 38, 42, 45, 51, 65, 71, 98, 100]
>>>
```

Nomer 6


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)
File Edit Format Run Options Window Help

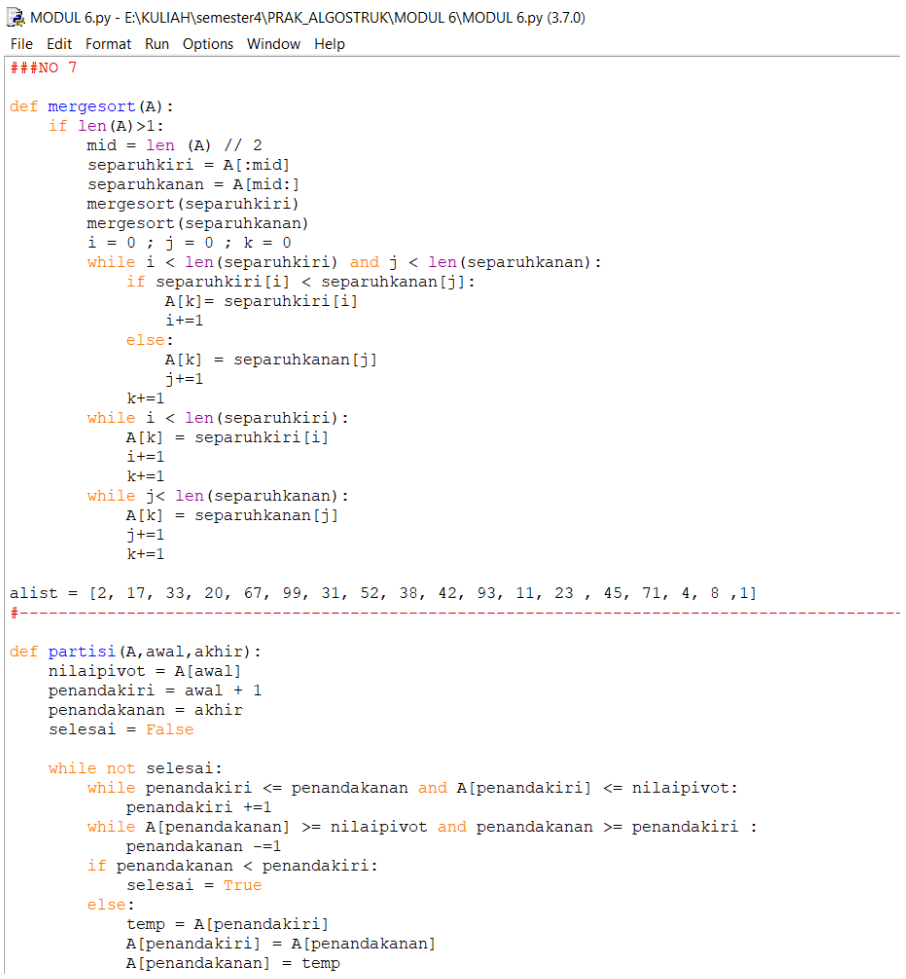
```
#Nomer 6

daftar = [55,20,95,18,78,31,44,59,27]

def quickSort(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

print("sebelum",daftar)
quickSort(daftar)
print("sesudah",daftar)
```

Hasil



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
sebelum [55, 20, 95, 18, 78, 31, 44, 59, 27]
sesudah [18, 20, 27, 31, 44, 55, 59, 78, 95]
>>>
```

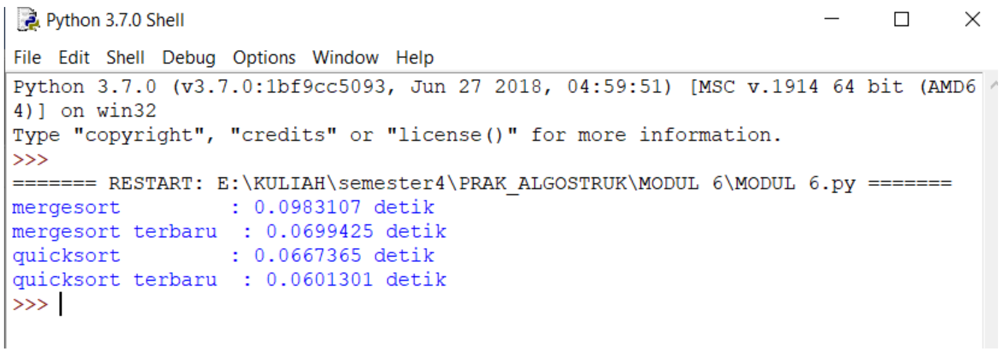
Nomer 7


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)
File Edit Format Run Options Window Help

```
###NO 7

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

alist = [2, 17, 33, 20, 67, 99, 31, 52, 38, 42, 93, 11, 23 , 45, 71, 4, 8 ,1]
#-------------------------------------------------------------------------------------------

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 +=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[penandakanan]
   A[penandakanan] = temp

   return penandakanan

------------------------------------------------------------------------------------------
ef quicksortbantu(A,awal,akhir):
   if awal < akhir:
       titikbelah = partisi(A,awal,akhir)
       quicksortbantu(A,awal,titikbelah -1)
       quicksortbantu(A,titikbelah+1,akhir)

------------------------------------------------------------------------------------------

ef quicksort(A):
   quicksortbantu(A,0,len(A)-1)

------------------------------------------------------------------------------------------

nerge sort terbaru
ef mergesort2_5(A, awal, akhir):
   mid = (awal+akhir)//2
   if awal < akhir:
       mergesort2_5(A, awal, mid)
       mergesort2_5(A, mid+1, akhir)
   a, f, l = 0, awal, mid+1
   tmp = [None] * (akhir - awal + 1)
   while f <= mid and l <= akhir:
       if A[f] < A[l]:
           tmp[a] = A[f]
           f+= 1
       else:
           tmp[a] = A[l]
           l += 1
       a += 1
```

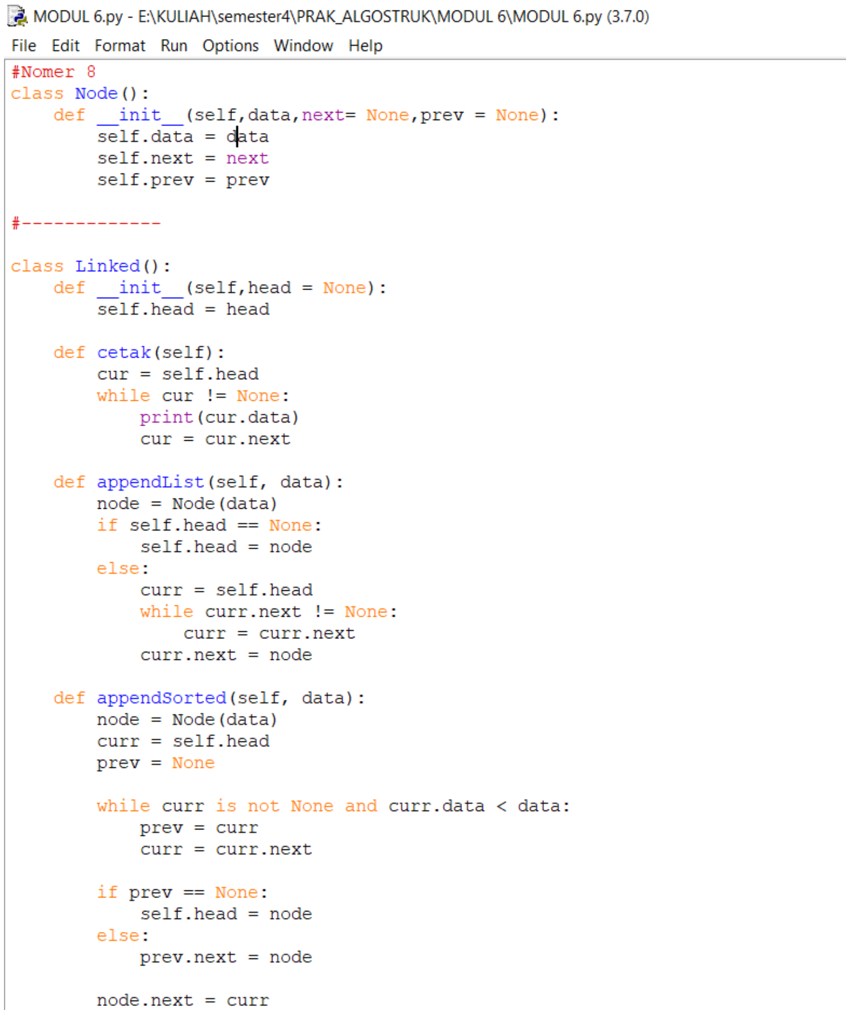
Hasil



Python 3.7.0 Shell

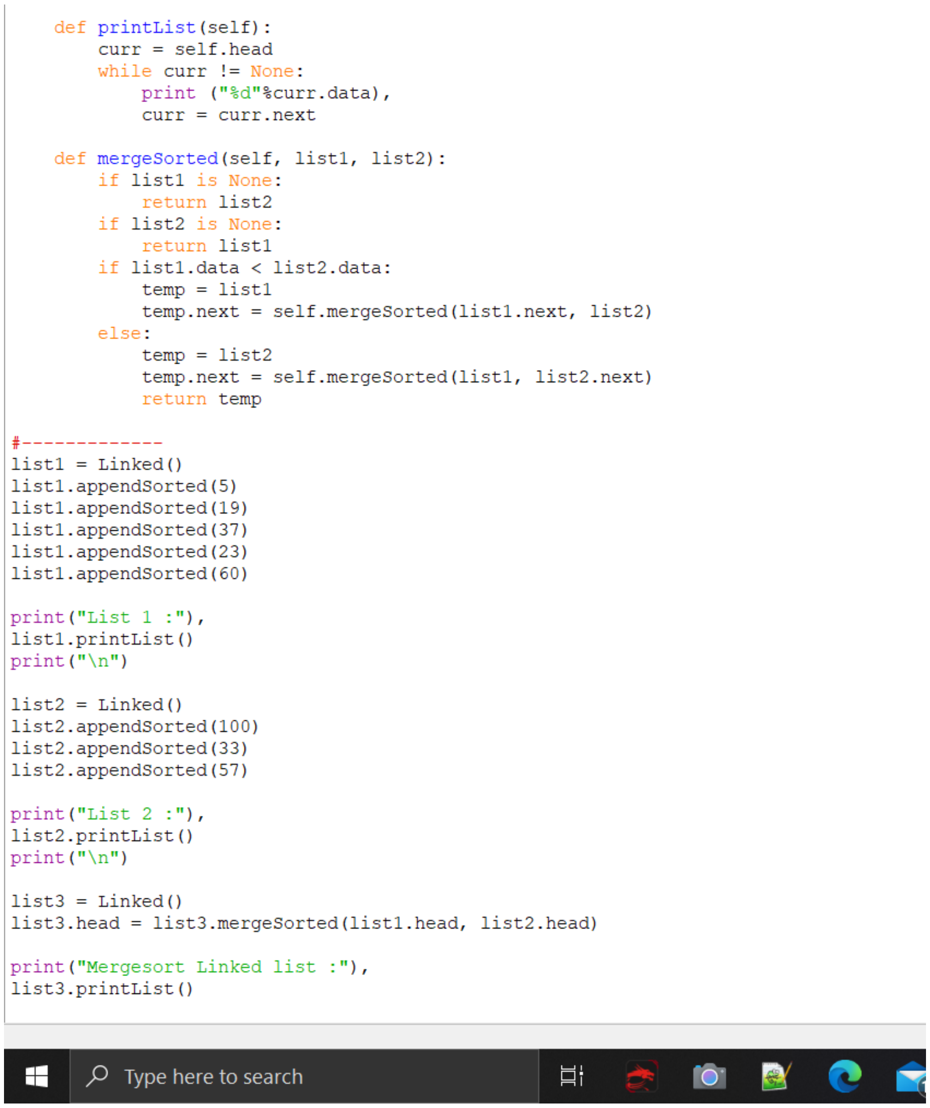
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
mergesort          : 0.0983107 detik
mergesort terbaru  : 0.0699425 detik
quicksort          : 0.0667365 detik
quicksort terbaru  : 0.0601301 detik
>>> 
```

Nomer 8


MODUL 6.py - E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py (3.7.0)

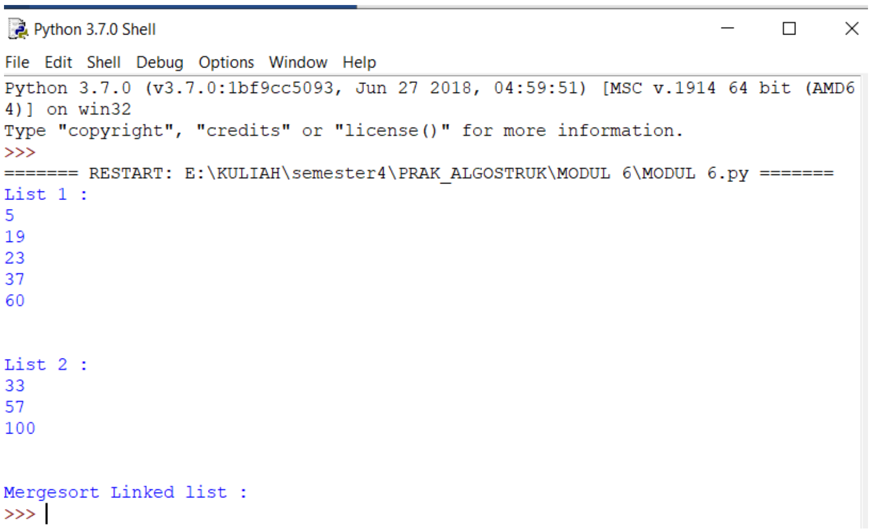
File Edit Format Run Options Window Help

```
#Nomer 8
class Node():
    def __init__(self,data,next= None,prev = None):
        self.data = data
        self.next = next
        self.prev = prev

#-------------

class Linked():
    def __init__(self,head = None):
        self.head = head

    def cetak(self):
        cur = self.head
        while cur != None:
            print(cur.data)
            cur = cur.next

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

#-------------
list1 = Linked()
list1.appendSorted(5)
list1.appendSorted(19)
list1.appendSorted(37)
list1.appendSorted(23)
list1.appendSorted(60)

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

list2 = Linked()
list2.appendSorted(100)
list2.appendSorted(33)
list2.appendSorted(57)

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

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

print("Mergesort Linked list :"),
list3.printList()
```

Hasil



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: E:\KULIAH\semester4\PRAK_ALGOSTRUK\MODUL 6\MODUL 6.py =======
List 1 :
5
19
23
37
60


List 2 :
33
57
100


Mergesort Linked list :
>>> 
```