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## MODUL 6

### Pengurutan Lanjut

No 1.

.

```
class Mahasiswa(object):
    def __init__(self, nama, NIM, kota, us):
        self.nama = nama
        self.NIM = NIM
        self.kotaTinggal = kota
        self.uangSaku = us

a0 = Mahasiswa('Sukma', 147, 'Yogyakarta', 500000)
a1 = Mahasiswa('Nindi', 100, 'Sragen', 700000)
a2 = Mahasiswa('Cantik', 200, 'Surakarta', 250000)
a3 = Mahasiswa('Nurma', 180, 'Surakarta', 500000)
a4 = Mahasiswa('Fitra', 112, 'Boyolali', 600000)
a5 = Mahasiswa('Retno', 110, 'Salatiga', 250000)
a6 = Mahasiswa('Muhibah', 131, 'Klaten', 500000)
a7 = Mahasiswa('Zahra', 201, 'Wonogiri', 245000)
a8 = Mahasiswa('Rizka', 231, 'Klaten', 400000)
a9 = Mahasiswa('Iis', 143, 'Karanganyar', 700000)
a10 = Mahasiswa('Ayasha', 129, 'Purwodadi', 100000)

Daftar = [a0, a1, a2, a3, a4, a5, a6, a7, a8, a9, a10]

def urutkanNIM(a):
    baru = {}
    for i in range(len(a)):
        baru[a[i].nama] = a[i].NIM
    listofTuples = sorted(baru.items(), key = lambda x: x[1])
    for elem in listofTuples:
        print (elem[0], ': ', elem[1])
    urutkanNIM(Daftar)
```

Setelah di run :

```
or 1.py
Nindi : 100
Retno : 110
Fitra : 112
Ayasha : 129
Muhibah : 131
Iis : 143
Sukma : 147
Nurma : 180
Cantik : 200
Zahra : 201
Rizka : 231
>>> |
```

No 2.

```
def bubblesort(arr):
    n = len(arr)
    for i in range(n):
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]
    return arr

def gabung(a,b):
    c = []
    c = a+b
    n = len(c)
    for i in range(n):
        for j in range(0, n-i-1):
            if c[j] > c[j+1]:
                c[j], c[j+1] = c[j+1], c[j]
    return c

a = [5,45,12,32,6,10,2]
b = [26,8,20,14,40]
a,b = bubblesort(a),bubblesort(b)

print(a, '\n', b)
print()
print(gabung(a,b))
```

Setelah di run :

```
or 2.py
[2, 5, 6, 10, 12, 32, 45]
[8, 14, 20, 26, 40]

[2, 5, 6, 8, 10, 12, 14, 20, 26, 32, 40, 45]
>>>
```

No 3 & 4.

```
from time import time as detik
from random import shuffle as kocok
import time

k = [i for i in range(1,6001)]
kocok(k)

def bubb(arr):
    n = len(arr)
    for i in range(n):
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]

def sele(A):
    for i in range(len(A)):
        min_idx = i
        for j in range(i+1, len(A)):
            if A[min_idx] > A[j]:
                min_idx = j
        A[i], A[min_idx] = A[min_idx], A[i]

def inse(arr):
    for i in range(1, len(arr)):
        key = arr[i]
        j = i-1
        while j >=0 and key < arr[j]:
            arr[j+1] = arr[j]
            j -= 1
        arr[j+1] = key

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

```

        arr[k] = L[i]
        i+=1
    else:
        arr[k] = R[j]
        j+=1
        k+=1
    while i < len(L):
        arr[k] = L[i]
        i+=1
        k+=1
    while j < len(R):
        arr[k] = R[j]
        j+=1
        k+=1
def partition(arr,low,high):
    i = ( low-1 )
    pivot = arr[high]
    for j in range(low , high):
        if arr[j] <= pivot:
            i = i+1
            arr[i],arr[j] = arr[j],arr[i]
    arr[i+1],arr[high] = arr[high],arr[i+1]
    return ( i+1 )

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

bub = k[:]
sel = k[:]
ins = k[:]
mer = k[:]
qui = k[:]

aw=detak();bubb(bub);ak=detak();print('bubble : %g detik' %(ak-aw));
aw=detak();sele(sel);ak=detak();print('selection : %g detik' %(ak-aw));
aw=detak();inse(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,0,len(qui)-1);ak=detak();print('quick : %g detik' %(ak-

```

Setelah di run :

```

or 3 dan 4.py
bubble : 9.65642 detik
selection : 4.04041 detik
insertion : 4.32121 detik
merge : 0.0936 detik
quick : 0.0468001 detik
>>> |

```

No 5.

```
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])
    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([13,45,12]))
```

Setelah di run :

```
or 5.py
[12, 13, 45]
>>> |
```

No 6.

```
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

listel = list([12,4,15,124,123])

quickSort(listel, False) # descending order
print('sorted :', listel)
```

Setelah di run :

```
or 6.py
sorted : [124, 123, 15, 12, 4]
>>> |
```

No 7.

```
from time import time as detik
from random import shuffle as kocok
import time

k = [i for i in range(1,6001)]
kocok(k)

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

def partition(arr,low,high):
    i = ( low-1 )
    pivot = arr[high]
    for j in range(low , high):
        if arr[j] <= pivot:
            i = i+1
            arr[i],arr[j] = arr[j],arr[i]
    arr[i+1],arr[high] = arr[high],arr[i+1]
    return ( i+1 )

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

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)
        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=detak();merge_sort(mer2);print('merge mod : %g detik' %(ak-aw));
aw=detak();quickSortMOD(qui2, False);print('quick mod : %g detik' %(ak-aw));

```

Setelah di run :

```

or 7.py
merge : 0.0936 detik
quick : 0.0467999 detik
merge mod : 0 detik
quick mod : -0.1248 detik
>>> |

```

No 8.

```
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:
        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(13)
list1.appendSorted(12)
list1.appendSorted(3)
list1.appendSorted(16)
list1.appendSorted(7)

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

list2 = LinkedList()
list2.appendSorted(9)
list2.appendSorted(10)
list2.appendSorted(1)

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

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

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

```

Setelah di run :

```

or 8.py
List 1 :
3
7
12
13
16
List 2 :
1
9
10
Merged List :
1
3
7
9
10
12
13
16
>>> |

```