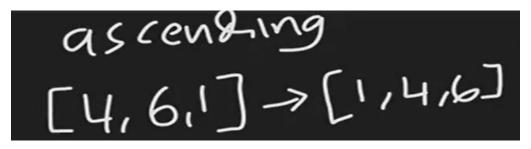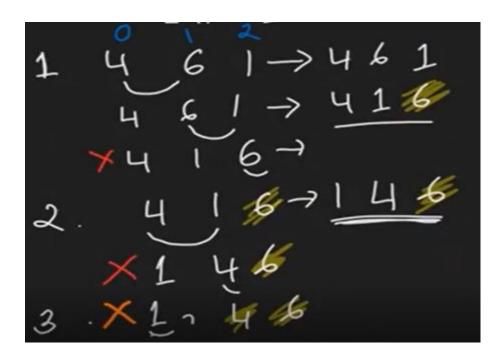Contoh: pengurutan IP mhs tkait pberian beasiswa maka data nilai mhs diurutkan tlebih dahulu kmdn missal diambil 10 IP teratas.
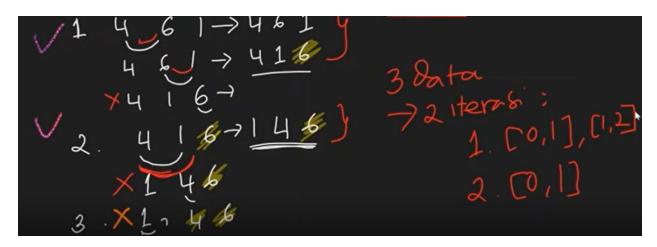
Bubble sort: algoritma yg melakukan iterasi terus mnerus sehingga indeks data terakhir adalah data tbesar (ascending) sdmkian hingga semua data dlm keadaan terurut.

Hal ini spt yg tjadi (filosofi) pada bubble/gelembung bahwa gelembung akan bgerak dr bawah ke atas kmdn bubble tsb akan pecah.
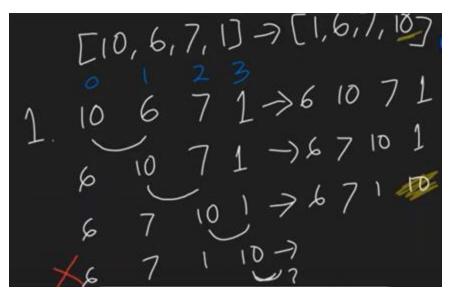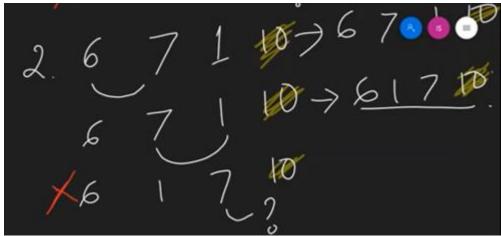
Konsep:

✓1   4 6 1 → 4 6 1 }
       4 6 → 4 1 6 }
     ×4 1 6 →
✓2.   4 1 6 → 1 4 6 }
     ×1 4 6
3. ×1 → 4 6

3 data
→ 2 iterasi :
  1. [0,1], [1,2]
  2. [0,1]

Contoh lain

[10, 6, 7, 1] → [1, 6, 7, 10]
  0   1   2   3
1. 10 6 7 1 → 6 10 7 1
     6 10 7 1 → 6 7 10 1
     6   7 10 1 → 6 7 1 10
    ×6   7   1 10 → ?

2. 6 7 1 10 → 6 7 1 10
     6 7 1 10 → 6 1 7 10
    ×6 1 7 10 → ?

3. 6 1 7 10 → 1 6 7 10

X1 6 7 10 →

4. X1 6 7 10

[10, 6, 7, 1] → [1, 6, 7, 10]

1) 10 6 7 1 → 6 10 7 1
6 10 7 1 → 6 7 10 1
6 7 10 1 → 6 7 1 10
X6 7 1 10 ?

2) 6 7 1 10 → 6 7 1 10
6 7 1 10 → 6 1 7 10
X6 1 7 10 ?

3) 6 1 7 10 → 1 6 7 10
X1 6 7 10 →

4 X1 6 7 10

4 data :
3 iterasi

4 data :
3 iterasi

1. 3x →
   [0,1]
   [1,2]
   [2,3]
2. 2x →
   [0,1]
   [1,2]
3. 1x → [0,1]

5 data → 4 iterasi :

1. 4x → [0,1]
   [1,2]
   [2,3]
   [3,4]

$$2. \quad 3x \rightarrow \begin{array}{l}[0,1]\\[1,2]\\[2,3]\end{array}$$

$$3. \quad 2x \rightarrow \begin{array}{l}[0,1]\\[1,2]\end{array}$$

$$4. \quad 1x \rightarrow [0,1]$$

Bubble Sort

In [1]:
```
n=3
for i in range(n):
    print('iterasi-',i)
```
```
iterasi- 0
iterasi- 1
iterasi- 2
```

In [2]:
```
n=3
for i in range(n-1):
    print('iterasi-',i)
```
```
iterasi- 0
iterasi- 1
```

In [3]:
```
n=4
for i in range(n-1):
    print('iterasi-',i)
```
```
iterasi- 0
iterasi- 1
iterasi- 2
```

In [4]:
```
n=5
for i in range(n-1):
    print('iterasi-',i)
```
```
iterasi- 0
iterasi- 1
iterasi- 2
iterasi- 3
```

3 data
$\rightarrow 2$ iterasi :

$2x \leftarrow 1. [0,1],[1,2]$

$1x \leftarrow 2. [0,1]$

In [5]: ▶
```python
n=5

for i in range(n-1,0,-1): #(awal,akhir,interval=-1)
    print('iterasi-',i)
```
```
iterasi- 4
iterasi- 3
iterasi- 2
iterasi- 1
```

In [7]: ▶
```python
n=5

for i in range(n-1,0,-1): #(awal,akhir,interval=-1)
    print('jumlah iterasi-',i)
    for j in range(i):
        print(j,j+1)
```
```
jumlah iterasi- 4
0 1
1 2
2 3
3 4
jumlah iterasi- 3
0 1
1 2
2 3
jumlah iterasi- 2
0 1
1 2
jumlah iterasi- 1
0 1
```

In [8]: ▶
```python
n=3

for i in range(n-1,0,-1): #(awal,akhir,interval=-1)
    print('jumlah iterasi-',i)
    for j in range(i):
        print(j,j+1)
```
```
jumlah iterasi- 2
0 1
1 2
jumlah iterasi- 1
0 1
```

In [9]: ▶
```python
n=4

for i in range(n-1,0,-1): #(awal,akhir,interval=-1)
    print('jumlah iterasi-',i)
    for j in range(i):
        print(j,j+1)
```
```
jumlah iterasi- 3
0 1
1 2
2 3
jumlah iterasi- 2
0 1
1 2
jumlah iterasi- 1
0 1
```

Indeks sdh bjalan sesuai dg algoritma bubble sort.

Slanjutnya bmain datanya

```
In [9]:  n=4
         a=[4,6,1]
         for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
             print('jumlah iterasi-',i)
             for j in range(i):
                 if a[j]>a[j+1]:

                     print(j,j+1)
```

```
In [10]:  a=5
          b=6
          print(a,b)

          5 6
```

```
In [11]:  a=5
          b=6
          print(a,b)
          a,b=b,a
          print(a,b)

          5 6
          6 5
```

```
In [12]:  n=4
          a=[4,6,1]
          for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
              print('jumlah iterasi-',i)
              for j in range(i):
                  if a[j]>a[j+1]:
                      a[j],a[j+1]=a[j+1],a[j]
                  print(a)

          jumlah iterasi- 2
          [4, 6, 1]
          [4, 1, 6]
          jumlah iterasi- 1
          [1, 4, 6]
```

```
In [13]:  n=4
          a=[10,6,7,1]
          for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
              print('jumlah iterasi-',i)
              for j in range(i):
                  if a[j]>a[j+1]:
                      a[j],a[j+1]=a[j+1],a[j]
                  print(a)

          jumlah iterasi- 3
          [6, 10, 7, 1]
          [6, 7, 10, 1]
          [6, 7, 1, 10]
          jumlah iterasi- 2
          [6, 7, 1, 10]
          [6, 1, 7, 10]
          jumlah iterasi- 1
          [1, 6, 7, 10]
```

```
In [14]:  n=4
          a=[10,6,7,1]
          for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
              print('jumlah iterasi-',i)
              for j in range(i):
                  if a[j]>a[j+1]:
                      a[j],a[j+1]=a[j+1],a[j]
                  print(a)
          print('data terurut=',a)
```

```
jumlah iterasi- 3
[6, 10, 7, 1]
[6, 7, 10, 1]
[6, 7, 1, 10]
jumlah iterasi- 2
[6, 7, 1, 10]
[6, 1, 7, 10]
jumlah iterasi- 1
[1, 6, 7, 10]
data terurut= [1, 6, 7, 10]
```

```
In [15]:  n=4
          a=[10,6,7,1,10,12,100,1,0,23,45,7,8,9]
          for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
              print('jumlah iterasi-',i)
              for j in range(i):
                  if a[j]>a[j+1]:
                      a[j],a[j+1]=a[j+1],a[j]
                  print(a)
          print('data terurut=',a)
```

```
jumlah iterasi- 13
[6, 10, 7, 1, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 10, 1, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
```

```
jumlah iterasi- 13
[6, 10, 7, 1, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 10, 1, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 100, 1, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 100, 0, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 100, 23, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 23, 100, 45, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 23, 45, 100, 7, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 23, 45, 7, 100, 8, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 23, 45, 7, 8, 100, 9]
[6, 7, 1, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
```

```
jumlah iterasi- 12
[6, 7, 1, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 12, 1, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 12, 0, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 45, 7, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 7, 45, 8, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 7, 8, 45, 9, 100]
[6, 1, 7, 10, 10, 1, 0, 12, 23, 7, 8, 9, 45, 100]
```

```
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
jumlah iterasi- 4
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
jumlah iterasi- 3
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
jumlah iterasi- 2
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
jumlah iterasi- 1
[0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
data terurut= [0, 1, 1, 6, 7, 7, 8, 9, 10, 10, 12, 23, 45, 100]
```

In [20]:
```python
n=4
a=[10,6,7,1]
for i in range(len(a)-1,0,-1): #(awal,akhir,interval=-1)
    print('iterasi ke-',len(a)-i, 'jumlah iterasi-',i)
    for j in range(i):
        if a[j]>a[j+1]:
            a[j],a[j+1]=a[j+1],a[j]
        print(j+1,' = ',a)
print('data terurut=',a)
```

```
iterasi ke- 1 jumlah iterasi- 3
1  =  [6, 10, 7, 1]
2  =  [6, 7, 10, 1]
3  =  [6, 7, 1, 10]
iterasi ke- 2 jumlah iterasi- 2
1  =  [6, 7, 1, 10]
2  =  [6, 1, 7, 10]
iterasi ke- 3 jumlah iterasi- 1
1  =  [1, 6, 7, 10]
data terurut= [1, 6, 7, 10]
```