

## Ordenamientos

### 1) Burbuja

[100, 22, 95, 1, 23, 45, 450, 18, 35]

def ordenamientoBurbuja (lista):

for i in range (len(lista), len(lista)):

for j in range (len(lista)-1, 0, -1):

if lista [j] > lista [j+1]:

K = lista [j+1]

lista [j+1] = lista [j]

if lista [j] <= K:

print (lista)

Bucle for i      Bucle for j

N veces	i en el bucle for i	lista	len(lista)
1	1	[100, 22, 95, 1, 23, 45, 450, 18, 35]	9
2	2	[22, 100, 95, 1, 23, 45, 450, 18, 35]	9
3	3	[22, 95, 1, 23, 45, 18, 35, 100, 450]	9
4	4	[1, 22, 23, 45, 18, 35, 95, 100, 450]	9
5	5	[1, 22, 23, 18, 35, 95, 95, 100, 450]	9
6	6	[1, 22, 18, 23, 35, 45, 95, 100, 450]	9
7	7	[1, 18, 22, 23, 35, 45, 95, 100, 450]	9
8	8	[1, 18, 22, 23, 35, 45, 95, 100, 450]	9

Bucle for j

Primera pasada: rango de 0 a 7

j=0      |      0      [22, 100, 95, 1, 23, 145, 150, 18, 35]      8  
              |      [22, 100, 95, 1, 23, 145, 150, 18, 35]      7

100 > 22      # si

K=22

Lista[j+1] = Lista[j] # 100

Lista[j] = K # 22

[22, 100, 95, 1, 23, 145, 150, 18, 35]

j=1      100 > 95      # NO  
              K=95

Lista[j+1] = 100

Lista[j] = K # 95

[22, 95, 100, 1, 23, 145, 150, 18, 35]

j=2      100 > 1      # si  
              K=1

Lista[j+1] = 100

Lista[j] = K # 1

[22, 95, 1, 100, 23, 145, 150, 18, 35]

$j = 3$

$100 > 23 \# si$

$K = 23$

$\text{Lista}[j] = 23 \# 23$

$\text{Lista}[j+1] = 100$

$[22, 95, 1, 23, 100, 45, 450, 18, 35]$

$j = 4$

$100 > 45 \# si$

$\text{Lista}[j] = 45$

$\text{Lista}[j+1] = 100$

$[22, 95, 1, 23, 45, 100, 450, 18, 35]$

$j = 5$

$100 > 450 \# NO$

$j = 6$

$450 > 18 \# si$

$\text{Lista}[j] = 18$

$\text{Lista}[j+1] = 450$

$[22, 95, 1, 23, 45, 18, 450, 35]$

$j = 7$

$450 > 35 \# si$

$\text{Lista}[j] = 35$

$\text{Lista}[j+1] = 450$

$[22, 95, 1, 23, 45, 35, 450, 18, 35]$

Segunda pasada: rango 0 a 6

j = 0      22 > 95    # NO

j = 1      95 > 1    # SI

Lista[j] = 9

Lista[j+1] = 95

[22, 1, 95, 23, 15, 100, 18, 35, 450]

j = 2      95 > 23    # SI

Lista[j] = 23

Lista[j+1] = 95

[22, 1, 23, 95, 45, 100, 18, 35, 450]

j = 3      95 > 45    # SI

Lista[j] = 45

Lista[j+1] = 95

[22, 1, 23, 45, 95, 100, 18, 35, 450]

j = 4      95 > 100    # NO

j = 5      100 > 18

Lista[j] = 18

Lista[j+1] = 100

[22, 1, 23, 45, 95, 18, 100, 35, 450]

$j=6$

$100 > 35 \# si$

$\text{Lista}[j] = 35$

$\text{Lista}[j+1] = 100$

$[22, 1, 23, 95, 95, 18, 35, 100, 450]$

Tercera pasada : range 0 a 5

$j=0$

$22 > 1 \# si$

$\text{Lista}[j] = 1$

$\text{Lista}[j+1] = 22$

$[1, 22, 23, 95, 95, 18, 35, 100, 450]$

$j=1$

$22 > 23 \# NO$

$j=2$

$23 > 45 \# NO$

$j=3$

$45 > 95 \# NO$

$j=4$

$95 > 18 \# si$

$\text{Lista}[j] = 18$

$\text{Lista}[j+1] = 95$

$[1, 22, 23, 95, 18, 95, 35, 100, 450]$

$j=5$

$95 > 35 \# si$

$\text{Lista}[j] = 35$

$\text{Lista}[j+1] = 95$

$[1, 22, 23, 95, 18, 35, 95, 100, 450]$

Cuarta pasada : rango 0 a 4

j=0      1722 # No

j=1      22>23 # No

j=2      23>45 # No

j=3      95>18 # Si

$$\text{Lista}[j] = 18$$

$$\text{Lista}[j+1] = 95$$

[1, 22, 23, 18, 45, 35, 95, 100, 450]

j=4      45>35 # Si

$$\text{Lista}[j] = 35$$

$$\text{Lista}[j+1] = 45$$

[1, 22, 23, 18, 35, 45, 95, 100, 450]

Quinta pasada : rango 0 a 3

j=0      1722 # No

j=1      22>23 # No

j=2      23>18 # Si

$$\text{Lista}[j] = 18$$

$$\text{Lista}[j+1] = 23$$

[1, 22, 18, 23, 35, 45, 95, 100, 450]

$j=3$        $23 > 35$      $\# \text{ NO}$

Sexta pasada      range 0 a 2

$j=0$        $17 > 22$      $\# \text{ NO}$

$j=1$        $22 > 18$      $\# \text{ si}$

$\text{Lista}[j] = 18$

$\text{Lista}[j+1] = 22$

$\boxed{15, 18, 22, 23, 35, 45, 95, 100, 150}$

$j=2$        $22 > 23$      $\# \text{ NO}$

Séptima pasada      range 0 a 1

$j=0$        $1 > 18$      $\# \text{ NO}$

$j=1$        $18 > 22$      $\# \text{ NO}$

$\text{Lista} = \boxed{1, 18, 22, 23, 35, 45, 95, 100, 150}$

Fin.

2) Selectionsort (lista) # [100, 22, 95, 1, 23, 45, 450, 18, 35]

```

def selectionsort (lista):
    for i in range (len(lista)-1):
        minimo=i
        for j in range (i+1, len(lista)):
            if lista[minimo] > lista[j]:
                minimo=j
        aux = lista[minimo]
        lista[minimo] = lista[i]
        lista[i] = aux
    print (lista)

```

N veces	i	minimo	aux	Lista	len(lista)
1	0	0		[100, 22, 95, 1, 23, 45, 450, 18, 35]	9
2	1	7		[1, 18, 95, 100, 23, 45, 450, 22, 35]	9
3	2	7		[1, 18, 22, 100, 23, 45, 450, 95, 35]	9
4	3	4		[1, 18, 22, 23, 100, 45, 450, 95, 35]	9
5	4	8		[1, 18, 22, 23, 35, 45, 450, 95, 100]	9
6	5	5		[1, 18, 22, 23, 35, 45, 450, 95, 100]	9
7	6	7		[1, 18, 22, 23, 35, 45, 95, 450, 100]	9
8	7	8		[1, 18, 22, 23, 35, 45, 95, 100, 450]	9

Bucle Forj

Primera pasada: rango de 1 a 8

j=1 i=0

100 > 22 # Si

minimo = 1

aux = 22

Ejemplo: 100, 22, 95, 12, 3, 5, 7

j=2 minimo = 1

j=2 i=1 22 > 95 # No

aux = 22

minimo = 1

j=3 minimo = 1

22 > 1 # Si

minimo = 3

aux = 1

j=4 minimo = 3

1 > 23 # NO

aux = 1

j=5 minimo = 1

1 > 45 # NO

aux = 1

$j = 6$  minimo = 3  
 $1 > 450 \# No$   
aux = 1

$j = 7$  minimo = 3  
 $1 > 18 \# No$   
aux = 1

$j = 8$  minimo = 3  
 $1 > 35 \# No$   
aux = 1

Segunda pasada: range  $\geq a + 1$

$j = 2$  minimo = 1  
 ~~$2 > 85 \# si$~~   
aux = 2

$j = 3$  minimo = 1  
 ~~$2 > 100 \# No$~~   
aux = 2

$j = 4$  minimo = 1  
 ~~$2 > 23$~~   
aux = 2

$j=5$  minimo = 1

$22 > 45 \# ND$

$aux = 22$

$j=6$  minimo = 1

$22 > 450 \# ND$

$aux = 22$

$j=7$  minimo

$22 > 18 \# S_i$

minimo = 7

$aux = 18$

$j=8$  minimo = 7

$18 > 35 \# ND$

$aux = 18$

Tercera pasada: rango 1 a 6

$j=3$  minimo = 2

$95 > 100 \# ND$

$aux = 95$

$j=4$  minimo = 2

$95 > 23 \# S_i$

minimo = 4

$aux = 23$

$j=5$  minimo = 4

$23 > 45 \# NO$

aux = 23

$j=6$  minimo = 4

$23 > 450 \# NO$

aux = 23

$j=7$  minimo = 4

$j <$   $23 > 22 \# si$

minimo = 7

aux = 22

$j=8$  minimo = 7

$22 > 33$

aux = 22

Cuenta pasada rango: 1 a 50

$j=4$  minimo = 3

$100 > 23 \# si$

minimo = 4

aux = 23

$j = 5$  minimo = 4

$43 > 45 \# NO$

$aux = 23$

$j = 6$  minimo = 4

$23 > 450 \# NO$

$aux = 23$

$j = 7$  minimo = 4

$23 = 45$

$aux = 23$

$j = 8$  minimo = 4

$23 = 35$

$aux = 23$

Quinta passada range 1 a 4

$j = 5$  minimo = 4

$100 > 45 \# SI$

minimo = 5

$aux = 45$

$j = 6$  minimo = 5

$45 > 450 \# NO$

$aux = 45$

$j = 7$  minimo = 5  
 $45 > 95 \# NO$   
 $aux = 45$

$j = 8$  minimo = 5  
 $45 > 35 \# SI$   
minimo = 8  
 $aux = 35$

Quinta pasada rango 6 a 3

$j = 6$  minimo = 5  
 $45 > 150 \# NO$   
 $aux = 45$

$j = 7$  minimo = 5  
 $45 > 95 \# NO$   
 $aux = 45$

$j = 8$  minimo = 5 10  
 $45 > 100 \# NO$   
 $aux = 45$

Sexta pasada rango 7 a 2

$j = 7$  minimo = 6  
 $150 > 95 \# SI$   
minimo = 7  
 $aux = 95$

$j = 8$  minimo = 7

$95 > 100 \# NO$

$AVX = 95$

Septima pasada, solo pasa una vez

$j = 8$  minimo = 7

$100 > 450 \# SI$

minimo = 8

$AVX = 100$

3) insercionDirecta(lista): # [100, 22, 95, 1, 23, 45, 450, 18, 35]

def insercionDirecta(lista):

for i in range(1, len(lista)):

v = lista[i]

j = i - 1

while j >= 0 and lista[j] > v:

lista[j + 1] = lista[j]

j = j - 1

lista[j + 1] = v

print(lista)

Bucle for i

N veces	i	v	j	Lista	len(lista)
1	1	22	0	[22, 100, 95, 1, 23, 45, 450, 18, 35]	9
2	2	95	1	[22, 95, 100, 1, 23, 15, 450, 18, 35]	9
3	3	1	2	[1, 22, 95, 100, 23, 15, 450, 18, 35]	9
4	4	23	3	[1, 22, 23, 95, 100, 45, 450, 18, 35]	9
5	5	45	4	[1, 22, 23, 45, 95, 100, 450, 18, 35]	9
6	6	450	5	[1, 22, 23, 45, 95, 100, 450, 18, 35]	9
7	7	18	6	[1, 18, 22, 23, 45, 95, 100, 450, 35]	9
8	8	35	7	[1, 18, 22, 23, 35, 45, 95, 100, 450]	9

## Bucle while

Primera pasada

$j=0 \quad v=22$      $j \geq 0$  and  $100 > 22$  #si

$\text{lista}[1] = 100$

$j = -1$

$\Rightarrow \text{Lista} = [100, 100, 95, 1, 23, 45, 450, 18, 35]$

---

Segunda pasada

$j=1 \quad v=95$      $j \geq 0$  and  $100 > 95$  #si

$\text{lista}[2] = 100$

$j = 0$

$\Rightarrow \text{Lista} = [22, 100, 100, 1, 23, 45, 450, 18, 35]$

$j=0 \quad v=95$      $j \geq 0$  and  $22 > 95$  #No

$\Rightarrow \text{Lista} = [22, 100, 100, 1, 23, 45, 450, 18, 35]$

Tercera pasada

$j=1 \quad v=1$      $j \geq 0$  and  $100 > 1$  #Si     $\Rightarrow \text{Lista} = [22, 45, 100, 100, 23, 45, 450, 18, 35]$

$\text{lista}[3] = 100$

$j = 1$

$j=1 \quad v=1$      $j \geq 0$  and  $95 > 1$  #Si     $\Rightarrow \text{Lista} = [22, 95, 95, 100, 23, 45, 450, 18, 35]$

$\text{lista}[2] = 95$

$j = 0$

$j=0 \quad v=1$      $j \geq 0$  and  $22 > 1$  #Si

$\text{lista}[1] = 22$

$j = -1$

$\Rightarrow \text{Lista} = [22, 22, 95, 100, 23, 45, 450, 18, 35]$

sexta pasada

$j=3 \quad v=23$

$j >= 0$  and  $100 > 23$  # si

$\text{Lista}[4] = 100 \Rightarrow \text{Lista} = [1, 22, 95, 100, 100, 15, 150, 18, 35]$   
 $j=2$

$j=2 \quad v=23$

$j >= 2$  and  $95 > 23$  # si

$\text{Lista}[3] = 95$

$j=1$

$j=1 \quad v=23$

$j >= 1$  and  $22 > 23$  # No

$\Rightarrow \text{Lista} = [1, 22, 95, 95, 100, 15, 150, 18, 35]$

$j=4 \quad v=45$

$j >= 0$  and  $100 > 45$  # si

Quinta pasada

$\text{Lista}[5] = 100 \Rightarrow \text{Lista} = [1, 22, 23, 95, 100, 100, 450, 18, 35]$   
 $j=3$

$j=3 \quad v=45$

$j >= 0$  and  $95 > 45$  # si

$\text{Lista}[4] = 95$

$j=2$

$\Rightarrow \text{Lista} = [1, 22, 23, 95, 95, 100, 450, 18, 35]$

$j=2 \quad v=4$

$j >= 0$  and  $23 > 45$  # No

$\Rightarrow \text{Lista} = [1, 22, 23, 95, 95, 100, 450, 18, 35]$

Sexta pasada

$j = 5 \quad v = 150$   
 $j >= 0 \text{ and } 100 > 150 \# NO$   
 $\Rightarrow \text{Lista} = [1, 22, 23, 15, 95, 100, 150, 18, 35]$

Septima pasada

$j = 6 \quad v = 18$   
 $j >= 0 \text{ and } 150 > 18 \# si$   
 $\text{lista}[7] = 150 \Rightarrow \text{Lista} = [1, 22, 23, 15, 95, 100, 150, 18, 35]$   
 $j = 5$

$j = 5 \quad v = 18$   
 $j >= 0 \text{ and } 100 > 18 \# si$   
 $\text{lista}[6] = 100 \Rightarrow \text{Lista} = [1, 22, 23, 15, 95, 100, 100, 150, 35]$   
 $j = 4$

$j = 4 \quad v = 18$   
 $j >= 0 \text{ and } 45 > 18$   
 $\text{lista}[5] = 45 \Rightarrow \text{Lista} = [1, 22, 23, 15, 45, 100, 150, 35]$   
 $j = 3$

$j = 3 \quad v = 18$   
 $j >= 0 \text{ and } 23 > 18 \# si$   
 $\text{lista}[4] = 23$   
 $j = 2 \quad \Rightarrow \text{Lista} = [1, 22, 23, 23, 45, 100, 150, 35]$

$j = 2 \quad v = 18$   
 $j >= 0 \text{ and } 22 > 18 \# si$   
 $\text{lista}[3] = 22$   
 $j = 1 \quad \Rightarrow \text{Lista} = [1, 22, 22, 23, 45, 100, 150, 35]$

$j = 1 \quad v = 18$   
 $j >= 0 \text{ and } 1 > 18 \# NO$   
 $\Rightarrow \text{Lista} = [1, 22, 22, 23, 45, 100, 150, 35]$

para pasarla

$$j=7 \quad v=35$$

$j >= 0$  and  $450 > 35$  # si

$$\text{Lista}[8] = 450$$

$$j=6 \Rightarrow \text{Lista} = [1, 18, 22, 23, 45, 95, 100, 450, 450]$$

$$j=6 \quad v=35$$

$j >= 0$  and  $100 > 35$  # si

$$\text{Lista}[7] = 100$$

$$j=5 \Rightarrow \text{Lista} = [1, 18, 22, 23, 45, 95, 100, 100, 450]$$

$$j=5 \quad v=35$$

$j >= 0$  and  $95 > 35$  # si

$$\text{Lista}[6] = 95$$

$$j=4 \Rightarrow \text{Lista} = [1, 18, 22, 23, 45, 95, 95, 100, 450]$$

$$j=4 \quad v=35$$

$j >= 0$  and  $45 > 35$  # si

$$\text{Lista}[5] = 45$$

$$j=3 \Rightarrow \text{Lista} = [1, 18, 22, 23, 45, 45, 95, 100, 450]$$

$$j=3 \quad v=35$$

$j >= 0$  and  $23 > 35$  # NO

$$\Rightarrow \text{Lista} = [1, 18, 22, 23, 45, 45, 95, 100, 450]$$

#### 4) Orden Shell

```
def OrdenShell(lista): # [100, 22, 95, 1, 23, 45, 450, 18, 35]
    inc = int(len(lista)/2)
    while inc > 0:
        for i in range(inc, len(lista)):
            j = i
            temp = lista[i]
            while j >= inc and lista[j - inc] > temp:
                lista[j] = lista[j - inc]
                j = j - inc
            lista[j] = temp
        if inc == 2:
            inc = 1
        else:
            inc = int(inc / 2.5)
    print(lista)
```

Bucle While inc > 0

Inc inicial	Lista	lenLista
4	[23, 22, 95, 1, 35, 45, 450, 18, 100]	9
1	[18, 22, 23, 35, 45, 95, 100, 450]	9

## Bucle For i

Primeras pasadas rango de 4 a 8

$$i=4 \quad inc=4$$

$$j=4$$

$$temp=23$$

Iteración del while

$$lista[0]=23$$

While			
Pasadas	Condición	Cambio	j
1	$4 \geq 4 \text{ and } 100 > 23$	list[0] = 100	0
2	$0 >= 4 \text{ NO}$		

$$\Rightarrow lista = [23, 22, 95, 1, 100, 45, 450, 18, 35]$$

$$i=5 \quad inc=4$$

$$j=5$$

$$temp=45$$

Iteración del while

$$lista[5]=45$$

While			
Pasadas	Condición	Cambio	j
1	$5 \geq 4 \text{ and } 22 > 45$	#NO	

$$\Rightarrow [23, 22, 95, 1, 100, 45, 450, 18, 35]$$

$$i=6 \quad inc=4$$

$$j=6$$

$$temp=450$$

Iteración del while

$$lista[6]=450$$

While			
Pasadas	Condición	Cambio	j
1	$6 \geq 4 \text{ and } 95 > 450$	#NO	

$$\Rightarrow [23, 22, 95, 1, 100, 45, 450, 18, 35]$$

$$i=7 \quad inc=4$$

$$j=7$$

$$temp=18$$

Iteración del while

$$lista[7]=18 \Rightarrow [23, 22, 95, 1, 100, 45, 450, 18, 35]$$

$$i=8 \quad inc=4$$

$$j=8$$

$$temp=35$$

Iteración while

$$lista[8]=35 \Rightarrow [23, 22, 95, 1, 35, 45, 450, 18, 100]$$

While			
Pasadas	Condición	Cambio	j
1	$8 \geq 4 \text{ and } 100 > 35$	list[8] = 100	8
2	$4 \geq 4 \text{ and } 23 > 35$	#NO	

Segunda pasada range de 1 a 9

$i=1 \ inc=1$

$j=1$

$temp = 22$

Iteración del while

$Lista[0] = 22$

Pasadas	Condición	Cambio	J
1	$i >= 1 \text{ and } 22 > 22$	$Lista[1] = 23$	0
2	$i >= 1 \# NO$		

$\Rightarrow Lista = [22, 23, 95, 1, 35, 45, 450, 18, 100]$

$i=2 \ inc=1$

$j=2$

$temp = 95$

Iteración del while

$Lista[2] = 95 \Rightarrow Lista = [22, 23, 95, 1, 35, 45, 450, 18, 100]$

$i=3 \ inc=1$

$j=3$

$temp = 1$

Iteración del while

$Lista[0] = 1$

Pasadas	Condición	Cambio	J
1	$3 >= 1 \text{ and } 95 > 1$	$Lista[3] = 95$	2
2	$2 >= 1 \text{ and } 23 > 1$	$Lista[2] = 23$	1
3	$1 >= 1 \text{ and } 22 > 1$	$Lista[1] = 22$	0

$\Rightarrow Lista = [1, 22, 23, 95, 35, 45, 450, 18, 100]$

$i=4 \ inc=1$

$j=4$

$temp = 35$

Iteración del while

$Lista[3] = 35$

Pasadas	Condición	Cambio	J
1	$4 >= 1 \text{ and } 95 > 35$	$Lista[4] = 95$	3
2	$3 >= 1 \text{ and } 23 > 35 \# NO$		

$\Rightarrow Lista = [1, 22, 23, 35, 95, 45, 450, 18, 100]$

$i=5 \ inc=1$

$j=5$

$temp = 45$

Iteración del while

$Lista[4] = 45$

Pasadas	Condición	Cambio	J
1	$5 >= 1 \text{ and } 95 > 45$	$Lista[5] = 95$	4
2	$4 >= 1 \text{ and } 35 > 45 \# NO$		

$\Rightarrow Lista = [1, 22, 23, 35, 45, 95, 450, 18, 100]$

$i=6 \ inc=1$

$j=6$

$temp = 450$

Iteración del while

$Lista[6] = 450$

# NO  $6 >= 1 \text{ and } 95 > 450$

$\Rightarrow Lista = [1, 22, 23, 35, 45, 95, 450, 18, 100]$

$i=7$   $inc=1$

$j=7$

$temp=18$

Iteración del while

$lista[1] = 18$

while

Pasadas	Condición	Cambio	j
1	$7 \geq 1$ and $18 > 18$	$lista[7] = 450$	6
2	$6 \geq 1$ and $95 > 18$	$lista[6] = 95$	5
3	$5 \geq 1$ and $45 > 18$	$lista[5] = 45$	4
4	$4 \geq 1$ and $35 > 18$	$lista[4] = 35$	3
5	$3 \geq 1$ and $23 > 18$	$lista[3] = 23$	2
6	$2 \geq 1$ and $22 > 18$	$lista[2] = 22$	1

$\Rightarrow Lista = [1, 18, 22, 23, 35, 45, 95, 450, 100]$

$i=8$   $inc=1$

$j=8$

$temp=100$

Iteración del while

$lista[7] = 100$

Pasadas	Condición	Cambio	j
1	$8 \geq 1$ and $450 > 100$	$lista[8] = 450$	7
2	$7 \geq 1$ and $95 > 100$	# NO	

$\Rightarrow Lista = [1, 18, 22, 23, 35, 45, 95, 100, 450]$

## 5) Quicksort

```
def quicksort(lista):
    if len(lista) == 1 or len(lista) == 0:
        return lista
    else:
        pivot = lista[0]
        i = 0
        for i in range(len(lista)-1):
            if lista[j+1] < pivot:
                lista[j+1], lista[i+1] = lista[i+1], lista[j+1]
                i += 1
        lista[0], lista[i] = lista[i], lista[0]
        primera = quicksort(lista[:i])
        segunda = quicksort(lista[i+1:])
        primera.append(lista[i])
        return (primera + segunda).
```

Lista = [100, 22, 95, 1, 23, 45, 450, 18, 35]

pivot = 100

for j in range(len(lista)-1):

j	Lista
0	[100, 22, 95, 1, 23, 45, 450, 18, 35]
1	[100, 22, 95, 1, 23, 45, 450, 18, 35]
2	[100, 22, 95, 1, 23, 45, 450, 18, 35]
3	[100, 22, 95, 1, 23, 45, 450, 18, 35]
4	[100, 22, 95, 1, 23, 45, 450, 18, 35]
5	[100, 22, 95, 1, 23, 45, 450, 18, 35]
6	[100, 22, 95, 1, 23, 45, 18, 450, 35]
7	[100, 22, 95, 1, 23, 45, 18, 35, 450]

Lista = [35, 22, 95, 1, 23, 45, 18, 100, 450]

Llamada recursiva # primera = quicksort(Lista[:i])

Lista = [35, 22, 95, 1, 23, 45, 18]

pivot = 35

for j in range(len(Lista)-1):

j	Lista
0	[35, 22, 95, 1, 23, 45, 18]
1	[35, 22, 95, 1, 23, 45, 18]
2	[35, 22, 1, 95, 23, 45, 18]
3	[35, 22, 1, 23, 95, 45, 18]
4	[35, 22, 1, 23, 95, 45, 18]
5	[35, 22, 1, 23, 18, 45, 95]

Lista = [18, 22, 1, 23, 35, 45, 95]

- llamada recursiva # primera = quicksort[:i]

lista = [18, 22, 1, 23]

qivot = 18

for i in range(len(lista) - 1)

j

lista

0

[18, 22, 1, 23]

1

[18, 1, 22, 23]

2

[18, 1, 22, 23]

lista = [18, 22, 23]

- llamada recursiva # primera = quicksort[:i]

lista = [ ]

return lista

- llamada recursiva # segunda = quicksort([i+1: ])

lista = [22, 23]

qivot = 22

for i in range(len(lista) - 1)

j

lista

0

[22, 23]

lista = [22, 23]

- llamada recursiva # segunda = quicksort([i+1: ])

lista = [23]

return lista

- llamada recursiva # segunda = quicksort([i+1:j])

lista = [45, 95]

pivot = 45

for i in range(len(lista)-1)

j	lista
0	[45, 95]

lista = [45, 95]

- llamada recursiva # segunda = quicksort([i+1:j])

lista = [95]

return lista

- llamada recursiva # segunda = quicksort([i+1:j])

lista = [450]

return lista

Desarrollo de la lista

$$[22] + [23] = [22, 23]$$

$$[1, 18] + [22, 23] = [1, 18, 22, 23]$$

$$[45] + [95] = [45, 95]$$

$$[1, 18, 22, 23, 35] + [45, 95] = [1, 18, 22, 23, 35, 45, 95]$$

$$[1, 18, 22, 23, 35, 45, 95, 100] + [450] = [1, 18, 22, 23, 35, 45, 95, 100, 450]$$

$$\text{Lista} = [1, 18, 22, 23, 35, 45, 95, 100, 450]$$

## 6) Radix

```
def largo(n):
    if not type(n) == int:
        return "Error"
    elif n == 0:
        return 1
    cont = 0
    for i in range(n):
        cont += 1
        if n == 0:
            return cont
    # [100, 22, 95, 123, 45, 450, 18, 35]
def radix(lista):
    if not type(lista) == list:
        return "Dato invalido"
    elif lista == []:
        return []
    else:
        mayor = 0
        for i in range(len(lista)):
            if i == 0:
                mayor = lista[i]
            else:
                if lista[i] > mayor:
                    mayor = lista[i]
        cont = 0
        for i in range(largo(mayor)):
            L0 = []
            L1 = []
            L2 = []
            L3 = []
            L4 = []
            L5 = []
            L6 = []
            L7 = []
            L8 = []
            L9 = []
            for j in range(len(lista)):
                if lista[j] // (10 ** i) % 10 == 0:
                    L0.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 1:
                    L1.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 2:
                    L2.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 3:
                    L3.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 4:
                    L4.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 5:
                    L5.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 6:
                    L6.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 7:
                    L7.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 8:
                    L8.append(lista[j])
                elif lista[j] // (10 ** i) % 10 == 9:
                    L9.append(lista[j])
            print(L0)
            print(L1)
            print(L2)
            print(L3)
            print(L4)
            print(L5)
            print(L6)
            print(L7)
            print(L8)
            print(L9)
```

```
while lista != []:
    if lista[0] // (10**cont) % 10 == 0:
        L0 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 1:
        L1 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 2:
        L2 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 3:
        L3 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 4:
        L4 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 5:
        L5 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 6:
        L6 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 7:
        L7 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 8:
        L8 += [lista[0]]
    elif lista[0] // (10**cont) % 10 == 9:
        L9 += [lista[0]]
    lista = lista[1:]
    cont += 1
print(lista)
```

Primer for i # Determinar el mayor

i	Mayor	list[i]	(en lista)
0	0	100	9
1	100	22	9
2	100	95	9
3	100	1	9
4	100	23	9
5	100	45	9
6	100	450	9
7	450	18	9
8	450	35	9

Segundo for i # Arroja en la lista

i	0	1	2
L0	[100, 22, 95, 1, 23, 45, 450, 18, 35]	[100, 450, 1, 22, 23, 95, 45, 35, 18]	[100, 1, 18, 22, 23, 35, 45, 450, 95]
L1	[1]	[18]	[100]
L2	[22]	[22, 23]	[ ]
L3	[23]	[35]	[ ]
L4	[ ]	[45]	[450]
L5	[95, 45, 35]	[450]	[ ]
L6	[ ]	[ ]	[ ]
L7	[ ]	[ ]	[ ]
L8	[18]	[ ]	[ ]
L9	[ ]	[95]	[ ]
cont	0	1	2

Lista final = [1, 18, 22, 23, 35, 45, 95, 100, 450]

?) ShakeSort(lista):  
    inicio, final = 0, len(lista) - 1  
    while inicio < final:  
        print(lista)  
        intercambiado = False  
        for i in range(inicio, final):  
            if lista[i] > lista[i+1]:  
                lista[i], lista[i+1] = lista[i+1], lista[i]  
                intercambio = True  
        if not intercambio:  
            break  
        final = final - 1  
        for i in range(final, inicio, -1):  
            if lista[i] < lista[i-1]:  
                lista[i], lista[i-1] = lista[i-1], lista[i]  
                intercambio = True  
        if not intercambio:  
            break  
        inicio += 1

# While

inicio	final	lista
0	8	[100, 22, 95, 1, 23, 45, 150, 18, 35]
1	7	[1, 22, 95, 18, 23, 45, 100, 35, 150]
2	6	[1, 18, 22, 23, 35, 45, 95, 100, 150]

Primera pasada primer for

i	Lista	Intercambio
0	[100, 22, 95, 1, 23, 45, 150, 18, 35]	False
1	[22, 100, 95, 1, 23, 45, 150, 18, 35]	True
2	[22, 95, 100, 1, 23, 45, 150, 18, 35]	True
3	[22, 95, 1, 100, 23, 45, 150, 18, 35]	True
4	[22, 95, 1, 23, 100, 45, 150, 18, 35]	True
5	[22, 95, 1, 23, 45, 100, 150, 18, 35]	True
6	[22, 95, 1, 23, 45, 100, 150, 18, 35]	True
7	[22, 95, 1, 23, 45, 100, 18, 150, 35]	True

final = 7

Primeras pasadas segundo for

i	Lista	Intercambio
7	[22, 95, 1, 23, 45, 100, 18, 35, 150]	True
6	[22, 95, 1, 23, 45, 100, 18, 35, 150]	True
5	[22, 95, 1, 23, 45, 18, 100, 35, 150]	True
4	[22, 95, 1, 23, 18, 45, 100, 35, 150]	True
3	[22, 95, 1, 18, 23, 45, 100, 35, 150]	True
2	[22, 95, 1, 18, 23, 45, 100, 35, 150]	True
1	[22, 1, 95, 18, 23, 45, 100, 35, 150]	True

inicio = 1

intercambio = False

Segunda pasada primer for

i	lista	Intercambio
1	[1, 22, 95, 18, 23, 45, 100, 35, 450]	False
2	[1, 22, 95, 18, 23, 45, 100, 35, 450]	False
3	[1, 22, 18, 95, 23, 45, 100, 35, 450]	True
4	[1, 22, 18, 23, 95, 45, 100, 35, 450]	True
5	[1, 22, 18, 23, 45, 95, 100, 35, 450]	True
6	[1, 22, 18, 23, 45, 95, 100, 35, 450]	True

final = 6

Segunda pasada segundo for

i	lista	Intercambio
6	[1, 22, 18, 23, 45, 95, 35, 100, 450]	True
5	[1, 22, 18, 23, 45, 35, 95, 100, 450]	True
4	[1, 22, 18, 23, 35, 45, 95, 100, 450]	True
3	[1, 22, 18, 23, 35, 45, 95, 100, 450]	True
2	[1, 22, 18, 23, 35, 45, 95, 100, 450]	True

inicio = 2

intercambio = False

Tercera pasada primer for

i	lista	Intercambio
2	[1, 18, 22, 23, 35, 45, 95, 100, 450]	False
3	[1, 18, 22, 23, 35, 45, 95, 100, 450]	False
4	[1, 18, 22, 23, 35, 45, 95, 100, 450]	False
5	[1, 18, 22, 23, 35, 45, 95, 100, 450]	False

## 8) MergeSort

```
def mergesort(lista):
    print(lista)
    if len(lista)>1:
        | medio = len(lista)//2
        | izq = lista[:medio]
        | der = lista[medio:]
        | mergesort(izq)
        | mergesort(der)
        |
        | i=0; j=0
        |
        | K=0
        | while i < len(izq) and j < len(der):
        |     if izq[i] < der[j]:
        |         lista[K] = izq[i]
        |         i+=1
        |     else:
        |         lista[K] = der[j]
        |         j+=1
        |     K+=1
        | while j < len(der):
        |     lista[K] = der[j]
        |     j+=1
        |     K+=1
        |
        | while i < len(izq):
        |     lista[K] = izq[i]
        |     i+=1
        |     K+=1
    return lista.
```

Valores cada llamada

Número	Medio	Primer	Segundo
2	2	[100, 21, 95, 1]	[23, 15, 450, 18, 35]
3	1	[100]	[95, 1]
4	1	[95]	[1]
5	2	[23, 45]	[150, 18, 35]
6	1	[23]	[45]
7	1	[450]	[18, 35]
8	1	[18]	[35]

Primer while

i	lista	N	Llamada
0	[100, 21]	1	
0	[95, 1]	2	
0	[100, 22, 95, 1]	3	
0	[1, 22, 95, 1]	3	
1	[1, 22, 95, 1]	3	
0	[23, 45]	4	
0	[18, 35]	5	
0	[450, 18, 35]	6	
0	[18, 18, 35]	6	
0	[23, 45, 450, 18, 35]	7	
0	[18, 45, 450, 18, 35]	7	
1	[18, 23, 450, 18, 35]	7	
1	[18, 23, 35, 18, 35]	7	
0	[100, 22, 95, 1, 23, 45, 450, 18, 35]	8	
1	[1, 22, 95, 1, 23, 45, 450, 18, 35]	8	
1	[1, 18, 95, 1, 23, 45, 450, 18, 35]	8	

2	$[1, 18, 22, 1, 23, 45, 450, 18, 35]$	8
2	$[1, 18, 22, 23, 45, 450, 18, 35]$	8
2	$[1, 18, 22, 23, 35, 45, 450, 18, 35]$	8
2	$[1, 18, 22, 23, 35, 45, 450, 18, 35]$	8
3	$[1, 18, 22, 23, 35, 45, 95, 100, 35]$	8

Segundo while

i	Lista	N	Llamadas
0	$[22, 22]$	1	
0	$[1, 1]$	2	
1	$[1, 22, 95, 1]$	3	
0	$[18, 35, 35]$	4	

Tercer while

i	Lista	N	Llamadas
1	$[13, 45]$	1	
1	$[18, 35]$	2	
2	$[18, 23, 35, 45, 35]$	3	
4	$[1, 18, 22, 23, 35, 45, 95, 100, 35]$	4	

Lista final =  $[1, 18, 22, 23, 35, 45, 95, 100, 450]$