

Selection Sort

```
SelectionSort(A,n)
1: per  $i \leftarrow 1, 2, \dots, n$  ripeti
2:   per  $j \leftarrow i+1, \dots, n$  ripeti
3:     se  $a_j < a_i$  allora
4:       scambia  $a_i$  e  $a_j$ 
5:     fine-condizione
6:   fine-ciclo
7: fine-ciclo
```

Ex. Ordinare $A=\{4,2,1,3\}$

1. $A = (4, 2, 1, 3)$	$\rightarrow$	$A = (1 \mid 2, 4, 3)$
2. $A = (1 \mid 2, 4, 3)$	$\rightarrow$	$A = (1, 2 \mid 4, 3)$
3. $A = (1, 2, \mid 4, 3)$	$\rightarrow$	$A = (1, 2, 3 \mid 4)$
4. $A = (1, 2, 3 \mid 4)$	$\rightarrow$	$A = (1, 2, 3, 4)$

Insertion Sort

```
InsertionSort(A,n)
1: per  $i \leftarrow 2, 3, \dots, n$  ripeti
2:    $k \leftarrow i-1$ 
3:   fintanto che  $k \geq 1$  e  $a_k > a_{k+1}$  ripeti
4:     scambia  $a_k$  e  $a_{k+1}$ 
5:      $k \leftarrow k-1$ 
6:   fine-ciclo
7: fine-ciclo
```

Ex. Ordinare $A = \{5, 2, 3, 1, 4\}$

$A = (5 \mid 2, 3, 1, 4)$	$\rightarrow$	$A = (2, 5 \mid 3, 1, 4)$
$A = (2, 5 \mid 3, 1, 4)$	$\rightarrow$	$A = (2, 3, 5 \mid 1, 4)$
$A = (2, 3, 5 \mid 1, 4)$	$\rightarrow$	$A = (1, 2, 3, 5 \mid 4)$
$A = (1, 2, 3, 5 \mid 4)$	$\rightarrow$	$A = (1, 2, 3, 4, 5)$

Insertion Sort

```

InsertionSort(A,n)
1: per  $i \leftarrow 2, 3, \dots, n$  ripeti
2:    $k \leftarrow i - 1$ 
3:   fintanto che  $k \geq 1$  e  $a_k > a_{k+1}$  ripeti
4:     scambia  $a_k$  e  $a_{k+1}$ 
5:      $k \leftarrow k - 1$ 
6:   fine-ciclo
7: fine-ciclo

```

```

i=2;
  k=2-1=1;
  1 >= 1 e  $a_1 > a_2$  (5 | 2,3,1,4)
    Scambia  $a_1$  e  $a_2$  (2,5 | 3, 1,4)
    k=1-1=0;
  Esco dal ciclo

```

$A = (5 \mid 2,3,1,4) \rightarrow A = (2,5 \mid 3, 1,4)$

Insertion Sort

```

InsertionSort(A,n)
1: per  $i \leftarrow 2, 3, \dots, n$  ripeti
2:    $k \leftarrow i - 1$ 
3:   fintanto che  $k \geq 1$  e  $a_k > a_{k+1}$  ripeti
4:     scambia  $a_k$  e  $a_{k+1}$ 
5:      $k \leftarrow k - 1$ 
6:   fine-ciclo
7: fine-ciclo

```

```

i=3;
  k=3-1=2;
  2 >= 1 e  $a_2 > a_3$  (2,5 | 3, 1,4)
    Scambia  $a_2$  e  $a_3$  (2,3 | 5, 1,4)
    K=2-1=1;
  1 >= 1 e  $a_1 > a_2$  (2,3 | 5, 1,4)
    esco dal ciclo

```

$A = (2,5 \mid 3, 1,4) \rightarrow A = (2,3,5 \mid 1,4)$

```

InsertionSort(A,n)
1: per  $i \leftarrow 2, 3, \dots, n$  ripeti
2:    $k \leftarrow i - 1$ 
3:   fintanto che  $k \geq 1$  e  $a_k > a_{k+1}$  ripeti
4:     scambia  $a_k$  e  $a_{k+1}$ 
5:      $k \leftarrow k - 1$ 
6:   fine-ciclo
7: fine-ciclo

```

```

i=4;
k=4-1=3;
3>=1 e a3>a4 (2,3,5 | 1,4)      2>=1 e a2>a3 (2,3,1 | 5,4)
scambia a3 e a4 (2,3,1 | 5,4)    scambia a2 e a3 (2,1,3 | 5,4)
k=3-1=2                          k=2-1=1

                                0>=1 esco dal ciclo

1>=1 e a1>a2 (2,1,3 | 5,4)
scambia a1 e a2 (1,2,3 | 5,4)
k=1-1=0

```

$A = (2, 3, 5 \mid 1, 4) \rightarrow A = (1, 2, 3, 5 \mid 4)$

Bubble Sort

```

BubbleSort(A,n)
1:  $flag \leftarrow 1$ 
2:  $stop \leftarrow n - 1$ 
3: fintanto che  $flag \leftarrow 1$  ripeti
4:    $flag \leftarrow 0$ 
5:   per  $i \leftarrow 1, 2, \dots, stop$  ripeti
6:     se  $a_i > a_{i+1}$  allora
7:       scambia  $a_i$  e  $a_{i+1}$ 
8:        $flag \leftarrow 1$ 
9:   fine-condizione
10:  fine-ciclo
11:   $stop \leftarrow stop - 1$ 
12: fine-ciclo

```

Ex. Ordinare $A=\{3,5,2,4,1\}$

1. $A = (3, 5, 2, 4, 1) \rightarrow A = (3, 5, 2, 4, 1) \rightarrow A = (3, 2, 5, 4, 1) \rightarrow A = (3, 2, 4, 5, 1) \rightarrow A = (3, 2, 4, 1 \mid 5)$
2. $A = (3, 2, 4, 1 \mid 5) \rightarrow A = (2, 3, 4, 1 \mid 5) \rightarrow A = (2, 3, 4, 1 \mid 5) \rightarrow A = (2, 3, 1 \mid 4, 5)$
3. $A = (2, 3, 1, \mid 4, 5) \rightarrow A = (2, 3, 1 \mid 4, 5) \rightarrow A = (2, 1 \mid 3, 4, 5)$
4. $A = (2, 1 \mid 3, 4, 5) \rightarrow A = (1, 2, 3, 4, 5)$

Subroutine

