

# Quicksort

- Ordena o vetor particionando recursivamente
- A cada iteração, localiza a posição final de um elemento aleatório (**pivô**) e subdivide o vetor em duas partes para prosseguir a ordenação



# Partição

- Localiza a posição final do **pivô** (um elemento aleatório do vetor) e divide o vetor em duas partes, garantindo:
  - Todos os elementos à esquerda do pivô são **menores ou iguais** a ele
  - Todos os elementos à direita do pivô são **maiores** que ele



# Partição

```
function partition(V, left, right)
    pivot = V[left]
    i = left-1
    j = right+1
    while true do
        repeat j=j-1 until V[j]<=pivot
        repeat i=i+1 until V[i]>=pivot
        if i<j then
            V[i], V[j] = V[j], V[i]
        else
            return j
        end
    end
end
```



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# Quicksort

```
function quicksort(V, left, right)
  if left<right then
    middle = partition(V, left, right)
    quicksort(V, left, middle)
    quicksort(V, middle+1, right)
  end
end
```

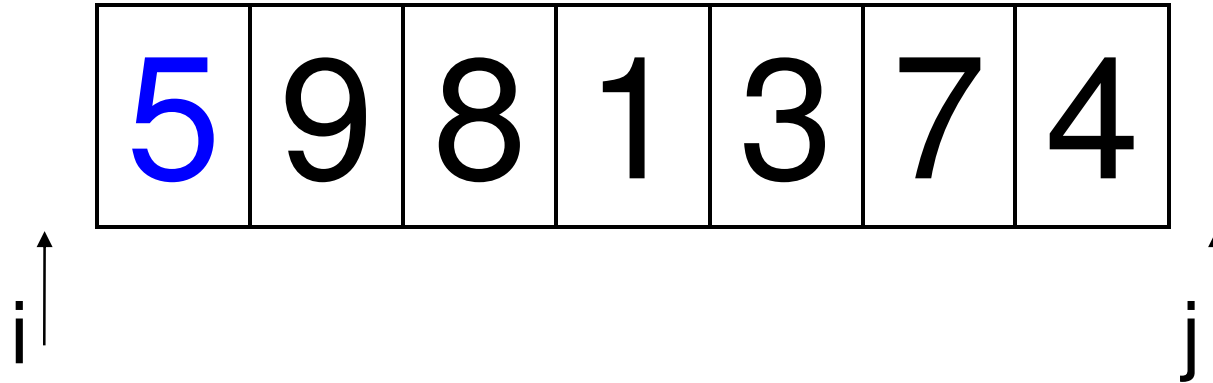


# Quicksort - *quicksort*(1,7)

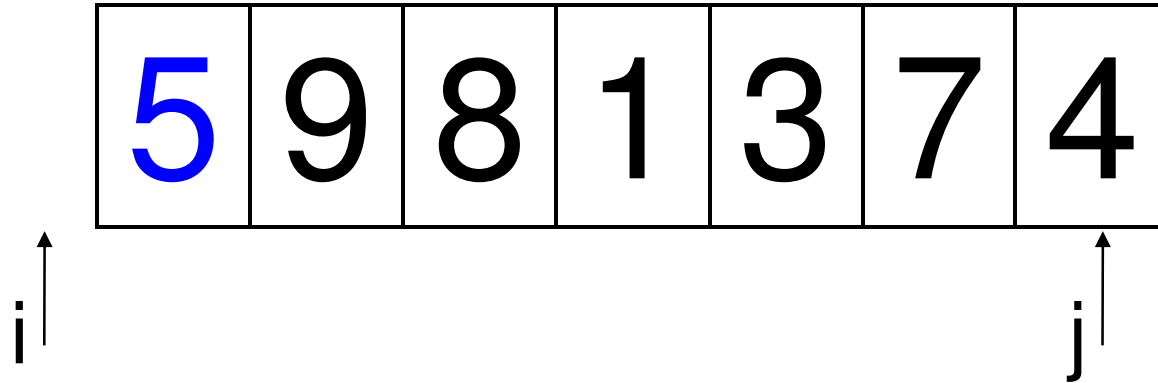
5	9	8	1	3	7	4
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1    2    3    4    5    6    7

# Quicksort - *partition*(1,7)



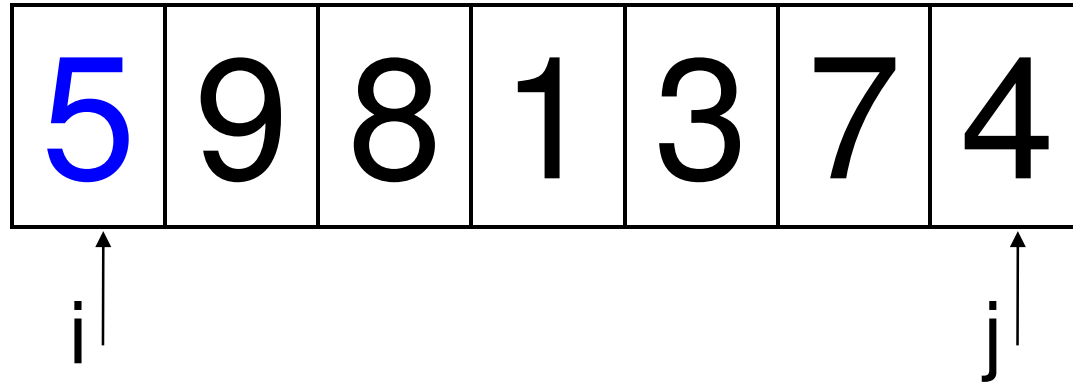
# Quicksort - *partition*(1,7)



until  $V[j] \leq 5$  ?



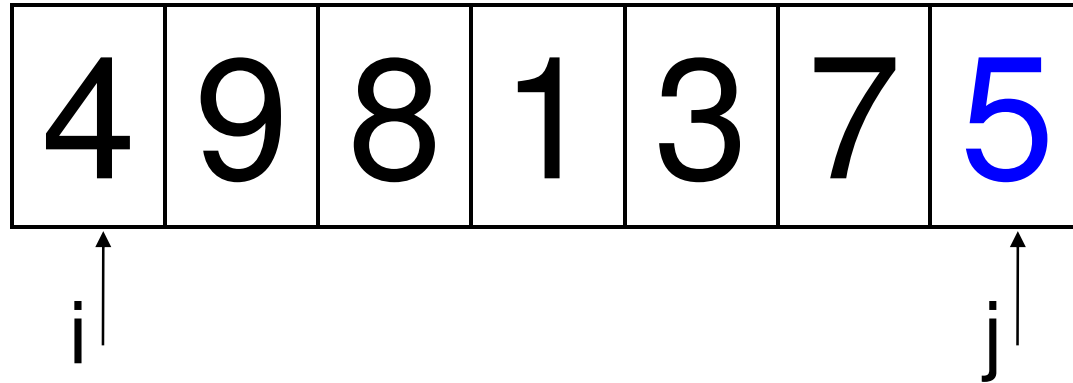
# Quicksort - *partition*(1,7)



until  $V[i] \geq 5$  ?

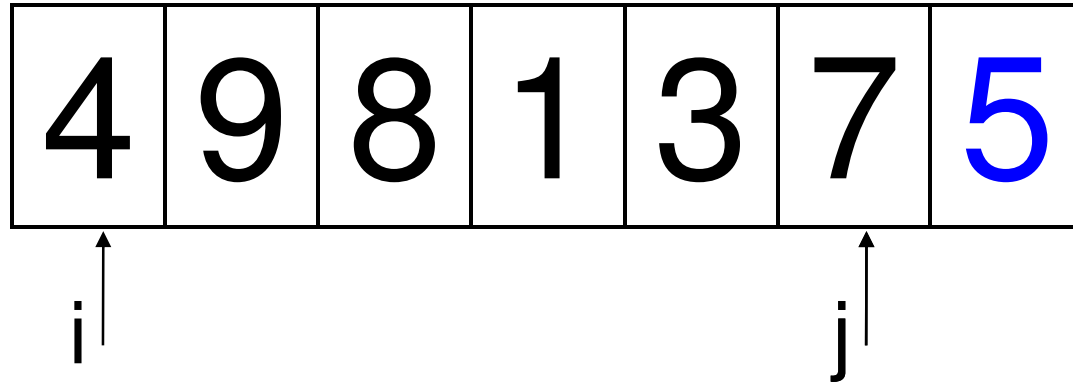


# Quicksort - *partition*(1,7)



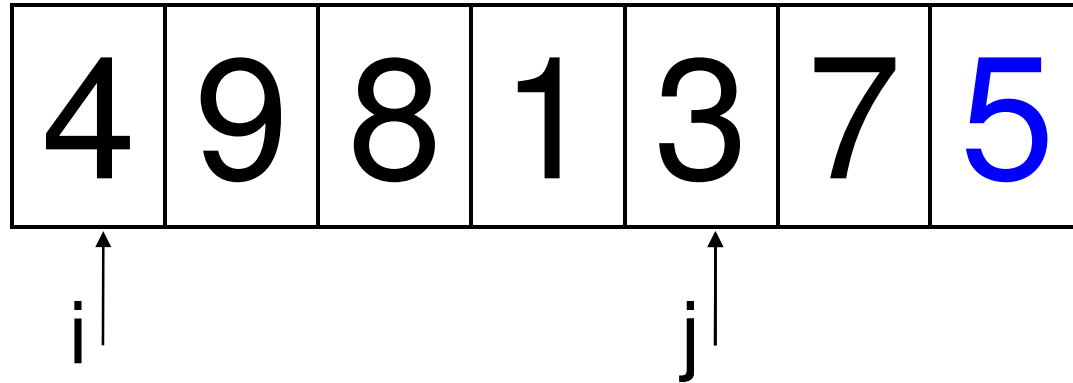
$$V[i], V[j] = V[j], V[i]$$

# Quicksort - *partition*(1,7)



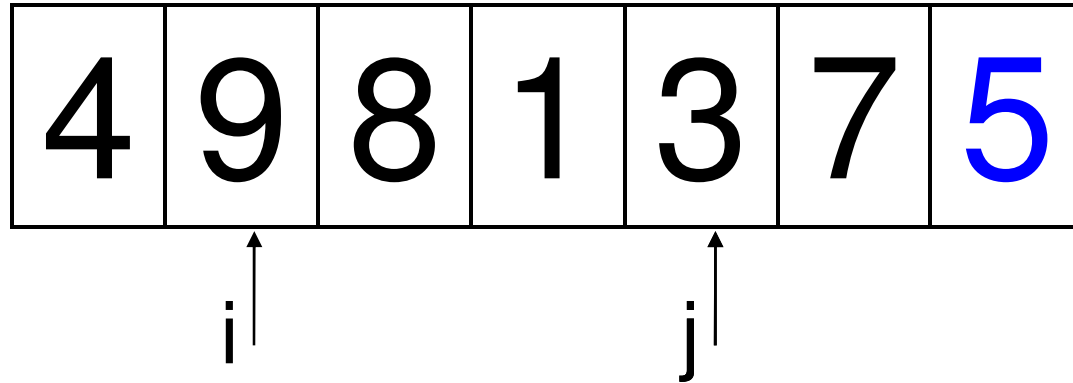
until  $V[j] \leq 5$  ?

# Quicksort - *partition*(1,7)



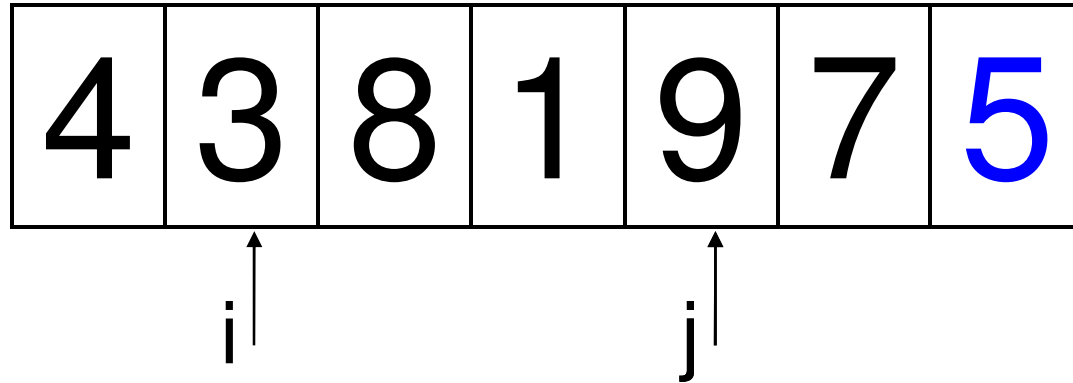
until  $V[j] \leq 5$  ?

# Quicksort - *partition*(1,7)



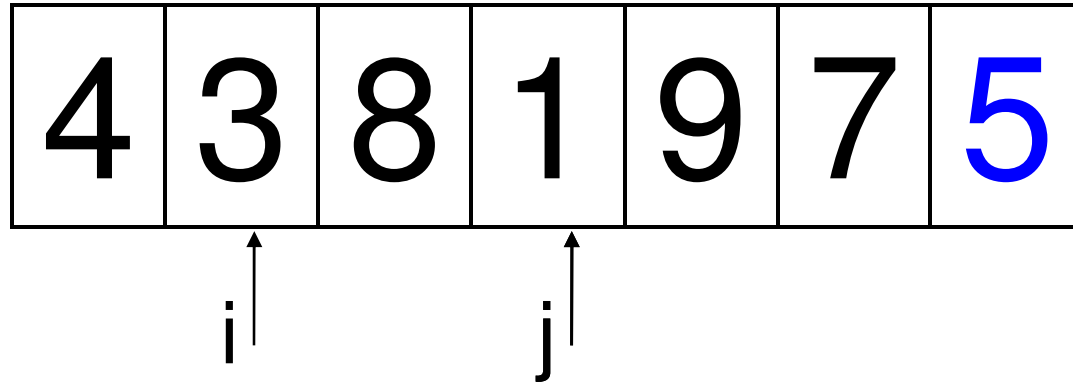
until  $V[i] \geq 5$  ?

# Quicksort - *partition*(1,7)



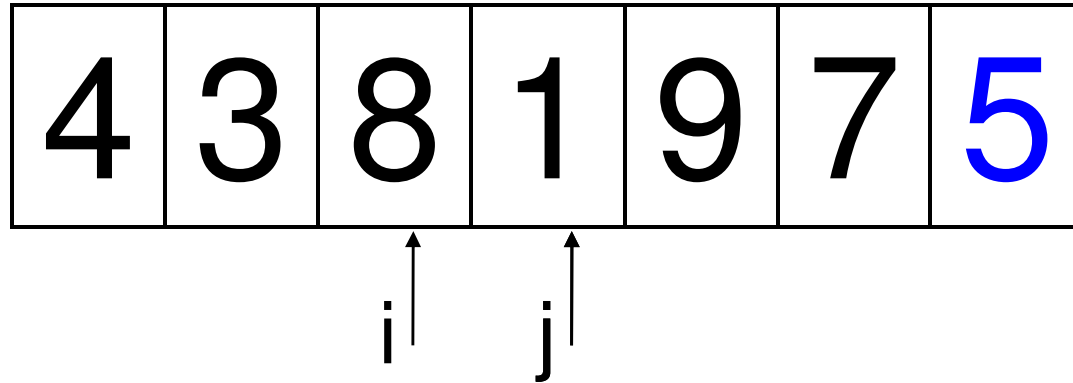
$$V[i], V[j] = V[j], V[i]$$

# Quicksort - *partition*(1,7)



until  $V[j] \leq 5$  ?

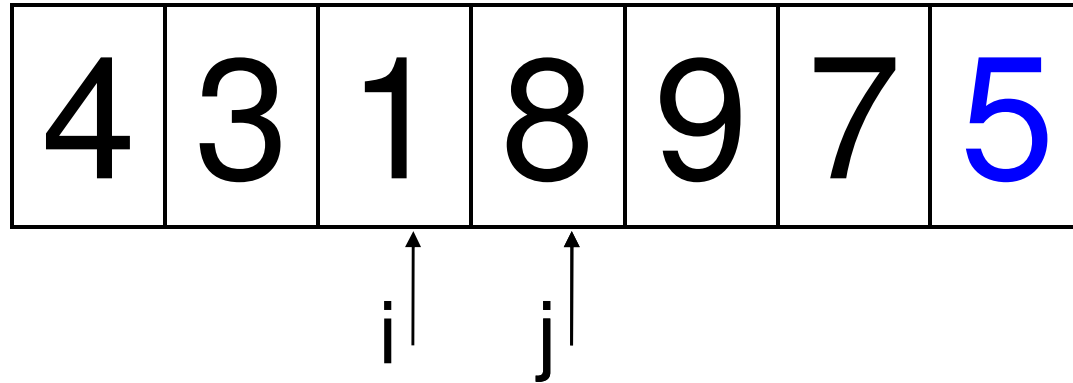
# Quicksort - *partition*(1,7)



until  $V[i] \geq 5$  ?

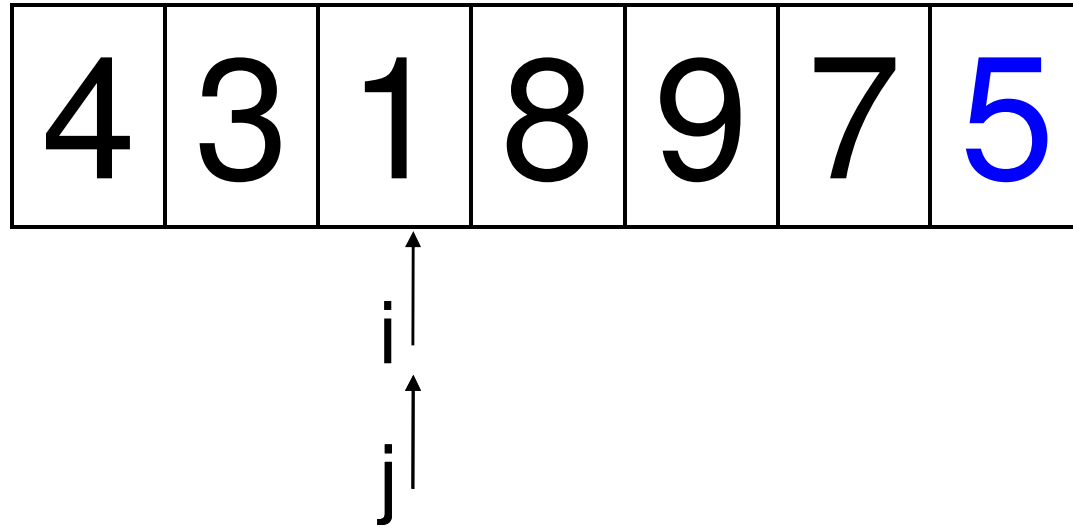


# Quicksort - *partition*(1,7)



$$V[i], V[j] = V[j], V[i]$$

# Quicksort - *partition*(1,7)



until  $V[j] \leq 5$  ?

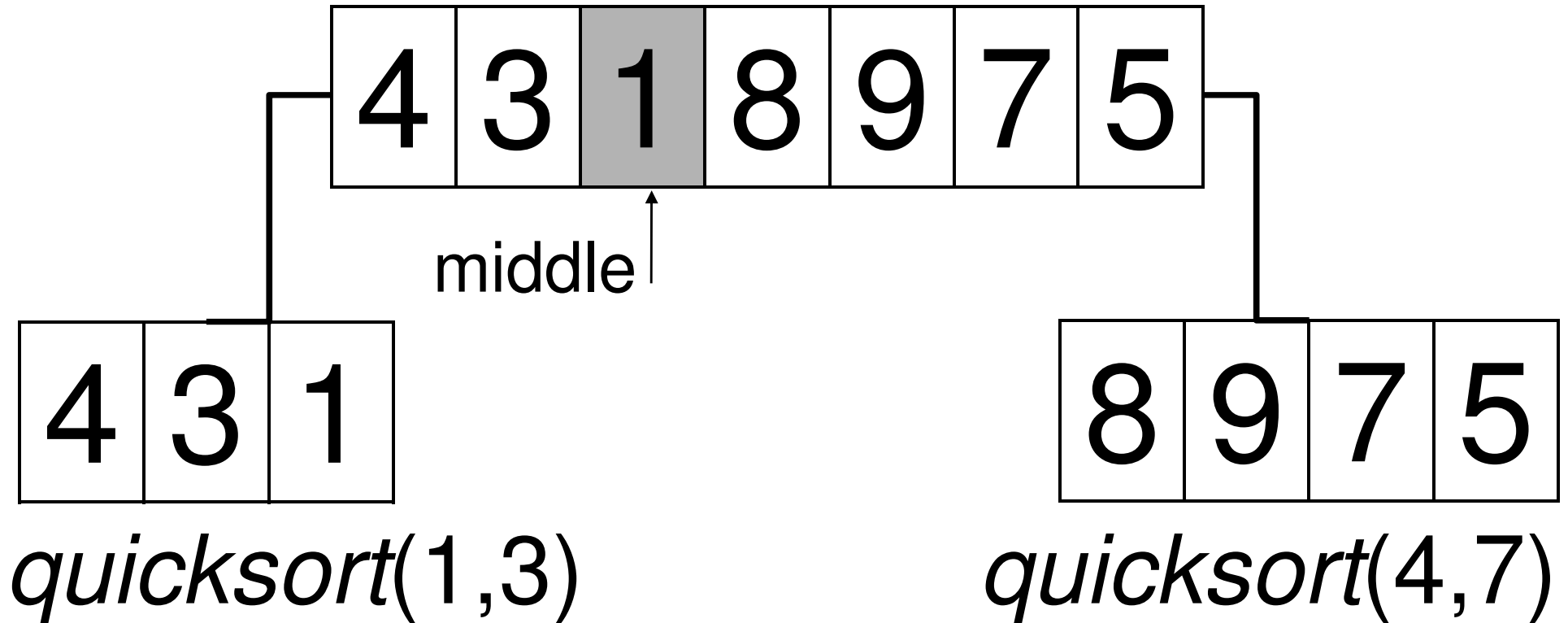
# Quicksort - *partition*(1,7)

4	3	1	8	9	7	5
---	---	---	---	---	---	---

$j \uparrow$   
 $i \uparrow$

until  $V[i] \geq 5$  ?

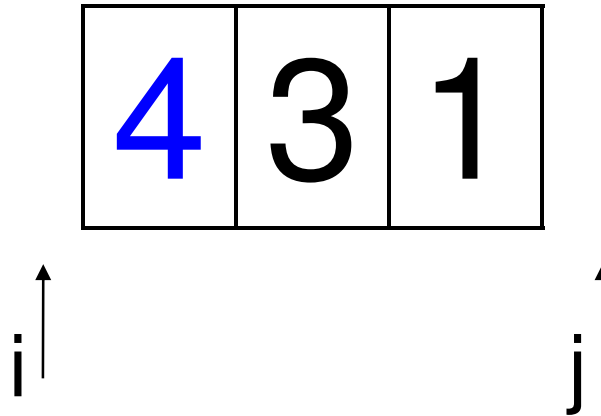
# Quicksort - *quicksort*(1,7)



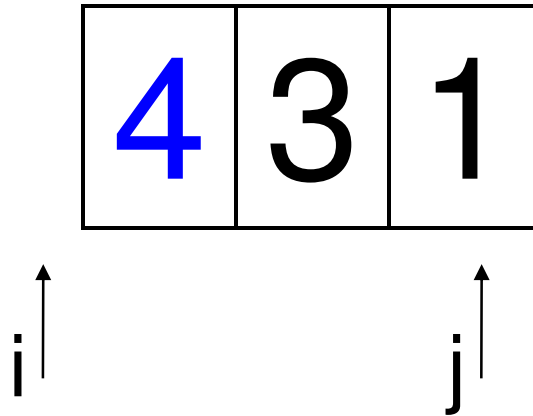
# Quicksort - *quicksort*(1,3)

4	3	1
1	2	3

# Quicksort - *partition*(1,3)



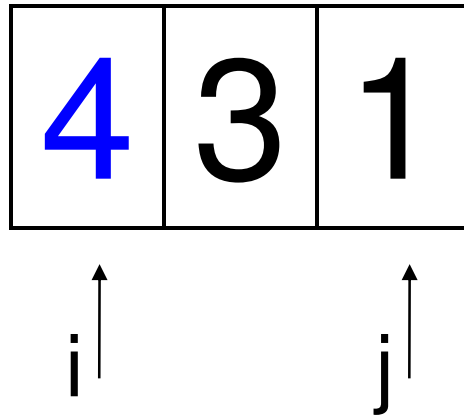
# Quicksort - *partition*(1,3)



until  $V[j] \leq 4$  ?

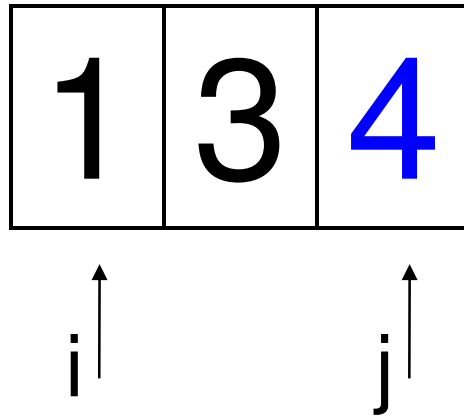


# Quicksort - *partition*(1,3)



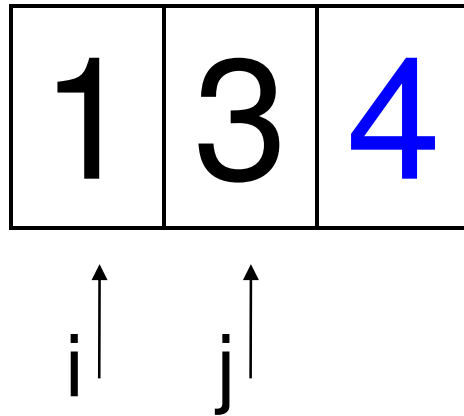
until  $V[i] \geq 4$  ?

# Quicksort - *partition*(1,3)



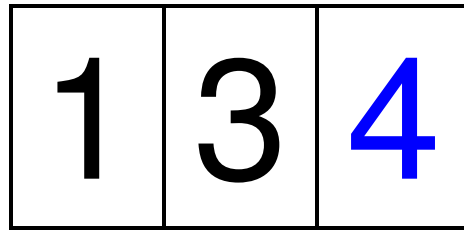
$$V[i], V[j] = V[j], V[i]$$

# Quicksort - *partition*(1,3)



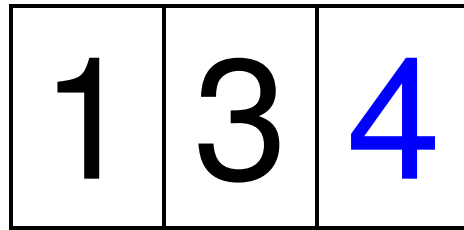
until  $V[j] \leq 4$  ?

# Quicksort - *partition*(1,3)



until  $V[i] \geq 4$  ?

# Quicksort - *partition*(1,3)



j ↑

i ↑

until  $V[i] \geq 4$  ?

# Quicksort - *partition*(1,3)

