Algorithm

Quicksort

Code Walkthrough

quicksort()

Quicksort

```
def quicksort(lst, low, high):
    if low < high:

        pivot_index = partition(lst, low, high)

        quicksort(lst, low, pivot_index-1)
        quicksort(lst, pivot_index+1, high)
```

Quicksort

```
[7, 2, 8, 1, 0, 3, 5]
```

[0] [1] [2] [3] [4] [5] [6]

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```
a = [7, 2, 8, 1, 0, 3, 5]
quicksort(a, 0, len(a)-1)
```

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[7, 2, 8, 1, 0, 3, 5]
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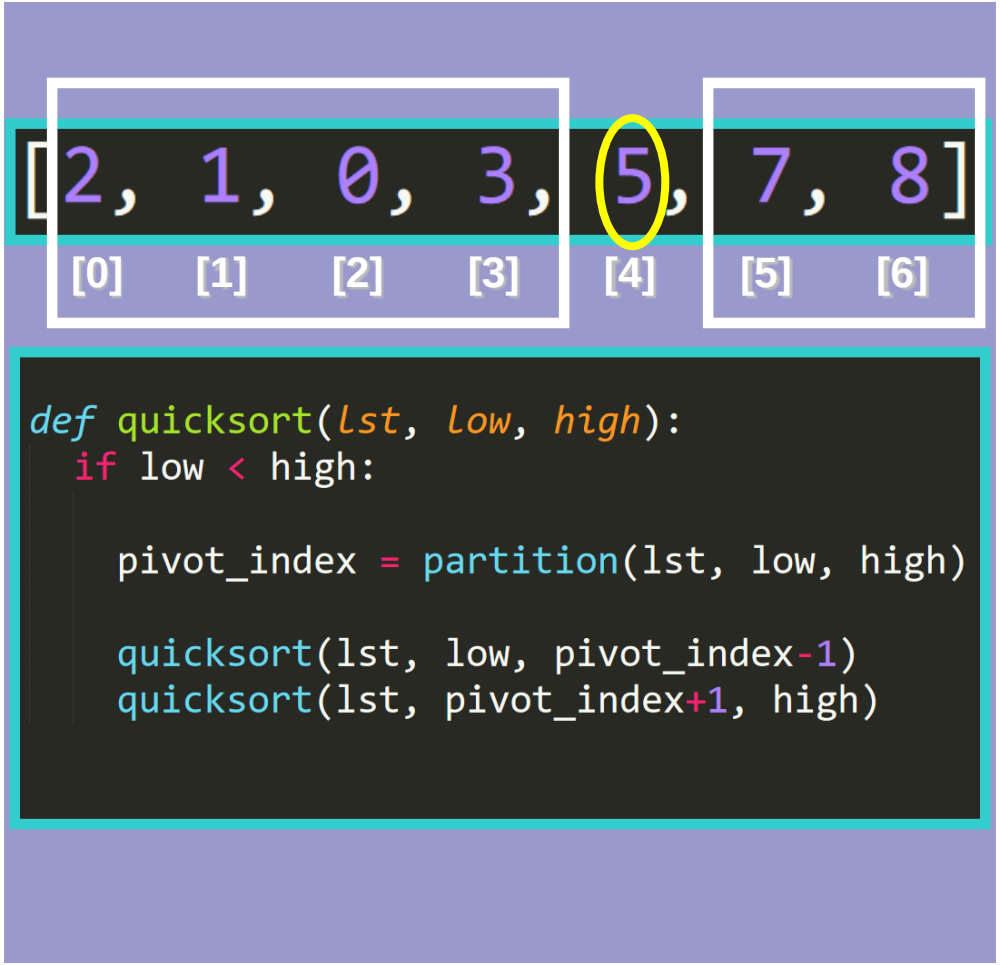
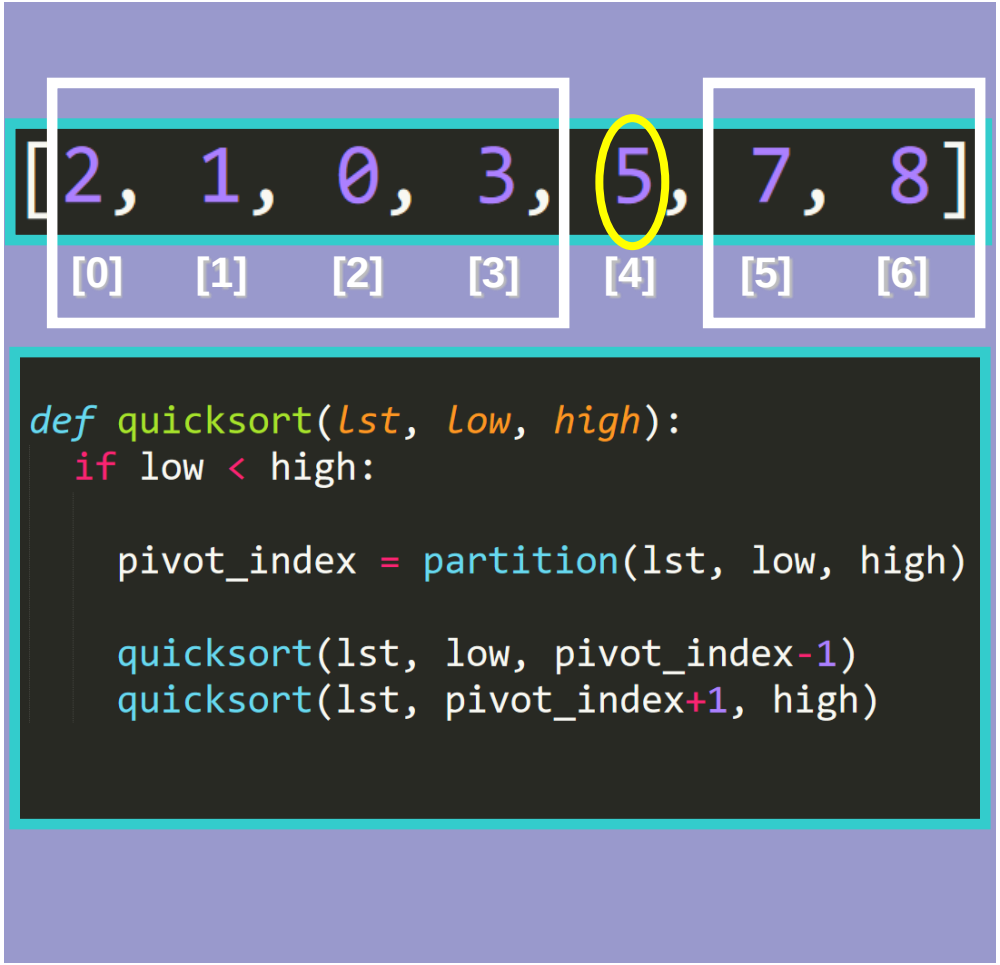



```
quicksort(a, 0, len(a)-1)
```

↓

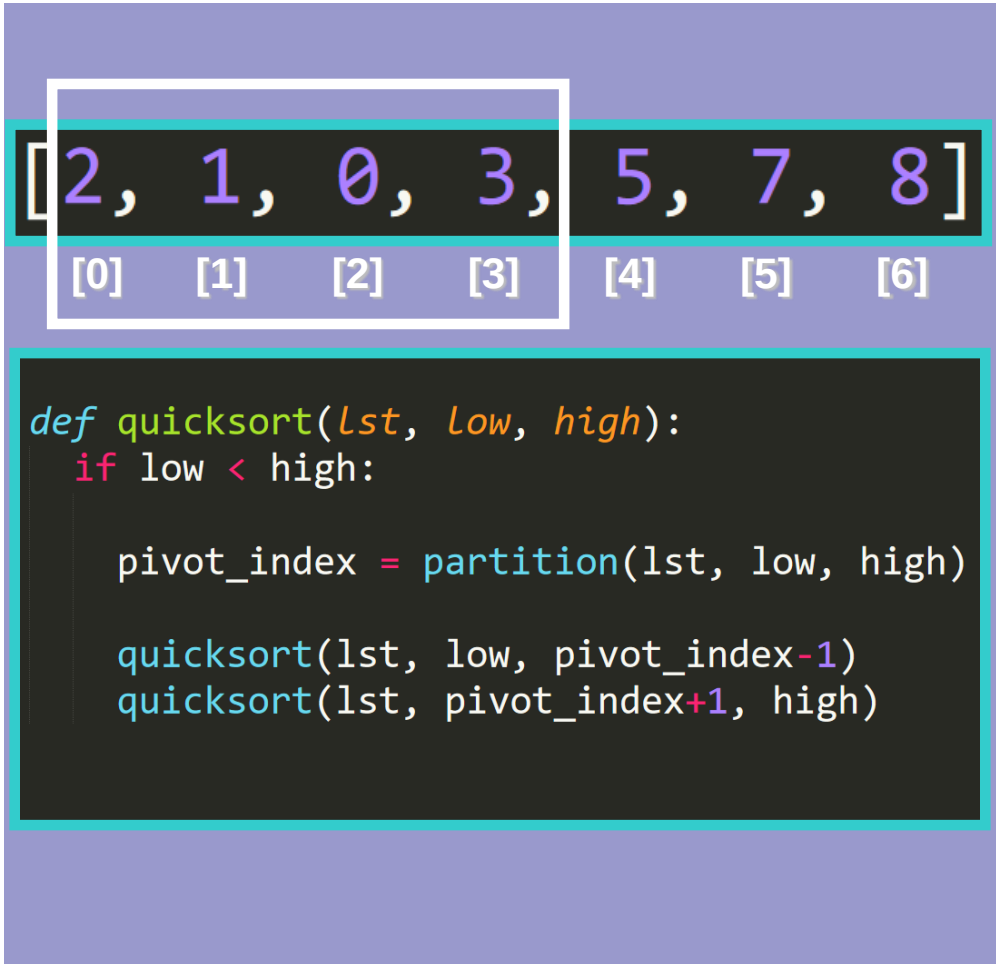
```
quicksort(lst, 0, 3)
```




```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```




```
quicksort(a, 0, len(a)-1)
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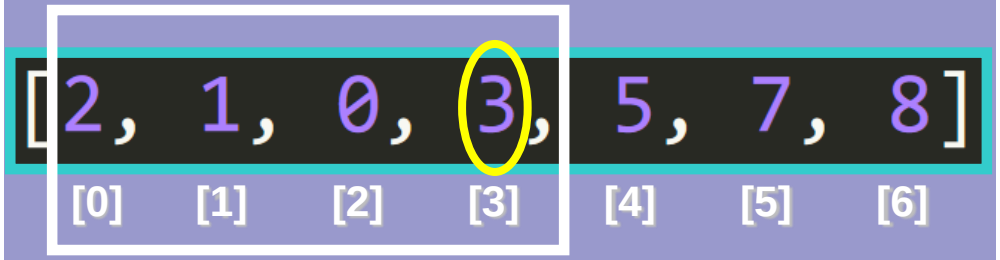
<waiting recursive call>

```
quicksort(lst, 0, 3)
```

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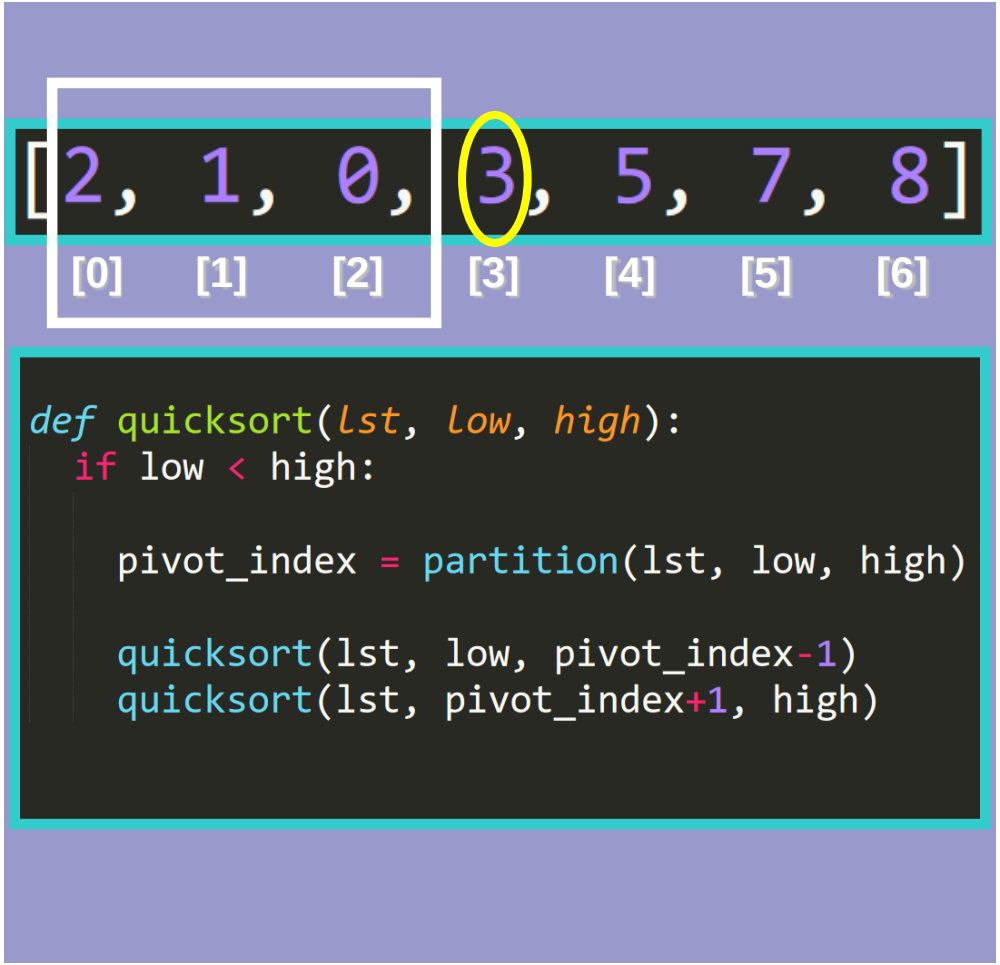
```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

Partition…


[2, 1, 0, 3, 5, 7, 8]
[0] [1] [2] [3] [4] [5] [6]
def quicksort(lst, low, high):
if low < high:
pivot_index = partition(lst, low, high)
quicksort(lst, low, pivot_index-1)
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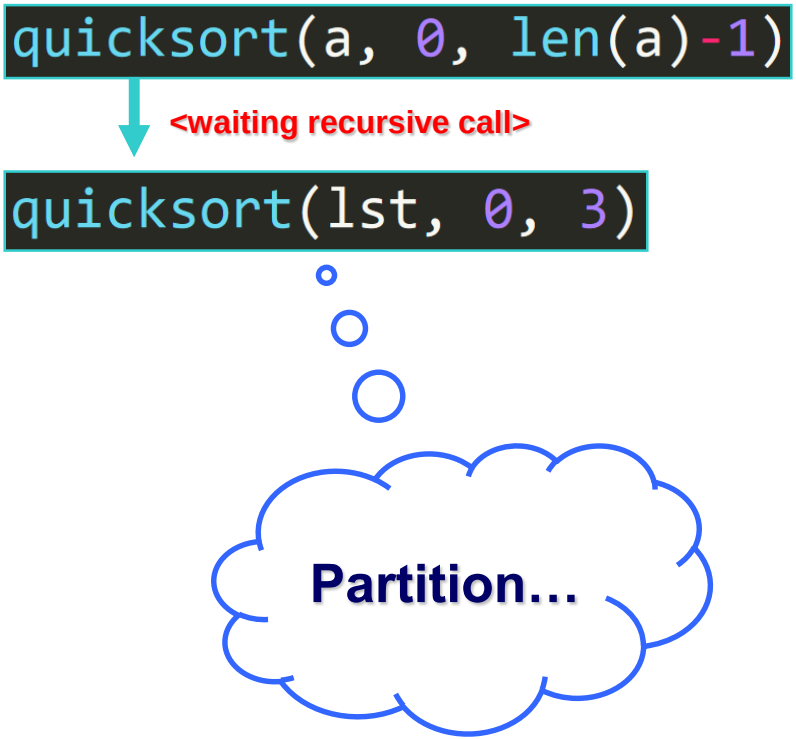
quicksort(a, 0, len(a)-1)
<waiting recursive call>
quicksort(lst, 0, 3)
Partition…


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def quicksort(lst, low, high):
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    quicksort(lst, low, pivot_index-1)
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```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

<waiting recursive call>

```
quicksort(lst, 0, 2)
```


```
def quicksort(lst, low, high):
  if low < high:

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    quicksort(lst, low, pivot_index-1)
    quicksort(lst, pivot_index+1, high)
```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

<waiting recursive call>

```
quicksort(lst, 0, 2)
```

Partition…

```
[0, 1, 2, 3, 5, 7, 8]
 [0] [1] [2] [3] [4] [5] [6]
```

```
def quicksort(lst, low, high):
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```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

<waiting recursive call>

```
quicksort(lst, 0, 2)
```

0

```
[0, 1, 2, 3, 5, 7, 8]
```

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```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

<waiting recursive call>

```
quicksort(lst, 0, 2)
```

<waiting recursive call>

```
quicksort(lst, 0, -1)
```

Stop!

```
[0, 1, 2, 3, 5, 7, 8]
```

[0] [1] [2] [3] [4] [5] [6]

```
def quicksort(lst, low, high):
  if low < high:

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<waiting recursive call>

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quicksort(lst, 0, 3)
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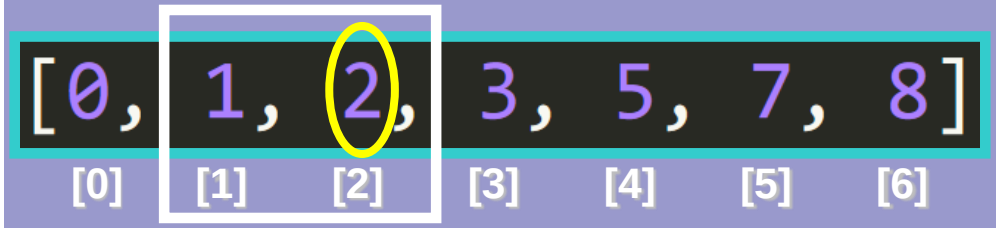
<waiting recursive call>

```
quicksort(lst, 0, 2)
```

```
quicksort(lst, 0, -1)
```

```
quicksort(lst, 1, 2)
```

Partition…

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```
quicksort(a, 0, len(a)-1)
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<waiting recursive call>

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quicksort(lst, 0, 3)
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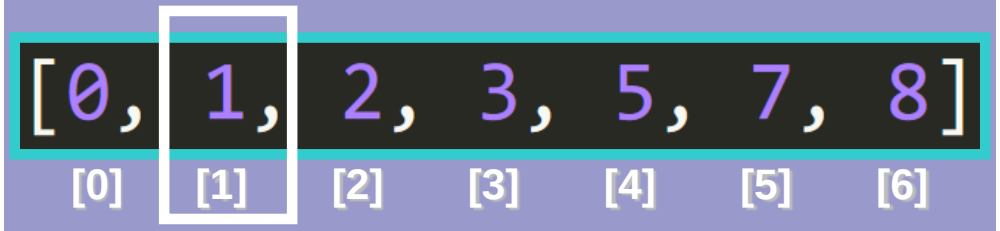
quicksort(lst, 0, 2)
```

```
quicksort(lst, 0, -1)
```

```
quicksort(lst, 1, 2)
```

Partition…

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    quicksort(lst, low, pivot_index-1)
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```

```
quicksort(a, 0, len(a)-1)
```

<waiting recursive call>

```
quicksort(lst, 0, 3)
```

<waiting recursive call>

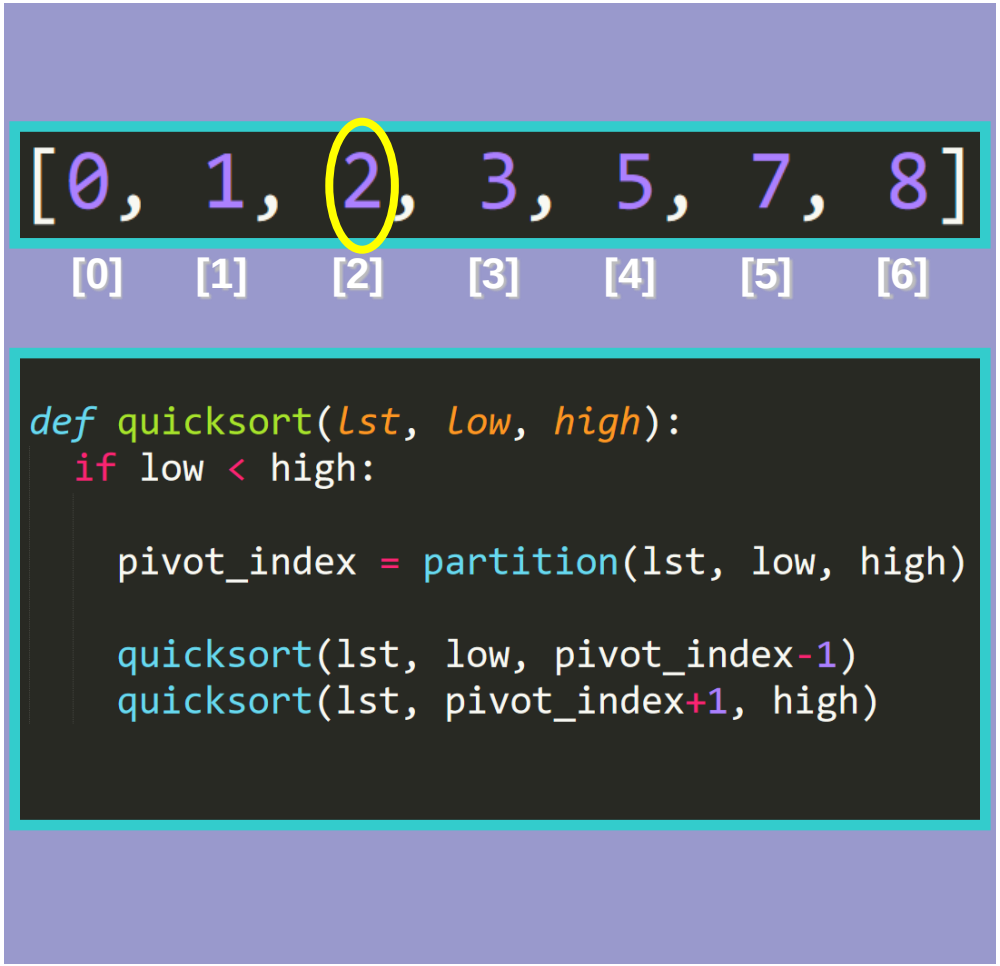
```
quicksort(lst, 0, 2)
```

```
quicksort(lst, 0, -1)
```

```
quicksort(lst, 1, 2)
```

```
quicksort(lst, 1, 1)
```

Stop!


[0, 1, 2, 3, 5, 7, 8]
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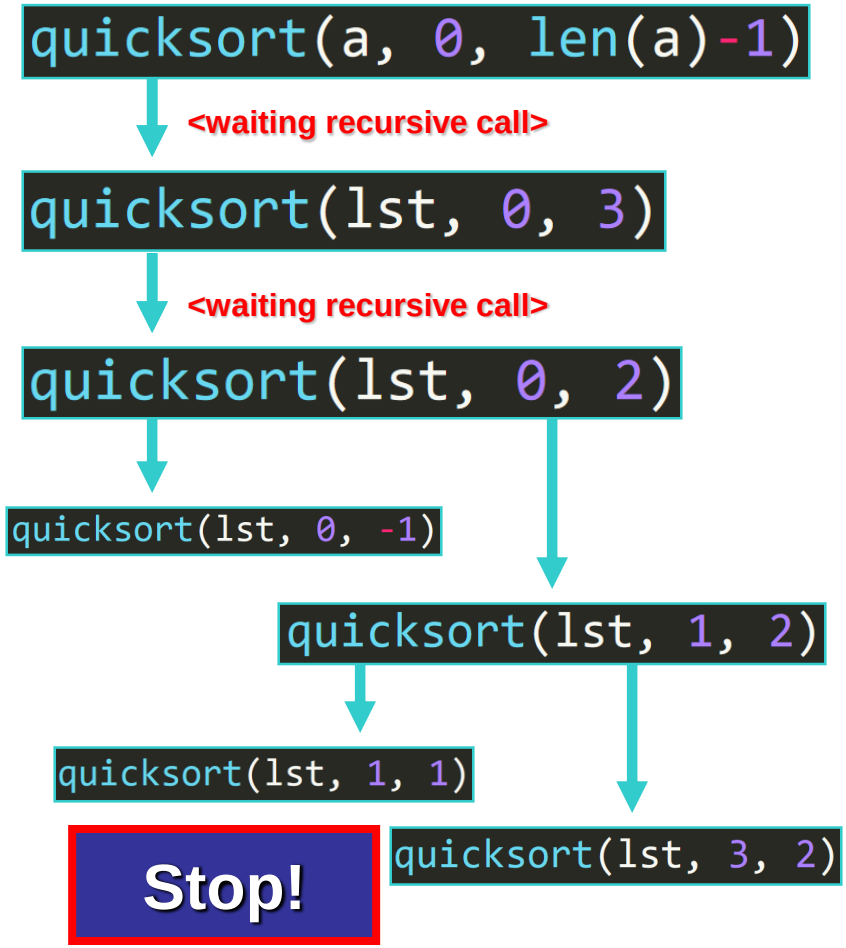
quicksort(a, 0, len(a)-1)
<waiting recursive call>
quicksort(lst, 0, 3)
<waiting recursive call>
quicksort(lst, 0, 2)
quicksort(lst, 0, -1)
quicksort(lst, 1, 2)
quicksort(lst, 1, 1)
Stop!
quicksort(lst, 3, 2)

```
[0, 1, 2, 3, 5, 7, 8]
 [0] [1] [2] [3] [4] [5] [6]
```

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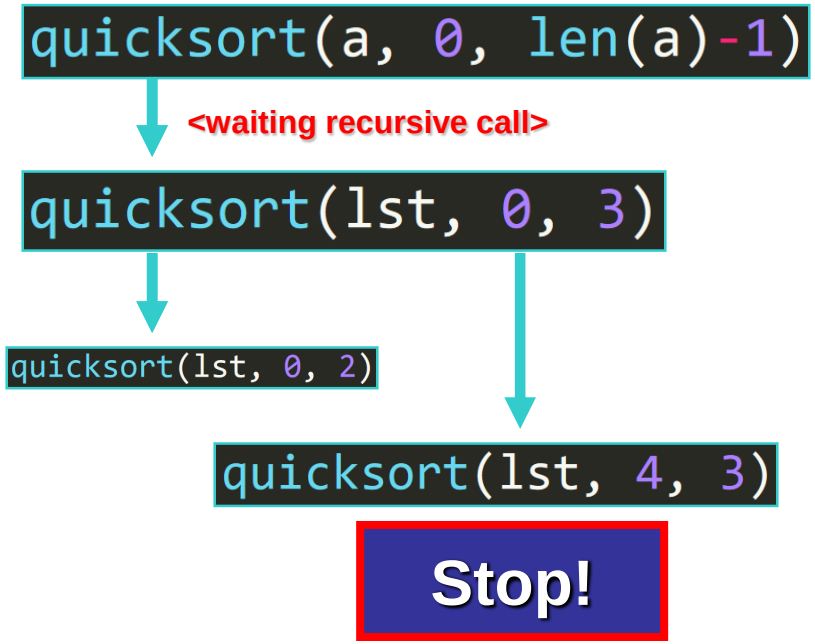

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```

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```

```
quicksort(a, 0, len(a)-1)
```

```
quicksort(lst, 0, 3)
```

```
quicksort(lst, 5, 6)
```

```
[0, 1, 2, 3, 5, 7, 8]
```

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```
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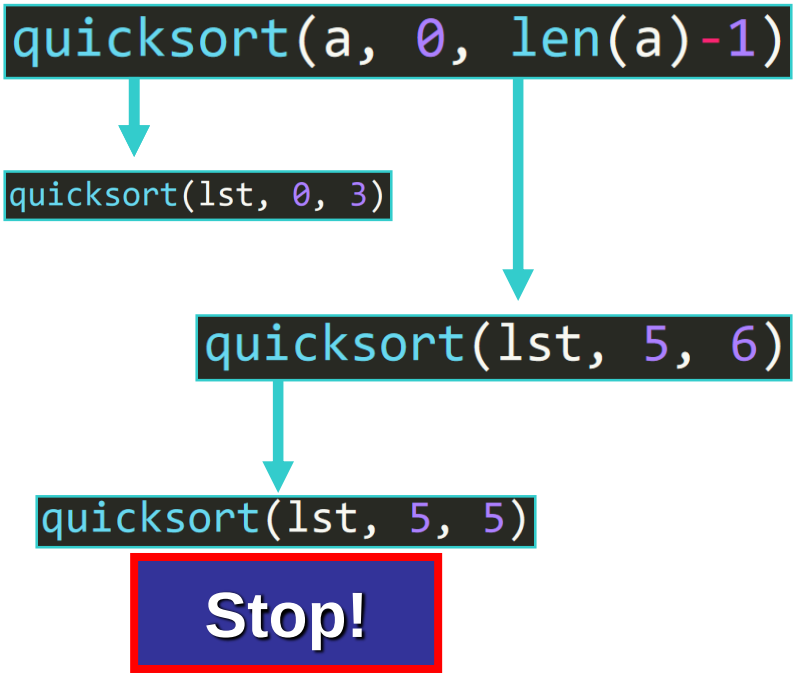

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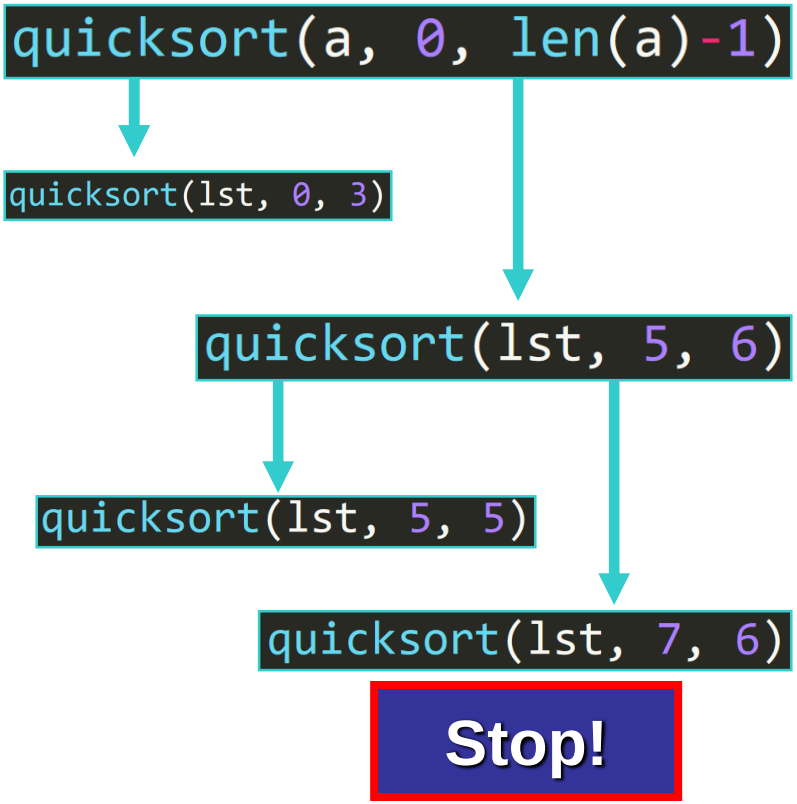
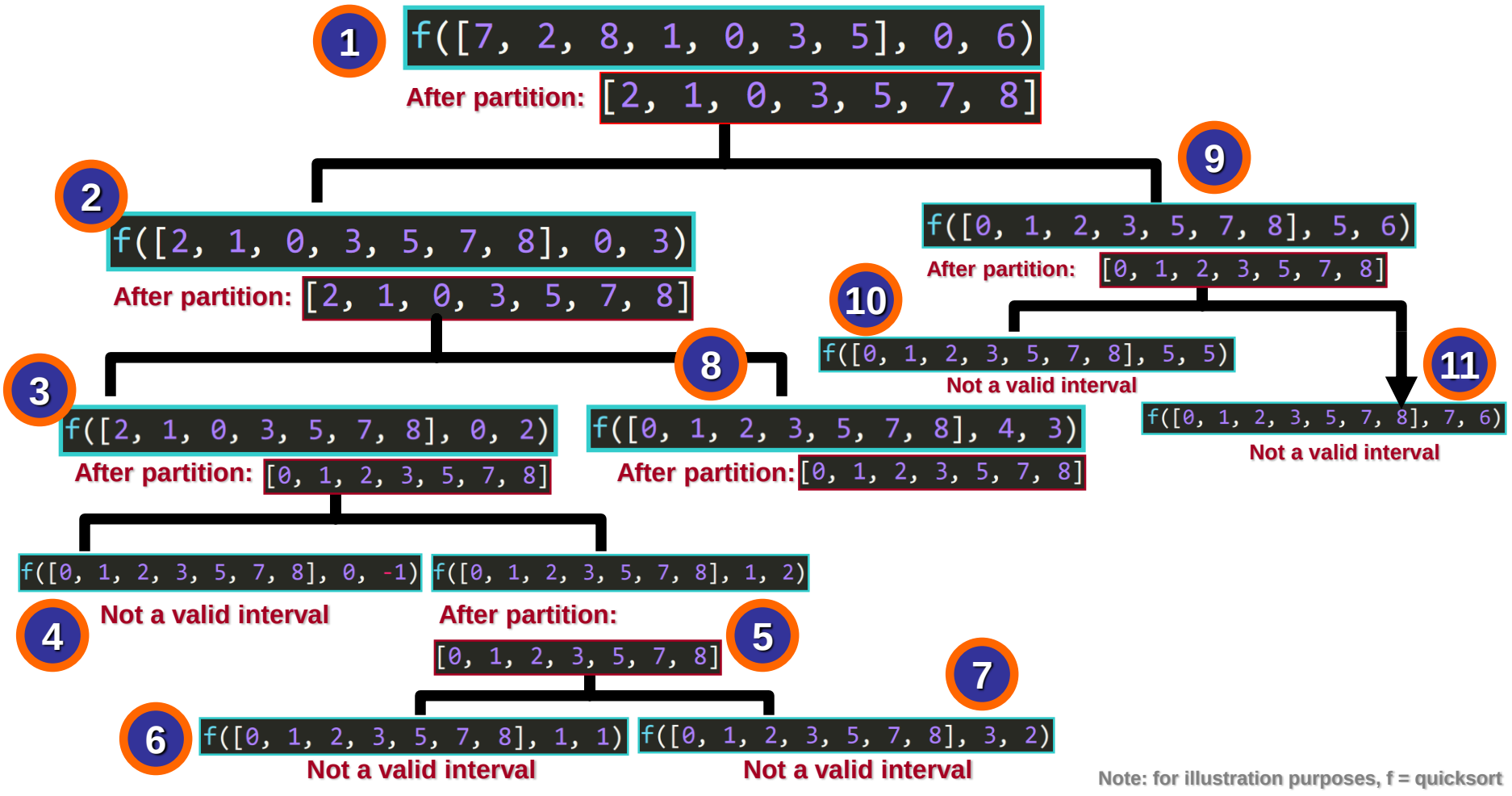


Quicksort

```
[0, 1, 2, 3, 5, 7, 8]
```

Sorted!


1
f([7, 2, 8, 1, 0, 3, 5], 0, 6)
After partition: [2, 1, 0, 3, 5, 7, 8]
2
f([2, 1, 0, 3, 5, 7, 8], 0, 3)
After partition: [2, 1, 0, 3, 5, 7, 8]
9
f([0, 1, 2, 3, 5, 7, 8], 5, 6)
After partition: [0, 1, 2, 3, 5, 7, 8]
10
f([0, 1, 2, 3, 5, 7, 8], 5, 5)
Not a valid interval
11
f([0, 1, 2, 3, 5, 7, 8], 7, 6)
Not a valid interval
3
f([2, 1, 0, 3, 5, 7, 8], 0, 2)
After partition: [0, 1, 2, 3, 5, 7, 8]
8
f([0, 1, 2, 3, 5, 7, 8], 4, 3)
After partition: [0, 1, 2, 3, 5, 7, 8]
f([0, 1, 2, 3, 5, 7, 8], 0, -1)
4
Not a valid interval
f([0, 1, 2, 3, 5, 7, 8], 1, 2)
After partition:
[0, 1, 2, 3, 5, 7, 8]
5
6
f([0, 1, 2, 3, 5, 7, 8], 1, 1)
Not a valid interval
7
f([0, 1, 2, 3, 5, 7, 8], 3, 2)
Not a valid interval
Note: for illustration purposes, f = quicksort

To partition()