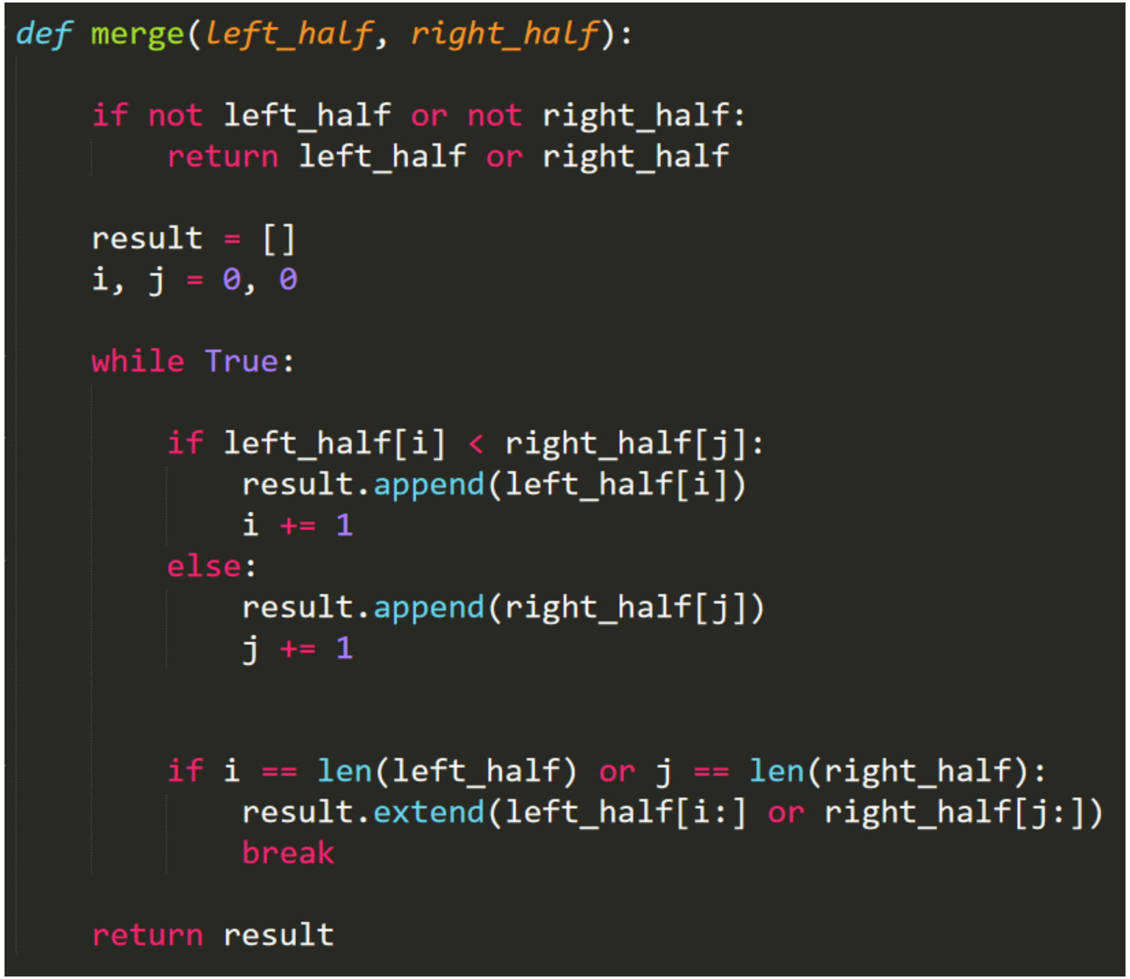
Algorithm

Merge Sort

Code Walkthrough

Part 2

Merge Sort



```python
def merge(left_half, right_half):

    if not left_half or not right_half:
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    result = []
    i, j = 0, 0

    while True:

        if left_half[i] < right_half[j]:
            result.append(left_half[i])
            i += 1
        else:
            result.append(right_half[j])
            j += 1


        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

Merge Sort

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def merge_sort(lst):

    if len(lst) == 0 or len(lst) == 1:
        return lst
    else:
        middle_index = len(lst)//2

        left = merge_sort(lst[:middle_index])
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```
merge_sort([5, 1, 4, 7, 3])
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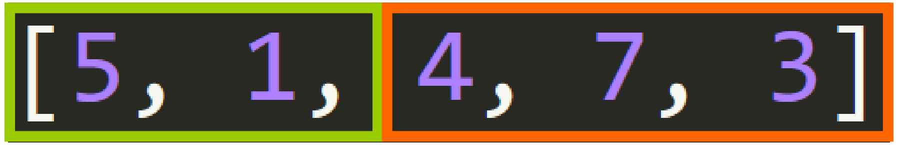

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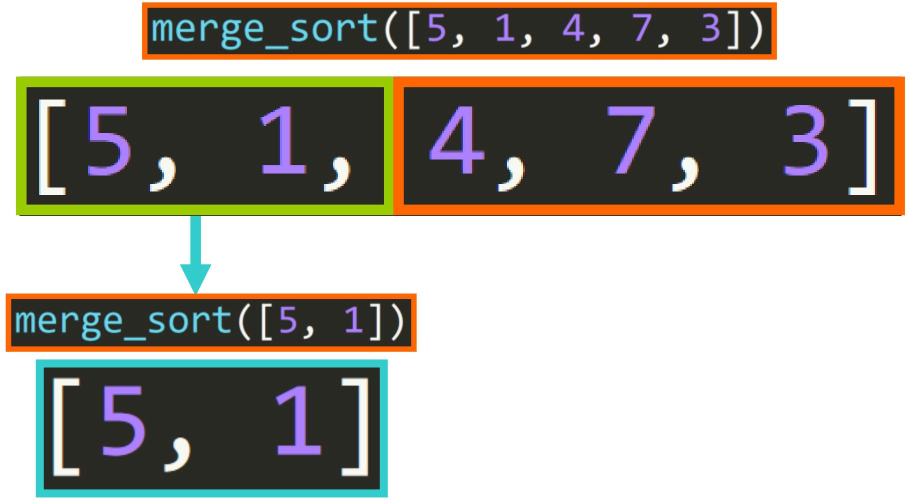

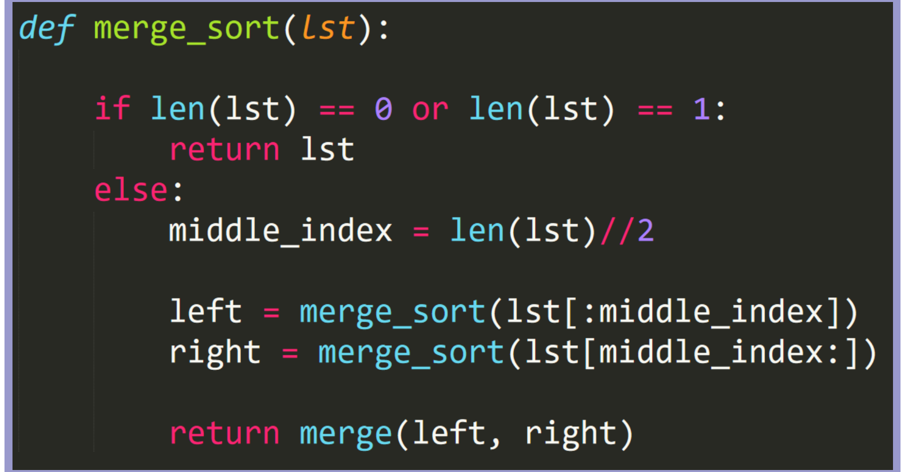
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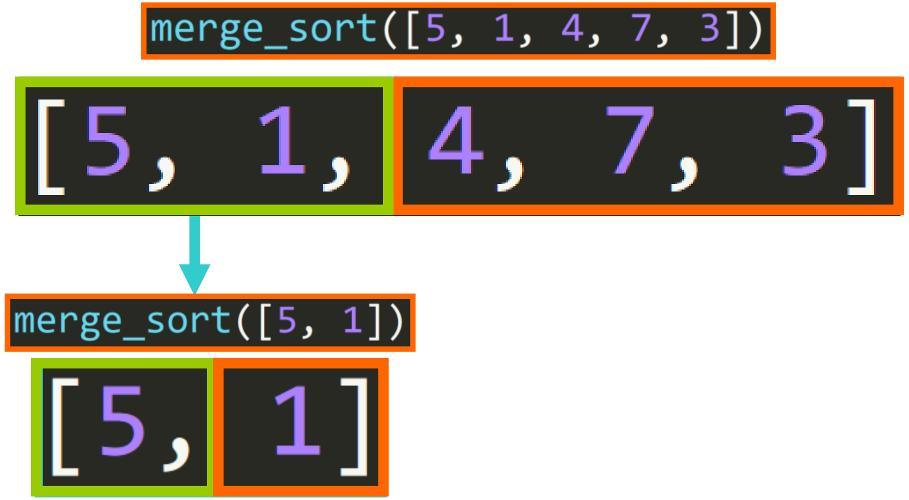

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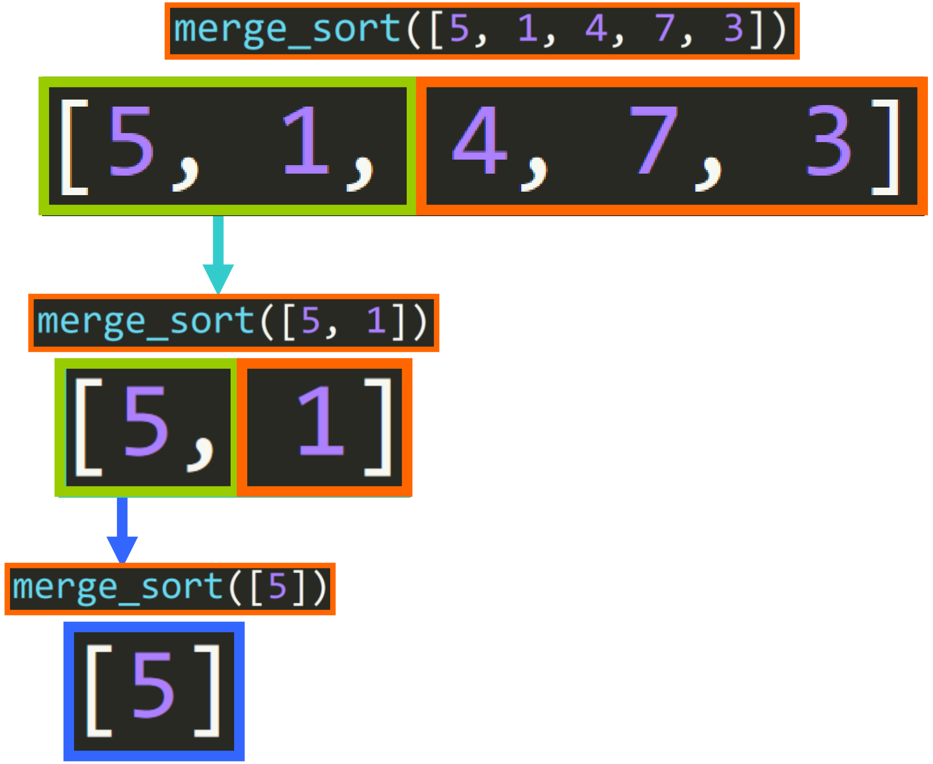

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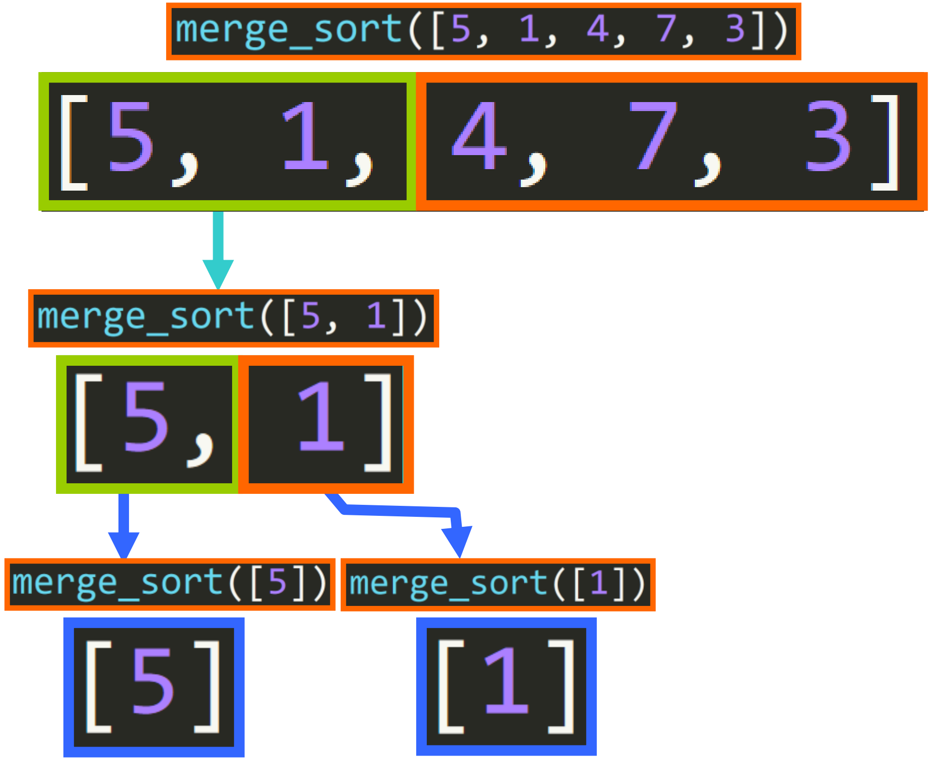

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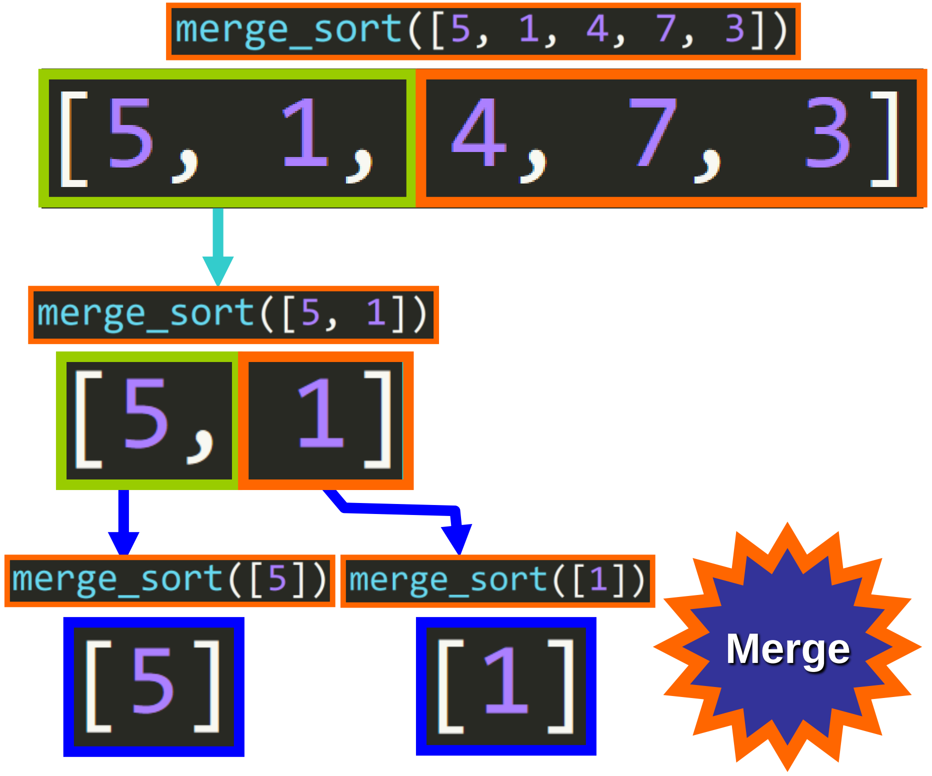

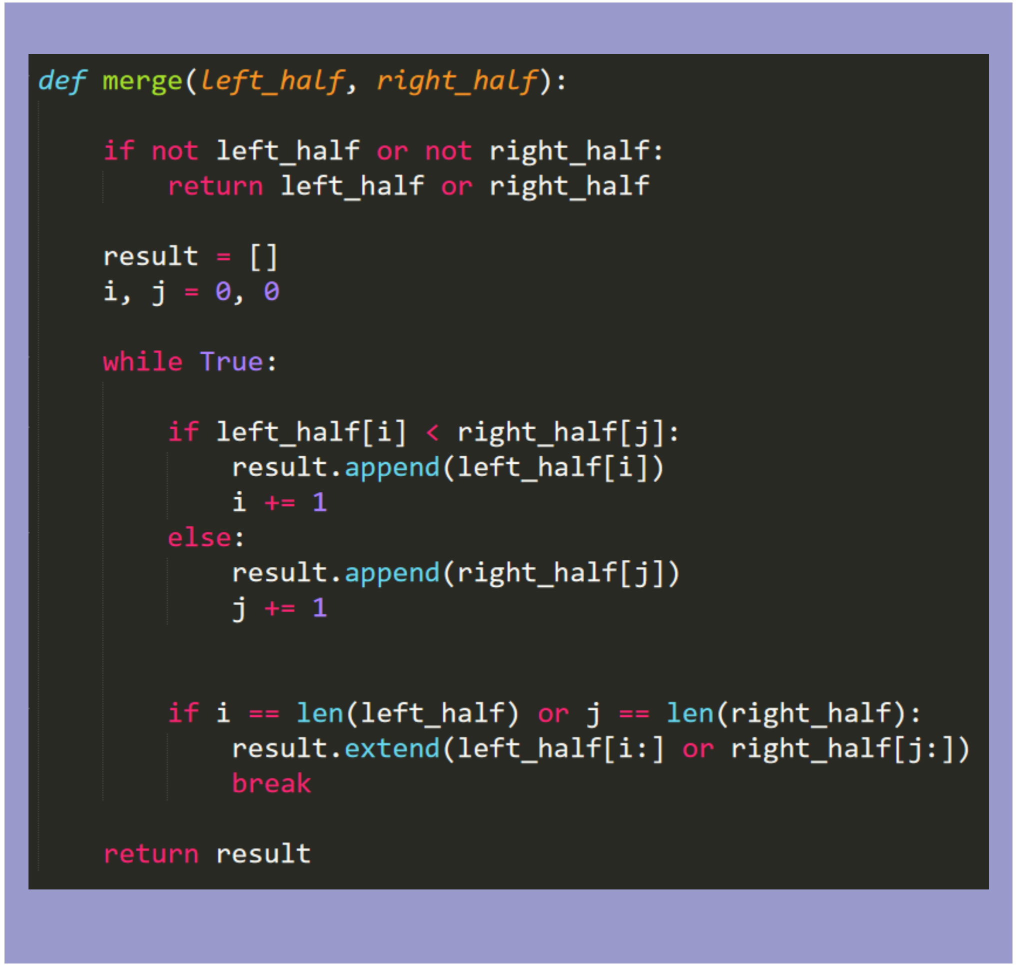

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            i += 1
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    return result
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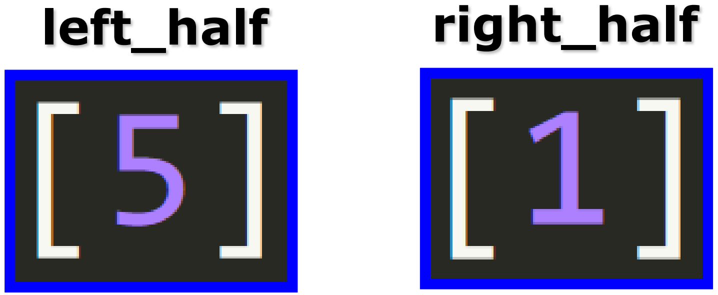

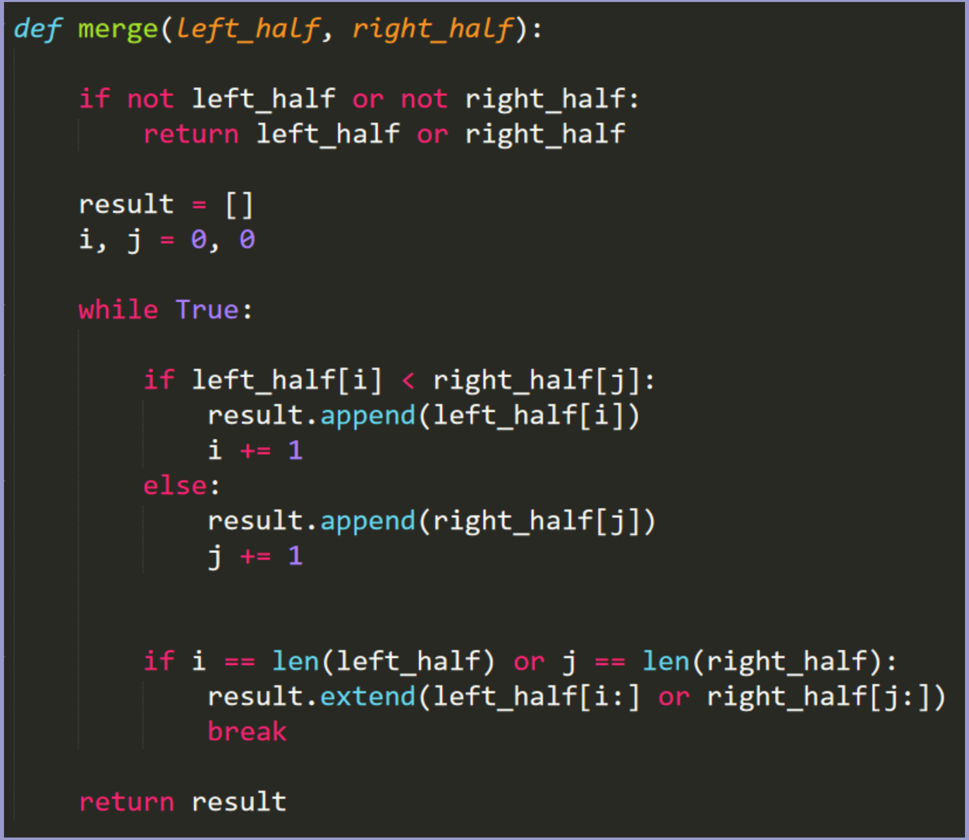

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            break

    return result
```

i = 0   j = 0

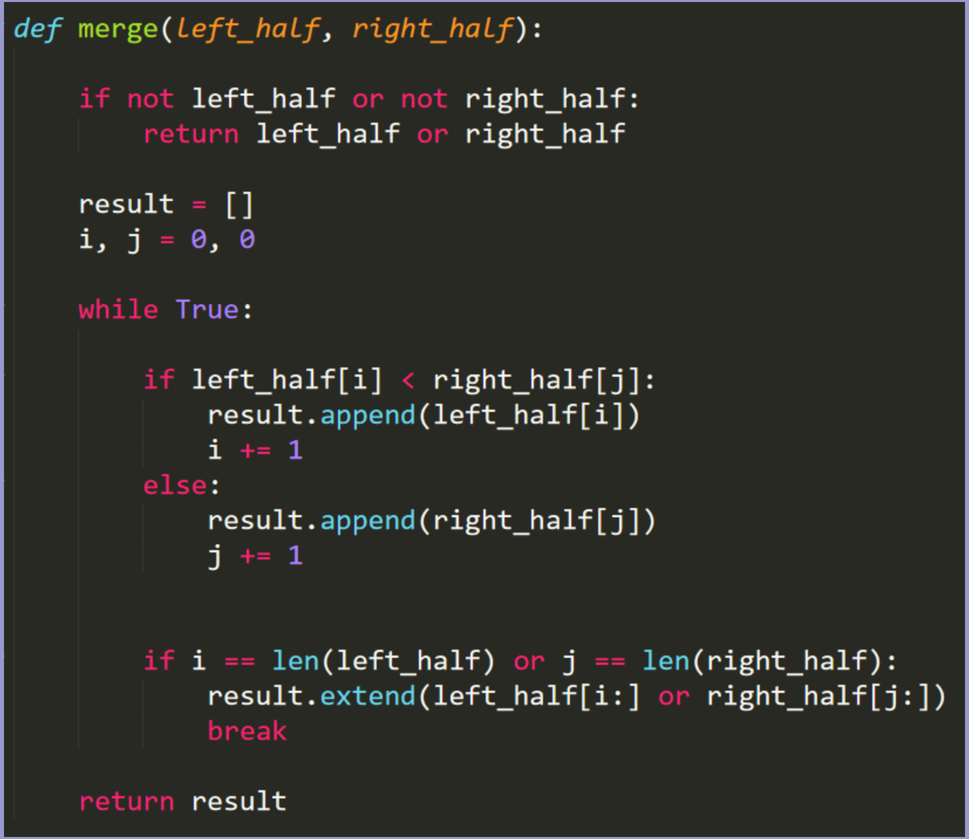
left_half

[5]

right_half

[1]

result = [ ]



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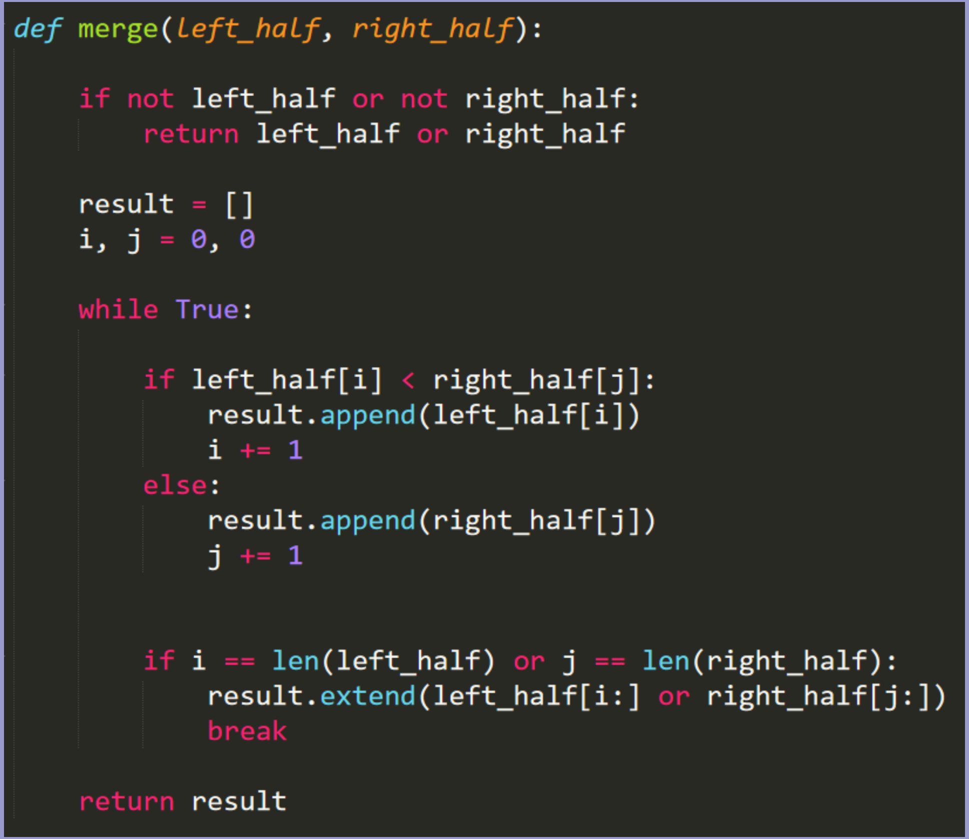
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 0   j = 0

left_half	right_half
[5]	[1]
(i) [0]	(j) [0]

result = [ ]



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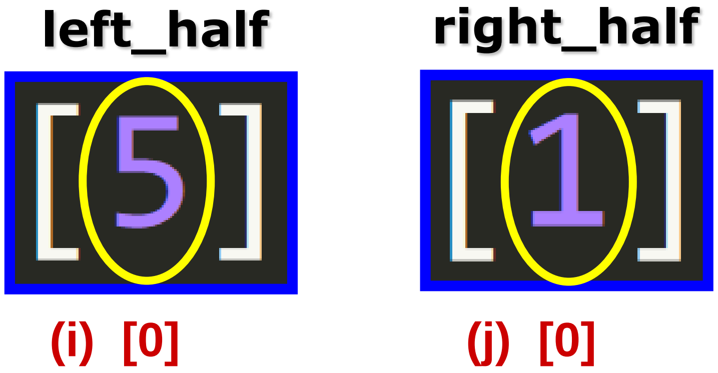
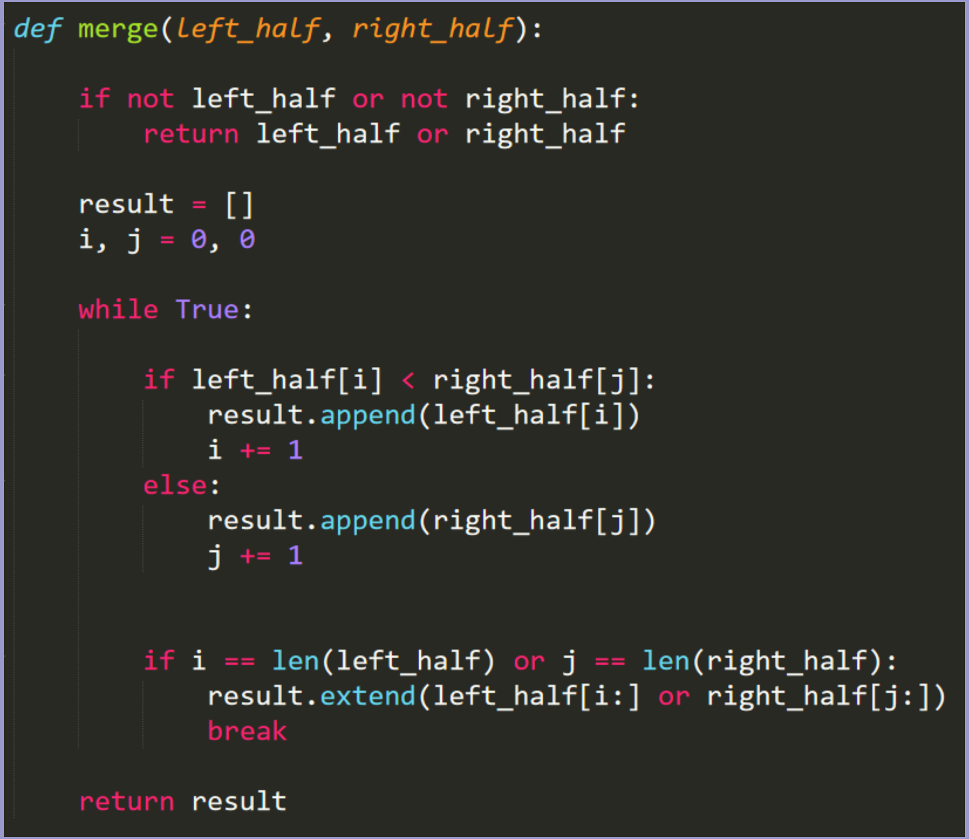
```

i = 0   j = 0



5 < 1?

result = [ ]



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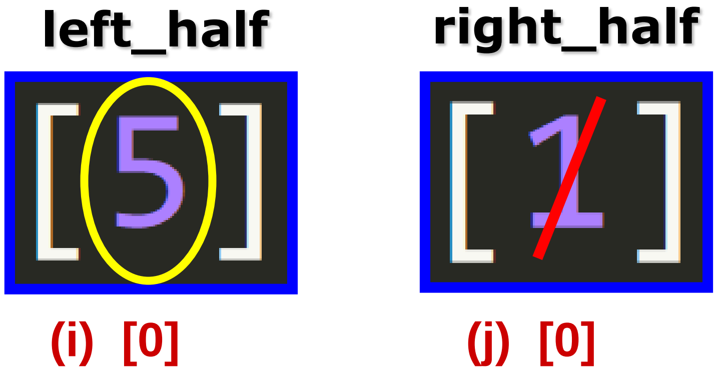
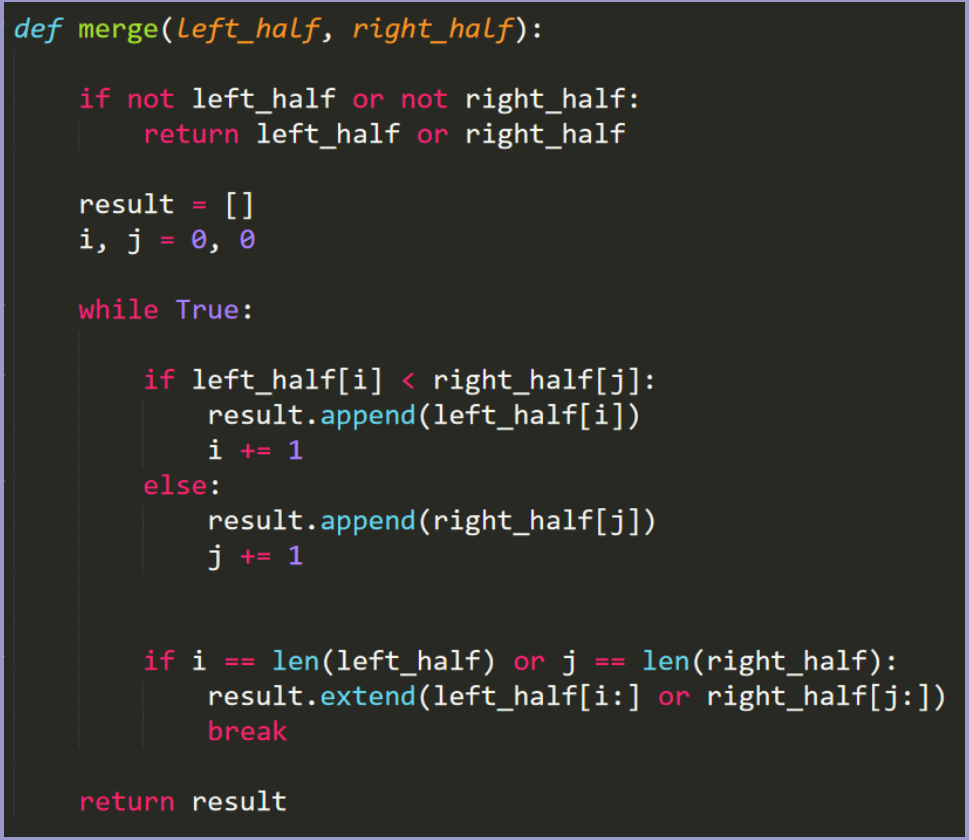


result = [1]



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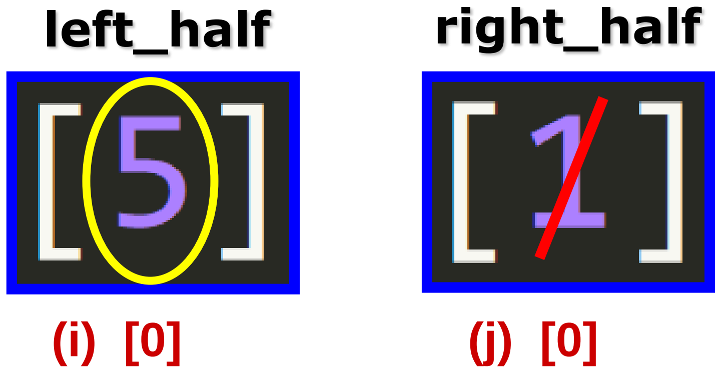
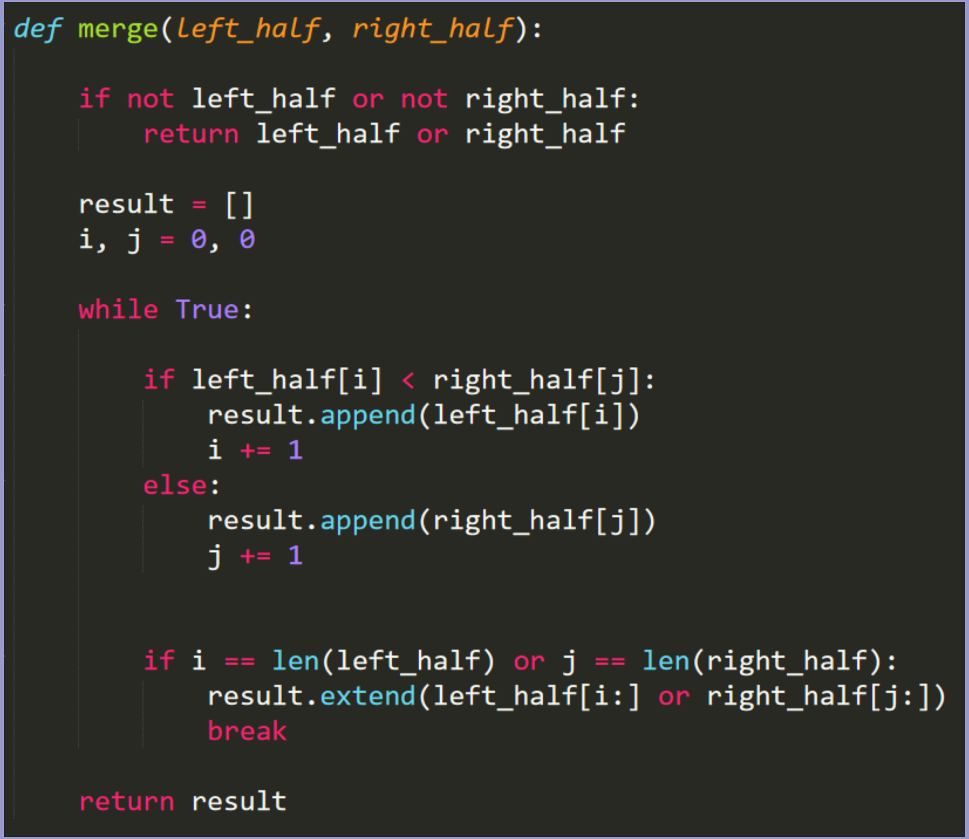


result = [1, 5]



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            break

    return result
```

i = 0   j = 1

[1, 5]

result = [1, 5]

```python
def merge_sort(lst):

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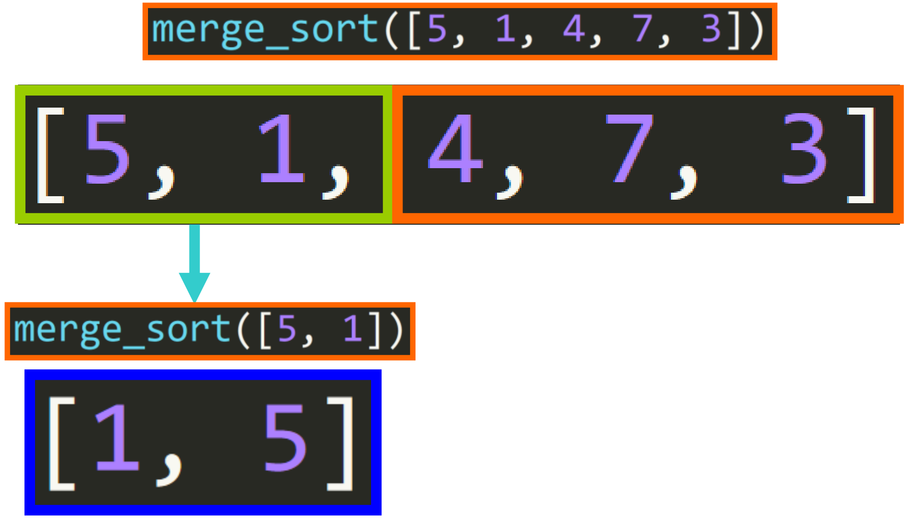

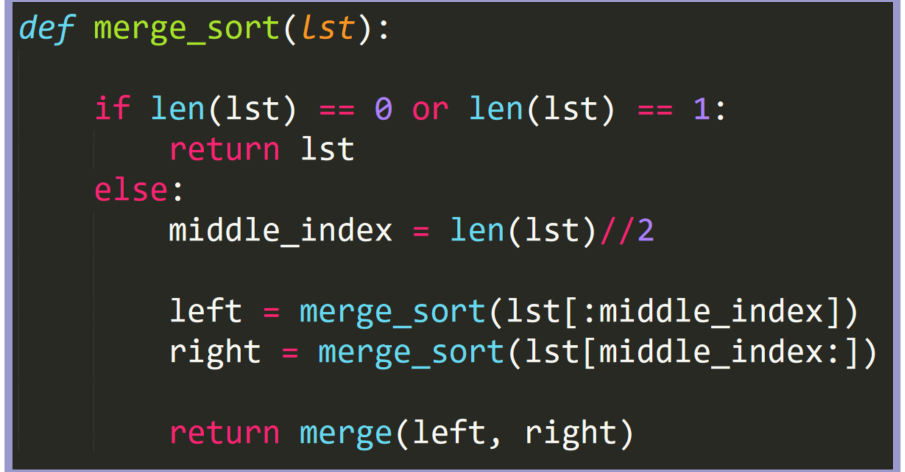

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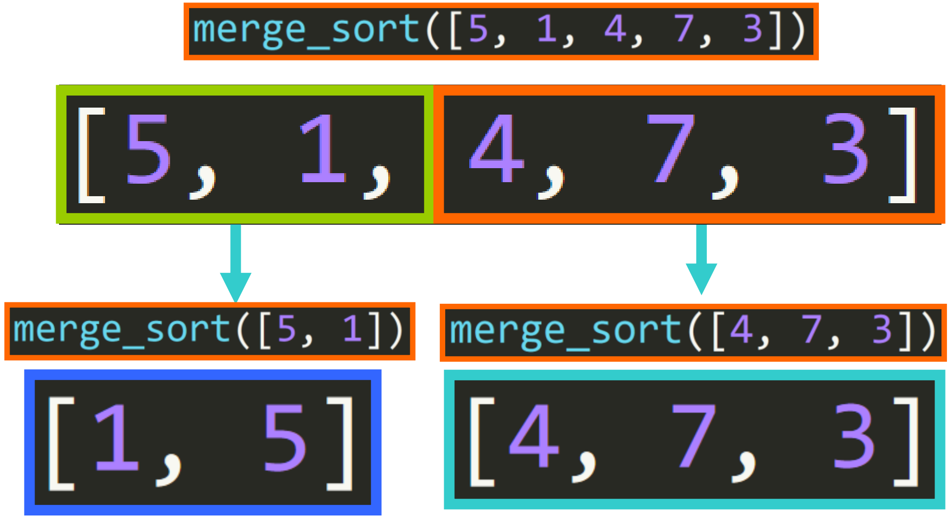

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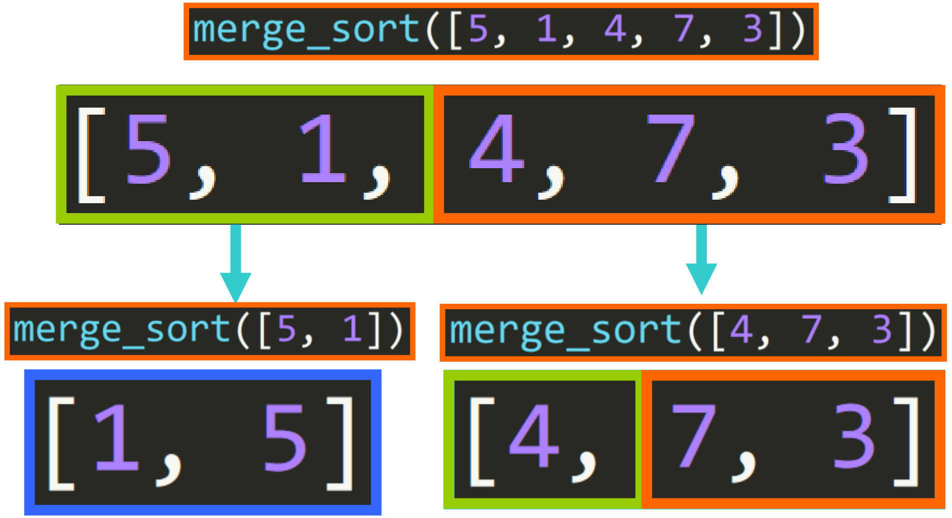

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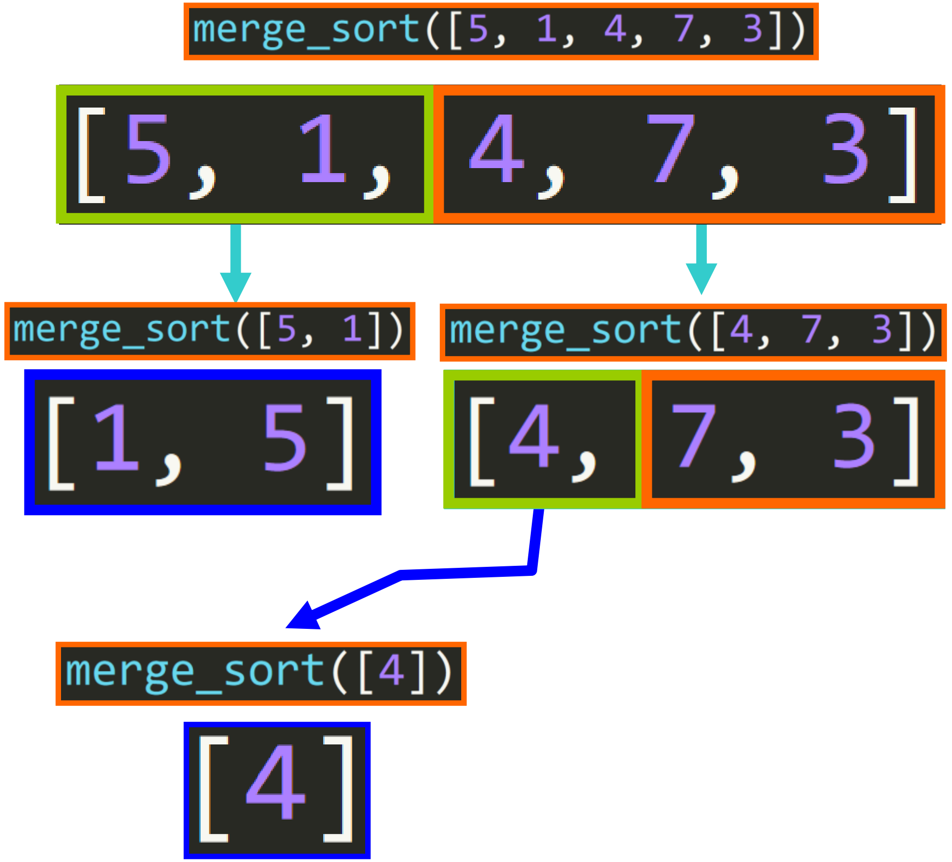

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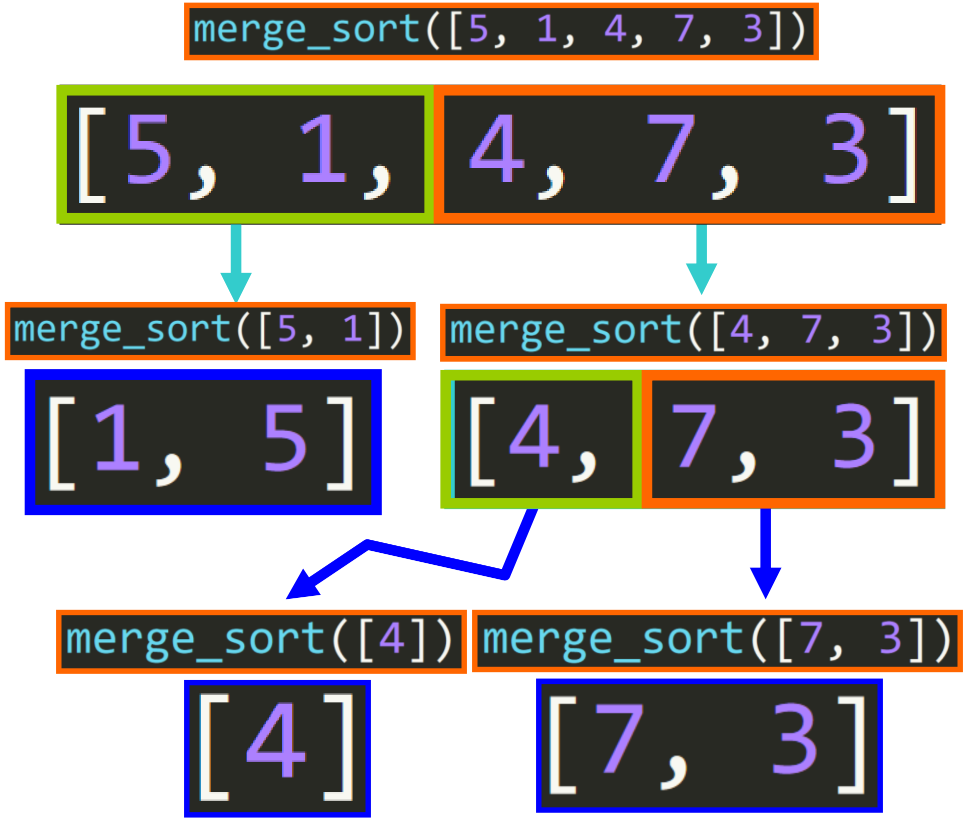

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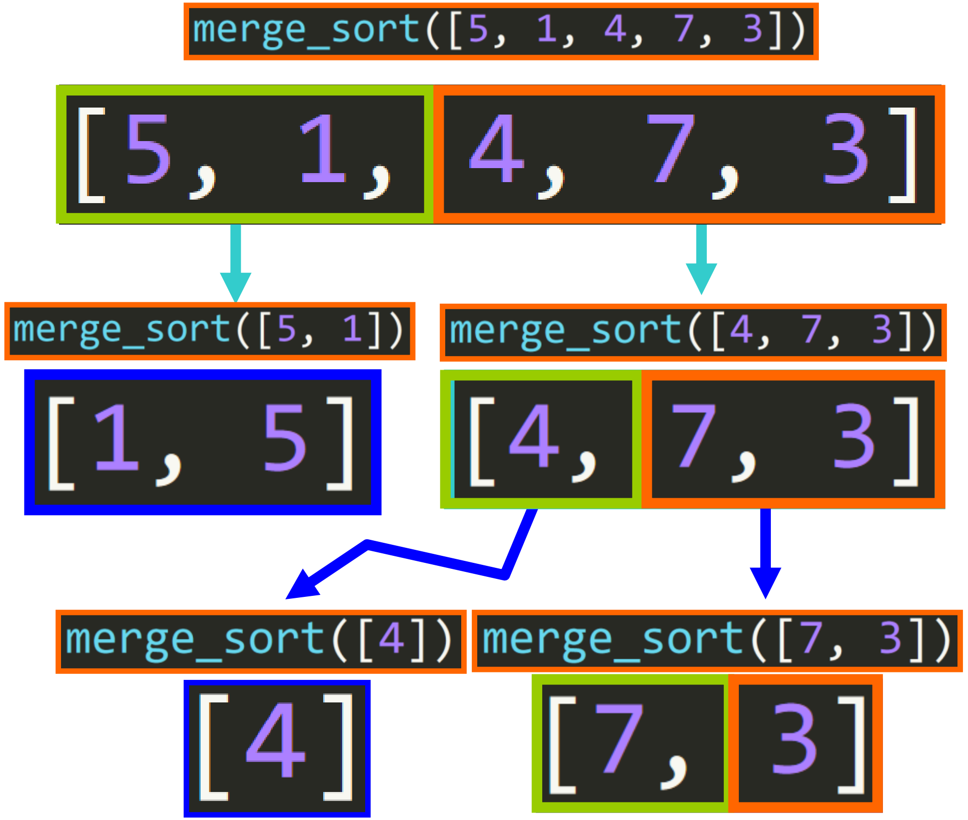

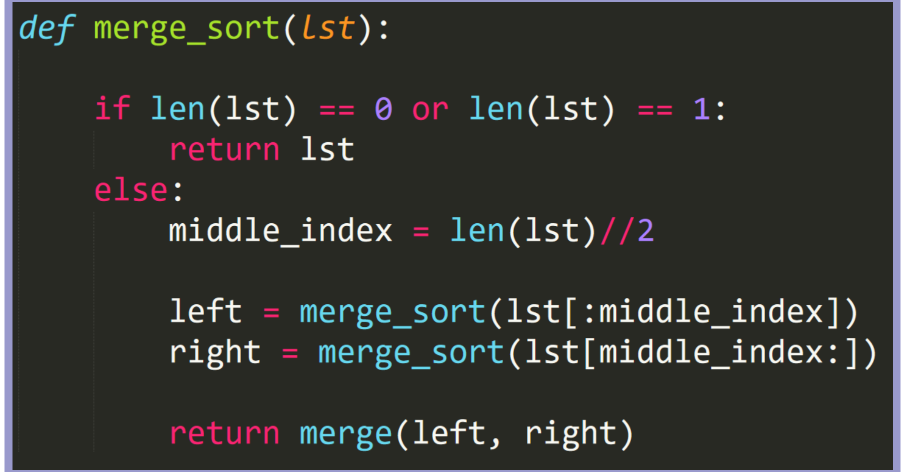

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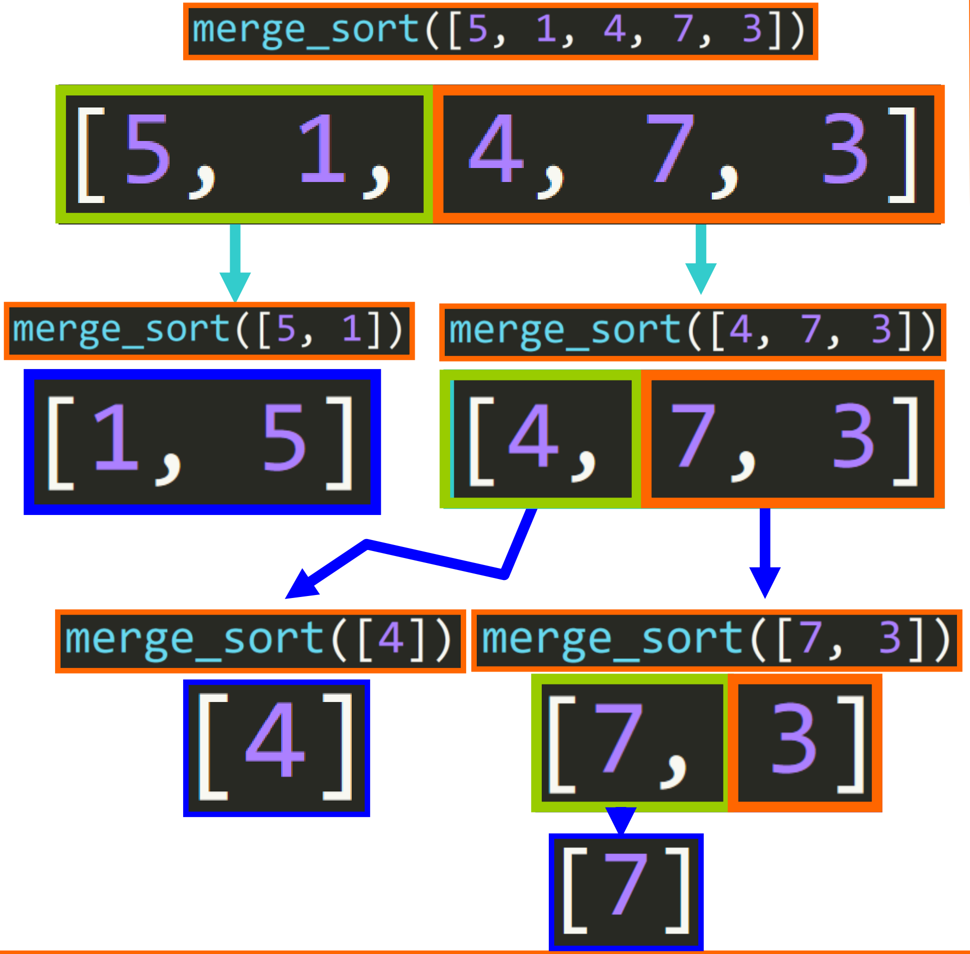

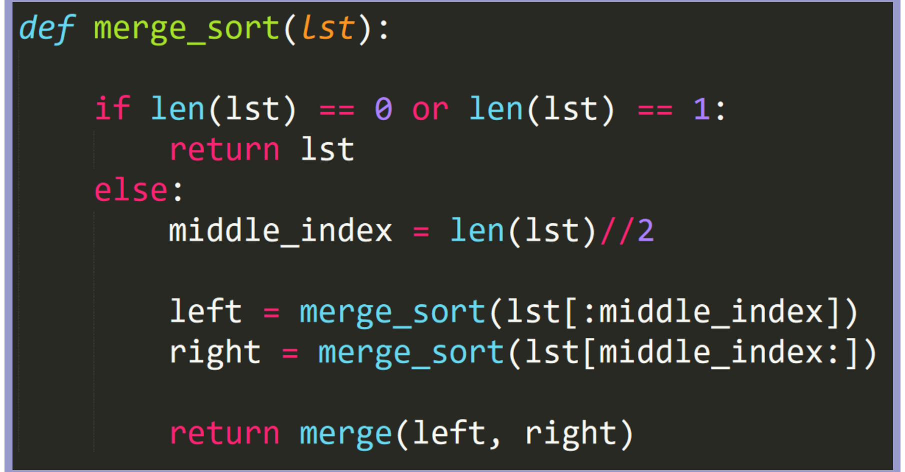

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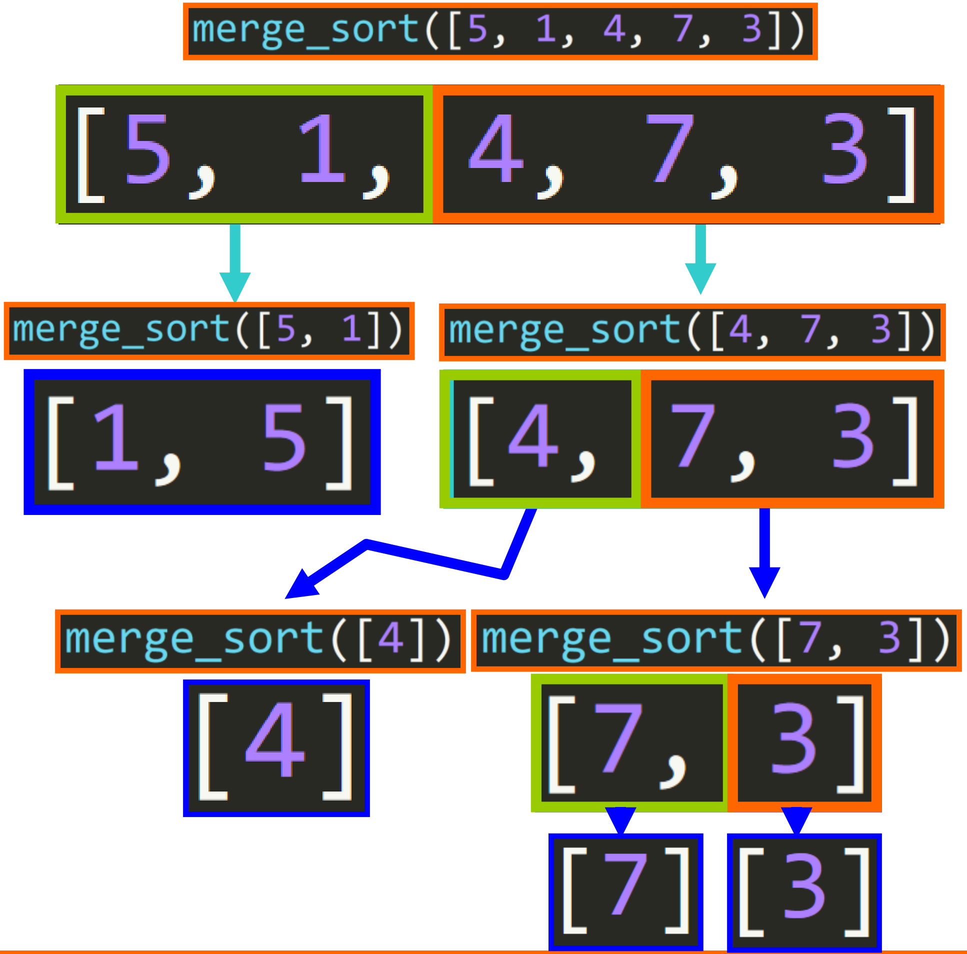

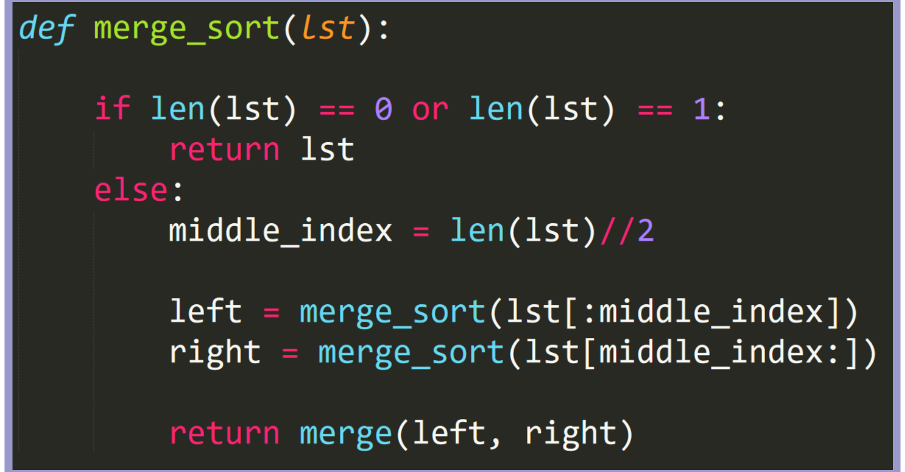
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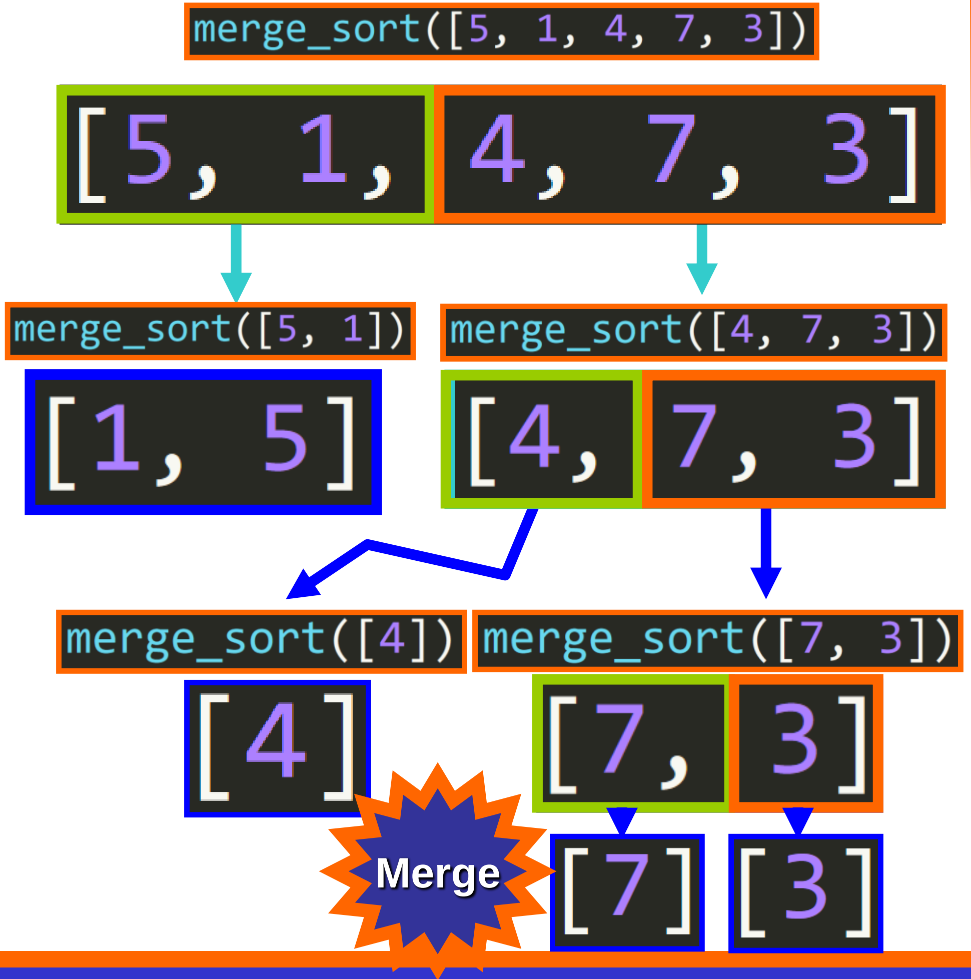

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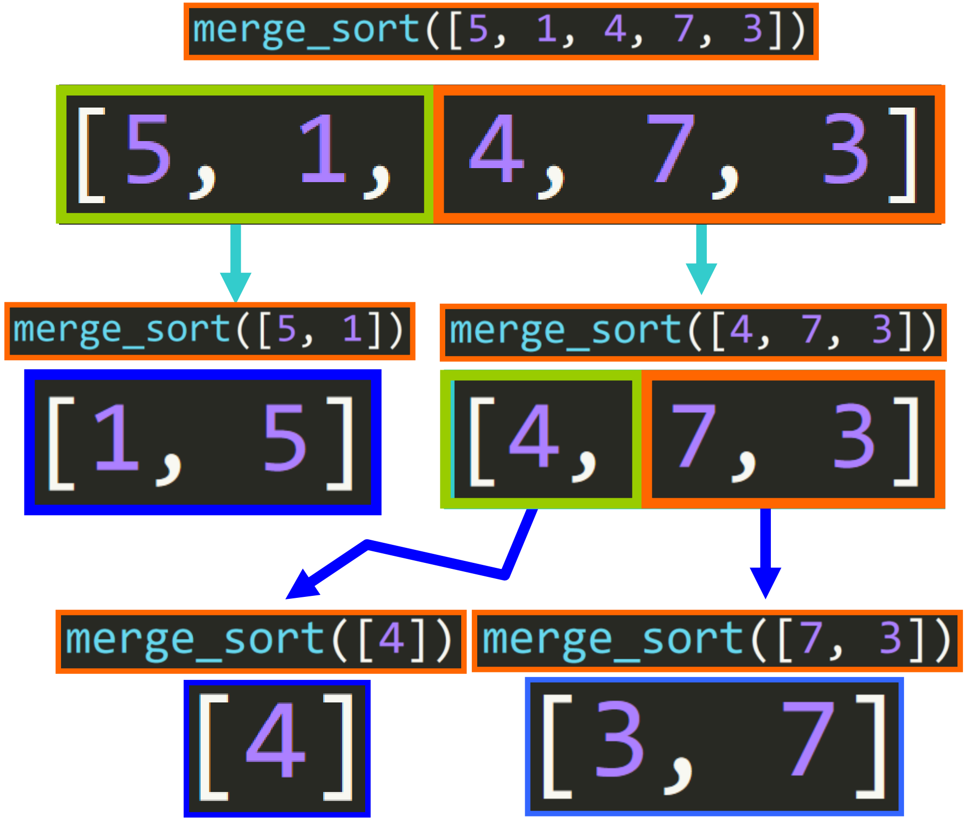

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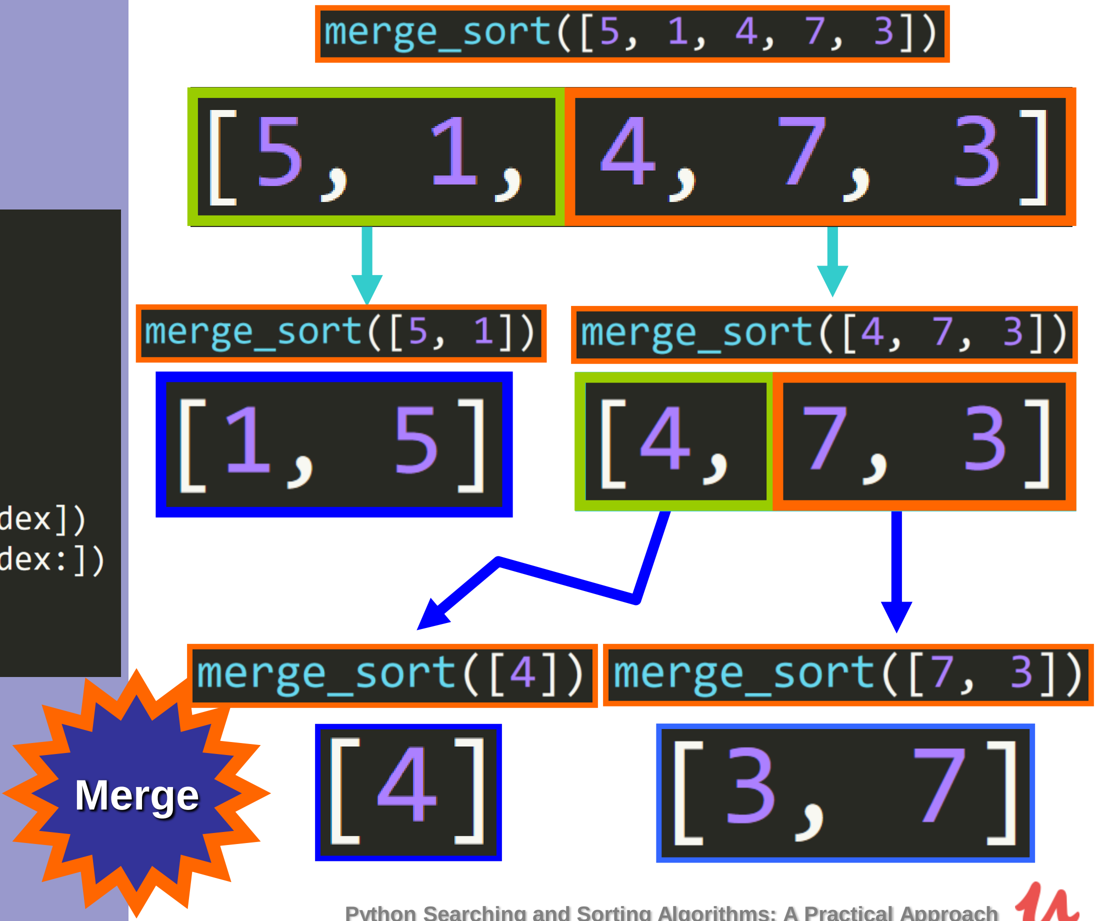

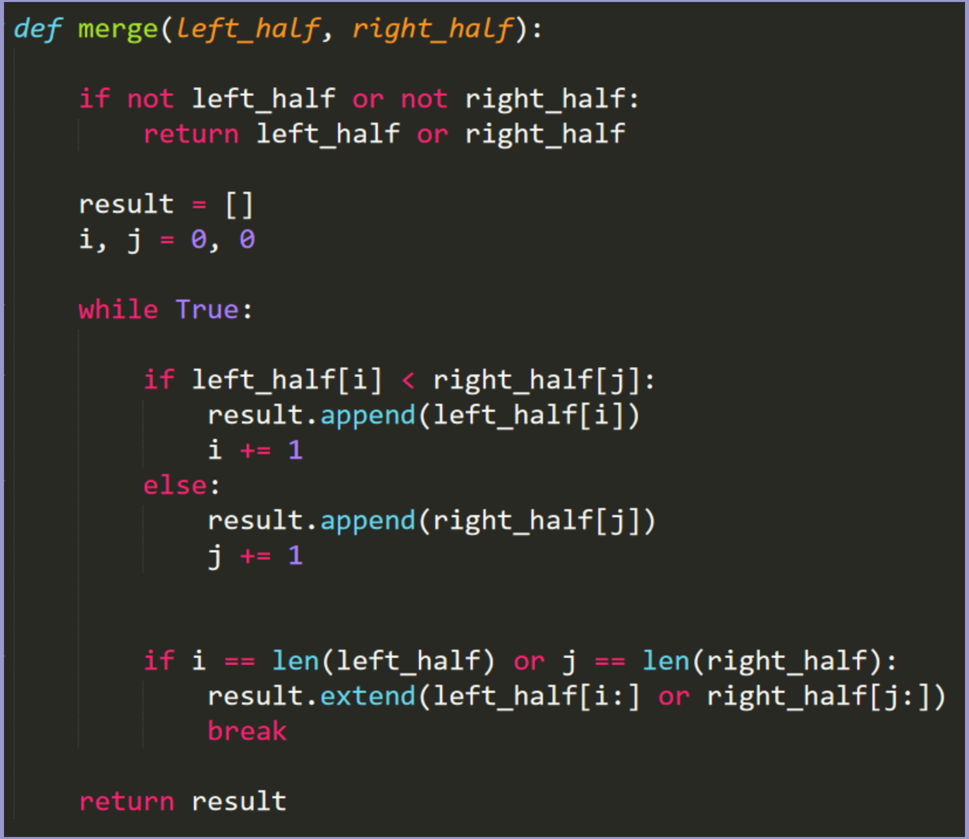

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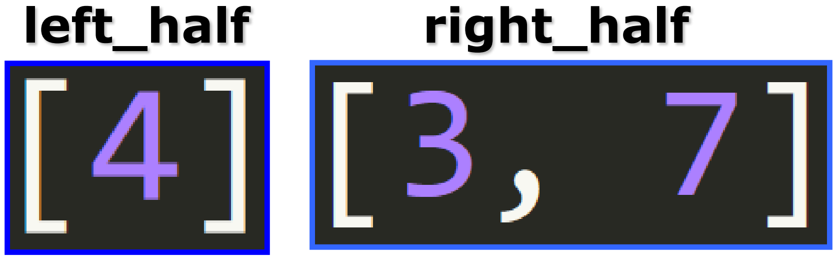

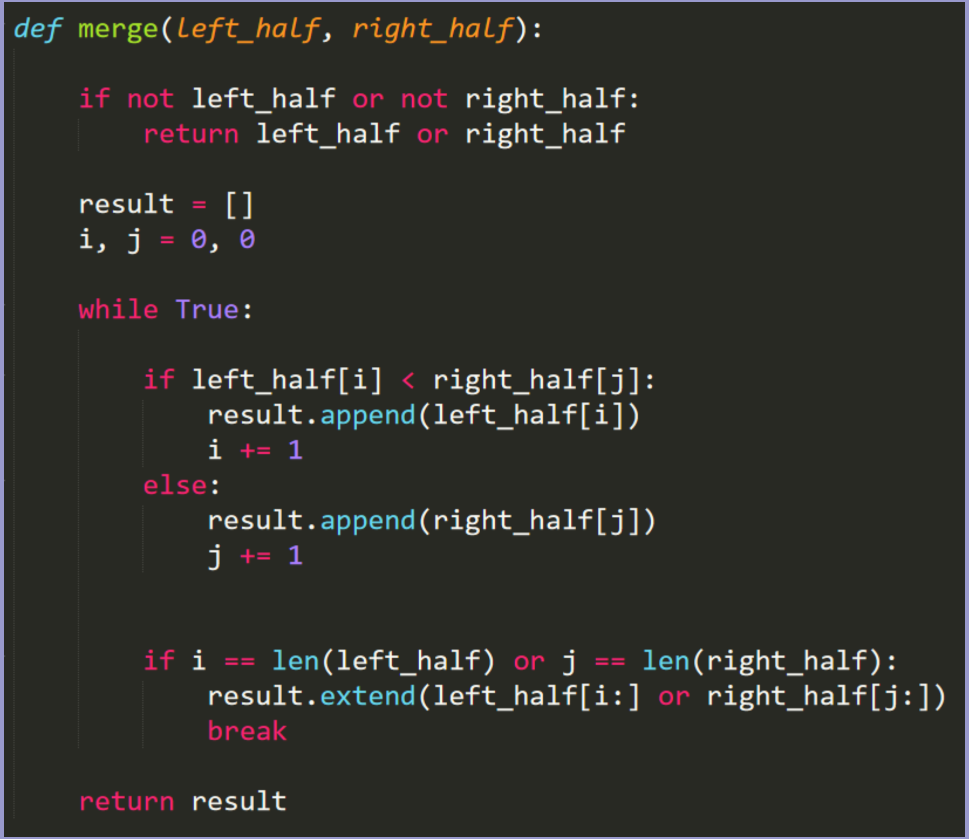

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```
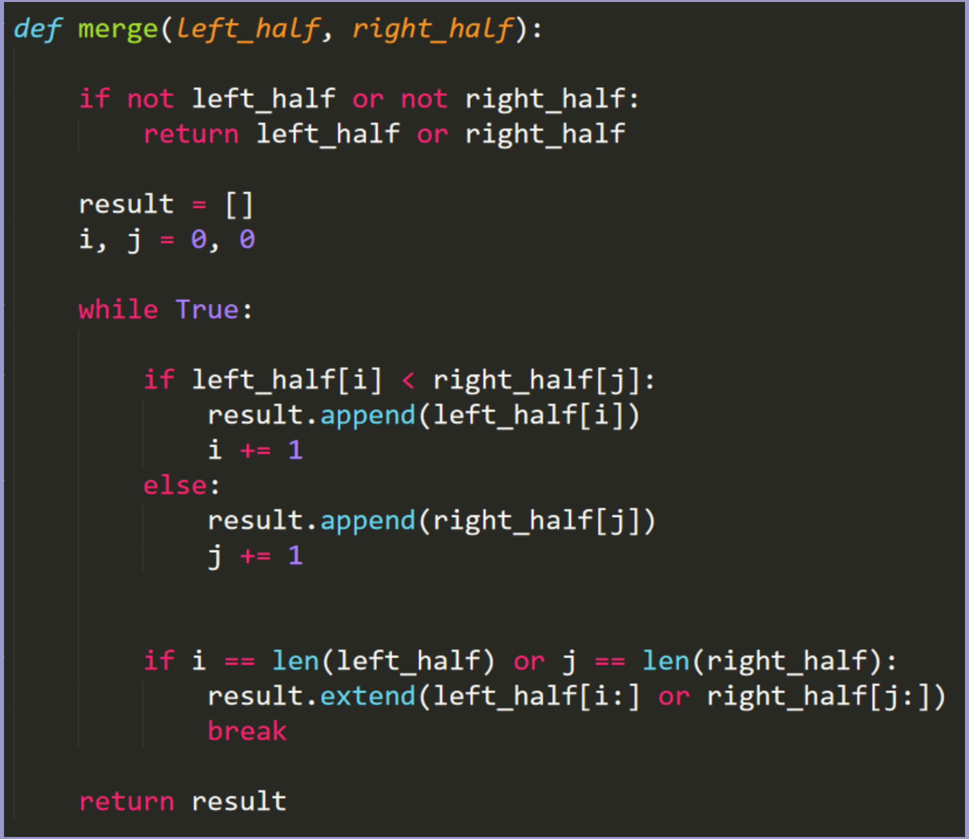

i = 0   j = 0

left_half	right_half
[4]	[3, 7]
(i) [0]	(j) [0] [1]

result = [ ]



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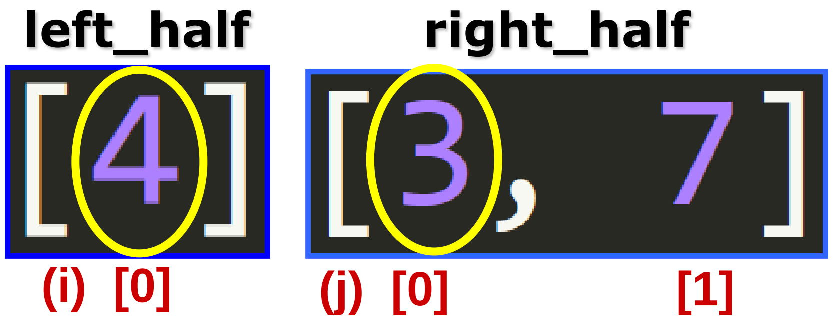
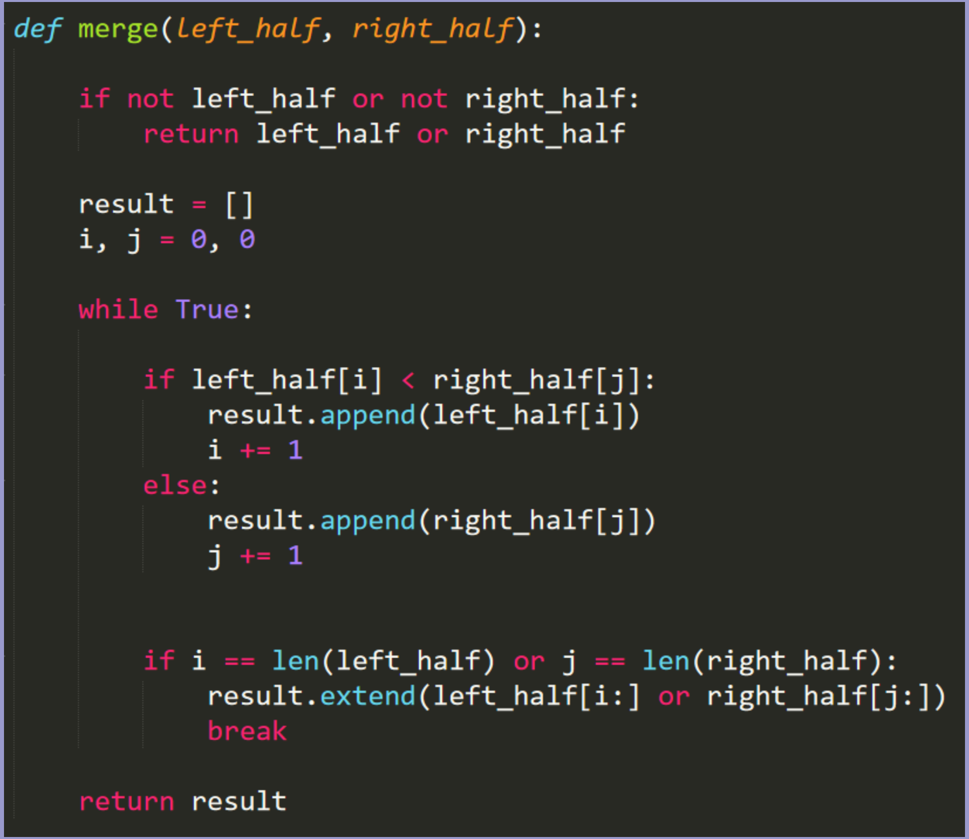
i = 0 j = 0



4 < 3?

result = [ ]



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def merge(left_half, right_half):

    if not left_half or not right_half:
        return left_half or right_half

    result = []
    i, j = 0, 0

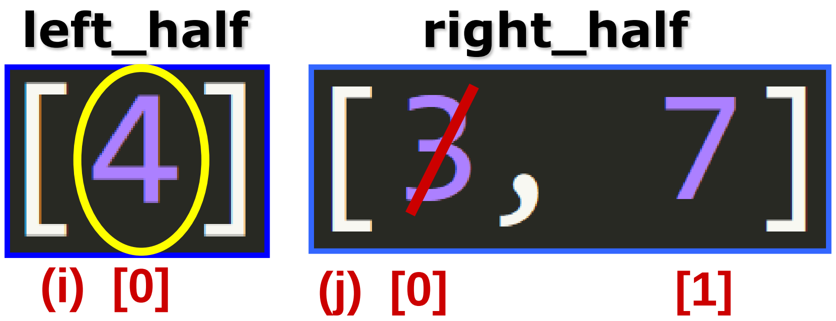
    while True:

        if left_half[i] < right_half[j]:
            result.append(left_half[i])
            i += 1
        else:
            result.append(right_half[j])
            j += 1

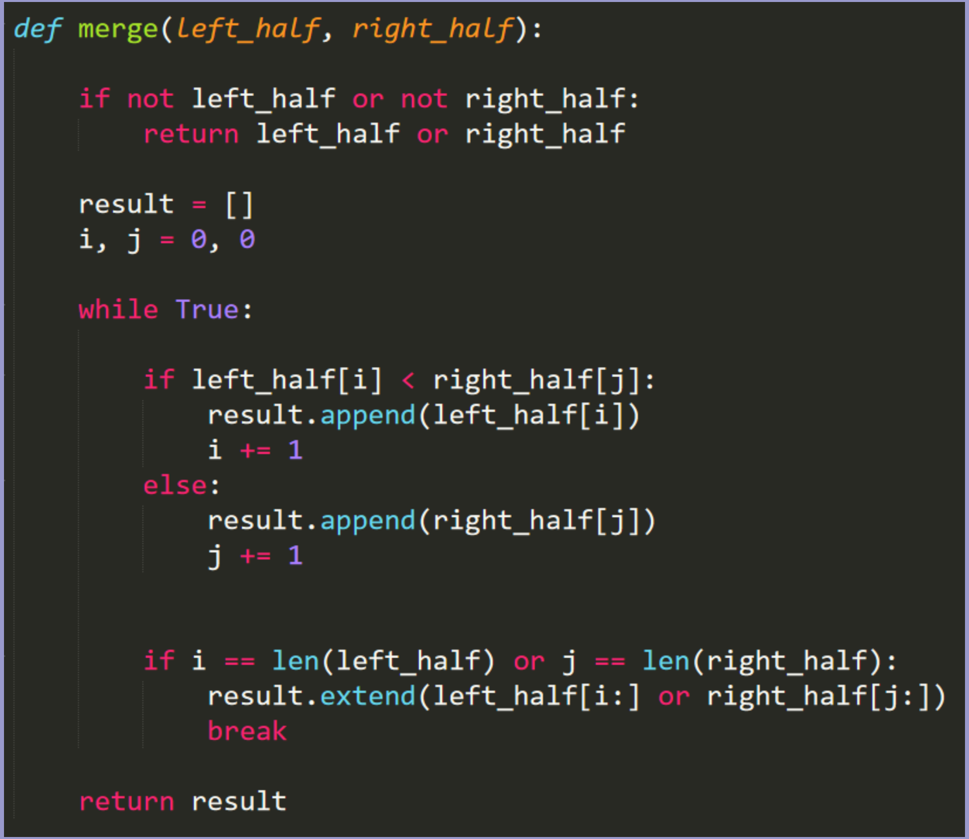

        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 0   j = 1



result = [3]



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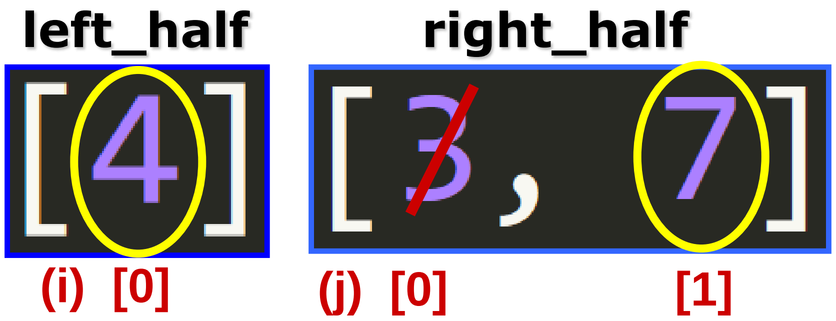
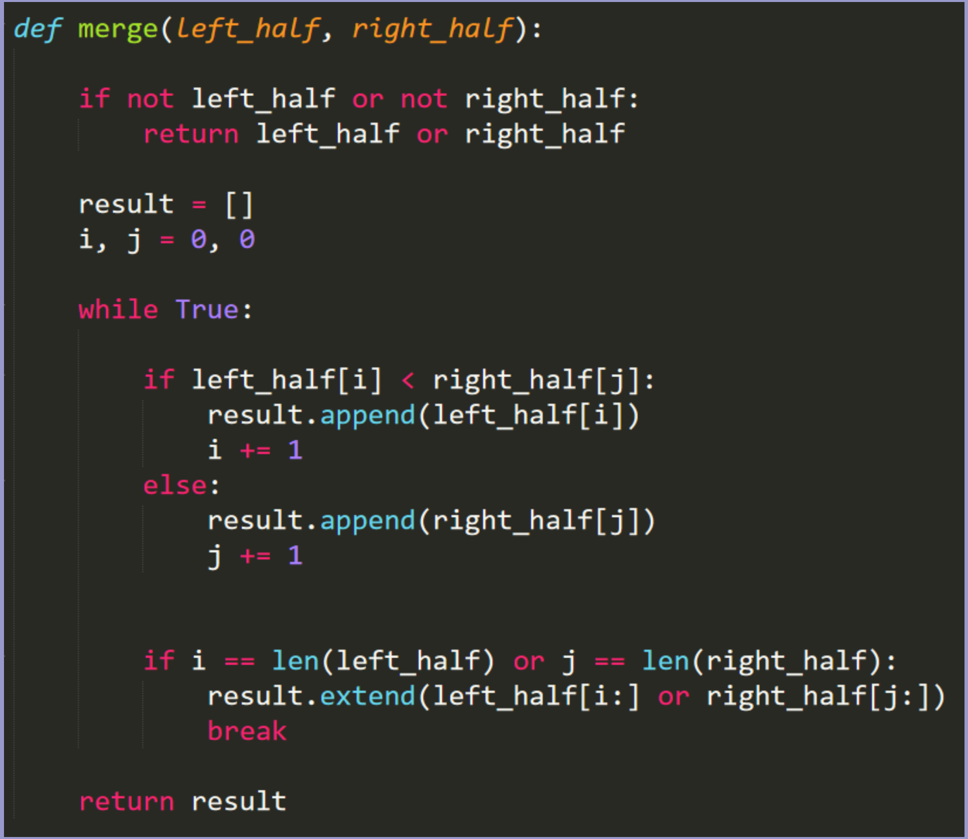
i = 0   j = 1



4 < 7?

result = [3]



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            result.extend(left_half[i:] or right_half[j:])
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    return result
```
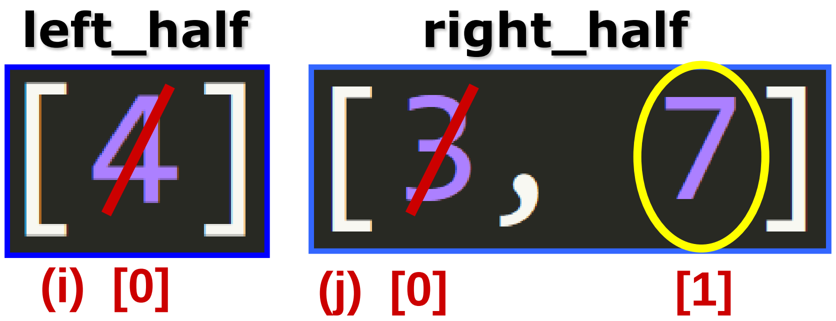
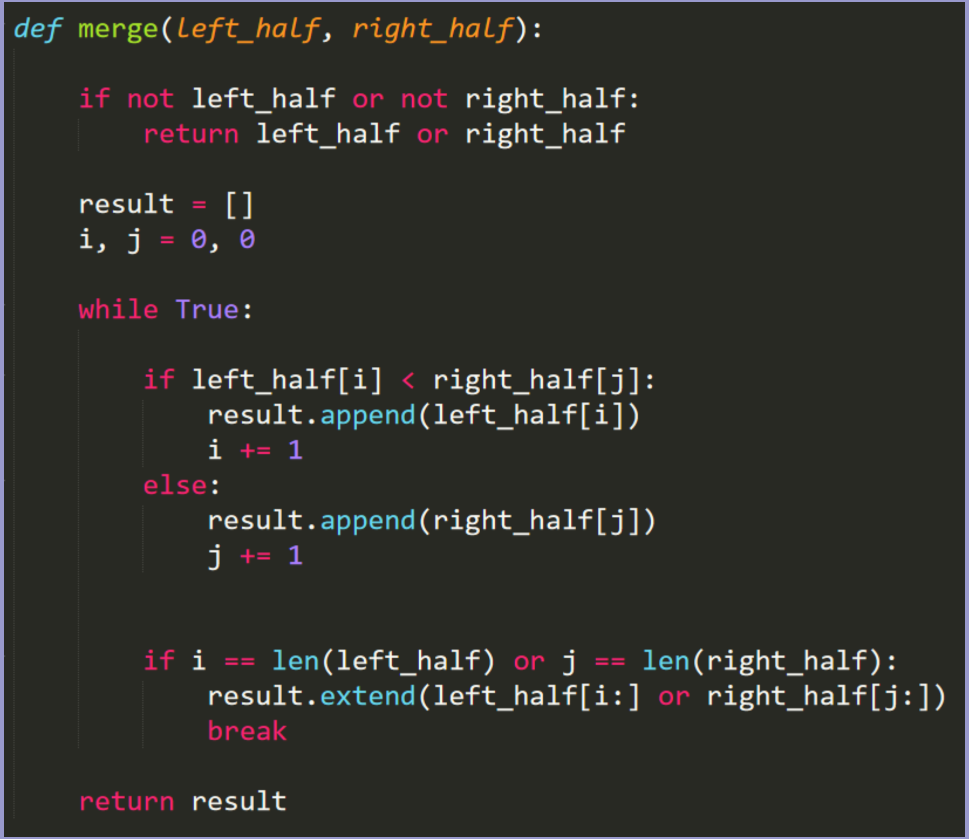

i = 1   j = 1



4 < 7?

result = [3, 4]



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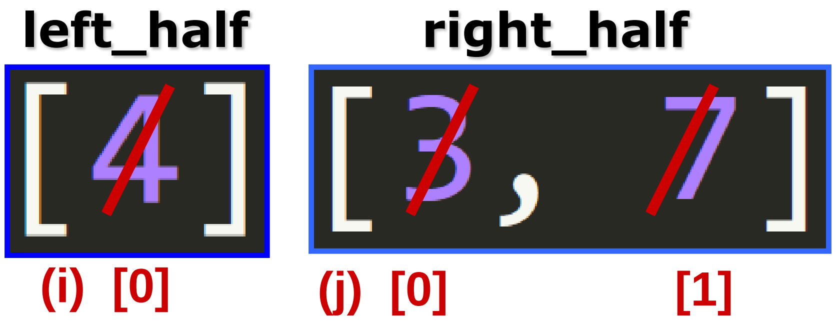
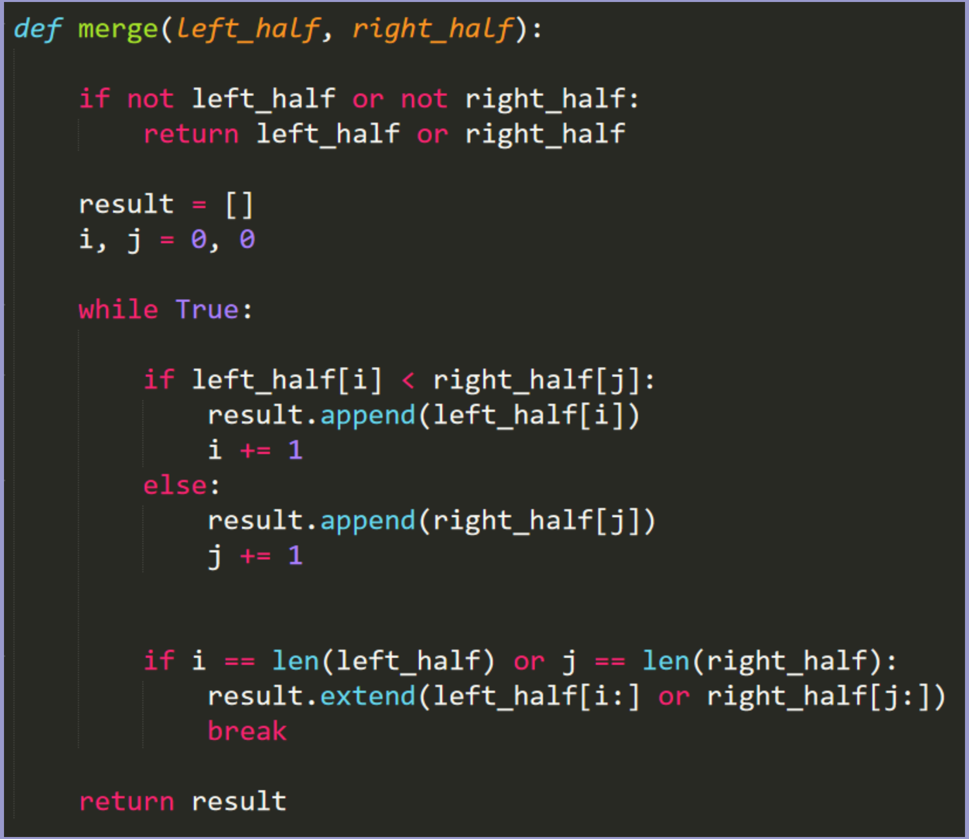
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 1   j = 1



result = [3, 4, 7]



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        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 1   j = 1

[3, 4, 7]

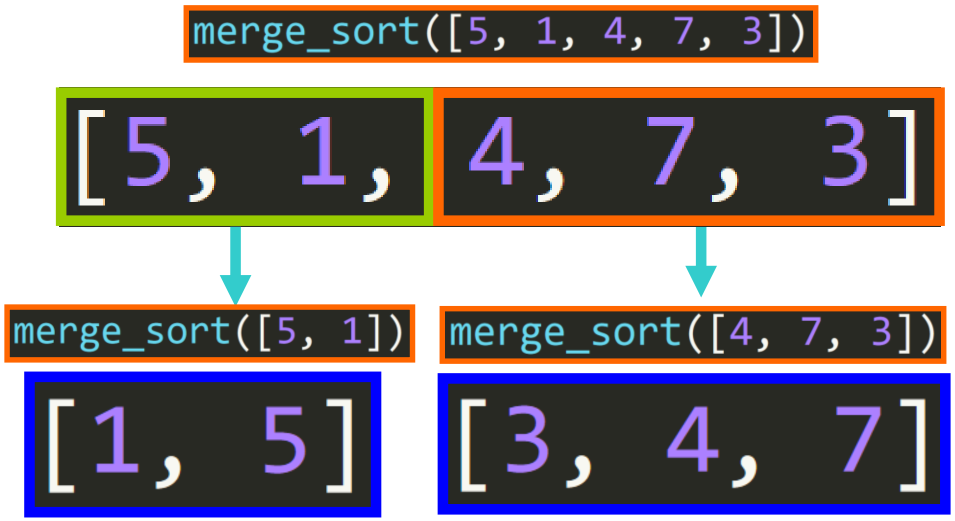
result = [3, 4, 7]

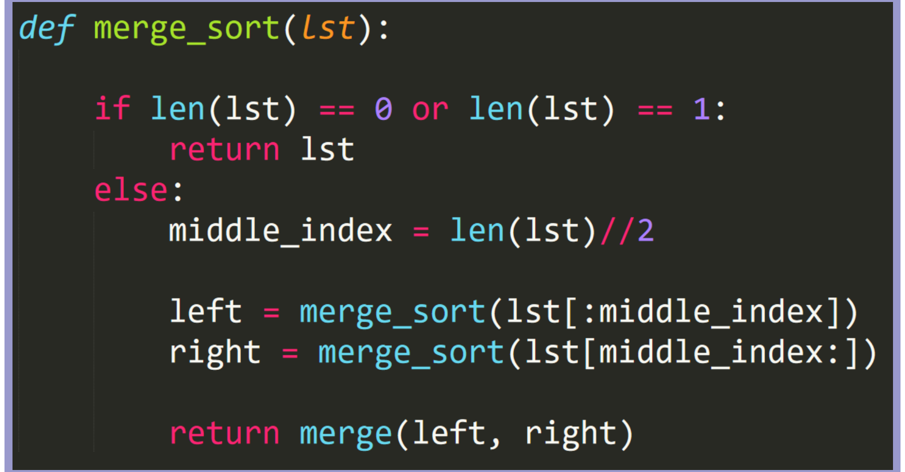
```python
def merge_sort(lst):

    if len(lst) == 0 or len(lst) == 1:
        return lst
    else:
        middle_index = len(lst)//2

        left = merge_sort(lst[:middle_index])
        right = merge_sort(lst[middle_index:])

        return merge(left, right)
```





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    if len(lst) == 0 or len(lst) == 1:
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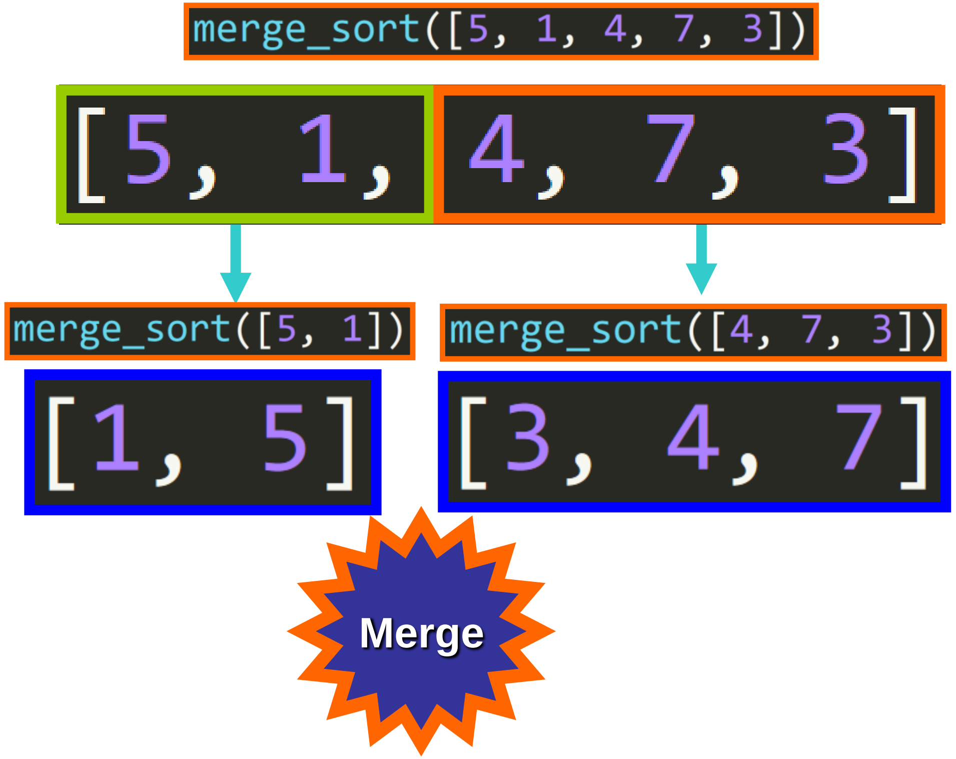

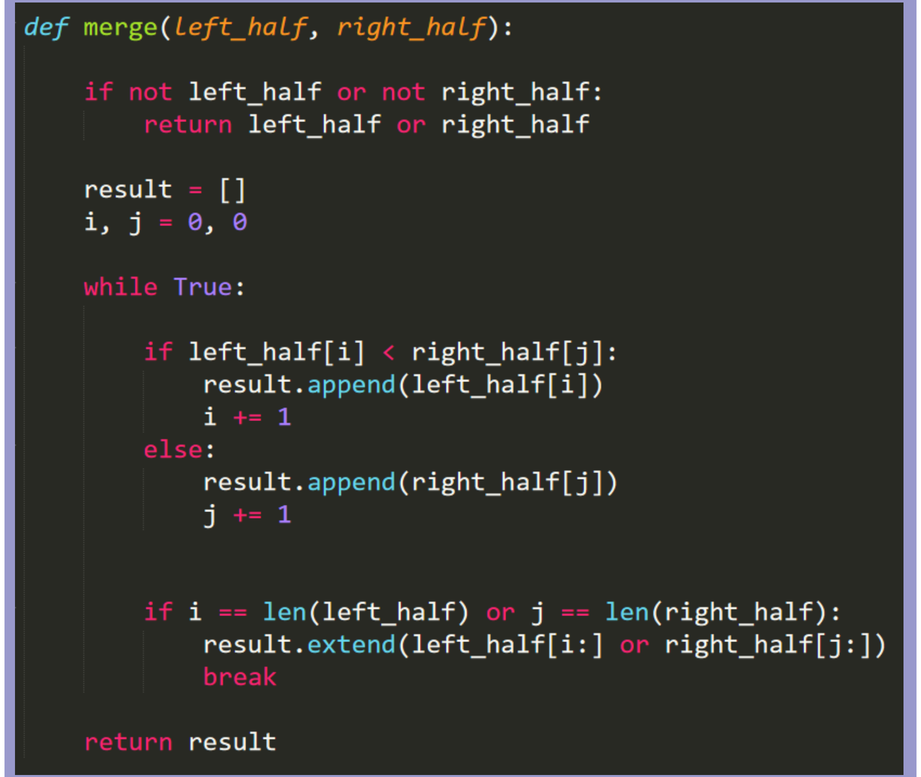

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    result = []
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    while True:

        if left_half[i] < right_half[j]:
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            i += 1
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        if i == len(left_half) or j == len(right_half):
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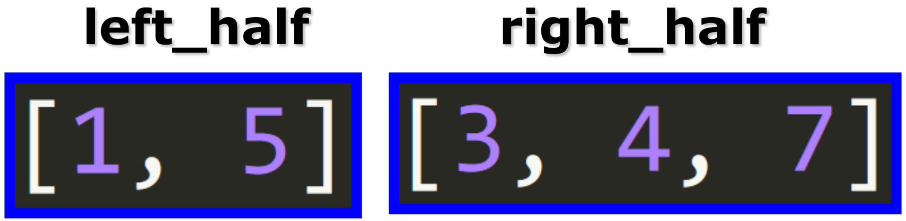
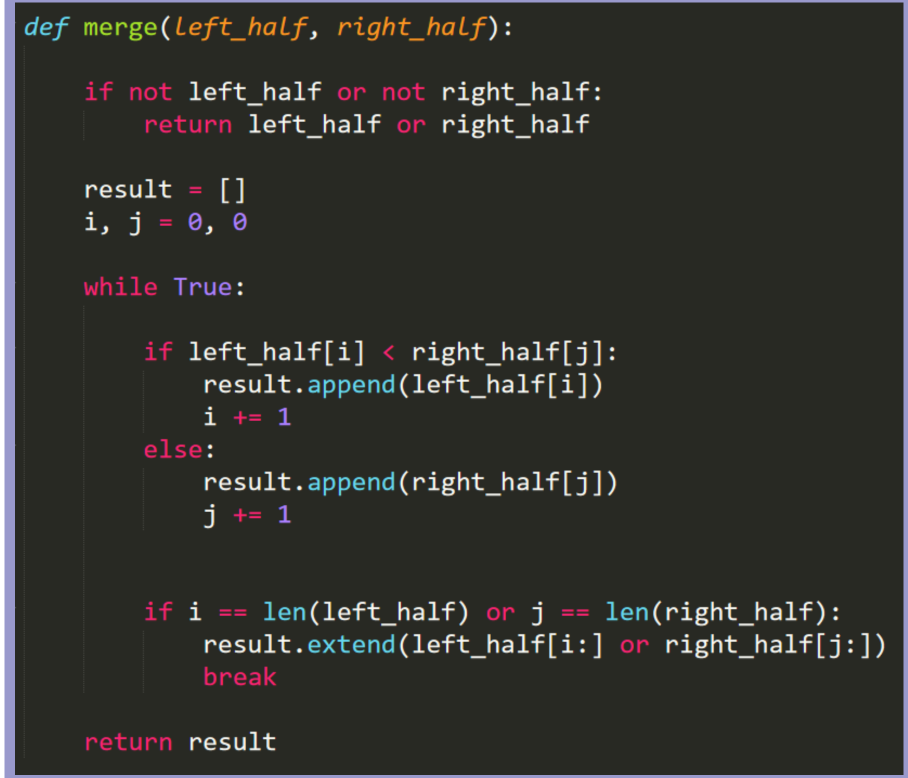
    return result
```





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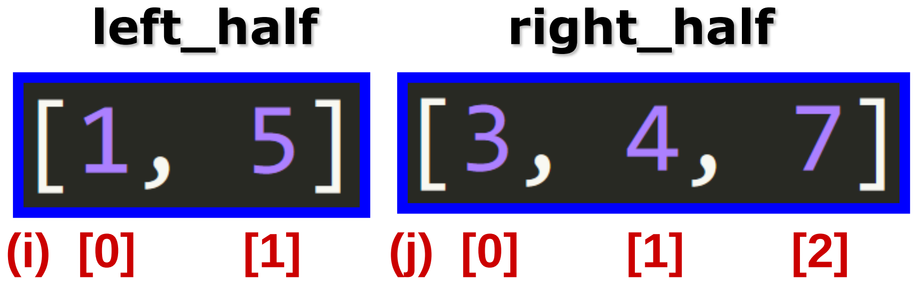
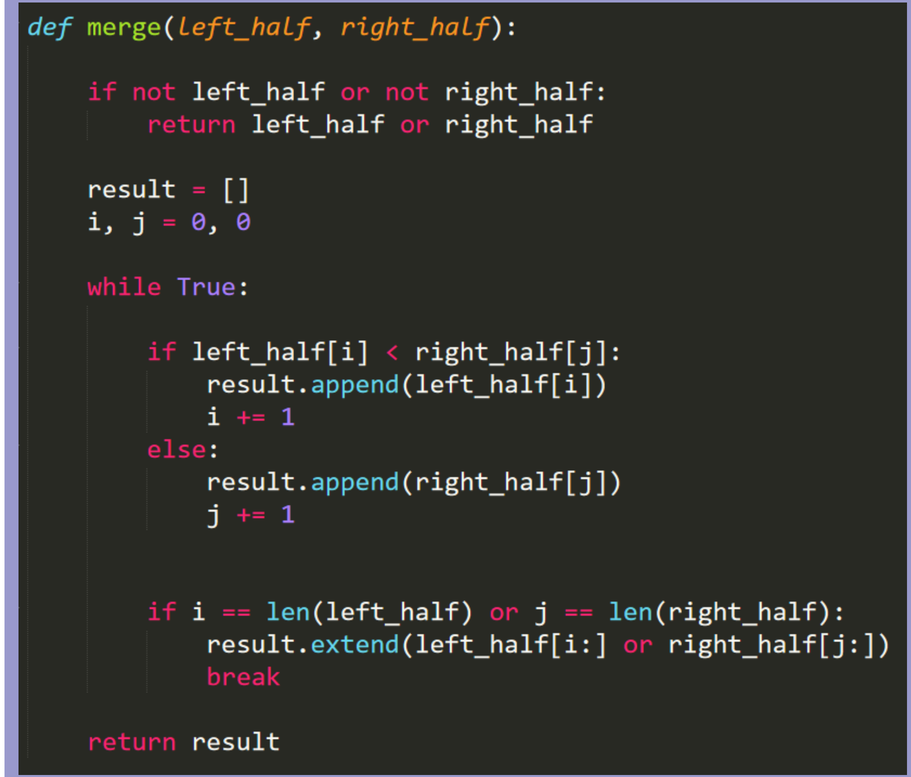
        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 0   j = 0



result = [ ]



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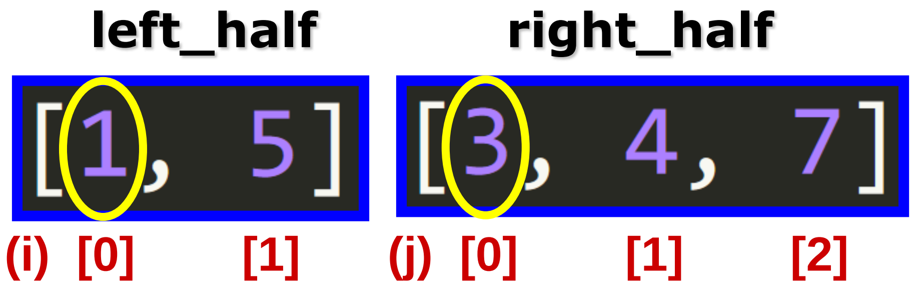
            break

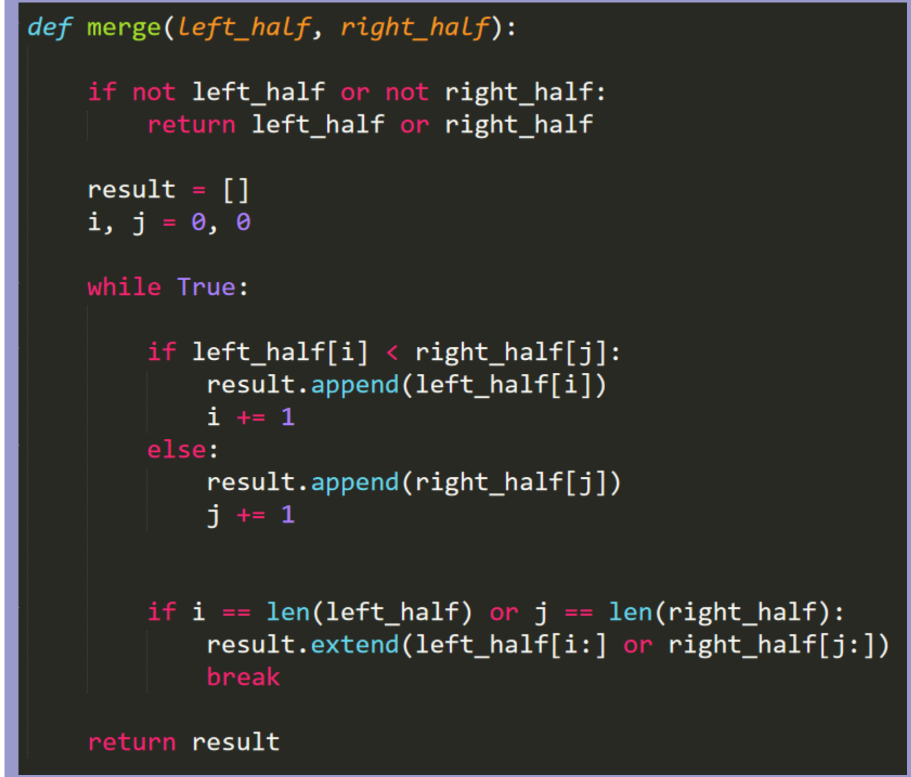
    return result
```

i = 0   j = 0



1 < 3?

result = [ ]



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        if i == len(left_half) or j == len(right_half):
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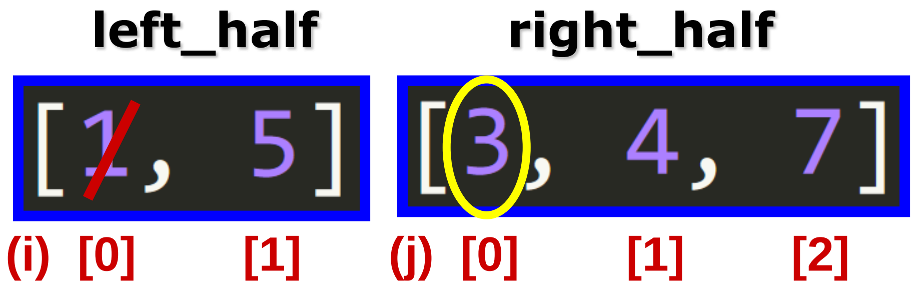
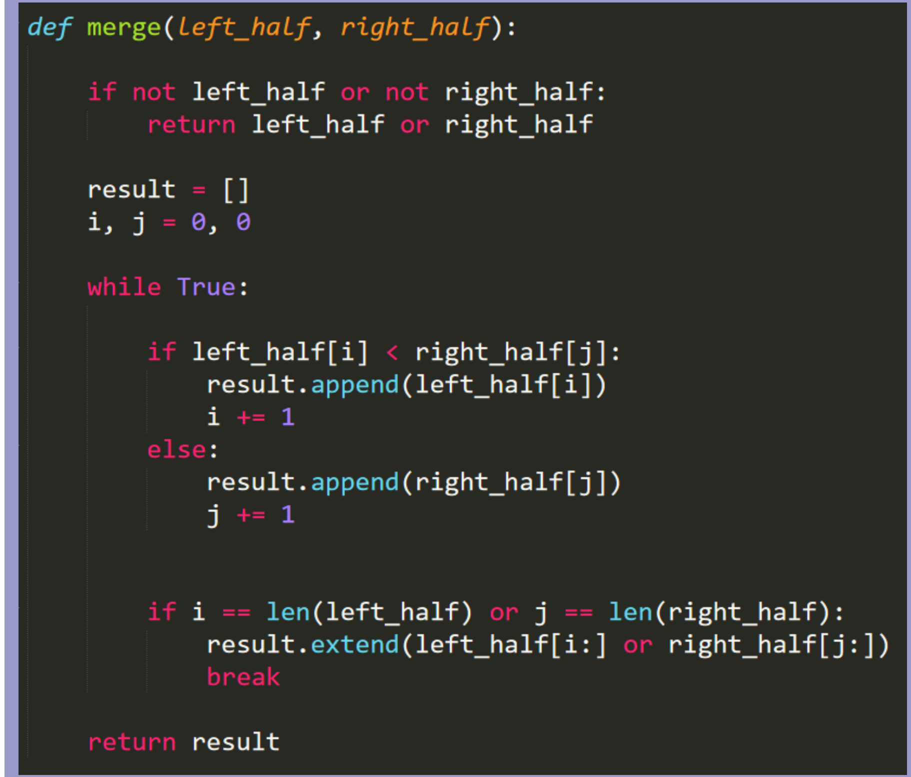
            break

    return result
```

i = 1   j = 0



result = [1]



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            j += 1


        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

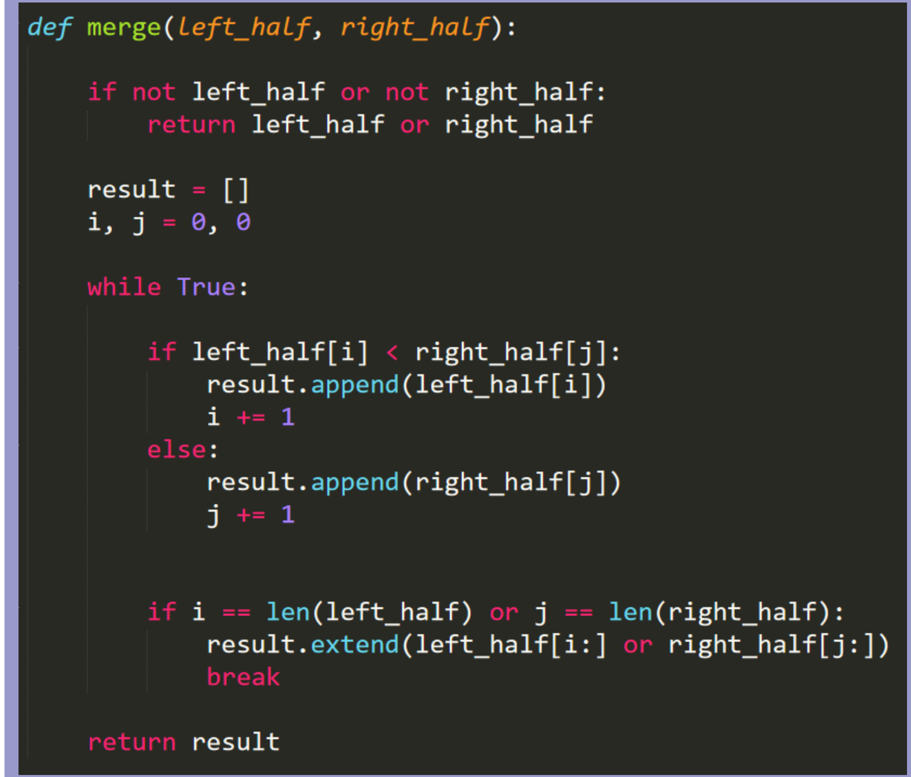
    return result
```

i = 1   j = 0

left_half		right_half		
~~1~~	5	3	4	7
(i) [0]	[1]	(j) [0]	[1]	[2]

5 < 3?

result = [1]



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            j += 1


        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 1   j = 1

left_half

[$\cancel{1}$, 5]

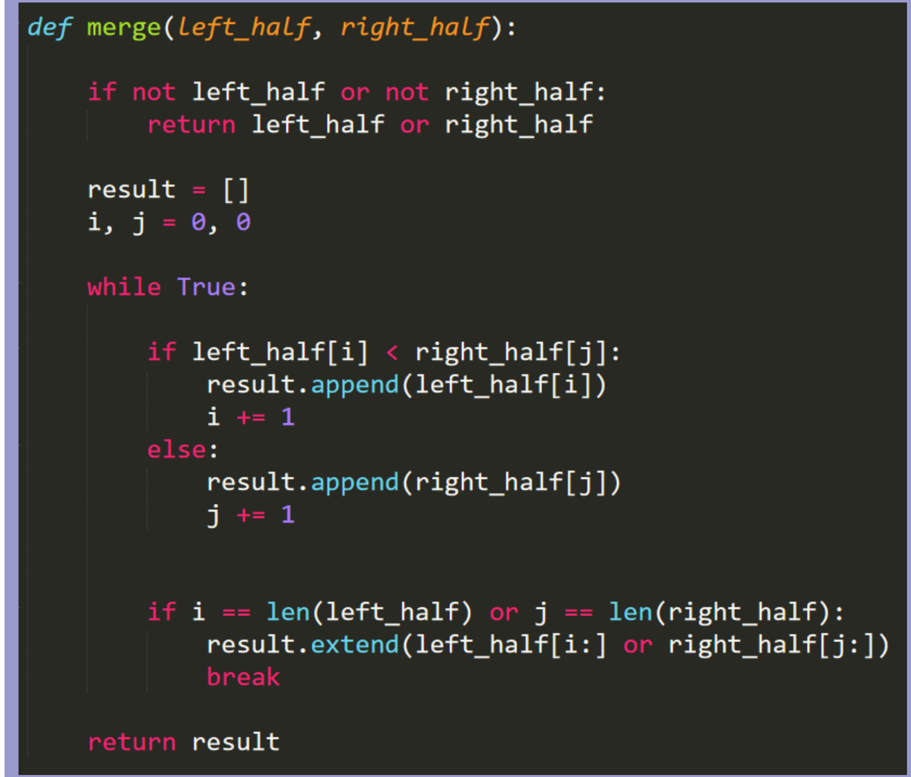
(i) [0] [1]

right_half

[$\cancel{3}$, 4, 7]

(j) [0] [1] [2]

result = [1, 3]



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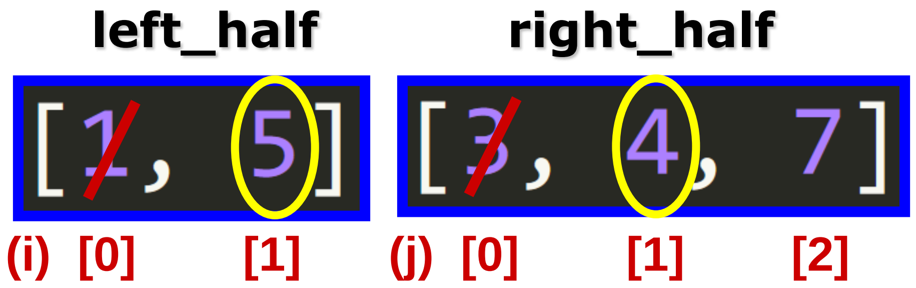
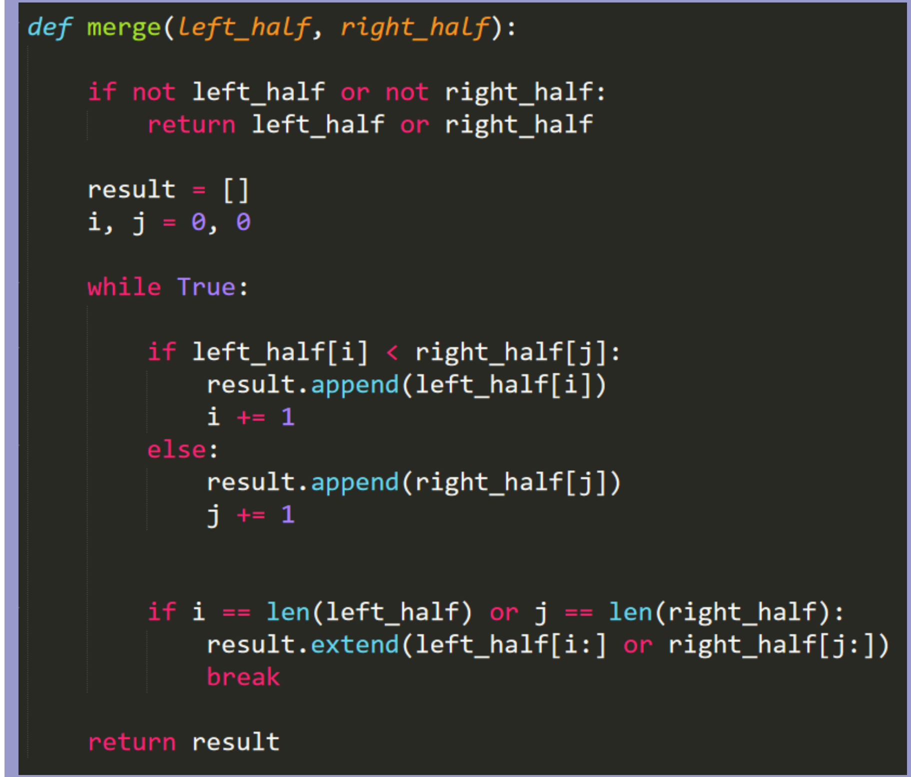
i = 1 j = 1



5 < 4?

result = [1, 3]



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        if i == len(left_half) or j == len(right_half):
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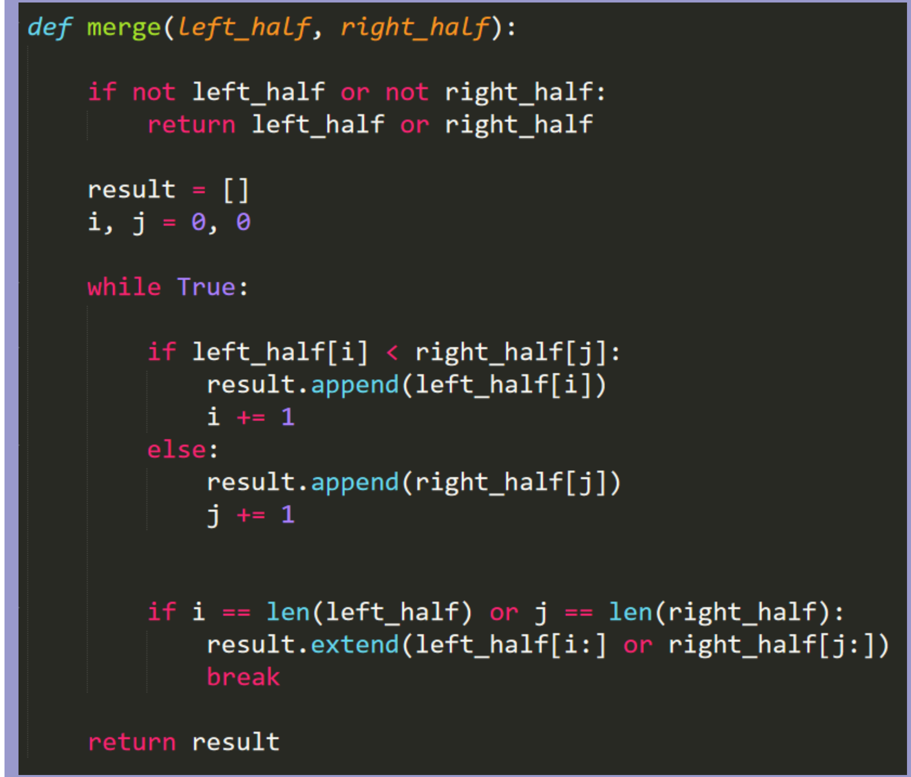
            break

    return result
```

i = 1 j = 2

left_half		right_half		
[~~1~~,	5]	[~~3~~,	~~4~~,	7]
(i) [0]	[1]	(j) [0]	[1]	[2]

result = [1, 3, 4]



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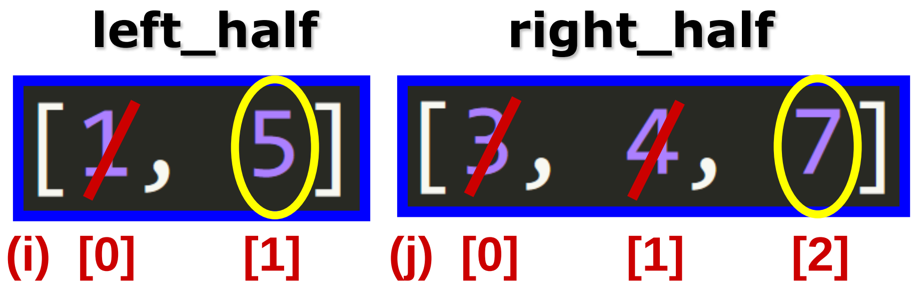
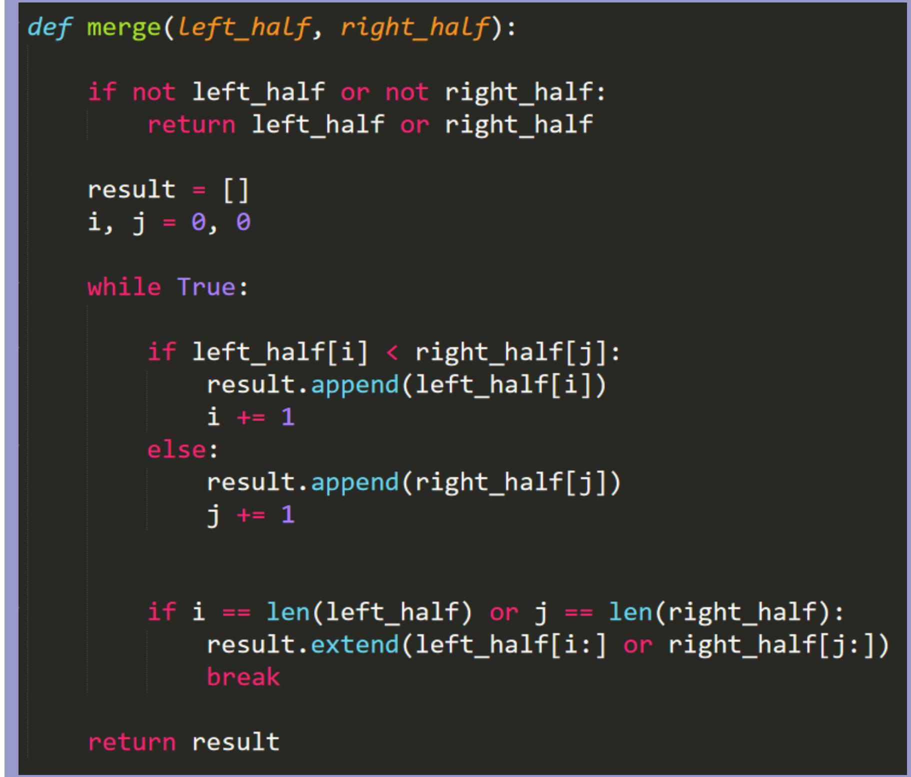
```

i = 1   j = 2



5 < 7?

result = [1, 3, 4]



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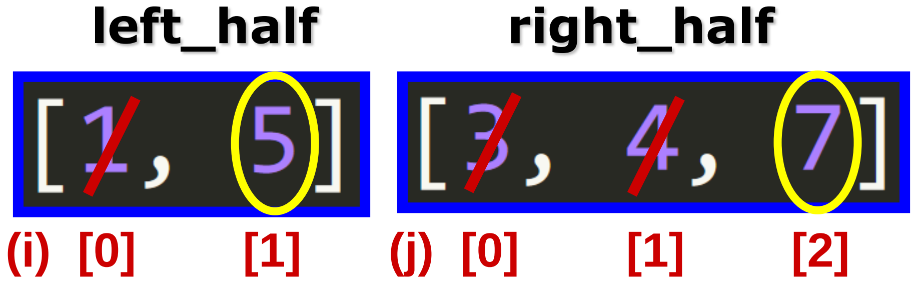
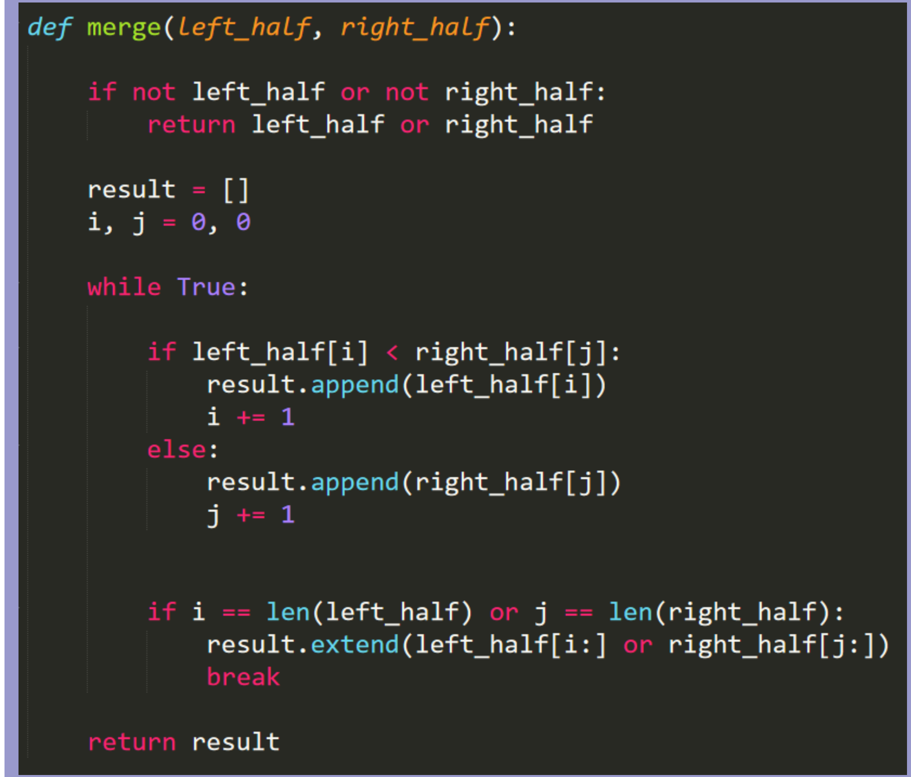
    return result
```

i = 1   j = 2



5 < 7?

result = [1, 3, 4, 5]



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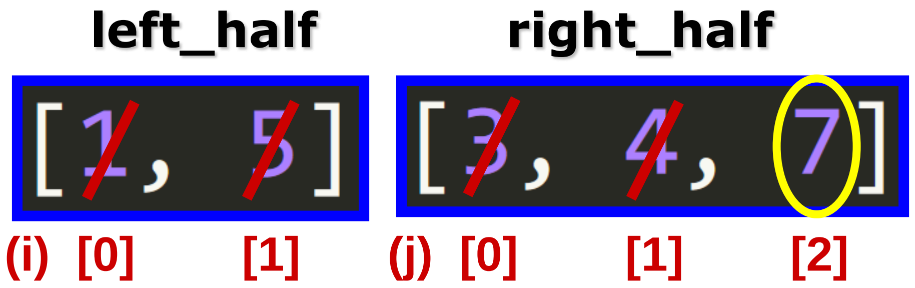
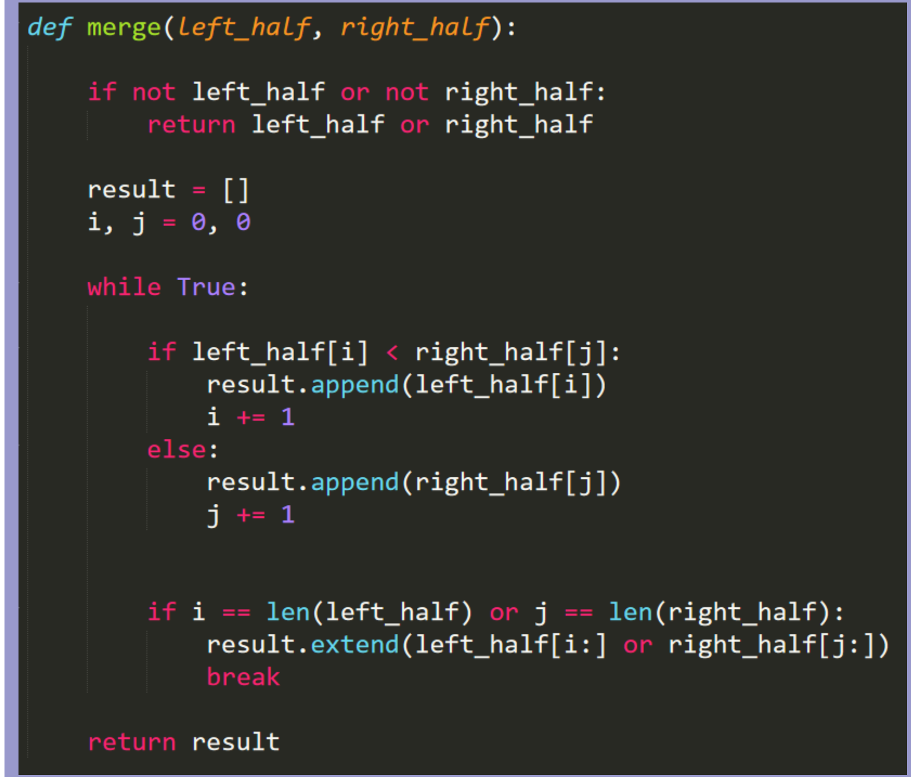
        if i == len(left_half) or j == len(right_half):
            result.extend(left_half[i:] or right_half[j:])
            break

    return result
```

i = 2   j = 2



result = [1, 3, 4, 5]



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    return result
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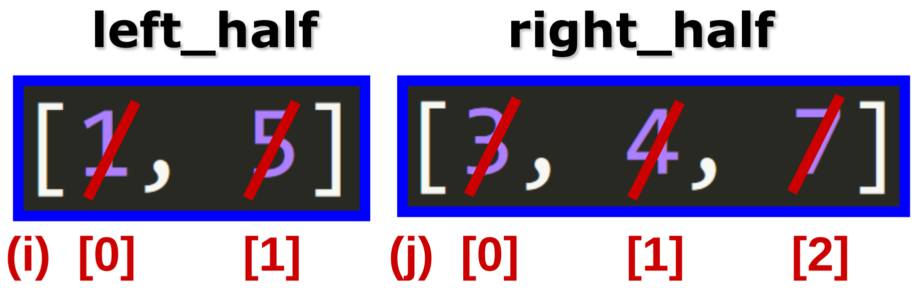
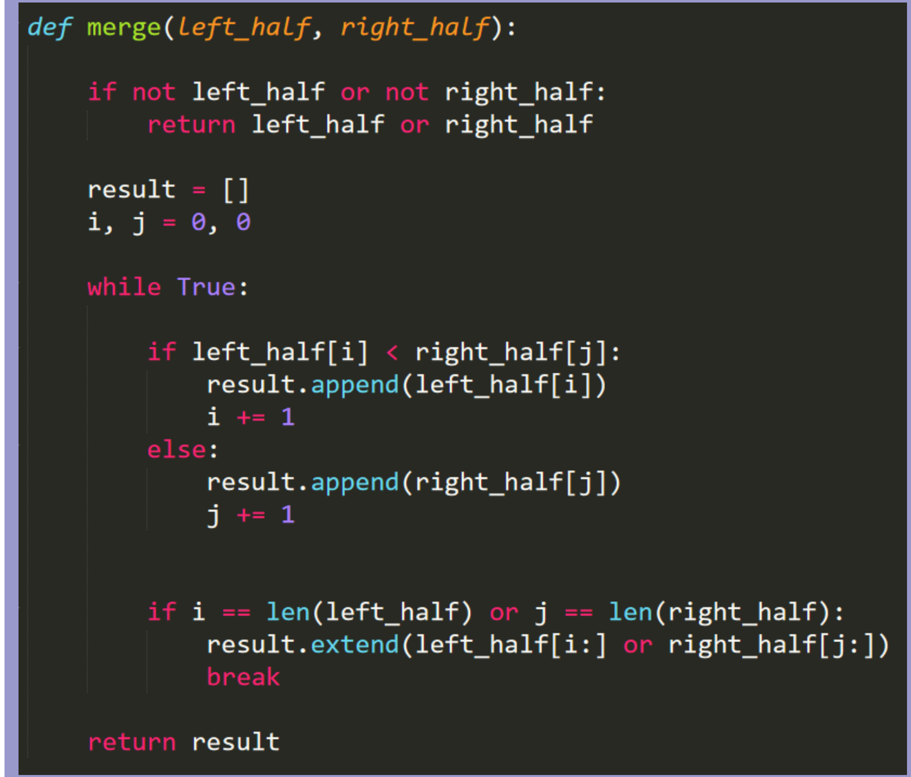
i = 2   j = 2



result = [1, 3, 4, 5, 7]



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            result.extend(left_half[i:] or right_half[j:])
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    return result
```

i = 2   j = 2

```
[1, 3, 4, 5, 7]
```

result = [1, 3, 4, 5, 7]

```python
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    else:
        middle_index = len(lst)//2

        left = merge_sort(lst[:middle_index])
        right = merge_sort(lst[middle_index:])

        return merge(left, right)
```

Sorted

```
[1, 3, 4, 5, 7]
```

Time to Practice