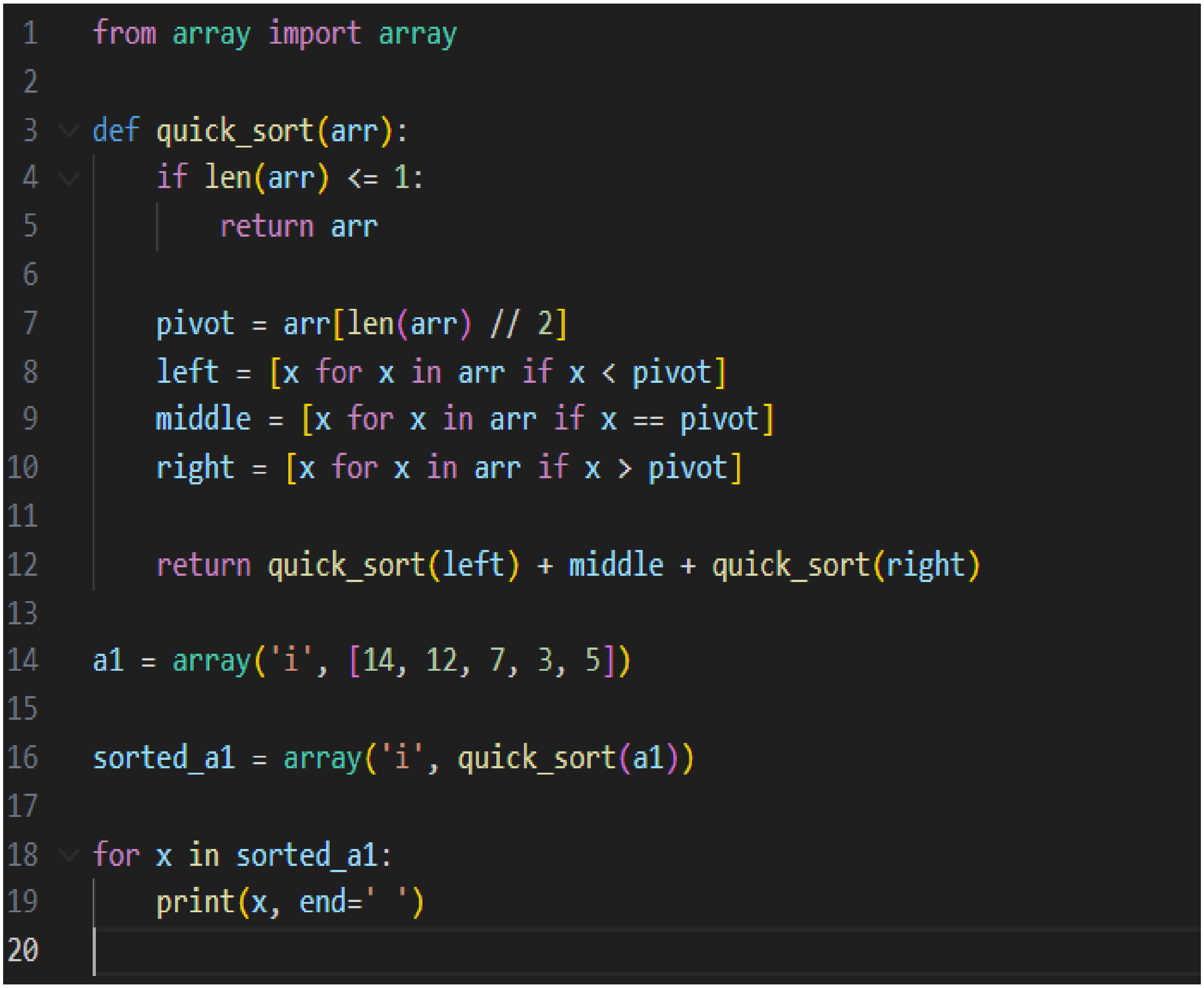
LAB#21

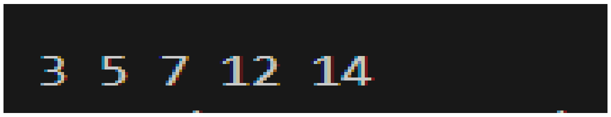
Example#1: Write a program to sort an unsorted array by using a quick sort algorithm.

Solution:



```python
from array import array

def quick_sort(arr):
    if len(arr) <= 1:
        return arr

    pivot = arr[len(arr) // 2]
    left = [x for x in arr if x < pivot]
    middle = [x for x in arr if x == pivot]
    right = [x for x in arr if x > pivot]

    return quick_sort(left) + middle + quick_sort(right)

a1 = array('i', [14, 12, 7, 3, 5])

sorted_a1 = array('i', quick_sort(a1))

for x in sorted_a1:
    print(x, end=' ')

```

Result:



```
3 5 7 12 14
```

Explanation:

```
1. def quick_sort(arr):
        If len([14,12,7,3,5])<=1:
                Return arr
        Pivot=arr[5//2]
        Pivot=arr[2]
        Pivot=7
        Left=[3,5]
        Middle=[7]
        Right=[12,14]
I       return quick_sort([3,5])+middle+quick_sort([12,14])
```

1-left→quick_sort([3,5])

Middle→7

1-right→quick_sort([12,14])

```
quick_sort([3,5])

1-left:

        def quick_sort(arr):

                if len[3,5]<=1

                        X

                Pivot=arr[1]

                Left=3

                Middle=5

                Right=[]

II              return quick_sort[3]+middle+quick_sort[]
```

1-left-left→quick_sort[3]

1-left-middle→5

1-left-right→empty

```
1-left-left:

        def quick_sort(arr):

                if len[3]<=1:

                        return 3
```

Now:

II		return quick_sort[3]+middle+quick_sort[]

II		return [3,5]

We have:

1-left=[3,5]

quick_sort([12,14])

1-right:

```
    def quick_sort(arr):
        if len[12,14]<=1
            X
        Pivot=arr[1]
        Left=12
        Middle=14
        Right=[]
III     return quick_sort[12]+14+quick_sort[]
```

1-right-left→12

1-right-middle→14

1-right-right→empty

```
1-right-left:
    def quick_sort(arr):
        if len[12]<=1:
            return 12
```

now:

```
III     return quick_sort[12]+14+quick_sort[]
```

Return [12,14]

We have:

1-right=[12,14]

```
I   return quick_sort([3,5])+middle+quick_sort([12,14])
    return[3,5,7,12,14]
```

sorted_a1=[3,5,7,12,14]

Class Assignment

Q.1: Write a program to sort an unsorted array by using the quick sort algorithm consider first element as a pivot element.

Q.2: Write a program to sort an unsorted array by using the quick sort algorithm consider last element as a pivot element.

Q.3: Write a program to sort an unsorted array by using the quick sort algorithm consider any random element as a pivot element.