LAB 07: Quick Sort

CS211 – Data Structures and Algorithms
Usman Institute of Technology
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- **How to submit:**
  - Online: Submit on your respective MS Teams.

A. Implement the following functions of recursion in Python.

1. A function **Write()** that takes an argument n and prints the numbers in reverse order recursively.

```
    def Write(n):
        // your code goes here
```

```
Example:
Write(5)

#The result should be like this:
5
4
3
2
1
```

2. Add a function **Factorial()** that returns the factorial of a number.

```
    def Factorial(n):
        // your code goes here
```

```
Example:
Factorial(5)


#The result should be like this:
5! = 5x4x3x2x1 = 120
```

3. A function **GCD()** that takes two numbers and returns their greatest common divisor.

```
    def GCD(a,b):
```

```
        // your code goes here
```

```
Example:
GCD(8,12)

#The function should return 4
```

```
Algorithm:
GCD(a,0) = a               Base Case
GCD(a,b) = GCD(b,a mod b)  Recursive case
```

4. A function **BinarySearch()** that implements the binary search algorithm for non-empty sorted array using recursion. The function should take the arguments List, value, low, high and returns the location of the searched value.

```
    def BinarySearch(List,low,high,value):
        // your code goes here
```

5. A function **QuickSort()** which sorts the list in ascending/descending order.

```
    def QuickSort():
        // your code goes here
```

```
function partitionFunc(left, right, pivot)
   leftPointer = left
   rightPointer = right - 1

   while True do
      while A[++leftPointer] < pivot do
         //do-nothing
      end while

      while rightPointer > 0 && A[--rightPointer] > pivot do
         //do-nothing
      end while

      if leftPointer >= rightPointer
         break
      else
         swap leftPointer,rightPointer
      end if

   end while

   swap leftPointer,right
   return leftPointer
```

```
end function

procedure quickSort(left, right)

   if right-left <= 0
      return
   else
      pivot = A[right]
      partition = partitionFunc(left, right, pivot)
      quickSort(left,partition-1)
      quickSort(partition+1,right)
   end if

end procedure
```

Source: TutorialsPoint