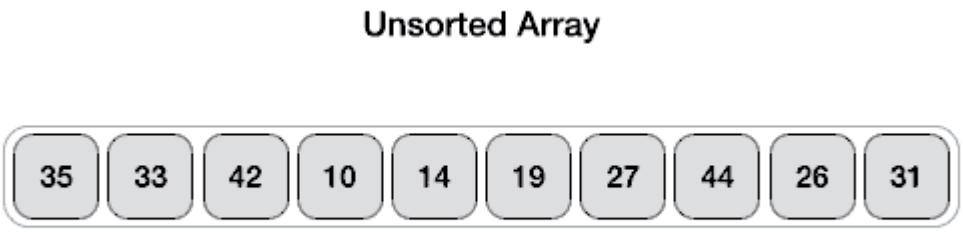
DATA STRUCTURE - QUICK SORT

Quick sort is a highly efficient sorting algorithm and is based on partitioning of array of data into smaller arrays. A large array is partitioned into two arrays one of which holds values smaller than specified value say pivot based on which the partition is made and another array holds values greater than pivot value.

The quick sort partitions an array and then calls itself recursively twice to sort the resulting two subarray. This algorithm is quite efficient for large sized data sets as its average and worst case complexity are of O*nlogn* where n are no. of items.

Partition in Quicksort

The below given animated representation explains how to find pivot value in the array.



The pivot value divides the list in to two parts. And recursively we find pivot for each sub-lists until all lists contains only one element.

QuickSort Pivot Algorithm

Based on our understanding of partitioning in quicksort, we should now try to write an algorithm for it here.

```
Step 1 − Choose the highest index value has pivot
Step 2 − Take two variables to point left and right of the list excluding pivot
Step 3 − left points to the low index
Step 4 − right points to the high
Step 5 − while value at left is less than pivot move right
Step 6 − while value at right is greater than pivot move left
Step 7 − if both step 5 and step 6 does not match swap left and right
Step 8 − if left ≥ right, the point where they met is new pivot
```

QuickSort Pivot Pseudocode

The pseudocode for the above algorithm can be derived as −

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

   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
```

QuickSort Algorithm

Using pivot algorithm recursively we end-up with smaller possible partitions. Each partition then processed for quick sort. We define recursive algorithm for quicksort as below −

```
Step 1 − Make the right-most index value pivot
Step 2 − partition the array using pivot value
Step 3 − quicksort left partition recursively
Step 4 − quicksort right partition recursively
```

QuickSort Pseudocode

To get more into it, let see the pseudocode for quick sort algorithm −

```
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
```

To see quick sort implementation in C programming language, please click here.