# <2T>

# Quicksort Description

Quicksort, like merge sort, applies the divide-and-conquer paradigm introduced

in Section 2.3.1. Here is the three-step divide-and-conquer process for sorting a

typical subarray A[p..r]:

**Divide:** Partition (rearrange) the array a[p..r] into two (possibly empty) subarrays

A[p..q-1] and A[q + 1..r] such that each element of A[p..q - 1] is

less than or equal to A[q], which is, in turn, less than or equal to each element

of A[q+1 ..r]. Compute the index q as part of this partitioning procedure.

**Conquer:** Sort the two subarrays A[p..q - 1] and A[q + 1..r] by recursive calls

to quicksort.

**Combine:** Because the subarrays are already sorted, no work is needed to combine

them: the entire array A[p..r] is now sorted.

# Quicksort Pseudocode

QUICKSORT(A, p, r)  
1 if p < r  
2 q = PARTITION(A, p, r)  
3 QUICKSORT(A, p, q-`1)  
4 QUICKSORT{A, q + 1, r}

**Partitioning the array**

The key to the algorithm is the PARTITION procedure, which rearranges the subarray

A[p..r] in place.

**Partition**

PARTITION(A, p, r)  
1 x = A[r]  
2 i = p – 1  
3 for j = p to r – 1  
4 if A[j] <= x  
5 I = i + 1  
6 exchange A[i] with A[j]  
7 exchange A[I + 1] with A[r]  
8 return i + 1

# Quicksort Code

def quicksort(myList, start, end):

    if start < end:

        # partition the list

        pivot = partition(myList, start, end)

        # sort both halves

        quicksort(myList, start, pivot-1)

        quicksort(myList, pivot+1, end)

    return myList

def partition(myList, start, end):

    pivot = myList[start]

    left = start+1

    right = end

    done = False

    while not done:

        while left <= right and myList[left] <= pivot:

            left = left + 1

        while myList[right] >= pivot and right >=left:

            right = right -1

        if right < left:

            done= True

        else:

            # swap places

            temp=myList[left]

            myList[left]=myList[right]

            myList[right]=temp

    # swap start with myList[right]

    temp=myList[start]

    myList[start]=myList[right]

    myList[right]=temp

    return right