Perfect Plan B

Learn, grow and become leaders of tomorrow

Problem 1 : Python Program for Linear Search

Problem: Given an array arr[] of n elements, write a function to search a given element x in arr[].

Examples :

Input : arr[] = {10, 20, 80, 30, 60, 50,
110, 100, 130, 170}
x = 110;
Output : 6
Element x is present at index 6

Input : arr[] = {10, 20, 80, 30, 60, 50,
110, 100, 130, 170}
x = 175;
Output : -1
Element x is not present in arr[].

Solution: Python Program for Linear Search

```
# Searching an element in a list/array in python
# can be simply done using \'in\' operator
# Example:
# if x in arr:
# print arr.index(x)

# If you want to implement Linear Search in python

# Linearly search x in arr[]
# If x is present then return its location
# else return -1

def search(arr, x):

        for i in range(len(arr)):

                if arr[i] == x:
                        return i

        return -1
```

Problem 2 : Python Program for Binary Search (Recursive and Iterative)

Examples:

Input : [2, 3, 4, 10, 40]

X = 10

Output : Element is present at index 3

Solution : Python Program for Binary Search (Recursive and Iterative)

```
# Python 3 program for recursive binary search.
# Returns index of x in arr if present, else -1
def binary_search(arr, low, high, x):

    # Check base case
    if high >= low:

        mid = (high + low) // 2

        # If element is present at the middle itself
        if arr[mid] == x:
            return mid

        # If element is smaller than mid, then it can only
        # be present in left subarray
        elif arr[mid] > x:
            return binary_search(arr, low, mid - 1, x)

        # Else the element can only be present in right subarray
        else:
            return binary_search(arr, mid + 1, high, x)

    else:
        # Element is not present in the array
        return -1
```



```
# Test array
arr = [ 2, 3, 4, 10, 40 ]
x = 10

# Function call
result = binary_search(arr, 0,
len(arr)-1, x)

if result != -1:
    # In Python 2: print
"Element present at index %d"
% result
    print("Element is present
at index", str(result))
else:
    # In Python 2: print
"Element not present in array"
    print("Element is not
present in array")
```

Solution : Python Program for Binary Search (Iterative)

```
# Iterative Binary Search Function
# It returns index of x in given array arr if present,
# else returns -1
def binary_search(arr, x):
        low = 0
        high = len(arr) - 1
        # optimization: pooled variable
        mid = 0

        while low <= high:

                mid = (high + low) // 2

                # Check if x is present at mid
                if arr[mid] < x:
                        low = mid + 1

                # If x is greater, ignore left half
                elif arr[mid] > x:
                        high = mid - 1

                # If x is smaller, ignore right half
                else:
                        return mid

        # If we reach here, then the element was not present
        return -1
```



```
# Test array
arr = [ 2, 3, 4, 10, 40 ]
x = 10

# Function call
result = binary_search(arr, 0,
len(arr)-1, x)

if result != -1:
        # In Python 2: print
"Element present at index %d"
% result
        print("Element is present
at index", str(result))
else:
        # In Python 2: print
"Element not present in array"
        print("Element is not
present in array")
```

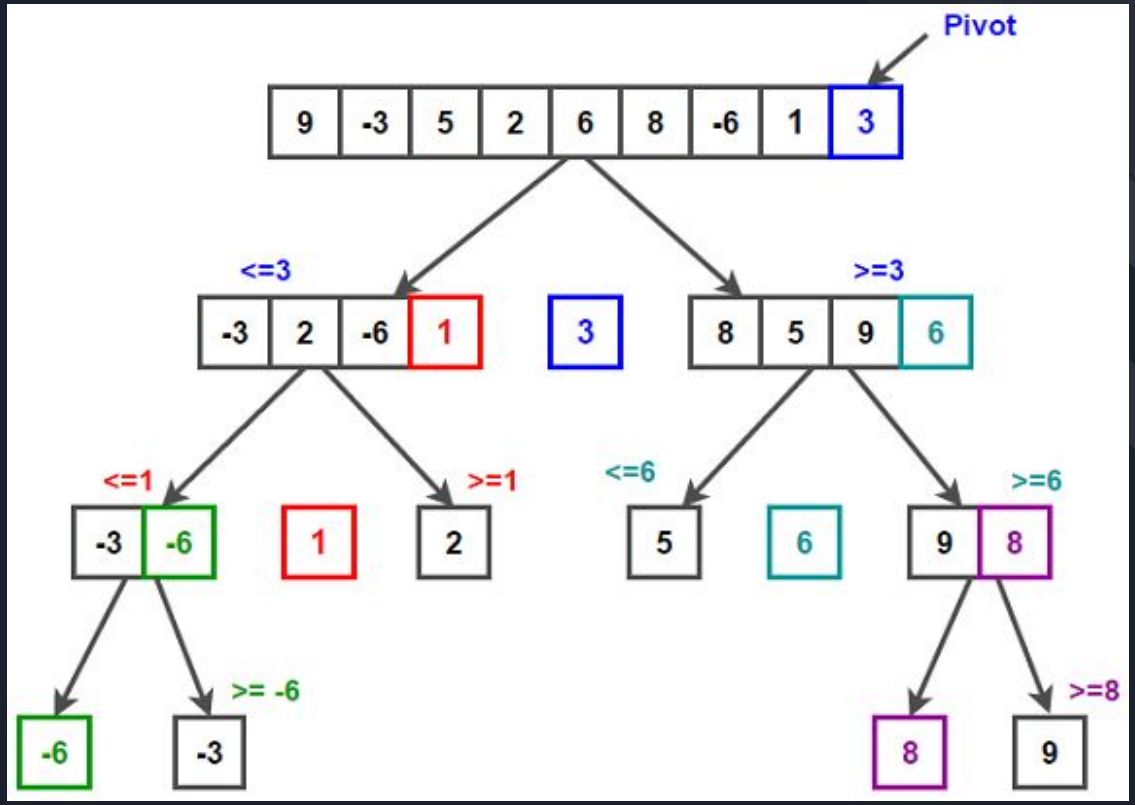
Problem 3 : Python Program for QuickSort

QuickSort is a Divide and Conquer algorithm. It picks an element as pivot and partitions the given array around the picked pivot. There are many different versions of quickSort that pick pivot in different ways.

1. Always pick first element as pivot.
2. Always pick last element as pivot (implemented below)
3. Pick a random element as pivot.
4. Pick median as pivot.

The key process in quickSort is partition(). Target of partitions is, given an array and an element x of array as pivot, put x at its correct position in sorted array and put all smaller elements (smaller than x) before x, and put all greater elements (greater than x) after x.

QuickSort



Solution : Python Program for QuickSort (PseudoCode)

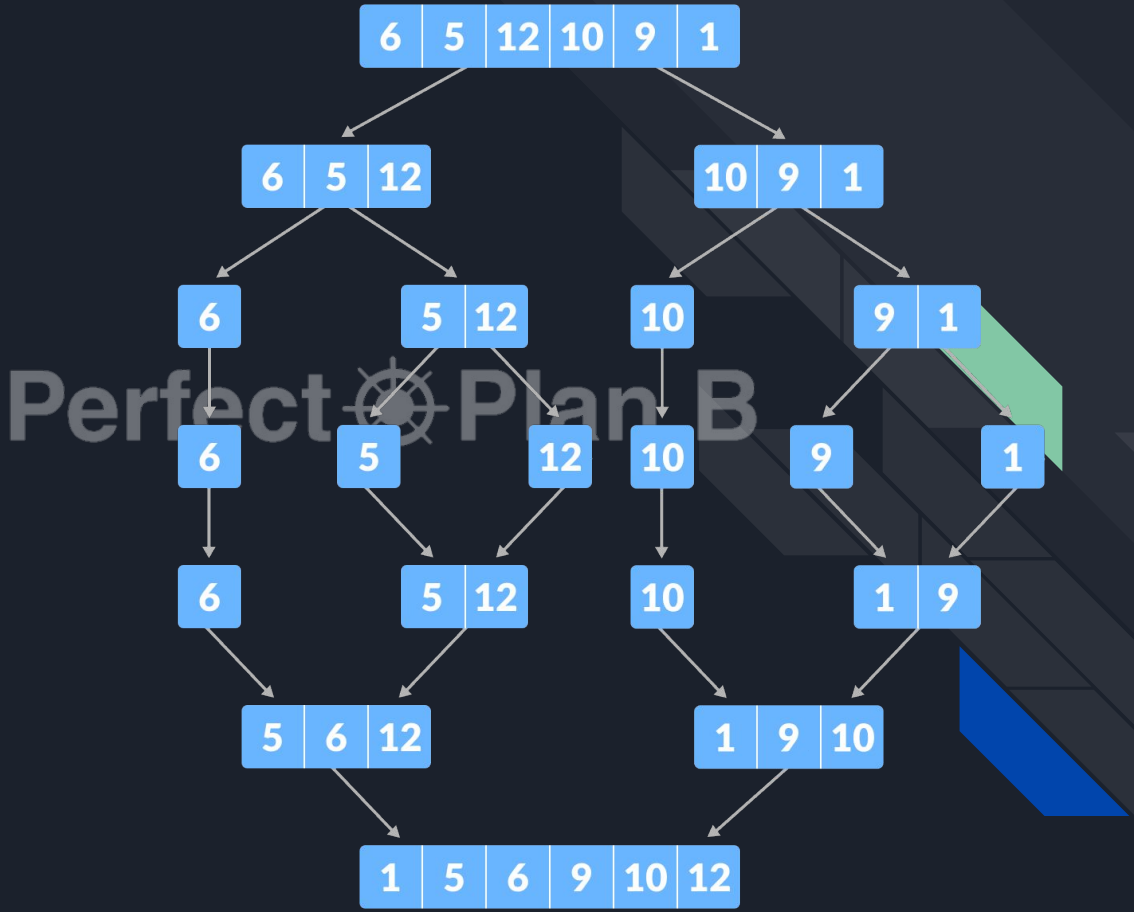
```
/* low  --> Starting index,  high  --> Ending index */
quickSort(arr[], low, high)
{
    if (low < high)
    {
        /* pi is partitioning index, arr[p] is now
           at right place */
        pi = partition(arr, low, high);

        quickSort(arr, low, pi - 1);  // Before pi
        quickSort(arr, pi + 1, high); // After pi
    }
}
```

Solution : Python Program for QuickSort

```
# Python program for implementation of Quicksort Sort

# This function takes last element as pivot, places
# the pivot element at its correct position in sorted
# array, and places all smaller (smaller than pivot)
# to left of pivot and all greater elements to right
# of pivot
def partition(arr,low,high):
        i = ( low-1 )               # index of smaller element
        pivot = arr[high]       # pivot

        for j in range(low , high):

                # If current element is smaller than or
                # equal to pivot
                if arr[j] <= pivot:

                        # increment index of smaller element
                        i = i+1
                        arr[i],arr[j] = arr[j],arr[i]

        arr[i+1],arr[high] = arr[high],arr[i+1]
        return ( i+1 )

# The main function that implements QuickSort
# arr[] --> Array to be sorted,
# low --> Starting index,
# high --> Ending index

# Function to do Quick sort
def quickSort(arr,low,high):
        if low < high:

                # pi is partitioning index, arr[p] is now
                # at right place
                pi = partition(arr,low,high)

                # Separately sort elements before
                # partition and after partition
                quickSort(arr, low, pi-1)
                quickSort(arr, pi+1, high)

# Driver code to test above
arr = [10, 7, 8, 9, 1, 5]
n = len(arr)
quickSort(arr,0,n-1)
print ("Sorted array is:")
for i in range(n):
        print ("%d" %arr[i]),
```

Problem 4 : Python Program for Merge Sort

Merge Sort is a Divide and Conquer algorithm. It divides input array in two halves, calls itself for the two halves and then merges the two sorted halves.



Solution : Python Program for Merge Sort

TRYYYYYYY!!!!!

Perfect Plan B

Tasks to do

- Try to find the complexity of each and every algorithm written.
- Try to find sorting algorithms which run in O(n) complexity.

About Piazza

Please watch this video about how to use Piazza:

https://youtu.be/ndzsh5ShhhA

Social Media Links

Facebook: https://www.facebook.com/P2BGlobal/

Twitter: https://twitter.com/P2BGlobal

Linkedin: https://www.linkedin.com/company/p2bglobal

Instagram: https://www.instagram.com/p2bglobal

Quora: https://qr.ae/pN25Iq

Youtube: https://www.youtube.com/c/P2BGlobal