Tutorial - 3

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Ques-1 Write linear search pseudocode to search an element in a sorted array with minimum comparisons:

```
void linear(arr, key){
    for(int i=0 to n)
        if(arr[i] == key)
            return i;
    return -1;
}
```

Ques-2

Insertion Sort :-

→ Iterative :-

```
insertion (int arr[], int n) {
    for(i=1; i<n; i++)
    { int val = a[i]; j=i-1;
      while(j>0 && a[j-1]>val)
      { a[j] = a[j-1]
        j--;
      }
    a[j] = val;
}}
```

Recursive:

```
insertion (int a[], int i, int n){
    int val = a[i], j=i-1;
    while (j>0 && a[j-1] > val){
      a[j] = a[j-1]
      j--;
    }
    a[j] = val
    if(i+1 <= n)
      insertion(a, i+1, n);
}
```

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Ques-21

	Stable	Inplace
Bubble Sort	✓	✓
Selection Sort	✗	✓
Insertion Sort	✓	✓

Ques-22 Time complexity

	Best	Average	Worst	Space complexity
Bubble	$O(n^2)$	$O(n^2)$	$O(n^2)$	1
Selection	$O(n^2)$	$O(n^2)$	$O(n^2)$	1
Insertion	$O(n)$	$O(n)$	$O(n^2)$	1

Ques- Recursive-

```
Binary (arr, l, r, key){
  if (l < r){
    mid = l+(r-l)/2;
    if (arr[mid] == key)
      return;
    if (key < arr[mid])
      Binary (l, mid-1, key);
    else
      Binary (midt, r, key);
  }
```

Iterative

```
while (l < r){
  mid = l+(r-l)/2
  if (arr[mid] == key)
    return;
  if (key < arr[mid])
    r = mid-1;
  else
    l = mid+1;
}
```

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