

Merge Sort

arr[] = {12, 31, 35, 8, 32, 17}

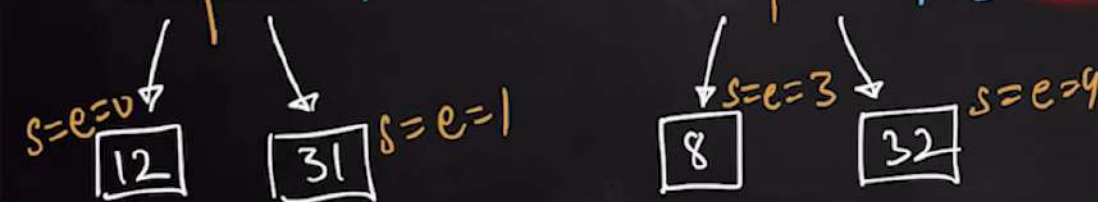
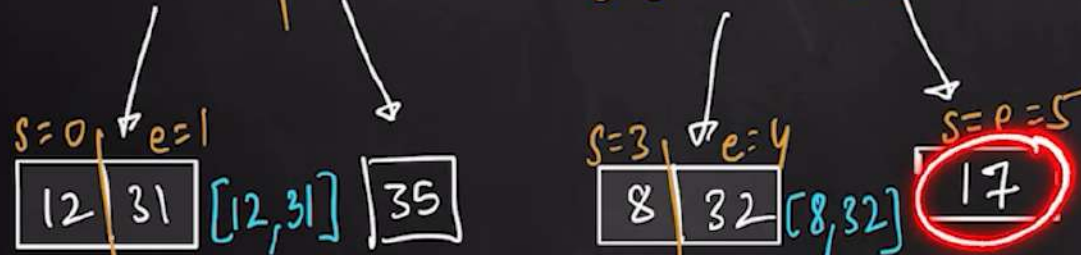
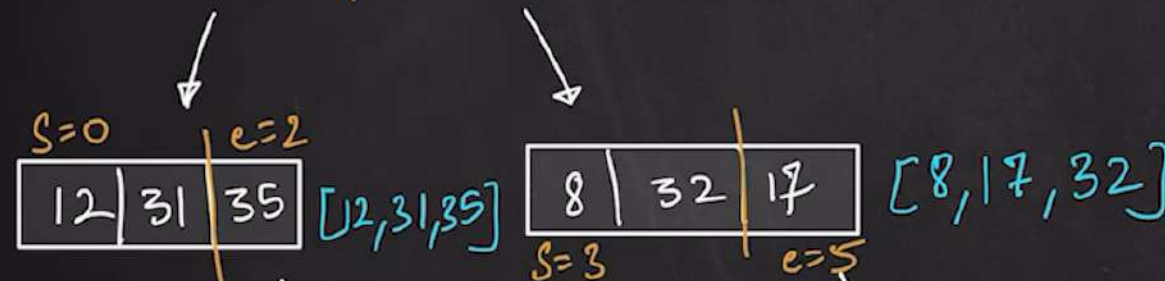
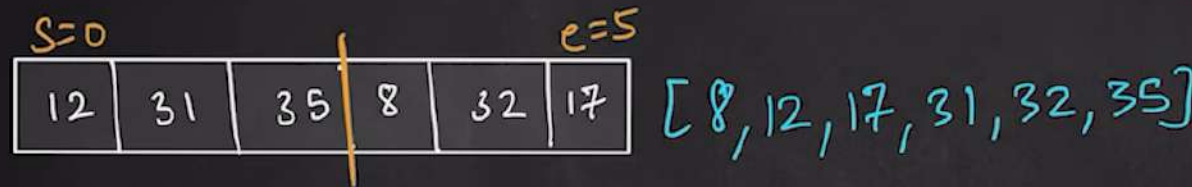
Divide & Conquer

if(s < e)
s == e

① Divide the array

mid

② merge parts to create a sorted array



①

Merge Sort

Recursive Function

```
void mergeSort(arr[], start, end) {  
    if (s < e) {  
        int mid = st +  $\frac{(end - st)}{2}$   
        mergeSort(arr, st, mid) // Left  
        mergeSort(arr, mid+1, end) // Right  
        merge(arr, st, mid, end)  
    }  
}
```

Merge Sort

Merge Step

st=0, mid=2, end=5

12	31	35
----	----	----

$$i^4 = 1$$

8 | 17 | 32

$$j = 3$$

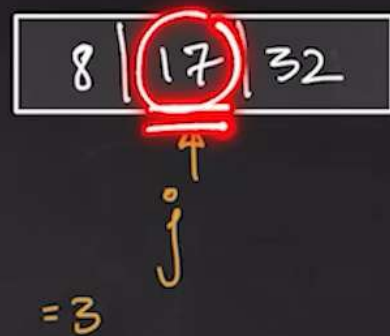
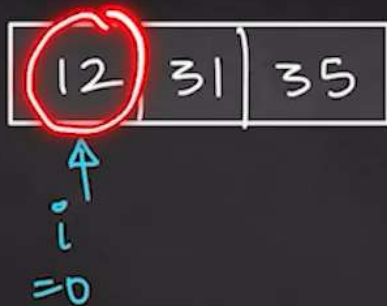
8

temp

Merge Sort

Merge Step

st=0, mid=2, end=5



Merge Sort

Merge Step

$st=0, mid=2, end=5$

12	31	35
----	----	----

i

$=0$

8	17	32
---	----	----

j

$=3$

8	12				
---	----	--	--	--	--

temp

Merge Sort

Merge Step

$st=0, mid=2, end=5$

12	31	35
----	----	----

i
 $=0$

8	17	32
---	----	----

j
 $=3$

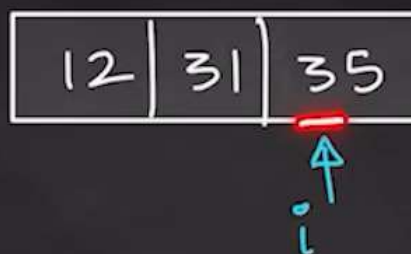
8	12	17			
---	----	----	--	--	--

temp

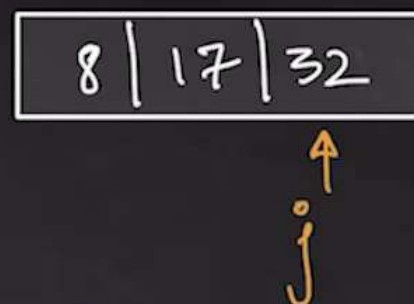
Merge Sort

Merge Step

$st=0, mid=2, end=5$



$=0$



$=3$



Merge Sort

Merge Step

$st=0, mid=2, end=5$

12	31	35
----	----	----

$i \uparrow$

$=0$

8	17	32
---	----	----

$j \uparrow$

$=3$

8	12	17	31	32	
---	----	----	----	----	--

temp

Merge Sort

Merge Step

$st=0, mid=2, end=5$

12	31	35
----	----	----



$i \uparrow$

$=0$

8	17	32
---	----	----



$j \uparrow$

$=3$

8	12	17	31	32	35
---	----	----	----	----	----

temp

Merge Sort

Merge Step

$st=0, mid=2, end=5$

8	12	17	31	32	35
---	----	----	----	----	----

\uparrow
 i

$=0$

$=3$

\uparrow
 j

8	12	17	31	32	35
---	----	----	----	----	----

temp

Merge Sort

②

Merge Step

```
void merge (arr, st, mid, end) {  
    vector<int> temp;  
    i = st, j = mid+1;  
    while (i <= mid & j <= end) {  
        if (A[i] <= A[j]) {  
            temp.pb(A[i]);  
            i++;  
        } else {  
            temp.pb(A[j]);  
            j++;  
        }  
    }  
}
```

```
Left  
while (i <= mid) {  
    temp.pb(A[i]);  
    i++;  
}  
Right  
while (j <= end) {  
    temp.pb(A[j]);  
    j++;  
}
```

```
for (idx = 0; idx < temp.size(); idx++)  
    A[idx+st] = temp[idx]
```

