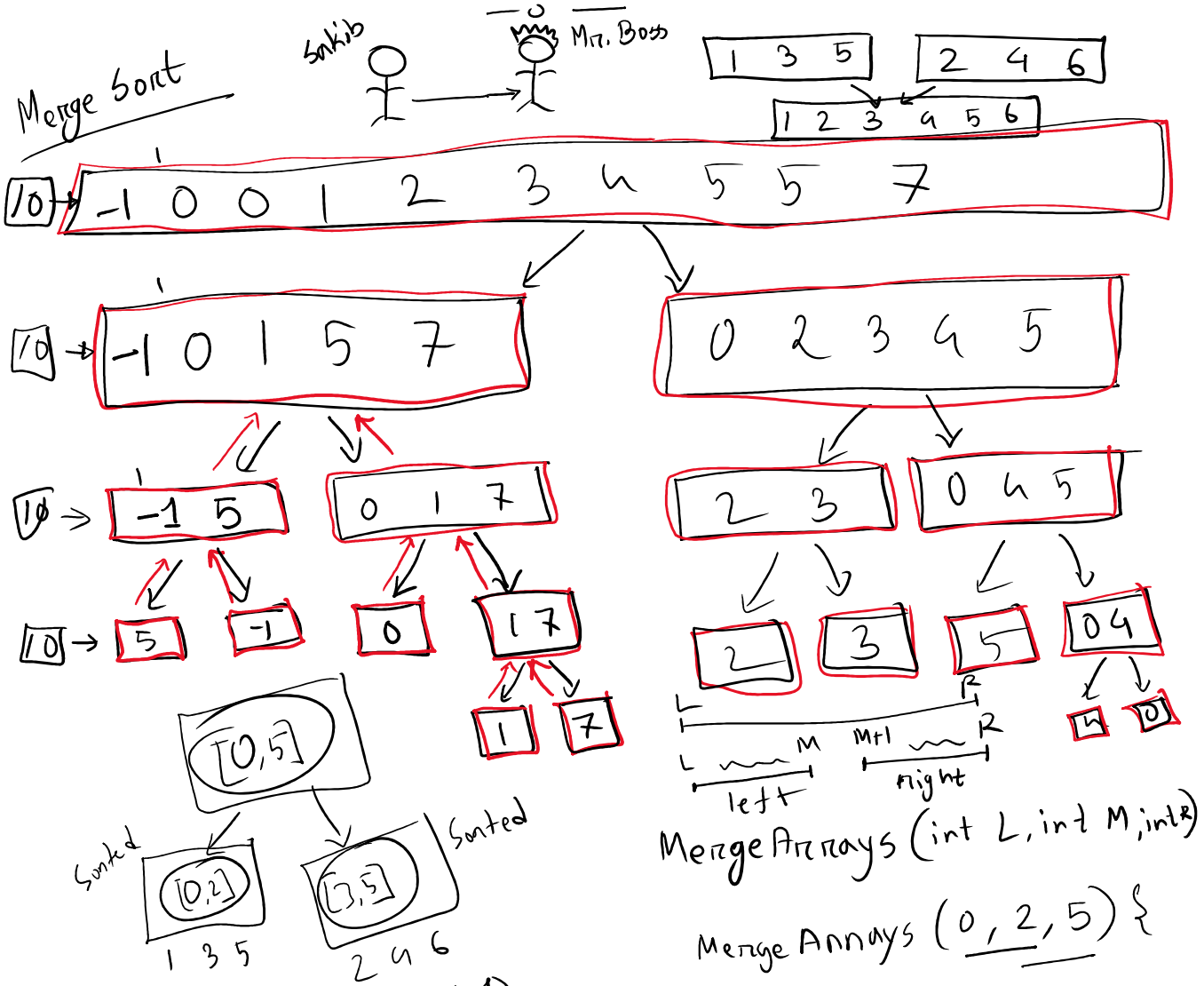
Merge Sort

Comparison based → fastest → $O(N \log_2 N)$

	Merge Sort	Quick Sort
TC →	$O(N \log_2 N)$	$O(N \log_2 N)$
MC →	$O(N \log_2 N)$	$O(\log_2 N)$

Intro Sort | Hybrid

↳ Insertion sort $O(N)$
↳ Heap sort
↳ Quick sort
$O(N \log_2 N)$



MergeArrays (int L, int M, int R)

MergeArrays (0, 2, 5) {

}

MergeSort (v, 0, v.size()-1)

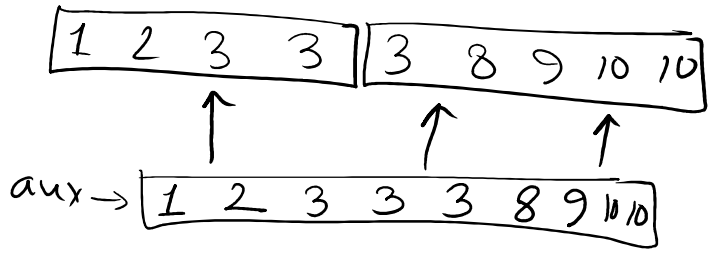
void MergeSort (vector<int> &v, int L, int R) {

// v vector এর [L...R] পর্যন্ত subarray টাকে sort করবে

```
if(L>=R) return;
int M = L+(R-L)/2;
MergeSort(v, L, M);
MergeSort(v, M+1, R);
MergeArrays(v, L, R);
}
```

Merge Sort Tree

O(N)



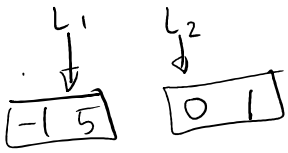
N (i<j) (a[i]>a[j])

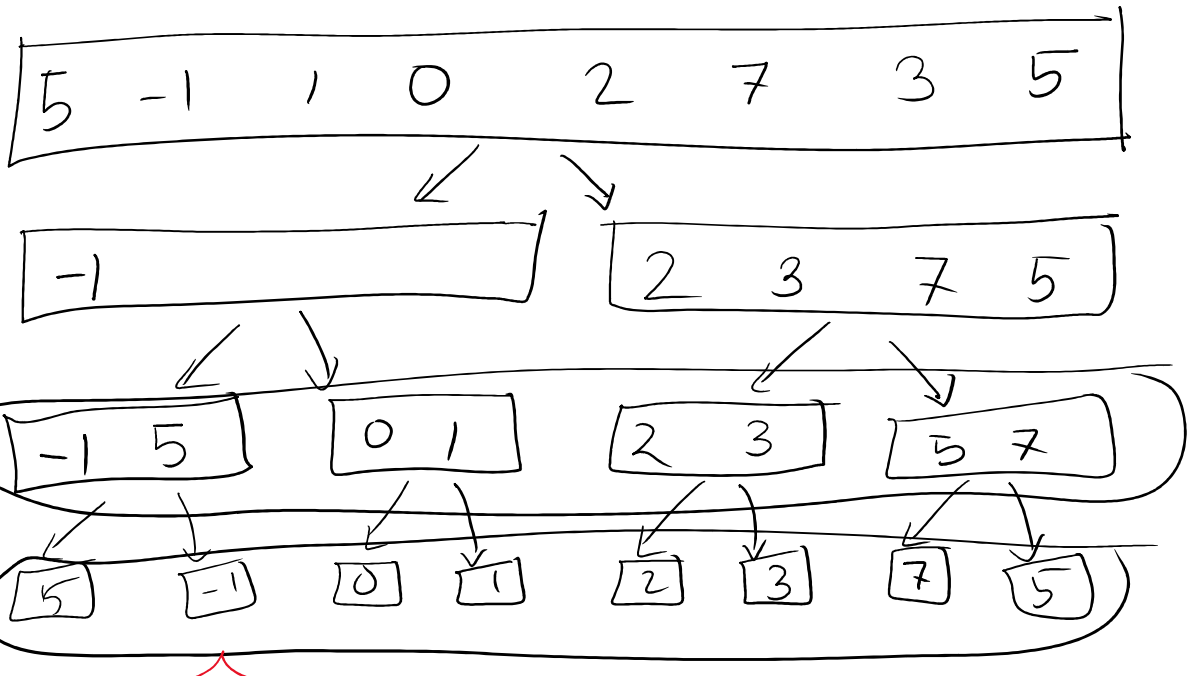
1 3 4 2 5

(3,2) (4,2)

5 4 3 2 1

10C2 pair

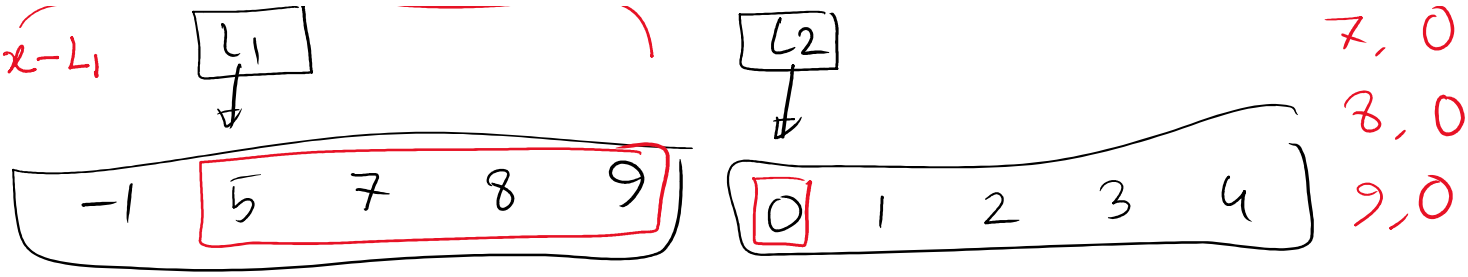




5, 0

7, 0

cnt += x - L1



7, 0

8, 0

9, 0

-1 0