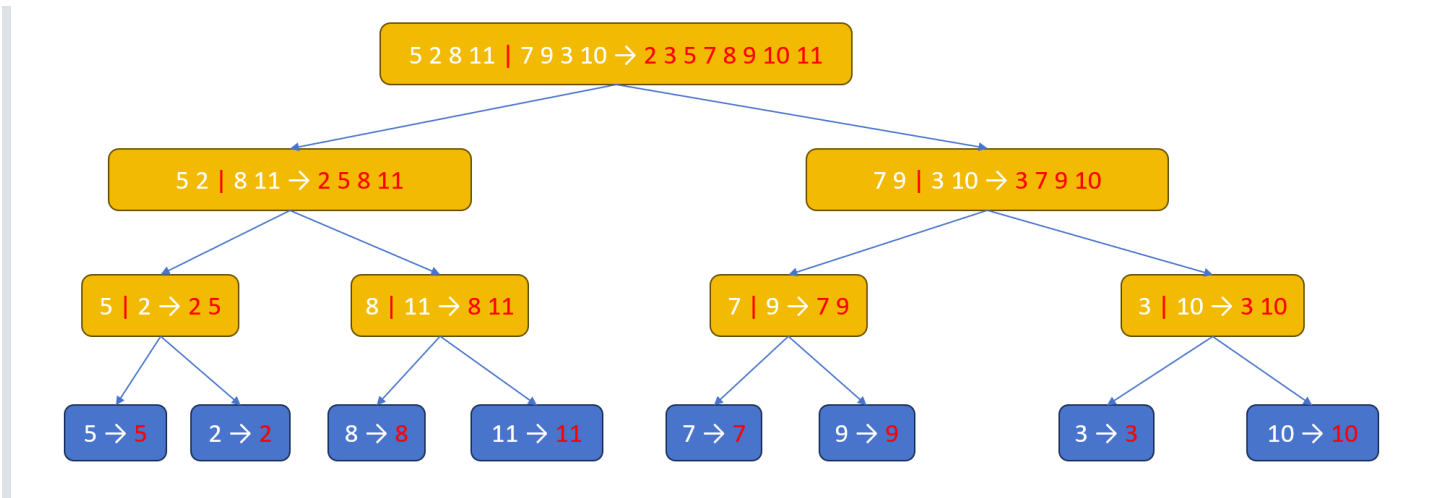


# Exercise on Merge Sort And Quick Sort

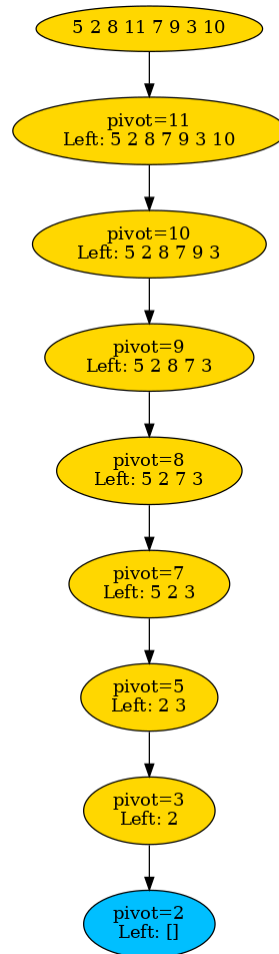
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(1) Demonstrate merge sort on sequence S=[5, 2, 8, 11, 7, 9, 3, 10].

1	Original:	[5, 2, 8, 11, 7, 9, 3, 10]
2	Divide:	[5, 2, 8, 11] [7, 9, 3, 10]
3		
4	Divide again:	[5, 2] [8, 11] [7, 9] [3, 10]
5	Divide again:	[5] [2] [8] [11] [7] [9] [3] [10]
6		
7	Merge:	[2, 5] [8, 11] [7, 9] [3, 10]
8	Merge:	[2, 5, 8, 11] [3, 7, 9, 10]
9	Final merge:	[2, 3, 5, 7, 8, 9, 10, 11]

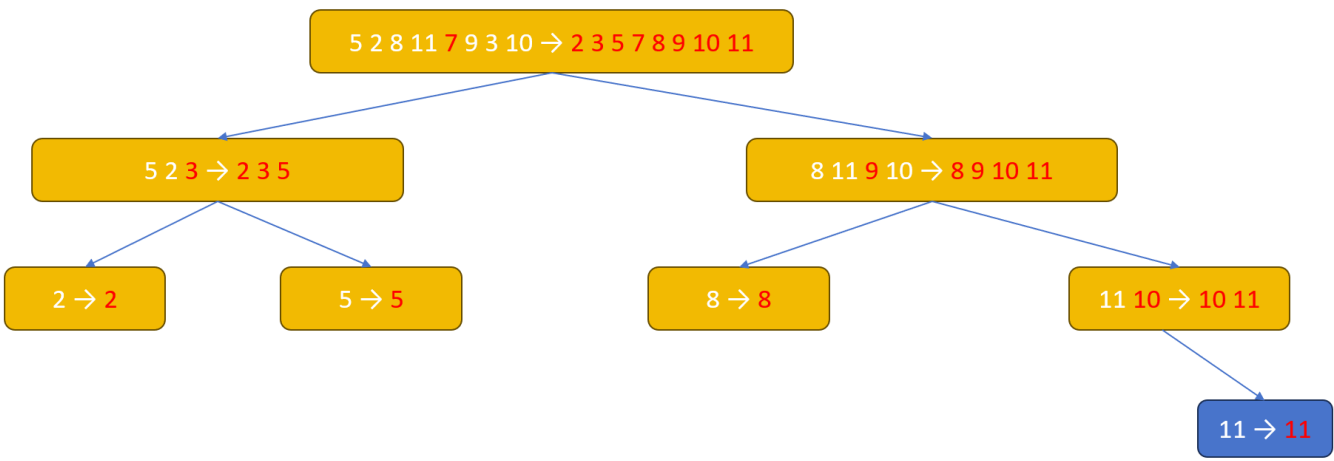


(2) Demonstrate quick sort on sequence S, where you need to show a case such that the random pivot selection selects only bad pivots and taking maximum number of comparisons.



```
1 Pivot = 11 → Left: [5, 2, 8, 7, 9, 3, 10]
2 Pivot = 10 → Left: [5, 2, 8, 7, 9, 3]
3 Pivot = 9 → Left: [5, 2, 8, 7, 3]
4 Pivot = 8 → Left: [5, 2, 7, 3]
5 Pivot = 7 → Left: [5, 2, 3]
6 Pivot = 5 → Left: [2, 3]
7 Pivot = 3 → Left: [2]
8
9 // Final sorted result:
10 [2, 3, 5, 7, 8, 9, 10, 11]
11 // Each step removes only one element (the pivot itself), requiring the maximum
    number of comparisons.
12 // O(n²) time complexity in the worst case
```

(3) Demonstrate quick sort on sequence S again, where the pivot selection selects only good pivots and taking minimum number of comparisons.



Time Complexity :  $O(n \log n)$