CS310: ALGORITHMS AND DATA STRUCTURES

Pseudo Code – MergeSort

```
MergeSort (a[1…n])
   If n > 1
      Copy A[1 … ½ n] into B[1… ½n]
      Copy A[½n… n] into C[1… ½n]
      Mergesort (B[1… ½n])
      Mergesort (C[1… ½n])
      Merge(B, C, A)
   End If
End MergeSort
```

Divide

Conquer

Combine

Pseudo Code – Merge Step

l_B=1, l_C=1, l_A=1
While l_B <= p and l_C <= q
    If B[l_B] < C[l_C]
        A[l_A] = B[l_B]; l_B = l_B + 1
    Else
        A[l_A] = C[l_C]; l_C = l_C + 1
    End if
    l_A = l_A+1
End While
If l_B == p+1
    Copy C[l_C…q] into A[l_A…p+q]
Else
    Copy B[l_B…p] into A[l_A…p+q]
End if

Running Time = Kn = Θ(n)

Quiz

- Show all intermediate stages the following array will go through while being sorted by MergeSort:

  {8,7,1,4,9,3,2,5}

Identify divide, conquer and combine stages.

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   End If
End MergeSort
```

Running Time Analysis

- $T(n) = T(\frac{1}{2} n) + T(\frac{1}{2} n) + Kn$
- $T(n) = 2\ T(\frac{1}{2} n) + Kn$

Recurrence Equation

How to solve recurrence equations?

Recursion Tree Method