MCAC 301: Design and Analysis of Algorithms

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Merge Sort

input : Array: $l, r, A[l \ldots r]$

output: Sorted Array: $A[l] \leq A[l+1] \leq .... \leq A[r]$

```
MergeSort(A, l, r)
if l < r then
    q = ⌊(l+r)/2)⌋
    MergeSort(A, l, q)
    MergeSort(A, q + 1, r)
    Merge(A, l, r, q)
end
```

Merge Sort Example

10, 13, 8, 3, 11, 1, 28, 7, 19

Merge Sort Example

10, 13, 8, 3, 11, 1, 28, 7, 19

10, 13, 8, 3 11, 1, 28, 7, 19

Merge Sort Example

10, 13, 8, 3, 11, 1, 28, 7, 19

10, 13, 8, 3 | 11, 1, 28, 7, 19

Sort the two halves recursively

3, 8, 10, 13 | 1, 7, 11, 19, 28

Merge Sort Example

10, 13, 8, 3, 11, 1, 28, 7, 19

10, 13, 8, 3 | 11, 1, 28, 7, 19

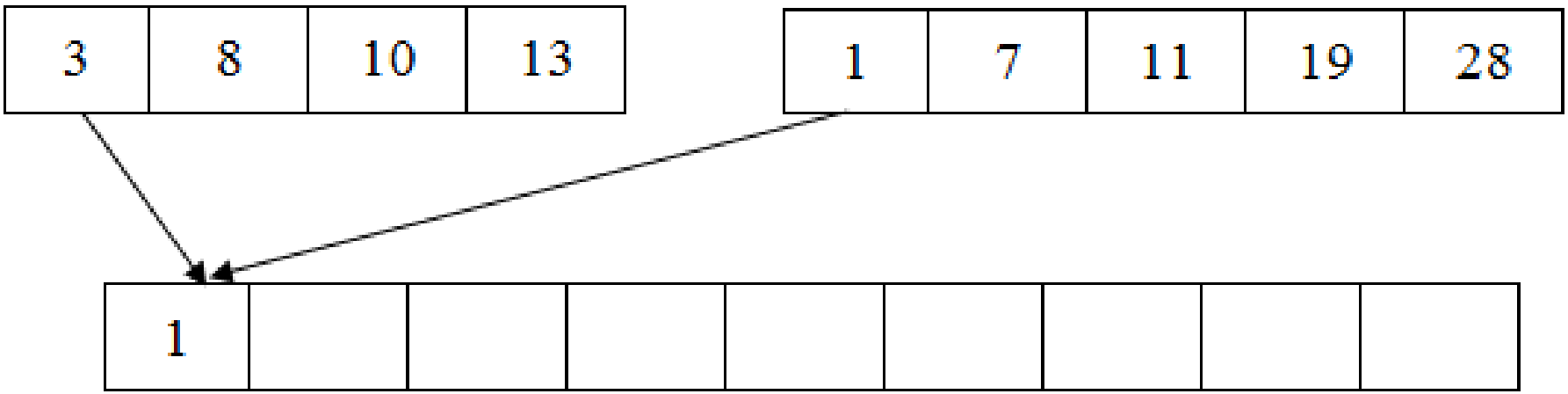
Sort the two halves recursively

3, 8, 10, 13 | 1, 7, 11, 19, 28

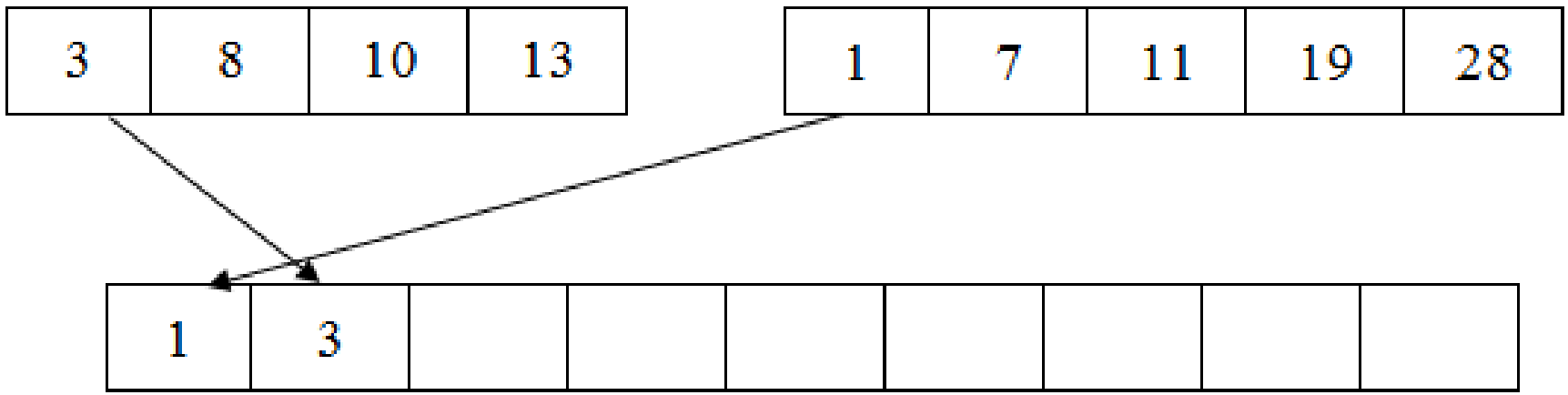
And merge the two sorted halves

1, 3, 7, 8, 10, 11, 13, 19, 28

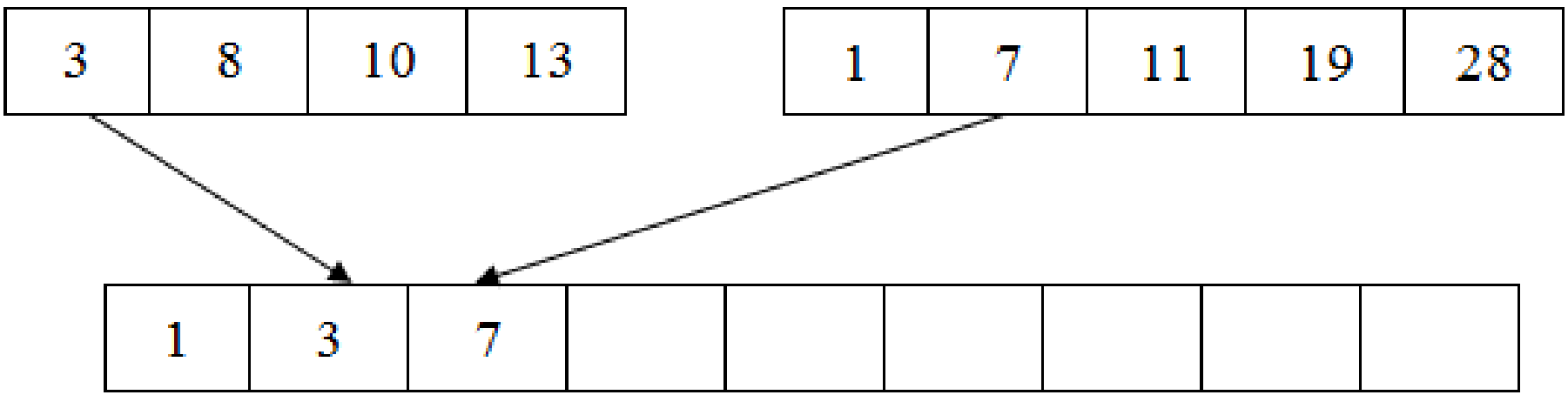
Merging Two Sorted Arrays



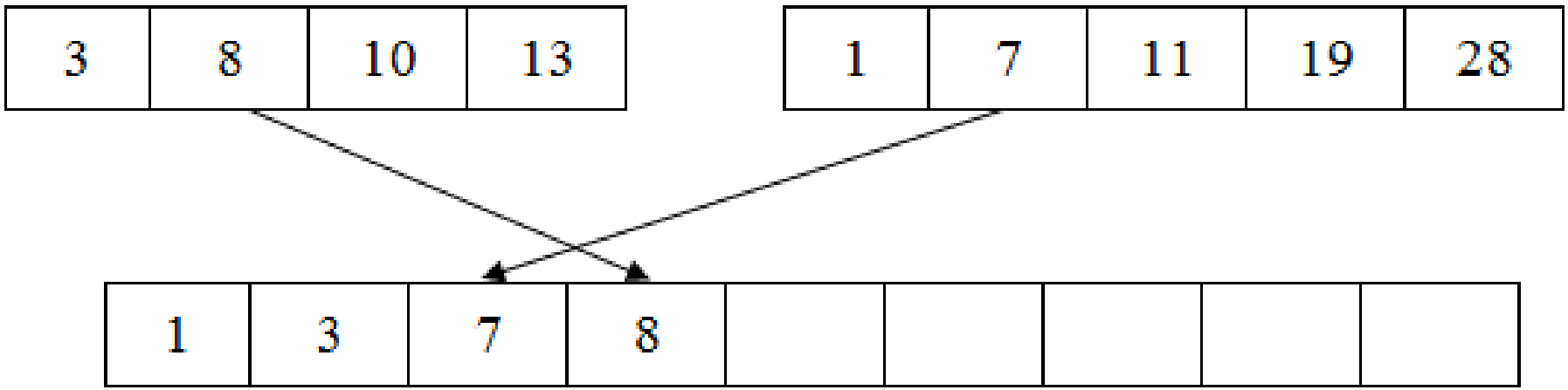
Merging Two Sorted Arrays



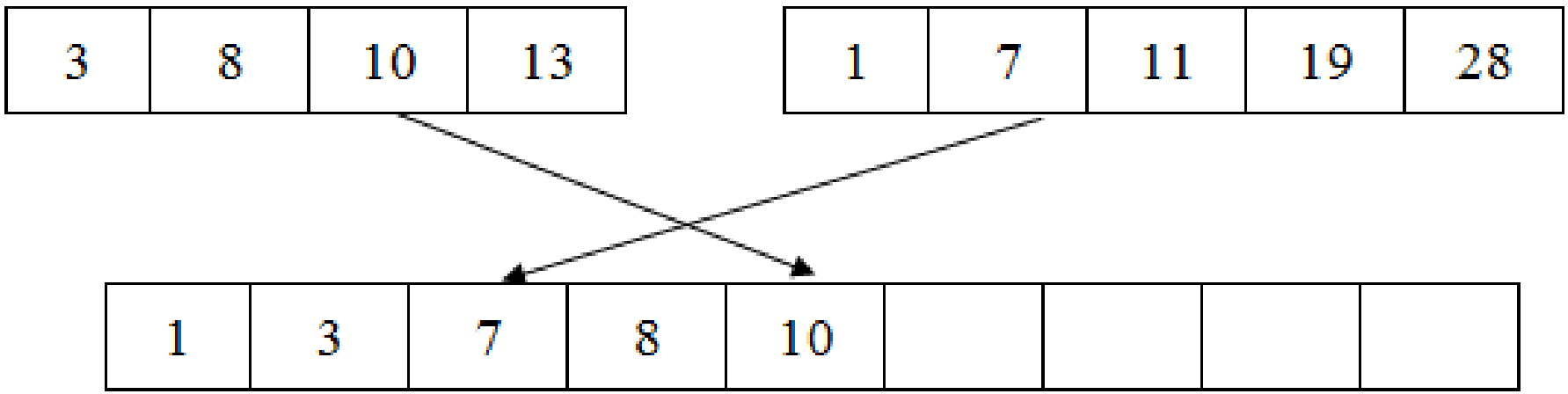
Merging Two Sorted Arrays



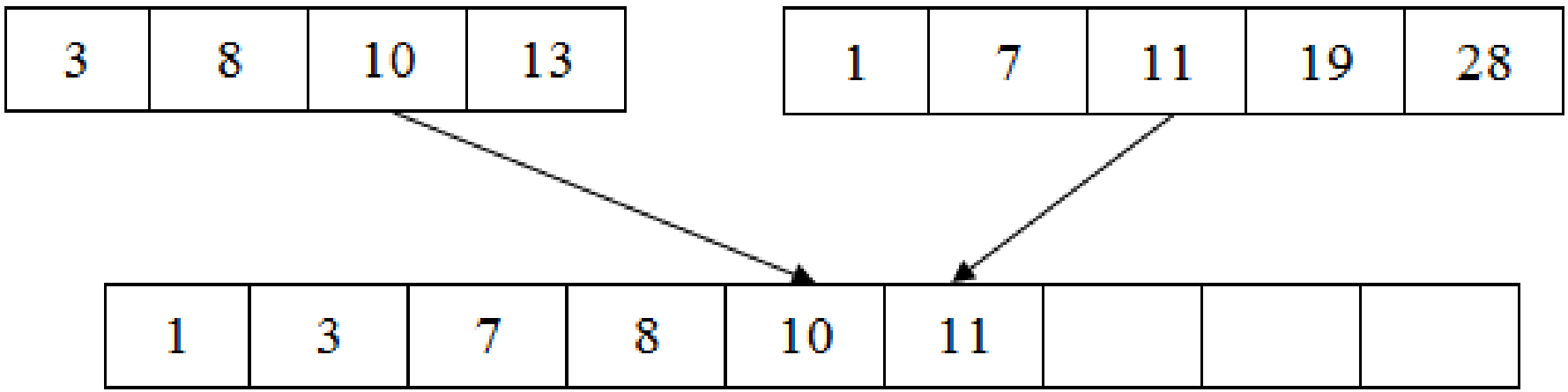
Merging Two Sorted Arrays



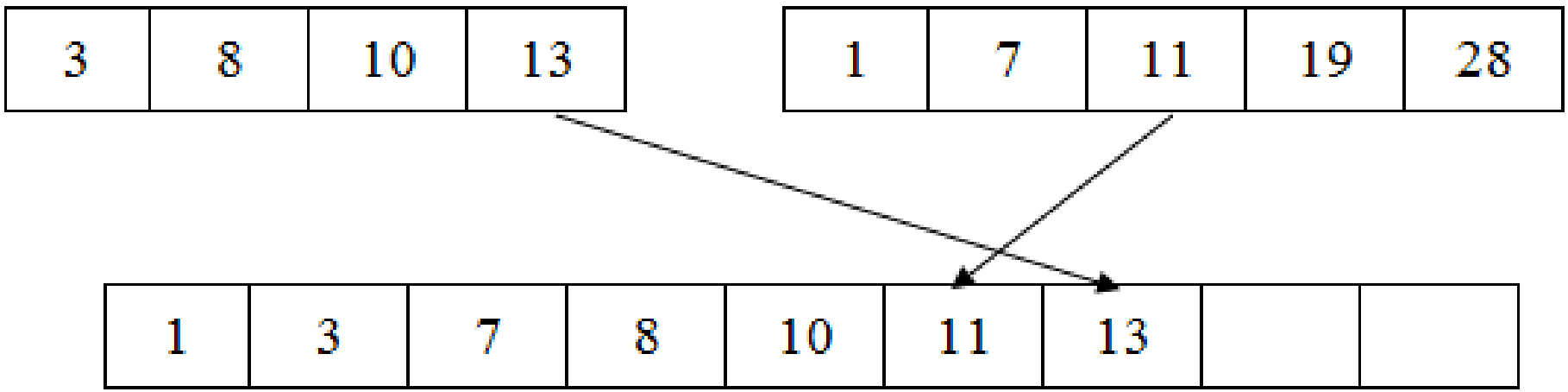
Merging Two Sorted Arrays



Merging Two Sorted Arrays



Merging Two Sorted Arrays



Merging Two Sorted Arrays

Copy the rest in the output array.