$T(n) \leq cn$

$\frac{3}{7} + \frac{1}{2} = \frac{6+7}{14} = \frac{13}{14}$

$T(k) \leq ck \quad \forall k < n \longrightarrow$ $\frac{13}{14}c + 1 < c$

$\frac{1}{14}c > 1$

$c > 14$

$T(n) = 3T(n/7) + 4T(n/8) + n$

$\leq \frac{3nc}{7} + \frac{4cn}{8} + n \leq \frac{13}{14}nc + n < cn$

$T(n) = 3T(n/10) + 8T(n/8) + n > 8T(n/8) + n$

$> n \log n$

M.I.

$> 3T(n/10) + 8T(n/10) + n \left(\frac{3}{10} + 1\right)$

$= 11T(n/10) + n$

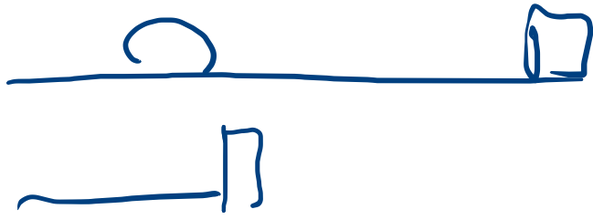
$> 10T(n/10) + n$

$> n \log n$

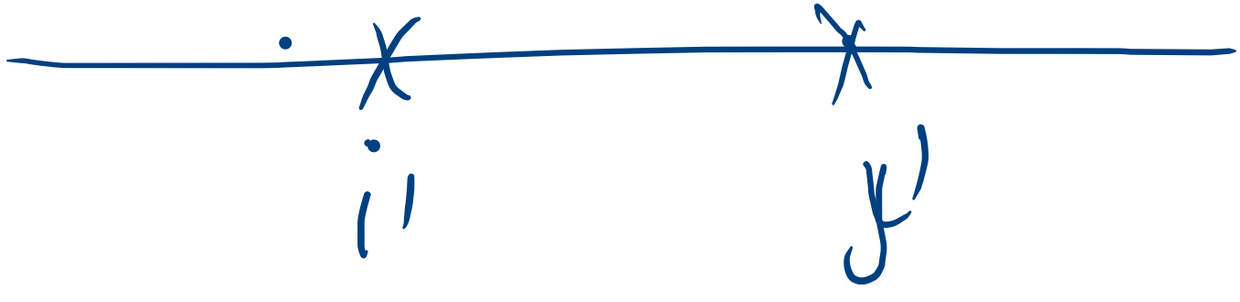
$T(n/10) < T\left(\frac{n}{k}\right)$

$nk + 10^k T(n/5^k)$

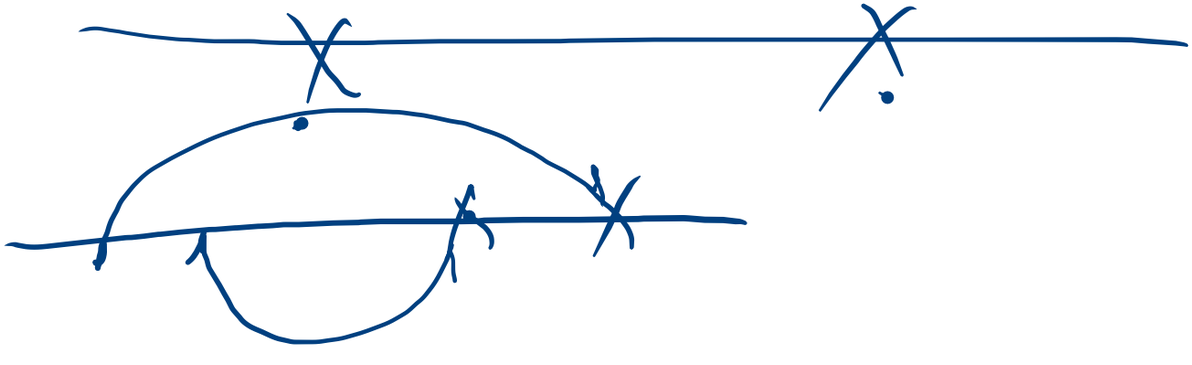
Stable sort:



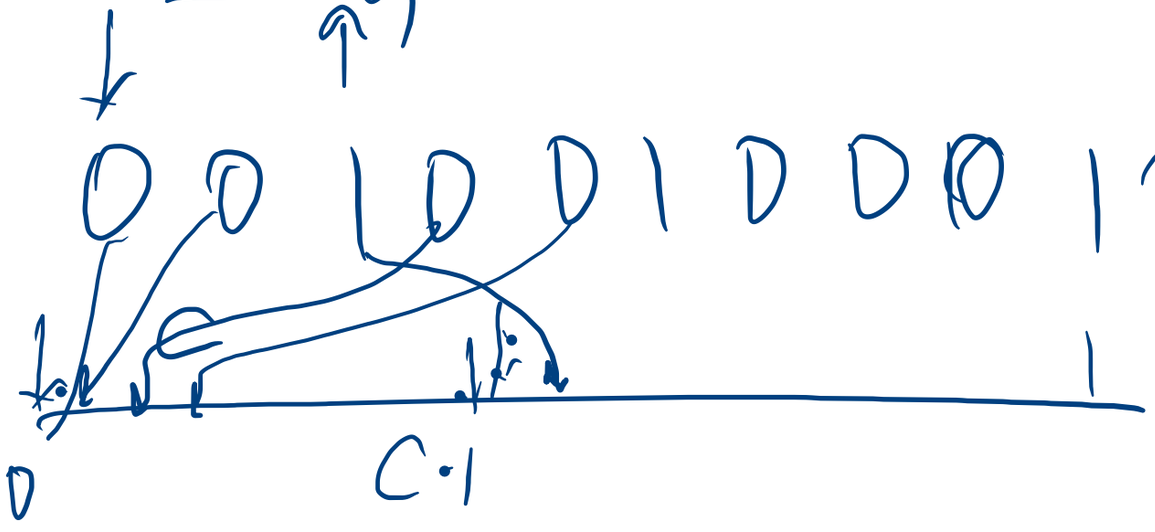
$a_i = a_j$



BS
SS
IS
MS
DS

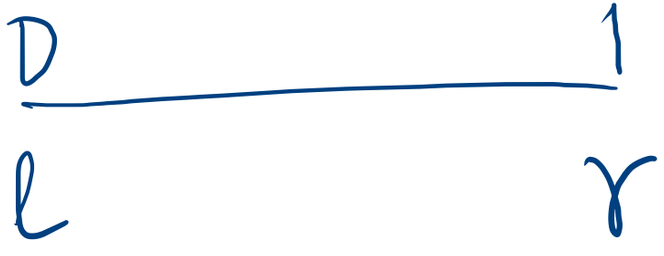


B Linear time Sorting $\Omega(n \log n)$.



$\theta(n)$

$l=0$ $\gamma=C$



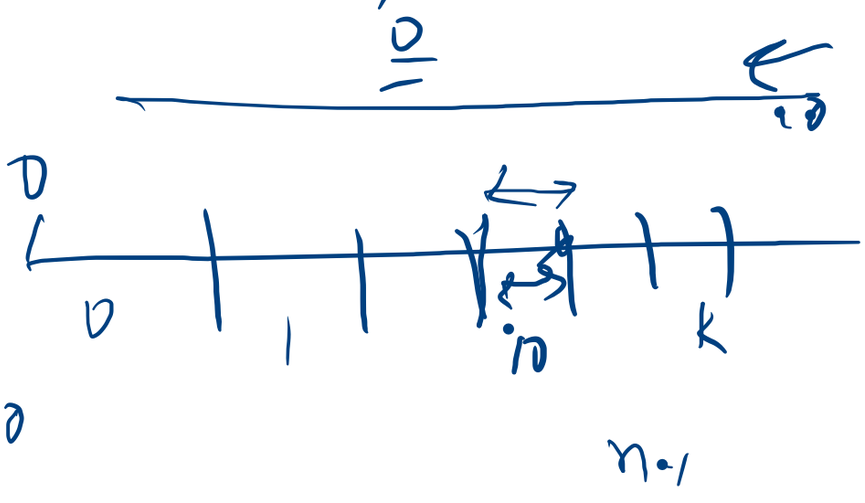
$0 \le A[i] < k$

Countsort:

$C \to k$

$i \to 0$ to n

$C[A[i]] += 1;$



$j \to 1$ to k

$C[j] = C[j-1];$

$i \to n-1$ to 0

$B[--C[A[i]]] = A[i]$

Time $\Theta(n+k)$

Space $(n+k)$

B C

Given

Radix Sort.

784	531	531
532	532	532
676	785	246
785	786	676
531	676	785
246	246	786

246
× 531
532
676
785
786

$\left[\frac{A[i]}{10^{i-1}}\right]\%10$

$\Theta(nk)$

$\Theta(n)$

Space

786
532
676
785
531
246

246
532
531
676
786
785

246
531
532
676
785
786.

10^{10}

105

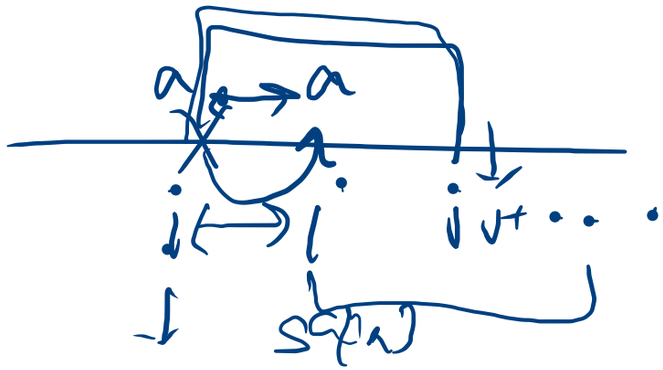
105

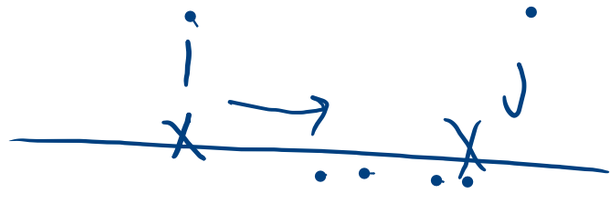
$n \times 0(1)$

$= 0(n)$

□ 105

Count.	$\theta(n)$	Binary tree.
Radix		
Bucket sort.		





$p_j - p_i = sum$

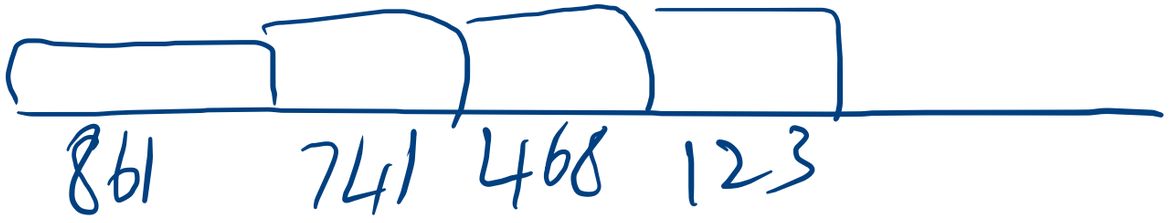
$sum += a_j$

$q_j - a_i$

$j - i > l$

$max > sum$ $\quad i \leftrightarrow q$

```
++a
[ i = s[a++]
  while(i < s[a])
      sum += qi
  i = a++.
  i+1
```



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