08 April 2023 16:34

Bubble	$O(n^2)$	$\Omega(n)$
Select	$O(n^2)$	$\Omega(n^2)$
Ins	$O(n^2)$	$\Omega(n)$
Merge	$O(n \lg n)$	$\Omega(n \lg n)$
Q	$O(n^2)$	$\Omega(n \lg n)$

Merge ⇒ outplace, extra space

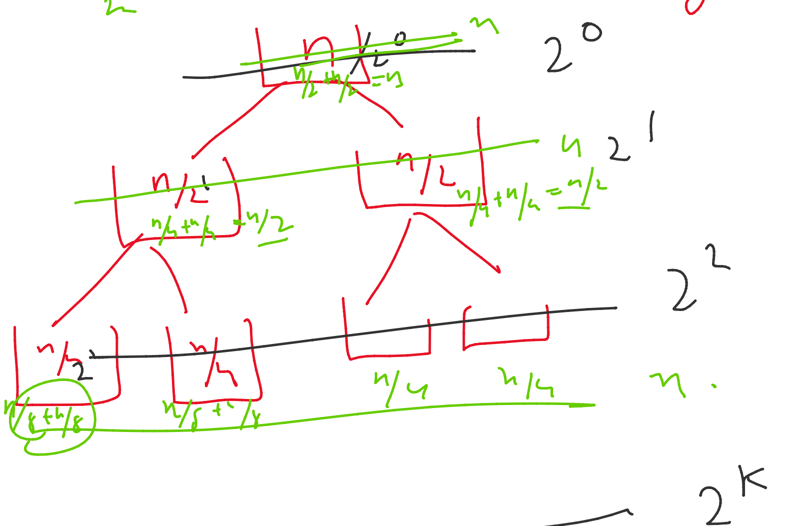
Q: inplace.

Tim

$$2^2 f(n/2^2) = 2^3 f\left(\frac{n}{2^3}\right) + \frac{n}{2^2}$$

$$2^k f(n/2^k) = 2^{k+1} f\left(\frac{n}{2^{k+1}}\right) + \frac{n}{2^k}$$

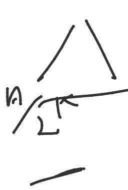
$$f(n) = n + n + n + \cdots n \quad (\lg N) = n \lg N$$



$2^0 + 2^1 + 2^2 + \cdots 2^k = 2^k$

$K = \lg N$

$2^{\lg N} = N^2 = N$



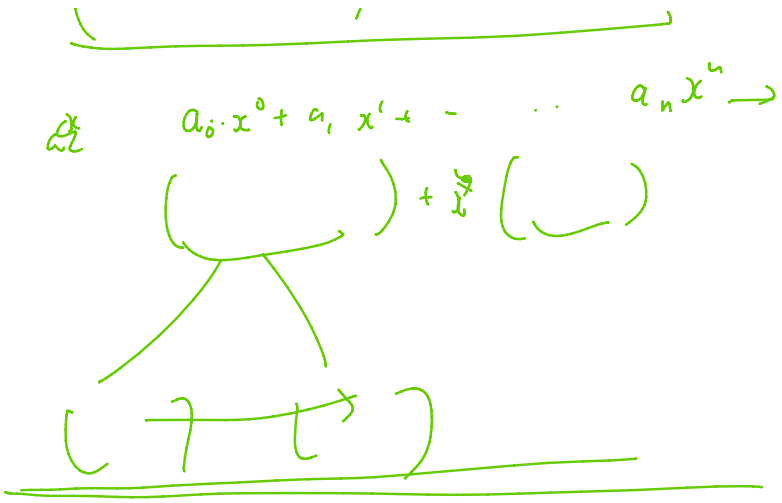
$\frac{n}{2^k} = 1$

$n = 2^k$

$K = \lg N$

no of operation

$\sum_{\forall f^n \text{ frame}} \text{op}$ ⇒ avg operation × no. of f^n frame



Quick sor.

[50,40,80,90,70,10,30,60,120]
0 1 2 3 4 5 6 7 n-1

```
while (L <= R) {
    while (arr[L] < pivot) {
        L++;
    }
    while (arr[R] > pivot) {
        R--;
    }
    int temp = arr[L];
    arr[L] = arr[R];
    arr[R] = temp;

    L++;
    R--;
}
```

[50,40,60,90,70,10,30,80,120]

[50,40,60,30,70,10,90,80,120]

[50,40,60,30,10,70,90,80,120]

[50, 40, 60, 30, 10] { 70, 90, 80, 120 }

{50,40,10,30,60}

$$f(n) = n + f(a) + f(n-a)$$

Pivot => (a=n/2) → media

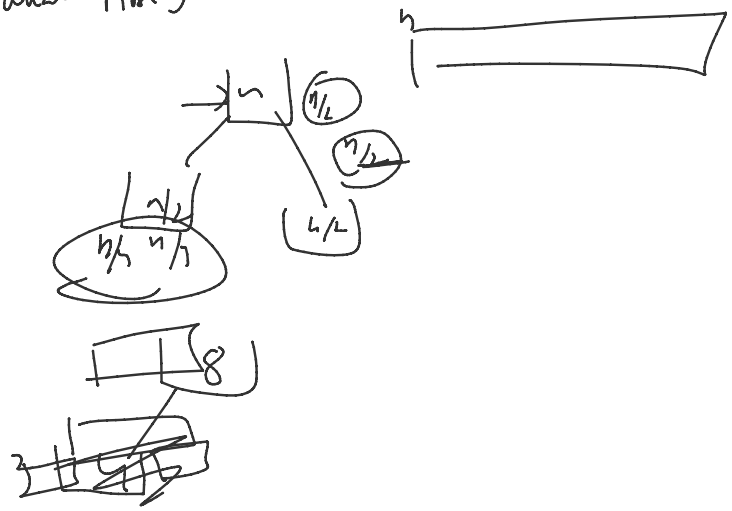
$f(n) = n + 2f(n/2)$

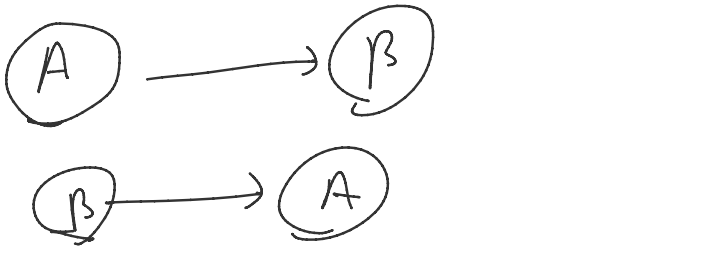
↳ , $n \lg n$

	worst	Best	
Merge	$n \log n$	$n \lg n$	→ O(n)
Quick	n^2	$n \lg n$	⇒ O(1)

Trando → $n \lg n$

dual Pivot





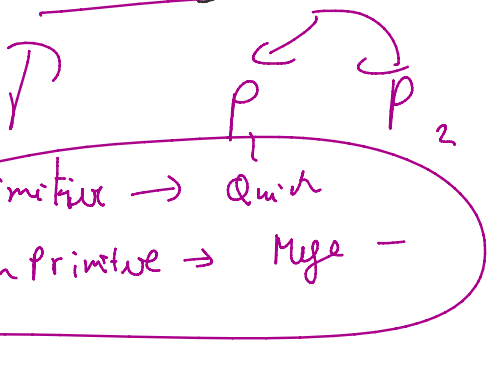
A_{100}, B_{100}

Stable sort → some values orginal order.

Stable sort → some values orginal order.

Merge sort → Non primitive data type

Quick - sort → unstable



Primitive → Quick

Non Primitive → Merge

Tim sort →