30 April 2023 10:42

2 Algo Konsa better

A) 10 sec ✓ Jute

B) 5 sec ~~Jute~~ Supe ??

operation

Space → variables

~~int ct~~ = 1
int i = 1 to n
syso(c)
c++;

$0 \le n \le 10^8$

(n)

1sec → ??

1 GHz → 10^9 Hz

1 GB → 10^9 B ✓

~~subset~~ → 2 sec

$2 \cdot a^{de}$

25,000

$(100)^2$

Logic → 1

$f_1(n) = 2n + 5$

$2 \cdot 10^7 + 5$

$1 \leftarrow n \leftarrow 10^7$

$f_2(n) = n^2 + 3n$

$= 10^{14} + 3 \cdot 10^7$

1) Var, array creation, initialization ← constant

2) Arith, Maths → constant

i = 0 (1)
while (i < n) {
syso(i)
i++;

$f(n) = 2 + 3l$ → loop

~~= 1 + 3l~~

$\approx 2 + 3l$

Syso(i)
i++;
}

$\approx 2+3l$

$f(n) = 2+3n$

$1 \leftarrow n \leftarrow 10$ 10

---

i-

```
i = 0
while (i < n) {
    Syso(i)
}
```

i = i + 5 ; n/2

$f(n) = 2+3n$

1) i++
2) i = i+2
3) i = i+3
4) i = i+k

5) i = i × 2 → $2 + 3\log_2 n$ → $< 10\log_2 n$ → $O(\log_2 n)$
6) i = i × 3 → $2 + 3\log_3 n$ → $O(\log_3 n)$
7) i = i × K → $2 + 3\log_K n$ → $O(\log_K n)$

$\log_a b = \log$ ...

$f(n) = 2 + 3/2\, n$

$O(1)$

$O(n/K)$

i	l
0	1
2	2
4	3
6	4
(5-1)·2	5
(l-1)·2	l

$(l-1)\cdot 2 = n$

$l-1 = n/2$

$l = n/2 + 1$

$f(n) = 1 + 3l$

$= 1 + \frac{3 \cdot n}{2} < 1 + 1.5n$

i	l
0	1
3	2
3·2	3
3·3	4
3(l-1)	l

$3\cdot(l-1) = n/3$

$l = n/3 + 1$

$f(n) = 2 + \frac{3n}{K}$

l	i
1	1
2	2
3	2^2
4	2^3
5	2^4
l	2^{l-1}

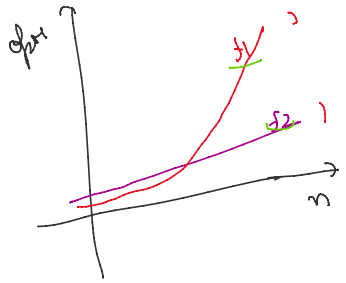
$2^{l-1} = n$

$l - 1 = \log n$

$l = \log n + 1$

$f_1(n) = n^2 + 3n + 5$

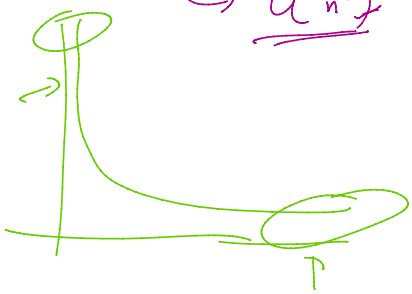
$f_2(n) = 5n + 99$

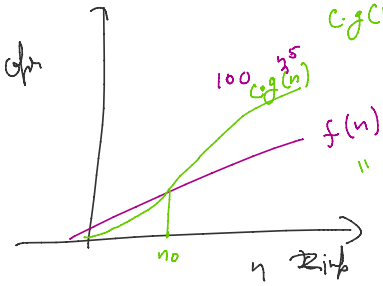


$f_1(n) = 2n^2 + 5n - 99 + 8n^3 + 4n^3$

$\hookrightarrow O(n^3)$

$f(n) \leq 100 \cdot n^5$





$f(n) = 2n^2 + 5n + 3$

$g(n) = n^2$

$c = 10$

$10n^2 \geq 2n^2 + 5n + n \quad n > 5$

$\hookrightarrow O(10n^2) \rightarrow O(n^2)$

$f(n) = a_0 n^0 + a_1 n^1 + a_2 n^2 + a_3 n^3 + \dots + a$

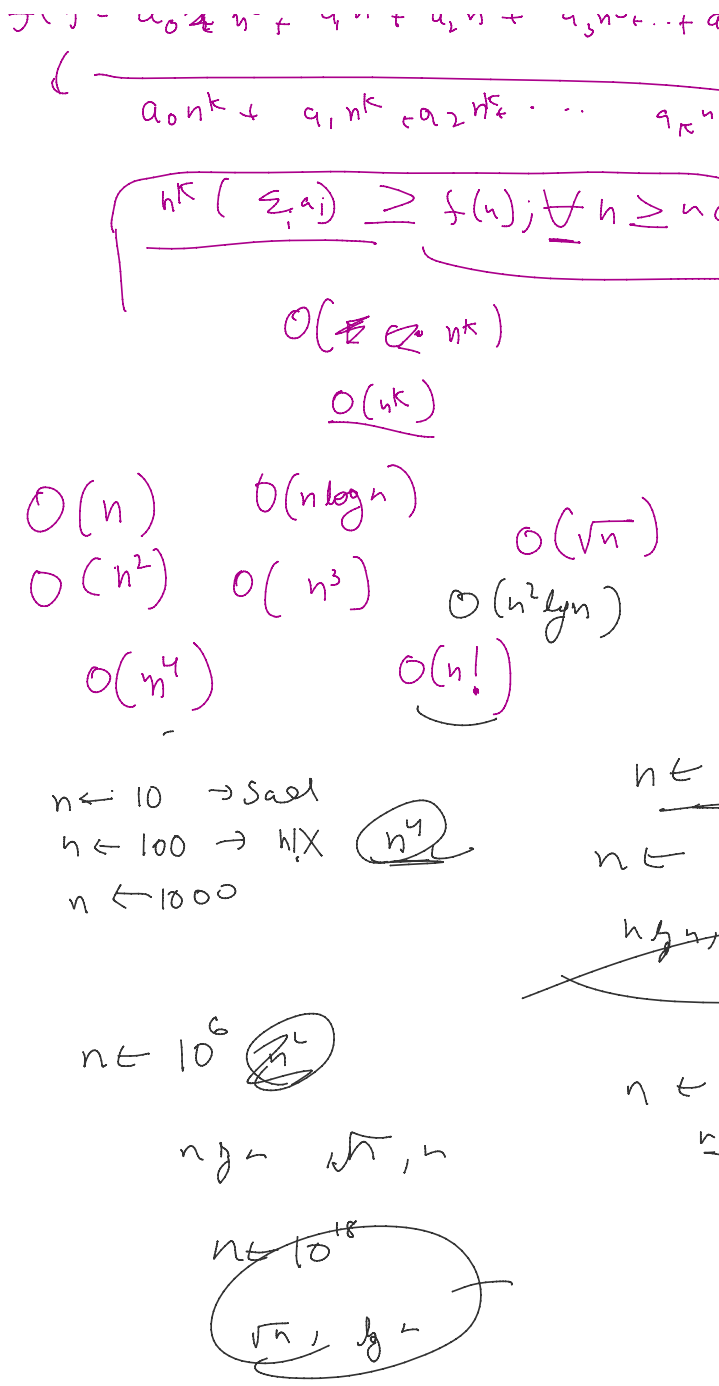
$\geq f(n)$; $\forall n \geq n_0$

$f(n) \rightarrow g(n)$

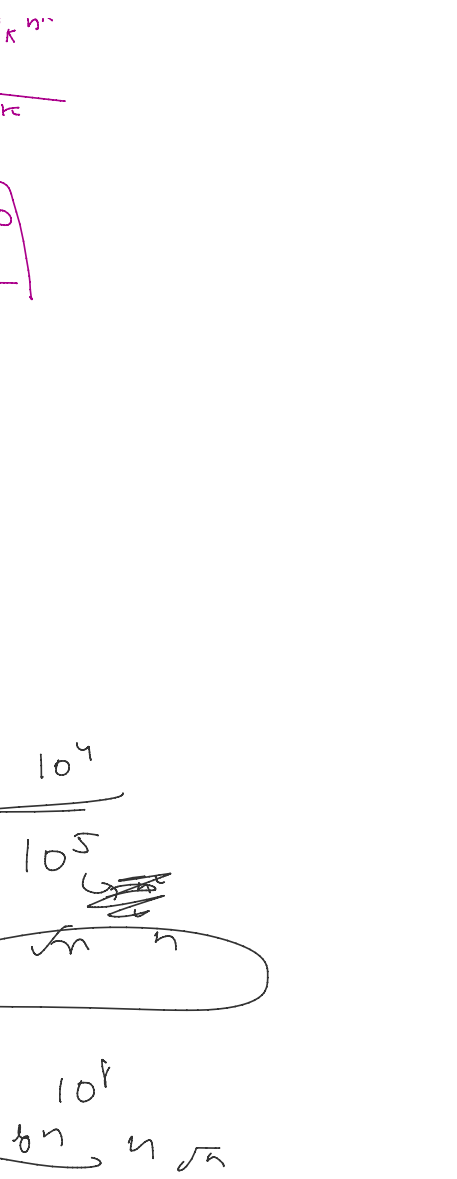
$\hookrightarrow O(g(n))$

k n^k

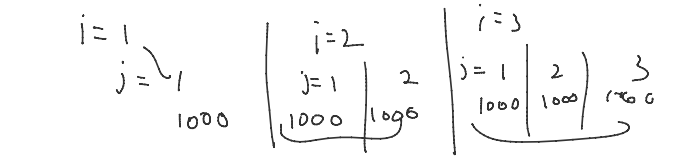
k



n<=10	O(n!) O(2^n)	permutation Subsets
n<=100	O(n^4)	4 nested Loop
n<=400	O(n^3)	Floyd warshell Graph
n<=2000	O(n2logn)	2 nested loops + BS
n<=10^4	O(n2)	Bubble.Selection.Insertion
n<=10^6	O(nlogn)	Merge, Quick
n<=10^8	O(n)	LS
n<=10^18	O(log(n))	BS



```
int i,j,k;
for(i=1; i≤n; i++){
    for(j=1, j≤i; j++){
        for(k=1; k≤1000; k++){
            sysо("XD");
        }
    }
}
```



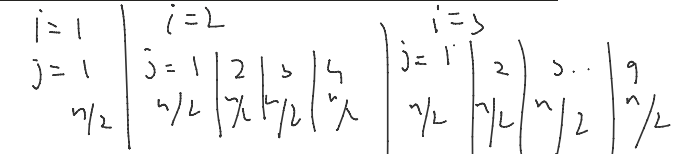
$1000 + 2\cdot 1000 + 3\cdot 1000 + \cdots$

$1000(1+2+3+4+5+\cdots n)$

$1000\left(\frac{n\cdot(n+1)}{2}\right)$

$\rightarrow O(n^2)$

```
for(i=1; i≤n; i++){
    for(j=1; j≤i²; j++){
        for(k=1; k≤n/2; k++){
            sysо("Ques Karo");
        }
    }
}
```



$\frac{n}{2}\left(1+2^2+3^2+\cdots n^2\right)$

$\frac{n}{2}\cdot\frac{n\cdot(n+1)(2n+1)}{6}$

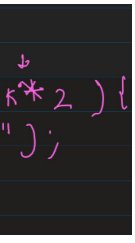
```
for(i=n/2; i≤n; i++){
    for(j=1; j≤n/2; j++){
        for(k=1; k≤n; k++){
            sysо("Try Karo");
        }
    }
}
```

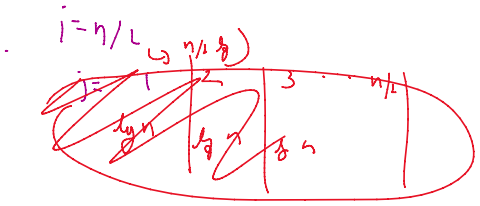
i=4	i=5	i=n
j=		
4.1000	5.1000	n.1000

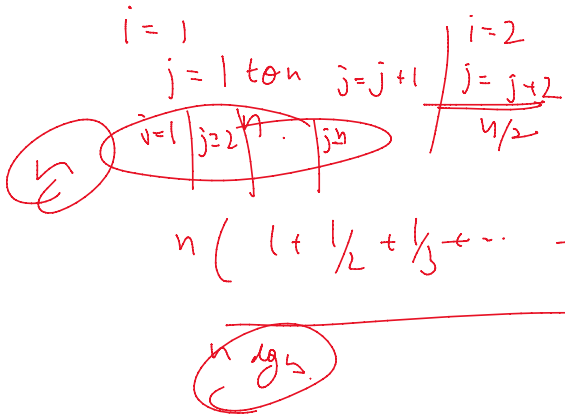
n.1000

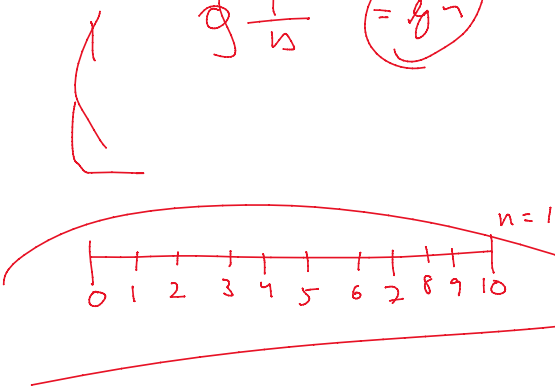
(n)

i=4	4
16.n/2	n^2.n/2



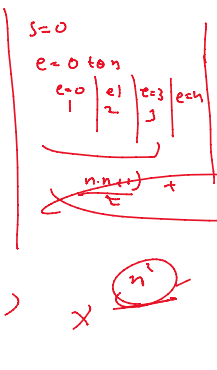







```
for (int s = 0; s < arr.length; s++) {
        for (int e = s; e < arr.length; e++) {
            int sum = 0;
            for (int i = s; i <= e; i++) {
                sum = sum + arr[i];
            }
            System.out.println("=>" + sum);

        }
    }
```



$n/2 \times n/2 \log n$

$\frac{n^2 \log n}{n} \rightarrow O(n \log n)$

$i = 3$	$i = n$
$j = j + 3$	$j = j + n$
$n/3$	n/n

0

$k = 2$

$s = 1$

$e = 1$ to n

$e=1$	$e=2$	$e=3$
1	2	3

$+ \frac{n(n+1)}{2}$