Class 04

Tuesday, November 8, 2022 11:11 PM

```
for(i=1; i<=n; i++)
    for(j=1; j<=n; j++)
        for(k=2j; k<=n; k+=2)
```

$\frac{n^3}{4} + 2n^2 + \frac{n}{2} \sim n$

↳ n^3

$j=1 \longrightarrow k=2; k\le 10; k+=2$

$\frac{n}{2}$ 2, 4, 6, 8, 10 → 5 বার

$j=2 \longrightarrow k=4; k\le 10; k+=2$

$\frac{n}{2}-1$ 4, 6, 8, 10 → 4 বার

$j=3 \longrightarrow 6, 8, 10$

$\frac{n}{2}-2$ → 3 বার

$\frac{n}{2} + 0 \sim n$

$j=1$ $n=20$

$\frac{n}{2} \to 10 \leftarrow$ 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

```
for(k=1; k<=n; k+=2)   // O(n/2 - j + 1)
```

$O\left(\frac{n}{2}\right)$

$\sim O(n)$

exact	approx
10^{14}	4×10^{13}
1.6×10^{9}	2.5×10^{9}
16s	25s

$n \to 5\times10^{9}$

1 sec এ 10^8 টি cycle complete করতে পারে।

$O\left(\frac{2}{3}n^2 + \frac{3}{5}\cdot(2n)\right)$

$O(n^2)$

512MB → RAM

$x \times 4B \le 512MB$

$n \le 500MB$

$\frac{5\times10^{8}}{1}$ 3 KB

$\frac{5 \times 10}{1}$

↳ 1234456

↳ 1500000

$x \times 4B \leq 500MB$

$\Rightarrow x \times 4B \leq 500 \times 10^3 KB$

$\Rightarrow \quad " \quad \leq 500 \times 10^6 B$

$\Rightarrow \quad " \quad \leq 5 \times 10^8 B$

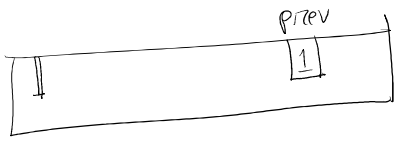
$\Rightarrow x \times 4B \leq 5 \times 10^8 B$

$\therefore x \leq 1.25 \times 10^8$

80% → sz < 10

5% → sz = 500

15% → sz < 30




```
class Vector
{
    int *arr;
    int size=0;

    void push_back(int v)
    {
        ...
    }
};
```

```
int a1[4]
int a2[8]
for(i=0; i<4; i++)
    a2[i]=a1[i]
```

```
int arr[0]
```

↓ pb(1)

```
int arr[1] → {1}
```

↓ pb(2)

```
int arr[2] → {1,2}
```

↓ pb(3)

```
int arr[4] → {1,2,3,_}
```

↓ pb(4)

```
int arr[4] → {1,2,3,4}
```

↓ pb(5)

```
int arr[8] → {1,2,3,4,5,_,_,_}
```

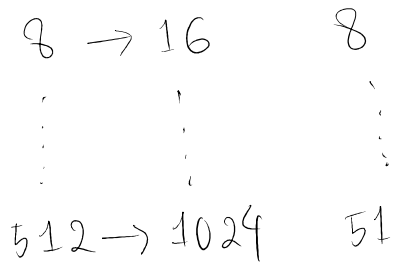
pb(6) pb(7) pb(8)

```
int arr[8] → {1,2,3,4,5,6,7,8}
```

pb(9)

```
int arr[16] → {.....9,_____}
```

	cost
0 → 1	~~1~~ 0
1 → 2	~~2~~
2 → 4	2
4 → 8	4
8 → 16	8



$1+2+4+8+16+32+\ldots+512=1023$