

- 1) Codeforces → are খুব ভালো হক
 - 2) LightOJ
 - 3) vjudge
- o—

* Complexity Analysis

↳ Time

execution → n

Big-O notation

↳ $O(n)$

$$i \leq \sqrt{N}$$

$$\Rightarrow i^2 \leq N$$

$$\Rightarrow i \times i \leq N$$

for (i=1; i ≤ \sqrt{n} ; i++)
sum += i;

↳ $O(\sqrt{n})$

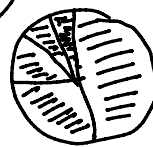
$n \log n$

$$n + \frac{n}{2} + \frac{n}{4} + \frac{n}{8} + \frac{n}{16} + \dots + \frac{n}{n}$$

$$= n \left(1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \right)$$

$$= n(2)$$

$$= 2n$$



= 1

$$y_1 = 2n$$

$$y_2 = n \log n$$

$$\Rightarrow \frac{y_1}{y_2} = \frac{2}{\log n}$$

$$S = \frac{a}{1-r}$$

$$= \frac{1}{1-\frac{1}{2}}$$

$$= \frac{1}{\frac{1}{2}}$$

$$= 2$$

$2^k > n$ ← কখন লুপ শেষ হবে

$k \leq \log_2(n)$ ← কখন লুপ চলেবে

$$2 / n$$

$$\Rightarrow \log(2^k) > \log(n)$$

$$\Rightarrow k \log(2) > \log(n)$$

$$\Rightarrow k > \frac{\log(n)}{\log(2)}$$

$$\Rightarrow k > \log_2(n) \quad \left[\because \log_a b = \frac{\log_k b}{\log_k a} \right]$$

$$k \leq \log_2(n)$$

$$\log(A/B) = \log A - \log B$$

$$\frac{n}{2^1} \rightarrow \frac{n}{2^2} \rightarrow \frac{n}{2^3} \rightarrow \dots \rightarrow \frac{n}{2^k} = 1$$

$$\text{sum}(1 \dots n)$$

$$1 \leq n \leq 10^9$$

$$\text{Time: } 1 \text{ s}$$

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

$$\Rightarrow n = 2^k$$

$$\therefore k = \log_2(n)$$

$$O(n) \quad n \xrightarrow{\sqrt{\quad}} \sqrt{n}$$

$$10^9 \rightarrow 10^{4.5} < 10^8$$

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

$$\rightarrow O(1)$$

$$\frac{10^9}{10^8} \text{ s} = 10 \text{ s}$$

$$10^9 \xrightarrow{\quad} 1 \text{ s}$$

$$\therefore 1 \xrightarrow{\quad} \frac{1}{10^8} \text{ s}$$

$$\therefore 10^9 \xrightarrow{\quad} \frac{10^9}{10^8} \text{ s}$$

$$O(1)$$

$$O(\log_2 n)$$

$$O(\sqrt{n})$$

$$O(n)$$

$$O(n \log_2 n)$$

$$O(n\sqrt{n})$$

$$O(n^2)$$

$$O(n^3)$$

$$O(n^4)$$

$$O(2^n)$$

$$O(n!)$$

$$O(n^n)$$

$$1 \leq n \leq 10^5$$

$$TL: 1 \text{ s}$$

$$(10^5)^2 = \frac{10^{10}}{10^8} \text{ s} = 100 \text{ s}$$

$$O(n \log_2 n) \quad O(2^n)$$

$$\frac{10^9}{10^8} = 0.0015$$

10^8 संचरण step complete 25 1 sec 4

$\therefore 1$ " " " " $\frac{1}{10^8}$ " "

$\therefore n$ " " " " $\left(\frac{n}{10^8}\right)$ " "

$$f(n) = \begin{cases} n \\ n^2 \\ n \log n \end{cases}$$

$$\frac{f(n)}{10^8} \leq \text{Time limit}$$

$$\frac{n \log n}{10^8} \leq \frac{n^2}{10^8}$$

4