

```

c++>n;
→ for(i=0; i<n; i++) {
    // print
    if for(j=0; j<n; j++) {
        //
    }
}

```

$$T \propto n$$

$$T_1 = O(N)$$

$$T_2 = O(N^2)$$

```

for(i=1; i<=n; i*=2) {
    // printf("%d", i);
}

```

$$V \propto I \quad V \propto T$$

$$O(\log)$$

$$n=100 \leftarrow O(\log_2 N) \quad T \propto N \Rightarrow O(N) \times$$

1	2	4	8	16	32
64					

1	2	4	8	16	32	64	128
2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7

$$a^x = b$$

$$\log_a b = x$$

$$\dots 2^x \geq N$$

$$x \geq \log_2 N$$

$$\log_2 1024 = 10$$

```

for(i=1; i<=N; i*=i) {
}

```

1 2 4

$$O(\log_2 N)$$

}

```

for(i=0, j=1; i<=N; i+=j, j++) {
}

```

$$\uparrow O(\sqrt{N})$$

$$\begin{array}{ccccccc}
 & 1+2 & 1+2+3 & 1+2+3+4 & 1+2+3+4+5 & \dots & 1+2+\dots+x \\
 \downarrow & 0 & 1 & 3 & 6 & 10 & \dots \sum_{i=1}^x i \\
 \nearrow & 1 & 2 & 3 & 4 & 5 & \dots x \\
 & \frac{x(x+1)}{2} & & & & & > N
 \end{array}$$

```

for( —————→ ) {
}

```

$$O(N)$$

$$\rightarrow x^2 + x \geq 2N$$

$$x^2 \geq 2N$$

$$x^2 > N$$

$$\left. \begin{array}{l} \{ \\ f_{oh}(\longrightarrow) \{ \\ f_{oh}(\longrightarrow) \{ \\ \} \end{array} \right\} O(N) \quad \left| \quad \begin{array}{l} x^2 \geq N \\ x \geq \sqrt{N} \end{array} \right.$$

$$O(N) + O(N^2) \approx O(N^2)$$

$$N=10^5 \Rightarrow 10^5 + 10^{10}$$

$$N=10^6 \Rightarrow 10^6 + 10^{12} = 1000001000000$$

$$arr[] = \{1, 2, 3, 4, 5\}$$

$$\rightarrow x[] = \{1, 3, 6, 10, 15\} \quad O(N)$$

$$x_i[j][j] = \begin{pmatrix} 1 & 3 & 6 & 10 & 15 \\ & 2 & 5 & 9 & 14 \end{pmatrix} \quad O(N^2)$$

$$N^3 = 10^6 < 10^8$$

$$15 \approx 10^8$$

$$N \leq 100$$

$$O(N), O(N^2), O(N^3), O(N^4)^*$$

(in Mo9N)

$$O(N), O(N^2), O(N^3), \dots, O(N^4 \log N)$$

$$T \leq 100$$

$$\frac{10^8}{100} = 10^6$$

$$N^3 = 10^{12} > 10^8$$

$$N \leq 10^4$$

$$O(N), O(N^2)^*, O(N \log N)$$

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