Primality Testing $\longrightarrow$ $O(\sqrt{N})$

$1 \backsim N \longrightarrow O(N\sqrt{N})$

```
for(i=1; i ≤ N; i++)
{
    if(isPrime(i))
        ↳ (i)
}
```

$N = 10^6$

$N\sqrt{N} = 10^6 \times 10^3 = \dfrac{10^9}{10^8} \backsim 10s$

— o —

$1, 2, 3, 4, 5, 6, 7, 8, \ldots\ldots, \overset{100}{N}$

$\overset{10}{\nearrow}$
$1, 2, 3$

isPrime(20) $\nearrow \sqrt{20} \quad O(\sqrt{N})$
            $\searrow$ 10 এর গুণিতক $O(1)$

— o —

X, ②, ③, X, ⑤, X, ⑦, 8, 9, 10,

⑪, 12, ⑬, 14, 15, 16, ⑰, 18, ⑲, 20,

21, 22, ㉓, 24, 25, 26, 27, 28, ㉙, 30,

㉛, 32, 33, 34, 35, 36, �37, 38, 39, 40.

$2 \rightarrow$ multiple ✗ $17 \rightarrow$
$3 \rightarrow$ $19 \rightarrow$
$5 \rightarrow$ $23 \rightarrow$

$$7 \rightarrow -$$
$$29 \rightarrow$$
$$11 \rightarrow \cdot$$
$$13 \rightarrow \cdot$$

— o —

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \cdots + \frac{1}{N} \approx \log(N+1)$$

— o —

$$i = 2 \rightarrow \boxed{\frac{N}{2}}$$

$$i = 3 \rightarrow \boxed{\frac{N}{3}}$$

$$\boxed{i = 4} \rightarrow \boxed{\frac{N}{4}}$$

$$i = 5 \rightarrow \boxed{\frac{N}{5}}$$

$$i = 6$$
$$\vdots$$

$$i = N \rightarrow \boxed{\frac{N}{N} = 1}$$

$$2, 3, 5, 7, 11, 13,$$

$$\frac{N}{2} + \frac{N}{3} + \frac{N}{4} + \cdots + \frac{N}{N}$$

$$= N\left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots + \frac{1}{N} \right)$$

$$= N \cdot \log N$$

$$= N\left(\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \frac{1}{11} + \frac{1}{13} + \cdots \right)$$

$$\hookrightarrow \boxed{N \log N}$$

— o —

$$\hookrightarrow N \log(\log(N))$$

$$\rightarrow 10^6 \times \log(20)$$

$$\rightarrow 10^6 \times 5$$

— o — $\overline{O(N \log N)}$, $\underset{\frown}{O(N\sqrt{N})}$

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

$$\overset{O(N\log N)}{}$$

①, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

$j \rightarrow$

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	②	3	②	5	②	7	②	3	②	11	2	3	2	3
		4		3		4	9	5			3		7	5
				6		8		10			4		14	15
											6			
											12			

⑥

$$720720 = 2^{④} \times 3^{②} \times 5^{①} \times 7^{①} \times 11^{①} \times 13^{①}$$

$$(4+1)(2+1)(1+1)(1+1)(1+1)(1+1)$$

$$5 \times 3 \times 16$$

$$80 \times 3 \rightarrow 240$$

$$\boxed{10^{18}}$$

$$10^{6} \rightarrow 240$$

$$K = 2^{a_1} \times 3^{a_2} \times 5^{a_3} \times 7^{a_4} \times 11^{a_5} \times 13^{a_6} \times \cdots \times \quad 10^{18} \rightarrow ?K$$

$$a_1 \quad a_2 \quad a_3 \quad a_4 \quad a_5 \quad a_6$$

$$\boxed{\log N}$$