Class 20

Thursday, August 5, 2021 10:00 PM

$[0, 10^{10}] \longrightarrow 10^5$ $\quad div[3] \rightarrow \{4, 9, 25, 49, \ldots\}$

1 → 1
2 → 4
3 → 9
4 → 16
5 → 25
6 → 36
7 → 49
8 → 64
9 → 81
10 → 100

$N = p_1^{\alpha_1} \times p_2^{\alpha_2} \times p_3^{\alpha_3} \times \cdots$

$= (\alpha_1 + 1)(\alpha_2 + 1) \cdots$

$12 = 2^{\textcircled{2}} \times 3^{\textcircled{1}}$

$= (2+1)(1+1)$

$= 3 \times 2 = 6$

$N = 12 = 2^2 \times 3^1$

$N^2 = 144 = (2^2 \times 3^1)^2$

$= 2^{2\times2} \times 3^{2\times1}$

$= (2\times2+1)(2\times1+1)$

$= 5 \times 3$

$= 15$

$n! \leftarrow p$

$\left\lfloor \frac{n}{p} \right\rfloor + \left\lfloor \frac{n}{p^2} \right\rfloor + \left\lfloor \frac{n}{p^3} \right\rfloor + \cdots + 0$

$\left\lfloor \frac{8}{2} \right\rfloor + \left\lfloor \frac{8}{4} \right\rfloor + \left\lfloor \frac{8}{8} \right\rfloor = 4 + 2 + 1 = 7$

— ∘ —

Sieve:

$[1 \sim 1000]$ $\quad O(N\sqrt{N}) \longrightarrow N = \text{MAX LIMIT} = 1000$

almost $O(N)$

2, 3, 4, 5, 6, 7, 8, 9, 10

1 ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~ ~~12~~ ~~13~~

~~14~~ ~~15~~ ~~16~~ ~~17~~ ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~ ~~25~~ ~~26~~

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

```
for(i=2; i<=n; i++){
{  if( marked[i]==0){
       for(j=i+i; j<=n; j=j+i)
            marked[j]=1;
}  }
```

$$\frac{N}{1}+\frac{N}{2}+\frac{N}{3}+\frac{N}{4}+\frac{N}{5}+\frac{N}{6}+\cdots+\frac{N}{N}$$

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

Harmonic Series

$$= N \cdot \log(\log N)$$