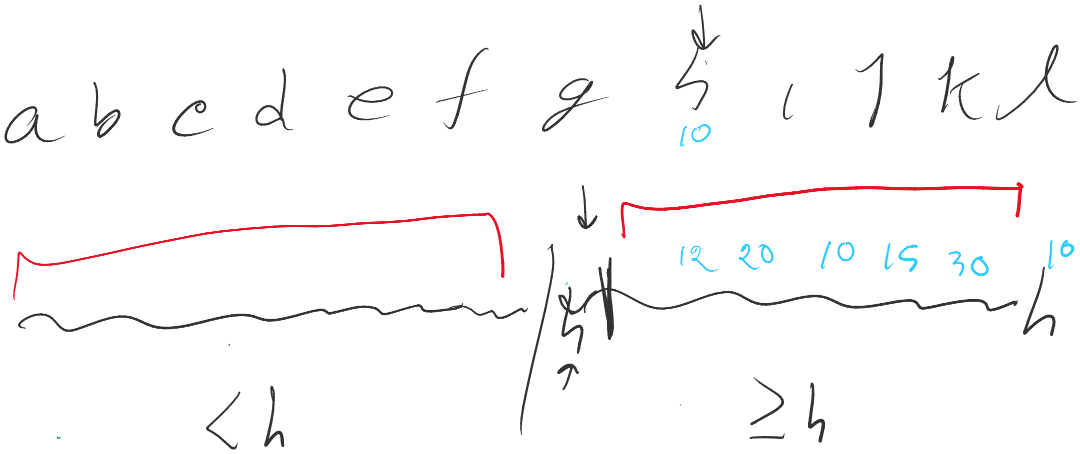
08

Sunday, March 27, 2022 9:55 PM



$$\left(1 + x + x^2 + x^3 + x^4 + \dots\dots x^n\right) \% \, MOD$$

$$1 \le x, N \le 10^9, \quad MOD = 10^9 + 7$$

$$\left[1 + \frac{x(x^n - 1)}{x - 1}\right] \% \, MOD$$

$$(A \pm\times B) \% M = A\%M \pm\times B\%M$$

~~$\frac{A}{B} \% M \ne \frac{A\%M}{B\%M}$~~

$$f(x,n) \rightarrow \left(1 + x + x^2 + x^3 + \dots\dots x^n\right) \% \, MOD$$

$$a^8 = (a^4)^2$$

$\log_2 N$

fun(⟶)

f( )

$$x(1 + x + x^2 + x^3 + x^4 + x^5)$$

$$f(x,7) \rightarrow \left(1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7\right) \% \, MOD$$

$$= 1 \cdot (1 + x + x^2 + x^3) + x^4(1 + x + x^2 + x^3)$$

$$(1 + x^4)(1 + x + x^2 + x^3) \% \, MOD$$

$= (1+x^4)(1+x+x^2+x^3) \pmod 5$

fermat's little

$a^p \equiv a \pmod p$ given p is prime

$a^{p-1} \equiv 1 \pmod p$ | $4^6 \% 7 = 1$

$a^{p-1} \equiv 1 \pmod p$

$\Rightarrow \frac{a^{p-1}}{a} \equiv \frac{1}{a} \pmod p$

$\Rightarrow a^{-1} \cdot a^{p-1} \equiv a^{-1} \pmod p$

$\Rightarrow a^{p-2} \equiv a^{-1} \pmod p$

$\frac{a}{b} \% m$

$\Rightarrow (a \cdot b^{-1}) \% m$

$\Rightarrow (a \% m \times b^{-1} \% m)$

$\frac{1}{b} \% m$ | $\frac{a^x}{b^y} \% m$

$\Rightarrow a^x \% m \times b^{-y} \% m$

$\Rightarrow a^x \% m \times (b^{(-1)\cdot y}) \% m$

$\Rightarrow a^x \% m \times (b^y)^{-1} \% m$

$\Rightarrow a^x \% m \times (b^{-1})^y \% m$

$\frac{a}{b} \% m$

$(a \% m \times b^{m-2} \% m) \% m$

$a^{xy} = (a^x)^y$

$a^b \% m$

$\log_2 N$

$1+x+x^2+x^3+\cdots\ x^n$ の和

$\log_2 N$

$\frac{x^{n+1}-1}{x-1}$ の和

$a\frac{r^{k+1}-1}{r-1}$

→ $\log_2 n$

$x=2,\ n=1$

$1+2=3$

${}_N C_R$ →

$\frac{20}{5}$ の和 $= 2$

$\frac{a}{b}$ の和

$\frac{20}{6}$ の和 5

$\frac{20\times3}{6}$ の和 5

$\sqrt{-1}$

$\frac{20}{6}$ の和 7

$= 20$ の和 7×6^5 の和 7

$= 6 \times 6$

10

$\frac{20\times3}{6}$ の和 7

$= 10$ の和 7

$= 3$

$= 6 \times 6$

$= 36 \% 7$

$= 1$

$= 3$

$\frac{20}{6} \% 7 \times 3 \% 7$

$= 1 \times 3$

$= 3$

10^5

$$^{N}C_{R} = \frac{N!}{R!\,(N-R)!}$$

$^{N}C_{R} \% 10^{9}+7$

$N, R \leq 10^5$

$\sqrt{N}$

$Q\sqrt{N}$

$0 \rightarrow 59$

$\frac{N}{2} + \frac{N}{3} + \frac{N}{5} + \frac{N}{7}$

~~0~~	~~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~~	~~27~~	~~28~~	29
~~30~~	31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	~~37~~	~~38~~	~~39~~
~~40~~	~~41~~	~~42~~	~~43~~	~~44~~	~~45~~	~~46~~	~~47~~	~~48~~	~~49~~
~~50~~	~~51~~	~~52~~	~~53~~	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	~~59~~

~~50~~ ~~51~~ ~~52~~ 53 ~~54~~ ~~55~~ ~~56~~ ~~57~~ ~~58~~ 59

$f[4] = 1$

$f[6] = 1$

7.1
7.2
7.3
7.4
7.5
7.6
7.7

$$\frac{N}{2} + \frac{N}{3} + \frac{N}{5} + \frac{N}{7} + \frac{N}{11} + \cdots \frac{N}{\sqrt{N}}$$

$$N\left[\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \frac{1}{11} + \cdots \frac{1}{\sqrt{N}}\right]$$

$\log_2$
$\log_e$
2.7...

Harmonic series

$$H(N) \geq 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \cdots \frac{1}{N} \approx \log N + 6$$

$< N \log N$

$\approx N \log \log N$

$\approx N$

10^7 $\log 10^7 = 25$

$\log 25$

≈ 6