

GCD

$$\begin{aligned} \text{gcd}(a, b) \\ &= \text{gcd}\left(\frac{b \% a}{a}, \frac{a}{b}\right) \\ &= \text{gcd}(a \% (b \% a), b \% a) \\ &\vdots \\ &= \text{gcd}(0, z) \end{aligned}$$

Recursive Function

$$\begin{aligned} f(5) &= f(4) \times 5 \\ f(n) &= f(n-1) \times n \end{aligned}$$

'z' is the gcd of a, b

$$5! = 1 \times 2 \times 3 \times 4 \times 5$$

$$5! = 4! \times 5$$

$$\begin{aligned} 20 &\rightarrow 1, 2, 4, 5, \textcircled{10}, 20 \rightarrow 6 \\ 30 &\rightarrow 1, 2, 3, 5, 6, \textcircled{10}, 15, 30 \rightarrow 8 \end{aligned}$$

$$\text{gcd}(20, 30) \rightarrow \textcircled{10}$$

$$\begin{aligned} (20, 30) &\rightarrow 4 \\ \text{count_of_divisors}(\text{gcd}(a, b)) \end{aligned}$$

$$10 \rightarrow \textcircled{1} \textcircled{2} \textcircled{5} \textcircled{10}$$

LCM → ल.स.ग. → लघिष्ठ साधारण गुणिक
Least Common Multiple

$$\begin{aligned} a \times b &= \text{gcd}(a, b) \times \text{LCM}(a, b) \\ \Rightarrow \text{LCM}(a, b) &= \frac{a \times b}{\text{gcd}(a, b)} \end{aligned}$$

$$(4, 5) \rightarrow$$

$$\begin{aligned} &1 \quad 4 \quad 8 \quad 12 \quad 16 \quad \textcircled{20} \quad 24 \quad \dots \quad \textcircled{40} \\ &5 \quad 10 \quad 15 \quad \textcircled{20} \quad \dots \quad \textcircled{40} \end{aligned}$$

8 weeks → Bonus A

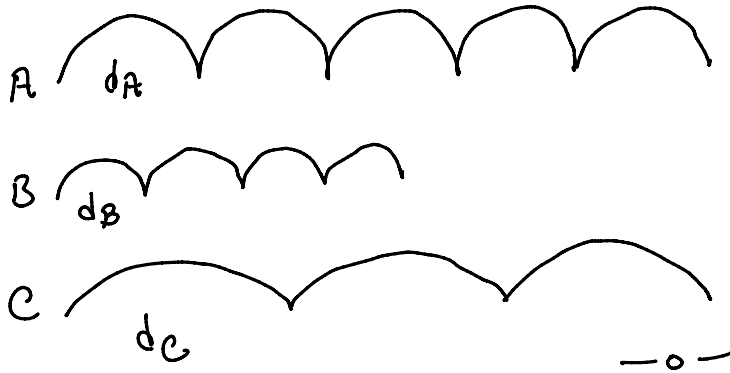
$$\text{LCM}(8, 15, 4)$$

15 weeks → Bonus B

$$\begin{aligned} &= \text{LCM}(120, 4) \\ &= 120 \end{aligned}$$

15 weeks \rightarrow Bonus 15 = LCM(120, 4) = 120
 4 weeks \rightarrow Bonus C

8 16 24 32 40 48 56 64 72 80
 15 30 45 60 75 90 - - - -



$$\text{LCM}(d_A, d_B, d_C)$$

Divisor Finding

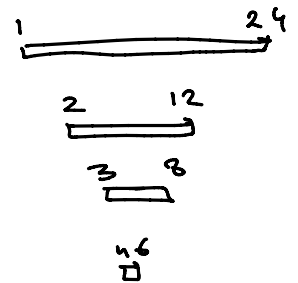
$$N \rightarrow 24 =$$

$$\begin{array}{l} 1 \quad (24/1) \rightarrow 24 \\ 2 \quad (24/2) \rightarrow 12 \\ 3 \quad (24/3) \rightarrow 8 \\ 4 \quad (24/4) \rightarrow 6 \end{array}$$

$$d^2 = N$$

$$\therefore d = \sqrt{N}$$

$$\begin{array}{l} 1 \times 24 \\ 2 \times 12 \\ 3 \times 8 \\ 4 \times 6 \\ \vdots \\ d, d \end{array}$$



$$N \rightarrow 506 \rightarrow 1, 506$$

$$2, 253$$

$$11, 46$$

$$22, 23$$

$$\lfloor \sqrt{N} \rfloor = 22$$

$$N = 10^8$$

$$10 \text{ कोरि}$$

$$1 \text{ sec}$$

$$N = 10^8 \rightarrow \sqrt{N} = 10^4$$

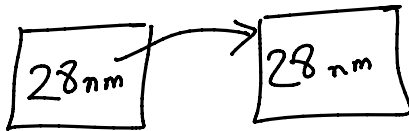
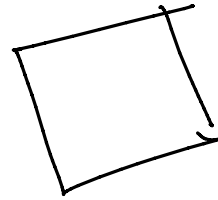
0.0001 sec

$$10^{-9} \text{ sec}$$

$$\frac{10^{-9}}{10^8} = \frac{10^4}{10^8}$$

$$10^{18} \rightarrow 10^9 \rightarrow 500 \sim 1000$$

— o —



— o —

Primality Testing

(N)

$$11 = 1 \times 11$$

} }

$$[2, N-1] \times$$

$$[2, \sqrt{N}]$$

$$[2, 3]$$

$$7 = 1, 7$$

$$11 = 1, 11$$

~~12~~

$$11 \rightarrow (2, 3) \dots \dots \dots 10$$

$$11 \rightarrow \sqrt{11} \rightarrow 3$$

hashCode()

19 digit

$$4 = 1, 2, 4$$

$$9 = 1, 3, 9$$

$$16 = 1, 2, 4, 8, 16$$

$$25 = 1, 5, 25$$

$$25 = 1 \times 25$$

$$5 \times 5$$

Modular Arithmetic

Prime ~~*~~ ~~*~~
* * *



toggle

OFF ON OFF ON
1, 3, 5, 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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Round 1: ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓

Round 2: ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓

square → OFF
else → ON



1 ~ 10¹⁸

60%

51	100
51	74
63	74
63	67
66	67

$\log_2(N)$