GCD / HCF

GCD → Greatest common divisor

HCF → Highest common factor

for ex

a , b

↳ HCF no → ?

a → divide complete

∴ a % hcf = 0

∴ b % hcf = 0

max no

a = 24 = 1 × 2 × 2 × 2 × 3

b = 72 = 1 × 2 × 2 × 2 × 3 × 3

common

HCF = 1 × 2 × 2 × 2 × 3 ⇒ 24

1) Euclid's Algo to find GCD

↳ gcd(a, b) = gcd(a − b, b) ⇒ mathematical Induction prove this formula

or

gcd(a + b, b)

2. lcm(a, b) * gcd(a, b) = a * b

GCD

$gcd(a,b) = gcd(a-b, b)$ $\quad a > b$

$\qquad\qquad\quad\; gcd(b-a, a)$ $\quad a < b$

Apply this till one of the parameter becomes 0

for

$gcd(72, 24)$

↳ $gcd(48, 24)$

↳ $gcd(24, 24)$

↳ $gcd(0, 24) \rightarrow$ gcd

```
class Solution
{
    public:
   int gcd(int a, int b)
    {
      if(a == 0) return b;
      if(b == 0) return a;

      while(a > 0 && b > 0){
         if(a > b){
            a = a - b;
         }
         else{
            b = b - a;
         }
      }
      return a == 0 ? b : a;
    }
};
```

Lcm

$$LCM * HCF = a * b$$

$$\boxed{LCM(a, b) * HCF(a, b) = a * b} \Rightarrow \text{Euclid theorem}$$

$$LCM = \frac{a * b}{gcd}$$