Topics to discuss

- Find HCF / GCD of two numbers
- Brute force and Optimal Solution.
- Its time & space complexity.
- Add to Github

GCD or HCF of two Numbers

Greatest common divisor

Heighest common factor.

For example:

$a = 10$, $b = 32$

{ divisors of 10 is 1, 2, 5, 10
{ divisors of 32 is 1, 2, 4, 8, 16, 32

Common divisors = 1, 2

Greatest common divisor = 2

```
static int gcd(int a, int b){
    int min = Math.min(a,b);
    int result = 1;
    for(int i=1 ; i<=min ; i++){
        if(a%i==0 && b%i==0){
            result=i;
        }
    }
    return result;
```


Test case I :

I/p : a=10 , b=32

O/p : 2

Test case II :

I/p : a=50 , b=100

O/p : 50

i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

~~ans=1~~ ans = 2

Euclidean Algorithm / Euclid's Method

Example : $a = 35$, $b = 25$

$min = 25$

$$
\begin{array}{r|l}
25 & 35 \;(\; 1 \\
 & \underline{25} \\
\hline
10 & 25 \;(\; 2 \\
 & \underline{20} \\
\hline
5 & 10 \;(\; 2 \\
 & \underline{10} \\
\hline
 & \times\times
\end{array}
$$

HCF is 5

Note : Let 'b' be smaller than 'a'

$$gcd(a, b) = gcd(a-b, b)$$

$$
\begin{aligned}
5 &= gcd(10, 25) \\
&= gcd(10, 15) \\
&= gcd(10, 5) \\
&= gcd(5, 5) \\
&= 5
\end{aligned}
$$

```
Static int ESolution(int a, int b){
    int min = Math.min(a,b);
    int max = Math.max(a,b);
    if(a==b) return a;
    else return ESolution(max-min, min);
}
```

$$gcd(a, b) = gcd(a-b, b)$$

$$b < a$$

$$gcd(a, b) = gcd(b, a \% b)$$

example : a = 8 , b = 36

$$gcd(8, 36) = gcd(36, 4)$$
$$= gcd(4, 0)$$
$$= 4$$

$8 \% 36 = 4$

$36 \% 4 = 0$

```
Static int ESolution2 (int a, int b) {
        if (b==0) return a;
        else return ESolution(b, a%b);
}
```

$$gcd(a, b) = gcd(b, a \% b)$$

#DSAWithArfin

Follow Now

Start Practicing

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