

## Experiment Title 1

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**Branch:** CSE

**Section/Group:** 607 B

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**Subject Name:** DAA Lab

**Subject Code:** 20CSP-312

### 1. Aim/Overview of the practical:-

Code and analyse to compute the greatest common divisor (GCD) of two numbers.

### 2. Task to be done/ Which logistics used:-

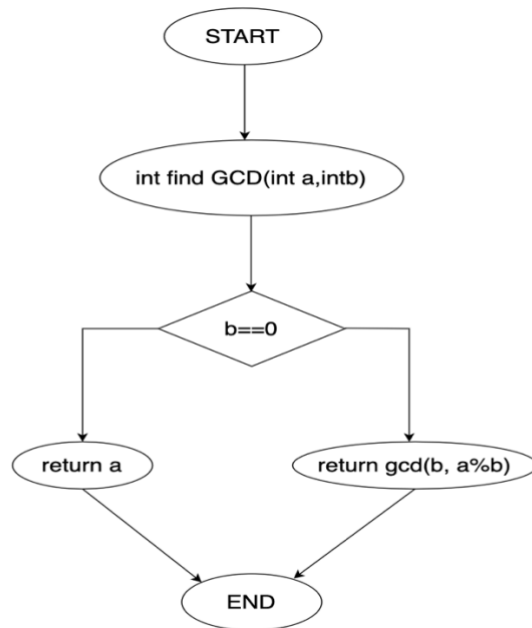
The GCD of two or more integers is the largest integer that divides each of the integers such that their remainder is zero. Or we say that GCD (Greatest Common Divisor) or HCF (Highest Common Factor) of two numbers is the largest number that divides both of them. An efficient solution is to use the Euclidean algorithm which is the main algorithm used for this purpose. The idea is, GCD of two numbers doesn't change if the smaller number is subtracted from a bigger number.

### 3. Algorithm/Flowchart (For programming based labs):

Algorithm:-

- Step 1: Start.
- Step 2: Let a,b be the two numbers.
- Step 3: If  $b=0$  then  $\text{gcd}(a,b)=a$  since the greatest Common Divisor of 0 and a is a.
- Step 4: Let r be the remainder of dividing a by b assuming  $a>b$ . ( $r=a\%b$ ).
- Step 5: Find  $\text{gcd}(b,a\%b)$  because  $\text{gcd}(a,b)=\text{gcd}(b,a\%b)$ . Use the above steps again.
- Step 6: End.

Flowchart:-



#### 4. Steps for experiment/practical/Code:-

```

#include <iostream>
using namespace std;
int gcd(int a, int b)
{
    if (b == 0) return a;
    return gcd(b, a % b);
}
int main()
{
    int a = 66, b = 99;
    cout<<"GCD of "<<a<<" and "<<b<<" is "<<gcd(a, b);
    return 0; }
  
```

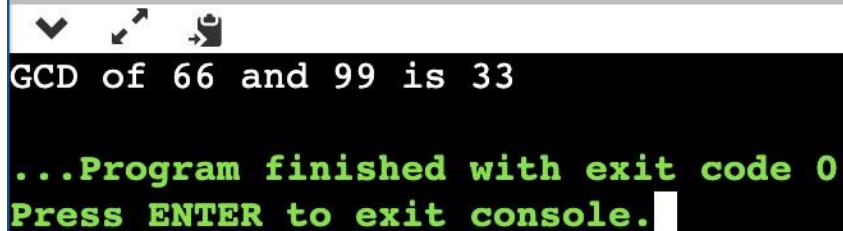
```
1  #include <iostream>
2  using namespace std;
3  int gcd(int a, int b)
4  {
5      if (b == 0)
6          return a;
7      return gcd(b, a % b);
8  }
9  int main()
10 {
11     int a = 66, b = 99;
12     cout<<"GCD of "<<a<<" and "<<b<<" is "<<gcd(a, b);
13     return 0;
14 }
```

## 5. Observations/Discussions/ Complexity Analysis:

Time Complexity:  $O(\log(a+b))$

Space Complexity:  $O(\log(a+b))$

## 6. Result/Output/Writing Summary:-



GCD of 66 and 99 is 33

...Program finished with exit code 0

Press ENTER to exit console.

**Learning outcomes (What I have learnt):**

1. We can quickly find the GCD of 2 integers using this method.
2. Optimized Euclidean Algorithm.
3. Complexity .

**Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):**

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			