

### Worksheet-1

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**Subject Code:-** 20CSP-314

**Semester:-** 5<sup>th</sup>

**Subject Name:-** DAA Lab

**1. Aim -** To calculate the Greatest Common Divisor (GCD) of two numbers.

**2. Task to be done/ Which logistics used-**

An efficient method is to use Euclidean algorithm which is the main algorithm used for finding the Greatest Common Divisor (GCD) of two numbers. The idea is, GCD of two numbers doesn't change if smaller number is subtracted from a bigger number.

**3. Algorithm (For programming-based labs)-**

Euclidean algorithm is used here for calculating the GCD of two numbers.

➤ **Pseudo Code of the Algorithm**

Step 1: Let a, b be the two numbers

Step 2:  $a \bmod b = R$

Step 3: Let  $a = b$  and  $b = R$

Step 4: Repeat Steps 2 and 3 until  $a \bmod b$  is greater than 0

Step 5:  $GCD = b$

Step 6: Finish

**4. Input Code-**

```
#include <iostream>
using namespace std;
int hcf(int n1 , int n2)
{ if (n2 == 0) return n1;
  return hcf(n2, n1 % n2);
}
```

```
}  
int main()  
{ int n1,  
  n2;  
  cout << "Enter two numbers: "; cin >> n1 >> n2; cout << " HCF of " << n1  
  << " and " << n2 << " is " << hcf(n1,n2); return 0;  
}
```

➤ **Complexity Analysis-**

Euclidean algorithm is an efficient method for finding the GCD (Greatest Common Divisor) of two integers.

The time complexity of this algorithm =  $O(\log(\min(a, b)))$ . Recursively it can be expressed as-  $\text{gcd}(a, b) = \text{gcd}(b, a \% b)$  where,  $a$  and  $b$  are two integers.

**5. Output-**

```
Enter two numbers: 12 8  
HCF of 12 and 8 is 4  
-----  
Process exited after 3.165 seconds with return value 0  
Press any key to continue . . . |
```

**6. Learning outcomes (What I have learnt) -**

- To implement problems based on different algorithm design techniques.
- To learn the importance of designing an algorithm in an effective way by considering space and time complexity.

- c. Analyse and compare the efficiency of algorithms (Here we have compared both Iterating Method and Recursive method for finding the GCD).
- d. Here Euclidean algorithm proved to be more efficient to solve the problem for finding the GCD.

**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.			