Walchand College Of Engineering, Sangli

Department of Computer Science and Engineering

Subject: C&NS Lab

Batch: B4

Name: Gayatri Sopan Gade PRN:2020BTECS00210

Assignment 8

Title:

Implementation of Euclidean and Extended Euclidean Algorithm

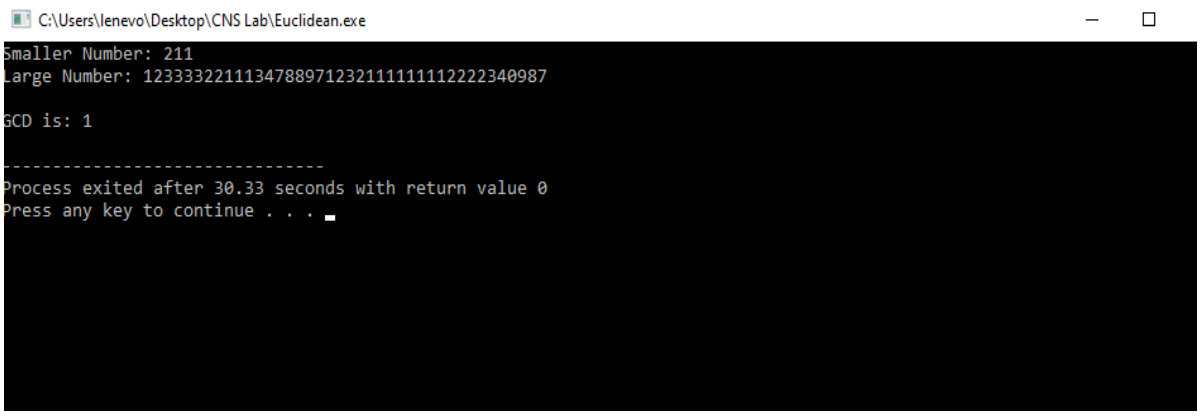
Implementation of Euclidean Algorithm

Code:

```
#include<bits/stdc++.h>
using namespace std;
typedef long long int ll;

// function to find gcd of two integer numbers
ll gcd(ll a, ll b)
{
        if (!a)
                return b;
        return gcd(b % a, a);
}

ll reduceB(ll a, char b[])
{
        // Initialize result
        ll mod = 0;

        // calculating mod of b with a to make
        // b like 0 <= b < a
        for (int i = 0; i < strlen(b); i++)
```

```
            mod = (mod * 10 + b[i] - '0') % a;

        return mod; // return modulo
}

ll gcdLarge(ll a, char b[])
{
        // Reduce 'b' (second number) after modulo with a
        ll num = reduceB(a, b);

        // gcd of two numbers
        return gcd(a, num);
}

int main()
{
        // first number which is integer
        ll a = 1221;

        char b[] =
"12345678910111213141516171819202122232425262728 29";

        cout<<"Enter a Smaller Number: ";
        cin>>a;

        cout<<"Enter a Large Number: ";
        cin>>b;

        cout<<"\nThe GCD of Given Number is: ";

        if (a == 0)
                cout << b << endl;
        else
                cout << gcdLarge(a, b) << endl;

        return 0;
```

Output:



Implementation of Extended Euclidean Algorithm

Code:

```
#include<bits/stdc++.h>

typedef long long LL;

void extended_Euclidean_algorithm(LL a, LL b, LL &u, LL &v, LL &w,
LL &x, LL &y, LL &z){

    /* Initialization */
    // 1. equation
    u = 1; v = 0; w = a;
    // 2. equation
    x = 0; y = 1; z = b;


    if( w < z ){ // we change the equations' order
        std::swap( u, x );
        std::swap( v, y );
        std::swap( w, z );
    }
```

```
        LL q;
        while( z != 0 ){

                q = w / z;

                // (1. equation) - q * (2. equation)
                u -= q*x;
                v -= q*y;
                w -= q*z;


                // we change the equations' order
                std::swap( u, x );
                std::swap( v, y );
                std::swap( w, z );
        }
}


int main(){

        LL a, b, u, v, w, x, y, z;

        // -------------------------

        printf( "Data input\n" );

        printf( "a = " );
        scanf( "%lld", &a );

        printf( "b = " );
        scanf( "%lld", &b );

        // -------------------------

        extended_Euclidean_algorithm(a, b, u, v, w, x, y, z);
```

```
        // -------------------------

        printf( "\nResults:\n" );

        printf( "1. equation: (%lld)*(%lld) + (%lld)*(%lld) = %lld\n", a, u,
    b, v, w );
        printf( "2. equation: (%lld)*(%lld) + (%lld)*(%lld) = %lld\n", a, x,
    b, y, z );

        // -------------------------

        return 0;
    }
```

Output: