1.Find prime numbers in a range to N using sieve algorithm

```
#include <bits/stdc++.h>
using namespace std;
void prime(long long n);
int main()
{
    long long int n;
    cout << "enter range: ";
    cin >> n;
    prime(n);
}
void prime(long long n)
{

    long long arr[n];
    for (long long i = 2; i * i <= n; i++)
    {
        for (long long k = i+1; k <= n; k++)
        {
            if (k%i== 0)
            {
                arr[k] = 1;
            }
        }
    }
    cout<<" 2";
    for(long long i=3;i<=n;i++)
    {
        if(arr[i]!=1)
        {
            cout<<" "<<i;
        }

    }
}
```

2.Prime factorization of a number

```
#include <iostream>
using namespace std;
void find_prime(int num, int arr[]);
bool if_prime(int num);
int k=0;
int main(){
```

```
    int num;
    cout << "Enter a number: ";
    cin >> num;
    cout << "prime factorization : ";
    if (if_prime(num)){
        cout << num;
    }
    else {
        int arr[num / 2];
        find_prime(num, arr);

        while (1){
            for (int i = 0; i<k; i++){
                if (num % arr[i] == 0){
                    cout << arr[i] << " ";
                    num /= arr[i];
                    break;
                }
            }
            if (if_prime(num)) {
                cout<<num;
                break;
            }
        }
    }
}
void find_prime(int num, int arr[]){
    arr[k++]=2;
    arr[k++]=3;
    for(int i=4;i<=num;i++) {
        int flag=0;
        for(int j=2;j<=i/2;++j){
            if(i%j==0){
                flag=1;
                break;
            }
        }
        if(flag==0){
            arr[k++]=i;
        }
    }
}
bool if_prime(int num){
    bool is_prime = true;
    if (num == 0 || num == 1){
```

```
        is_prime = false;
    }
    for (int i = 2; i <= num / 2; ++i){
        if (num % i == 0){
            is_prime = false;
            break;
        }
    }
    return is_prime;
}
```

3. Determine gcd and Bezout’s coefficient of two numbers.

```
#include <bits/stdc++.h>
using namespace std;
int gcd(int a, int b,int &s,int &t)
{
    if (b == 0){
        s = 1;
        t = 0;
        return a;
    }
        int r=gcd(b, a % b,s,t);
        int x=t;
        t = s - (a / b) * t;
        s = x;
        return r;
}
int main()
{
    int a, b;
    int s, t;
    cout << "Enter 2 number :";
    cin >> a >> b;
    if (a >= b)
        cout << "GCD= "<<gcd(a, b,s,t) <<endl;
    else
         cout << "GCD= "<<gcd(b, a,s,t) <<endl;

    cout<<"BEZOUT's COEFFICIENT: ";
    cout << s << " " << t;
    return 0;
}
```