Compilando Conocimiento

Refence

Competitive Programming

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Contents

Part I

Number Theory

Chapter 1

Primes

1.1 Sieve of Eratosthenes

1.1.1 Get the Boolean Version

```
    std::vector<bool> isPrime(n + 1, true);                 //Ok, first, allocate space
    isPrime[0] = isPrime[1] = false;                        //Now, 0 & 1(maybe) are not prime

    for (T i = 4; i <= n; i += 2) isPrime[i] = false;       //Eliminate all the evens numbers

    for (T i = 3; i * i <= n; i += 2)                       //For every odd number < n
        if (isPrime[i])                                     //If we found a prime :0
            for (T j = i * i; j <= n; j += 2 * i)           //ForEach multiple we have'nt check
                isPrime[j] = false;                         //Each multiple is not prime

    return isPrime;                                         //Return the complete sieve
}

// *******   ERATOSTHENES SIEVE / VECTOR OF PRIMES    *******
```

1.1.2 Get the Vector of Primes

```
std::vector<T> EratosthenesSievePrimes(T n) {               //Return a vector of only primes
    std::vector<bool> isPrime(n + 1, true);                 //Create the origianl Sieve
    std::vector<T> Primes{2};                               //2 is a prime, dahhhhh!

    //isPrime[0] = isPrime[1] = false;                      //Uncomment if you want bool version
    //for (T i = 4; i <= n; i += 2) isPrime[i] = false;     //Uncomment if you want bool version

    for (T i = 3; i <= n; i += 2) {                         //For every odd number < n
        if (isPrime[i]) {                                   //If we still believe it's a prime
            Primes.push_back(i);                            //Add it to the vector, it's a prime

            if (i * i <= n)                                 //It make sense to delete multiples?
                for (T j = i * i; j <= n; j += 2 * i)       //ForEach multiple we have'nt check
                    isPrime[j] = false;                     //Each multiple is not prime
        }
    }

    return Primes;                                          //Return the vector of only primes
}
```