

204. Count Primes / Sieve of Eratosthenes

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$N = 40$ find out prime number till 40?

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37

// Brute force

Before solution \Rightarrow T.C $\Rightarrow n\sqrt{n}$

// Optimised \rightarrow multiple are removed and till \sqrt{n} .

	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

0 \rightarrow false (prime)

X \rightarrow true (not prime)

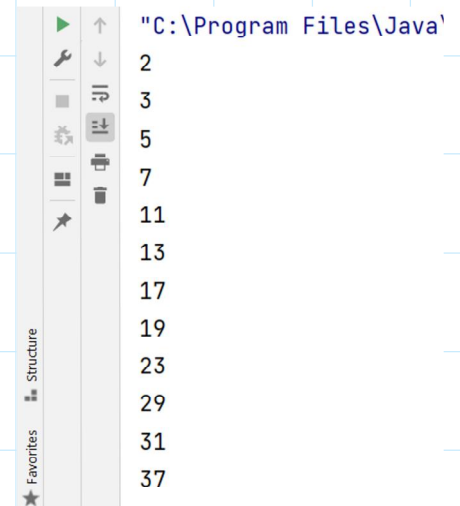
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37

```

public class Seive {
    public static void main(String[] args) {
        int n = 40;
        boolean[] primes = new boolean[n+1];    // array start from 0
        sieve(n, primes);
    }

    // false in array means number is prime
    static void sieve(int n, boolean[] primes){
        for (int i = 2; i*i ≤ n; i++) {
            if(!primes[i]){
                for (int j = i*2; j ≤ n; j+=i) {
                    primes[j] = true;
                }
            }
        }
        for (int i = 2; i ≤ n; i++) {
            if(!primes[i]){
                System.out.println(i + " ");
            }
        }
    }
}

```



$$S.C \Rightarrow O(n)$$

Time Complexity:

$$\frac{n}{2} + \frac{n}{3} + \frac{n}{5} + \frac{n}{7} + \dots$$

$$n \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \dots \right)$$

Harmonic Progression for primes



$$\log(\log N)$$

$$\text{Total T.C} \Rightarrow O(N * \log(\log N))$$

Leet Code 204