

* Count Primes

for each checking $2 \dots n-1$ for prime will give TLE

for each non prime value, take multiples & then ~~remove~~ ^{mark as not a} from primes. Then take the count

$$\begin{aligned} \text{loop } (2 \dots n) &\rightarrow O(n) \\ \text{loop } (j \leq n) &\rightarrow O(\log(\log n)) \end{aligned}$$

$O(n \log(\log n))$
 $O(n)$

$$\begin{aligned} &\text{for } i: \frac{n}{2} \\ &\text{for } i: \frac{n}{3} \\ &\text{for } i: \frac{n}{5} \\ &\text{for } i: \frac{n}{\dots} \end{aligned}$$

$$O\left(\frac{n}{2}\right) + O\left(\frac{n}{3}\right) + O\left(\frac{n}{5}\right) + \dots + O\left(\frac{n}{\text{last prime}}\right)$$

$$= O\left(\frac{n}{2} + \frac{n}{3} + \frac{n}{5} + \dots + \frac{n}{\text{last prime}}\right)$$

$$= O(n) * O\left(\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \dots + \frac{1}{\text{last prime}}\right)$$

$$= O(n) * O(\log(\log(n)))$$

$$= \underline{\underline{O(n \log(\log(n)))}}$$