

{% note info %} **摘要** Title: 874. 筛法求欧拉函数 Tag: 欧拉函数、线性筛 Memory Limit: 64 MB Time Limit: 1000 ms {% endnote %}

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874. 筛法求欧拉函数

• 题意

给定一个正整数 n ，求 $1 \sim n$ 中每个数的欧拉函数之和。

• 思路

可以利用线性筛把欧拉函数也筛出来 递推式为 $\varphi(ab) = \frac{\varphi(a)\varphi(b)\gcd(a,b)}{\varphi(\gcd(a,b))}$

所以可以推出来：

- $\varphi(\text{primes}[j]) = \text{primes}[j] - 1$
- 当 $i \% \text{primes}[j] == 0$ ， $\varphi(i * \text{primes}[j]) = \varphi(i) * \text{primes}[j]$
- 当 $i \% \text{primes}[j] \neq 0$ ， $\varphi(i * \text{primes}[j]) = \varphi(i) * (\text{primes}[j] - 1)$

ps: $\text{phi}[1] = 1$ 别忘了初始化

• 代码

```
...
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N = int(1e6 + 10)
st, phi, prime = [0] * N, [0] * N, [0] * N

def init(n):
    res, cnt = 0, 0
    phi[1] = 1
    for i in range(2, n + 1):
        if st[i] == 0:
            prime[cnt] = i
            phi[i] = i - 1
            cnt += 1
        j = 0
        while i <= n // prime[j]:
            st[i * prime[j]] = 1
            if i % prime[j] == 0:
                phi[i * prime[j]] = phi[i] * prime[j]
            else:
                phi[i * prime[j]] = phi[i] * (prime[j] - 1)
            j += 1
```

```
        st[i * prime[j]] = 1
        if i % prime[j] == 0:
            phi[i * prime[j]] = phi[i] * prime[j]
            break
        phi[i * prime[j]] = phi[i] * (prime[j] - 1)
        j += 1
    for i in range(1, n + 1):
        res += phi[i]
    print(res)

n = int(input())
init(n)
```