Counting Prime Numbers (5)

Euler's Totient Function

ϕ**(N)** = # of **1** $\leq$ **K** $\leq$ **N** such that

K and N are **relatively prime**

(i.e. **GCD(K,N)=1**)

Example (N=10)

1 2 **3** 4 5 6 **7** 8 **9** 10

$\Rightarrow \phi(10) = 4$

Leonhard
Euler
(1707-1783)

https://en.wikipedia.org/wiki/Leonhard_Euler

Counting Prime Numbers (6)

Euler's Totient Function $\phi(N)$

N	1	2	3	4	5	6	7	8	9	10
$\phi(N)$	1	1	2	2	4	2	6	4	6	4

Theorem The sum of $\phi(K)$, where K divides N, is equal to N.

Example (N=10)

$$\phi(1)+\phi(2)+\phi(5)+\phi(10) = 1+1+4+4 = 10$$

Counting Prime Numbers (7)

Theorem The sum of $\phi(K)$, where K divides N, is equal to N.

Example (N=10)

$$\phi(1)+\phi(2)+\phi(5)+\phi(10) = 1+1+4+4 = 10$$

$$\frac{1}{10} \quad \frac{2}{10} \quad \frac{3}{10} \quad \frac{4}{10} \quad \frac{5}{10} \quad \frac{6}{10} \quad \frac{7}{10} \quad \frac{8}{10} \quad \frac{9}{10} \quad \frac{10}{10}$$

$$\frac{1}{10} \quad \frac{1}{5} \quad \frac{3}{10} \quad \frac{2}{5} \quad \frac{1}{2} \quad \frac{3}{5} \quad \frac{7}{10} \quad \frac{4}{5} \quad \frac{9}{10} \quad \frac{1}{1}$$