Class 17

Thursday, May 19, 2022 9:19 PM

Euler Totient

phi

$\phi(n)$

সহমৌলিক

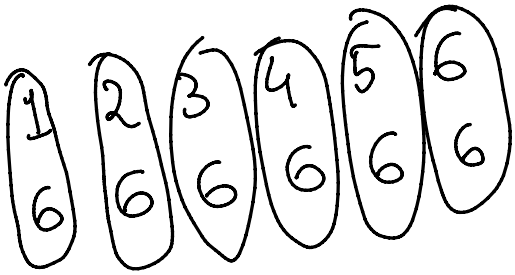
co-prime

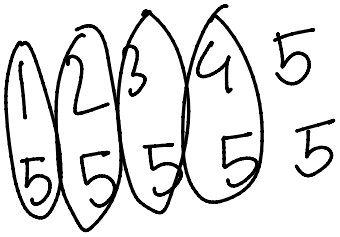
$\phi(P) = P-1$

$\phi(6) = 2$

$\phi(10) = 4$

$\phi(5) = 4$





$i < P$

$i \leq P$

$\gcd(i, P) = 1$

$i = 1 \ldots\ldots P$

$\phi(P) = P - 1$

$$N = P_1^{\alpha_1} \times P_2^{\alpha_2} \times P_3^{\alpha_3} \times P_4^{\alpha_4} \times \ldots\ldots \times P_K^{\alpha_K}$$

$$\phi(N) = N\left(1 - \frac{1}{P_1}\right)\left(1 - \frac{1}{P_2}\right) \ldots\ldots \left(1 - \frac{1}{P_K}\right)$$

$$= N \cdot \prod_{i=1}^{K}\left(1 - \frac{1}{P_i}\right) = N \cdot \prod_{i=1}^{K}\left(\frac{P_i - 1}{P_i}\right)$$

$$\phi(20) = 20 \cdot \frac{2-1}{2} \cdot \frac{5-1}{5} = \cancel{20}^{2} \cdot \frac{1}{\cancel{2}} \cdot \frac{4}{\cancel{5}}$$

$$\phi(20) = 8$$

$\phi(N) = N \cdot (x_1 \cdot x_2 \ldots\ldots)$

6/7 10/11

1 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

$\phi(n) \leq n$

$$\phi(14) = 14 \cdot \frac{2-1}{2} \cdot \frac{7-1}{7} = 7 \cdot \frac{6}{7} = 6$$

$$\frac{N}{x}(x-1) = \frac{Nx - N}{x} = N - \frac{N}{x}$$

$N - \left(\frac{N}{x}\right)$

$\frac{N(x-1)}{x}$