Class 15

Saturday, August 27, 2022 10:09 PM

$\phi(n) =$

$\phi(6) = 2$

$n = 6$: 1 2 3 4 5 6 / 6 6 6 6 6 6

$\phi(10) = 4$

$\phi(7) = 6 \rightarrow \phi(p) = p-1$

$f(ab) = f(a) \cdot f(b)$

$\phi(12) = \phi(2^2 \cdot 3)$

$= \phi(2^2) \cdot \phi(3) = \phi 4$

$2^2 \cdot \frac{1}{2} = 2 \cdot 2$

$\phi(p^k) = p^k - \frac{p^k}{p}$

$= p^k\left(1 - \frac{1}{p}\right)$

$= p^k\left(\frac{p-1}{p}\right)$

$27 - \frac{27}{3}$

27

$\phi(3^3) = 1$ [3, 6, 9, 12, 15, 18, 21, 24, 27]

```
cnt=0
for(i=1; i≤n; i
{
    if(_gcd(i,n)=
        cnt++;
}
```

↳ $\phi(n) = cnt$

1111

$\phi(10) = \phi(2 \times 5)$

$= \phi(2) \cdot \phi(5)$

$= 1 \cdot 4 = 4$

$\phi(12) = 1$

$\phi(4) = 1, 3$

$\phi(8) = 1, 3,$

$\phi(16) = 1, 3, 5$

$\phi(9) = 1, 2, 4$

$\phi(3^2) = 1, (3, 6,$

$$\phi(p) = p-1$$

$$\phi(p^k) = p^k \cdot \left(\frac{p-1}{p}\right)$$

$$\phi(n) = \phi(p_1^{\alpha_1}) \cdot \phi(p_2^{\alpha_2}) \cdots$$

$$n = p_1^{\alpha_1} \cdot p_2^{\alpha_1} \cdot p_3^{\alpha_3} \cdots p_1^{\alpha}$$

$$= p_1^{\alpha_1}\left(\frac{p_1-1}{p_1}\right) \cdot p_2^{\alpha_2} \cdots$$

$$= p_1^{\alpha_1} p_2^{\alpha_2} p_3^{\alpha_3} \cdots p_k^{\alpha_k} \left(\frac{p_1-1}{p_1}\right)\left(\frac{p_2-1}{p_2}\right) \cdots$$

$$\phi(n) = n\left(\frac{p_1-1}{p_1}\right)\left(\frac{p_2-1}{p_2}\right) \cdots = n \prod_{i=1}^{k} \left(\frac{p_i}{p}\right)$$

$$\phi(n) = n\left(\frac{1}{2}\right)\left(\frac{2}{3}\right)\left(\frac{4}{5}\right)\left(\frac{18}{19}\right)$$

$$a^{b} \% m = a^{[b\% \phi(m)]+\phi(m)} \% m$$

$$f(a,b,m) = f(a,[b\% \phi(m)]+\phi(m), m)$$

$$\phi(52) = \frac{2}{\cancel{52}}\left(\frac{1}{\cancel{2}}\right)\left(\frac{12}{\cancel{13}}\right) \quad 2,12$$

$1 \le T \le 10^5$

$1 \le N \le 10^6$

$\phi(N) = ?$

$n \longrightarrow \phi(n)$

$P = 2$

$P = 3$

$\phi(2) = 2\left(\frac{1}{2}\right)$

$\phi(4) = 4\left(\frac{1}{2}\right)$

$\phi(6) = 6\left(\frac{1}{2}\right)\left(\frac{2}{3}\right)$

$\phi(8) = 8\left(\frac{1}{2}\right)$

$\phi(10) = 10\left(\frac{1}{2}\right)$

$\phi(12) = 12\left(\frac{1}{2}\right)$

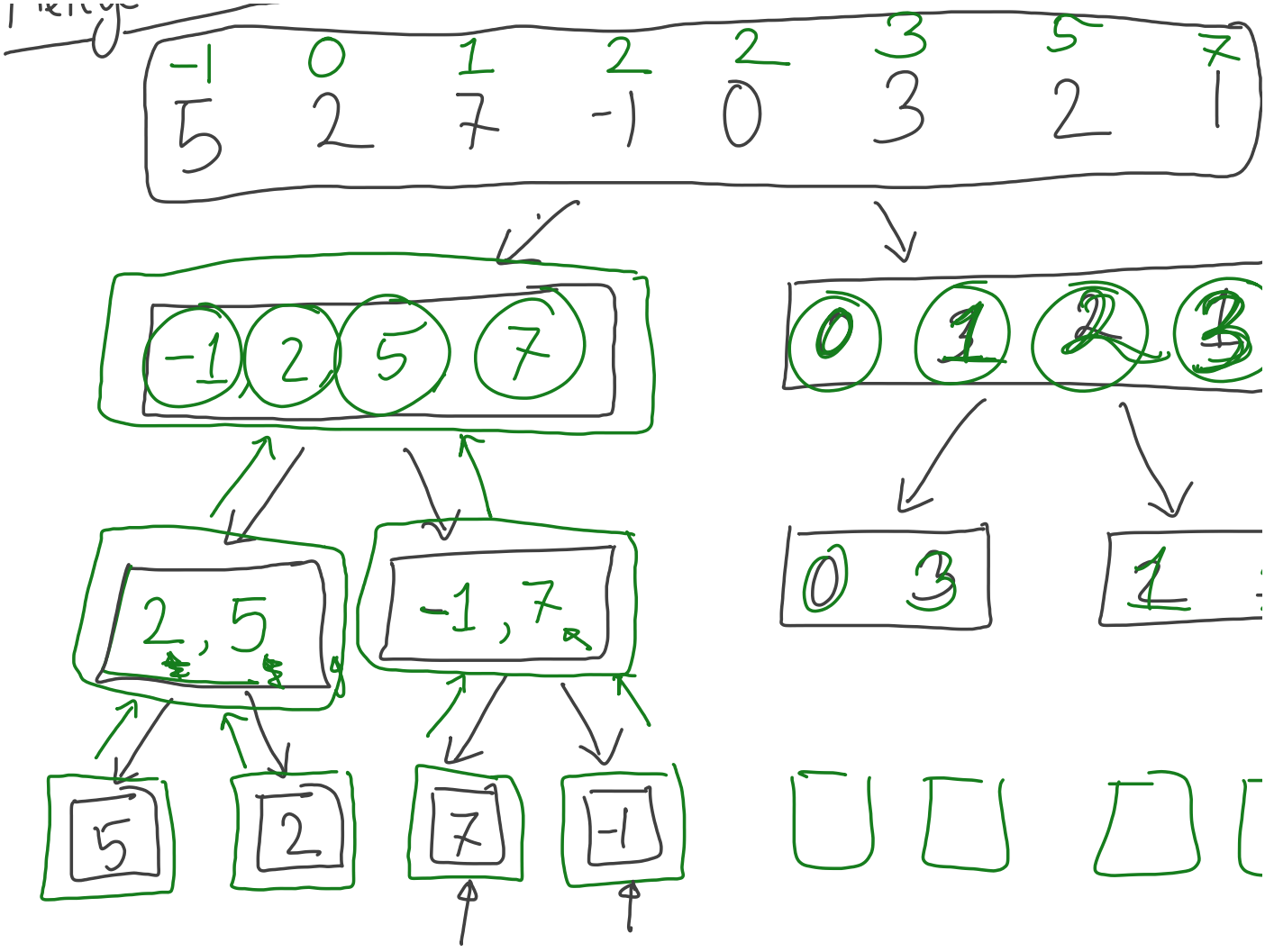
	x	↓	↓	↓	↓	↓	↓	↓	↓	↓
n	1	2	3	4	5	6	7	8	9	10
$\phi(n)$	1	2	3	4	5	6	7	8	9	10
		×1/2	×2/3	×1/2	×4/5	×1/2	×6/7	×1/2	×2/3	×1/2
						×2/3				×4/5
	1	1	2	2	4	2	6	4	6	4

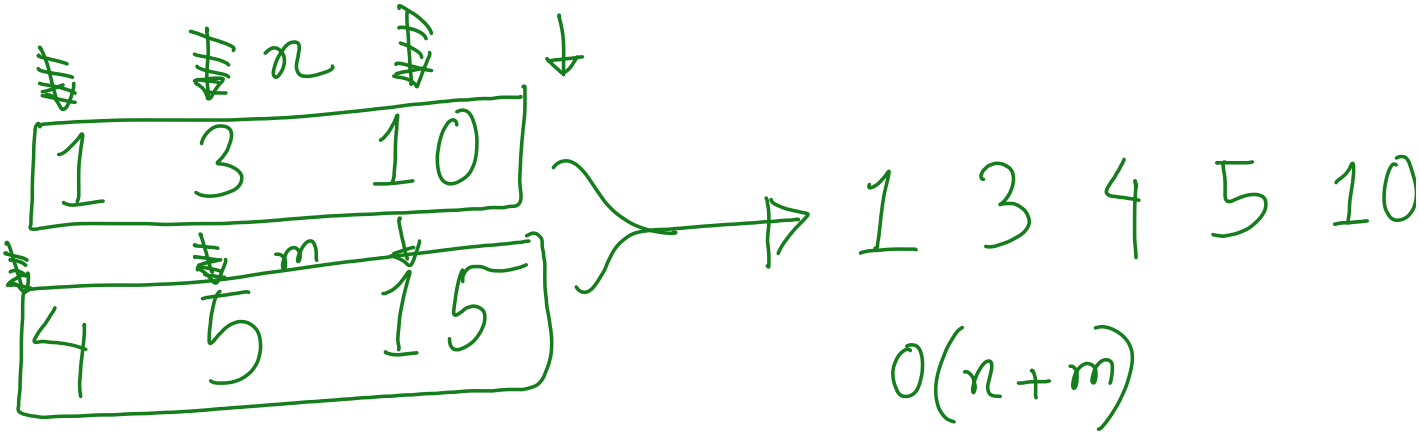
$n \rightarrow \frac{n}{i}(i-1) = \frac{ni - n}{i}$

$= \boxed{n - \frac{n}{i}}$

$n \rightarrow n -$

Merge Sort


-1 0 1 2 2 3 5 7
5 2 7 -1 0 3 2 1
-1 2 5 7
0 1 2 3
2,5
-1,7
0 3
1
5
2
7
-1


n
1 3 10
m
4 5 15
1 3 4 5 10
O(n+m)