Class 04

Thursday, March 3, 2022 8:52 PM

Bitwise operation

AND XOR

OR

NOT

$N = 10110101$

$\sim N = \underbrace{01001010}$

$13 \rightarrow 001101$

$21 \rightarrow 010101$

13 OR 21 $\rightarrow \boxed{011101} \rightarrow 29$

13 XOR 21 $\rightarrow \boxed{011000} \rightarrow 24$

NOT CYCLIC

<< left shift

$0010\ 0101 \rightarrow 37$

$0 \leftarrow 0100\ 1010 \rightarrow 74$

$2^{a_1} + 2^{a_2} + 2^{a_3} + \dots + 2^{a_p} = N$

$2^{a_1+K} + 2^{a_2+K} + 2^{a_3+K} + \dots + 2^{a_p+K}$

$= 2^k \cdot 2^{a_1} + 2 \cdot 2^{a_2} + \dots + 2 \cdot 2^{a_p}$

$= 2^k\left(2^{a_1} + 2^{a_2} + \dots + 2^{a_p}\right)$

$= 2^k \cdot N$

$= (2 \cdot N)$

$x, N \xrightarrow{N \text{ left shift}} \boxed{2^N \cdot x}$

Output

$1, N \longrightarrow 2^N \cdot 1$

$1 << N \longrightarrow 2^N$

2^{75}

$1 << 75$

$\boxed{1 \leq n \leq 10^{18}}$

$1_{10} \longrightarrow$ 0000 0001 $\to 2^0$

0000 0010 $\to 2^1$

0000 0100 $\to 2^2$

0000 1000 $\to 2^3$

$n = 24$

$\downarrow$

$12 \to 6 \to 3$

60

1|000 0000 000

$\downarrow$

$16_{10} \longrightarrow$ 000010000

$15_{10} \longrightarrow$ 000001111

0000 00000

$\log_2(N)$

$N \& (N-1) \longrightarrow 0$

$\longrightarrow$ perfect power of two

③ signed ⑧ unsigned

~ 10 ~ 10

$\downarrow$

0000 1010 0000 1010

1$\boxed{1111\ 0101}$ $\boxed{1111\ 0101}$

-11

000 1010

1011

$\sim n = (2^{b_n} - 1) - n$

$= (2^{32} - 1) - 10 =$

-11

$$= (2^{32} - 1) - 10 =$$

$$1 \longrightarrow 2^0$$
$$2 \longrightarrow 2^1$$
$$4 \longrightarrow 2^2$$
$$8 \longrightarrow 2^3$$
$$16 \longrightarrow 2^4$$
$$32 \longrightarrow 2^5$$

$$2^{k} = N$$

$$\Rightarrow \log(2^k) = \log(N)$$

$$\Rightarrow k \log(2) = \log(N)$$

$$\therefore k = \log_2(N)$$