True and True = True —— Boolean

1 and 1 = 1

5 and 2

↓ bitwise and

$5 = \underline{1}\,\underline{0}\,\underline{1}$, $2 = \underline{1}\,\underline{0} = 010$

3 bit   2 bit

101 and 010 = 000

5 and 2 = $\underline{\underline{0}}$

P & Q → Boolean

X & Y → bitwise

angka desimal : 0, 1, 2, 3, ..., 9 $(_{10})$

binary : 1, 0 $(_2)$

Hexadecimal : Basis 16

Decimal → Binary

Mod basis

5 → Binary

5 mod 2 = 1

2 mod 2 = 0

1 mod 2 = 1

101 = 00000101

0 mod 2 → stop

5 = □□□5

$5_{10} = 101_2$ $\sim 5 = -5 - 1$

$= -6$

$\sim 5 = 010$

$\sim 5 = 2$ →

& Bitwise And

$x \& 1 = 0$ (x genap)

$x \& 1 = 1$ (x ganjil)

$x \& (2^k - 1) = 0$ (x habis dibagi 2^k)

For loop

$x = 5$, $x \& = 1$, $x = 0$

p and q → True, jika dan hanya jika keduanya True

p → bit
q → bit

$\ldots x \; 0 \ldots = 0$ bit terakhir

$x = 1$ → x ganjil

$x = 0$ → x genap

$p \,\&\, 0 = 0$

$x \,\&\, 1 = x \,\&\, 0000\underline{1}$

$\underline{\ldots\ldots\ldots\ldots}$ $\underline{\text{bit terakhir}}$ x & $0000\ldots\underline{1}$

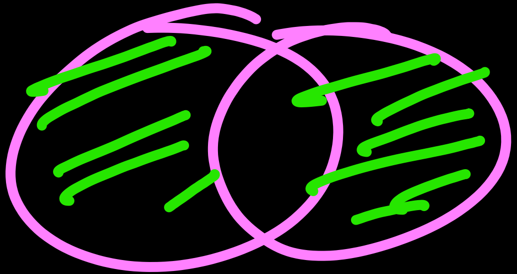
$= 0$

* Bitwise or

x or y = Menentukan apakah ada "1" didalam bit x atau y

* Bitwise xor (^)

x = Ap y = Ang



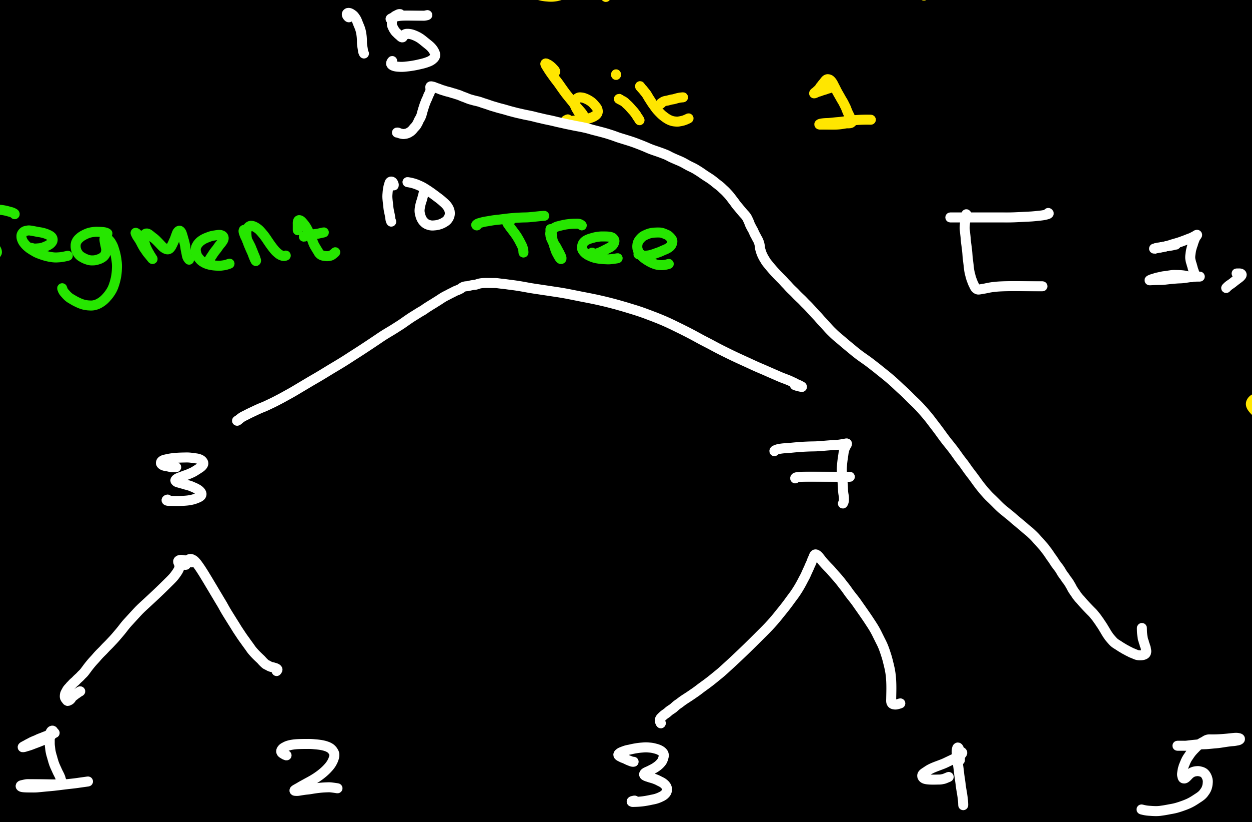
$$= (x \underset{\text{dan}}{\wedge} \overset{\text{Not}}{\neg} y) \vee (y \underset{\text{dan}}{\wedge} \overset{\text{not}}{\neg} x)$$

$\underline{X}$ xor $\underline{X} = 0$

$x \text{ xor } y = (x \,\&\, !y) \mid (y \,\&\, !x)$

↳ cek apakah salah sam (Tepat sam) antara x dan y mengandung bit 1

* Segment Tree



[1, 2, 3, 4, 5]

sum[l ... K]

* Bitwise Not

$$\sim x = \underline{-x - 1}$$
$$= -(x+1)$$

* Bit shifting

right shift

$$x \gg y \quad , \quad 5 \gg 2$$

$$10\cancel{1} \longrightarrow 10 \longrightarrow 1$$

y bit terakhir x kita hapus / buang

$5 >> 2 = 1$

$x << y$, $5 << 2$

$101 \rightarrow 10100 = 20$

$x << y \rightarrow$ tambahkan sebanyak y bit "0" pada bit x

$000101 \rightarrow 001010$

$\rightarrow 010100$

$$x >> y = \left\lfloor \frac{x}{2^y} \right\rfloor$$

$$x << y = x * 2^y$$

$$5 >> 2 = 1 = \left\lfloor \frac{5}{2^2} \right\rfloor$$

$$= \lfloor 5/4 \rfloor = 1$$

$$5 << 2 = 20 = 5 \times 2^2$$

$$= 20$$

$k = 1, 2, 3, 4, 5$

$$N \,\&\, (2^k - 1) = 0$$

$$N \,\&\, (N + 1)$$

$N = 2000$

$[1, 2, 3, 4, 5, \ldots, 2000]$

$N = 2001$

$[1, 2, 3, 4, 5, \ldots, 2000, 1]$

$N > 2000 \rightarrow$ pasti ada $(A_i = A_j)$

$$(1 \text{ xor } 2) * (1 \text{ xor } 3) * (1 \text{ xor } 4) * \ldots$$

$$* (1 \text{ xor } 2000) * (1 \text{ xor } 1) = 0$$

$N > 2000 \rightarrow$ hasil kali $= 0$

$N \leq 2000 \rightarrow$ bruteforce $\rightarrow O(N^2) = 10^6$

$$(a + b) \bmod n = ((a \bmod n) + (b \bmod n)) \bmod n$$

$$(a * b) \bmod n = ((a \bmod n) * (b \bmod n)) \bmod n$$

decimal : 0, 1, 2, 3, ..., 9 (basis 10)
binary : 0, 1 (basis 2)

* bagi 2

$5_{10} = 101_2$

5 mod 2 = 1

2 mod 2 = 0

1 mod 2 = 1

0 mod 2 → stop

7 = 111

101

7 mod 2 = 1

3 mod 2 = 1

1 mod 2 = 1

1 = 1

2 = 10

3 = 11

4 = 100

5 = 101

[1, 2, 3] → [3, 2, 1]

sum[3, 1] = sum[1, 3]

$[1, 2, 3, 4, 5]$

$sum[1 \ldots 2] = 1 + 2 = 3$

$sum[1 \ldots 3] = 1 + 2 + 3$

$= sum[1 \ldots 2] + 3$

$Prefix[N] = sum[1 \ldots N]$

$Pref[N] = Pref[N-1] + arr[N]$

$sum[L \ldots R]$

$[1, 2, 3, 4, 5, 6]$

$sum[1 \ldots 4] = 1+2+3+4$

$sum[3 \ldots 4] = 3+4$

$= \cancel{1+2}+3+4-(1+2)$

$sum[3 \ldots 4] = sum[1 \ldots 4] - sum[1 \ldots 2]$

$$sum[L \ldots R] = sum[1 \ldots R] - sum[1 \ldots L-1]$$

$$sum[1 \ldots N] = pref[N]$$

$$sum[L \ldots R] = pref[R] + pref[L-1]$$