**2’s complement**

* Finding 2’s complement 🡪 -5 🡪5(Binary rep) 🡪 Scan from right side till you find 1 and then reverse rest of the bits
* 10 🡪 01010 🡪 -10 🡪 10110
* -12 🡪01100(12) 🡪10100

**Operators for bitwise operations**

* bitwise operations are faster than arithmetic operations because they are executed using hardware circuits specifically designed for this purpose and can be executed in parallel. In contrast, arithmetic operations involve more complex calculations that require more processing time to execute.
* bitwise operations are faster than logical operations because they work on the individual bits of a number, allowing for parallel processing and hardware optimization

**5 &3 🡪 0101 & 0011 🡪 0001**.

**5 | 3 🡪 0101 | 0011 🡪 0111**

**5 ^ 3 (XOR)**

* + **a^a = 0**
  + **a^0 = a**

**~a (a complement)**

**<< left shift operator🡪 10<<2 = 10 \* (2\*\*2)**

**>> right shift operator 🡪 10>>2 = 10/(2\*\*2)**

**XOR**

Q-1 Important Questions . There are many numbers that are occurring more than once but there is only one number occurring only once find that number

a^a = a’s complement hence XOR every number in that array

2,2,3 🡪 2^ 3^2

Steps : 3^3 = 0 and then 0 ^ 3 =3

Extract ith bit …101.. via XOR with the number/ find via & operation via keeping 1 at that position and keeping 0 in other places and then you will get the number at ith place

**AND**

Q-2 Detect even or odd

100 & 1 =0 (even & 1 =0 and odd & 1 = 1)

**OR**

Set the ith bit