**left shift**

N<<i

N is the number being LEFT shifted by i

eg. 2<<i

**right shift**

N>>i

N is the number being RIGHT shifted by i

eg. 2<<i

**BITMASKING: manipulating numbers so that to change the value of bits at different positions in the same number.**

**BITMASK - This is done through an additional number which is named as bitmask.**

Bitmasking is **the act of applying a mask over a value to keep, change or modify a piece of given information**

Masking is a general concept in which we keep, change, or remove some part of the information.

Note: Every process will have different bitmask, so first identify bitmask and then identify which operation to perform.

**Four major operations on binary numbers:**

1. GET - In a binary number, to know the bit at ith position.
2. SET - In a binary number, to set the bit at ith position as 1, i.e, if 0 set it to 1/ if 1 -> let it be 1
3. CLEAR - In a binary number, make the bit at ith position as 0, i.e, if 0 leave it to 0/ if 1 -> make it 0

4. UPDATE - In a binary number, update the bit at ith position as 0 if 1 and vice- versa

1. **GET**

**Get the 3rd bit (position=2) of a number n. (n=0101)**

Note: Here, position starts from right -> left

1. 1 0 1

3 2 1 0 (positions of bits)

**Process layout to do GET OP/R – (here position-i)**

1. **Bit Mask: 1<<i ( i.e, making bit mask)**  -> 1<<2
2. **Operation: AND**
3. **Check AND operation resultant is equal to zero or not**
4. **OBTAIN BITMASK 1<<i**
5. << 2

0 0 0 1 << 2

1. **1 0 0 -**🡪 **Final bitmask obtained**
2. **Operation: AND**

Perform and operation for **(n=0101)** with bitmask.

**0100 & 0101 = 0100 (4)**

Thus, we GET our value of bit at position 2.

**LOGIC:** originally phle Step a. me number tha 1 -> 0001.

Iska 2 position tk left shift op/r krne pr mila 0100 🡪 ye binary number h bitmask.

Bitmask me dhyan dene wali baat h ki number 2nd position pe shift ho gayi h jiise ki 2n posn pe hi 1 and baki sb jagah 0 h.

Ab jb Step b. me number 0101 (decimal h 5) k saath AND op/r with bitmask krenge to 2nd position hi 1 rhega baki sb 0 ho jayega kyunki AND me 1 & 1 -> 1 hota h; 0 & 1 -> 0; 0 & 0 -> 0.

1. **Check number is zero or 1**

Number 1 h kyunki 0100 me 2nd posn 1 h. agar 0 hot to sb 0 hota -> 0000. Iska mtlb ki n =0101 ka 2nd posn ka bit h = 1.

Ye hua get operation for a bit in any binary number.