Assignment Solution

Number System

① num = 5

Binary Representation

$\rightarrow$ 101 ✓

$O\left(\log \frac{n}{2}\right)$

```
2 | 5
2 | 2   1
  | 1   0
```

1×2^2
4

MSB | LSB

0×2^1
0

1×2^0
1

= 5

AND

A	B	O/P
1	1	1
0	1	0
1	0	0
0	0	0

while (num > 0)

① 5 & 1 = ① LSB

```
101
001
001 = 1
```

2 & 1 = 0

2 >> 1 = 1
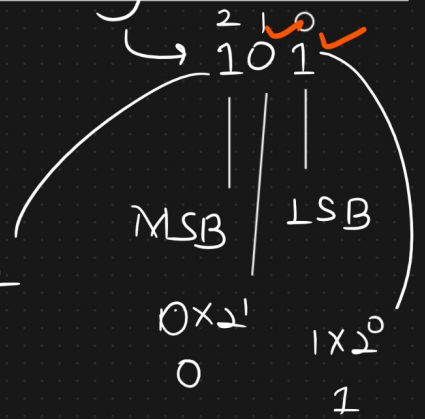
```
 010
 001
 000
```

101
010 → 2

Right shift ② 5 >> 1 = 2

num

Division
by 2

1 & 1 = 1

1 >> 1 = 0

○ 1 0
0 0 1 → 1

101

5 = num

$$num = 15 \longrightarrow 1111$$

$$15 = \underset{1*2^3}{8} + \underset{1*2^2}{4} + \underset{1*2^1}{2} + \underset{1*2^0}{1}$$

② Power of 2

Set bit $\rightarrow$ "1"

$$\left\{ \begin{array}{l} 4 \underline{\hspace{1cm}} 100 \\ 2 \underline{\hspace{1cm}} 10 \\ 8 \underline{\hspace{1cm}} 1000 \\ 16 \underline{\hspace{1cm}} 10000 \end{array} \right.$$

100

$$\underline{num = 4} \quad \& \quad \underline{num-1 = 3} \overset{\curvearrowright}{} 011$$

$$\underbrace{}$$

$$\underline{\underline{O}}$$

100
011
___
000
___

$$\left\{ \begin{array}{l} \left(num \ \& \ num-1\right) == 0 \\ \\ \underline{return \ true} \\ \\ else \\ \\ \underline{return \ false} \end{array} \right.$$

③   num = 6 $\longrightarrow$ 110

(Even Num) $\dfrac{001}{000}$

$\dfrac{(num \ \& \ 1) == 0}{}$

           $\longrightarrow$ Even

num = 8 $\dfrac{\begin{matrix}1000\\0001\end{matrix}}{0000}$

Even

num = 9 $\dfrac{\begin{matrix}1001\\0001\end{matrix}}{0001}$

Odd

④   num = 15 $\dfrac{1111}{}$ $\dfrac{\begin{matrix}1110\\0001\end{matrix}}{0001}$

          $\longrightarrow$ count = 4

getSetBits (num)

   while (num > 0) ⋊ $\dfrac{\begin{matrix}0111\\0001\end{matrix}}{0001}$

     Count += num & 1;

               $O(\log_2 n)$

     num = num >> 1;

4
return count)

↑ Return
Odd times
(freq)

XOR Operation

⑤

0 1 2 3 4 5 6 7 8 9 10
arr[] = [4, 3, 6, 2, 6, 4, 2, 3, 4, 3, 3]

$0 \wedge 4 = 4$
$4 \wedge 4 \wedge 4$

4 ——— 3
3 ——— 4 ✓
6 ——— 2 ✓
2 ——— 2 ✓

Result = 4

$3 \wedge 3 \wedge 3 \wedge 3$
$0 \wedge 0 = 0$

$6 \wedge 6 = 0$

1 1

$2 \wedge 2 = 0$

XOR Operation

A XOR A = 0

A XOR 0 = A

$4 \wedge 0 = 4$

A	B	O/P
0	0	0
0	1	1
1	0	1
1	1	0

time Complexity = $O(n)$

Space Complexity = $O(1)$