

Q Array. Every number occurs twice except one num that occurs once. Find that unique no.

Eg1

4	5	5	4	1	6	6				ans = 1
7	5	5	1	7	6	1	6	4		ans = 4

Brute: Count the freq for every elem
TC: $O(N^2)$

Idea: what is $a \wedge a = 0$

Hence what is $a \wedge c \wedge b \wedge a \wedge c = b$

Obs: XOR of all elems = unique

Code

```
ans = 0
for (i=0; i<n; i++) {
    ans = ans ^ arr[i]
}
```

TC: $O(n)$

return ans

Dry run

2 4 6 4 2

$\cancel{2} \wedge \cancel{4} \wedge \cancel{6} \wedge \cancel{4} \wedge \cancel{2}$

Q2 Array. Every number occurs thrice except one num that occurs once. Find that unique no.

Eg: 4 5 5 4 1 6 6 4 5 6 ans = 1

Brute: Count the freq for every elem
TC: $O(N^2)$

Idea:

	5	7	5	9	7	11	11	7	5	11
			3		2		1		0	
5	0			1			0			1
7	0			1			1			1
5	0			1			0			1
9	1			0			0			1
7	0			1			1			1
11	1			0			1			1
11	1			0			1			1
7	0			1			1			1
5	0			1			0			1
11	1			0			1			1
	<u>4</u>			<u>6</u>			<u>6</u>			<u>10</u>

Obs: If bit count is divisible by 3 \rightarrow bit is OFF in unique
If bit count is not divisible by 3 \rightarrow bit is ON in unique

Code

```
ans = 0
for ( bit = 0 ; bit < 32 ; bit ++ ) {
    count = 0
    for ( i = 0 ; i < n ; i ++ ) {
        if ( checkbit (a[i], bit) == true )
            count ++
    }
    if ( count % 3 != 0 )
        ans = ans | 1 << bit
}
```

return ans ,

TC: $32n = O(n)$

Q3 Array. Every number occurs twice except two num
that occurs once. Find that unique numbers
eg 4 5 4 1 6 6 5 2 and = 1 2

Idea: xor might help like prev ques?

$$a \wedge b \wedge c \wedge d \wedge c \wedge d = a \wedge b$$

xor of array = xor of the two unique numbers

Now lets say xor of $a \wedge b = c$

Some bit will be set in c .

lets say i^{th} bit is set in c ($a \wedge b$)

\Rightarrow This means that

a and b are different on i^{th} bit

a	b
$a \wedge b$	$\frac{1}{i^{\text{th}}}$

Idea: Find xor of array = $a \wedge b = c$

Find a set bit in c . (say i^{th} bit)

Divide the array into parts

i^{th} bit = 0	i^{th} bit = 1
----------------------------	----------------------------

4 5 4 1 6 6 5 2

2 1 0
0 1 1

no. of array = 3

take 0th bit as the ON bit

4 5 4 1 6 6 5 2

↓ 0th bit ON

5 1 5

↓ 0th bit OFF

4 4 6 6 2

no. 1

no. 2

3 4 3 1 4 5 5 11

no. = 10

1 0 10

3 2 1 0

↓ bit 1 ON

3 3 11

↓ bit 1 OFF

4 1 4

5 5

no₁

no₂

2 2 6 1

no. = 7

1 1 1
2 1 0

↓ 0th bit

2 2 6

1

Code

1) find xor of all array nums. = C

```
pos = 0
for (bit = 0; bit < 32; bit++) {
    if (checkbit(c, bit)) {
        pos = bit
        break
    }
}
```

$a = 0$ $b = 0$

```
for (i = 0; i < n; i++) {
    if (checkbit(a[i], pos)) {
        a ^= a[i]
    }
    else {
        b ^= a[i]
    }
}
```

print(a)
print(b)

$$\begin{array}{r} 101 \\ 101 \\ \hline 101 \end{array}$$

$$\begin{array}{r} 101 \\ 110 \\ \hline 100 \end{array} \quad 4$$

Q4 Max AND Pair.

Find the index pair with max AND value

Eg → ⁰5 ¹4 ²6 ³8 ⁴5 ans = 0, 4

Hint: Check for all the pairs

Idea: Use bits here

Eg

	26	13	23	28	27	7	25				
	5	4	3	2	1	0	4	3	2	1	0
26	0	1	1	0	1	0	1	1	0	1	0
13	0	0	1	1	0	1	= 26				
23	0	1	0	1	1	1	26 & 27 = 26				
28	0	1	1	1	0	0					
27	0	1	1	0	1	1					
7	0	0	0	0	1	1					
25	0	1	1	0	0	1					

Iterate from the highest bit. For a pair to have this bit = 1, atleast 2 people should have this bit set as 1

Now, for people with 0 this place → make them 0

	4	3	2	1	0
26	1	1	0	1	0
13	0	1	1	0	1
23	1	0	1	1	1
28	1	1	1	0	0
27	1	1	0	1	1
7	0	0	0	1	1
25	1	1	0	0	1

{26, 27} → 1

{26, 26, 27} → 3

{4 elem} = 6
 $\frac{4 \times 3}{2}$

$n \rightarrow \frac{n(n-1)}{2}$

- 1) big bit to small bit
- 2) if ≥ 2 ON, then ans is ON
- 3) eliminate 0's

Code

ans = 0

for (bit = 31 ; bit > 0 ; bit--) {

 count = 0

 for (i = 0 ; i < n ; i++) {

 if (checkbit (a[i], bit))

 count ++

 }

 if (count < 2)

 continue ;

 ans = ans | 1 << bit

 for (i = 0 ; i < n ; i++) {

 if (checkbit (a[i], bit) == false)

 a[i] = 0

 }

}

return ans

TC: $O(n)$

Q Prev ques. Count number of pairs with max AND value

⇒ simple idea.

at the end. some $a[i] = 0$
some $a[i] > 0$

get count of > 0 . say x

⇒ you can take any 2 of them.

$$\text{ans} = \frac{x(x-1)}{2}$$

②

④

4

3

$$\frac{4 \times 3}{2}$$

①

③

③

①

15 Dec
Friday
Contest

Arav
Bis