

19 June 2023 19:10
 $\text{odd} \rightarrow \text{odd}$
 $1 \rightarrow 1$

You are given an array of elements in which all numbers are appearing twice, except two numbers.

$\bar{5}, \bar{8} \bar{2}, \bar{3}, \bar{4}, \bar{3}, \bar{2}, \bar{6}$

Find out those 2 numbers: \rightarrow

\sum XOP of a number with itself is always '0'

what does it signify?? \nearrow

$$\begin{array}{c}
 \text{Diagram showing } 11 + 5 = 16 \\
 \begin{array}{r}
 \overset{+}{\textcircled{1}} \overset{+}{\textcircled{1}} \quad \rightarrow 3 \\
 \overset{+}{\textcircled{5}} \quad \rightarrow 5 \\
 \hline
 \overset{+}{\textcircled{1}} \overset{+}{\textcircled{0}} \quad \rightarrow 6.
 \end{array}
 \end{array}
 \qquad \mid \qquad
 \begin{array}{c}
 \text{Diagram showing } 11 + 5 = 16 \\
 \begin{array}{r}
 \overset{+}{\textcircled{1}} \overset{+}{\textcircled{1}} \quad \rightarrow 3 \\
 \overset{+}{\textcircled{5}} \quad \rightarrow 5 \\
 \hline
 \overset{+}{\textcircled{1}} \overset{+}{\textcircled{0}} \quad \rightarrow 6.
 \end{array}
 \end{array}$$

6, 8, 2, 3, 4, 3, 2, 6

3	2	1	0	
9	4	2	1	
0	1	1	0	6 → grille
0	0	1	0	3 → twirl
0	0	1	1	2 → twirl
0	0	1	0	8 → grille
1	0	0	0	4 → grille
0	1	0	0	9 → twirl

6 → grille
3 → twirl
2 → twirl
8 → grille
4 → grille
9 → twirl

Of numbers
 which are
 not → factors
 of 2^{nd} 6^{th} 3^{rd}
 bit and diff.

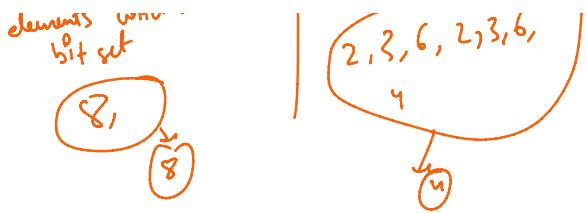
XOXI - -

1st Club
 elements having 1st bit set.
 { 6, 5, 9 }
 $\therefore P = 4$

2nd Club
 elements having 2nd bit set.
 { 2, 1 }
 $\therefore P = 2$

$\therefore P = 8$

elements with 3rd bit set



For a particular bit in binary, each no. has 2 choices, either that bit will be set or not

$$\begin{array}{c} 6 \\ \text{or} \\ 7 \end{array}$$

$$\{6, 8, 4, 3, 2, 3, 2, 6\} \rightarrow \text{XOR} = 12$$

// finding out first/diff. bit because it is carry

→ You can given number (XOR) find out its first set bit from right:

(1100) → 2nd bit is set
 $c++ \rightarrow \text{set bit}$
 while (num)
 if (num > 0)
 break;
 $c++;$
 $\text{num} = \text{num} \gg 1;$

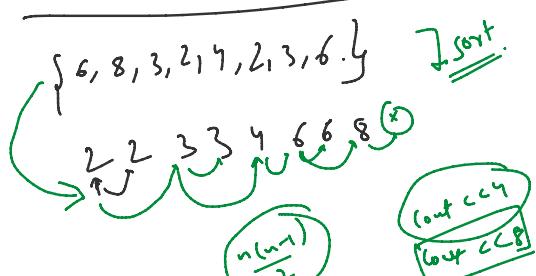
1100
 1011
 -
 1011

$c=2$

mask = 1 << c;
 all f → 4.
 6 ← mask = 00001
 0x00001
 ~ 1st bit
 setbits = 0
 unsetbits = 0.

for (int i = 0; i < n; i++)
 if (mask & arr[i]) → bit is set
 $\text{set}^{\wedge} = \text{arr}[i];$

else $\text{unset}^{\wedge} = \text{arr}[i];$
 $\text{out} \ll \text{set} \ll \sim \text{t} \ll \text{unset} \ll \text{endl};$





$12 \rightarrow \begin{array}{c} 1100 \\ -1101 \\ \hline 1000 \end{array}$
 You have to walk 4 bits (last from left)
 (first bit from right) set bit 0.

$i/p(12) \rightarrow 8 o/p.$

$i/p(10) \rightarrow 6 o/p.$

$10 \rightarrow \underline{\underline{0}}.$

$\begin{array}{r} 00010000 \\ \underline{\underline{11101111}} \\ \hline 00010000 \end{array}$
 4th bit
 mask $\rightarrow 0$
 mask $\rightarrow 1$.

$\text{mask} = 1 \ll 4$
 $\sim (00010000) = \underline{\underline{11101111}}$

$12 \rightarrow 8$
 $1100 \quad \underline{\underline{1000}}$

$\sim \begin{array}{c} 1100 \\ 0001000 \\ \hline 1000 \end{array} \rightarrow 8/p.$

483
 $\begin{array}{r} 100 \\ 011 \\ 000 \\ \hline 1100 \end{array}$
 $887 \rightarrow \begin{array}{r} 1000 \\ 0111 \\ 0000 \\ \hline 1100 \end{array}$
 $1 \rightarrow (011) \rightarrow 0$
 $2 \rightarrow (010) \rightarrow 0$
 $4 \rightarrow (000) \rightarrow 0$
 $8 \rightarrow (001) \rightarrow 0$
 $16 \rightarrow (011) \rightarrow 0$
 $32 \rightarrow (100) \rightarrow 0$
 $64 \rightarrow (101) \rightarrow 0$
 $128 \rightarrow (110) \rightarrow 0$
 $256 \rightarrow (111) \rightarrow 0$
 $512 \rightarrow (000) \rightarrow 0$
 $1024 \rightarrow (000) \rightarrow 0$

12
 $\begin{array}{c} 1 \\ 0 \\ 1 \\ 1 \\ 0 \\ 0 \end{array}$
 $(8+4) + (3+2) \rightarrow 0$
 $12 \rightarrow 8$
 $11 \rightarrow \begin{array}{c} 1100 \\ -1011 \\ \hline 0000 \end{array}$
 $12811 \rightarrow 0$

$[n/8(n-1)] \rightarrow i^t \text{ with } \text{set}$
 last set bit to 0.

$8:40 \text{ PM} \rightarrow \text{or with } \underline{\underline{0}}$

Prefix Array

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

5 times $\oplus[6, 5] \rightarrow$ find out the sum of elements from $arr[4]$ index
 → $1 + 2 + 3 + 4 + 5 = 15$

4 times $\oplus[2, 5] \rightarrow 3 + 4 + 5 + 6 \rightarrow 18$.

3 times $\oplus[1, 3] \rightarrow 9 = 2 + 3 + 4$.

6 times $\oplus[0, 1] \rightarrow 2$

array has $\frac{10^6}{10^6}$ elements.
 gives $\frac{10^6}{10^6}$ qualities
 at most $10^6 \times 10^6$ computations
 In C++, in \leq sec. you can do almost 10^8 computations
 → 10^{12} computations → TLC (Time limit exceeded.)

$$arr = \{1, 2, 3, 4, 5, 6\}$$

$$\rightarrow pref.arr[] = \{1, 3, 6, 10, 15, 21\} \leftarrow$$

$$\begin{aligned} \text{pref.arr}[0] &\rightarrow arr[0] \\ [1] &\rightarrow arr[1] + arr[0] \\ [2] &\rightarrow arr[2] + arr[1] + arr[0] \\ [3] &\rightarrow arr[3] + arr[2] + arr[1] + arr[0] \end{aligned}$$

$$\{ \oplus[0, i] \rightarrow \text{pref.arr}[i] - \text{pref.arr}[0-1]$$

$$\{ \oplus[1, 5] \rightarrow (1) \rightarrow \text{pref.arr}[5] - \text{pref.arr}[0-1] \rightarrow 21 - 1 = 20.$$

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

$$pref.arr = [1, 3, 6, 10, 15, 21]$$

$$pref.arr[0] = arr[0]$$

for (int $i=1$; $i < n$; $i++$)

$$i = 1$$

if n times
 10⁶ elements
 are given → 10⁶ times

$$\{ \text{pref.arr}[i] = arr[i] + \text{pref.arr}[i-1];$$

$$(3) \oplus(2)$$

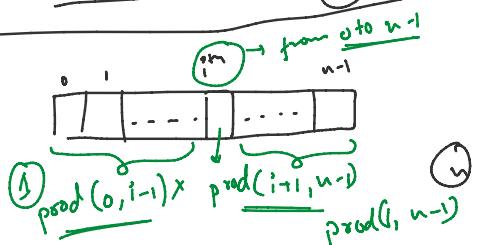
10^6 queries can give
 $\rightarrow 2 \times 10^6$ computations
 $\rightarrow 3 \times 10^6$ computation < 10^8
 for $\text{1 query } [i, j]$
 $\rightarrow p[i] - p[i-1]$
 \downarrow
 \downarrow computation
 \downarrow computation

If more than 1 zero \rightarrow all zeros
 \rightarrow $\text{0} \rightarrow \text{Sol};$
and print (arr)

\rightarrow if there is only 1 zero / no zero

at the index of 0
 prod. of rest of the array
 will come to be at the end of the array with some

\downarrow
 $\text{prod of arr} = 1 \rightarrow \text{prod. of whole array}$
 $\left\{ \begin{array}{l} \text{for (int } i=0; i < n; i++) \\ \quad \text{prod}[\text{arr}/\text{arr}[i]] \times \text{end} \end{array} \right.$



$i=0 \text{ to } n-1$
 $\text{ans}[i] = \text{prod}(0, i-1) \times \text{prod}(i+1, n-1)$
 \downarrow
 \downarrow computation

$10^6 \rightarrow 10^6$ computations

$\text{ans}[i] = \text{prod}[0 \text{ to } i-1] \times \text{prod}[i+1, n]$

$i=0$ $i=1$ $i=2$ $i=3$ \vdots $i=n-2$ $i=n-1$	$\text{prod}[0, 1]^2$ $\text{prod}[0] \times \text{prod}[0, 1] \times \text{prod}[2, n-1]$ $0 \cdot \text{prod}[0, 2] \times \text{prod}[3, n-1]$ $[\text{prod}[0, 3]] \times \text{prod}[4, n-1]$ $[\text{prod}[0, n-3]] \times \text{prod}[n-1]$ $[\text{prod}[0, n-2]] \times \text{prod}[n, n-1]$
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\uparrow
 \uparrow

$a(0) \times a(1) \times \dots \times a(3)$
 $(1 \times a[0]) \times (1 \times a[1] \times a[2]) \times \dots$

$\text{left bracket fix.} \rightarrow$

