

# Bit-Manipulation



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Find the original  
Array of Prefix Xor

Company :-



## 2433. Find The Original Array of Prefix Xor

Medium

693

37



Companies

You are given an **integer** array **pref** of size **n**. Find and return the array **arr** of size **n** that satisfies:

- $\text{pref}[i] = \text{arr}[0] \oplus \text{arr}[1] \oplus \dots \oplus \text{arr}[i]$ .

Note that  $\oplus$  denotes the **bitwise-xor** operation.

It can be proven that the answer is **unique**.

Example :-  $\text{pref} = [5, 2, 0, 3, 1]$  ←

$\text{arr} = [5, 7, 2, 3, 2]$

$$\begin{aligned} \text{pref}[4] \oplus \text{pref}[3] &= \text{arr}[4] \\ \text{pref}[i] \oplus \text{pref}[i-1] &= \text{arr}[i] \end{aligned}$$

$5 = a_0$

$2 = a_0 \oplus a_1$

$0 = a_0 \oplus a_1 \oplus a_2$

$3 = a_0 \oplus a_1 \oplus a_2 \oplus a_3$

$1 = a_0 \oplus a_1 \oplus a_2 \oplus a_3 \oplus a_4$

$3 \oplus 1 = (a_0 \oplus a_1 \oplus a_2 \oplus a_3) \oplus (a_0 \oplus a_1 \oplus a_2 \oplus a_3 \oplus a_4)$

||

$$\begin{array}{r} 01 \\ \hline 10 \end{array}$$

$$= (\cancel{a_0 \wedge a_0}) \wedge (\cancel{a_1 \wedge a_1}) \wedge (\cancel{a_2 \wedge a_2}) \wedge (a_3 \wedge a_3) \wedge a_4$$

$$2 = a_4$$

Associative  $\Rightarrow \underline{(a \wedge b) \wedge c} = \underline{a \wedge (b \wedge c)}$   $\Leftarrow$

Commutative  $\Rightarrow \underline{(a \wedge b)} = \underline{(b \wedge a)}$   $\Leftarrow$

XOR  $\Rightarrow$

$\cancel{1} \wedge \cancel{1}$	$= \textcircled{0}$	$\Leftarrow$
$\cancel{1} \wedge 0$	$= \textcircled{1}$	
$0 \wedge \cancel{1}$	$= \textcircled{1}$	
$0 \wedge 0$	$= \textcircled{0}$	

Story to code...

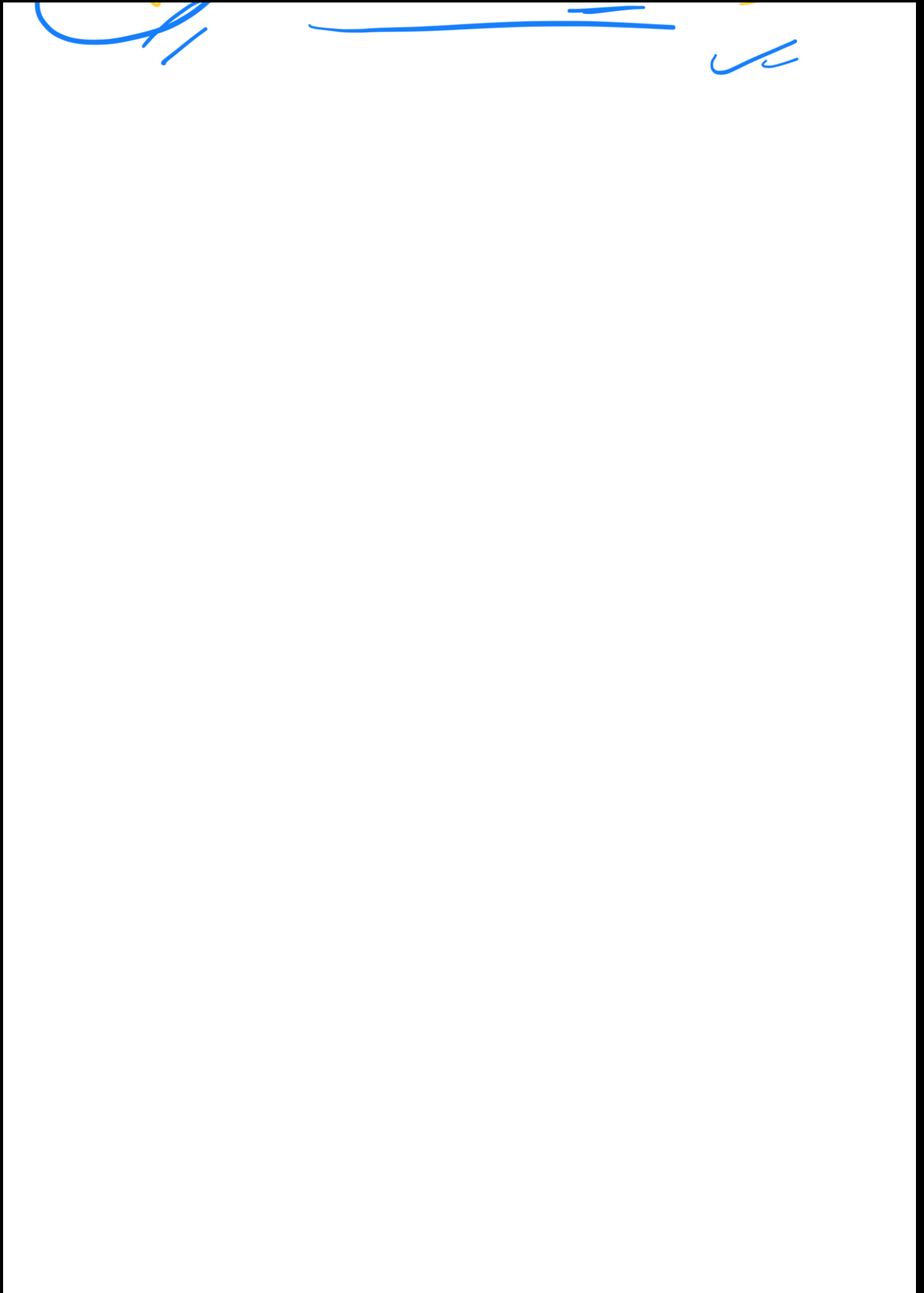
(a) arr

(b)  $arr[0] = pref[0]$

(c)  $arr[i] = pref[i] \wedge pref[i-1]$

T.C.  $O(n)$

pref = { <sup>0</sup>5, <sup>1</sup>7, <sup>2</sup>2, <sup>3</sup>3, <sup>4</sup>2 }



the 1990s, the number of people in the world who are under 15 years of age has increased by 1.2 billion (United Nations 1999).

There is a growing awareness of the need to address the needs of children in the 21st century. The United Nations Convention on the Rights of the Child (1989) has been signed by 112 countries, and the United Nations Millennium Declaration (2000) has set out a commitment to 'ensure that all children, everywhere, have access to primary education by 2015'. The United Nations Secretary-General Kofi Annan (1999) has called for 'a new global compact for children' to ensure that the rights of children are protected and promoted.

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