Exit full screen

Problem

You are given arrays A and B with N non-negative integers each.

An array X of length N is called *good*, if:

- All elements of the array X are non-negative;
- $X_1 \mid X_2 \mid \ldots \mid X_i = A_i$ for all $(1 \le i \le N)$;
- $X_i \,\&\, X_{(i+1)} \,\&\, \ldots \,\&\, X_N = B_i$ for all $(1 \le i \le N)$.

Find the **maximum** bitwise XOR of all elements over all good arrays X.
More formally, find the maximum value of $X_1 \oplus X_2 \oplus \ldots X_N$, over all good arrays X.
It is guaranteed that at least one such array X exists.

Note that $|$, $\&$, and $\oplus$ denote the bitwise or, and, and xor operations respectively.

Input Format

- The first line of input will contain a single integer T, denoting the number of test cases.
- Each test case consists of multiple lines of input.
  - The first line of each test case contains one integer N — the size of the array.
  - The next line contains N space-separated integers describing the elements of the array A.
  - The next line contains N space-separated integers describing the elements of the array B.

Output Format

For each test case, output on a new line, the **maximum** bitwise XOR of all elements over all good arrays X.

Constraints

- $1 \le T \le 10^5$
- $1 \le N \le 10^5$
- $0 \le A_i < 2^{30}$
- $0 \le B_i < 2^{30}$
- It is guaranteed that at least one such array X exists.
- Sum of N over all test cases is less than $3 \cdot 10^5$.

Sample 1:

Input	Output
2 3 0 3 3 0 2 2 2 2 3 0 1	1 3

Explanation:

Test case 1**:** An optimal *good* array is $X = [0, 3, 2]$.

- For $i = 1$: $A_1 = X_1 = 0$ and $B_1 = X_1 \,\&\, X_2 \,\&\, X_3 = 0$.
- For $i = 2$: $A_2 = X_1 \mid X_2 = 3$ and $B_2 = X_2 \,\&\, X_3 = 2$.
- For $i = 3$: $A_3 = X_1 \mid X_2 \mid X_3 = 3$ and $B_3 = X_3 = 2$.

The XOR of all elements of X is $0 \oplus 3 \oplus 2 = 1$. It can be proven that this is the maximum XOR value for any X.

Test case 2**:** An optimal *good* array is $X = [2, 1]$.

- For $i = 1$: $A_1 = X_1 = 2$ and $B_1 = X_1 \,\&\, X_2 = 0$.
- For $i = 2$: $A_2 = X_1 \mid X_2 = 3$ and $B_2 = X_2 = 1$.

The XOR of all elements of X is $2 \oplus 1 = 3$. It can be proven that this is the maximum XOR value for any X.

More Info

Contributors