

Programming (/courses/programming)
/ Bit Manipulation (/courses/programming/topics/bit-manipulation/)
/ Different Bits Sum Pairwise

Different Bits Sum Pairwise

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We define $f(X, Y)$ as number of different corresponding bits in binary representation of X and Y . For example, $f(2, 7) = 2$, since binary representation of 2 and 7 are 010 and 111 , respectively. The first and the third bit differ, so $f(2, 7) = 2$.

You are given an array of N positive integers, A_1, A_2, \dots, A_N . Find sum of $f(A_i, A_j)$ for all pairs (i, j) such that $1 \leq i, j \leq N$. Return the answer modulo 10^9+7 .

For example,

$A = [1, 3, 5]$

We return

$$\begin{aligned} &f(1, 1) + f(1, 3) + f(1, 5) + \\ &f(3, 1) + f(3, 3) + f(3, 5) + \\ &f(5, 1) + f(5, 3) + f(5, 5) = \end{aligned}$$
$$\begin{aligned} &0 + 1 + 1 + \\ &1 + 0 + 2 + \\ &1 + 2 + 0 = 8 \end{aligned}$$
[See Expected Output](#)