Problem D. XOR Determinant

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are given two arrays b and c of length n, consisting of non-negative integers. Construct $n \times n$ matrix A as $A_{ij} = b_i \oplus c_j$. Find the determinant of A modulo 998 244 353.

Input

Each test contains multiple test cases. The first line contains an integer t ($1 \le t \le 1000$) — the number of test cases. The descriptions of the t test cases follow.

The first line of each test case contains one integer n ($1 \le n \le 5000$).

The second line contains the array $b_1, b_2, \ldots, b_n$ ($0 \le b_i < 2^{60}$).

The third line contains the array $c_1, c_2, \ldots, c_n$ ($0 \le c_i < 2^{60}$).

The sum of n over all test cases does not exceed 10 000.

Output

For each test case, print the determinant of matrix A modulo 998 244 353.

Example

standard input	*standard output*
3 2 2 5 4 1 1 1000000000000000001 987467354324283836 4 1 2 3 4 1 2 3 4	21 214139910 998244129

Note

First test case:

$$\begin{vmatrix} 6 & 3 \\ 1 & 4 \end{vmatrix} = 6 \cdot 4 - 1 \cdot 3 = 21$$

Second test case:

$|23\,792\,195\,055\,071\,677| = 23\,792\,195\,055\,071\,677$

$23\,792\,195\,055\,071\,677 \bmod 998\,244\,353 = 214\,139\,910$

Third test case:

$$\begin{vmatrix} 0 & 3 & 2 & 5 \\ 3 & 0 & 1 & 6 \\ 2 & 1 & 0 & 7 \\ 5 & 6 & 7 & 0 \end{vmatrix} = 3\cdot3\cdot7\cdot7 - 3\cdot1\cdot7\cdot5 - 3\cdot6\cdot2\cdot7 - 2\cdot3\cdot7\cdot6 + 2\cdot6\cdot2\cdot6 - 2\cdot6\cdot1\cdot5 - 5\cdot3\cdot1\cdot7 - 5\cdot1\cdot2\cdot6 + 5\cdot1\cdot1\cdot5 =$$

$$= 441 - 105 - 252 - 252 + 144 - 60 - 105 - 60 + 25 = -224$$

$(-224) \bmod 998\,244\,353 = 998\,244\,129$