ERA'S XOR CALCULATOR

ERA, a little girl loves XOR operations. And today she makes XOR sequence and describes the sequence like below:

$S_0 = 0, S1 = 1$

$S_N = N \oplus S_{N-1} \oplus S_{N-2} \oplus S_{N-3} \oplus \ldots \oplus S_1$

The few elements of the sequence are: 0, 1, 3, 0, 4, 1, 7, 0, 8, 1 . . .

Now Era wants to make a mini-calculator which can calculate the Nth value of her sequence. Since you are a good programmer, Era gives you the sequence and requests you to write a program for her which will generates the Nth value of her sequence.

So, your task is to write a program for Era's XOR calculator.

INPUT

Input start with an integer T (1<=T<=1000) denoting the number of test cases. Each case contains an integer N (0<=N<=10^1000) in a line.

OUTPUT

For each case, print S_N (Nth value of Era's sequence) in a single line.

Sample Input	Output for Sample Input
5 1 2 3 33 124527	1 3 0 1 0

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