

Secret Key Transfer

Input file: **standard input**
Output file: **standard output**
Time limit: **2 seconds**
Memory limit: **512 megabytes**

The Wuhan Invitational Tournament is in full swing. Little C needs to pass an important secret key to Little M. However, for some special reason, the two agreed on the following encryption algorithm:

Let there be a hidden sequence $A_0, A_1, \dots, A_{10^8}$, where for $1 \leq i \leq 10^8$, the following holds true:

$$A_i = (((A_{i-1} + 115549630) \times 12113231) \bmod 998244353) \oplus 998254311,$$

Where \oplus represents the bitwise XOR operation. After that, for the given sequence (b_1, b_2, \dots, b_m) , the secret key is decoded as the sequence $(A_{b_1}, A_{b_2}, \dots, A_{b_m})$.

Unfortunately, after agreeing on this encryption algorithm, Little C's keyboard malfunctioned. Fortunately, A_0 is a very small number, so Little C decided to use emojis to convey its value. Specifically, given the following 4 emoji images, assuming their corresponding numbers are v_1, v_2, v_3, v_4 respectively, where $v_i \in \{0, 1\}$, it means that $A_0 = (v_4v_3v_2v_1)_2$, i.e. the value of the binary number $\overline{v_4v_3v_2v_1}$.

However, Little M cannot decipher the meaning of the emojis, and he has no choice but to forward all the messages to you for help.



Figure 1. Iroha Sakayori



Figure 2. Chisato Nishikigi



Figure 3. Yuxiu Bai



Figure 4. Touko Nanami

Input

The first line contains a single integer m ($1 \leq m \leq 10^6$), denoting the length of the given sequence.

The second line contains m integers b_1, \dots, b_m ($1 \leq b_i \leq 10^8$).

Output

Output a single line containing m integers, denoting the secret key.

Example

standard input	standard output
4 1 2 3 4	

Note

For some reason, the 4 numbers in the sample output have been stolen by Kaguya, Takina Inoue, Ling'er Feng, and Yuu Kioto, respectively.