Problem G. Guess the Data Structure

Input file:	*standard input*
Output file:	*standard output*
Time limit:	6 seconds
Memory limit:	256 mebibytes

You are given an array A consisting of n integers. All its elements are numbered with consecutive integers from 1 to n. Your task is to process m queries. Each of these queries is one of the following kinds:

1. Append integer x_j to the end of the array A.
2. Output the value of $\sum_{i=l_j}^{r_j} A_i$ $(l_j \le r_j)$.
3. Perform $A_i = A_i \oplus x_j$ for each element of the array A. Expression $A_i \oplus x_j$ means applying the operation of bitwise exclusive "OR" to numbers A_i and x_j.
4. Sort the array A.

Your task is to implement a proper data structure to process m given queries for a given array A.

Input

First line of input contains the only integer n — the initial size of the array A $(1 \le n \le 2 \cdot 10^5)$.

Second line of input contains n non-negative integers A_i — elements of the array A $(0 \le A_i \le 10^9)$.

Third line of input contains the only integer m — the number of queries $(1 \le m \le 2 \cdot 10^5)$.

Each of the following lines contains a separate query in the following format:

- For the first kind of query: 1 x_j
- For the second kind of query: 2 l_j r_j
- For the third kind of query: 3 x_j
- For the fourth kind of query: 4

For any query of the first or the third kind $0 \le x_j \le 10^9$. For any query of the second kind l_j and r_j do not violate bounds of the array A.

You may assume that at least one query in each test case is of the second kind.

Output

For each query of the second kind output its resulting sum on a separate line.

Example

standard input	standard output
5 3 4 7 3 6 7 3 5 2 2 4 4 1 15 2 3 6 3 1 2 1 6	9 30 33