Xorstanta (xorstanta)

Giorgio is a big fan of board games and he has asked William to play with him. This time they are going to play a cooperative game, which means they need to play together in order to maximize their score. They have a lot of free time, so they are going to play T matches.

Figure 1: The numbers used in the game.

The rules of the game are very simple. First of all, in the i-th match they choose a number N_i. Then, for each number from 1 to N_i they need to decide whether Giorgio or William keeps it. Let's call A the set of numbers given to Giorgio and B the set of numbers given to William. Let X_A be the *bitwise xor* of all the numbers in A and X_B the *bitwise xor* of all the numbers in B. The score of the match is given by the sum of X_A and X_B. What is the maximum score they can achieve in each match?

☞ Among the attachments of this task you may find a template file `xorstanta.*` with a sample incomplete implementation.

Input

The first line contains the only integer T, the number of matches. Each one of the next T lines contains one integer N_i, the number chosen in the i-th match.

Output

For each match, you need to write a single line with an integer: the maximum score that can be achieved.

Constraints

- $1 \leq T \leq 100\,000$.
- $1 \leq N_i \leq 10^9$ for each $i = 0 \ldots T-1$.

Scoring

Your program will be tested against several test cases grouped in subtasks. In order to obtain the score of a subtask, your program needs to correctly solve all of its test cases.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (10 points) $T = 1$ and $N_0 \leq 20$.

– **Subtask 3** (20 points) $T = 1$ and $N_0 \leq 100\,000$.

– **Subtask 4** (70 points) No additional limitations.

Examples

input	output
2 6 15	7 30

Explanation

In the **first sample case** there are two matches.

In the first match, $N = 6$ and the best score is 7, which can be achieved by giving all the numbers from one to six to Giorgio. In this case $A = \{1, 2, 3, 4, 5, 6\}$, B is empty, $X_A = 7$ and $X_B = 0$.

In the second match, $N = 15$ and the best score is 30, which can be achieved by giving the numbers 1, 5 and 11 to Giorgio and the rest to William. In this case $A = \{1, 5, 11\}$, $B = \{2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15\}$, $X_A = 15$ and $X_B = 15$.