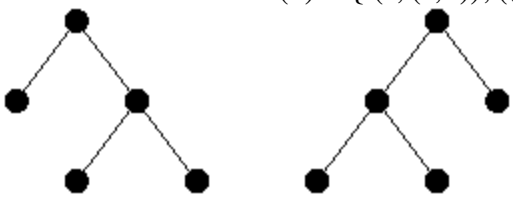
Problem: E Who's next?

Every computer science student knows binary trees. Here is one of many possible definitions of binary trees. Binary trees are defined inductively. A binary tree t is either an external node (leaf) • or a single ordered pair (t_1,t_2) of two binary trees, left subtree t_1 and right subtree t_2 respectively, called an internal node. Given an integer n, $B(n)$ is the set of trees with n leaves. For instance, the picture below shows the two trees of $B(3) = \{ (\bullet, (\bullet, \bullet)), ((\bullet, \bullet), \bullet) \}$.



Observe that those trees both have two internal nodes and a total of five nodes.

Given a tree t we define its unique integer identifier $N(t)$:

1. $N(\bullet) = 0$
2. $N(t_1, t_2) = 2^{n_1 + n_2} + 2^{n_2} N(t_1) + N(t_2)$, where n_1 and n_2 are the number of nodes in t_1 and t_2 respectively.

For instance, we have $N(\bullet, \bullet) = 2^2 + 2^1 \times 0 + 0 = 4$, $N(\bullet, (\bullet, \bullet)) = 2^4 + 2^3 \times 0 + 4 = 20$ and $N((\bullet, \bullet), \bullet) = 2^4 + 2^1 \times 4 + 0 = 24$.

The ordering $\succcurlyeq$ is defined on binary trees as follows:

$$\bullet \succcurlyeq t$$

$$(t_1, t_2) \succcurlyeq (u_1, u_2), \text{when } t_1 \prec u_1, \text{ or } t_1 = u_1 \text{ and } t_2 \succcurlyeq u_2$$

Hence for instance, $(\bullet, (\bullet, \bullet)) \succcurlyeq ((\bullet, \bullet), \bullet)$ holds, since we have $\bullet \prec (\bullet, \bullet)$.

Using the ordering $\succcurlyeq$, $B(n)$ can be sorted. Then, given a tree t in $B(n)$, we define $S(t)$ as the tree that immediately follows t in the sorted presentation of $B(n)$, or as the smallest tree in $B(n)$, if t is maximal in $B(n)$. For instance, we have $S(\bullet, \bullet) = (\bullet, \bullet)$ and $S(\bullet, (\bullet, \bullet)) = ((\bullet, \bullet), \bullet)$.

By composing the inverse of N, S and N we finally define a partial map on integers.

$$s(n) = N(S(N^{-1}(n)))$$

1 Task

Write a program that computes $s(n)$.

2 Input

The first input line contains an integer K, with $K > 0$. It is followed by K lines, each specifying an integer n_i with $1 \le i \le K$ and $0 \le n_i < 2^{31}$.

3 Output

The output should consist of K lines, the i^{th} output line being $s(n_i)$, or NO if $s(n_i)$ does not exist.

4 Example

For the input:

```
5
4
0
20
5
432
```

The correct answer is:

```
4
0
24
NO
452
```

This document was translated from L^AT_EX by H^EV^EA.