1997 ACM Mid-Central Regional Programming Contest

Problem #4: Skew Binary

Source file: `skew.{c|cpp|pas}`
Input file: `skew.in`
Output file: `skew.out`

When a number is expressed in decimal, the kth digit represents a multiple of 10^k. (Digits are numbered from right to left, where the least significant digit is number 0.) For example,

$$\begin{aligned} 81307_{10} &= 8\times10^4 + 1\times10^3 + 3\times10^2 + 0\times10^1 + 7\times10^0 \\ &= 80000 + 1000 + 300 + 0 + 7 \\ &= 81307. \end{aligned}$$

When a number is expressed in binary, the kth digit represents a multiple of 2^k. For example,

$$\begin{aligned} 10011_2 &= 1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 \\ &= 16 + 0 + 0 + 2 + 1 \\ &= 19. \end{aligned}$$

In **skew binary**, the kth digit represents a multiple of $2^{k+1} - 1$. The only possible digits are 0 and 1, *except* that the least-significant nonzero digit can be a 2. For example,

$$\begin{aligned} 10120_{\text{skew}} &= 1\times(2^5-1) + 0\times(2^4-1) + 1\times(2^3-1) + 2\times(2^2-1) + 0\times(2^1-1) \\ &= 31 + 0 + 7 + 6 + 0 \\ &= 44. \end{aligned}$$

The first 10 numbers in skew binary are 0, 1, 2, 10, 11, 12, 20, 100, 101, and 102. (Skew binary is useful in some applications because it is possible to add 1 with at most one carry. However, this has nothing to do with the current problem.)

The input file contains one or more lines, each of which contains an integer n. If $n = 0$ it signals the end of the input, and otherwise n is a nonnegative integer in skew binary. For each number, output the decimal equivalent. The decimal value of n will be at most $2^{31} - 1 = 2147483647$.

Example input:

```
10120
20000000000000000000000000000000
10
10000000000000000000000000000000
11
100
11111000001110000101101102000
0
```

Example output:

```
44
2147483646
3
2147483647
4
7
1041110737
```