Statement

What is the smallest base larger than 2 in which the integer n contains only the digits 0 and 1?

Input format

The first line of each input file contains the number t of test cases.

Each of the following t lines contains a single integer n (in base 10).

Output format

For each test case output a single line with a single number.

If n cannot be represented using 1s and 0s in any base larger than 2, output -1.

Otherwise, output an integer b: the smallest base larger than 2 in which n's representation contains only 1s and 0s.

Subproblem B1 (17 points, public)

Input file: B1.in

Constraints: $1 \leq t \leq 10^3$ and in each test $1 \leq n \leq 10^3$.

Subproblem B2 (30 points, public)

Input file: B2.in

Constraints: $1 \leq t \leq 10^4$ and in each test $1 \leq n \leq 10^9$.

Subproblem B3 (53 points, secret)

Input file: B3.in

Constraints: $1 \leq t \leq 10^4$ and in each test $1 \leq n \leq 10^{18}$.

Example

input	output
3 20 273 1332	4 3 6

273 in base 3 is 101010.