G. Power Substring

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given n positive integers $a_1, a_2, ..., a_n$.

For every a_i you need to find a positive integer k_i such that the decimal notation of 2^{k_i} contains the decimal notation of a_i as a substring among its last $min(100, length(2^{k_i}))$ digits. Here $length(m)$ is the length of the decimal notation of m.

Note that you don't have to minimize k_i. The decimal notations in this problem do not contain leading zeros.

Input

The first line contains a single integer n ($1 \le n \le 2\,000$) — the number of integers a_i.

Each of the next n lines contains a positive integer a_i ($1 \le a_i < 10^{11}$).

Output

Print n lines. The i-th of them should contain a positive integer k_i such that the last $min(100, length(2^{k_i}))$ digits of 2^{k_i} contain the decimal notation of a_i as a substring. Integers k_i must satisfy $1 \le k_i \le 10^{50}$.

It can be shown that the answer always exists under the given constraints. If there are multiple answers, print any of them.

Examples

input
2 8 2

output
3 1

input
2 3 4857

output
5 20