Project Euler #123: Prime square remainders

This problem is a programming version of Problem 123 from projecteuler.net

Let p_n be the nth prime: $2, 3, 5, 7, 11, \ldots$, and let r be the remainder when $(p_n - 1)^n + (p_n + 1)^n$ is divided by p_n^2.

For example, when $n = 3$, $p_3 = 5$ and $4^3 + 6^3 = 280 \equiv 5 \pmod{25}$.

The least value of n for which the remainder first exceeds 100 is 5.

Find the least value of n for which the remainder first exceeds B.

Input Format

The first line of input contains T, the number of test cases.

Each test case consists of a single line containing a single integer, B.

Constraints

$1 \leq T \leq 10^5$
$1 \leq B \leq 10^{12}$

Output Format

For each test case, output a single line containing a single integer, the requested answer.

Sample Input

```
1
100
```

Sample Output

```
5
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Explanation

As noted above, the first n for which the remainder exceeds 100 is 5. The remainder when $n = 5$ is $(p_5 - 1)^5 + (p_5 + 1)^5 = 10^5 + 12^5 = 348832 \equiv 110 \pmod{11^2}$, which definitely exceeds 100. You may easily check that the remainder doesn't exceed 100 when $n < 5$.