Problem J. Junk or Joy

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

You are given a positive integer k. Find the number of tuples of positive integers (n, p, m) such that $n^2 - k \cdot p^m = 1$ and p is a prime number, or report that an infinite number of such tuples exists.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 100$). Description of the test cases follows.

The only line of each test case contains a single integer k ($1 \le k \le 10^9$).

Output

For each test case, print the number of positive integer tuples (n, p, m) such that $n^2 - k \cdot p^m = 1$ and p is a prime, or -1 if there's an infinite number of them.

Example

standard input	standard output
2	3
5	0
22	

Note

In the first example test case, for $k = 5$, the only possible tuples are $(4, 3, 1)$, $(6, 7, 1)$, and $(9, 2, 4)$.

In the second example test case, for $k = 22$, no possible tuples exist.