

## E. Tree Colorings

time limit per test: 4 seconds  
memory limit per test: 256 megabytes

Consider a rooted undirected tree. Each vertex can be colored blue, green, or yellow. A coloring is called *beautiful* if it meets these conditions:

- the root of the tree is green;
- if you consider **all blue and green vertices**, they are reachable from each other without passing through any **yellow** vertices;
- if you consider **all yellow and green vertices**, they are reachable from each other without passing through any **blue** vertices;

You are given an integer  $m$ . Your task is to calculate the minimum number of vertices in a tree with **exactly**  $m$  *beautiful* colorings.

### Input

The first line contains a single integer ( $1 \leq t \leq 10^5$ ) — the number of test cases.

The only line of each test case contains a single integer  $m$  ( $1 \leq m \leq 5 \cdot 10^5$ ).

### Output

For each test case, print a single integer — the minimum number of vertices in a tree with **exactly**  $m$  *beautiful* colorings. If such a tree does not exist, print  $-1$ .

### Example

input	Copy
5	
1	
3	
5	
7	
9	
output	Copy
1	
2	
3	
4	
3	

### Note

In the following notes, let  $g$  describe green color,  $b$  be blue, and  $y$  be yellow.

In the first example, consider a simple tree with just 1 vertex. This tree has exactly 1 beautiful coloring: the root is green.

In the second example, consider a simple tree with 2 vertices with a root at the 1-st vertex. There are exactly 3 beautiful colorings:  $[g, g]$ ,  $[g, b]$  and  $[g, y]$ .

In the third example, consider a bamboo tree with 3 vertices with a root at the 1-st vertex. There are exactly 5 beautiful colorings:  $[g, g, g]$ ,  $[g, g, b]$ ,  $[g, g, y]$ ,  $[g, b, b]$  and  $[g, y, y]$ .

In the fifth example, consider a tree with 3 vertices with a root at the 1-st vertex, and the other 2 vertices connected to it. There are exactly 9 beautiful colorings:  $[g, g, g]$ ,  $[g, g, b]$ ,  $[g, g, y]$ ,  $[g, b, g]$ ,  $[g, b, b]$ ,  $[g, b, y]$ ,  $[g, y, g]$ ,  $[g, y, b]$  and  $[g, y, y]$ .

### Educational Codeforces Round 180 (Rated for Div. 2)

Finished

Practice



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Start virtual contest

### → Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest

### → Submit?

Language: GNU G++23 14.2 (64 bit, ms) ▼

Choose file:  No file chosen

Submit

### → Last submissions

Submission	Time	Verdict
<a href="#">325960745</a>	Jun/25/2025 08:38	Accepted
<a href="#">325960546</a>	Jun/25/2025 08:35	Wrong answer on test 2
<a href="#">325960311</a>	Jun/25/2025 08:33	Wrong answer on test 2
<a href="#">325786155</a>	Jun/23/2025 18:55	Wrong answer on test 2
<a href="#">325723415</a>	Jun/23/2025 17:49	Wrong answer on test 2

### → Problem tags

combinatorics dp graphs math trees

No tag edit access

→ **Contest materials**

- Announcement



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