

# Number of Factors

Filename: *factors*

Arup has a company that sells soda and he also happens to like numbers that have many factors. For example, the number 6 has 4 factors: 1, 2, 3 and 6. Thus, he can package a group of 6 sodas in 4 rectangular arrangements: 1 x 6, 2 x 3, 3 x 2 and 6 x 1. (He considers all four of these distinct because the vertical and horizontal arrangements look different.)

Arup has realized that consumers will buy more soda whenever it's repackaged in a different shape. So he has plans to sell packages of soda of a particular size (number of sodas) and has set dates he'll keep the same size but change the packaging arrangement. Naturally, people are less likely to buy very large packages of soda, so Arup's preference is to minimize the number of sodas in a package, given the number of arrangements possible. Thus, if Arup wants 4 possible arrangement of packages of a fixed size, he prefers a package of 6 sodas over 8 sodas (8 sodas can be arranged in 4 ways also: 1 x 8, 2 x 4, 4 x 2 and 8 x 1).

At various times, Arup will ask his staff to find the smallest integer with a particular number of factors. One other restriction Arup has is that he doesn't like numbers with more than two distinct prime factors, so his actual request for you is to find the smallest integer with no more than two distinct prime factors that has a particular number of factors.

## **The Problem**

Given a positive integer  $n$ , greater than 1, determine the smallest integer with two or fewer distinct prime factors that has exactly  $n$  distinct positive factors.

## **The Input**

The first line of input will contain a single positive integer,  $n$  ( $n \leq 300$ ), the total number of input cases. Each of the following  $n$  lines contains a single positive integer,  $d$  ( $2 \leq d$ ), representing the input for the test case. Each of these inputs will be such that there exists an integer less than  $10^{15}$  with no more than two distinct prime factors that has exactly  $d$  distinct factors.

## **The Output**

For each input case,  $d$ , output the smallest integer with two or fewer distinct prime factors that has exactly exactly  $d$  distinct positive factors on a line by itself.

## **Sample Input**

```
3
2
4
5
```

## **Sample Output**

```
2
6
16
```