

# Project Euler #57: Square root convergents

This problem is a programming version of [Problem 57](#) from [projecteuler.net](#)

It is possible to show that the square root of two can be expressed as an infinite continued fraction.

$$\sqrt{2} = 1 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \dots}}} = 1.414213\dots$$

By expanding this for the first four iterations, we get:

$$1 + \frac{1}{2} = \frac{3}{2} = 1.5$$

$$1 + \frac{1}{2 + \frac{1}{2}} = \frac{7}{5} = 1.4$$

$$1 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2}}} = \frac{17}{12} = 1.41666\dots$$

$$1 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2}}}} = \frac{41}{29} = 1.41379\dots$$

The next three expansions are  $\frac{99}{70}$ ,  $\frac{239}{169}$ , and  $\frac{577}{408}$ , but the eighth expansion,  $\frac{1393}{985}$ , is the first example where the number of digits in the numerator exceeds the number of digits in the denominator.

Given  $N$ . In the first  $N$  expansions, print the iteration numbers where the fractions contain a numerator with more digits than denominator.

## Input Format

Input contains an integer  $N$

## Output Format

Print the answer corresponding to the test case.

## Constraints

$$8 \leq N \leq 10^4$$

## Sample Input

14

## Sample Output

8  
13