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Your `Project Euler #65: Convergents of e` submission got 100 points.







# Project Euler #65: Convergents of e

#### **Problem Statement**

This problem is a programming version of Problem 65 from projecteuler.net

The square root of 2 can be written as an infinite continued fraction.

$$\sqrt{2} = 1 + rac{1}{2 + rac{1}{2 + rac{1}{2 + rac{1}{2 + \cdots}}}}$$

The infinite continued fraction can be written,  $\sqrt{2}=[1;(2)]$  , (2) indicates that 2 repeats *ad infinitum*. In a similar way,  $\sqrt{23} = [4; (1,3,1,8)]$ .

It turns out that the sequence of partial values of continued fractions for square roots provide the best rational approximations. Let us consider the convergents for  $\sqrt{2}$ .

$$1+rac{1}{2}=rac{3}{2}$$
 
$$1+rac{1}{2+rac{1}{2}}=rac{7}{5}$$
 
$$1+rac{1}{2+rac{1}{2+rac{1}{2}}}=rac{17}{12}$$
 
$$1+rac{1}{2+rac{1}{2+rac{1}{2}}}=rac{41}{29}$$

Hence the sequence of the first ten convergents for  $\sqrt{2}$  are:

$$1, \frac{3}{2}, \frac{7}{5}, \frac{17}{12}, \frac{41}{29}, \frac{99}{70}, \frac{239}{169}, \frac{577}{408}, \frac{1393}{985}, \frac{3363}{2378}, \cdots$$

What is most surprising is that the important mathematical constant,

$$e=[2;\ 1,2,1,\ 1,4,1,\ 1,6,1,\cdots,\ 1,2k,1,\cdots]$$

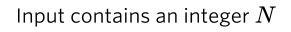
The first ten terms in the sequence of convergents for e are:

$$2, 3, \frac{8}{3}, \frac{11}{4}, \frac{19}{7}, \frac{87}{32}, \frac{106}{39}, \frac{193}{71}, \frac{1264}{465}, \frac{1457}{536}, \cdots$$

The sum of digits in the numerator of the  $10^{th}$  convergent is 1+4+5+7=17.

Find the sum of digits in the numerator of the  $N^{\it th}$  convergent of the continued fraction for e.

#### **Input Format**



#### **Output Format**

Print the answer corresponding to the test case.

#### Constraints

 $1 \leq N \leq 30000$ 

## Sample Input

10

## Sample Output

17