12/16/24, 4:35 AM USACO

# **USA Computing Olympiad**

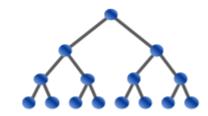
Overview

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# USACO 2024 DECEMBER CONTEST, BRONZE PROBLEM 1. ROUNDABOUNT ROUNDING

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Time Remaining: 0 hrs, 58 min, 27 sec

	Submitted; Results below show the outcome for each judge test case																						
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English (en)

Bessie the cow is back in school! She has started doing her math homework in which she is tasked to round positive integers to powers of 10.

To round a positive integer a to the nearest 10<sup>b</sup>, where b is a positive integer, Bessie first locates the b'th digit from the right. Let x denote this digit.

If  $x \ge 5$ , Bessie adds  $10^b$  to a.

Then, Bessie sets all the digits including and to the right of the b'th digit from the right to be 0.

For instance, if Bessie wanted to round 456 to the nearest  $10^2$  (hundred), Bessie would first locate the 2nd digit from the right which is 5. This means x = 5. Then since  $x \ge 5$ , Bessie adds 100 to a. Finally, Bessie sets all the digits in a to the right of and including the 2nd digit from the right to be 0, resulting in 500.

However, if Bessie were to round 446 to the nearest  $10^2$ , she would end up with 400.

After looking at Bessie's homework, Elsie thinks she has invented a new type of rounding: chain rounding. To chain round to the nearest  $10^{\rm b}$ , Elsie will first round to the nearest  $10^{\rm l}$ , then the nearest  $10^{\rm l}$ , and so on until the nearest  $10^{\rm b}$ .

Bessie thinks Elsie is wrong, but is too busy with math homework to confirm her suspicions. She tasks you to count how many integers x at least 2 and at most N ( $1 \le N \le 10^9$ ) exist such that rounding x to the nearest  $10^P$  is different than chain rounding to the nearest  $10^P$ , where P is the smallest integer such that  $10^P \ge x$ .

### INPUT FORMAT (input arrives from the terminal / stdin):

You have to answer multiple test cases.

The first line of input contains a single integer T ( $1 \le T \le 10^5$ ) denoting the number of test cases. T test cases follow.

The first and only line of input in every test case contains a single integer N. All N within the same input file are guaranteed to be distinct.

### **OUTPUT FORMAT (print output to the terminal / stdout):**

Output T lines, the i'th line containing the answer to the i'th test case. Each line should be an integer denoting how many integers at least 2 and at most N exist that are different when using the two rounding methods.

# **SAMPLE INPUT:**

4 1

100

4567 3366

5

183

60

Consider the second test case in the sample. 48 should be counted because 48 chain rounded to the nearest  $10^2$  is 100 (  $48 \rightarrow 50 \rightarrow 100$ ), but 48 rounded to the nearest  $10^2$  is 0.

In the third test case, two integers counted are 48 and 480. 48 chain rounds to 100 instead of to 0 and 480 chain rounds to 1000 instead of 0. However, 67 is not counted since it chain rounds to 100 which is 67 rounded to the nearest  $10^2$ .

### **SCORING:**

- Inputs 2-4:  $N \le 10^3$
- Inputs 5-7:  $N \le 10^6$
- Inputs 8-13: No additional constraints.

Problem credits: Weiming Zhou

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Language: C ✓

Source File: Choose File No file chosen

Submit Solution

# **Previous Submissions:**

<u>Sun, Dec 15, 2024 17:08:56 EST (C++17)</u> <u>Sun, Dec 15, 2024 17:09:46 EST (C++17)</u>