1995 East-Central Regionals

ACM International Collegiate Programming Contest

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Problem A - Pi

Professor Robert A. J. Matthews of the Applied Mathematics and Computer Science Department at the University of Aston in Birmingham, England has recently described how the positions of stars across the night sky may be used to deduce a surprisingly accurate value of π. This result followed from the application of certain theorems in number theory.

Here, we don't have the night sky, but can use the same theoretical basis to form an estimate for π:

> Given any pair of whole numbers chosen from a large, random collection of numbers, the probability that the two numbers have no common factor other than one (1) is
>
> $$\frac{6}{\pi^2}$$

For example, using the *small* collection of numbers: 2, 3, 4, 5, 6; there are 10 pairs that can be formed: (2,3), (2,4), etc. Six of the 10 pairs: (2,3), (2,5), (3,4), (3,5), (4,5) and (5,6) have no common factor other than one. Using the ratio of the counts as the probability we have:

$$\frac{6}{\pi^2} \approx \frac{6}{10}$$

$$\pi \approx 3.162$$

In this problem, you'll receive a series of data sets. Each data set contains a set of pseudo-random positive integers. For each data set, find the portion of the pairs which may be formed that have no common factor other than one (1), and use the method illustrated above to obtain an estimate for π. Report this estimate for each data set.

INPUT

The input consists of a series of data sets.

The first line of each data set contains a positive integer value, N, greater than one (1) and less than 50.

There is one positive integer per line for the next N lines that constitute the set for which the pairs are to be examined. These integers are each greater than 0 and less than 32768.

Each integer of the input stream has its first digit as the first character on the input line.

The set size designator, N, will be zero to indicate the end of data.

OUTPUT

A line with a single real value is to be emitted for each input data set encountered. This value is the estimate for π for the data set. The default real/float output format should be used. Answers must be within 0.1% of the correct answer.

For some data sets, it may be impossible to estimate a value for π. This occurs when there are *no* pairs without common factors. In these cases, emit the single-line message:

No estimate for this data set.

exactly, starting with the first character, "N", as the first character on the line.

EXAMPLE (Two data sets. Your output for the float/real, using your chosen language, may be default-formatted differently.)

Input File	Output File
5	3.162
2	No estimate for this data set.
3	
4	
5	
6	
2	
13	
39	
0	