

College of the Holy Cross, Spring Semester, 2010
Department of Mathematics and Computer Science
Problem of the Week #1: March 8, 2010

For the purposes of this problem, a real number x *mimics an integer to k decimals* if there exists a decimal representation of x having at least k consecutive zeros to the right of the decimal point, but does not admit a decimal representation having at least $k + 1$ zeros. For example,

$$1.01 = 1.009\bar{9}$$

mimics an integer to two decimals, as does 1.00314159, while 1.0100000001 mimics an integer to one decimal.

When you take the square root of an integer N , the result is either an integer (for example, $\sqrt{4} = 2.0\bar{0}$, which mimics an integer to an infinite number of decimals) or is irrational (for example, $\sqrt{2} = 1.4142135623\dots$, *ad infinitum* without repetition).

Problem 1 Find the smallest positive integer N whose square root mimics an integer to one million decimals.

Written or typed answers should be submitted to Professor Hwang (office: Swords 339). The first correct answer wins a candy bar and Math/CS Club web page fame!