HIGH SCHOOL MATHEMATICS CONTESTS

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Contest Number 1

Any calculator without a QWERTY keyboard is allowed. Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

October 30, 2001

Name _____ Teacher _____ Grade Level _____ Score _____

Time Limit: 30 minutes

Answer Column

1-1. If $a+b+c+d = 2001$ and $b+d = 2002$, what is the value of $a-b+c-d$?

1-1.

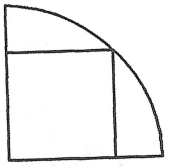
1-2. Dad dreamed that he put \$1 on the first square, \$2 on the second, \$4 on the third, and so on, doubling the amount each time. If it cost \$65 535 to cover all the squares, how many squares were in Dad's dream?

1-2.

1-3. What percent of the first 1 million positive integers are perfect squares?

1-3.

1-4. A square is inscribed in a quarter-circle region, as shown, so that one vertex of the square lies on an arc of the quarter-circle, and two sides of the square lie on radii. If the area of the quarter-circle is 4π, what is the area of the square?



1-4.

1-5. A sequence of numbers is *arithmetic* if the difference between successive terms is a constant. In a sequence of integers, S, the first term is 81, one term is 144, the last term is 256, and no terms are consecutive integers. If S is arithmetic, how many terms does S have?

1-5.

1-6. What are both primes $p > 0$ for which $\frac{1}{p}$ has a purely periodic decimal expansion with a period 5 digits long? [NOTE: $\frac{1}{37} = 0.\overline{027}$ starts to repeat immediately, so it's *purely periodic*. Its *period* is 3 digits long.]

1-6.

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