Nassau County Interscholastic Mathematics League

Team Contest Answers must be integers from 0 to 999, inclusive. 2014 – 2015

Calculators are allowed.

Time: 40 minutes

1) What is the 2015^{th} digit of the base-ten decimal representation of the fraction $2/7$?

2) The function f has the property that for all real numbers x and y, $f(xy) = f(x) + 2f(y)$. Compute $f(2015)$.

3) A man can dig a rectangular hole 5 feet wide, 7 feet long, and 3 feet deep in 30 minutes. If his partner works at the same rate, how many minutes will it take the two of them to dig a rectangular hole 10 feet wide, 14 feet long, and 6 feet deep?

4) Find the only real root of $5^{2x} - 5^x = 600$.

5) What is the whole number remainder when 2^{2014} is divided by 7?

6) If r and s are roots of $x^2 - 1024x = -2$, compute $\frac{1}{r^2 s} + \frac{1}{rs^2}$.

7) If $x^2 - y^2 = 3xy$, and x and y are both positive, and $\frac{x}{y}$ is expressed in simplest form as $\frac{a+\sqrt{b}}{c}$, compute $a + b + c$.

8) The diagonals $\overline{QS}$ and $\overline{RT}$ of quadrilateral $QRST$ intersect at point P and have lengths 20 and 16 respectively. The measure of $\measuredangle QPR = 30°$. Compute the area of quadrilateral $QRST$.

9) What is the only value of x for which $\frac{x-1}{\sqrt{3x+x^2}} = \frac{\sqrt{x-3}}{\sqrt{x}}$?

10) A single die is tossed only as many times as is necessary until a five occurs. If the probability that an odd number of tosses is required can be expressed in simplest form as p/q, compute $p + q$.