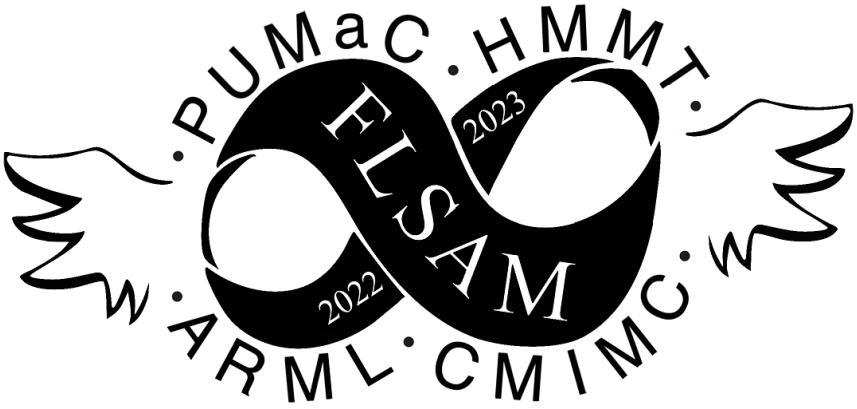
Florida Student Association of Mathematics



2024 FLSAM PUMAC Tryout

October 26-27, 2024

Round 2: Number Theory

Welcome to the **2024 FLSAM PUMAC Tryout!** This is round two of four, each of which will consist of four problems to be completed in 30 minutes. Scoring is simply based on correct answers; there is no penalty for wrong answers. Good luck!

1. Given that 23 in base a is equal to 34 in base b which is equal to 45 in base c, compute the smallest c.

2. Compute the number of ordered pairs of integers (x, y) for which

$$\frac{xy}{x+y+1}$$

is an integer between 1 and 16 inclusive.

3. Let $P(x)$ be a degree 4 polynomial with integer coefficients, and let S be the number of integers n with $1 \leq n \leq 5005$ for which 5005 divides $P(n)$. Over all possible such $P(x)$, compute the number of distinct possible values of S.

4. A pair of integers m and n are called *coconspirators* if there exist integers a and b such that 2024 divides both $am + n$ and $m + bn$. Compute the number of pairs (m, n) of nonnegative integers less than 2024 such that m and n are coconspirators.