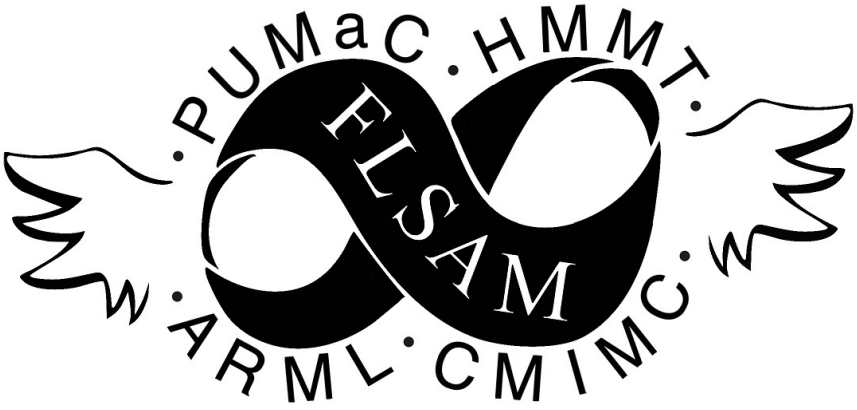
Florida Student Association of Mathematics



2025 FLSAM PUMAC Tryout

October 25-26, 2025

Round 4: Combinatorics

Welcome to the **2025 FLSAM PUMAC Tryout!** This is round four of four, each of which will consist of four problems to be completed in 30 minutes. There is no penalty for wrong answers. Good luck!

1. Aaryan, Darsh, Jayden, and Ashvin are playing a game with coins. Each player starts with one coin. If after a turn a player has no coins, then they are out and are no longer playing. Every turn, each player still in the game randomly selects another player who is still playing to give a coin to. Find the probability that after two turns, two players have consolidated all the coins.

2. The positive divisors of 1001 are randomly written on four two-sided cards, one on each face. Find the probability that on every card, one number divides the other.

3. Find the number of sequences $s_1, s_2, \ldots, s_{15}$ such that $s_1 = 1$, $s_2 = 2$, $s_3 = 3$, and for all integers $3 < k \leq 15$,

$$s_k \in \{s_{k-1}, s_{k-2}, s_{k-3}\}.$$

4. Jacob is searching for hooligans on an archipelago of 501 islands, some pairs of which may be connected by a two-way bridge (bridges may overlap). He plans out a route that starts at some island, traverses bridges to visit every island at least once, and returns back to the starting island (note that the starting island is not fixed). He finds that every such route traverses at least M bridges and there are exactly $N > 0$ routes traversing exactly M bridges. Given that $M = 1000$, find the largest possible value of N less than 10^6.

Q1	Q2	Q3	Q4