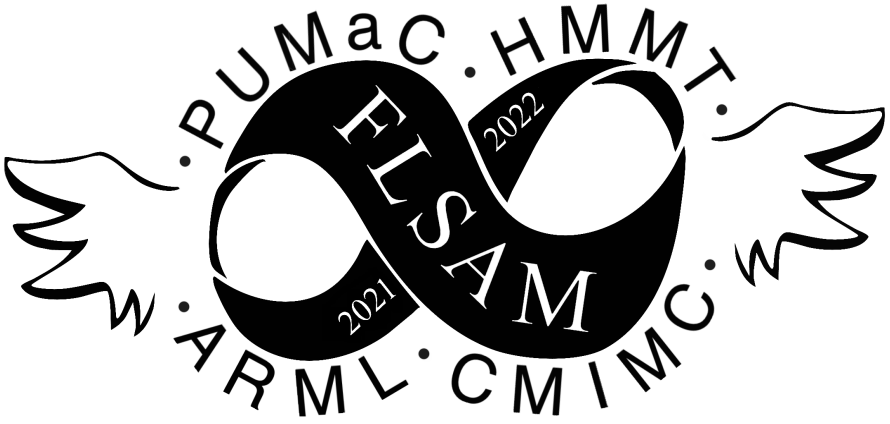
Florida Student Association of Mathematics



2022 ARML Tryout

Set 6 of 7

Welcome to the **2022 FLSAM ARML Tryout!** The tryout will consist of **7 sets** of **2 problems each**. You will have **10 minutes** to work on each set. Write your name and answers directly on each problem set. Scoring is based on the number of correct answers; there is no penalty for wrong answers. Good luck!

Round 6

Name: _____

11. _____ **12.** _____

11. Suppose that x and y are real numbers which satisfy the following equations:

$$4^x + (\sqrt{2})^x = 84$$

$$9^y + (\sqrt{3})^y = 260$$

Compute xy.

12. Consider the following operation I on a positive integer n: for the largest integer k satisfying $2^k \mid n$, replace n with $n + 2^k$. For instance, $I(5) = 6$ and $I(6) = 8$. Let $f(n)$ be the least number of applications of I to n necessary to turn it into a power of 2. For instance, $f(1) = f(2) = f(4) = 0$ since $1, 2, 4$ are already powers of 2, and $f(5) = 2$. Compute $\sum_{n=1}^{512} f(n)$.