# 2022 SSMO Tiebreaker Round

SMO Team

**Tiebreaker Round Problem 1:** For all positive integers $n$, let $S(n)$ denote the least positive integer $x$ such that $n+x$ is a palindrome. Find the value of $\sum_{n=1}^{100} S(n)$.

**Tiebreaker Round Problem 2:** Let $P(x) = x^3 - 7x^2 + 9x - 2$. If $P(x) = (x-a)^3 + b(x-a) + c$ where $a, b, c$ are real numbers, then the value of $a - b - c$ can be expressed as $\frac{m}{n}$ for relatively prime positive integers $m$ and $n$. Find $m + n$.

**Tiebreaker Round Problem 3:** Find the sum of the 5 smallest positive prime numbers $p$ such that $3^n + 4^n \equiv 0 \pmod{p}$ has no positive integer solutions for $n$.