Tiebreaker, Division A

Gunn Math Competition 2026

Instructions and Format

- This round contains 3 short-answer questions to be solved in 15 minutes individually. You may not discuss these problems during the 15 minutes
- Each problem is worth slightly more points than previous problems.
- All answers are integers between 0 and 999, and so responses must be integers in that range.
- You will be given reminders about the time you have remaining at the 10, 5, 2, and 1 minute mark. At the end, stop immediately after you are told to.
- NO CALCULATORS (or abaci). Protractors, rulers, and compasses are permitted. Do not cheat in any way. When caught, you will be blacklisted from the competition.
- Thank you to our sponsors. Without them, we would never have been able to make this event possible.

1. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Let $f(n)$ be a function that takes in an input from A and outputs a value in A. How many such function $f(n)$ exist such that $f(f(n)) \equiv n^3 \pmod{10}$ for all possible n?

2. Let S be the set of all ordered triples of integers (a, b, c) such that $a > b > c > 0, a^2 + a + 1 = (b^2 + b + 1)(c^2 + c + 1)$, and b is minimized for a given c (no other triple exists with the same value of c and a lower value of b). Compute

$$\left\lfloor 100 \sum_{(a,b,c) \in S} \left(\frac{1}{a} + \frac{1}{bc} \right) \right\rfloor.$$

3. Let $ABCD$ be a unit square, and let E be a point on line segment CD. Let F be the intersection of AD and BE, and let G be the intersection of AE and BC. Given that $EF = FG$, then compute $\lfloor 100 \cdot DE \rfloor$.