2024 SSMO Relay Round 2

SMO Team

RR 2 Part 1: In a regular hexagon $ABCDEF$, let X be a point inside the hexagon such that $XA = XB = 3$. If the area of the hexagon is $6\sqrt{3}$, then $XE^2 = a + b\sqrt{c}$, for squarefree c. Find $a + b + c$.

RR 2 Part 2: Let $T = TNYWR$. If

$$a = \sum_{n=1}^{N} n(n+1)(n+2),$$

find the last three digits of a.

RR 2 Part 3: Let $T = TNYWR$. A point P is randomly chosen inside the square with vertices $A = (0, 0), B = (0, T), C = (T, T)$, and $D = (T, 0)$. Find the perimeter of the set S containing all points P for which $AP + CP \geq BP + DP$.