



★ REGIONAL LEVEL ★

The Mandelbrot Competition

Round One Test

Time Limit:
40 minutes

Name: _____

<p>1. Henry and Daniel each randomly write down 1, 2, or 3 every second for three seconds. Find the probability that the sum of Henry's numbers is equal to the sum of Daniel's numbers.</p>	①
<p>2. In the addition</p> $\begin{array}{r} T \quad I \quad D \quad E \\ + \quad P \quad O \quad D \quad S \\ \hline T \quad A \quad S \quad T \quad Y \end{array}$ <p>each letter represents a distinct digit. Find the maximum possible value of <i>TASTY</i>.</p>	①
<p>3. The ordered triple (33, 34, 35) is the smallest triple of consecutive integers, each with exactly 4 positive integer divisors. Find the next ordered triple with such property. Write your answer in the form $(n, n + 1, n + 2)$.</p>	②
<p>4. In a group of 7 boys, each boy is friends with exactly two other boys. Two boys are acquaintances if they are friends or if one is acquainted with an acquaintance of the other. Compute the probability that every two boys are acquaintances.</p>	②
<p>5. The set of points $S = \{P(x^2, y^2), x, y \in \mathbb{Z}\}$ is plotted on the coordinate plane. How many squares with sides parallel to the coordinate axes have their four vertices in S and area at most 2018?</p>	②
<p>6. Let $\triangle ABC$ be an equilateral triangle with side length 1, and let \mathcal{T} be the locus of all points P such that exactly one triangle in the set $\{\triangle APB, \triangle BPC, \triangle CPA\}$ is obtuse. The points in \mathcal{T} form multiple regions of finite area. Find the total area of these regions.</p>	③
<p>7. Compute $S = \sum_{a+b+c=12} ab + bc + ac$, where a, b, c are positive integers.</p>	③