



★ REGIONAL LEVEL ★

The Mandelbrot Competition

Round Two Test

Name: _____

*Time Limit:
40 minutes*

<p>1. Let $p(x)$ be a polynomial with integer coefficients such that $p(4) = p(8) = 16$ and $p(6) = 36$. Find the minimum possible value of $p(0)$.</p>		①
<p>2. Ana and Banana are playing a game with a pile of n coins. Each turn, starting from Ana, each player removes either 1, 3 or 4 coins from the pile, and the player removing the last coin wins. For how many values of $1 \leq n \leq 2019$ is there a winning strategy for Banana?</p>		①
<p>3. A number n is reversible if reversing its digits then squaring it will result in the same number as squaring n then reversing its digits. For example, 1 and 2 are reversible numbers. What is the sum of all 2 digits reversible numbers that aren't a multiple of 10?</p>		②
<p>4. On the Cartesian plane, circle C is tangent to the lines $x = 0$, $y = 0$, $x - y = 1$, and $x + y = m$. What is the product of all possible values of m?</p>		②
<p>5. Illogical left his house $x < 12$ hours after noon, and when he came back $y < 12$ hours later, the hour and minute hands have switched positions. If $\lfloor x \rfloor$ is an even positive integer not divisible by 4 and $\lfloor y \rfloor$ is an odd positive integer, find the number of possible distinct arrival times.</p>		②
<p>6. Find the number of ordered pairs of relatively prime positive integers (a, b) so that the equation $\lfloor ax \rfloor + \lfloor bx \rfloor = 2019$ has no solution for x over the real numbers.</p>		③
<p>7. Let \mathcal{C} be a cube with side length 1. Find the smallest possible integer value of n such that the surface area of the locus of all points whose sum of the square of the distances from the vertices of \mathcal{C} is n is at least 1000.</p>		③