Contest Number 5

Name ___________________ Teacher ___________________ Grade Level ______ Score ____

Time Limit: 30 minutes NEXT CONTEST: MAR. 11, 2014

5-1. What value of \( x \) satisfies \( x^2 - 3x + 2 = 0 \) but not \( x^2 - x - 2 = 0 \)?

5-2. A circle and a square share a common center, as shown. If the area of each is 2014, what is the difference between the area of that part of the circle that's outside the square and the area of that part of the square that's outside the circle?

5-3. If \( m \) is the maximum number of acute interior angles a convex quadrilateral can have, and \( M \) is the maximum number of obtuse interior angles a convex quadrilateral can have, what is the value of \( m + M \)?

5-4. The garbage dump manager has clothes pins in only 3 colors, and 1 more than half his clothes pins are red. If the red ones are removed, then 1 less than half the remaining clothes pins are green. If the green ones are also removed, then 8 more than half the remaining clothes pins are blue. How many clothes pins does the garbage dump manager have all together?

5-5. A certain polynomial \( P \) has the property that \( P(z) = P(iz) \) for all numbers \( z \), real or imaginary, where \( i^2 = -1 \). If the number 2 is known to be a root of \( P(z) = 0 \), what are all numbers, real or imaginary (including 2), which must be roots of \( P(z) = 0 \)?

5-6. If \( a \) and \( x \) are real numbers, then, explicitly in terms of \( a \), what real number \( x \) satisfies \( \sqrt[3]{x + \sqrt{x^2 + a^3}} + \sqrt[3]{x - \sqrt{x^2 + a^3}} = a \)?