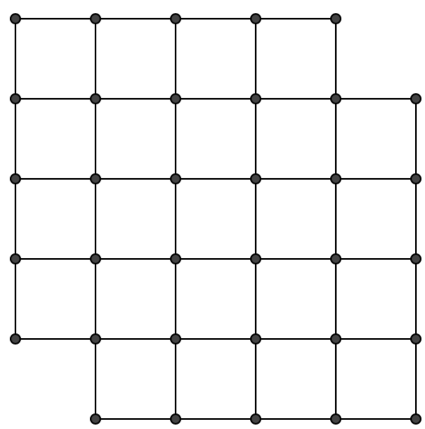
Directions: This is Day 2 of the Individual Round portion of the 2015 Mission Math Tournament, and is used as a factor in determining our MSJ teams in future on-site competitions like the Stanford and Berkeley Math Tournaments. There are 6 short-answer problems to be solved in 30 minutes, and problems are weighted 2x of Day 1 problems. *Only answers written on your answer sheet will be scored.* Good luck!

Problem 1: Let O be the midpoint of $\overline{AC}$ in rectangle $ABCD$. Find the probability that a randomly chosen point inside rectangle $ABCD$ is closer to point O than any vertex of the rectangle.

Problem 2: Find the value of $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n^2-1} = \frac{1}{2^2-1} + \frac{1}{3^2-1} + \frac{1}{4^2-1} + \cdots$.

Problem 3: The function $f(x)$ outputs the truncation of the result when x is divided by 5. For example, $f(4) = 0$ and $f(12) = 2$ and $f(20) = 4$. The function $g(x)$ is defined to be f applied enough times until the result is less than 5. For example, $g(2) = 0$ and $g(33) = g(6) = g(1) = 1$ and $g(64) = g(12) = g(2) = 2$. For how many positive integers x such that $1 \leq x \leq 300$ is it true that $g(x) = 2$?

Problem 4: How many rectangles are in the figure below? (Remember that squares are rectangles.)



Problem 5: Given that x is a real number that satisfies $x^3 + 4x = 8$, find the value of $x^7 + 64x^2$.

Problem 6: Circles ω_1, ω_2, and ω_3 are mutually externally tangent, and their radii are 3, 4, and 5, respectively. Let their points of tangency be A, B, and C. Find the area of $\triangle ABC$.