December 2011

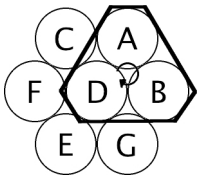
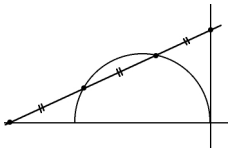
⋆ Regional Level ⋆

The Mandelbrot Competition

Round Two Test

Time Limit: 40 minutes

Name: _____

1. Determine the smallest positive integer, all of whose digits are even, that is a multiple of 9.		1
2. The goal of this puzzle is to return the letters to alphabetical order: A, B then C, D, E then F, G in the rows from top to bottom. On each move you may rotate any triangular block of circles, such as the highlighted block, by one or two places. What is the least number of moves required? 		1
3. Zach sells whizdoodles for a month, then decides to raise the price by \$1. In the next month he sells ten fewer whizdoodles, but earns the same amount of money as before. If he had sold ten more instead, his total revenue would have increased by \$260. What was his original price?		2
4. Farmer Theo has three straight, rigid lengths of fencing, each 20 feet long. He wishes to create a chicken coop in the shape of a quadrilateral by attaching the fence pieces to one another and to the side of his 100-foot barn. What is the largest area, in square feet, that he can enclose?		2
5. Rounded to the nearest hundredth, the positive real number x satisfying the equation $3^x + 6x = 99$ is given by $x = 3.93$. Find the solution to the equation $3^x + 2x = 31$, rounding your answer to the nearest hundredth.		2
6. A pair of two-digit numbers match if they have the same units or tens digit, or both. So 37 and 87 match, while 35 and 54 do not. Suppose Gina writes down two different two-digit numbers, then randomly calculates a third two-digit number. She wins if the random number does not match either of her numbers. If she uses the optimal strategy, what is her probability of winning?		3
7. A semicircle rests on the negative x-axis and is tangent to the y-axis. A line intersects both axes and the semicircle, as shown. Suppose that the points of intersection create three segments of equal length. What is the slope of the line? 		3

SCORE: