



★ REGIONAL LEVEL ★

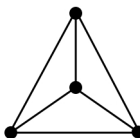
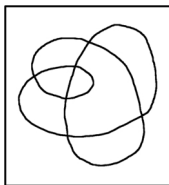
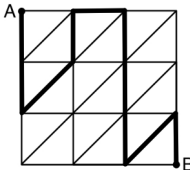
March 2014

The Mandelbrot Competition

Round Five Test

Name: _____

Time Limit:
40 minutes

1. Determine the smallest real number satisfying $ x - 20 + x - 14 = 8$.		1
2. A marker is placed on each large dot in the diagram at right. Each of the four markers is red on one side and black on the reverse side; to begin all the red sides are facing up. On a move you swap any two markers and flip them both over. What is the least number of moves needed to return each marker to its starting dot, but have them all black side up instead?		1
3. Find four integers such that their sum is -3 while the sum of their cubes is 3. (You may write the numbers in any order for your answer.)		2
4. Davis draws a doodle, which crosses over itself in some places, but never passes through any point more than twice, such as the doodle at right. If his doodle crosses over itself exactly 2014 times, then how many regions does it create on his sheet of paper? (The doodle at right creates 8 regions.)		2
5. Find the largest six-digit number using each of the digits from 1 to 6 once such that this number is divisible by 6, deleting the 6 gives a number divisible by 5, deleting the 5 leaves a number divisible by 4, and so forth down to 1. (Thus deleting the 6 from 136245 gives 13245, then deleting the 5 gives 1324.)		2
6. How many paths are there from A to B through the network shown if you may only move up, down, right, and up-right? A path also may not traverse any portion of the network more than once. A sample path is highlighted.		3
7. Suppose an ellipse and a hyperbola have the same points F_1 and F_2 as foci. These curves cross at four points; let P be one of them. These curves also intersect line F_1F_2 at four points Q , R , S and T in this order. Given that $RS = 20$, $ST = 14$, and $\triangle PF_1F_2$ is isosceles, find the area of $\triangle PF_1F_2$.		3

SCORE: