

2007 - 2008 Log1 Contest Round 3
Alpha Individual

Name: _____

4 points each	
1	Evaluate $\cos(\sin(\tan x))$, if $x=0$.
2	If Eric can write a math test in 1 hour and Trevor can write one in two hours, how long in hours will it take them to write 6 math tests if they work together?
3	A square is inscribed in a circle of diameter 4, what is the area inside the circle but outside the square?
4	If the angle between two points on a circle of radius 4 is 20° , then what is the length of the minor arc defined by these two points?
5	What are the roots of the equation $y = 3x^2 + 13x + 4$?

5 points each	
6	If $x+y=4$ and $xy=3$, then what is $3x^2 + 3y^2$?
7	What the largest base 10 number that can be expressed in 3 digits of base 16?
8	If $\sin \theta = \frac{12}{13}$, then what is $\cos 2\theta$?
9	If the letters of the word INDIVIDUAL are rearranged, then how many distinct possibilities are there?
10	Eric's route from his home to school has 5 stoplights, each with a 25% chance of delaying him 2 minutes, and the drive takes him 12 minutes with no stoplights slowing him. Every day he leaves for school 15 minutes before his first period class. What is Eric's expected amount of (average) time between when he arrives at school and when his first class starts?

6 points each	
11	If the points $(-1,17)$, $(2,8)$, and $(3,17)$ are on the parabola $y = Ax^2 + Bx + C$, then what is $(A + B + C)$?
12	What is the sum of the following infinite series: $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \frac{1}{64} - \dots$
13	A 60° sector is cut from a circle with radius 6 and rolled to form a cone. What is the volume of this cone?
14	Given two positive odd numbers: j and k with $j > k$; what is the largest integer that divides (no remainder) the quantity: $j^2 - k^2$?
15	An isosceles triangle has a perimeter of 50 and an altitude to the base (between the equal angles) of 5. What is the area of the triangle?