## VERMONT STATE MATHEMATICS COALITION TALENT SEARCH

Test 3 of the 2007 - 2008 school year (Test 4 will arrive at schools on February 18, 2008)

January 7, 2008

PRINT NAME:	Sign Name:
School	Grade
	Math Department Head
On separate sheets, in an organiz full credit for a complete correct You can receive half credit for coincomplete solutions. Included a solutions when the problem asks You may earn bonus points for "cand clarity. Your answers and so	<u>*</u> *
1. P is an interior point of the square.	uare ABCD for which PD = 10 and AP = $CP = 10\sqrt{5}$ .
	Answer:
	ose digits are non-zero, satisfies the equation the number $b$ with its digits reversed, and $P(b)$ is the product the solutions for $b$ .  Answer:
3. Find the smallest positive int	teger $n$ for which $n^{16}$ exceeds $16^{18}$ .
	Answer:

4. The triangle ABC is a right triangle with legs $BC = 3$ and $AC = 4$ . The two angle trisectors of angle C intersect the hypotenuse. The longer of these trisectors has length
$\frac{a\sqrt{3}+b}{c}$ , where gcf(a, b, c) = 1.
Evaluate $15a - 6b + 32c$ .
Answer:
5. The positive integers $a$ , $b$ , and $c$ satisfy the equations $a+b+c=2007$ If $c$ is a palindrome, find $c$ .
Answer:
6. Find the smallest real number $x$ , correct to the nearest hundredth, which satisfies the equation $(\log_2 x)^3 - \log_2 (2x^3) = (\log_2 x)^2 - \log_2 (x^2) - \log_2 2$
Answer:
7. Let $w \ne 1$ be a root of the equation $x^3 = 1$ . For the given real numbers $A$ and $B$ , find in simplest form the cubic equation whose roots are $A + B$ , $Aw + Bw^{-1}$ , and $Aw^2 + Bw^{-2}$ .
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