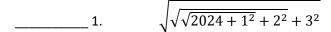# Speed Math
Test #402

Name: _____

ID Number: _____

School: _____

Division (circle one):

Mu   Alpha   Theta   Sponsor

Find the variable / value given in each problem in simplest form. You have 15 minutes to complete this test.

_____ 1. $\sqrt{\sqrt{\sqrt{2024 + 1^2} + 2^2} + 3^2}$

_____ 2. $2\sqrt{224} - 5\sqrt{126} + 3\sqrt{2744}$

_____ 3. $3a + 3b$, if $3a - b = 3$ and $a + 3b = 11$

_____ 4.   The number of ones in the binary representation of 3456

_____ 5.   The sum of the cubes of the roots of $x^2 - 6x + 1 = 0$

_____ 6. $\binom{24}{20}$

_____ 7.   The sum of a geometric series whose first two terms are $\frac{1}{3}$ and $\frac{1}{7}$

_____ 8. $\sqrt{132 + \sqrt{132 + \sqrt{132 + \cdots}}}$

_____ 9. $\sqrt[5]{20511149}$ (it's an integer!)

_____ 10. $f(10)$ if $f(x)$ is a quadratic polynomial with positive integer coefficients and $f(3) = 14$

_____ 11. $55555 + 6666 + 777 - 88 + 9$

_____ 12.   The sum of the positive integer factors of 2013

_____ 13.   The real part of $\left(\frac{i}{2} - \frac{\sqrt{3}}{2}\right)^{2024}$

_____ 14.   The obtuse angle between the hands of a clock at 7:20 (in degrees)

_____ 15.   The sum of the digits of $2024 \cdot 4042$

_____ 16. $\log_{343} 81 / \log_{625} 2187 \cdot \log_{25} 16807$

_____ 17.   The positive real root of $x^3 - 6x - 4 = 0$

_____ 18.   The magnitude of $\langle 3, -1, 2 \rangle \times \langle -2, 5, 2 \rangle$

_____ 19.   The product of the letters in $HERITAGE$, where each letter represents its position in the alphabet ($A = 1$, $B = 2$, …, $Z = 26$)

_____ 20.   The constant term in the expansion of $\left(x^2 + 1 + \frac{2}{x}\right)^6$

_____ 21. $\left(\sum_{n=0}^{2024} n^{2024}\right)$ mod 10

_____ 22.   The harmonic mean of 2, 3, and 4

_____ 23.   The volume of a tetrahedron whose vertices are at (0,0,0), (0,0,3), (3,4,5), and (4,0,0)

_____ 24. A, where $18275 \cdot 19293 = \overline{3A2A79575}$

_____ 25.   Consider the sequence of binary digits 10011. For each question on this test, add a 1 to the end of this sequence if it starts with the word "The" and a 0 otherwise. Convert each of the six groups of 5 binary digits to a base-10 number, and then convert these to letters ($A = 1$, $B = 2$, …, $Z = 26$). Write the six-letter word you obtain.