# Mental Math – Round 1 2013 Mu Alpha Theta National Convention

_____ 1) Find the number of square centimeters in the area of a triangle with a base of 92 centimeters and a height of 68 centimeters.

_____ 2) The arithmetic mean of nine consecutive positive numbers is 99. What is the sum of the largest and smallest values in this set of numbers?

_____ 3) What is the geometric mean of 3, 6, and 9? Answer in simplest radical form.

_____ 4) What is the sum of the first ten smallest positive perfect cubes?

_____ 5) Evaluate: $45^2 + 55^2 + 65^2$

_____ 6) Find the 100th term of the arithmetic sequence: 1, 8, 15, 22,…

_____ 7) Evaluate: $98 \times 111$

_____ 8) The sum of two numbers is 40. The positive difference of the two numbers is 4. What is the product of the two numbers?

_____ 9) How many positive perfect squares and positive perfect cubes are less than 2013? (You should count twice for a number that satisfies both properties.)

_____ 10) Evaluate: $\log_3 27 + \log_4 \frac{1}{16} + \log_8 2$. Express your answer as a common fraction.

_____ 11) Express $0.\overline{369}$ as a common fraction.

_____ 12) A book has 100 pages. The pages are numbered from 1 to 100, inclusive. What is the sum of all the digits used to number all the pages?

_____ 13) What is the probability of drawing two kings in a row, without replacement, from a standard 52-card deck? Express your answer as a common fraction.

_____ 14) Evaluate: LV – XIV. Express your answer in Arabic Numerals.

_____ 15) What is the sum of all positive two-digit integers that are divisible by 5?

_____ 16) In the expansion of $(2x - 3y)^6$, find the coefficient of the $x^5y$ term.

_____ 17) Let $A$ and $B$ be square matrices. If $|A| = 12$ and $B = A^{-1}$, what is $|B|$ as a common fraction?

_____ 18) Solve for $x$: $x = \sqrt{2 - \sqrt{2 - \sqrt{2 - \cdots}}}$

_____ 19) What is the maximum number of pieces that can be made by six straight lines cutting through a circle?

_____ 20) What is the sum of the number of edges, faces, and vertices of a regular tetrahedron?

_____ 21) Find the sum of the first 8 terms of the Fibonacci sequence: 1, 1, 2, 3, …

_____ 22) Using one or more of the positive integers from 1 to 10, inclusive, how many distinct sets will sum up to 10, if you can only use each integer once in each set?

_____ 23) What is the area of a triangle with side lengths of 7, 8, and 9? Answer in simplest radical form.

_____ 24) What is 15% of 24,680?

_____ 25) Evaluate: $13^2 + 39^2$

_____ 26) How many positive three-digit integers have exactly two digits that are the same?

_____ 27) What is the sum of the positive integral factors of 84?

_____ 28) Evaluate: $10002^2 - 9998^2$

_____ 29) Tim can mow a lawn in 22 hours and Bryan can mow the same lawn in 18 hours. Mowing at these rates, how fast can Bryan and Tim mow the lawn together? Express your answer in hours and as a mixed number.

_____ 30) If $f(x) = 3x - 2$ and $g(x) = 4x + 3$, find $f(g(0)) - g(f(0))$.

_____ 31) Evaluate: $\binom{20}{3}$

_____ 32) Solve for $x$ in the following equation: $\log_2(x-1) - \log_2(x+1) = 3$

_____ 33) How many positive one-digit integers divide 45,900?

_____ 34) What is the sum of the seven smallest positive prime numbers?

_____ 35) Compute $\frac{11}{30} + \frac{11}{40}$, and express your answer as a common fraction.

_____ 36) Express $4334_5$ as a base ten number.

_____ 37) Evaluate: $\sqrt{128 \times 50}$

_____ 38) Two fair six-sided dice are rolled. What is the probability, expressed as a common fraction, of obtaining a sum greater than 10?

_____ 39) Find the sum of the roots of the quadratic equation $42x^2 + 96x + 345 = 0$. Express your answer as a common fraction.

_____ 40) How many hours are there in 99 days?