5th Annual Lexington Math Tournament Guts Round - Part 1

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5th Annual Lexington Math Tournament Guts Round - Part 2

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5th Annual Lexington Math Tournament Guts Round - Part 3

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5th Annual Lexington Math Tournament Guts Round - Part 4

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5th Annual Lexington Math Tournament Guts Round - Part 5

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5th Annual Lexington Math Tournament Guts Round - Part 6

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5th Annual Lexington Math Tournament Guts Round - Part 7

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5th Annual Lexington Math Tournament Guts Round - Part 8

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5th Annual Lexington Math Tournament Guts Round - Part 9

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5th Annual Lexington Math Tournament Guts Round - Part 10

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5th Annual Lexington Math Tournament Guts Round - Part 1

1.[4] An iscoceles triangle has one angle equal to 100 degrees, what is the degree measure of one of the two remaining angles.

2.[4] Tanmay picks four cards from a standard deck of 52 cards at random. What is the probability he gets exactly one Ace, exactly exactly one King, exactly one Queen, exactly one Jack and exactly one Ten?

3.[4] What is the sum of all the factors of 2014?

5th Annual Lexington Math Tournament Guts Round - Part 2

4.[5] Which number under 1000 has the greatest number of factors?

5.[5] How many 10 digit primes have all distinct digits?

6.[5] In a far off universe called Manhattan, the distance between two points on the plane P = (x_1, y_1) and Q = (x_2, y_2) is defined as $d(P, Q) = |x_1 - x_2| + |y_1 - y_2|$. Let S be the region of points that are a distance of ≤ 7 away from the origin (0, 0). What is the area of S?

5th Annual Lexington Math Tournament Guts Round - Part 3

7.[6] How many factors does 13! + 14! + 15! have?

8.[6] How many zeroes does 45! have consecutively at the very end in its representation in base 45?

9.[6] A sequence of circles $\omega_0, \omega_1, \omega_2, \ldots$ is drawn such that:

- ω_0 has a radius of 1.
- ω_{i+1} has twice the radius of ω_i
- ω_i is internally tangent to ω_{i+1}

Let A be a point on ω_0 and B be a point on $\omega_1 0$. What is the maximum possible value of AB?

5th Annual Lexington Math Tournament Guts Round - Part 4

10.[6] A 3-4-5 triangle is constructed. Then a similar triangle is constructed with the shortest side of the first triangle being the new hypotenuse for the second triangle. This happens an infinite amount of times. What is the maximum area of the resulting figure?

11.[6] If an unfair coin is flipped 4 times and has a 3/64 chance of coming heads exactly thrice, what is the probability the coin comes tails on a single flip.

12.[6] Find all triples of positive integers (a, b, c) that satisfy 2a = 1+bc, 2b = 1+ac, and 2c = 1 + ab.

5th Annual Lexington Math Tournament Guts Round - Part 5

13.[7] 6 numbered points on a plane are placed so that they can create a regular hexagon $P_1P_2P_3P_4P_5P_6$ if connected. If a triangle is drawn to include a certain amount of points in it, how many triangles are there that hold a different set of points? (note: the triangle with P_1 and P_2 is not the same as the one with P_3 and P_4).

14.[7] Let S be the set of all numbers of the form $n(2n+1)(3n+2)(4n+3)(5n+4)$ for $n \geq 1$. What is the largest number that divides every member of S?

15.[7] Jordan tosses a fair coin until he gets heads at least twice. What is the expected number of flips of the coin that he will make?

5th Annual Lexington Math Tournament Guts Round - Part 6

16.[7] If you roll four fair 6-sided dice, what is the probability that at least three of them will show the same value

17.[7] In a tetrahedron with volume 1, four congruent speres are placed each tangent to three walls and three other spheres. What is the radii of each of the spheres

18.[7] let f(x) be twice the number of letters in x. What is the sum of the unique x,y such that $x \neq y$ and f(x)=y and f(y)=x.

5th Annual Lexington Math Tournament Guts Round - Part 7

19.[8] How many 4 digit numbers with distinct digits ABCD with A not equal to 0 are divisible by 11?

20.[8] How many (2-dimensional) faces does a 2014-dimensional hypercube have?

21.[8] How many subsets of the numbers 1,2,3,4...$2^2$014 have a sum of 2014 mod $2^2$014?

5th Annual Lexington Math Tournament Guts Round - Part 8

22.[8] Two diagonals of a dodecagon measure 1 unit and 2 units. What is the area of this dodecagon?

23.[8] Square ABCD has point X on AB and Y on BC such that angle ADX = 15 degrees and angle CDY = 30 degrees. what is the degree measure of angle DXY?

24.[8] A 4x4 grid has the numbers 1 through 16 placed in it, 1 per cell, such that no adjacent boxes have cells adding to a number divisible by 3. In how many ways is this possible?

5th Annual Lexington Math Tournament Guts Round - Part 9

25.[9]Let B and C be the answers to 26 and 27 respectively.If S(x) is the sum of the digits in x, what is the unique integer A such that S(A), S(B), S(C) $\subset$ A,B,C

26.[9]Let A and C be the answers to 25 and 27 respectively. What is the third angle of a triangle with two of its angles equal to A and C degrees.

27.[9]Let A and B be the answers to 25 and 26 respectively. How many ways are there to put A people in a line, with exactly B places where a girl and a boy are next to each other.

5th Annual Lexington Math Tournament Guts Round - Part 10

28.[$\leq$ 15] What is the sum of all the squares of the digits to answers to problems on the individual, team, and theme rounds of this years LMT? If the correct answer is N and you submit M, you will recieve $\lfloor 15 - 10 \times \log(M - N) \rfloor$

29.[$\leq$ 15] How many primes have all distinct digits, like 2 or 109 for example, but not 101. If the correct answer is N and you submit M, you will recieve $\lfloor 15 \min(\frac{M}{N}, \frac{N}{M}) \rfloor$

30.[$\leq$ 15] For this problem, you can use any 10 mathematical symbols that you want, to try to achieve the highest possible finite number. (So "Twenty-one", "$\frac{12}{100} + 843$" and "$\sum_{i=0}^{10} i^2 + 1$" are all valid submissions.) If your team has the Nth highest number, you will recieve $\max(16 - N, 0)$.