Girls in Math 2026

Individual Round

NAME

TEAM

ID

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11.

12.

– 75 minutes
– No calculators
– Positive integer answers
– Write answers INSIDE the box

1. For any real numbers a, b, define $a \triangleright b = 2a - b$. Evaluate $(311 \triangleright 131) + (131 \triangleright 113) + (113 \triangleright 311)$.

2. Parallelogram $ABCD$ has area 128. E, F, G, H and I are the midpoints of $\overline{AB}, \overline{BE}, \overline{CD}, \overline{FG}$, and $\overline{CF}$ respectively. What is the area of quadrilateral $HICG$?

3. Brenda has tasked you with buying the necessary materials to build the wire frame of a table. Each inch of wire costs you \$4. The wire will be used for the four legs of the table, as well as the four edges of the tabletop. The volume contained by the tabletop will be a rectangular prism, and Brenda wants this volume to be at least 500 in^3. What's the minimum price required to buy the necessary materials?

4. Find the sum of all real values of x that satisfy the equation $\log_3(x+5) - 2\log_9(x-1) = 1$.

5. For a finite set of integers A, we define the difference set $A - A := \{a_i - a_j \mid a_i, a_j \in A\}$ to be the set of all differences of two (possibly not distinct) elements of A. Let N be the minimum of $|A - A|$ over all subsets $A \subset \mathbb{Z}$ with $|A| = 99$, and let M be the maximum of $|A - A|$ over all subsets $A \subset \mathbb{Z}$ with $|A| = 99$. Find $N + M$.

6. $ABCD$ is a square with side length 40. Points E, F are chosen on $\overline{AB}, \overline{CD}$, respectively, such that $AE = 1$ and $CF = 9$. Point X_1 is chosen on $\overline{AB}$, points X_2 and X_3 are chosen on $\overline{BC}$, and point X_4 is chosen on $\overline{CD}$ so that $\angle EX_iF = 90^\circ$ for $i = 1, 2, 3, 4$. Given that the polygon $X_1X_2X_3X_4$ is non-degenerate, find its area.

7. Let N be the number of functions f from the integers $\{1, 2, \cdots, 25\}$ to integers in $\{1, 2, \cdots, 25\}$ such that $f(i) \neq f(j)$ for all $i \neq j$ and $f(i) + j \equiv i + f(j) \pmod 5$ for all $1 \leq i < j \leq 25$. How many divisors does N have?

8. For a positive integer n, let $\Omega(n)$ denote the number of prime factors of n, counted with multiplicity. What is the smallest positive integer n for which $2^{\Omega(n)} < n < 2.2^{\Omega(n)}$?

9. Let S be the set of prime numbers less than 2026. For $p \neq q$, p and q are considered `connected` if $pq \equiv k$ mod 2026, for some integer k with $0 < k < 2026$. The degree of p is the number of $q \in S$ such that p and q are connected. For what value of k is the maximum degree of an element in S maximized?

10. Triangle ABC is inscribed in a circle centered at O with radius 5. It is given that $BC = 6$ and the three distances from O to the sides of ABC form the side lengths of a right triangle. The area of ABC can be expressed as $\frac{m}{n}$, where m and n are relatively prime positive integers. What is $m + n$?

11. Define a `move` to be an operation on a binary string where we select four consecutive digits 0110 in the string and replace it with 1001. What is the maximal number moves can we perform to a length 100 binary string before no further moves are possible, across all 2^{100} starting strings?

12. Twenty points are evenly spaced on a unit circle. Three distinct points A, B, and C are chosen from them uniformly at random. The expected value of $AB^2 + BC^2 + CA^2$ can be expressed in the form $\frac{m}{n}$, where m and n are relatively prime positive integers. What is $m + n$?