

Algebra and Number Theory Round

May 17, 2026

LAMT 2026

1. The LA Rams will play 17 games in the NFL regular season. They will play each of their three division rivals (Seahawks, Cardinals, and 49ers) two times, while playing all other teams zero or one time. If there are 32 teams (including the Rams) in the NFL, find the number of teams (excluding the Rams) that will not play the Rams during the regular season.
2. Find the unique positive real number x for which

$$\left(\frac{\sqrt{x+1} + \sqrt{x+12}}{\sqrt{x+2} + \sqrt{x+17}}\right)^2 + \frac{1}{x+2} = 1.$$

3. Brooks assigns each of the 8 positive divisors of 30 to either a row or column of the 4×4 grid below, with no two numbers being assigned to the same row or column. In each cell, he writes the least common multiple of the numbers assigned to the row and column of that cell. Find the sum of the numbers assigned to the 4 columns.

6	2	10	30
30	10	10	30
6	3	15	15
30	30	30	30

4. Let p , q , and r be the roots of the polynomial $x^3 - 13x^2 + 40x - 3$. Find the value of

$$\frac{p^2}{1-qr} + \frac{q^2}{1-rp} + \frac{r^2}{1-pq}.$$

5. Let $[x]$ denote the greatest integer less than or equal to x . Find the number of positive integers $n \leq 420$ for which

$$\left[\frac{n}{2}\right] \cdot \left[\frac{n}{3}\right] \cdot \left[\frac{n}{5}\right] \cdot \left[\frac{n}{7}\right]$$

is even.

6. Let a , b , and c be positive real numbers satisfying

$$\sqrt{a+1} = \sqrt{b} + \sqrt{c}, \quad \sqrt{b+2} = \sqrt{c} + \sqrt{a}, \quad \sqrt{c+3} = \sqrt{a} + \sqrt{b}.$$

Find a .

7. Let a and b be positive integers. Suppose the smallest positive integer m such that b divides $am - 1$ is 81, and the smallest positive integer n such that a divides $bn - 1$ is 64. Find the smallest possible value of $a + b$.
8. Find the number of ordered pairs (a, b) of positive integers for which $\gcd(a, 10) = 1$, b divides 10^5 , and $ab \leq 10^5$.
9. Suppose $P(x)$ and $Q(x)$ are monic quadratic polynomials for which

$$\begin{aligned} 0 &= P(P(4) + Q(4)) = P(P(5) + Q(5)) = P(P(9) + Q(9)) \\ 0 &= Q(P(6) + Q(6)) = Q(P(8) + Q(8)) = Q(P(9) + Q(9)). \end{aligned}$$

Find $P(0) + Q(0)$.

10. Find the largest integer $n < 1000$ such that

$$\left| \sum_{k=1}^n ki^k \right|$$

is an integer.

11. **[TIEBREAKER]** Let (a_1, a_2, \dots, a_9) be a permutation of $(1, 2, \dots, 9)$. Define the function

$$f(x) = |\dots||x - a_1| - a_2| - a_3|\dots| - a_9|.$$

Estimate the maximum possible area bounded by the graph of $f(x)$ and the x -axis on the interval $[0, 45]$, over all permutations of $(1, 2, \dots, 9)$.

Express your answer as a number in base 10 (submissions not in this form will not be accepted). Ties will be broken based on distance to the correct answer.