

Theme Round

LMT Fall 2025

December 13th, 2025

Clash Royale

Clash Royale is a mobile game where two players manage their resources to topple the other player's structures. Although it was released in 2016, it became incredibly popular this year. It is also known for the plethora of memes that it inspired, such as "sneaky golem," overleveled mega knight users, and, of course, "HOG RIDERRRRRR."

1. [6] Let $CLASH$ be a regular pentagon and $ROYALE$ be a regular hexagon. Find the sum of both possible values of $\angle CLE$ in degrees.

2. [8] Archer and Giant, two perfectly logical people, know each other's favorite numbers are positive two-digit integers, and they don't know which.

Archer: My number has 3 factors including 1 and itself.

Giant: Ok, my number is less than your number then.

Archer: I see. My number is definitely more than twice your number, then.

Giant: Also, my number is divisible by 9.

Find the positive difference between Archer and Giant's favorite numbers.

3. [10] At a Clash Royale store, you can buy anywhere from 0 to 25 boxes of mega knights. In the normal store, boxes contain 3 or 12 mega knights; in the evil store, you can boxes contain 2 or 8 mega knights. Find the number of values n such that you can buy n mega knights in the evil store but not in the normal store.

4. [12] Suppose B, A, T, S are the distinct roots of the polynomial $x^4 - x^2 - 1$. Find the value of $B^8 + A^8 + T^8 + S^8$.

5. [14] Let $RAGE$ by a cyclic quadrilateral with perpendicular diagonals such that RG and AE intersect at O . Let L lie on ER such that L, O , and the midpoint of AG are collinear. If $LR = OA = 4$ and $EL = 9$, find the area of LOG .

Lebron

LeBron (LeBron James) is an American professional basketball player for the Los Angeles Lakers, the NBA's all-time leading scorer with four championships and four MVP awards, widely regarded as "the goat."

1. [6] In the 2025-2026 NBA Season, Lebron has played 6 games and is averaging 14 points per game. Find the number of points he must score in his next game such that he averages 23 points per game over all 7 games.

2. [8] Lebron is in a circular region centered at the origin with radius 3 meters, with defenders at the points $(1, 0)$, $(0, 1)$, $(-1, 0)$, $(0, -1)$. If Lebron is within 1 meter of exactly 2 defenders, he is heavily contested, and if he is within 1 meter of exactly 0 defenders, he is wide open. Given that he is placed uniformly at random inside the circular region, find the probability he is wide open minus the probability he is heavily contested.

3. [10] Let b, r, o, n be primes satisfying:

$$b \cdot r \cdot o + n = 784$$

$$b + r \cdot o \cdot n = 91.$$

Find $b + r + o + n$.

4. [12] Lebron's fans hold up L every 2 seconds, E every 3 seconds, B every 4 seconds, R every 6 seconds, O every 9 seconds, and N every 23 seconds. One second before noon, they start by holding up LEBRON at the same time. Over the next hour (including 1:00:00), for how many seconds are they holding up exactly 5 letters in LEBRON?
5. [14] Every point Lebron scores comes from a 2 point or 3 point shot. Find the number of ways he can score 23 points if he never scores two 3 points shots in a row.

Performative

"To be performative is to be human," a wise matcha-sipping Labubu and baggy-jean-wearing softboi listening to Clairo with his iPhone 5 and dingy Delta Airlines earbuds once said while reading Infinite Jest in one hand and All About Love in the other.

1. [6] Clairo has x ounces of matcha, and Laufey has x ounces of horchata. Clairo fills up the rest of her drink up to 12 ounces with a 20% matcha, 80% horchata solution, while Laufey fills up the rest of her drink up to 8 ounces with a 80% matcha, 20% horchata solution. To their surprise, after following this procedure, each of their resulting drinks has the same concentration of matcha and horchata. Find x .
2. [8] Let L, A, U, F, E, Y be six (not necessarily distinct) digits such that \overline{LAUFEY} is a prime number and $L + A + U + F + E + Y$ is an odd composite integer. Find the sum of all **three** possible values of $L + A + U + F + E + Y$.
3. [10] Adam has 6 distinct feminist literature books in a tote bag. He draws a book randomly and puts it back into the tote bag. He stops when he gets 2 draws in a row of the same book, or 3 draws in a row each with different books. Find the expected number of times he must draw.
4. [12] Let $ZIPS$ be a trapezoid with $ZI \parallel PS$ such that the following conditions are held:
 - if X is the midpoint of \overline{SP} , then $ZX = ZS$ and $\angle XZP = \angle PZI$,
 - and $\angle ISZ = \angle ISP$.

Given that $ZI = 4$, find a quarter $[\Delta ZIP]$ (a quarter of the area of triangle ZIP).

5. [14] A 4×4 grid is *performative* if each row, column, and 2×2 box in the corners contain exactly two T's, one O, and one E. Find the number of performative grids.

Below is an example of a performative grid:

T	O	T	E
T	E	T	O
O	T	E	T
E	T	O	T

Tiebreaker Estimation

This problem will only be used to break ties for individual aggregate awards. If two competitors are tied, then the one closest to the correct answer will win.

1. [TIEBREAKER] Let $P(x) = (1 + x)^{2025}$. Let c_k be the coefficient of the x^k term in $P(x)$. Let

$$c_{\max} = \max(c_0, c_1, \dots, c_{2025}).$$

Find the number of digits in c_{\max} .