Combinatorics Round

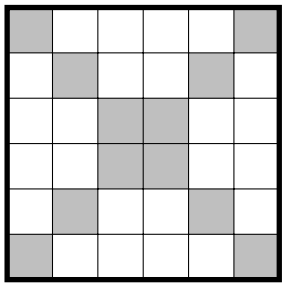
May 17, 2026

LAMT 2026

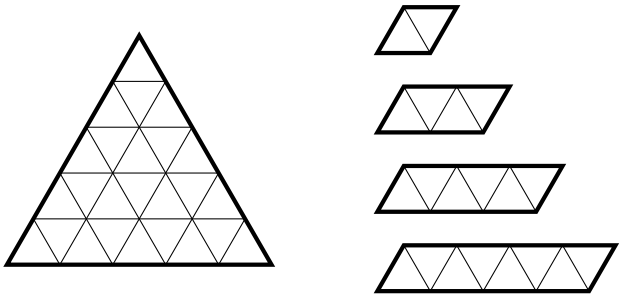
1. A full house is a set of five cards consisting of three cards of one rank, along with two cards from a different rank. (Rank refers to the numerical or face value assigned to a card; there are 13 ranks: $A, 2, 3 \ldots, 10, J, Q, K$.)

   Find the minimum number of cards that need to be drawn from a standard deck of 52 cards to guarantee that five of them will form a full house.

2. In a 6×6 grid, the cells on the two main diagonals are shaded. Tom starts in a cell, and moves to an adjacent cell every second. However, he may only change direction if he is in a shaded cell (he can pick his starting direction). Find the number of ways Tom can start in a cell, and follow a path which visits at least 3 distinct cells (without repeating any cells) that leads him to his starting cell (which is the only cell that can be repeated).



3. The equilateral triangle on the left has side length 5, and gridlines tile it into equilateral triangles of side length 1. Find the number of ways to place all 4 parallelograms pictured on the right onto the large equilateral triangle, so that their boundaries lie on the gridlines and no two of them overlap. The parallelograms may be rotated or reflected.



4. Arpit selects two nonempty sets A and B of integers from 1 to 2026 inclusive. Suppose $\min(A) = \max(B)$, $|A| = \min(B) + 2$, and $|B| = \max(A) - 2$. Find the number of ways Arpit could have selected the two sets A and B.

5. Vicky conducts a survey, asking UCLA students about their opinions on the movies Oppenheimer (2023), Legally Blonde (2001), and Scream 2 (1997). She notes the following results:

   - Among the students who liked both Oppenheimer and Legally Blonde, one-third also liked Scream 2.
   - Among the students who liked Scream 2, one-sixth also liked at least one other movie listed.
   - Among the students who liked less than 3 of the movies listed, one-sixth liked two of the movies listed.
   - Being UCLA students, everyone polled liked at least one of the movies listed.

   At random, Vicky chooses someone who did not like Scream 2. Find the probability they like exactly one of the three movies listed above.

6. Kenneth starts at the point $(0, 0)$ in the coordinate plane. Every second, he chooses to move right by some integer power of 2, or up by some integer power of 2. Suppose he never goes above the line $y = x$, and never uses a power of 2 more than once. Find the number of ways Kenneth can reach the point $(73, 54)$.

7. Nish has 20 boxes of cookies, having 1 cookie, 2 cookies, all the way to 20 cookies in the 20th box. If two boxes have a and b cookies, Nish can combine them into a single box of $a + b$ cookies in ab seconds. Find the minimum number of seconds it takes for Nish to combine all the cookies into one box.

8. Find the number of ways to partition the integers from 0 through 41 into 14 disjoint sets of 3 integers such that each set is of the form

$$\{n, n + 1, n + 22\} \text{ or } \{n, n + 21, n + 22\}$$

for some integer n. (All elements in the set are taken modulo 42)

9. In a tournament with 6 players, every pair of players plays exactly one game, and each game has exactly one winner. The tournament is called *boring* if there are exactly three ordered triples of distinct players (A, B, C) such that A beats B, B beats C, and C beats A. Find the number of ways to assign a winner to each game, so that the tournament is boring.

10. Ricky starts the bottom left cell of an 8×8 grid, and every second he can move to the cell either above or to the right of his current cell. There are 8 boulders placed in distinct cells according to following rules:

    - If a cell has a boulder, then the cell diagonally adjacent that is to the bottom-right of this cell is empty.
    - Ricky may not enter a cell with a boulder.
    - The bottom left cell and top right cell do not contain boulders.

    Find the number of arrangements of boulders for which Ricky cannot reach the top right cell of the grid.

11. **[TIEBREAKER]** A polyomino is a plane geometric figure formed by joining unit squares edge-to-edge. Two polyominoes are considered the same if one can be obtained from the other by rotation (but not reflection). For example:

    - There is 1 domino (2 squares)
    - There are 2 trominoes (3 squares)
    - There are 7 tetrominoes (4 squares, which are the Tetris pieces).

    Estimate the number of unique decominoes (polyominoes made of 10 unit squares), where rotations are considered identical but reflections are not.

    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.