2025 Gauss Math Tournament Target Round (Div. 2)

June 7, 2025

1. What is the largest 3 digit positive integer with the sum of the squares of its digits summing to 17?

2. How many two digit integers n are there such that the sum of n and the number found from reversing its digits is 132?

3. If I select 4 cards with replacement from a standard deck of 52 cards (13 ranks in each of the 4 suites: hearts, diamonds, spades, and clubs), what is the probability that I selected at least one club?

4. Sally writes a number from 0 to 9 (inclusive) on a whiteboard. She then repeatedly replaces the number with the units digit of $n^2 + 3$, where n is the number currently on the board. She does this 247 times. If she originally chose the starting number uniformly at random, what is the probability that the final number on the board is 2?

5. A right triangle has an area of 20 and a perimeter of 25. What is the length of its hypotenuse?

6. How many fractions are there in the form of $\frac{ab}{bc}$ that are less than 1 such that "cancelling" the b incorrectly (leading to $\frac{a}{c}$) results in the same value as the original fraction? $a, b, and c$ are distinct digits from 1-9 inclusive.
   Note for just this problem: the "ab" and "bc" in this problem do not mean the products ab or bc. They represent two-digit numbers. For example, if $a = 1$ and $b = 2$ here, ab would be 12 and not 2.

7. How many ways are there to pick a subset S of $\{1, 2, 3, ..., 15\}$(the positive integers from 1 to 15, inclusive) such that no two numbers in S have a difference that is a multiple of 6?

8. Let $f(n) = 12^n + 14^n$. Find the remainder when $f(25)$ is divided by 169.