# Problem Set - 19 Jan 2024

## **PROBLEM 1** (2016 AMC 10B #8)

What is the tens digit of $2015^{2016} - 2017$?

$\textbf{(A)}\ 0 \qquad \textbf{(B)}\ 1 \qquad \textbf{(C)}\ 3 \qquad \textbf{(D)}\ 5 \qquad \textbf{(E)}\ 8$

## **PROBLEM 2** (2017 AMC 10B #10)

The lines with equations $ax - 2y = c$ and $2x + by = -c$ are perpendicular and intersect at $(1, -5)$. What is $c$?

$\textbf{(A)}\ -13 \qquad \textbf{(B)}\ -8 \qquad \textbf{(C)}\ 2 \qquad \textbf{(D)}\ 8 \qquad \textbf{(E)}\ 13$

## **PROBLEM 3** (2011 UNCO MATH CONTEST II #6)

What is the remainder when $1! + 2! + 3! + \cdots + 2011!$ is divided by 18?

## **PROBLEM 4** (2012 AIME II #10)

Find the number of positive integers $n$ less than $1000$ for which there exists a positive real number $x$ such that $n = x\lfloor x \rfloor$.

Note: $\lfloor x \rfloor$ is the greatest integer less than or equal to $x$.

## **PROBLEM 5** (2016 IMO #3)

Let $P = A_1A_2 \cdots A_k$ be a convex polygon in the plane. The vertices $A_1, A_2, \ldots, A_k$ have integral coordinates and lie on a circle. Let $S$ be the area of $P$. An odd positive integer $n$ is given such that the squares of the side lengths of $P$ are integers divisible by $n$. Prove that $2S$ is an integer divisible by $n$.