Week 1 Friday

Turn to someone sitting near you who you haven't met before (or who you haven't talked to much before), and introduce yourself!

DKSSBUIGLDEBXOX

Then spend 5 minutes working together to decipher the above message, which was double encrypted: first using a Caesar cipher with a shift of 3 and then using rectangular transposition with the key word EARLY.

Modular Arithmetic

1. What is $-13 \bmod 5$?

(A) 3

(B) 2

(C) -3

(D) None of the above

2. What is $5^{2023202320232023} \bmod 6$?

(A) 0

(B) 1

(C) 5

(D) None of the above

3. Find a neighbor who brought a computer with them. Open up a blank SageCell (sagecell.sagemath.org) and work together to write some code to answer the following:

The year 2023 is "special" because 2023 is divisible by 7 $(2023 = 7 \cdot 289)$ and the digits of 2023 sum to 7 $(2 + 0 + 2 + 3 = 7)$. When was the last time these two things happened simultaneously? When is the next time?

4. "There exist three *odd* integers a, b, c such that every integer x is congruent mod 3 to either a or b or c."

This statement is...

(A) True.

(B) False.