# MATH 170: HOMEWORK 2

DUE: SEPTEMBER 17, 2021

**Graded for accuracy:** 3.
**Graded for completion:** 1, 2.
**Instructions:** Problems that are graded for accuracy must be correct to get points. Problems that are graded for completion must show some trying effort.

1. Are these numbers divisible by 2, 3, 5? To get points, use the criteria of divisibility that we covered in class. Optional: check your answers with a calculator.

   a. 12345;

   b. 10101010.

2. a. Let $a, b \in \mathbb{Z}$. Prove that $\gcd(a, b) = \gcd(a, -b)$.

   b. Compute $\gcd(12, -30)$ using Euclid's algorithm.

   c. Compute $\gcd(12\,345, 11\,100)$ using Euclid's algorithm.

   d. Optional: check your answers on https://www.wolframalpha.com/.
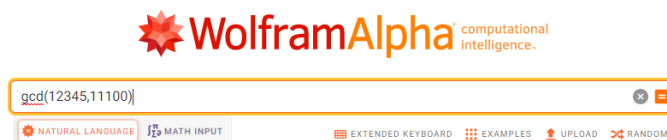


3. a. Divide the following numbers by 10 with remainder: 1234, 2021. That is, write them in the form $10 \cdot q + r$, where $0 \leqslant r < 10$. Compute $1234 + 2021$ and divide the result by 10 with remainder. Observe that the remainder you get is the sum of the first two remainders.

   b. Compute the remainder of 1236 and 2027 when dividing by 10, then compute the remainder of their sum. Why is it no longer just the sum of remainders?

   c. Rephrase the following rule in your own words: If you divide $a_1, a_2 \in \mathbb{Z}$ by $b > 0$ with remainder, write the remainder of $a_1$ as

$r_1$ and the remainder of $a_2$ as $r_2$. Then the remainder of $a_1 + a_2$ is $r_1 + r_2$ or $r_1 + r_2 - b$.

* Bonus: prove c.