
None of the problems on this assignment are graded. Instead, after completing it, please fill out the associated Google form. That form is the only graded component.

Math Background

Exercise 1. *Let $f : \mathbb{Z} \to \mathbb{Z}$. We define $f(x) = 3x + 4$.*
Determine the inverse function $f^{-1} : \mathbb{Z} \to \mathbb{Z}$.

Exercise 2. *Let $g : \mathbb{Z} \to \mathbb{Z}$. We define $g(x) = |x|$. Here $|x|$ is the absolute value of x.*
Is g one-to-one? Onto? Bijective? Does an inverse exist?

Exercise 3. *Determine the modular multiplicative inverse of:*

- *3 mod 7,*
- *6 mod 5,*
- *2 mod 9*

Cryptography

Exercise 4. *Go to the course website and make a copy of the Google colab notebook. Follow the instructions there.*

Bonus

Exercise 5. *How many possible unique key pairs exist for the affine cipher? Remember, not all numbers have modular multiplicative inverses.*