Some notes on the homework assignment:

- This is the last homework of the term! The only assignment after this will be the second part of the portfolio
- Remember to acknowledge your collaborators and cite your sources. The template has a section built in for you to do this (see the comments in the template).
- Remember to let me know if you can't do your peer review this week (for any reason)!

Here's the schedule of when things are due for this assignment.

Component Due	**Date**
Draft of Solutions	Thursday, March 3
Peer Review	Tuesday, March 8
Final Copy	Friday, March 11

And finally, here are the problem statements.

1. *Find all solutions to the following system of linear congruences:*

$$\begin{aligned} x &\equiv 0 \mod 2 \\ x &\equiv 0 \mod 3 \\ x &\equiv 1 \mod 5 \\ x &\equiv 6 \mod 7 \end{aligned}$$

2. *Find all solutions of the congruence* $x^2 + 6x - 31 \equiv 0 \mod 72$.

   Hint: Observe that $72 = 2^3 \cdot 3^2$, *then find all solutions* $\mod 8$ *and* $\mod 9$ *by brute force. Use Sun-Tsu's Theorem to convert those to solutions* $\mod 72$.

3. *Show that if* $a, b, c \in \mathbb{Z}$ *and* $(a, b) = 1$, *then there exists an integer* $n \in \mathbb{Z}$ *so that* $(an + b, c) = 1$

   Hint 1: Split this into two cases: the first case will be every prime which divides c *also divides* b. *The second case will be when some prime which divides* c *doesn't divide* b. *Liberally make use of the fact that if a prime* p *divides* x *but doesn't divide* y, *then* $p \nmid x + y$.

   Hint 2: There's a different proof that relies on a "sledgehammer" (i.e. you prove something using a theorem that is way more powerful than the result you're proving). Think about the fact that numbers of the form $an + b$ *form an arithmetic progression and since* $(a, b) = 1$ *you can use a powerful theorem from section 3.1...*