**Homework 7**

**Instructions:** Do as many of the problems as you like, but make sure to complete at least **three**. Then I will create a solution from your work.

1. Find a simultaneous solution modulo 455 to the system of congruences
2. Prove that for any integer *a.*
3. If *p*  is prime and *p* does not divide *a*, show that
4. Use Fermat’s Little Theorem to show that for any prime *p.* (This is sometimes referred to as the "freshman's dream"; see <https://en.wikipedia.org/wiki/Freshman%27s_dream> )
5. Find the solution of the system
6. Find five consecutive positive integers such that the first is divisible by 2, the second is divisible by 3, the third by 5, the fourth by 7 and the fifth by 11.
7. Write a code to implement the Chinese remainder theorem. Your code should check if the conditions of the theorem apply.