1. (a) Use Euclid’s algorithm to compute the gcd of 495 and 210. Write out the steps.
   (b) What is the prime factorization of 495 and of 210?
   (c) Is your answer to part (a) correct?

2. Prove the following theorem
   
   **Theorem:** If \( a \equiv b \pmod{m} \) and \( c \equiv d \pmod{m} \) then
   (a) \( a + c \equiv b + d \pmod{m} \)
   (b) \( ac \equiv bd \pmod{m} \)
   
   **Note:** If \( a = q_at + r_a \) and \( b = q_bt + r_b \) where \( r_a < m \) and \( r_b < m \) it is possible that \( r_a + r_b \geq m \).

3. Construct the multiplication table for arithmetic mod 7.

4. (Extended Euclidean Algorithm) What is multiplicative inverse of 400 mod 997?

5. (a) Prove for relatively prime \( a \) and \( b \) that if \( a \) divides \( bc \), then \( a \) divides \( c \).
   
   **Hint:** First show that there exist \( s \) and \( t \) such that \( sac + tbc = c \) and then argue that \( a \) divides \( c \).

   (b) Give counter example when \( a \) and \( b \) are not relatively prime.