

Worksheet #9; date: 09/26/2018
MATH 55 Discrete Mathematics

1. (*Rosen 4.4.21, 24*) Find all solutions to the system of congruences $x \equiv 1 \pmod{2}$, $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{5}$, and $x \equiv 4 \pmod{11}$ with two methods:

- (a) The construction in the proof of the Chinese remainder theorem
- (b) Back substitution.

2. (*Challenging*) Solve the system of congruences:

$$\begin{cases} 9x + 1 \equiv 0 \pmod{2} \\ 5x \equiv 1 \pmod{3} \\ x \equiv 4 \pmod{7} \end{cases}$$

3. (*Rosen 4.2.26; edited*) Use the square-and-multiple method to find $11^{644} \pmod{645}$.
4. (*Rosen 4.5.65*) Find all solutions of the congruences $x^2 \equiv 29 \pmod{35}$.
Hint: Find the solutions of this congruence modulo 5 and modulo 7, and then use the Chinese remainder theorem.