Dartmouth College
Mathematics 25

Assignment 3
due Wednesday, October 14

1. Find the general solution to the congruence $15x \equiv 12 \pmod{24}$.

2. Find the general solution to the congruence $13x \equiv 15 \pmod{24}$. Show all your work including the steps involved to obtain a particular solution.

3. Find the least nonnegative residue of $17^{208} \pmod{93}$.

4. Solve the system of congruences $x \equiv 3 \pmod{10}$ and $x \equiv 5 \pmod{7}$ by listing solutions to the first congruence modulo 70 and then determining which if any satisfy the second. Does this find them all? Why?

5. Find all solutions to the system of congruences:

$$\begin{aligned} x &\equiv 3 \pmod{17} \\ x &\equiv 10 \pmod{16} \\ x &\equiv 0 \pmod{15} \end{aligned}$$

   using the general procedures in the Chinese Remainder theorem.

6. A gaggle of 17 geese have 12 nests, eleven of which contain the same number $m > 1$ of eggs, and the twelfth with 6 eggs. Dividing all the eggs into 17 piles produces piles each with the same number of eggs. What is the minimum number of eggs possible.