Quantitative Reasoning 28:
The Magic of Numbers

Homework 18

Assigned on March 23
Due at 5:00 p.m. March 25

Please submit problem sets to the boxes outside the Math Department's main office, on the third floor of the Science Center (Room 325).

Reading:

Gross-Harris, Chapter 17

Problems:

Please explain your reasoning and show your work.

Remember that when working $\pmod{n}$, your final answer should be a symbol in the range $0, 1, \ldots, n-1$. Also recall that, when asked to do division in modular arithmetic, the answer could be "does not exist."

1. The goal of this problem is to find $5/17 \pmod{31}$. Note that 31 is prime, and thus we know that a solution exists.
   (a) Use the Euclidean Algorithm to find integers x and y such that $17x + 31y = 1$.
   (b) Using part (a), what is $1/17 \pmod{31}$?
   (c) Now multiply your answer to part (b) by 5 to find $5/17 \pmod{31}$.
2. Do the following divisions.
   (a) $7/10 \pmod{40}$.
   (b) $9/23 \pmod{40}$.
   (c) $10/2 \pmod{31}$.
   (d) $5/16 \pmod{17}$.
   (e) $10/2 \pmod{20}$.
   (f) $1/9 \pmod{44}$.