Quantitative Reasoning 28:
The Magic of Numbers

Homework 17

Assigned on March 21
Due at 5:00 p.m. March 23

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, Chapters 16

Problems:

Please explain your reasoning and show your work.

Remember that when working (mod n), your final answer should be a symbol in the range $0, 1, \ldots, n-1$.

1. Do the following computations in the given modulus.
   (a) $6 - 4 \pmod 7$.
   (b) $80 + 21 \pmod{101}$.
   (c) $3 - 12 \pmod{15}$.
   (d) $456 \cdot 450 \pmod{457}$.
2. Do the following divisions by trial and error. (Note that you don't need to write out the whole multiplication table; just try the different possibilities. Eventually, we'll develop a more systematic approach.)
   (a) $3/5 \pmod{13}$ (Remember that, by definition, this is the number which, when multiplied by 5, gives you 3 in (mod 13).)
   (b) $8/11 \pmod{17}$.
3. Compute the following.
   (a) $5^{491} \pmod{24}$.
   (b) $109^{10} \pmod{37}$.