

Quantitative Reasoning 28:

The Magic of Numbers

Homework 23

Assigned on Wednesday November 17th

Due at 12 noon **Friday** November 19th

Please submit problem sets at the end of the relevant lecture, or leave in the box labeled QR28 outside the Math Department's main office, on the third floor of the Science Center (Room 325).

Reading:

Chinese Remainder Theorem Handout

Problems:

Please explain your reasoning and show your work.

1. Compute the following roots:
 - (a) The 15th root of $2 \pmod{29}$?
 - (b) The 33rd root of $8 \pmod{17}$
2. Find a number congruent to $4 \pmod{81}$ and $53 \pmod{100}$.
3. Find the smallest positive number congruent to $15 \pmod{91}$ and $88 \pmod{120}$.
4. Suppose you work on the top floor of a skyscraper, and for exercise each day, you climb the stairs. Each day that you climb, you count the steps modulo a different number. One day you notice that when you count the steps modulo 47, there is only one left over, and when you count the steps modulo 54, there are 5 left over. Suppose that you're certain that you've been climbing at least 2000 stairs each day, but surely not more than 6000. How many steps have you been climbing each day?