Quantitative Reasoning 28:
The Magic of Numbers

Homework 3

Assigned on Monday September 24th
Due at 12 noon Wednesday September 26th

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:

Gross-Harris, Chapter 3

Problems:

Please explain your reasoning and show your work.

1. The American Students' Phonetic Association is trying to increase membership by pretending to be a fraternity. As part of this subterfuge it wants to pick a three-letter fraternity name but with names drawn from the phonetic alphabet which has 107 letters. How many names can be formed?

   How many names can be formed if each of the three letters has to be different?

   What if we only disallow names where all three letters are the same (like *e e e*) but all other combinations are okay - how many possible names are there then?

2. How many three-digit numbers are there?

   How many three-digit numbers are divisible by 3? How many three-digit numbers are divisible by 5?

   How many three-digit numbers are neither divisible by 3 nor by 5? (*Hint:* A number is divisible by *both* 3 and 5 exactly when it is divisible by 15.)

3. The most popular club in Harvard is, of course, the Diet Coke and Mentos Pyrotechics Club. Membership, as you know, is very exclusive. The Club always consists of 100 members: 10 drawn from the freshman, 20 from the sophomores, 30 from the juniors, and 40 from the seniors. Graduate students are vigorously barred.

   The club wishes to elect officers: the President, Vice-President, Mentos Master, and Diet Coke Panjandrum. How many ways are there to do this if no-one is allowed to hold more than one position?

   How many ways are there if the Presidential position has to be filled by a senior?

   How many ways are there if at least one of the four positions has to be filled by a senior?