Math 342 — Introduction

Problem 1. Consider the random experiment where we toss a coin four times. Let Ω be the sample space of the experiment, let A be the event that we get heads on the first two tosses, let B be the event that we get two heads in the first three tosses, and let C be the event we get an odd number of heads.

a. Find $|\Omega|$ and list some of the outcomes in Ω.

b. List the outcomes in each of A, B, and C.

c. Find $P(A), P(B)$, and $P(C)$.

Problem 2. Consider the random experiment of repeatedly rolling a die until you get a 6.

a. Using the words *success* and *failure*, give an informal explanation of how the following set Ω expresses the outcomes of this experiment:

$$\Omega = \{S, FS, FFS, FFFS, \ldots\}.$$

b. Which is true: $|\Omega| < \infty$ or $|\Omega| = \infty$? That is, is Ω finite or infinite?

c. Let A be the event that it takes three or fewer rolls to get a 6. List the outcomes in A.

d. We'll soon learn how to compute $P(A)$ when A is the event in the previous part. We'll find that $P(A) \approx 0.42$. Make a conjecture about the logical flaw in the following incorrect calculation:

$$P(A) = \frac{|A|}{|\Omega|} = 0.$$

Problem 3. A sample space has four elements, $\omega_1, \omega_2, \omega_3, \omega_4$, such that ω_1 is twice as likely as ω_2, which is three times as likely as ω_3, which is four times as likely as ω_4. Find the values of $P(\omega_1), P(\omega_2), P(\omega_3), P(\omega_4)$.

Problem 4. Here is a classical problem, called the Birthday Problem, for you to discuss with your groupmates and friends or family members outside of class. We'll discuss it later in the semester but I put it here as a fun preview. *How many people must be in a room so that the probability that at least two people share a birthday is at least 50%?* No need to write a solution, but tell me what your guess is, as well as the guess of a friend or family member outside of class. By the way, my birthday is August 17; is that yours too?