

**Homework 1: Due 5/22/14**

1. A four sided die is rolled 25 times and the following numbers are recorded:

4, 3, 2, 3, 1, 3, 1, 2, 1, 1, 3, 4, 2, 4, 1, 2, 2, 4, 4, 1, 2, 2, 3, 3, 4.

Construct a table showing the frequency and relative frequency of each possible result, then sketch a relative frequency histogram (you are welcome to use computer software or sketch by hand). What is the sample space of this experiment? What is the random variable?

2. Prove that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C).$$

3. When getting a physical exam, the probability of having neither lab work nor a referral to a specialist is 0.23. The probability of having lab work is 0.41 and the probability of getting a referral is 0.52. What is the probability of getting lab work but not referral work? If the probabilities above are instead relative frequencies in a sample of 120 patients, then how many patients had both lab work and a referral?

4. You want a pizza but can't decide what to order. The pizza comes in three sizes small, medium, and large; white or wheat dough; and there are 9 toppings you can choose from (you can also choose to have no toppings). How many different pizza combinations could you make?
5. The Georgia Lottery is considering a game where 4 numbers are randomly drawn (with replacement) between 0 and 9. You win a prize if any permutation of your selected integers is chosen. What are the odds of winning if you select four different numbers? 3 numbers with one repeated? Two pairs of numbers?
6. Find the probability of the event "three heads occur" in an experiment where a fair coin is flipped 5 times.

7. A hat is filled with 5 slips of paper, one saying *win* and four that say *lose*. You and another payer take turns picking pieces of paper until someone wins. If you draw first, find the probability of winning if the sampling is done with replacement. What about without replacement?
8. A student is asked to write down a string of one-digit numbers between 0 and 9 that seem to be random. She writes down the following string of 20 numbers:

8, 2, 6, 0, 3, 9, 1, 6, 5, 8, 7, 4, 9, 5, 0, 5, 2, 7, 5, 2.

Are the numbers really random? (You don't have to answer that one, that was rhetorical) In a random 20 digit string of numbers, what is the probability that 2 adjacent numbers are the same? that they differ by one? that they differ by more than one? What is the relative frequency of these three events in the sample above? In the sample, which of the events is *more likely than random?* less likely than random?