FAPP 9e Writing Projects – Chapter 8

1. Psychologists have shown that our intuitive understanding of chance behavior is rather poor. Amos Tversky (1937 – 96) was a leader in the study of how we make decisions in the face of uncertainty. In its obituary of Tversky, the New York Times cited the following example:

*Tversky asked subjects to choose between two public health programs that affect 600 people. One had a probability of 1/2 of saving all 600 and a probability of 1/2 that all 600 will die. The other was guaranteed to save exactly 400 of the 600 people. Most people chose the second program. He then offered a different choice. One program had a probability of 1/2 of saving all 600 and a probability of 1/2 of losing all 600, while the other would definitely lose exactly 200 lives. Most people chose the first program.*

Discuss this example. What is the difference between the two choices offered? What is the mean number of people saved by the two options in each choice? What do the reactions of most subjects to these choices show about how people make decisions?

2. There are about 1 x 1044 air molecules in the atmosphere and about 2 x 1022 molecules of air in a single breath taken at rest. What is the probability that the breath that you took just now contained at least one molecule of air that was exhaled by Pythagoras in his last breath? What probability rules did you use to calculate this? What assumptions did you make, and why do you think they were reasonable?

3. Double or Nothing: Gambler's Ruin. We have seen that by betting on "red" in American roulette, you have a 18/38 chance of winning, therefore doubling the money you bet. Suppose you have $5 and you want to bet until either you reach (and stop with) $10 or you go broke. Is placing individual $1 bets on red more, less, or equally likely to reach this goal than just placing a single $5 bet? First, try to give an answer based on intuition, taking into account the casino's advantage. You could also explore the following formula that gives the probability of going from h dollars to N dollars without going broke by making $1 bets on red in American roulette:

1 - (20/18)h

1 - (20/18)N

Discuss how the strategy for maximizing the chance of reaching a financial target compares to the strategy for maximizing the length of time that your money lasts (for entertainment value).