STAT/MA 41600

In-Class Problem Set #1: August 26, 2015

1. Consider a collection of 9 bears. There is a family of red bears consisting of one father bear, one mother bear, and one baby bear. There is a similar green bear family, and a similar blue bear family. In each of the scenarios below, we draw 5 consecutive times from this collection, keeping track (in order) of the kind of bears that we get.
1a. If we draw with replacement (i.e., returning the bear after each draw), how many possible outcomes are in the sample space S? (An outcome is a 5-tuple of bears.)
1b. If we draw without replacement (i.e., not returning the bear after each draw), how many possible outcomes are in the sample space S? (An outcome is a 5-tuple of bears.)
1c. If we draw with replacement, how many outcomes have no red bears?
1d. If we draw without replacement, how many outcomes have no red bears?

2. Consider a collection of 4 suite-mates. They choose which one of them (exactly 1 of them) goes to the store on Wednesday night.
2a. How many outcomes are there?
2b. How many events are there?
2c. Suppose on Friday they need to buy a lot of food for the weekend, so they choose (exactly) two suite-mates to go together to the store on Friday. (You can completely ignore what happened on Wednesday.) How many outcomes are there for the pair of Friday shoppers?
2d. Same scenario as (2c). How many events are there for the pair of Friday shoppers?

3. Consider 10 consecutive tosses of a coin.
3a. How many outcomes are there?
3b. How many events are there?
3c. In how many of the outcomes does the 3rd head occur on the 10th flip?

4. Addition review. Suppose $0 \leq a < 1$. Find a closed form expression for each of these:
4a. $\sum_{j=0}^{\infty} a^j$
4b. $\sum_{j=1}^{\infty} a^j$
4c. $\sum_{j=5}^{\infty} a^j$
4d. $\sum_{j=k}^{\infty} a^j$ (where k is a nonnegative integer)
4e. $\sum_{j=5}^{20} a^j$
4f. $\sum_{j=k}^{\ell} a^j$ (where k and ℓ are nonnegative integers, with $k \leq \ell$)