Problem Set #1

1. You are studying the habitat preferences of elk in order to guide conservation in the face of inevitable development. To evaluate habitat preferences you assessed habitat occupancy over the course of a winter by counting the number of elk present in each of three major habitat types. Your counts were: 1254 elk in habitat A, 1456 elk in habitat B, and 897 elk in habitat C. Based on this data, is there any evidence that the elk have a habitat preference?

2. You have collected and genotyped 100 individuals within a population of fruit flies. Your sequencing study revealed 31 individuals with genotype AA, 40 individuals with genotype Aa, and 29 individuals with genotype aa. Based on these genotype counts, is this population of fruit flies at Hardy-Weinberg equilibrium for this locus?

3. As part of your job with the Nature Conservancy, you are tasked with evaluating the long-term survival prospects for a threatened species of plant that lives primarily along small seasonal streams in the Zumwalt Prairie. This plant is a small, woody, perennial that reproduces throughout its life. Historically, the age structure of this plant was uniform such that individuals were distributed equally among age classes. Recently, however, it has been hypothesized that the age structure of the population is shifting toward older individuals as climate change makes conditions for seedling recruitment increasingly unfavorable. In order to evaluate this hypothesis, you have censused individuals along a 1km transect and assigned each individual to one of ten age classes:

Age	1	2	3	4	5	6	7	8	9	10
Count	12	14	11	15	13	17	19	24	14	27

Based on this data, is there evidence that the distribution of individuals among age classes is no longer uniform? *Hint: the probability of being in any particular age class for a uniform distribution is 1/n where n is the number of age classes.*

4. The pharmaceutical company you work for has developed a new drug to treat Ebola. The efficacy of this drug was tested by evaluating the outcome of infection in 50 individuals who received the drug. Although the results of the study were not terribly promising (only 22 individuals survived), this survival rate may still be better than that experienced by this population without treatment which has been shown to hover at 14%. In order to determine whether development of this drug should continue, you have been tasked with determining if the survival rate of individuals receiving the drug exceeds the background survival rate of the untreated population (14%).