HOMEWORK SET #1

Due: Tuesday, September 20

1. For a diploid population initially with unequal frequencies of allele *A* in females and males (p_f and p_m) at an autosomal locus, we saw in class that after one generation of random mating, the offspring genotype frequencies in both sexes are $P'_{AA} = p_m p_f$, $P'_{Aa} = p_m q_f + p_f q_m$, and $P'_{aa} = q_m q_f$, where $q_f = 1 - p_f$ and $q_m = 1 - p_m$ are the frequencies of allele *a* in females and males, respectively.

   (a) Use these genotype frequencies to show algebraically that the frequency of allele *A* among the offspring of both sexes is $p' = \frac{1}{2}\left(p_f + p_m\right)$ and the frequency of *a* is $q' = \frac{1}{2}\left(q_f + q_m\right)$. Also explain why these final formulas make biological sense.

   (b) Are genotype frequencies in these offspring necessarily in Hardy-Weinberg proportions? (Hint: try some specific values of p_f and p_m.)

   (c) If these offspring mate at random, what are the genotype and allele frequencies among their offspring (i.e., among the original parents' grandoffpsring)? Explain.

2. Nielsen & Slatkin, p. 19 problem #1.1

3. Nielsen & Slatkin, p. 19 problem #1.3

4. Nielsen & Slatkin, p. 19 problem #1.4

5. Nielsen & Slatkin, p. 19 problem #1.5

6. Nielsen & Slatkin, p. 20 problem #1.8
   Note: The statement of this otherwise very realistic problem is incomplete and contains a typo. You should assume the probability of a match at random is equal to the product of the genotype probabilities of the two loci (When is this assumption legit?). The forensic evidence that is "the exact same" is the genotype (CT, AC), <u>not</u> (TT, CC).

7. Nielsen & Slatkin, p. 126 problem #6.2

8. Nielsen & Slatkin, p. 126 problem #6.3

9. Nielsen & Slatkin, p. 127 problem #6.5

10. Nielsen & Slatkin, p. 127 problem #6.6 parts b and d only

11. Nielsen & Slatkin, p. 128 problem #6.7