

**Practice quiz #9, Mar. 18, 2002**

**Problem 1.** The MN blood group locus has two codominant alleles, M and N. Suppose that in a population in which both males and females are in Hardy-Weinberg equilibrium, the frequency of the M allele is  $3/4$ , while the frequency of the N allele is  $1/4$ .

(a) Find the proportions of the MM, NN, and MN phenotypes in the population.

(b) Suppose that an MM female marries an MN male, and they have 4 children (no twins). If  $X$  is the number of heterozygous children, what is  $P(X \leq 3)$ ? What is  $E(X)$ ? What is  $\text{Var}(X)$ ?

(c) Suppose that an MM female marries a male whose phenotype is unknown. The couple has two children, both of them MN. What is the probability that the father is NN?

**Problem 2.** Suppose that there are two boxes, A and B. Box A contains 3 white marbles and 2 black marbles. Box B contains 4 black marbles and 1 white marble. A box is selected at random, and a marble is drawn at random from the box selected. If the marble is white, what is the probability that box A was the box selected?

**Problem 3.** Suppose that  $1/4$  of all women who take a particular pregnancy test are actually pregnant. If the test has false-negative and false-positive probabilities of 2% each, what is the probability that a woman is pregnant, given that she tests positive? (Note: I made these numbers up.)