Name

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

1. In a small village of 900 people, 400 people have blood type *O* and the rest have blood type *B*. The population is at Hardy-Weinberg equilibrium with respect to blood type.

   a. What is the frequency of the *O* allele in this village?

   $$z = q^2 = \frac{400}{900} = \frac{4}{9}$$
   $$q = \sqrt{\frac{4}{9}} = \frac{2}{3}$$

   b. What is the frequency of the *B* allele in this village?

   $$p = 1 - q = 1 - \frac{2}{3} = \frac{1}{3}$$

   c. How many people in this village have genotype *BB*?

   $$freq(BB) = x = p^2 = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$$
   $$BB = 900 \cdot \frac{1}{9} = 100$$

   d. How many people in this village have genotype *BO*?

   $$BO = 900 - BB - OO = 900 - 100 - 400 = 400$$

2. In another small village of 900 people, everyone has blood type *AB*.

   a. How do we know that this population is not at Hardy-Weinberg equilibrium for blood type?

   The frequency of the heterozygotes (*AB*) is more than 50%.

   b. What is the frequency of the *A* allele in this village?

   $$p = x + \tfrac{1}{2}y = 0 + \tfrac{1}{2} \cdot \tfrac{900}{900} = \tfrac{1}{2}$$

   c. What is the frequency of the *B* allele in this village?

   $$q = 1 - p = 1 - \tfrac{1}{2} = \tfrac{1}{2}$$

   d. How many people in this village would have blood type *AB* if this population <u>was</u> at Hardy-Weinberg equilibrium with respect to blood type <u>and</u> it had the same allele frequencies that it currently has?

   $$freq(AB) = y = 2pq = 2 \cdot \tfrac{1}{2} \cdot \tfrac{1}{2} = \tfrac{1}{2}$$
   $$AB = 900 \cdot \tfrac{1}{2} = 450$$