A.P. Biology **Name:**

Hardy-Weinberg Explanation for Lab 8

Overview: The Hardy-Weinberg equation enables us to trace allele frequencies in a population, and to check to see if those frequencies are changing (i.e. the population is evolving).

Definitions:

Let **A** and **a** represent the dominant and recessive alleles for a certain trait.

Individuals who express the dominant form of the trait have the genotype **AA** or **Aa**; phenotypically recessive individuals have the genotype **aa**.

Let ***p*** represent the frequency of the dominant allele **A** in the population.
(e.g. If 25% of the alleles for this trait in the population are dominant, p = 0.25)
Let ***q*** represent the frequency of the recessive allele **a** in the population.
(e.g. If 75% of the alleles for this trait in the population are recessive, q = 0.75)

Important note #1 for the Hardy-Weinberg equation:

$$p + q = 1$$

The frequency of each given phenotype can be given as follows:

The frequency of AA would be p * p, or $\mathbf{p^2}$
The frequency of aa would be q * q, or $\mathbf{q^2}$
The frequency of Aa (or the identical aA) would be (p * q) + (q * p), or **2pq**

Important note #2 for the Hardy-Weinberg equation:

$$p^2 + 2pq + q^2 = 1$$

Examples of solving problems with the Hardy-Weinberg equation:

1. Using our values above of p=0.25 and q=0.75, find the frequency of individuals who are heterozygous for this trait.

2. If 9% of the population is expressing the recessive trait, what is the frequency of the dominant allele?

3. If 84% of the population is expressing the dominant trait, what is the frequency of individuals who are homozygous for the dominant allele?

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Examples of solving problems with the Hardy-Weinberg equation:

1. Using our values above of p=0.25 and q=0.75, find the frequency of individuals who are heterozygous for this trait.

2pq = 2(0.25)(0.75) = 0.375 = 37.5% of the population is heterozygous

2. If 9% of the population is expressing the recessive trait, what is the frequency of the dominant allele?

$q^2 = .09$; $q = .3$ $p + q = 1$ $p + .3 = 1$ $p = .7 = 70\%$

3. If 84% of the population is expressing the dominant trait, what is the frequency of individuals who are homozygous for the dominant allele?

$p^2 + 2pq = 0.84$ $p^2 + 2pq + q^2 = 1$ $0.84 + q^2 = 1$ $q^2 = 0.16$

$q = 0.4$ $p + q = 1$ $p + 0.4 = 1$ $p = 0.6$ $p^2 = 0.36 = 36\%$