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 \( p \times p \), or \( p^2 \)
- The frequency of \( aa \) would be \( q \times q \), or \( q^2 \)
- The frequency of \( Aa \) (or the identical aA) would be \( (p \times q) + (q \times p) \), 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?
A.P. Biology

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 \( p^2 \)

The frequency of aa would be \( q^2 \)

The frequency of Aa (or the identical aA) would be \( 2pq \)

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.

\[ 2pq = 2(0.25)(0.75) = 0.375 = 37.5\% \text{ of the population is heterozygous} \]

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

\[ q^2 = .09; \quad q = .3 \quad p + q = 1 \quad p + .3 = 1 \quad p = .7 = 70\% \]

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

\[ p^2 + 2pq = 0.84 \quad p^2 + 2pq + q^2 = 1 \quad 0.84 + q^2 = 1 \quad q^2 = 0.16 \]

\[ q = 0.4 \quad p + q = 1 \quad p + 0.4 = 1 \quad p = 0.6 \quad p^2 = 0.36 = 36\% \]