Hardy-Weinberg Principle

In a large population, mating at ransom and in the absence of other forces, the proportion of alleles, genotypes and phenotypes remain constant generation after generation.
This means → NO EVOLUTION!

The H-W is used to predict gene frequencies in a population, assuming:

- Large population size
- Random mating
- No selection
- No mutation
- No migration (immigration or emigration)
- No genetic drift (random loss of alleles)
- No allele specific mortality

The Equation: $p^2 + 2pq + q^2 = 1$

Dominant allele A, its frequency is p. Recessive allele a, its frequency is q
Therefore, $p + q = 1$ BUT, If A = p, then AA = p^2 If a = q, then aa = q^2 So, Aa = 2pq

If a population is known to be following the Hardy-Weinberg Principle, then the equation can be used to calculate unknown frequencies.

Example 1 - In Drosophia, 64 have red eyes (the wild type) and 36 have white eyes.
Calculate the frequency of the recessive trait first.

White eyes = aa = q^2 = 36/100 = 0.36
$q = 0.6$
$p + q = 1$
$p = 1 - q = 1 - 0.6 = 0.4$
$p^2 = 0.16$ = AA

Aa = 2pq = 2(0.4)(0.6) = 0.48

Example 2 - The ability to taste PTC is due to the dominant allele (T) and non-tasting is due to the recessive allele (t). 1600 people were tested in a survey. 461 were non-tasters, a frequency of 0.2888. Their genotype is homozygous recessive (tt). Calculate the gene frequencies in the population.

tt = q^2 = 0.288, then q = 0.537
$p = 1 - q = 1 - 0.537 = 0.463$
TT = p^2 = 0.214
2pq = frequency of heterozygotes (Tt) = 2 (0.463)(0.537) = 0.497