



Hardy-Weinberg Problem Set

- The frequency of two alleles in a gene pool is 0.19 (A) and 0.81 (a). Assume that the population is in Hardy-Weinberg equilibrium.
 - Calculate** the percentage of heterozygous individuals in the population.
 - Calculate** the percentage of homozygous recessives in the population.

- In a population that is in Hardy-Weinberg equilibrium, the frequency of the recessive homozygote genotype of a certain trait is 0.09. **Calculate** the percentage of individuals homozygous for the dominant allele.

- In a population that is in Hardy-Weinberg equilibrium, 38 % of the individuals are recessive homozygotes for a certain trait. In a population of 14,500, **calculate** the percentage of homozygous dominant individuals and heterozygous individuals.

- In humans, the Rh factor genetic information is inherited from our parents, but it is inherited independently of the ABO blood type alleles. In humans, Rh^+ individuals have the Rh antigen on their red blood cells, while Rh^- individuals do not. There are two different alleles for the Rh factor known as Rh^+ and rh . Assume that a dominant gene Rh produces the Rh^+ phenotype, and that the recessive rh allele produces the Rh^- phenotype. In a population that is in Hardy-Weinberg equilibrium, 160 out of 200 individuals are Rh^+ . **Calculate** the frequency of both alleles.

- In corn, kernel color is governed by a dominant allele for white color (W) and by a recessive allele (w). A random sample of 100 kernels from a population that is in H-W equilibrium reveals that 9 kernels are yellow (ww) and 91 kernels are white.
 - Calculate** the frequencies of the yellow and white alleles in this population.
 - Calculate** the percentage of this population that is heterozygous.

- A rare disease which is due to a recessive allele (a) that is lethal when homozygous, occurs within a specific population at a frequency of one in a million. **Calculate** the number of individuals in a town having a population of 14,000 can be expected to carry this allele?

Questions 7 & 8

Two Siamese and three Persian cats survive a shipwreck and are carried on driftwood to a previously uninhabited tropical island. All five cats have normal ears, but one carries the recessive allele f or folded ears (his genotype is Ff).

7. **Calculate** the frequencies of alleles F and f in the cat population of this island.

8. If you assume Hardy-Weinberg equilibrium for these alleles (admittedly very improbable), **calculate** the number of cats you would expect to have folded ears when the island population reaches 20,000?

9. In a certain African population, 4 % of the population is born with sickle cell anemia (aa). **Calculate** the percentage of individuals who enjoy the selective advantage of the sickle-cell gene (increased resistance to malaria)?

10. In Caucasian humans, hair straightness or curliness is thought to be governed by a single pair of alleles showing partial dominance. Individuals with straight hair are homozygous for the Is allele, while those with curly hair are homozygous for the Ic allele. Individuals with wavy hair are heterozygous (Is/Ic). In a population of 1,000 individuals, 245 were found to have straight hair, 393 had curly hair, and 362 had wavy hair.

(a) **Calculate** the allelic frequencies of the Is and Ic alleles.

(b) **Explain** whether or not this population is in Hardy-Weinberg equilibrium? Justify your answer. Your explanation should include a chi-square goodness of fit test.