

1. Define and describe the difference between
 - a. An allele and a gene.
 - b. A genotype and a gamete.

2. A population of fire belly toads is sampled and 167 individuals are genotyped at a single locus as follows. There were 63 BB individuals, 49 Bb individuals, and 55 bb individuals.
 - a. What are the allele frequencies in this population?
 - b. Is this population in Hardy-Weinberg equilibrium or not? If not, then how many individuals would we expect in each genotype category with the same sized population?

3. A second population of fire belly toads was sampled at a different locus. In this second population there were 43 C1C1 genotypes, 39 C1C2, 18 C1C3, 24 C2C2 and 9 C3C3 individuals.
 - a. Calculate the allele frequencies
 - b. Is this population in Hardy-Weinberg equilibrium?

4. Given that $P_{A_1B_1} = 0.3$, $P_{A_1B_2} = 0.1$, $P_{A_2B_1} = 0.2$, $P_{A_2B_2} = 0.4$, the amount of linkage disequilibrium (D) present and the allele frequencies (if possible).

5. A population is sampled at for two different genes, A and B. At the A locus there are three alleles, A1, A2 and A3 which occur at frequencies p_1 , p_2 , p_3 , and at the B locus there are also three alleles, B1, B2, and B3 which occur at frequencies q_1 , q_2 , and q_3 respectively. Assuming that $p_1 = 0.2$, $p_2 = 0.35$, $q_2 = 0.4$ and $q_3 = 0.5$ what are the expected frequency of gametes when a) there is no linkage, and b) when $D=0.3$.