

Hardy-Weinberg Problems

Please complete in your lab notebook.

1. In *Drosophila* (fruit fly), the allele for normal wing length is dominant over the allele for short wings. In a population of 1000 individuals, 360 show the recessive phenotype. How many individuals would you expect to be homozygous dominant for the trait?
2. The allele for a widow's peak (hairline) is dominant over the allele for a straight hairline. In a population of 500 individuals, 25% show the recessive phenotype. How many individuals would you expect to be homozygous dominant and heterozygous for the trait?
3. The allele for a hitchhiker's thumb is dominant over a straight thumb. In a population of 1000 individuals, 510 show the dominant phenotype. How many individuals would you expect for each of the three possible genotypes for this trait?
4. 1. If 9% of an African population is born with a severe form of sickle-cell anemia (ss), what percentage of the population will be more resistant to malaria because they are heterozygous (Ss) for the sickle-cell gene?
5. This is a classic data set on wing coloration in the scarlet tiger moth (*Panaxia dominula*). Coloration in this species had been previously shown to behave as a single-locus, two-allele system with incomplete dominance. Data for 1612 individuals are given below:

White-spotted (AA) = 1469 Intermediate (Aa) = 138 Little spotting (aa) = 5

Calculate the allele frequencies (p and q)
6. After graduation, you and 19 friends build a raft, sail to a deserted island, and start a new population, totally isolated from the world. Two of your friends carry (that is, are heterozygous for) the recessive cf allele, which in homozygotes causes cystic fibrosis. Assuming that the frequency of this allele does not change as the population grows, what will be the instance of cystic fibrosis on your island?

7. There are 100 students in a class. Ninety-six did well in the course whereas four blew it totally and received a grade of F. Sorry. In the highly unlikely event that these traits are genetic rather than environmental, if these traits involve dominant and recessive alleles, and if the four (4%) represent the frequency of the homozygous recessive condition, please calculate the following:
 - A. The frequency of the recessive allele.
 - B. The frequency of the dominant allele.
 - C. The frequency of heterozygous individuals.
8. Within a population of butterflies, the color brown (B) is dominant over the color white (b). And, 40% of all butterflies are white. Given this simple information, which is something that is very likely to be on an exam, calculate the following:
 - A. The percentage of butterflies in the population that are heterozygous.
 - B. The frequency of homozygous dominant individuals.