

NAME \_\_\_\_\_

# Hardy / Weinberg Assignment

1. A population of hamsters has a gene consisting of 90 % M alleles (black) and 10 % m alleles (grey). Mating is random. Determine the proportion of offspring that will be black and the proportion that will be grey.

recessive phenotype       $q^2 =$   
recessive allele           $q =$   
dominant allele           $p =$   
homozygous               $p^2 =$   
heterozygous              $2pq =$

2. You are working with pea plants and found 36 plants out of 400 were dwarf, which is the recessive phenotype.  
a.) Calculate the frequency of the tall gene (Report your answer as a decimal.) \_\_\_\_\_  
b.) Determine the number of heterozygous pea plants. (Record your answer as a whole number.)  
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recessive phenotype       $q^2 =$   
recessive allele           $q =$   
dominant allele           $p =$   
homozygous               $p^2 =$   
heterozygous              $2pq =$

3. A type of deformity appears in 4 % of a large herd of cattle. Assume the deformity was caused by a recessive allele. Calculate the percentage of the herd that are carriers of the gene.

recessive phenotype       $q^2 =$   
recessive allele           $q =$   
dominant allele           $p =$   
homozygous               $p^2 =$   
heterozygous              $2pq =$

4. In Caucasians, 1 in every 2 000 are affected by cystic fibrosis, a genetic disorder caused by a recessive allele. Calculate the frequency of heterozygotes in a Caucasian population. Report your answer as value from 0 to 1, rounded to two decimal places.

recessive phenotype       $q^2 =$   
recessive allele           $q =$   
dominant allele           $p =$   
homozygous               $p^2 =$   
heterozygous              $2pq =$

5. Sickle - cell anemia is caused by a recessive mutant of the hemoglobin gene. Sickle - cell anemia is most common among people of African descent and, to a lesser degree, among people of Mediterranean descent. In the early 1970s, nationwide screening programs were set up in the United States. Many states made the testing of African - American compulsory. The screen programs were not supported with counselling, however, and many people who were carriers assumed they had the disease. Furthermore, some carriers were denied health insurance after the results of their tests were not kept confidential. Racial tensions developed, and the compulsory screening programs were abandoned.  
If 150 in 100 000 African - Americans suffer from sickle - cell anemia, then how many individuals are carriers? What percentage is this?

6. The dominant allele T controls the ability to taste the chemical (PTC) phenylthiocarbamide. Individuals with the T allele find PTC bitter while tt individuals find the chemical tasteless. In a sample of  students in Biology 30,  were tasters and  were non-tasters. Using this information, calculate the
- Frequency of the recessive allele
  - Frequency of the dominant allele
  - genotype frequencies of the original sample of students
7. In a population of birds, the dominant beak color is brown. A recessive allele for blue beak color occurs in a frequency of 0.4.
- What is the genotype frequency of the blue beaked trait?
  - What is the genotype frequency of the heterozygous condition?
  - What is the genotype frequency of the homozygous dominant condition?
8. Suppose a population of lemmings has a dominant gene for white tooth enamel, while the recessive trait was yellow tooth enamel. If 23 lemmings in a population of 325 have the recessive trait
- What is the frequency of the recessive genotype in this population?
  - What is the frequency of the homozygous dominant condition?