**HARDY WEINBERG PROBLEMS NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

p2 + 2pq + q2 = 1 ANDp + q = 1 ALWAYS START WITH q2 HOMOZYGOUS RECESSIVE (aa)

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| --- | --- |
| p = frequency of the dominant allele in the population (A) q = frequency of the recessive allele in the population (a) | p2 = percentage of homozygous dominant individuals (AA) q2 = percentage of homozygous recessive individuals (aa) 2pq = percentage of heterozygous individuals (Aa) |

1. You have sampled a population in which you know that the percentage of the homozygous recessive genotype (aa) is 36%. Calculate allelic and genotypic frequencies for this population. SHOW YOUR WORK!

a = \_\_\_\_\_\_ (q)   
A = \_\_\_\_\_\_ (p)

aa = \_\_\_\_\_\_\_\_ (q2)  
Aa = \_\_\_\_\_\_\_ (2pq)  
AA = \_\_\_\_\_\_\_ (p2)

What is the frequency of HOMOZYGOUS DOMINANT individuals ? \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. A large population of randomly-mating laboratory mice contains 40% white mice. White coloring is caused by the double recessive genotype (aa). Calculate allelic and genotypic frequencies for this population.   
SHOW YOUR WORK!

a = \_\_\_\_\_\_ (q)   
A = \_\_\_\_\_\_ (p)

aa = \_\_\_\_\_\_\_\_ (q2)  
Aa = \_\_\_\_\_\_\_ (2pq)  
AA = \_\_\_\_\_\_\_ (p2)

What is the frequency of the DOMINANT ALLELE (A)? \_\_\_\_\_\_\_\_\_   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Sickle-cell anemia is a genetic disease. Individuals homozygous for the sickle-cell trait (ss) have red blood cells that readily change shape and cause serious medical complications that can be lethal. Homozygous individuals (SS) have normal blood cells but they can become infected with parasites if bitten by a malaria carrying mosquito. Individuals who are heterozygous (Ss) have some sickling of red blood cells, but not enough to cause death. In addition, the malaria parasite cannot survive within these "partially defective" red blood cells. Thus, heterozygotes tend to survive better than either of the homozygous conditions in places where malaria is found. If 9% of an African population is born with sickle-cell anemia (ss), Calculate allelic and genotypic frequencies for this population. SHOW YOUR WORK!

s = \_\_\_\_\_\_ (q)   
S = \_\_\_\_\_\_ (p)

ss = \_\_\_\_\_\_\_\_ (q2)  
Ss = \_\_\_\_\_\_\_ (2pq)  
SS = \_\_\_\_\_\_\_ (p2)

What is the frequency of HETEROZYGOUS carriers (Ss)? = \_\_\_\_\_\_\_\_\_\_  
What is the frequency of individuals who might get malaria (SS)? = \_\_\_\_\_\_\_\_\_\_

4. Cystic fibrosis is a recessive (cc) condition that affects about 1 in 2,500 babies in the Caucasian population of the United States. Calculate allelic and genotypic frequencies for this population.   
SHOW YOUR WORK!

c = \_\_\_\_\_\_ (q)   
C = \_\_\_\_\_\_ (p)

cc = \_\_\_\_\_\_\_\_ (q2)  
Cc = \_\_\_\_\_\_\_ (2pq)  
CC = \_\_\_\_\_\_\_ (p2)

What is the frequency of cystic fibrosis allele (c) in the population ? = \_\_\_\_\_\_\_\_\_   
What % of the population are carriers (Cc) for cystic fibrosis disorder? = \_\_\_\_\_\_\_\_\_  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
 5. Assume bushy tails is dominant (B) is dominant over bald tail (b) in squirrels. In a forest in Wisconsin scientists determine that in a population of squirrels there are 45% bald tailed squirrels.   
Calculate the following. SHOW YOUR WORK!

b = \_\_\_\_\_\_ (q)   
B = \_\_\_\_\_\_ (p)

bb = \_\_\_\_\_\_\_\_ (q2)  
Bb= \_\_\_\_\_\_\_ (2pq)  
BB = \_\_\_\_\_\_\_ (p2)

What is the frequency of the bald allele (b) in this population? \_\_\_\_\_\_\_\_  
What is the frequency of the bushy tail allele (B) in the population? \_\_\_\_\_\_\_\_\_  
  
25 years later, scientists return to the forest and determine that the frequency of the bald tailed (b) allele   
 in the squirrel population is 65%.  
 Is this population in Hardy Weinberg equilibrium? YES NO  
 Has evolution happened in this squirrel population? YES NO  
 EXPLAIN YOUR ANSWER