**HARDY WEINBERG**

**p2 + 2pq + q2 = 1 p frequency of the dominant allele**

**p + q = 1 q is the frequency of the recessive allele**

**Remember:**  
**% + % + % = 100%**  
**BB + Bb + bb = 100%  
The % will be expressed as a decimal (e.g. 14% = 0.14)**

EX. In a population that is in Hardy-Weinberg equilibrium, 16% of the individuals show the recessive trait. What is the frequency of the dominant allele in the population?

(Answer is 36%, now find out how)

1. **You will be given the % of the population that has the recessive trait! If not subtract and get to the recessive trait %**

**Since % will be expressed as a decimal, *be sure to convert it!* (e.g. 16% = 0.16)**  
**The % = q2**

1. **Figure out q.**

**q = the *Square Root* of the % given above (i.e. the *Square Root* of 0.16)  
Example q = .40 *(round it to 2 decimal places)***

1. **Figure out p.**

**p + q = 1  
*therefore*  
p = 1 - q  
Example p = 1 - .40 = .60 (p = .60)**

4. **Figure out:**

**A) p2**

**p2 = p x p  
Example p2 = .60 x .60= .36 (p2 = .36)  
*(round it to 2 decimal places)***

**B) 2pq**

**2pq = 2(p x q)  
2(.60 x . 40) = 2(.24) *(round it to 2 decimal places)* = .48**

**5. Write the numbers out underneath the formula!**

**p2 + 2pq + q2 = 1  
.36 + .48 + .16 = 1**

Continue the example problem there are 1800 people in this population how many of them have the heterozygote genotype?

1800 \* .48 = 864 people. You can find the homozygous dominant and recessive as well doing the same thing except using their frequencies.

Hardy Weinberg Problems

1. In people, light eyes are recessive to dark. In a population of 100 people, 36 have light eyes. What are the values of the following in population?
   1. Q2
   2. Q
   3. P
   4. P2
   5. 2PQ
   6. % of the population that would be heterozygous?
   7. % of the population that would be homozygous dominant?
   8. % of the population that would be homozygous recessive?
2. In the United States about 14% of the population is Rh-. Rh- is recessive to Rh+. What are the values of the following populations?
   1. Q2
   2. Q
   3. P
   4. P2
   5. 2PQ
   6. % of the population that would be heterozygous?
   7. % of the population that would be homozygous dominant?
   8. % of the population that would be homozygous recessive?
3. The ability to roll one’s tongue is dominant to the lack of the ability. In a population of people, 25% were found to possess the recessive phenotype. What are the values of the following in population?
   1. Q2
   2. Q
   3. P
   4. P2
   5. 2PQ
   6. % of the population that would be heterozygous?
   7. % of the population that would be homozygous dominant?
   8. % of the population that would be homozygous recessive?
4. Having a widow’s peak is dominant to lacking a peak. In a population of 1000 people, 510 show the dominant phenotype. How many individuals would you expect to have the 3 genotypes?
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. A study on blood types in a population found the following genotypic distribution among the people sampled: 1101 were MM, 1496 were MN and 503 were NN. Calculate the allele frequencies of M and N, the expected numbers of the three genotypic classes (assuming random mating).
6. A flock of 68 scarlet tanagers, 14 of which have a white cap (a recessive mutation). They breed and successfully raise 94 chicks. How many of these chicks do you expect to have a white cap? For this problem you are making a prediction about the next generation.