Key

Hardy-Weinberg Practice Problems

1. You have sampled a population in which you know that the percentage of the homozygous recessive genotype (aa) is 36%. Using that 36%, calculate the following:

A. The frequency of the "aa" genotype. .36 = q^2

B. The frequency of the "a" allele. .6 = q

C. The frequency of the "A" allele. .4 = p

D. The frequencies of the genotypes "AA" and "Aa." p^2 = .16 = AA 2pq = .48 = Aa

E. The frequencies of the two possible phenotypes if "A" is completely dominant over "a." .64 = dom AA & Aa .36 = recessive Aa = 2pq = 2(.6)(.4) = .48 + .16 = Aa + AA

2. The allele for a widow's peak (hairline) is dominant over the allele for a straight hairline. In a population of 500 indiviuals, 25% show the recessive phenotype. How many individuals would you expect to be homozyous dominant and heterozygous for the trait? q^2 = .25 p^2 = .25 Dom = 125 indiv .75 total

q = .5 p = .5 2(pq) = 2(.5)(.5) = .5 Heter = 250 indiv.

3. The allele for a hitchhiker's thumb is recessive compared to straight thumbs, which are dominant. 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. 375 total

490/1000 = q^2 = √.49 = q = .7 p = .3

Aa = 2(.7)(.3) = .48 = 480/1000 = 420

AA = p^2 = $.3^2$ = .09 = 90 indiv

Aa = 420 aa = 490 AA = 90

4. After graduation, you and 19 of your closest friends (lets say 10 males and 10 females) charter a plane to go on a round-the-world tour. Unfortunately, you all crash land (safely) on a deserted island. No one finds you and you start a new population totally isolated from the rest of the world. Two of your friends carry (i.e. are heterozygous for) the recessive cystic fibrosis allele (c).

Aa allele

Assuming that the frequency of this allele does not change as the population grows, what will be the incidence of cystic fibrosis on your island? .0025

#Aa/20 = .1 = 2pq 2(2)/40(alleles) = .05 = q q^2 = .0025

5. Cystic fibrosis is a recessive condition that affects about 1 in 2,500 babies in the Caucasian population of the United States. Please calculate the following.

The frequency of the recessive allele in the population. .02

The frequency of the dominant allele in the population. .98

The percentage of heterozygous individuals (carriers) in the population. .0392 = 2(.02)(.98) 3.9% carriers

1/2,500 = indiv cc = q^2 = .0004 = .02 = q