

POPULATION GENETICS ANSWERS

Hardy-Weinberg equilibrium

Problem 4

$$\text{Freq}(+) = p = 0.79$$

$$\text{Freq}(Sb) = q = 0.21$$

Population NOT in Hardy-Weinberg equilibrium ($\chi^2 = 7.0662 > \text{Threshold value} = 3.841$) because there are no Sb/Sb homozygotes

Problem 5

10 possible genotypes

$$H = 0.6454$$

Problem 6

$$q = 0.2$$

$$p = 0.8$$

$$P(\text{affected child from normal parents}) = 0.0278$$

Problem 7

$$\text{Freq}(A_1) = p = 0.426$$

$$\text{Freq}(A_2) = q = 0.574$$

χ^2 test is not possible because we only have genotype frequencies and not the absolute number of individuals with each genotype. So, we cannot be sure. However, according to Hardy-Weinberg equilibrium we would expect a higher frequency of heterozygotes than observed, so this population might not be in Hardy-Weinberg equilibrium.

Problem 8

$$\text{Freq}(a) = q = 0.5916$$

$$\text{Freq}(A) = p = 0.4084$$

$$\text{Freq}(AA) = P = 0.1668$$

$$\text{Freq}(Aa) = H = 0.4832$$

$$\text{Freq}(aa) = Q = 0.35$$

Problem 9

$$\text{Freq}(BB) = P_1 = 0.6$$

$$\text{Freq}(Bb) = H_1 = 0.3667$$

$$\text{Freq}(bb) = Q_1 = 0.0333$$

$$\text{Freq}(B) = p_1 = 0.7833$$

$$\text{Freq}(b) = q_1 = 0.2167$$

Problem 10

The incidence of cystic fibrosis will be 0.0025 (1 in 400 people will be affected)