Hardy Weinberg Example

Remember:

Dom rec $p + q = 1$	Homo Dom $f(CC) = p^2$
$P^2 + 2pq + q^2 = 1$	Hetero $f(Cc) = 2pq$
	Homo rec. $f(cc) = q^2$

*** 1 in 1700 US Caucasian newborns have cystic fibrosis. C for normal is dominant over c for cystic fibrosis.**

1/1700 is the same as saying a **frequency of 0.00059** or **0.059%** of population have the condition $= q^2$

1. When counting the phenotypes in a population why is cc the most significant?

Knowing the recessive can help us calculate the "normal"

2. What percent of the above population have cystic fibrosis (cc or q^2)?

1/1700

0.00059 x 100 = **0.059% = q^2**

3. From the above numbers you should be able to calculate the expectant frequencies of all the following (assuming a Hardy-Weinberg equilibrium):

ALLELE FREQUENCY CALCULATIONS:

(*f*)c = q = ? $0.00059 = q^2$ → $q = \sqrt{0.00059}$ = **0.024 = q (recessive)** ← in the pop. 2.4% are cc or Cc

p+q=1

(*f*)C = p = ? p = 1 - 0.024 = **0.976 = p (dominant)** ← in the pop 97.6% are CC or Cc

5. Now that you know that p =.976 and q = .024. The following genotypes can be found.

GENOTYPE FREQUENCY CALCULATIONS:

(*f*)CC- Normal homozygous dominant = p^2 = 0.976^2 = **0.95 = f(CC)** ← 95% of pop is CC

(*f*)Cc -carriers of cystic fibrosis = 2pq = ? 2(0.024)(0.976) = **0.047 f(Cc)** ← 4.7% of pop is Cc

* **Double check – $p^2 + 2pq + q^2 = 1$**

0.95 + 0.047 + 0.024 = 1.02 *YES (close enough)*

6. How many of the 1700 of the population are homozygous Normal?

1700 x 0.95 = **1615 people**

7. How many of the 1700 in the population are heterozygous (carrier)?

1700 x 0.047 = 79.99 or **80 people (since you can't have .99 of a person)**

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$P^2 + 2pq + q^2 = 1$	$f(Cc) = 2pq$
	$f(cc) = q^2$

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1. When counting the phenotypes in a population why is cc the most significant?

2. What percent of the above population have cystic fibrosis (cc or q^2)?

0.00059 x 100 =

3. From the above numbers you should be able to calculate the expectant frequencies of all the following (assuming a Hardy-Weinberg equilibirum):

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(f)c = q = ?

(f)C = p = ?

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GENOTYPE FREQUENCY CALCULATIONS:

(f)CC- Normal homozygous dominant = p^2 =

(f)Cc -carriers of cystic fibrosis = 2pq = ?

*** Double check – $p^2 + 2pq + q^2 = 1$**

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