Hardy-Weinberg Equilibrium problems

(These all assume the population is in Hardy-Weinberg equilibrium)

1. Suppose you are studying a recessive trait which results in a debilitating degenerative disease which develops during puberty. If a Canada has 35 million people, and the disease affects roughly 200,000 individuals, (assuming Hardy-Weinberg equilibrium) **how many Canadians would you expect to be *carriers* (heterozygous) of the disease?**

2. Let's say that in the Walking Dead, the zombie ("walker") condition is actually caused by a genetic mutation. For people who possess the dominant version of this allele, when they die, they turn into a walker. If we take a random sample of 1000 people and find that the dominant allele is found in 89% of the population have this trait. In other words, 89% possess the dominant phenotype ("walker"). **What is the frequency of the recessive allele? and, what percentage would you expect to express the recessive phenotype?**

3. In the X-men comics and movies, they often say that the "mutants" with super powers are the result of what is called the mutant-X gene. Let's say that the special abilities in these individuals are the result of a single recessive allele. I wonder how common this trait actually is in the population? If we sampled 500 individuals and found that 30% of them possess special powers (i.e. 30% were homozygous recessive), **what percentage of people would we expect to be homozygous dominant?**

answers:

1. *q^2 = 0.0057; q = 0.0756; p = 0.9244; SO, 2pq= 0.1398. i.e.* ***4,893,000 carriers***.

2. *890 dominant individuals,* ***110 recessive individuals (of course)****; 0.89 = p^2 + 2pq (i.e. dom. phenotype);* ***0.11 = q^2 ; q=0.332 ;***

3. *150 homozygous recessive, 350 dominant; q^2 = 0.3, q = 0.548 ; p = 0.452 ; p^2 = 0.205;* ***20.5% would be homozygous dominant***