Werewolf Genetics

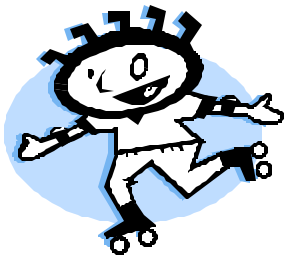
Geneticists use Punnett Squares to determine the mathematical probability of a child or offspring inheriting any one gene from its parents. This is important in tracing genetic diseases through families and determining paternity. Traits are inherited as genes on chromosomes. You inherit one half of each chromosome pair from your biological mother and the other half from your biological father. Each human has 23 chromosome pairs. It usually takes two genes to define a trait. One expression of any given gene is called an **allele**. There are alleles of genes that are stronger or more **dominant** than others, and there are alleles of genes that are weaker or **recessive.** Geneticists use large letters to represent dominant alleles and small letters to represent recessive alleles. The two letters that represent a trait are called the **genotype** for that trait; the way the trait appears is called the **phenotype.**

Case number 1:

The werewolf gene, W, is a dominant allele. A werewolf could have the genotype WW or Ww. Since the allele is dominant, it will mask the other non-werewolf allele. To be a non werewolf, you would have to have two recessive alleles, ww.

Werewolf

WW or Ww



Non-werewolf

has to be ww

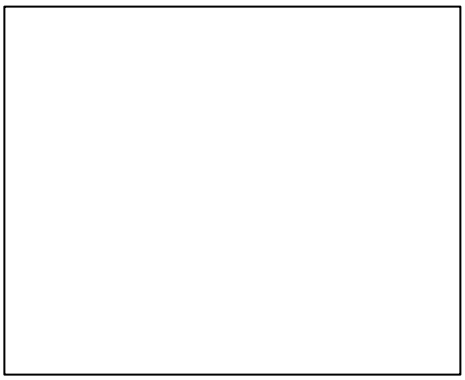
When you have 2 alleles that are exactly the same, such as WW or ww, you are said to be **homozygous** for that gene. If the two alleles are different, you are said to be **heterozygous** for that gene.

Question: Is the non-werewolf heterozygous or homozygous? _____

Case number 2:

Now, let's say you are a self-respecting werewolf male (Ww) and fall in love with a beautiful werewolf female(Ww). All your darling children would be werewolves, right? Wrong!!!!!

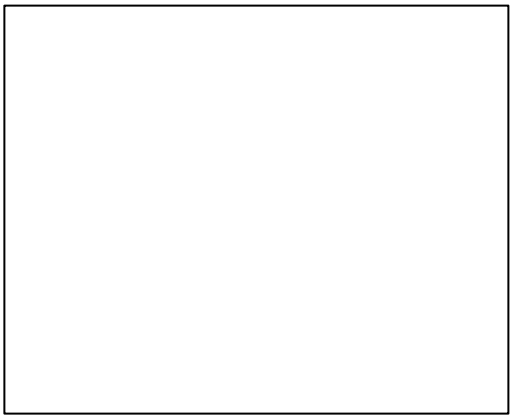
Here is where the Punnett Square comes in. A Punnett Square looks like a tic-tac-toe square. You write in the parent's genotypes on the outsides and then just combine the letters into the squares to get the children's genotypes. Here goes:



Now, look at the genotypes for the offspring of this werewolf pair. How many kids will probably be werewolves? _____

Case number 3:

What if a werewolf of genotype WW falls madly in love with a non-werewolf? Draw the Punnett Square and figure out the probability that their offspring will be werewolves. What, you say you do not have enough information? Think about it, you do!



Offspring genotypes: _____

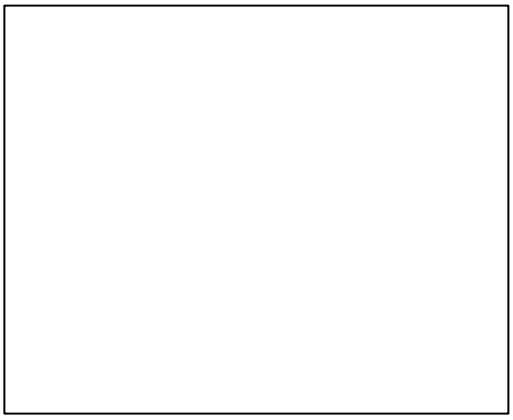
Genotypic Ratio: _____

Offspring phenotypes: _____

Phenotpyic Ratio: _____

Case number 4:

Of course, you can also use a Punnett Square to determine what the possible parental types of any offspring are. For example, Buffy, a young werewolf, is worried that her mother might have been a non werewolf. Buffy's genotype is Ww; her dad's is WW. Was her mother a werewolf? Use a Punnett Square and solve the mystery.



Case number 5:

So far, this was pretty easy; we have only talked about complete dominance in which the dominant allele completely masked the effects of the recessive allele. This is not always the case. For example, in vampires, a homozygous dominant genotype produces a true vampire, while any heterozygous genotype produces a mummy. This incomplete masking of a recessive trait is called **incomplete dominance** or **codominance.** Homozygous recessives produce normal humans. Here are the pictures to convince yourself:

vampire (VV)

mummy (Vv)

normal (vv)

a. If a mummy mates with another mummy, will their offspring be vampires, normal humans or just plain mummies? Do a Punnett Square to solve the problem.

Genotypic Ratio of offspring: _____

Phenotypic Ratio of offspring: _____

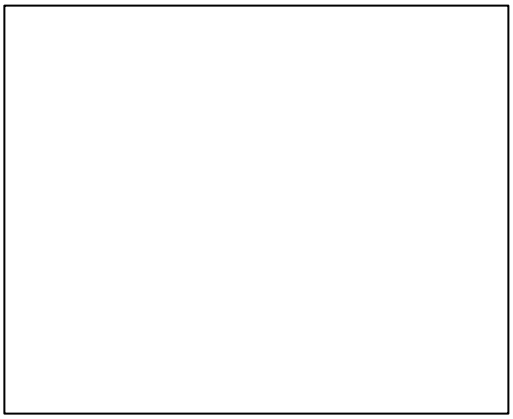
b. If Bill Gates mates with a female vampire, will their offspring consist of nerdy vampires? Draw another Punnett Square to find out.

Genotypic Ratio of offspring: _____

Phenotypic Ratio of offspring: _____

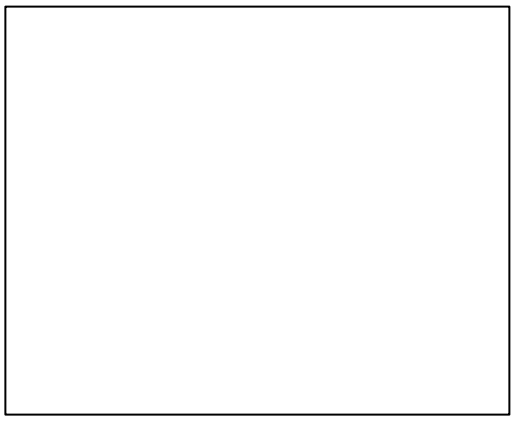
Case number 6:

Yes, you are probably getting tired of these squares already, but hang on just a little bit longer. While most genes are carried on chromosome pairs 1-22, there are some that are on our sex chromosomes. These genes will have different effects if you are male or female. Males only have one X chromosome along with a Y chromosome. The Y chromosome carries few genes. Females have two of these X chromosomes. This type of situation is called sex-linkage. In sex-link Punnett Squares, you don't just write in the allele, but you also indicate the X or Y chromosome. Here is the example: If a male werewolf has a recessive disease—let's say a fear of tuna fish (starkistphobia) which is in herited on the X chromosome, his genotype would be X^tY –the little t shows the disease. If this werewolf fell madly in love with a werewolf lady without the disease gene (XX), which of their offspring would be affected? Remember, the disease is recessive.



Question: Would any female actually have the disease? Would any male?

Females that have one diseased X allele are called **carriers.** They do not have the disease, but have it in their genotype. Here is why this is important: If afemale carrier for this gene marries a normal werewolf male, what are the chances of their offspring having the fear-of-tuna disease?



This happens in humans with disorders like hemophilia and color blindness, and maybe this will explain to you how it is possible that mostly m ales are affected with sex-linked diseases. There are many other cases that are possible, but this should be a pretty good introduction to the mathematics behind genetics.