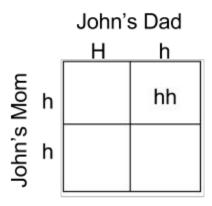# Punnett Squares
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A Punnett square is a tool people use in heredity, which is the study of people's genes, to find out what different traits the offspring might have. It is a 2x2 table with letters listed on the top and left hand side. The letters are called **alleles**. An allele is a variation of a gene. The letters outside of the box are the parents' alleles. In this case, John's dad's alleles are on the top of the box and his mom's are on the side of the box. To solve it, you take the allele from the top of the box and the allele from the side and join them together. We have done one for you in the Punnett square below to show how to do it. In heredity, there are dominant alleles and recessive alleles, and for this Punnett square, H=dominant and h=recessive. Dominant alleles always "cover" recessive alleles. That means that...

- Hh will give you the dominant trait because H covers h
- hh will give you the recessive trait
- HH will give you the dominant trait

For this square, the dominant trait is brown eyes and the recessive trait is blue eyes. So, Hh will give you brown eyes, hh will give you blue eyes, and HH will give you brown eyes. The combination of alleles (ex. Hh) is called the genotype. What the trait actually shows up as (ex. brown hair) is called the the phenotype. When the genotype has two different alleles (ex. Hh), it is called **heterozygous.** When the genotype has two of the same alleles (ex. HH or hh), it is called **homozygous.** Suppose you have hh as your genotype. That is called **homozygous recessive** since you have two recessive alleles. HH is similarly called **homozygous dominant** because you have two dominant alleles.

Directions: Answer the following questions based on the Punnett square below.

1) How many genotypes out of 4 will give John blue eyes? _____
2) How many genotypes out of 4 will give John brown eyes? _____
3) How many genotypes out of 4 are homozygous dominant ? _____
4) How many genotypes out of 4 are homozygous recessive? _____
5) How many genotypes out of 4 are heterozygous? _____
6) What phenotype does his dad have? _____
7) What phenotype does his mom have? _____