the mailman? No, it was genetics! Today you will learn how to use a **Punnett Square** to figure out the probability of certain genotypes, and therefore, how likely someone is to have a certain trait.

Some Ideas Refreshed:

- **Genotype:** combination of alleles in your DNA (i.e. GG)
- **Phenotype:** the trait that shows up based upon the genotype (i.e. green peas)

For each trait you have 2 alleles, one comes from each parent:

- **homozygous:** two of the same alleles.
- **heterozygous:** two different alleles.

The dominant allele BLOCKS the recessive allele (for ALL cases, unless labeled "Mated dominance")

Part I: First, lets practice some vocabulary.

Practice using these terms. For all questions, use these facts: the trait is **fur color (f).** Black fur is dominant over white fur.

1. Write the letter of the **dominant allele**. _____
2. Write the letter of the **recessive allele**. _____
3. Write the **genotype** for white fur (2 alleles!). _____
4. Write the **genotype** for black fur (2alleles!). _____ or _____
5. Write out the **homozygous dominant** genotype. _____
6. Write out the **heterozygous** genotype. _____
7. Write out the **homozygous recessive** genotype. _____
8. Write the **phenotype** for #5. _____
9. Write the **phenotype** for #6. _____
10. Write the **phenotype** for #7. _____

Lucy

How will the kids come out? Follow the steps below to find out.

(1) Make a tic-tac-toe board.
(2) X out the top left corner.
(3) Write the mom's alleles across the top.
(4) Write the dad's alleles down the side.
(5) Match the column & rows for each box.
(6) Write the capital letter first.

	F	f
f	Ff	ff
f	Ff	ff

(7) List probabilities of different **genotypes**

- $\frac{2 \text{ Ff}}{4 \text{ total}} = \frac{1}{2}$ Ff
- $\frac{2 \text{ ff}}{4 \text{ total}} = \frac{1}{2}$ ff

(8) List probabilities of different **phenotypes**:

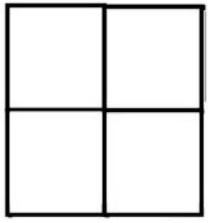
½ Black Fur

½ White Fur

Here are some problems for practice: (still for mouse fur color)

2) If the **mother is heterozygous**, and the **father is heterozygous**.

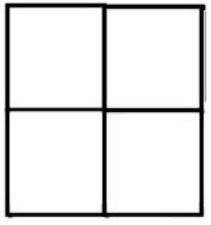
a) Write the **genotype** probabilities.



b) Write the **phenotype** probabilities.

3) If the **mother is heterozygous**, and the **father is homozygous dominant**.

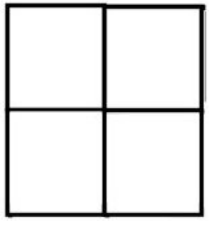
a) Write the **genotype** probabilities.



b) Write the **phenotype** probabilities.

4) If the **mother is homozygous recessive**, and the **father is heterozygous**.

a) Write the genotype probabilities.



b) Write the phenotype probabilities.

Part IV: Lets do some more **Punnett Square** practice using flower traits. If you are experimenting with orchids, where red flowers are **dominant** over white flowers. (Use the letter **"R"**). Make the following crosses:

eyes are dominant over blue. (Use the letter "**B**"). Make the following crosses.

1) Mate **two homozygous dominant** parents together.
2) Mate two **heterozygous** parents together.
3) Mate a **homozygous dominant** mom with a **heterozygous** dad together.
4) If Kevin has blue eyes, and both his parents have brown eyes, what must their genotypes be? (Look at Part III #1-3 for help)

Part VI: Are you now ready for a challenge? Pick a trait to practice Punnett squares, such as a bird's wing color. Decide upon the dominant and recessive allele. Then solve the following four Punnett squares.

1) Cross **homozygous dominant** with **homozygous recessive**.
2) Cross **heterozygous** with **homozygous recessive**.
3) Cross **homozygous recessive** with **heterozygous**.
4) Cross **homozygous dominant** with **heterozygous**.