Punnett Squares (from Reginald C. Punnett)

a chart used to predict possible combinations of genes in offspring (kids, baby goats, puppies, baby tomatoes, etc.)

Step 1: **Assign a letter to the dominant trait**.
For example: Right-handed (dominant): R Left-handed: (recessive): r

Step 2: **Determine the parent genotypes**. This will be stated, or you'll be given a clue and need to figure it out.
Both "carriers" or heteroyzygous Rr x Rr ("x" means the parents are "crossed" & have an offspring together)
Both homozygous recessive or dominant: RR x RR or RR x rr or rr x rr
Or RR x Rr rr x Rr

Step 3: **Write the possible gamete genotype** of one parent across the top of the Punnett square. Place the genotype of the other parent on the left of the Punnett square.

Step 4: **Fill the squares** by combining the alleles along the top with the alleles along the side. The letters in the boxes then indicate the possible genotypes of the offspring.

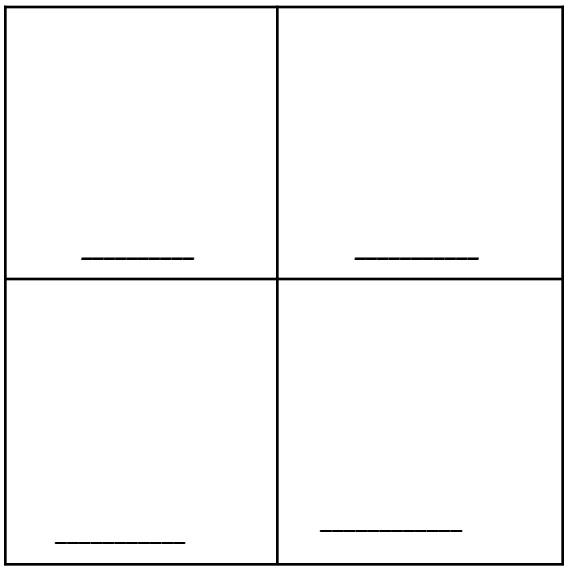
Step 5: **Calculate the probability** (percent chance that it will occur) of each genotype.

<u>Female</u>

Meiosis (cell division in gametes)
type of eggs formed

T = tall
t = short

<u>Male</u>
type of sperm formed



Predicted genotypes of offspring: _____% _____%_____ %

Carrier: an individual who "carries" a recessive trait but does not display that trait (and is usually unaware). Carriers are always *heterozygous* unless the gene is sex-linked.

Complete a Punnett square for each of the following problems.

1. A couple who do not have cystic fibrosis has a child. Dad is a carrier for the disease (Nn) and Mom is homozygous dominant. This is not a sex-linked trait.
   What is the probability that their child will have the disorder? _____

   What is the probability that their child will be a carrier? _____

   Draw your Punnett square here:

2. A couple who do not have cystic fibrosis has a child. Dad and Mom are both carriers for the disease.
   What is the probability that their child will have the disorder? _____

   What is the probability that their child will be a carrier for cystic fibrosis? _____

3. Dimples are dominant (D) and no dimples is recessive (d). What is the genotype of the missing parent? _____What are the phenotypes of the parents? _____ What are the possible phenotypes of the children? _____ If you don't have dimples, can you make sure your children will by choosing someone with dimples? Explain.

	?	?
D	Dd	Dd
d	dd	dd

FYI: It is currently thought that dimples can be controlled by other genes and is not a "single gene" trait.

4. To about 75% of us, the chemical PTC (phenylthiocarbamide) tastes very bitter. For the other 25%, it is tasteless. The ability to taste PTC is controlled mainly by a single gene that codes for a bitter-taste receptor on the tongue. Different variations, or alleles, of this gene control whether PTC tastes bitter or not.

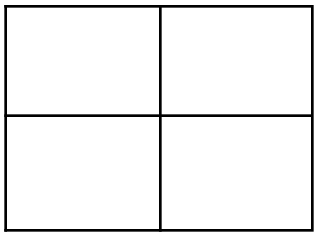
PTC tasting follows a very predictable pattern of inheritance. Tasting is dominant, meaning that if you have at least one copy of the tasting version of the gene, you can taste PTC. Non-tasters have two copies of the non-tasting allele. What is the probability that two parents who are heterozygous for this trait with have a non-taster child?

5. In humans, achondroplasia "dwarfism" (D) is dominant over non-Dwarfism ("normal" height, d). A homozygous dominant (DD) baby will unfortunately die before the age of one. A heterozygous (Dd) person has dwarfism. A homozygous recessive individual does not have dwarfism. What are the odds of a child having dwarfism if a heterozygous man has a child with a heterozygous woman?

Using Punnett Squares

Organisms pass on traits to their offspring. For each trait, an offspring usually inherits a pair of alleles, one from each parent. A dominant allele often prevents a recessive allele from being expressed.

Complete the Punnett square for each by first writing the parental genotypes in the correct place (it doesn't matter whether the male or female alleles are on the top or the side). Determine the possible genotypes and phenotypes of the offspring and calculate the probabilities.



Silkworm cocoon color
Yellow: C
White: c
Parents: CC x cc

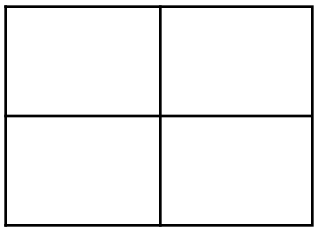
genotypes: _____% _____%

phenotypes: _____% _____%

Guinea pig fur length
Short: F
Long: f
Parents: Ff x ff

genotypes: _____% _____%

phenotypes: _____% _____%



Mice eye color
Black: E
Red: e
Parents: Ee x Ee

genotypes: _____% _____%

phenotypes: _____% _____%

Four o'clock flower color
Red: Fr
White: FW
Pink: FrFW (incomplete dominance)
Parents: white x pink

genotypes: _____% _____%

phenotypes: _____% _____%