

# Genetics and Punnett Squares

Unit 8

# Genetics

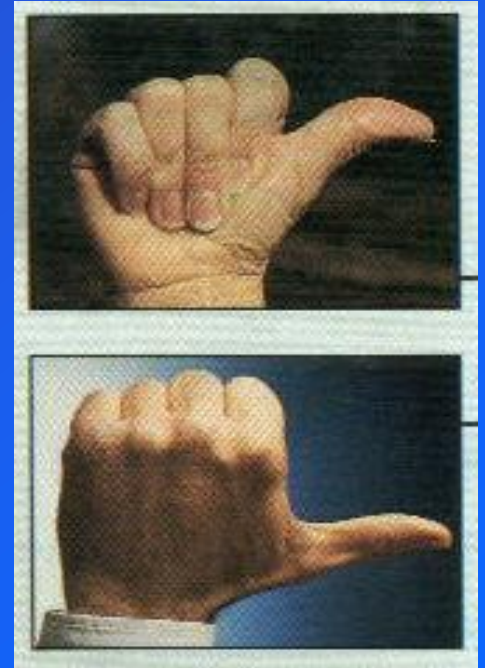
- Genetics is the study of heredity
- Heredity is the inheritance of traits

# Traits

- A trait is a characteristic passed from parent to offspring. Some human traits include:
- Tongue Rolling



Dimples



Hitch Hiker's  
Thumb

# Alleles

- The different forms of a gene that produce traits

# Phenotype and Genotype

- An organisms physical characteristics is called the **phenotype**
  - These are the traits we see, such as height, color, long antennae, short antennae
- The genetic makeup is called the **genotype**
  - These are the genes that make up the trait

# Genotypes

- Genotypes are expressed in different ways.
  - Organisms that have two identical alleles for a trait are called homozygous (homo meaning same)
    - Examples
      - TT, or tt
      - TT-Homozygous Dominant (because they are both the dominant trait)
      - tt-Homozygous Recessive (because they are both the recessive trait. All
    - These are also known as pure breed. Pure because there is no mixing. It is the same gene that makes up the allele

# Genotypes Continued

- Organisms that have two different alleles are known as heterozygous. (hetero-means different.
  - Example
    - Tt-These alleles are different.
  - These are also known as hybrids
    - Think of a hybrid car-its hybrid because it runs on both electric and gas. Two different things. The hybrid alleles are different.

# Phenotypes

- Again, a phenotype is the physical characteristic. It is what you see.
- Anytime the dominant trait is present that is what will be seen
  - Example
    - Tall is the Dominant trait (T), and short is the recessive trait (t).
    - If I have:
      - TT-I will be tall because it has the dominant trait
      - Tt-I am still tall because the dominant trait is present. It will always mask, or cover the recessive trait.
      - tt-I will be short. This is the only way that the recessive trait is seen, because the dominant is not present.



# Using a Punnett Square

# What is a PUNNETT SQUARE?

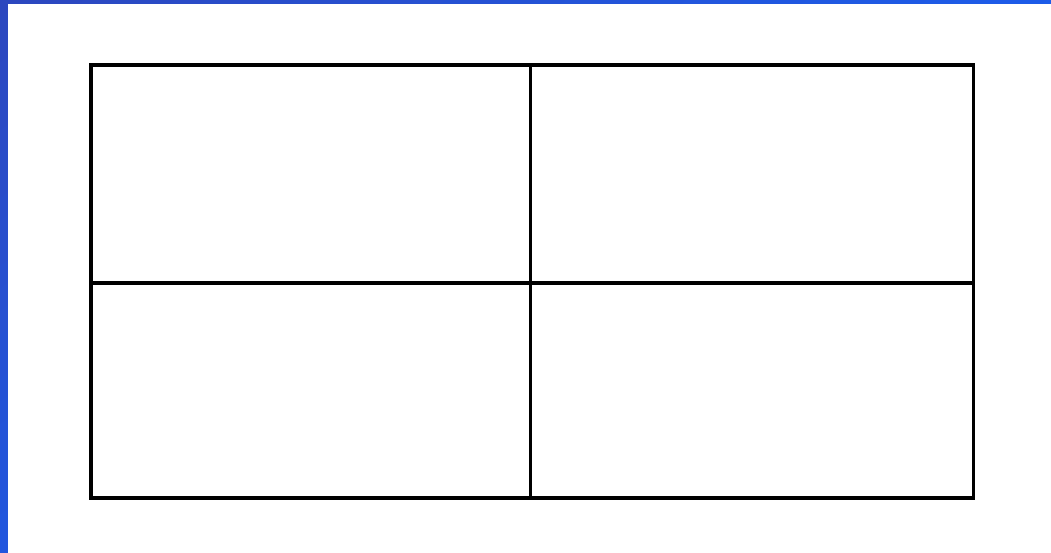
- A tool to predict the probability of certain traits in offspring that shows the different ways alleles can combine is known as a Punnett Square.
- A way to show phenotype & genotype
- A chart that shows all the possible combinations of alleles that can result when genes are crossed

# What is a PUNNETT SQUARE?

- Letters stand for dominant and recessive alleles
- An uppercase letter stands for a dominant allele
- Lowercase letters stand for recessive alleles

# Using a PUNNETT SQUARE

To set up a Punnett square, draw a large square, and then divide it into 4 equal sections (also squares). It should look something like this:



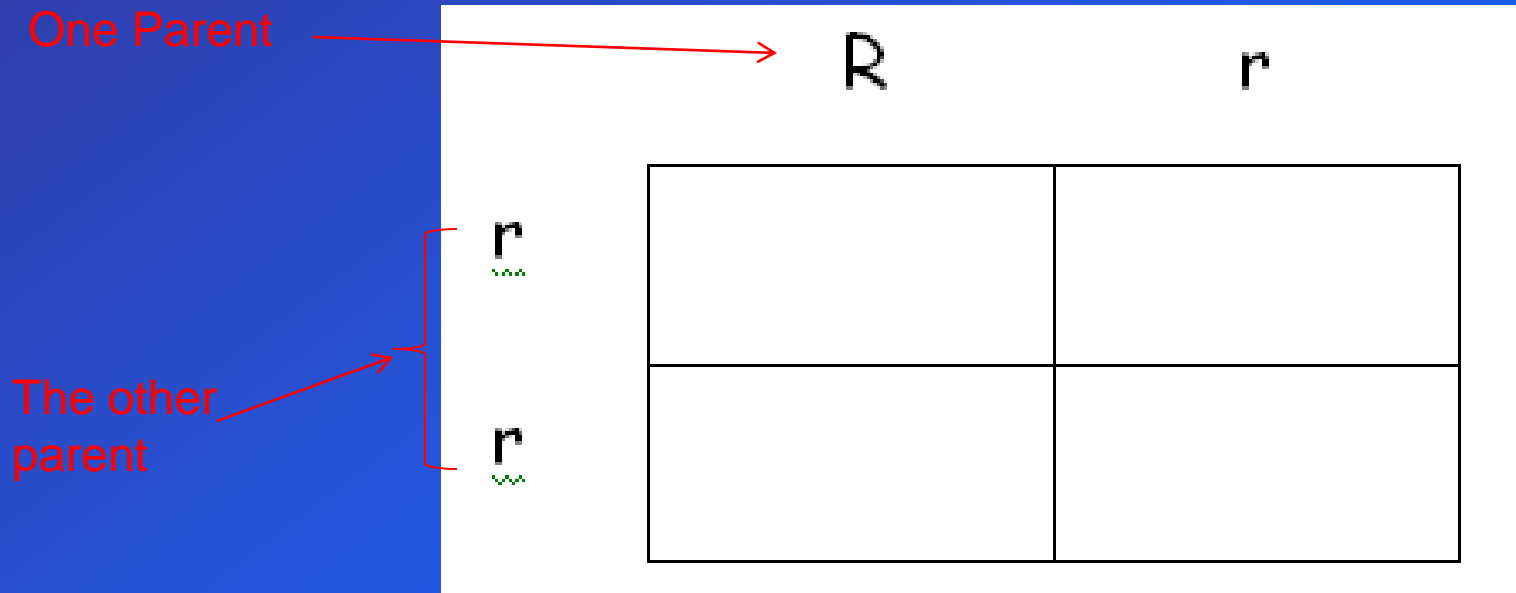
# Using a PUNNETT SQUARE

Now you need two parents to mate, ones with a known genotype (the traits). Remember each parent contribute two trait.

For example, a red flower (genotype Rr) and a white flower (genotype rr). Rr x rr are mated together.

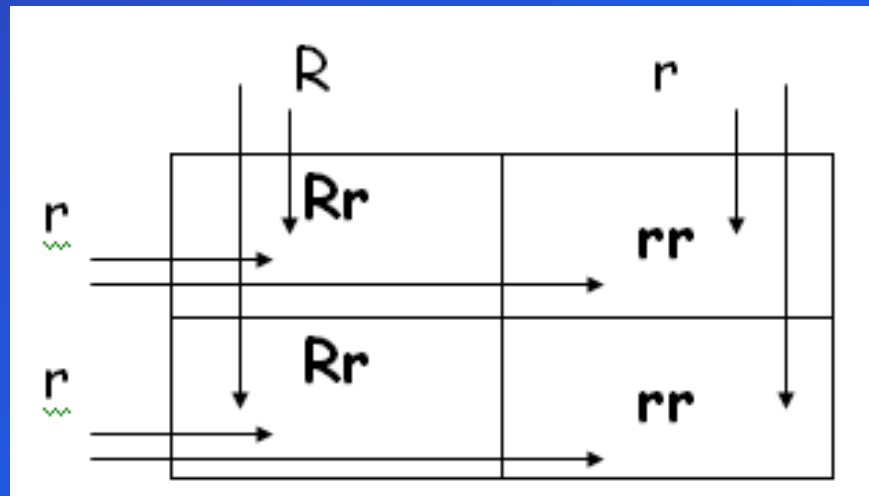
# Using a PUNNETT SQUARE

Place one of the parents on top, and one on the left. You should get a something similar to this:



# Using a PUNNETT SQUARE

Finally, take each letter in each column and combine it with each letter from each row in the corresponding square. You should now have a picture close to this:



# Using a PUNNETT SQUARE

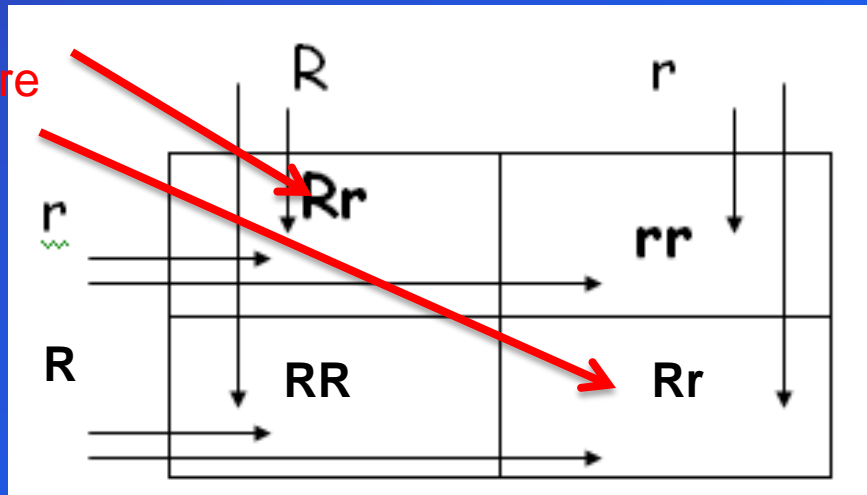
- The two-letter combinations are the possible genotypes of offspring
- They are: Rr, Rr, rr, and rr genotypes
- From this it is possible to determine the probability (chance) that a flower will have a red phenotype (2/4 or 50%) or a white phenotype (2/4 or 50%)



# Writing Genotypes

- When writing the Genotype, the Dominant (capital letter), always goes before the Recessive letter.

Notice the Dominant goes before the recessive



# Your Turn

- You will be doing Sponge Bob genetics
- You will practice writing genotypes and finding the phenotypes.
- You will be predicting traits through punnett squares
- This will be due on Monday along with the rest of your assignment with the Crazy Traits creatures. Don't forget with the Crazy traits you must share it with me on google.