

5 E Lesson: Solving Monohybrid Punnett Squares with Coding

SCIENCE
NORTH



SCIENCE
NORD

Genetics

Fill in the
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Options

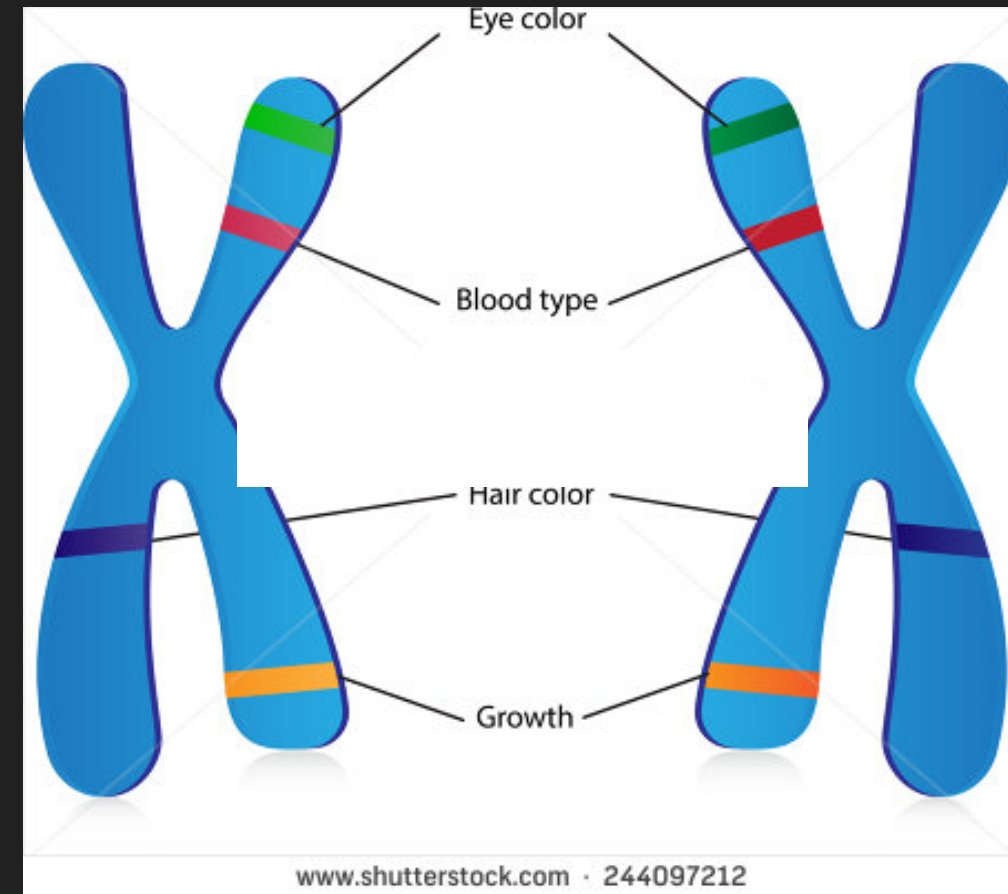
- Brown colour
- Hair texture

- A field of biology that studies heredity, or the passing of traits from parents to offspring!
- We can see that the labradoodle received the _____ trait from it's dad, the Labrador, and received the _____ trait from it's mom, the Poodle!



Genes and Chromosomes

- The chromosomes are contained in the **nucleus** of the cell.
- Chromosomes are made of **DNA**
- Chromosomes are a long chain of **genes**
- A gene is a segment of DNA that controls a hereditary trait and two different forms of a gene are called **alleles**.



Hereditary Trait:

The characteristics that an organism has, such as hair color, eye color, tall or short, skin color.

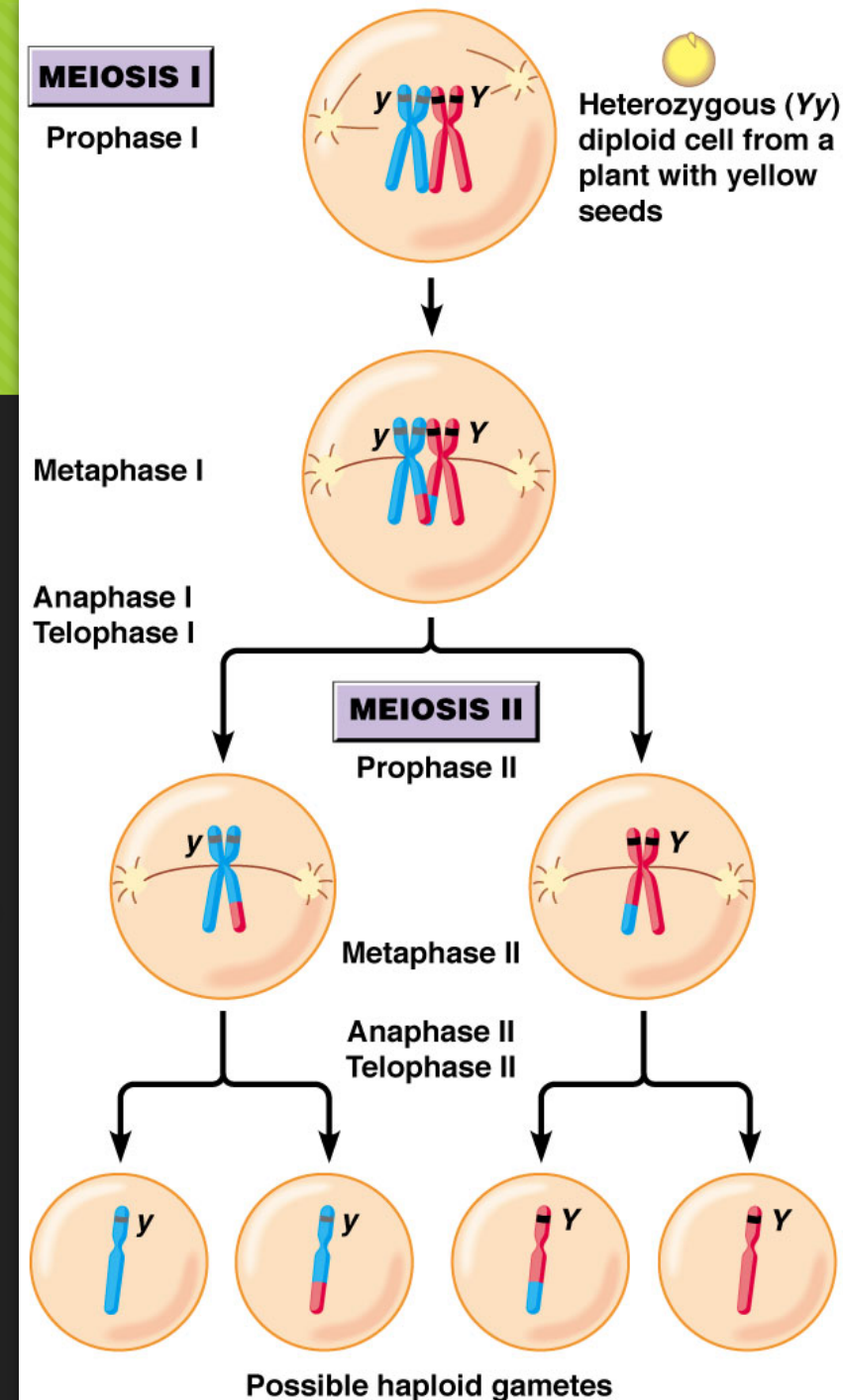
Two **alleles** must be present in order for a trait to show up in the offspring.

One **allele** comes from the 1st parent and the **other allele** comes from the 2nd parent. When fertilization occurs, the new offspring, a **zygote**, will have 2 **alleles** for every **trait**.



If a parent has 2 alleles for a trait, how does the parent only pass 1 allele to their offspring?

- The answer is the cell division of **meiosis**
- Meiosis is the cell division that forms **gametes**.
- Gametes are **sex cells**, such as **egg** and **sperm** cells.
- During meiosis, the DNA is replicated and then separated into 4 **gametes**.
- This way, each parent passes one allele for each gene to their offspring → Principle of Segregation
- The **capital letter**, Y, represents a **dominant allele**.
- The **lower case letter**, y, represents a **recessive allele**.



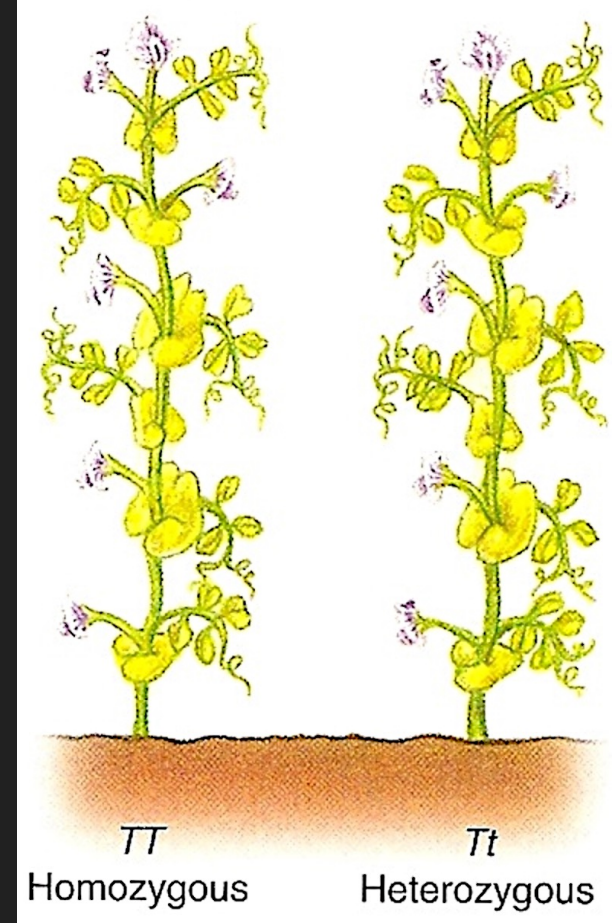
Genotype versus Phenotype

○ Genotype:

- Refers to the two alleles an individual has for a specific trait
- If identical, genotype is homozygous (TT, tt)
- If different, genotype is heterozygous (Tt)

○ Phenotype:

- Refers the physical appearance of the individual...
The observable expression of the genotype. ("what you see")

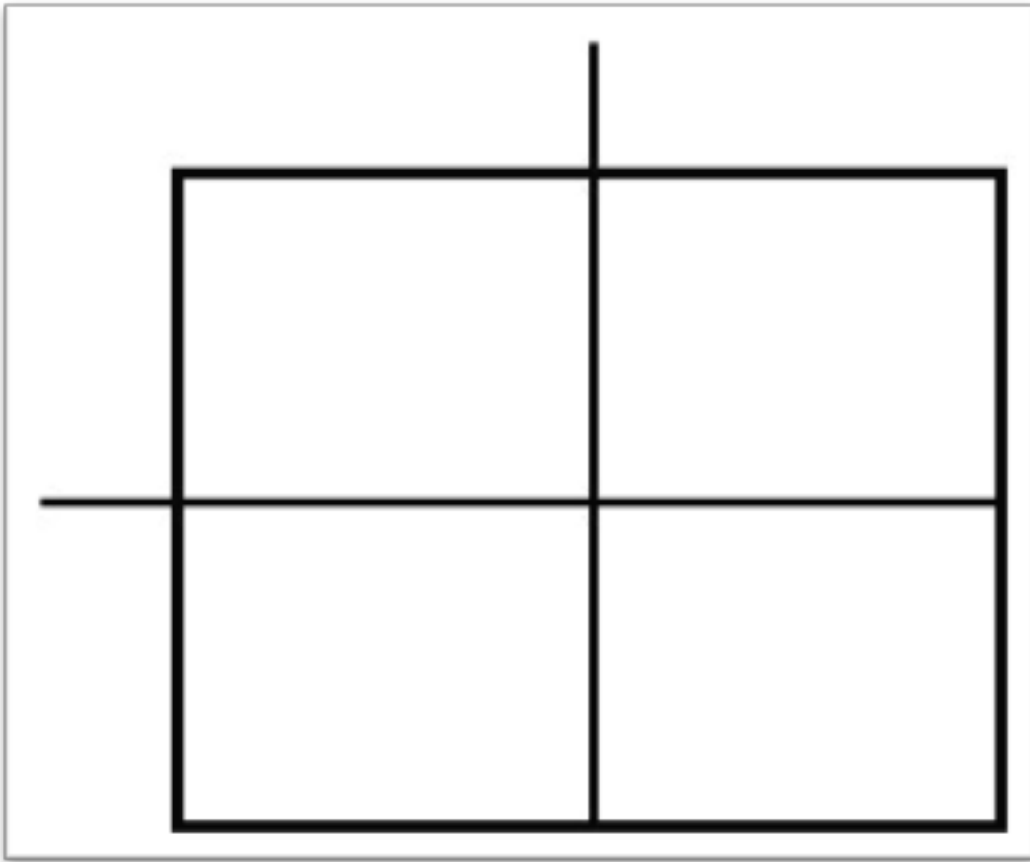


Genotype	Phenotype
TT	Tall
Tt	Tall
tt	Dwarf

Probability

- If we know the genetic makeup of parents, we can determine what type of offspring they can produce.
- We can determine the probability of producing different types of offspring.
- Probability: The likelihood that a particular event will occur.

Punnett Squares are used to show allele combinations that might result from a genetic cross between two parents.



The **alleles** of the first parent will be placed on the left, and the **alleles** of the second parent on the top of the Punnett square.

The letters represent the **alleles**.

A capital letter represents a _____ allele.

A lower case letter represents a _____ allele.

Fill in the Blank Options:
Dominant Recessive

The possible gene combinations of the offspring will be placed inside the squares, representing zygotes.

Punnett Squares are used to show allele combinations that might result from a genetic cross between two parents.

	t	t
T	Tt	Tt
T	Tt	Tt

The **alleles** of the first parent will be placed on the left, and the **alleles** of the second parent on the top of the Punnett square.

The letters represent the **alleles**.

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Fill in the Blank Options:
Dominant Recessive

The possible gene combinations of the offspring will be placed inside the squares, representing zygotes.

In dogs, the allele for short hair (B) is dominant over the allele for long hair (b). Two short haired dogs have a litter of puppies. Some of the puppies have short hair and some of the puppies have long hair. Use the Punnett Square and T-Chart to answer the following questions.

1. What are the genotypes of the parents?

Genotypes	Phenotypes



2. If the litter of puppies contained 12 pups, how many would you expect to have short hair?

3. How many would you expect to have long hair?

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1. What are the genotypes of the parents? **Bb and Bb**

	B	b
B	BB	Bb
b	Bb	bb

Genotypes	Phenotypes
1/4 BB	
2/4 Bb	3/4 short hair
1/4 bb	1/4 long hair



2. If the litter of puppies contained 12 pups, how many would you expect to have short hair?

3/4 of the 12 should have short hair. $\frac{3}{4}$ of 12 = 9 pups

3. How many would you expect to have long hair? $\frac{1}{4}$ of 12 = 3 pups