Mendel's Law of Heredity

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📖 Define ***pollination***

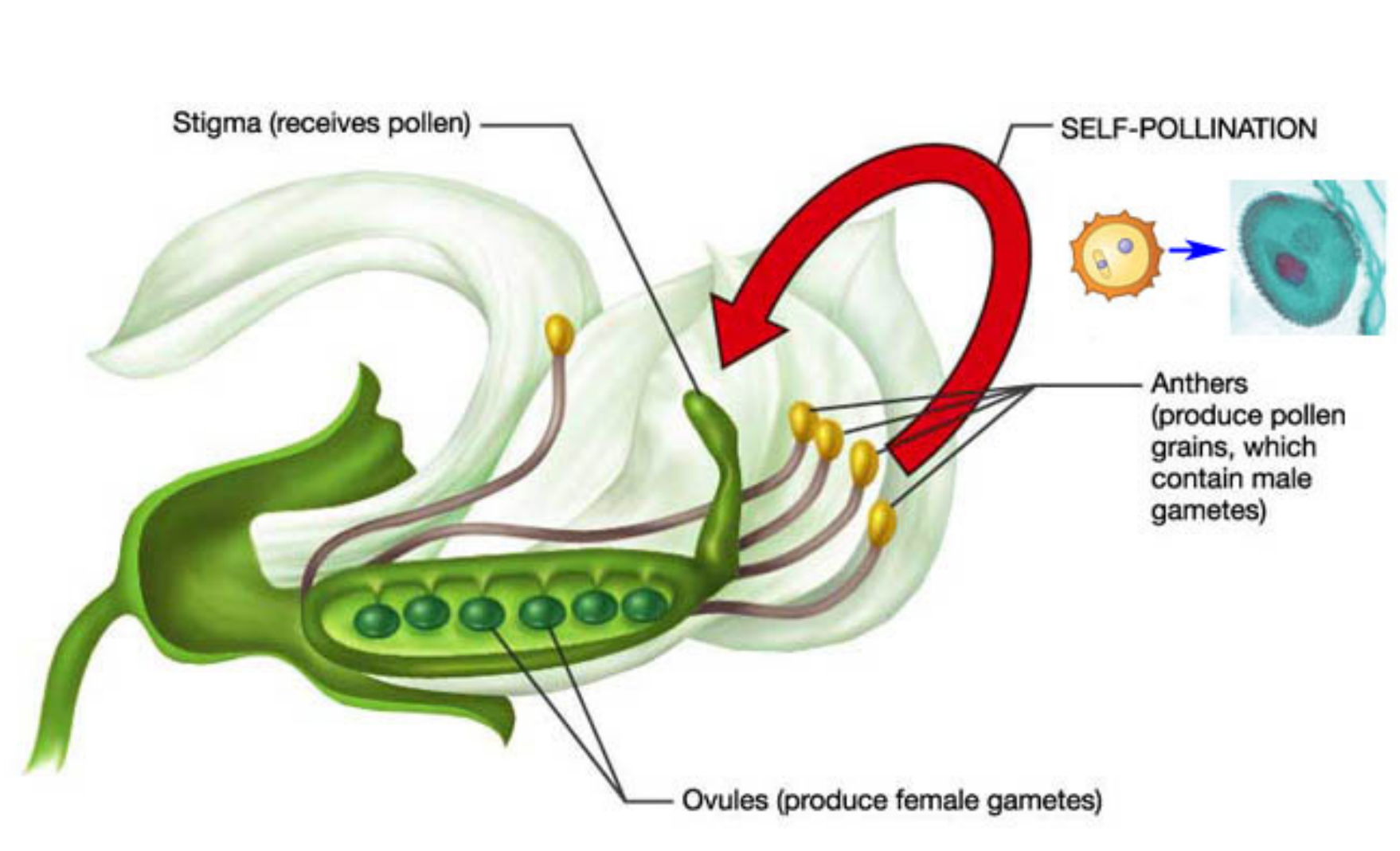
- The transfer of pollen grains from a male reproductive organ to a female reproductive organ in a plant is called ***pollination***.

📖 Define ***cross pollination***.

- ***Cross-pollination*** is the process of taking pollen from male plant and dusting female organs of another plant.

- 🗣 Need to know that…
  - ➔ using this technique, Mendel could **be sure** of the **parents** in his crosses.

Cross-pollination



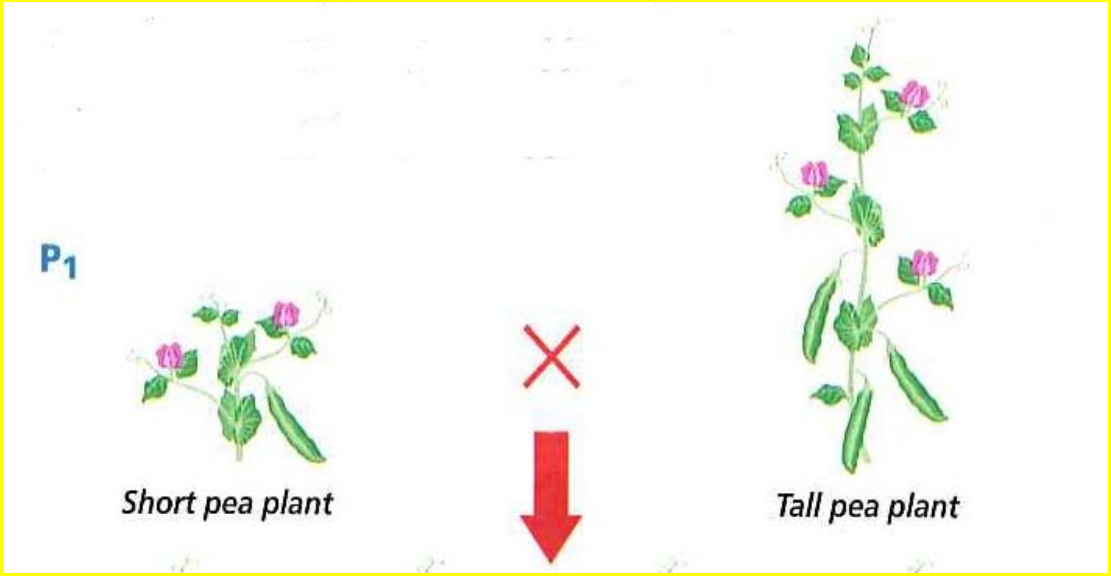
📖 How did Mendel control the variables in his experiment?

- Mendel studied **only one** trait at a time to control variables and he analyzed his data mathematically.

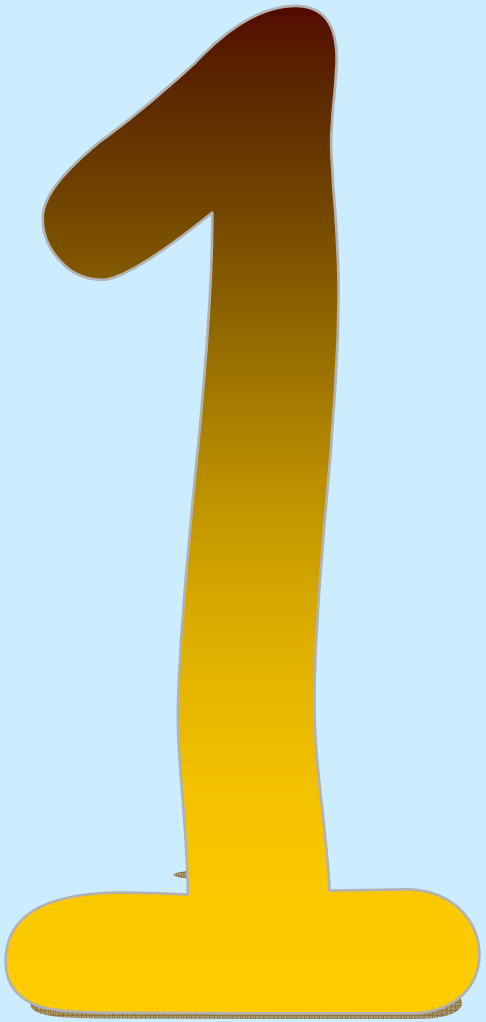
📖 Define ***hybrid***.

- A ***hybrid*** is the offspring of parents that have **<u>different</u> forms** of a **trait**.

➔ For example: **height** of pea plants



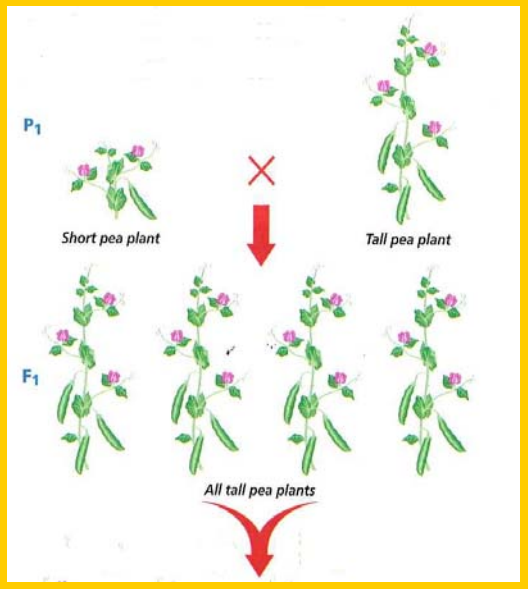
📖 How many traits are being analyzed in a **monohybrid cross**?



Mendel's Monohybrid Crosses

1.) Result of the First Generation

📖 What happen when Mendel cross a **tall** pea plant with a **short** pea plant of the parent generation (P_1)?



➔ Offspring grew to be as **tall** as the taller plant.

Mendel's Monohybrid Crosses Continues

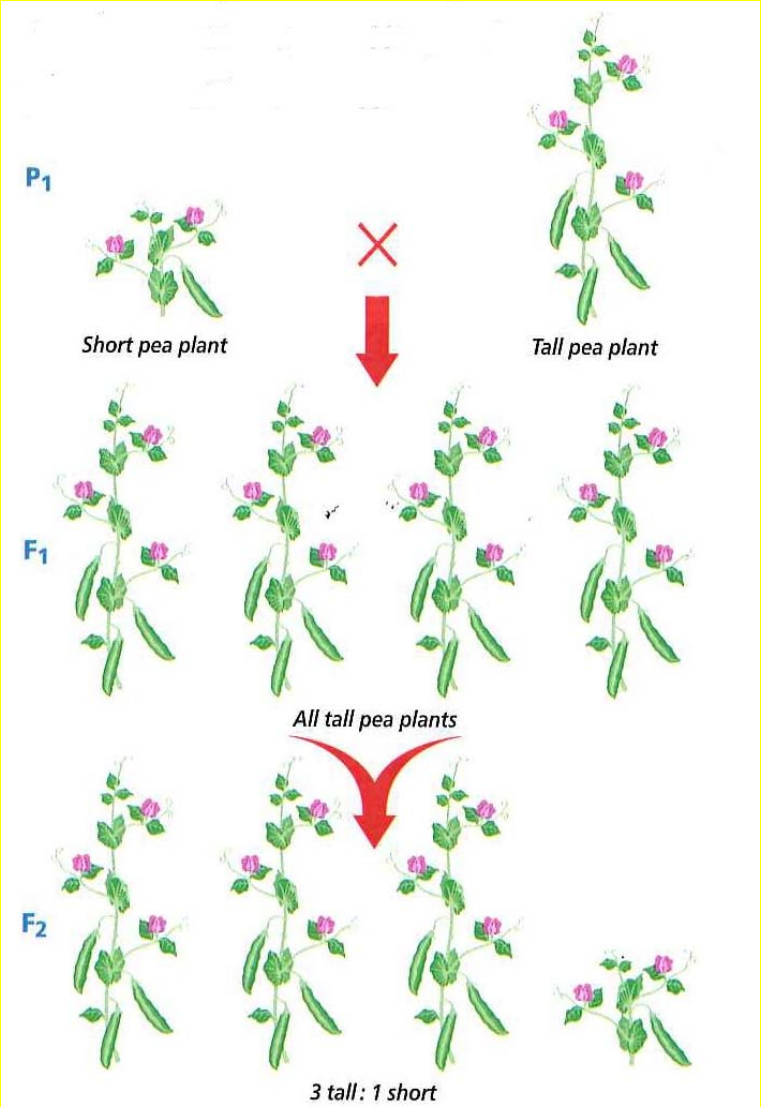
2.) Result of the Second Generation

📖 What happen when Mendel allowed the **tall** hybrids of generation 1 (F_1) to self pollinate?

➔ $\frac{3}{4}$ of the plants were **tall**

➔ $\frac{1}{4}$ of the plants were **short**

Result of the Second Generation



What is the ratio of hybrids of generation 2 (F_2)?

📖 Define $\underline{P_1}$.

- ❖ ***P_1*** represents the original parents.

- 📖 What does the "**F**" stand for in F_1, F_2, F_3, etc. generations?

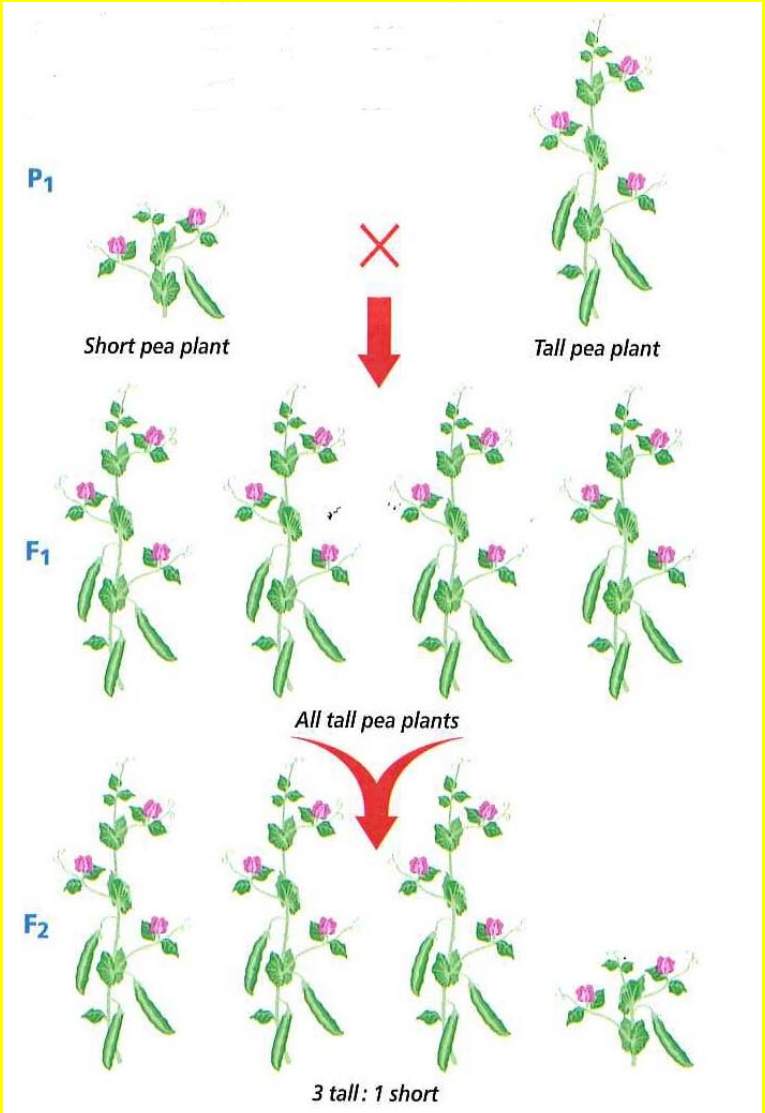
- ❖ **F** stands for ***"filial"***…meaning son and daughter.

📖 Name the **seven** traits that Mendel studied as ***dominant*** versus *recessive*.

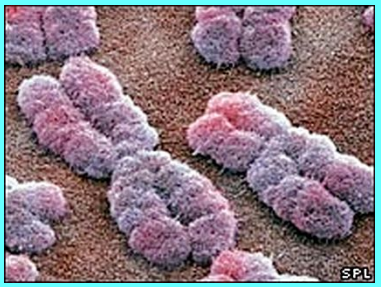
	Seed shape	Seed color	Flower color	Flower position	Pod color	Pod shape	Plant height
Dominant trait	 round	 yellow	 purple	 axial (side)	 green	 inflated	 tall
Recessive trait	 wrinkled	 green	 white	 terminal (tips)	 yellow	 constricted	 short

📖 What general observations did Mendel make when crossing each of these seven traits?

❖In every case, Mendel found that the **recessive** trait of the pair seemed to ***disappear*** in the F_1 generation and **only** ***reappear*** as $\frac{1}{4}$ (25%) in the F_2 generation.



📖 Where are your **genes located**?



- ***Genes*** are located on ***chromosomes***.

- 🗣 **<u>Recall</u>**: Long strands of **DNA** make up **chromosomes** located in the **nucleus**.

- 🗣 Building blocks of DNA are nucleotides

📖 Define ***alleles***.

❖ ***Alleles*** are **alternate** forms of genes

🗣 Need to understand that…

➔ for every trait the allele combinations can be either **TT**, **tt**, or **Tt**.

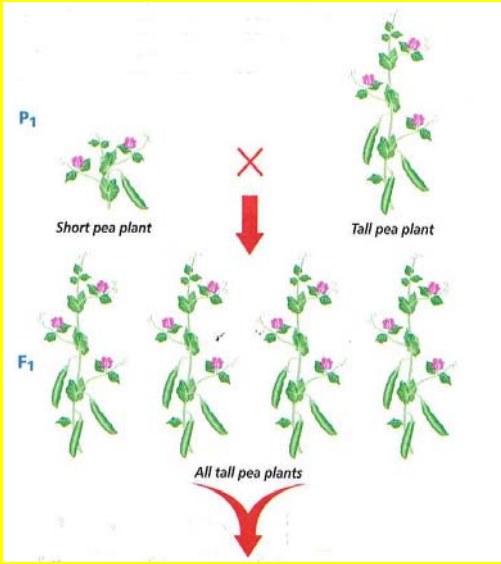
➔ one allele comes from **father** and the other allele comes from **mother**.

📖 Define ***dominant trait***.

- ***Dominant*** trait is the trait being **observed**.

- For example: Height (Tallness)

TT, **Tt**

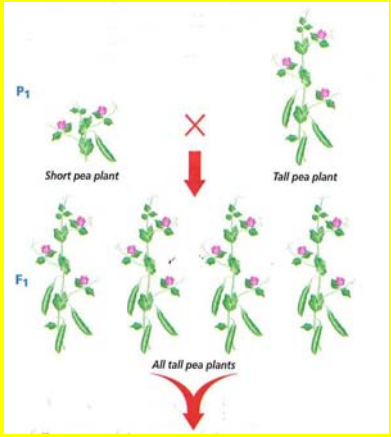


📖 Define ***recessive trait***.

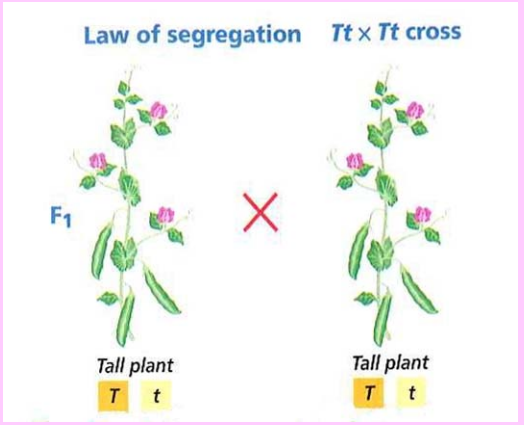
- ***Recessive*** trait is the trait that **disappeared** (in other words being "masked").

- For example: Height (Shortness)

<u>tt</u>



Mendel's Laws of Heredity



📖Define ***Law of Segregation***.

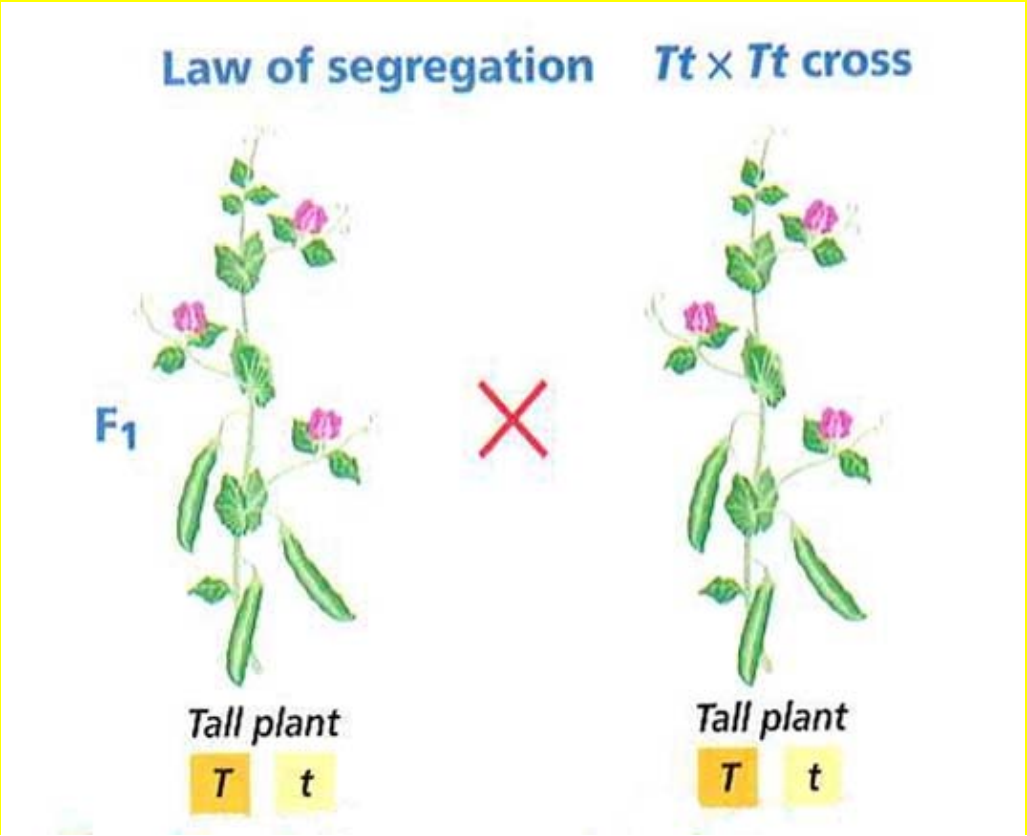
- Every individual has **2** alleles of each gene (trait) and when gametes (sex cells) are produced, **each** gamete receives one of these alleles.

- A parent **randomly** passes **1** allele of that gene (trait) to each gamete.

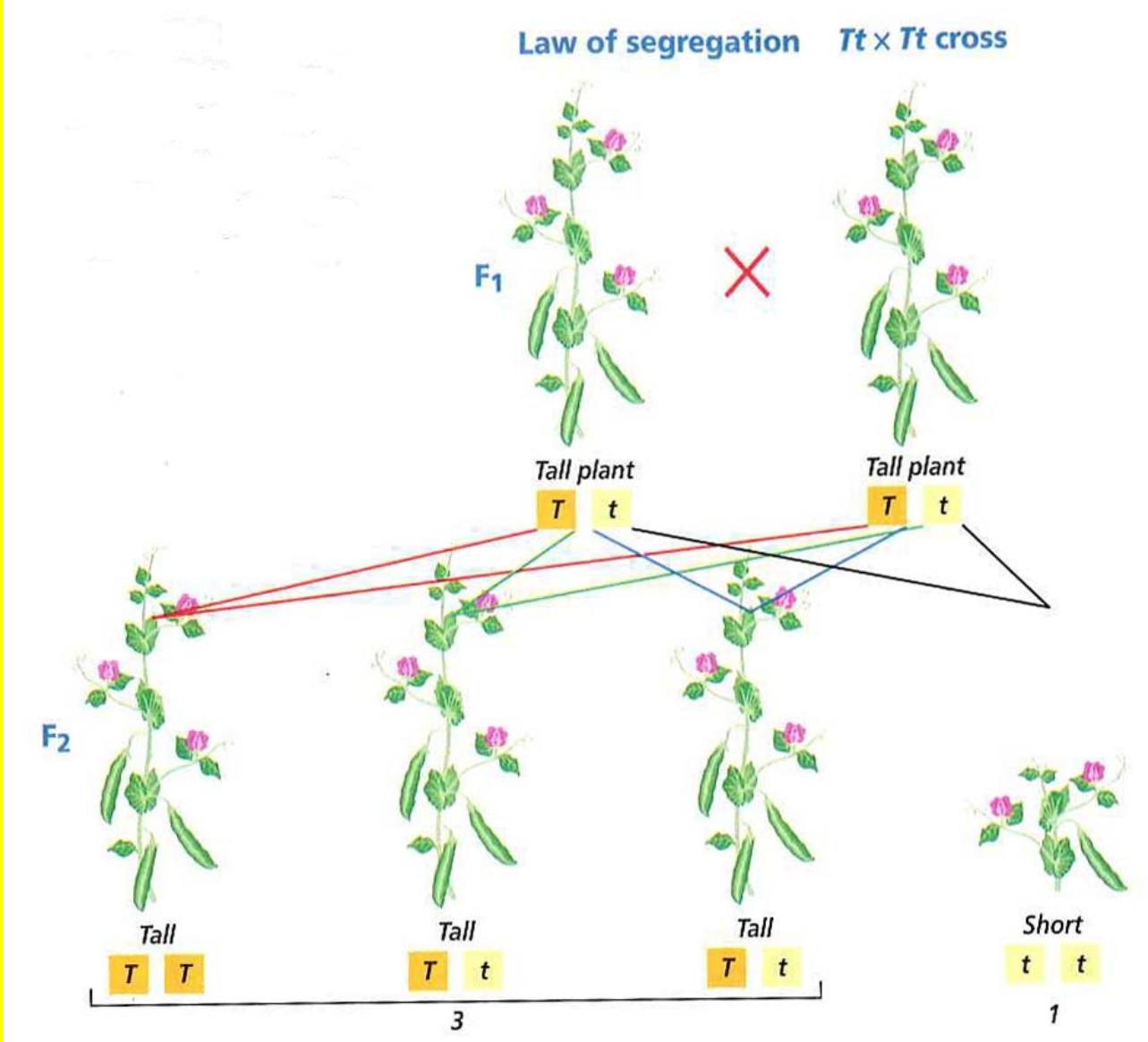
🗣 Mendel's Laws of Heredity Continues:

🗣Law of Segregation:

➔ can have <u>4</u> possible combinations



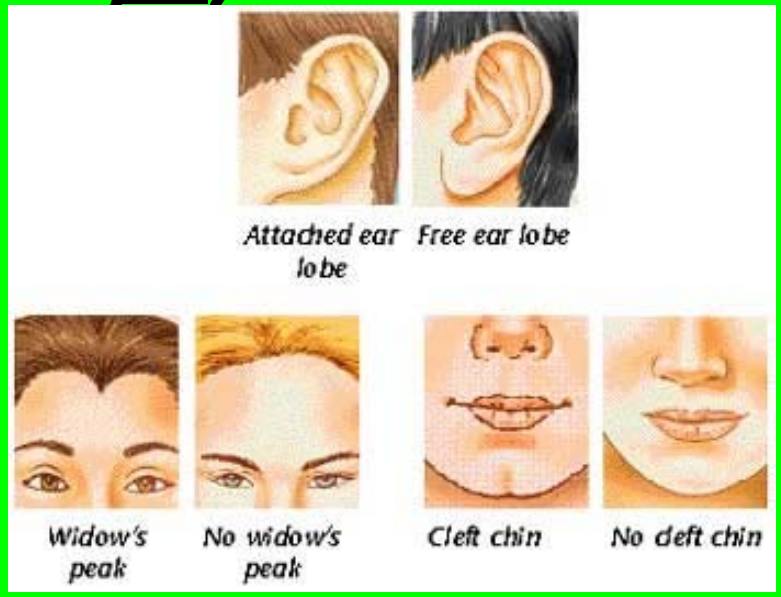
🗣 Law of Segregation:



📖 Define ***phenotype***.

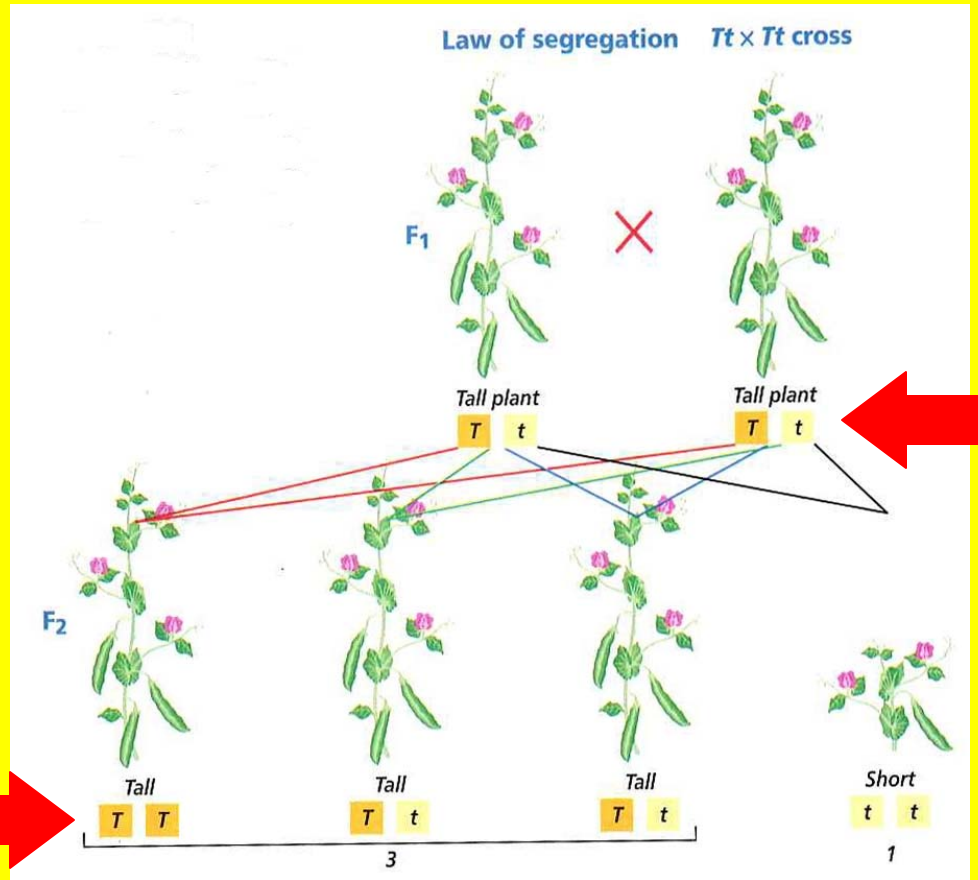
- ***Phenotype*** is the way the organisms **looks** and **behaves**.

- In other words, its "***physical***" **appearance**.



📖 Define ***genotype***.

- ***Genotype*** is the **allele** combination of a trait.



🗣 The Greek words…

- ***Phainein***…means "to show"
- ***Typos***…means "model"

Therefore…
phenotype is the **visible** characteristics of an organism.

- ***Gen*** or ***Geno***…means "race"
- ***Typos***…means "model"

Therefore…
genotype is the **allele** combination of an organism.

🗣 Mendel's Laws of Heredity Continues:

🗣 Let's Practice!!!

Name the following examples either as <u>genotype</u> or <u>phenotype</u>.

A.) LL genotype

B.) blond hair phenotype

C.) dimpled chin phenotype

D.) Dd genotype

E.) white and green leaves phenotype

F.) ss genotype

🗣 **Homozygous** versus **Heterozygous**

- ***Homozygous***: **2** alleles for the trait are the ***same***.

➔ For example: (**TT**) homozygous dominant
(**tt**) homozygous recessive

- ***Heterozygous***: **2** alleles for the trait that are ***different***. **ALWAYS DOMINANT!!!**

➔ For example: (**Tt**) heterozygous dominant

Let's Practice!!!

- **Name the following examples as either <u>Homozygous</u> or <u>Heterozygous</u>**

A.) GG homozygous dominant

B.) Gg heterozygous dominant

C.) gg homozygous recessive

D.) Tt heterozygous dominant

E.) BB homozygous dominant

F.) aa homozygous recessive

📖 Define ***dihybrid crosses***

- *A **dihybrid*** cross is a cross between **2 different** traits.

➔ For example: Seed Shape and Seed Color

🗣 Mendel wanted to investigate the following question:

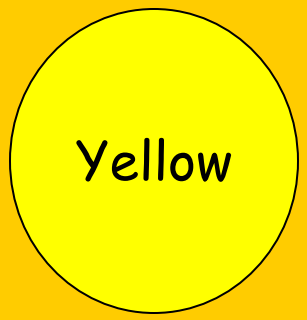
- 🗣 **Will the two different traits stay together in the next generation?**
- 🗣 **Will they be inherited independently of each other?**

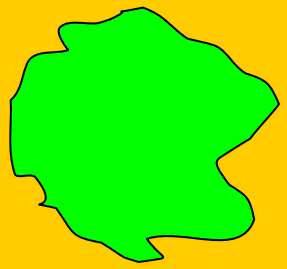
📖 What happened when Mendel crossed **round yellow seeds** (**RRYY**) with **wrinkled green seeds** (**rryy**) in the P_1 generation?

➔ The offspring in the F_1 generation were ***ALL round yellow*** seeds.

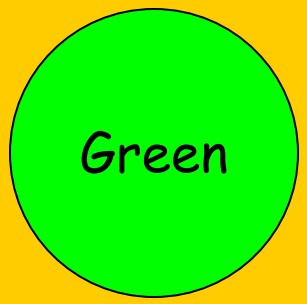
📖 What happened when Mendel allowed the F_1 generation to self pollinate?

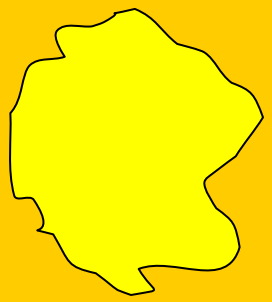
Offspring in the F_2 generation were





Wrinkled





📖 What was the **ratio** of F_2 generations?

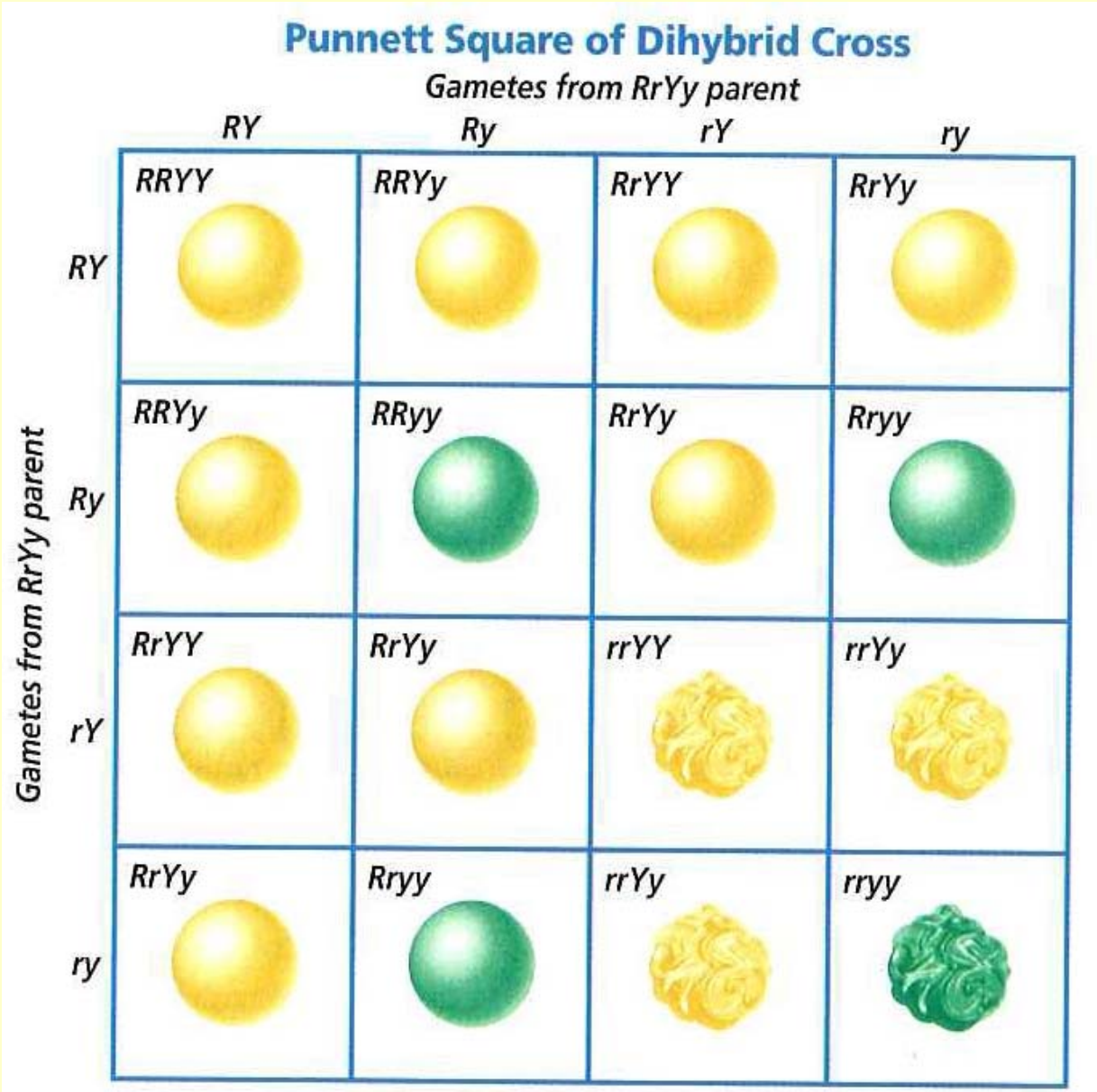
9:3:3:1

RY (9)

Ry (3)

rY (3)

ry (1)



📖 Define ***Law of Independent Assortment***.

- ***Law of Independent Assortment*** refers to genes for **different** traits are inherited **independently** of each other.

- 🗣 Need to understand that…
  - ➔ For example…Seed Color and Seed Shape

RrYy

Alleles will **separate** due to ***Law of Segregation***

2 different traits will **sort** according to ***Law of Independent Assortment***