

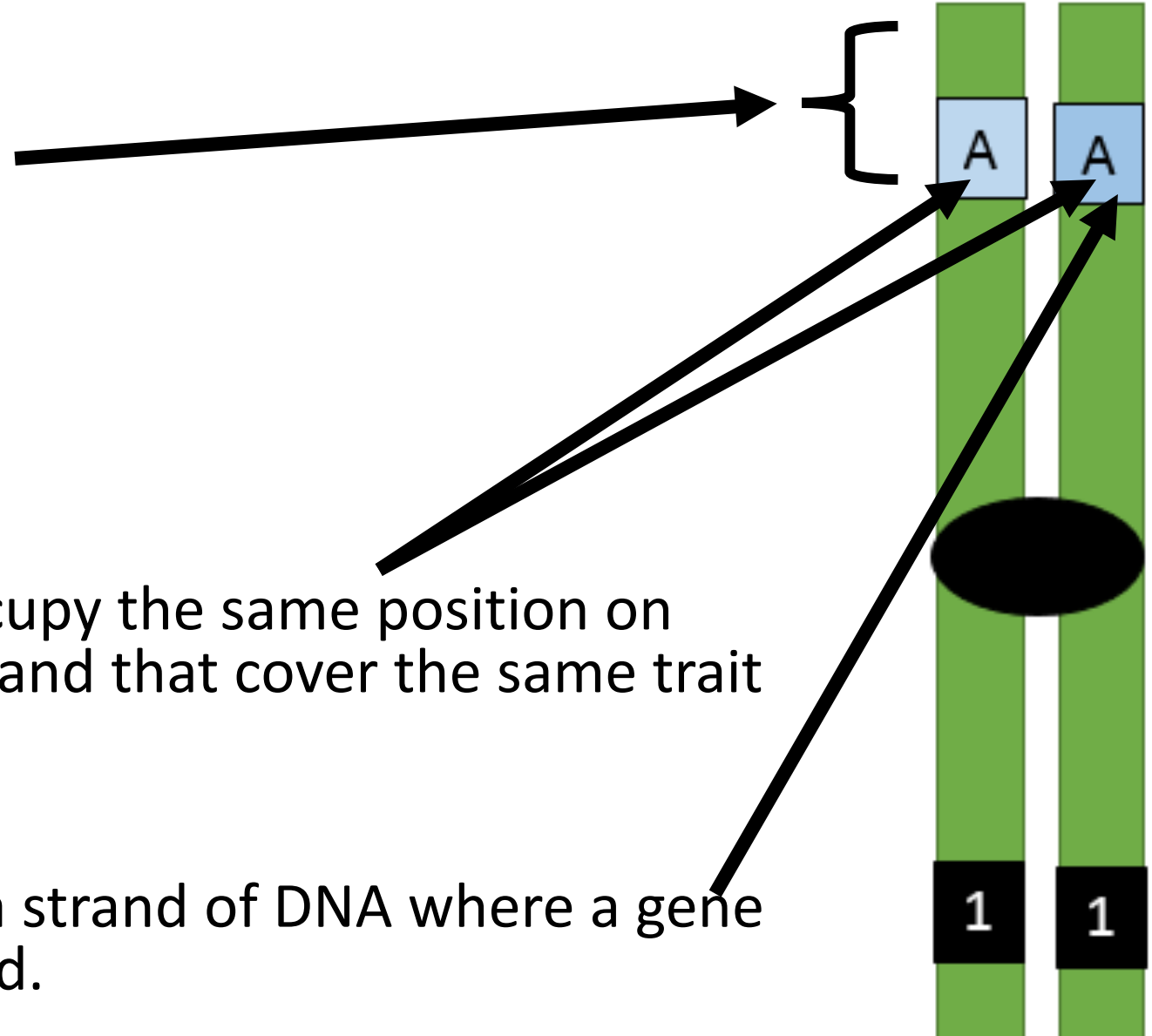
COMPLETE

DOMINANCE

NOTES

# Genetics terms you need to know:

- **Gene** – a unit of heredity; a section of DNA sequence encoding a single protein
- **Genome** – the entire set of genes in an organism
- **Alleles** – two genes that occupy the same position on homologous chromosomes and that cover the same trait (like ‘flavors’ of a trait).
- **Locus** – a fixed location on a strand of DNA where a gene or one of its alleles is located.



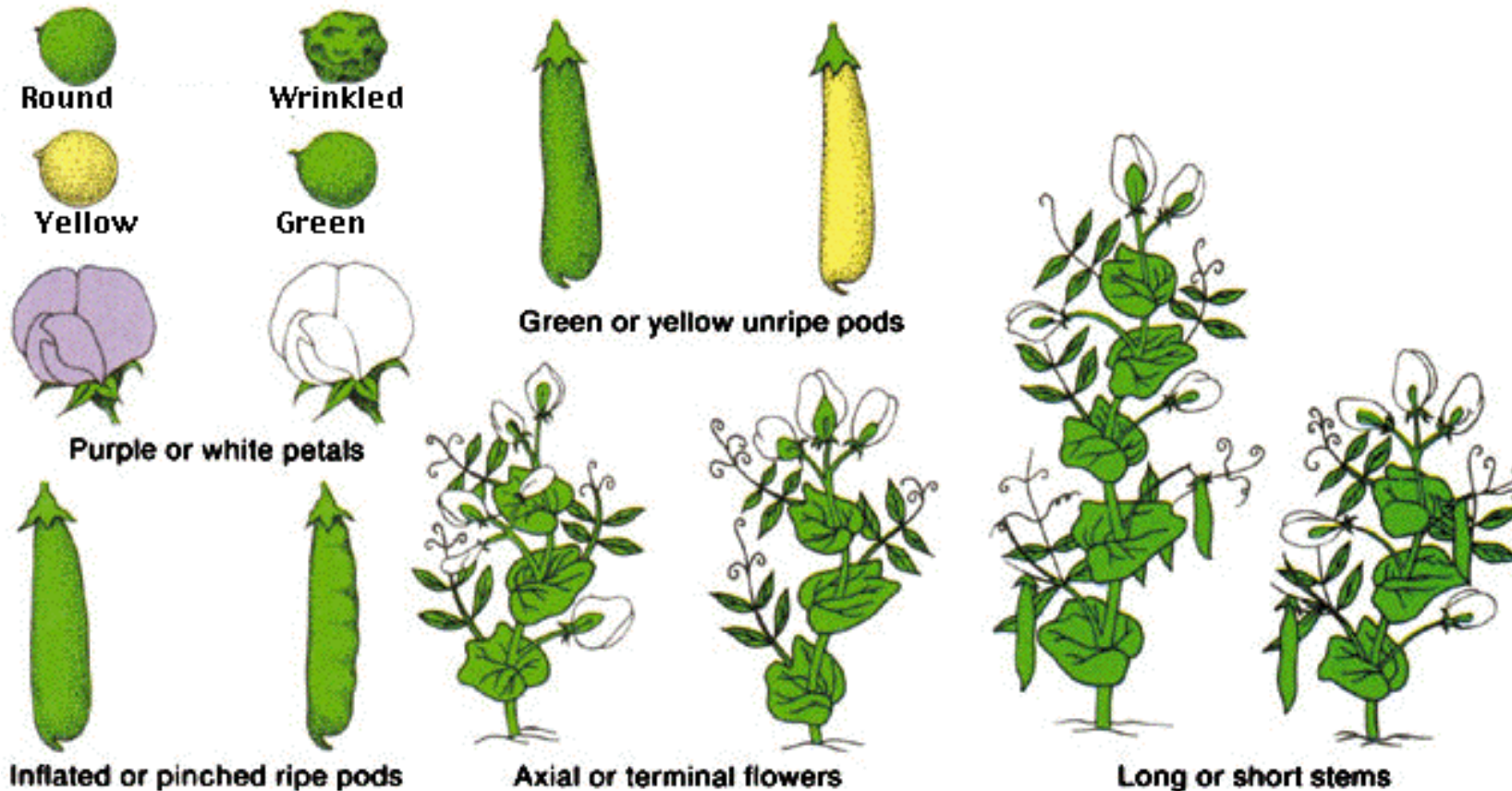
# Gregor Mendel

- The “Father of Genetics” – discovered the laws that determined inheritance of traits.
- Mendel’s work was not “recognized” until his paper was rediscovered in the 20<sup>th</sup> century
- How did he do this?
  - He cultivated and tested 28,000 pea plants and found that plants’ offspring retained traits of the parents.
- Mendel predicted the concept of genes & that genes occur in pairs (gene of each pair is present in the gametes)

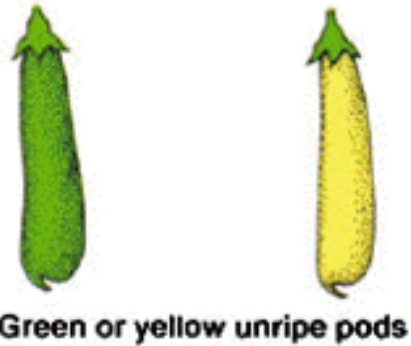


# Mendel's peas

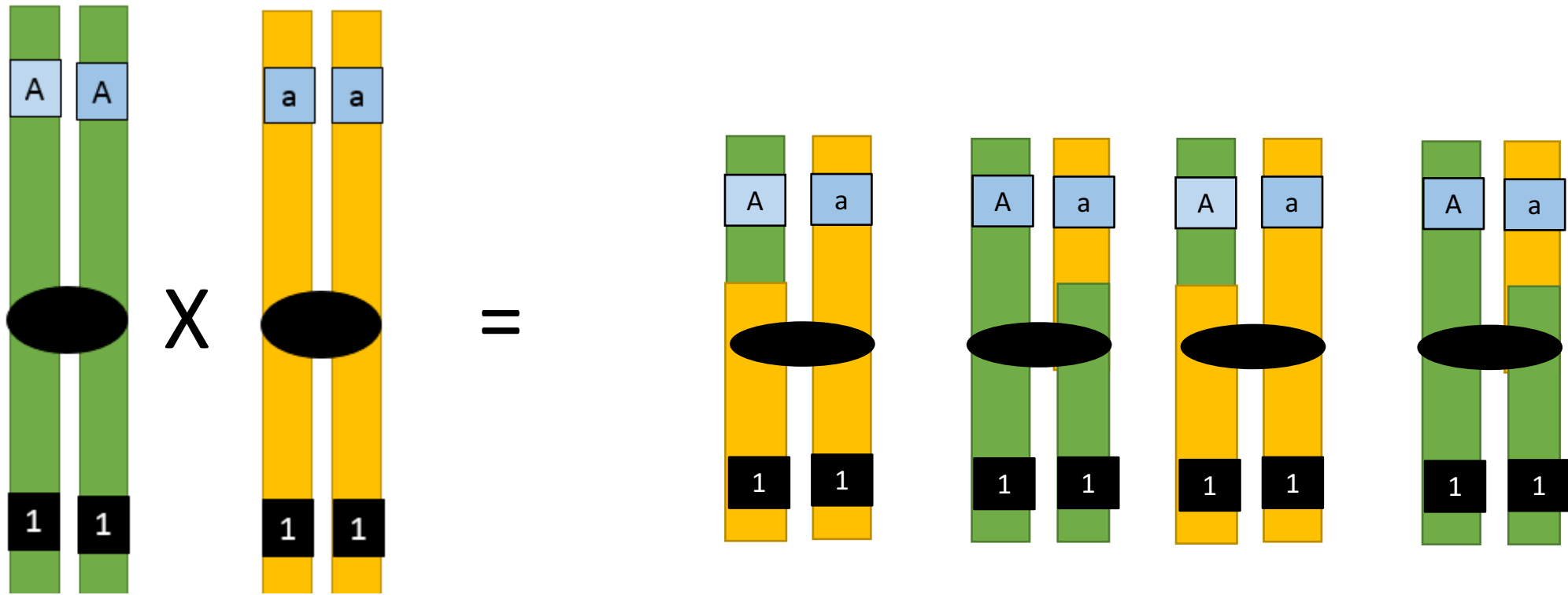
- Mendel looked at seven traits or characteristics of pea plants:

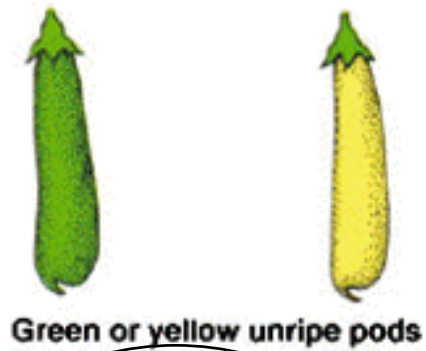


# How Mendel's experiment worked....

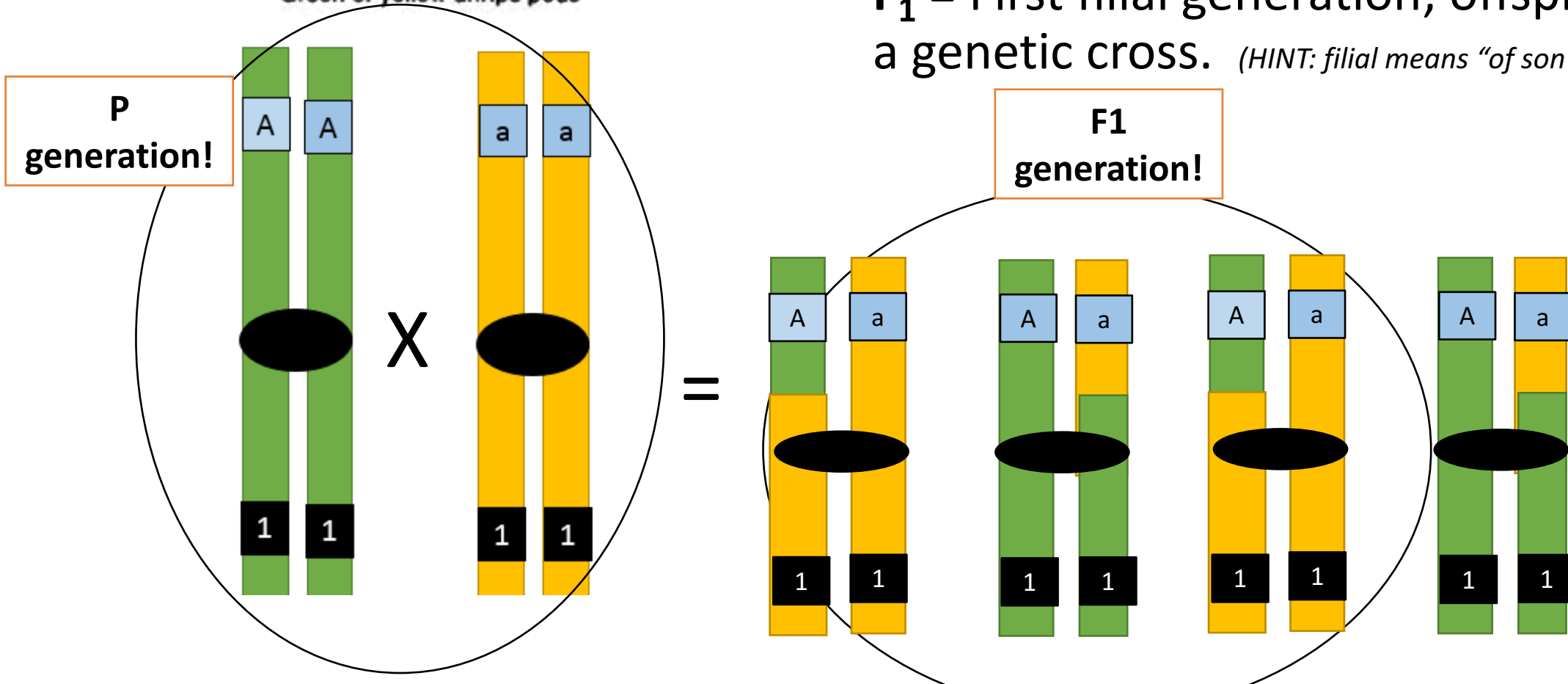


- Mendel took a pea plant that always produced green pods and “crossed” or mated it with a pea plant that always produced yellow pods.

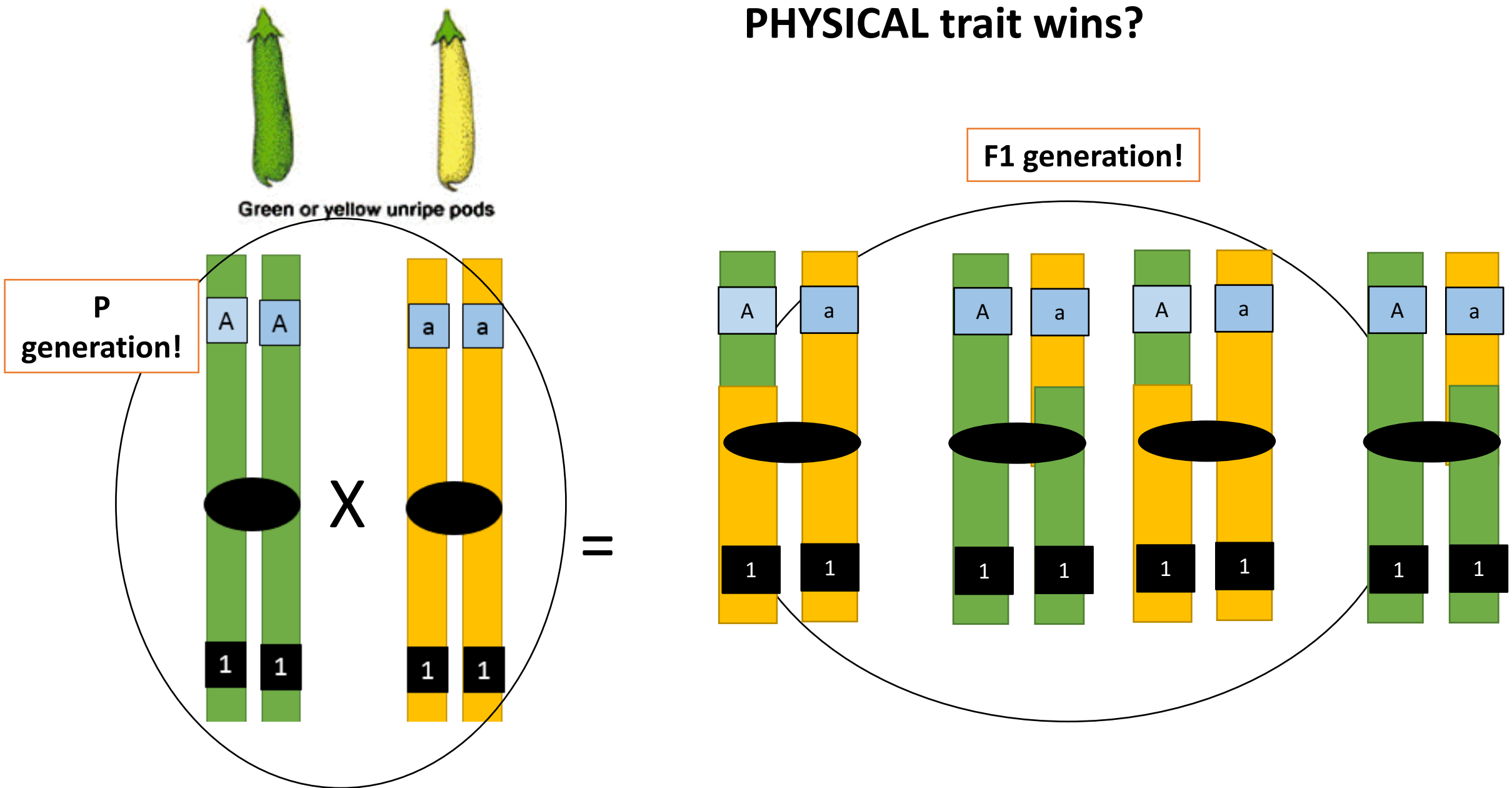


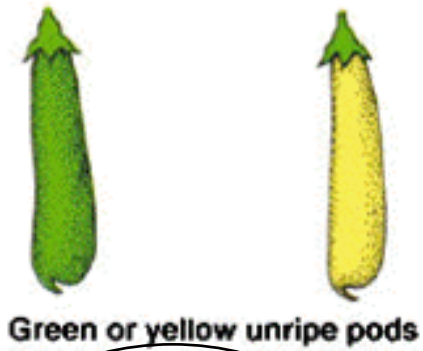


- **Monohybrid cross:** a genetic cross involving a single pair of genes (one trait); parents differ by a single trait.
- **P** = Parental generation
- **F<sub>1</sub>** = First filial generation; offspring from a genetic cross. (*HINT: filial means "of son or daughter"*)



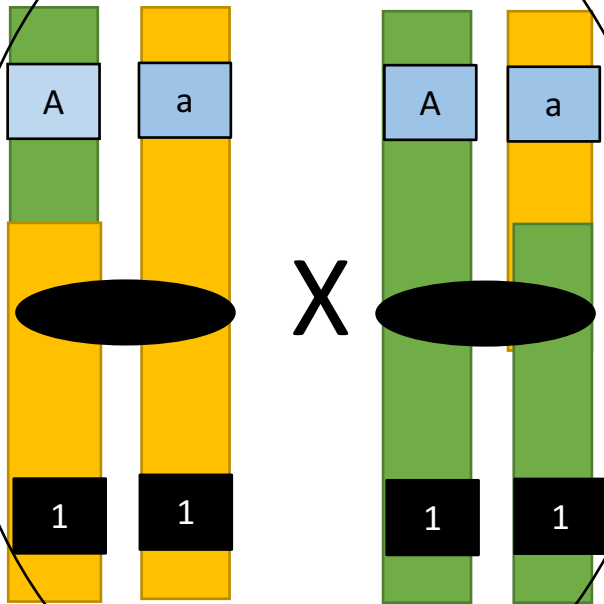
- Now, looking at the “children,” which **PHYSICAL** trait wins?



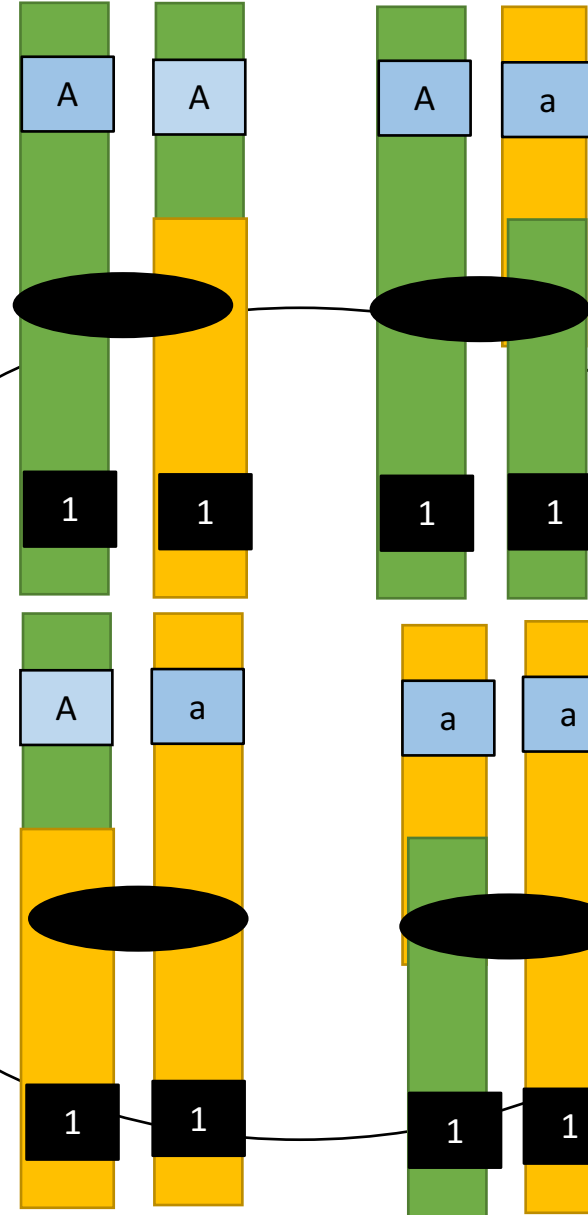


- Mendel didn't see any differences, so he crossed the F1 generation just to see the results

F1 generation!



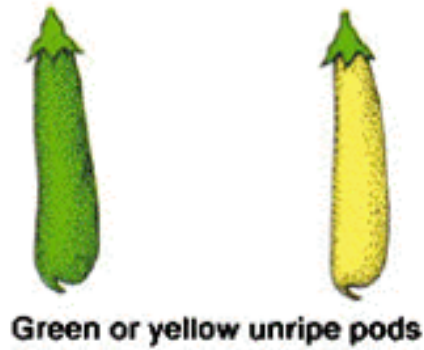
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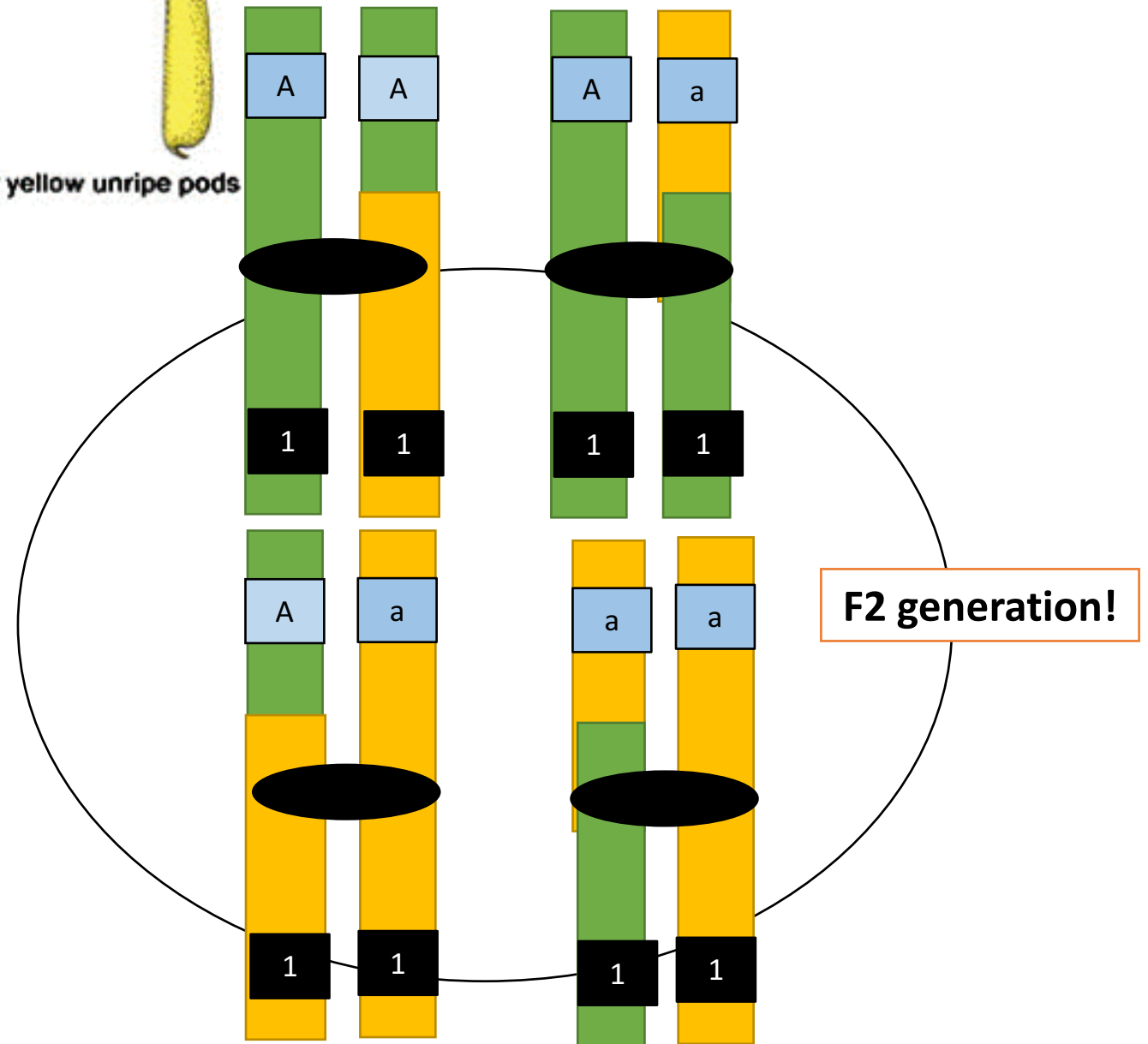
F2 generation!

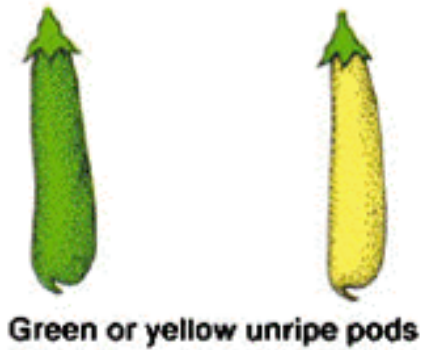


- Now, looking at the “children,” which **PHYSICAL** trait wins? What color pea pods will you have in each plant?

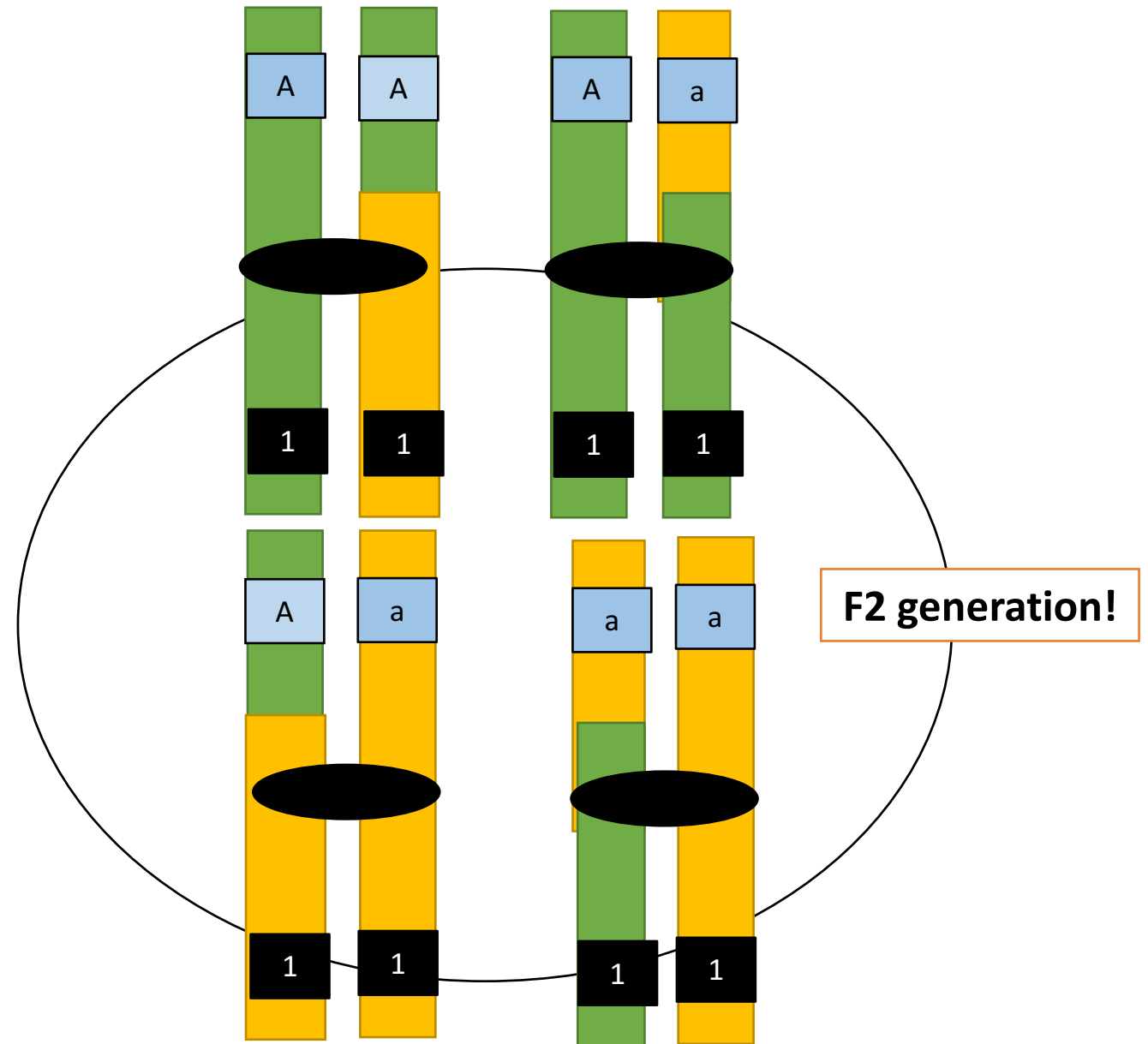


- What is its **PHENOTYPE?**(the physical appearance of an organism)
- **Dominant** – the allele of a gene that masks or suppresses the expression of an alternate allele
- **Recessive** – an allele that is masked by a dominant allele

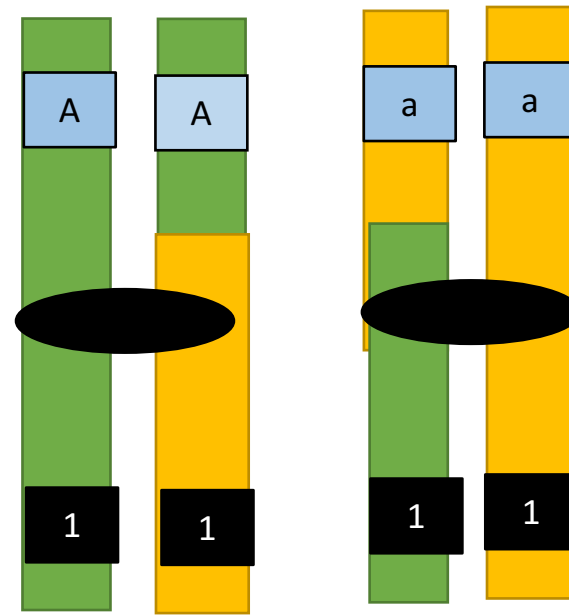




- Now, looking at the “children,” which **GENETIC** trait wins?
- What is the “**GENOTYPIC**” ratio?
- **Genotype** – the genetic makeup of an organism involving a description of the alleles

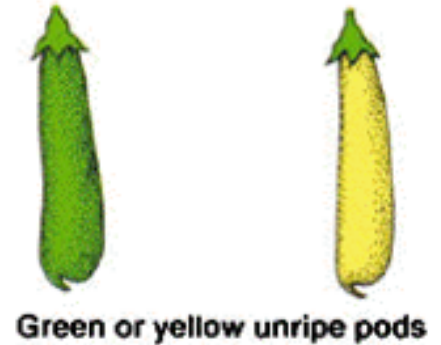
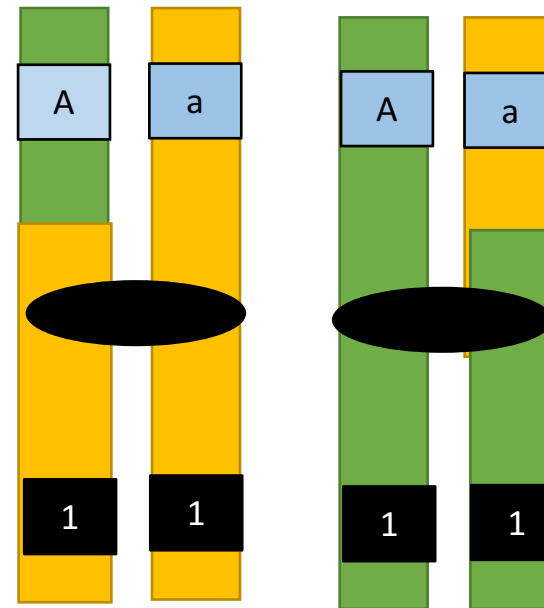


- **Homozygous** – having identical genes (one from each parent) for a particular characteristic.

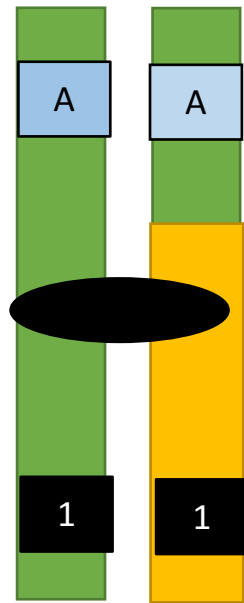


F2 generation!

- **Heterozygous** – having two different genes for a particular characteristic..

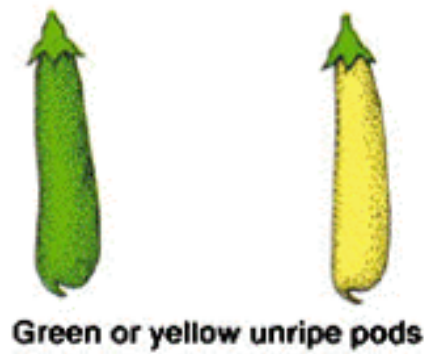
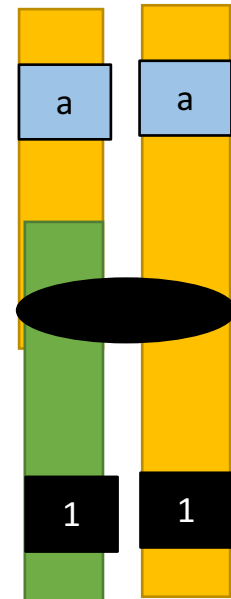


- **Homozygous dominant**  
– having identical genes (one from each parent) for a dominant characteristic



F2 generation!

- **Homozygous recessive**  
– having identical genes (one from each parent) for a recessive characteristic



- **Phenotypes:**

#1, #2 & #3 will all have GREEN pea pods

#4 will have YELLOW pea pods

- **Genotypes:**

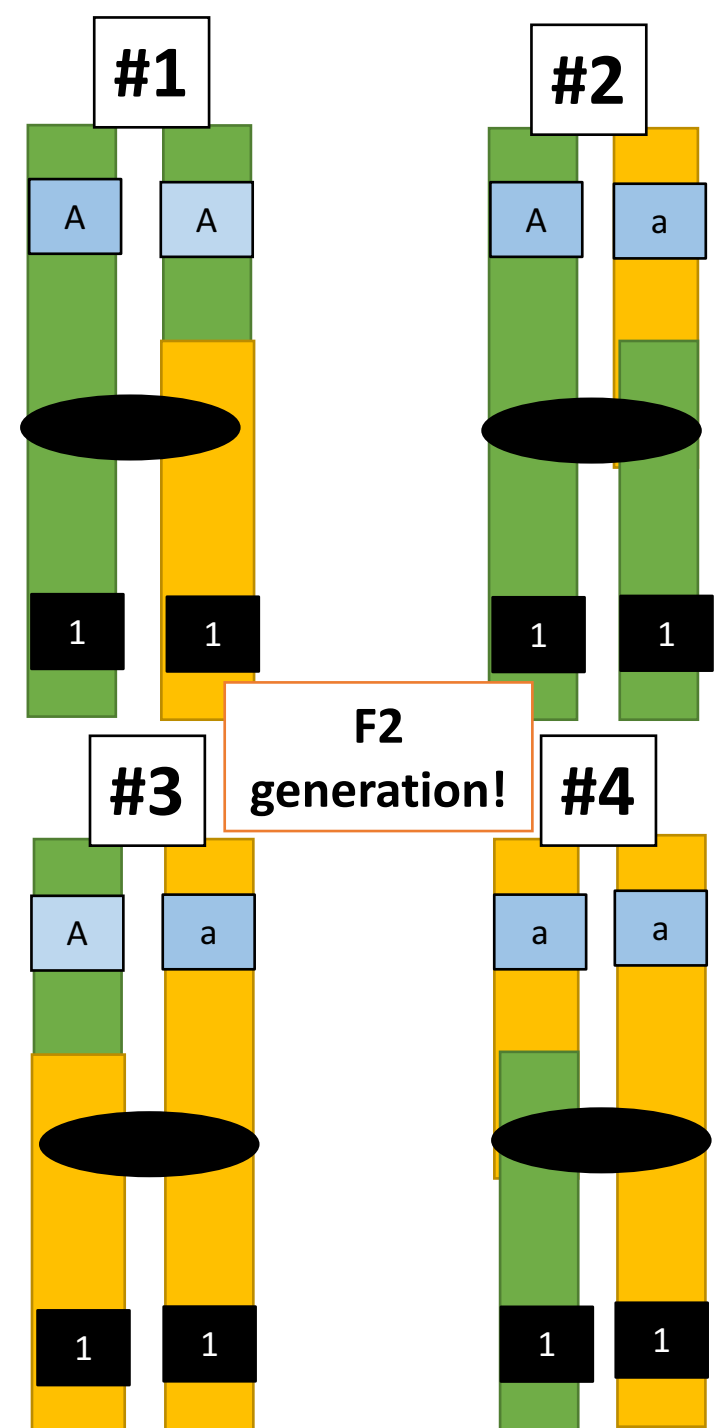
#1 is Homozygous dominant “*true breeding*”

#2 is Heterozygous “*Hybrid*”

#3 is Heterozygous “*Hybrid*”

#4 is Homozygous recessive “*true breeding*”

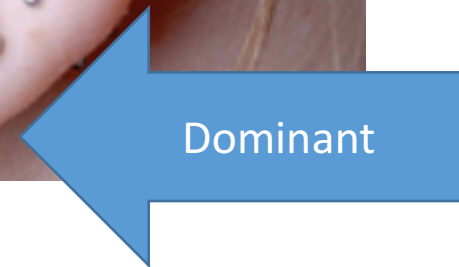
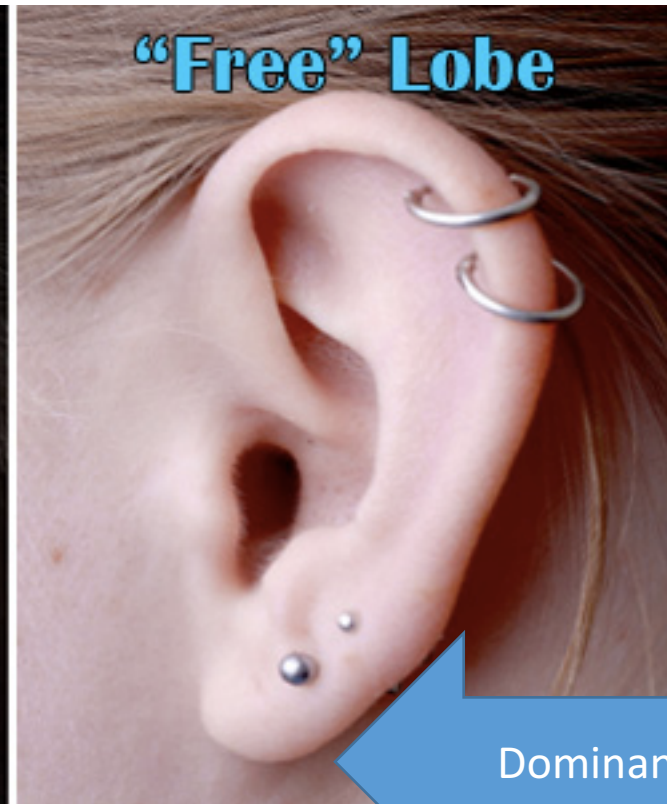
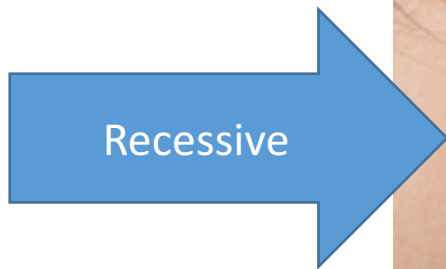
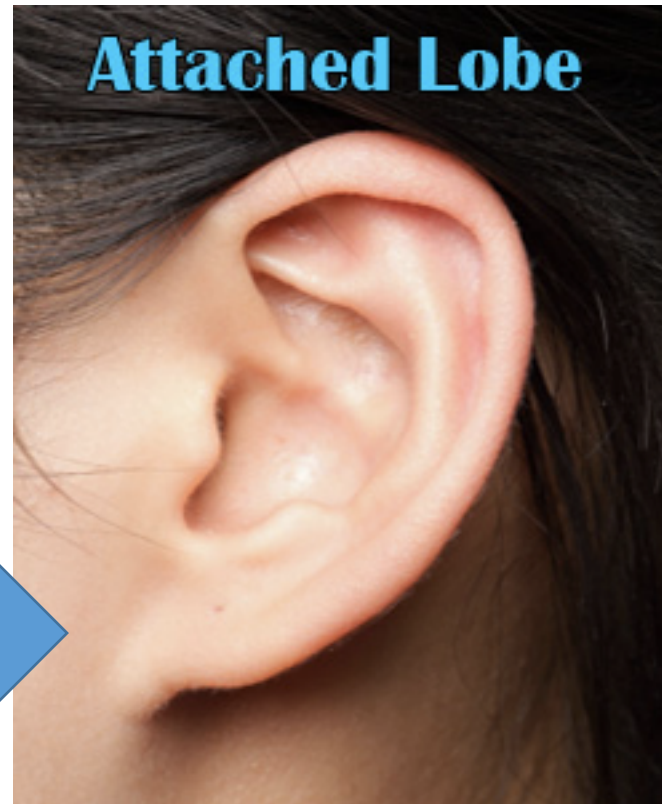
**Genotypic Ratio = 1:2:1**



# Mendel was the first biologist to use MATH.

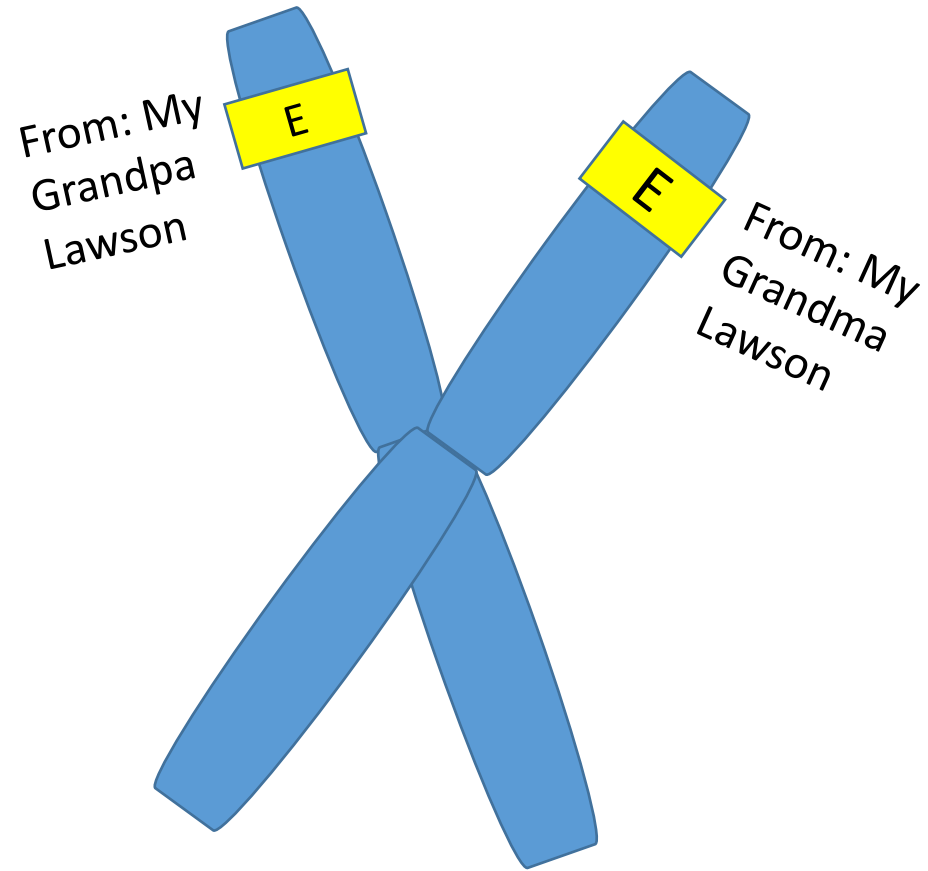
- A lot of his work was based on predictions, or probabilities.
- What is the probability of a penny landing on heads when it is flipped?
- What if it was a “double headed” penny? What would be the probability that it would land on heads when it is flipped?
- This relates to genes.....

Looking at a trait you actually might care about....

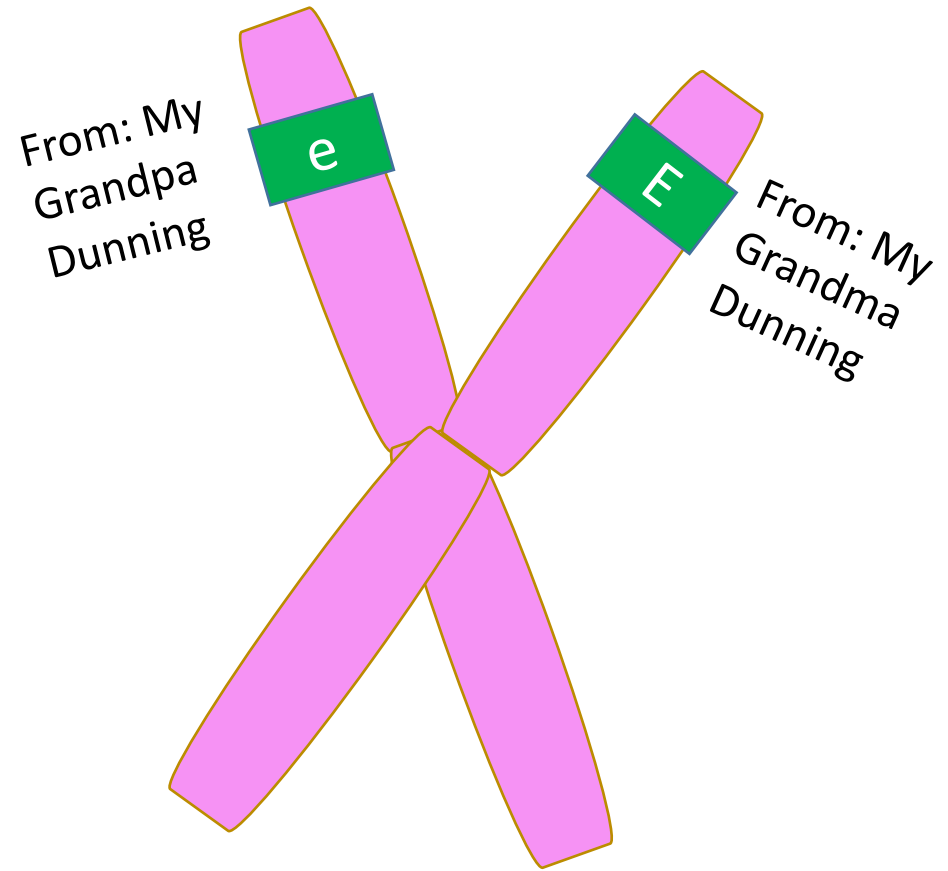


# Homologous pairs

E = Free ear lobe  
e = Attached ear lobe



From: My Daddy



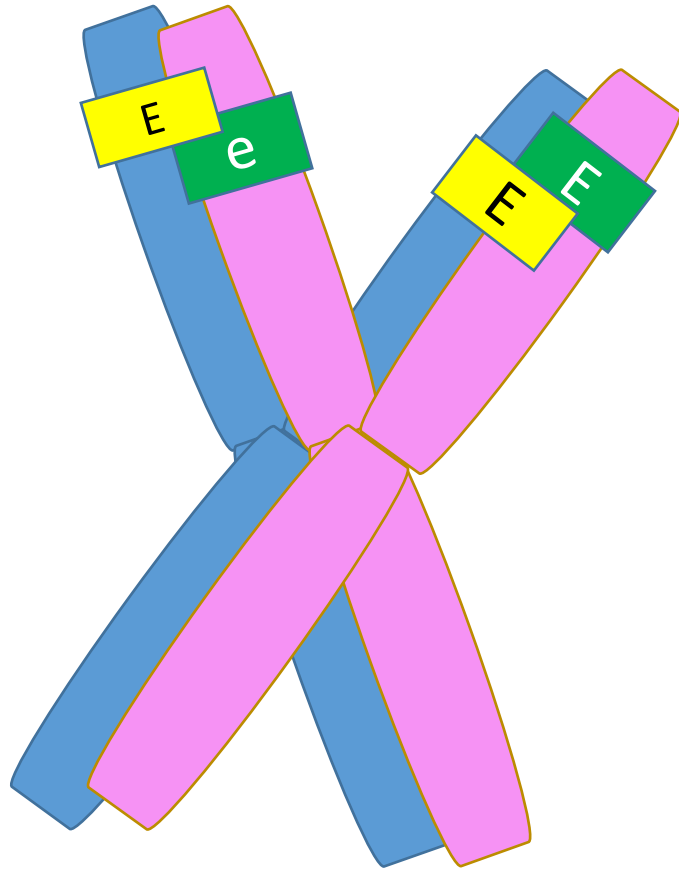
From: My Mommy



# Homologous pairs

E = Free ear lobe

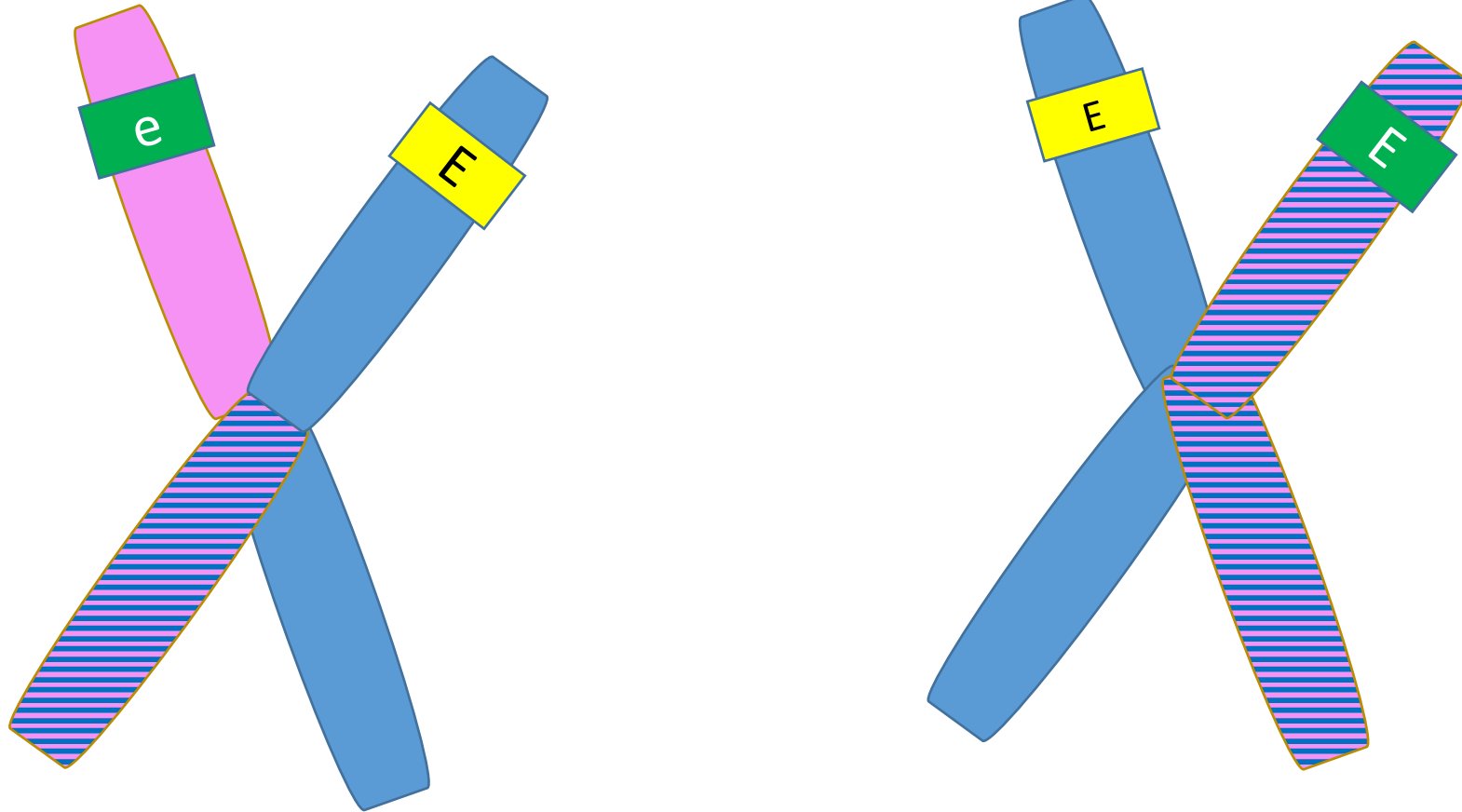
e = Attached ear lobe



Crossing over happening in **PROPHASE I** of **MEIOSIS I** in MY egg producing cells. The homologous chromosomes unite to form a **TETRAD**.

# Homologous pairs

E = Free ear lobe  
e = Attached ear lobe



Crossed over Homologous Pairs. Crossing happens in PROPHASE I of MEIOSIS I.

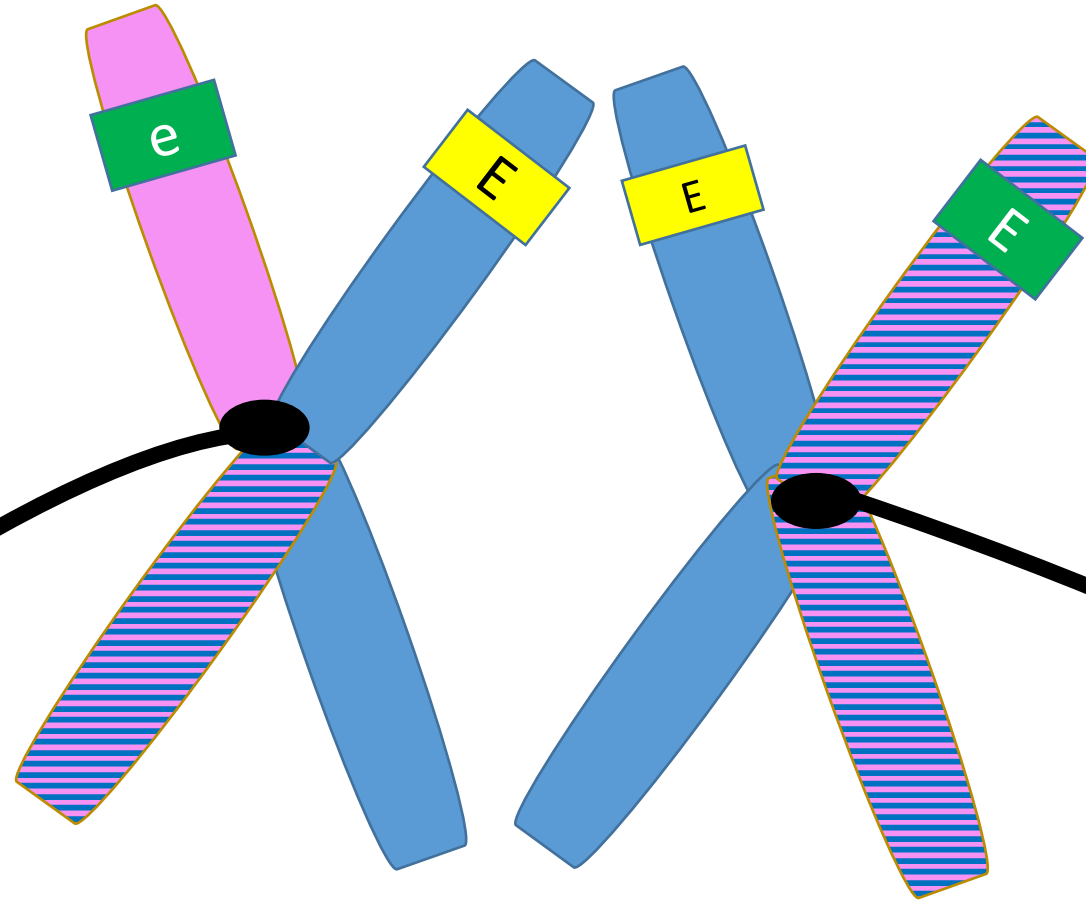
# Homologous pairs

E = Free ear lobe  
e = Attached ear lobe

## The Law of Independent Assortment

The law developed by Mendel stating that alleles (a string of genes that control a certain trait) separate as they are sorted into different haploid cells.

**INDEPENDENT ASSORTMENT IS OCCURRING IN METAPHASE I OF MEIOSIS I**

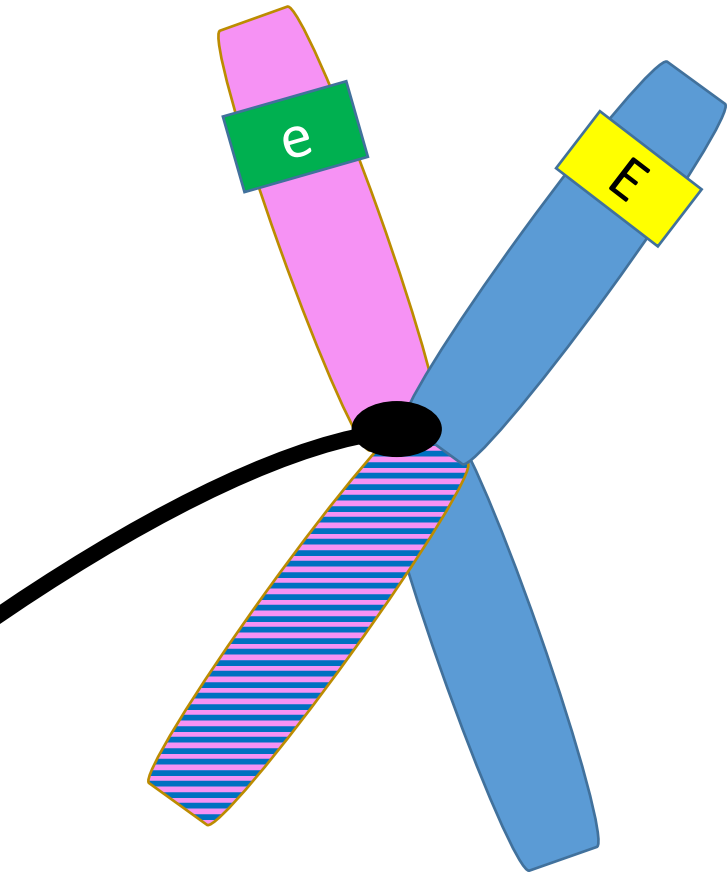


**MENDEL'S  
DISCOVERY  
#1**

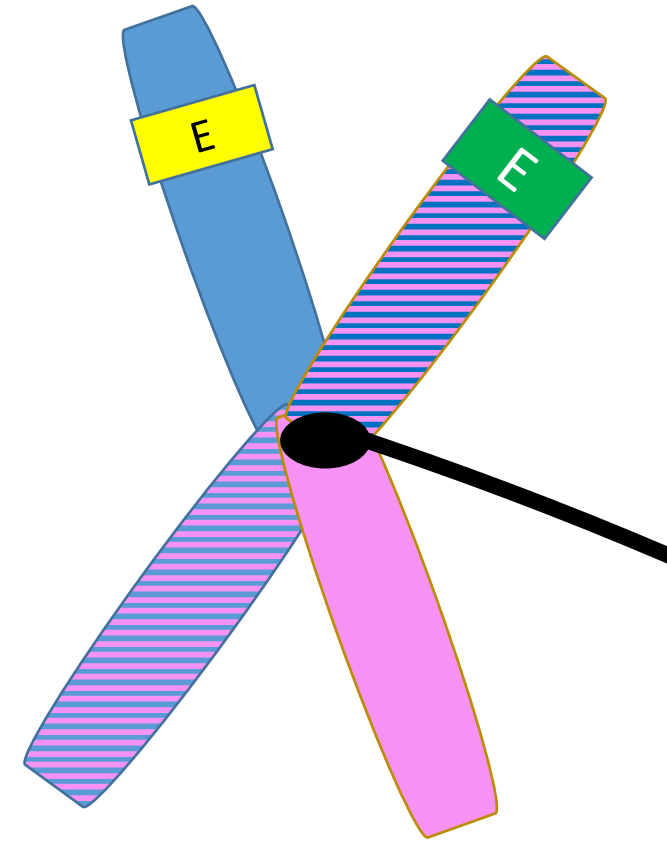
Homologous Pairs line up along the metaphase plate during METAPHASE I of MEIOSIS I

# Homologous pairs

E = Free ear lobe  
e = Attached ear lobe



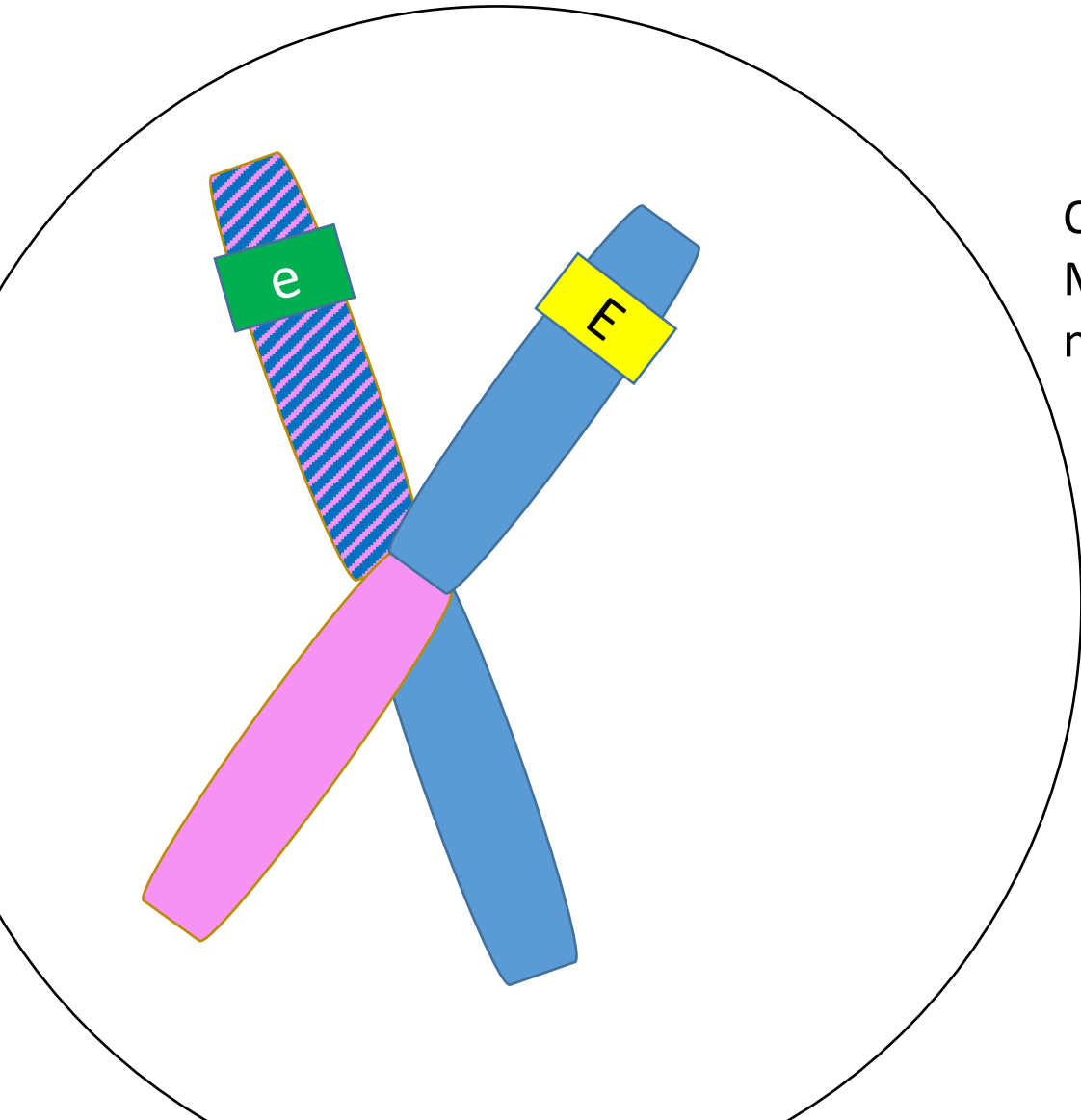
Homologous Pairs separate during ANAPHASE I of MEIOSIS I. **Nondisjunction** can occur



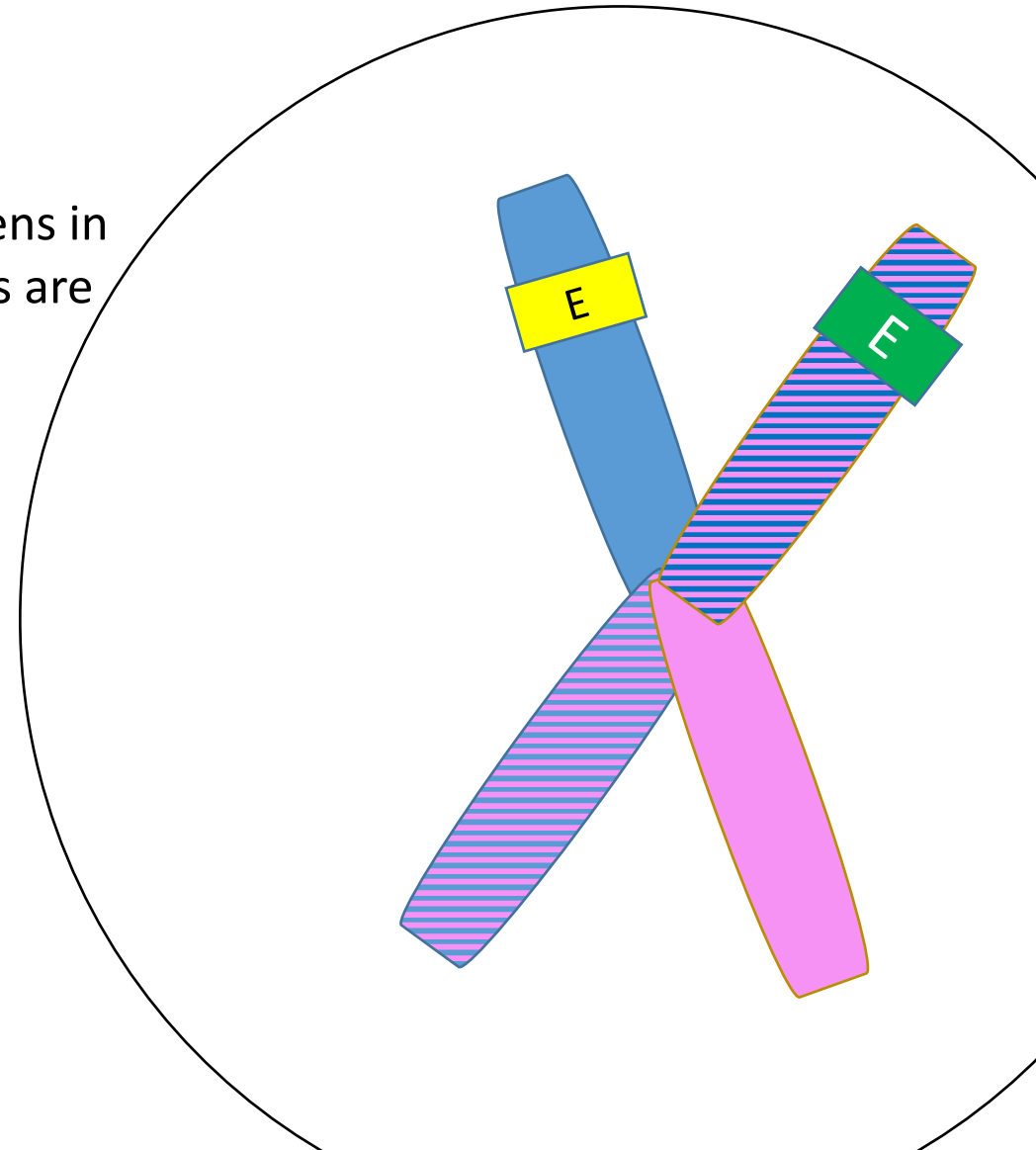
# Homologous pairs

E = Free ear lobe

e = Attached ear lobe



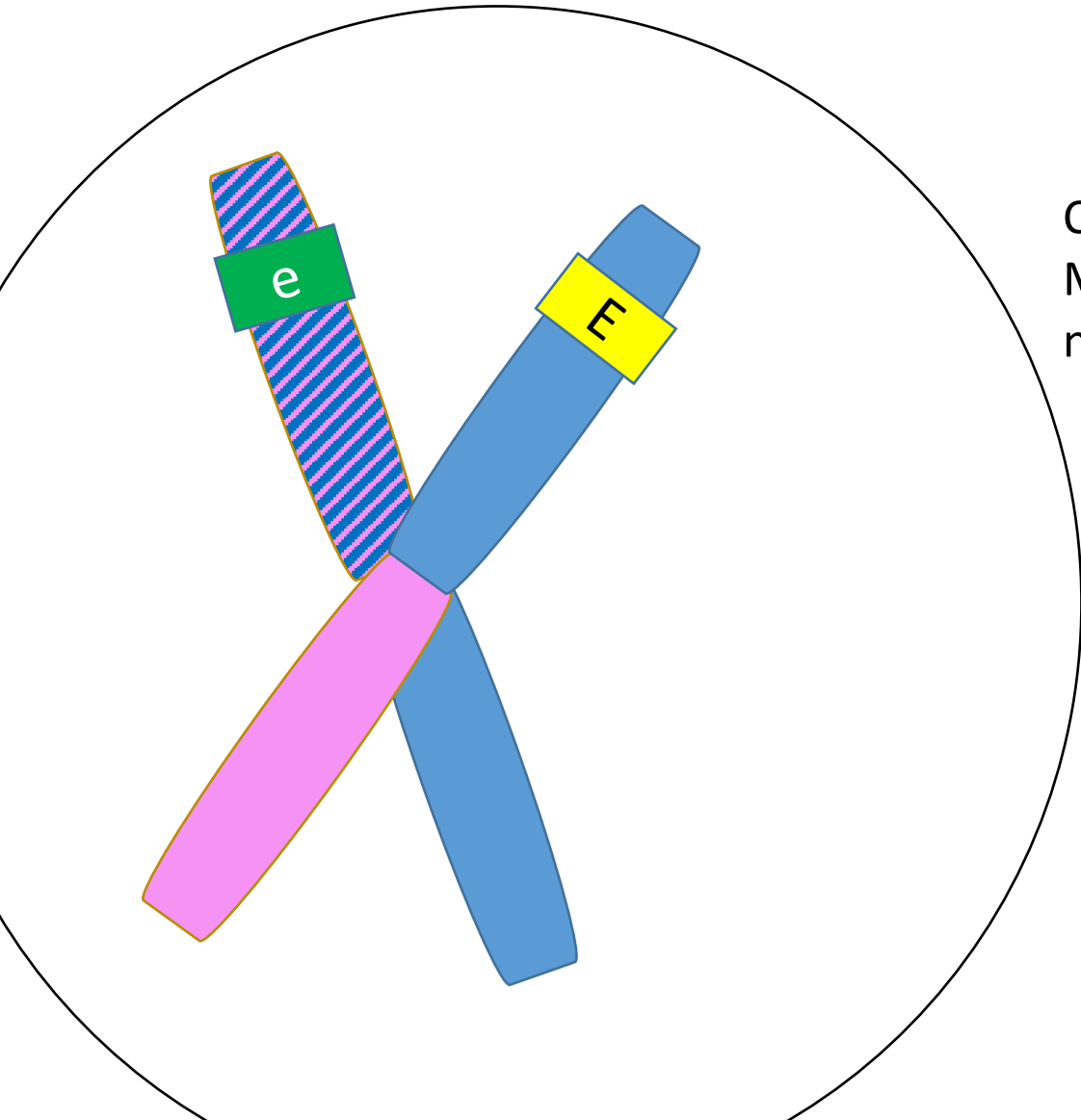
Cytokinesis I happens in  
MEIOSIS I. The cells are  
now **HAPLOID!**



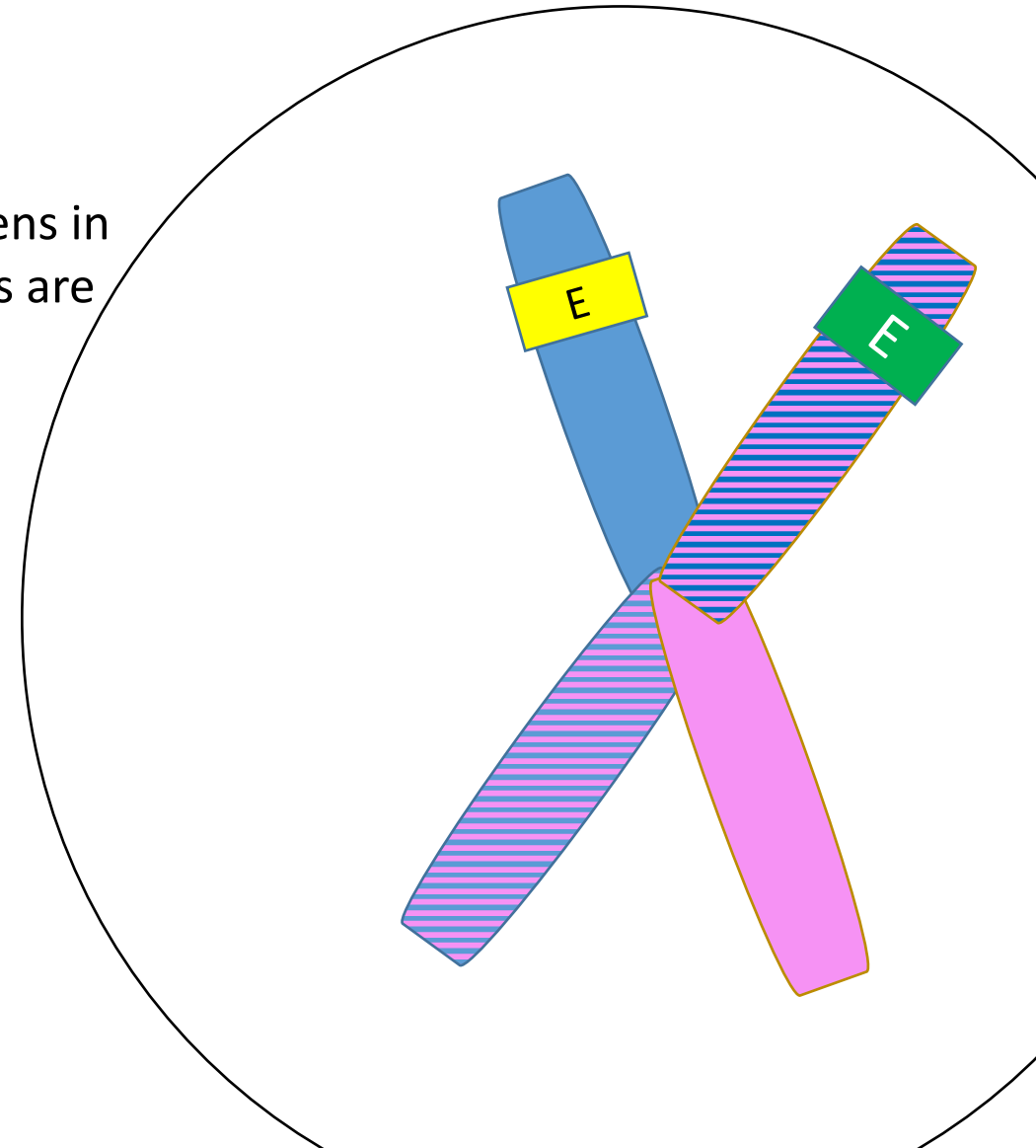
# MEIOSIS II, **NO** homologous chromosomes, just **CHROMOSOMES**

E = Free ear lobe

e = Attached ear lobe

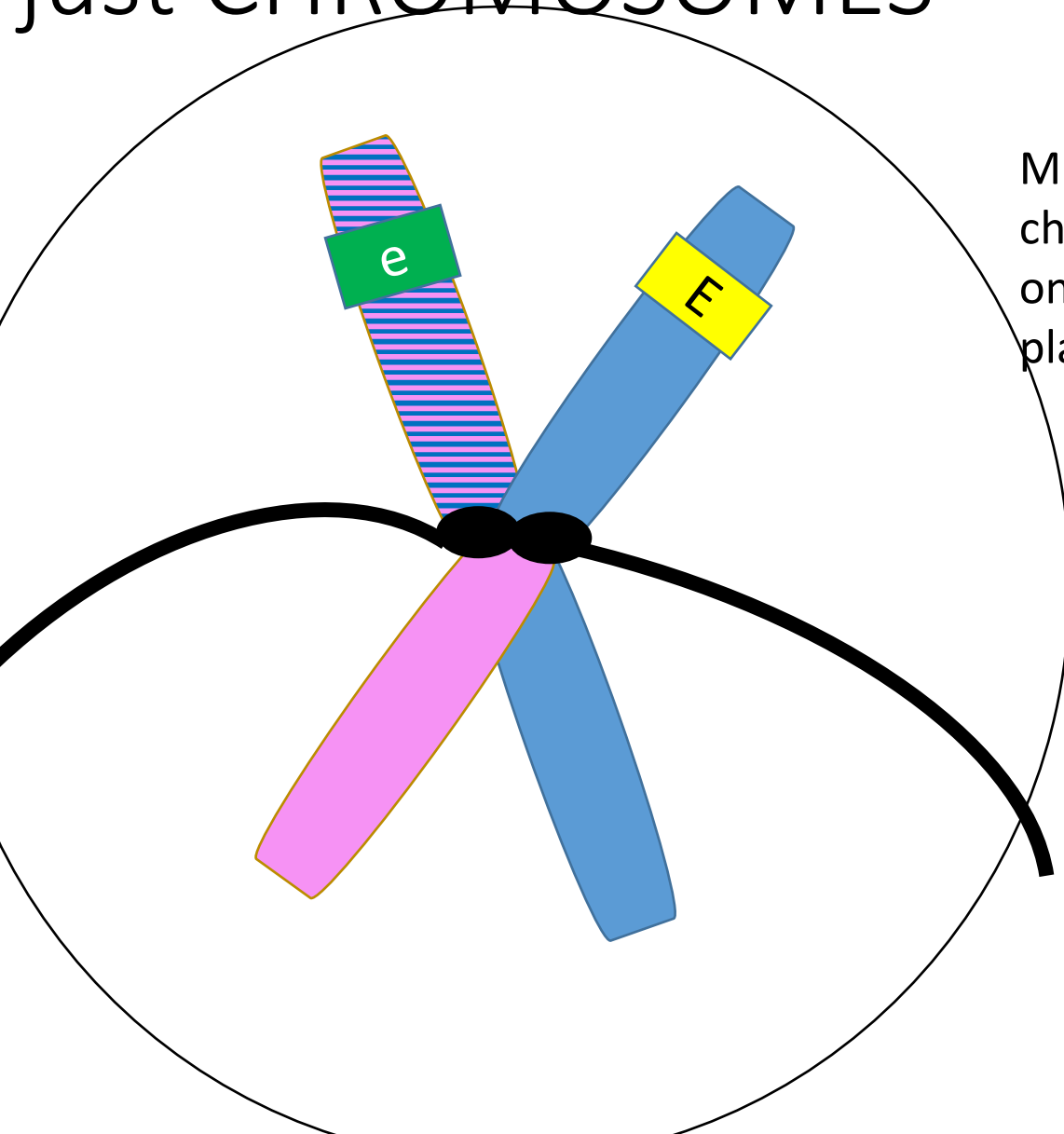


Cytokinesis I happens in  
MEIOSIS I. The cells are  
now **HAPLOID!**

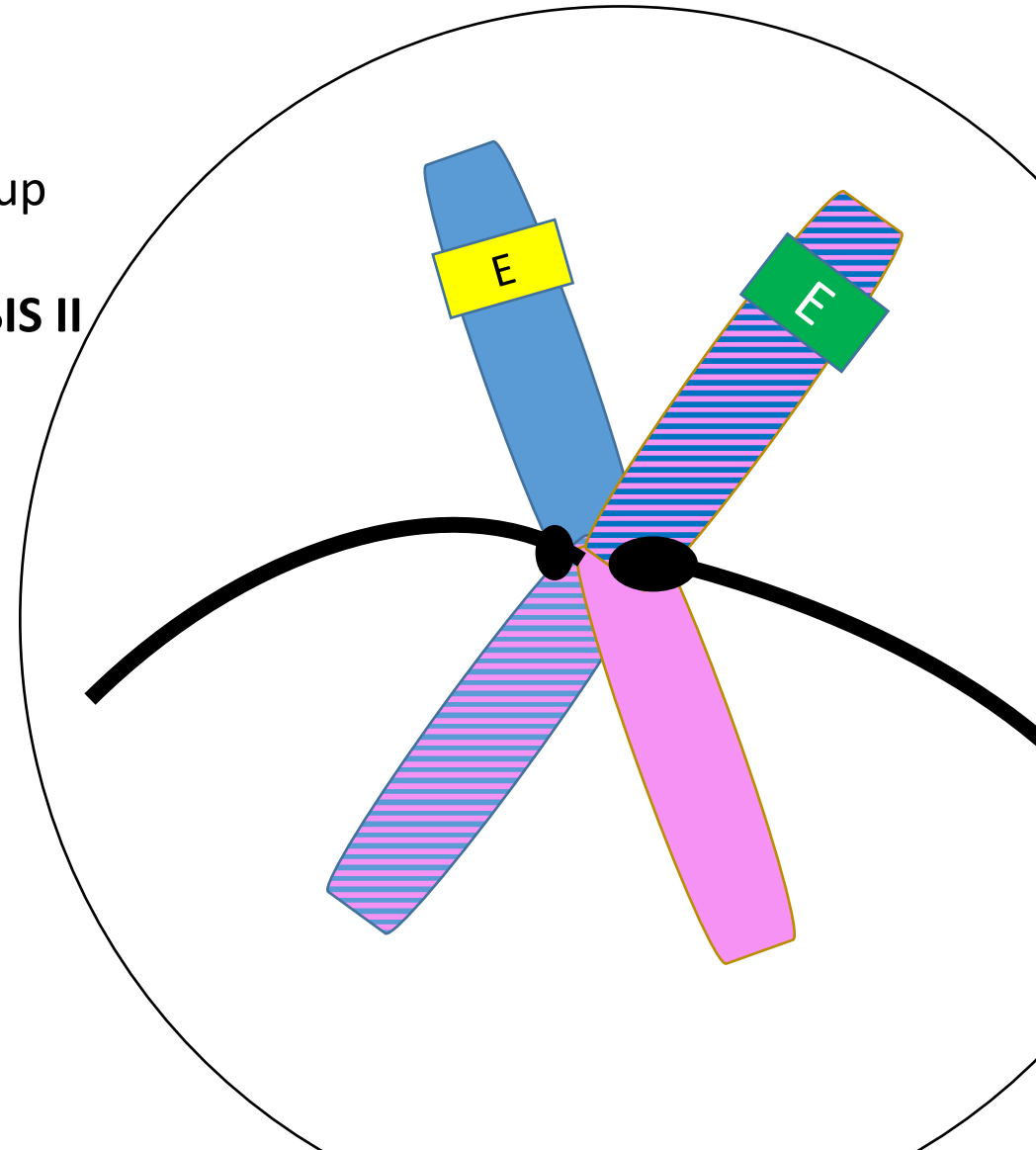


# MEIOSIS II, NO homologous chromosomes, just CHROMOSOMES

E = Free ear lobe  
e = Attached ear lobe

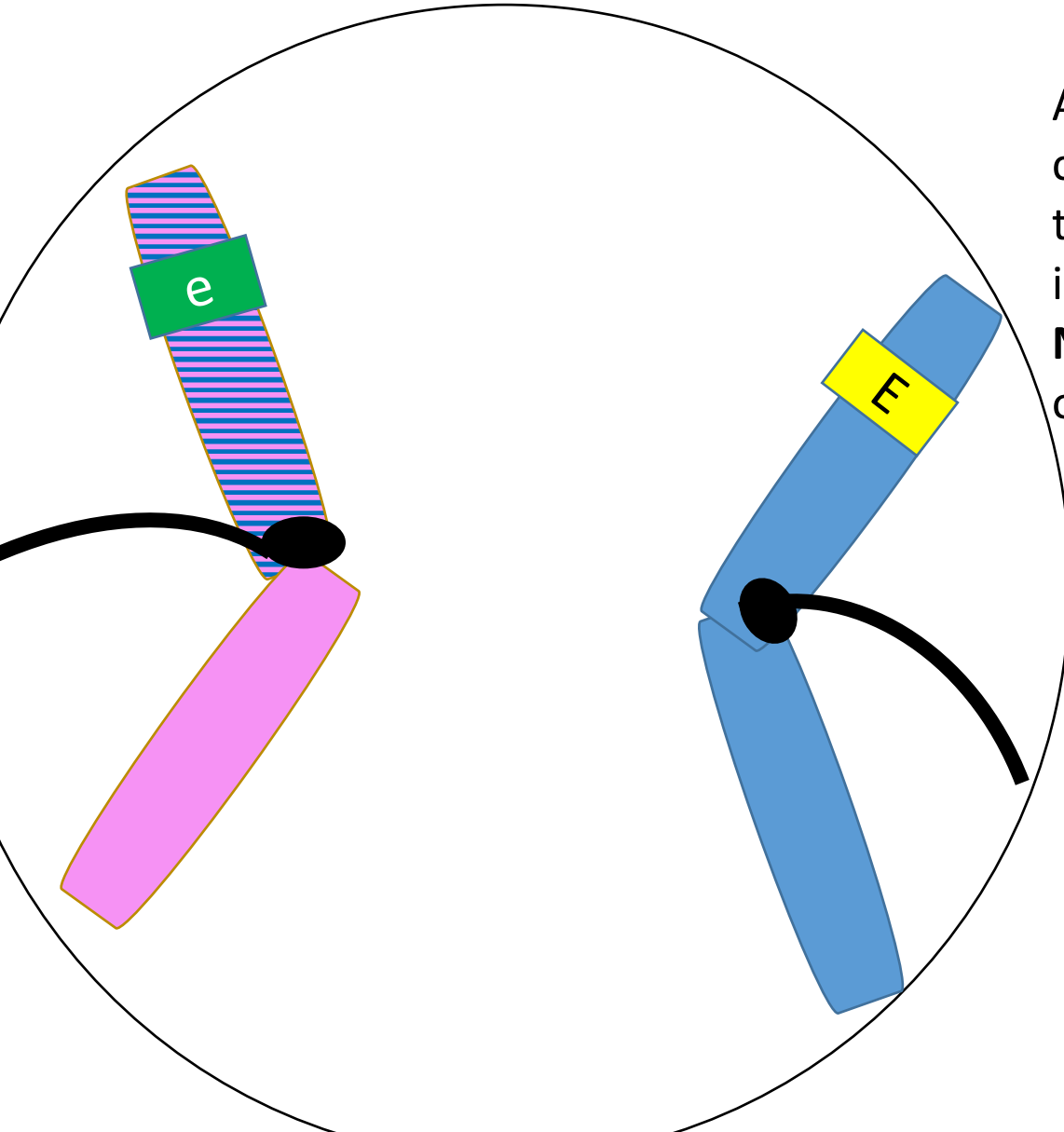


METAPHASE II, the  
chromosomes line up  
on the METAPHASE  
plate during **MEIOSIS II**

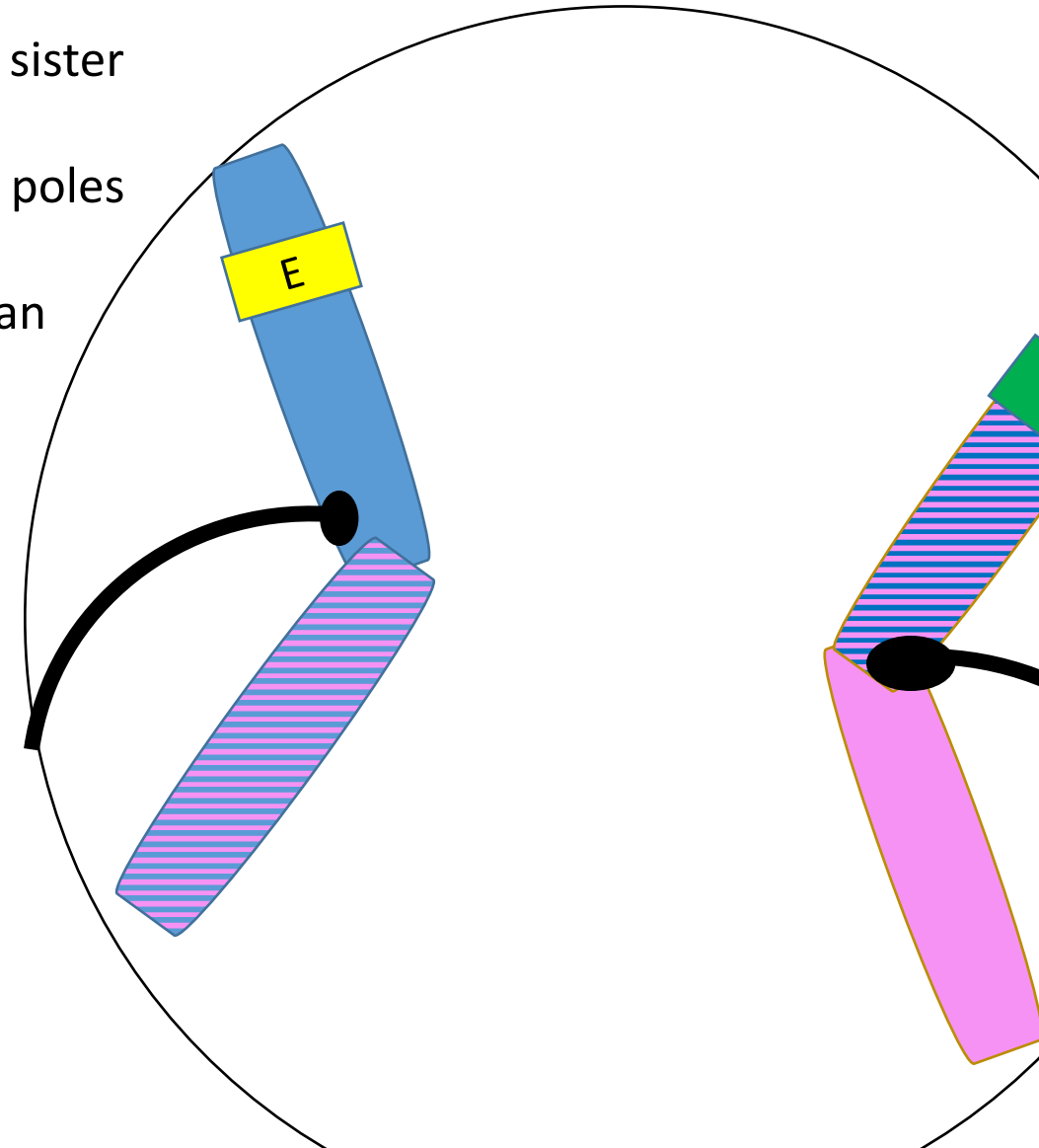


# MEIOSIS II, Chromosomes have been split into sister chromatids

E = Free ear lobe  
e = Attached ear lobe



ANAPHASE II, the sister chromatids move towards opposite poles in MEIOSIS II. **Nondisjunction** can occur.





## Cytokinesis II in MEIOSIS II

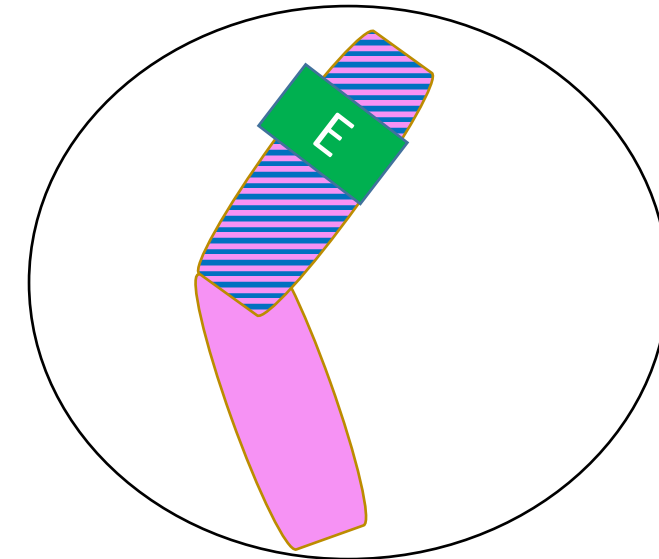
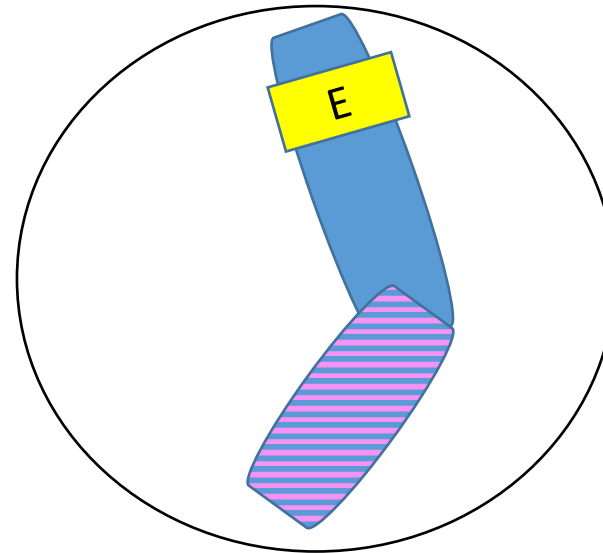
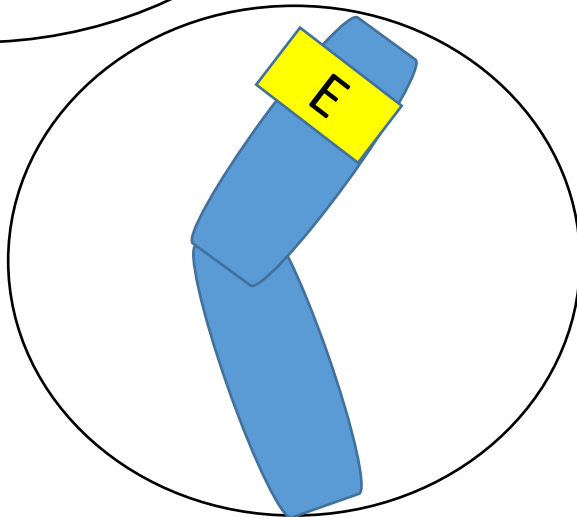
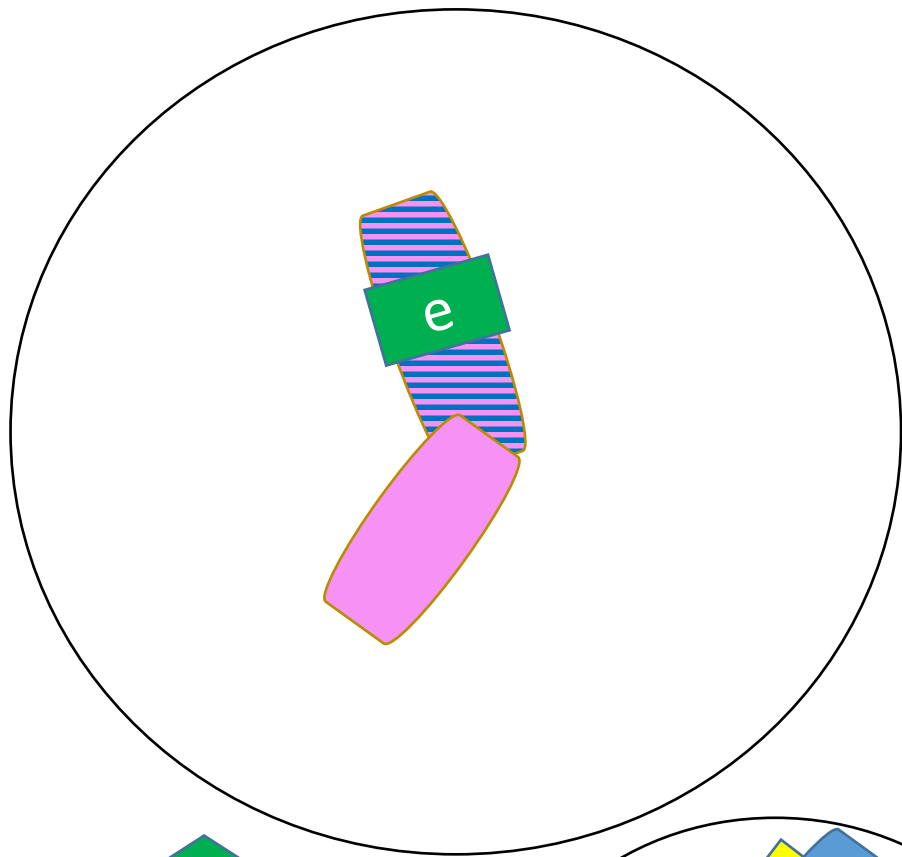
separates the  
cells into 4  
**HAPLOID** cells.

E = Free ear lobe  
e = Attached ear lobe

## The Law of Segregation

- The law developed by Mendel stating that chromosomes separated to form gametes.

**MENDEL'S  
DISCOVERY  
#2**



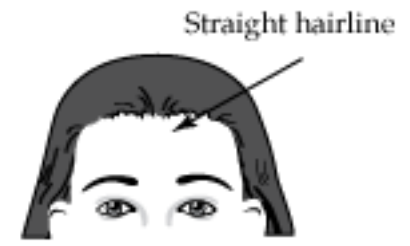


No dimples

Dimples



Widow's peak



Straight hairline



roll tongue



roll tongue

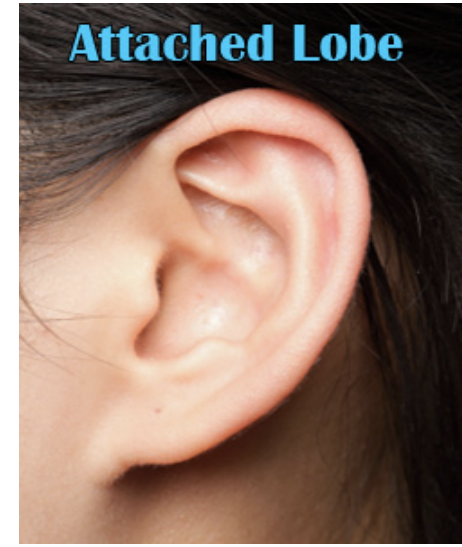


Regular thumb



Hitchhiker's thumb

# Finding your trait twin!



Attached Lobe



"Free" Lobe



NO Freckles

Freckles