

GENETICS



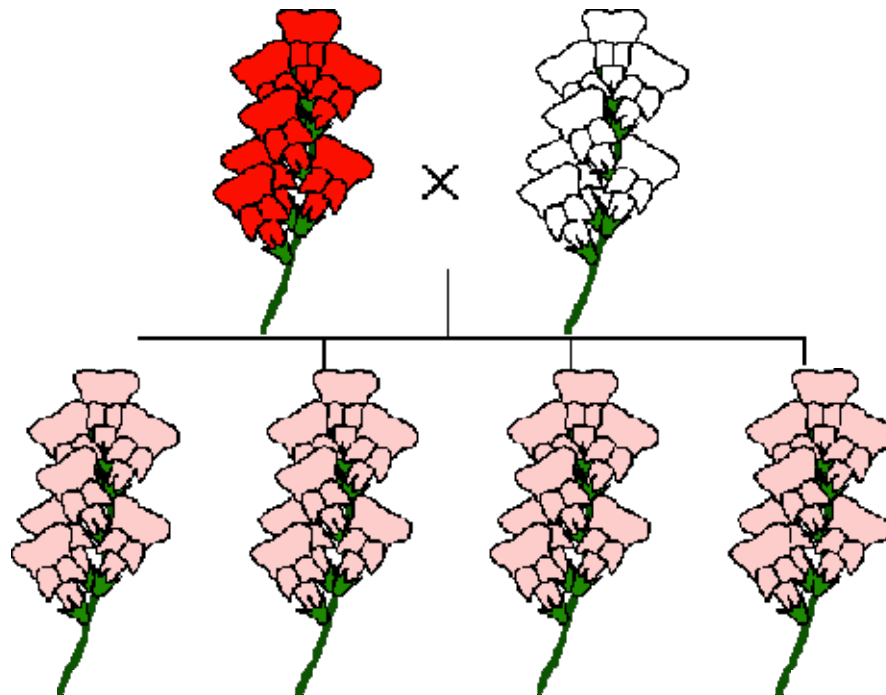
Gregor Mendel

- 19th century Austrian monk
- Studied pea plants in his garden
- “Father of modern genetics”



Blending Theory

- **Incorrect** idea that was popular during Mendel's time
- Thought that an offspring's traits were the result of parents' traits blending.



Mendelian Genetics

- Parents' traits are randomly combined in their offspring
- Certain traits are shown while others are hidden but can still be passed on



Genotype

- The genetic makeup of an organism.





Phenotype

- The physical traits of an organism.
- What is your phenotype?

Gene

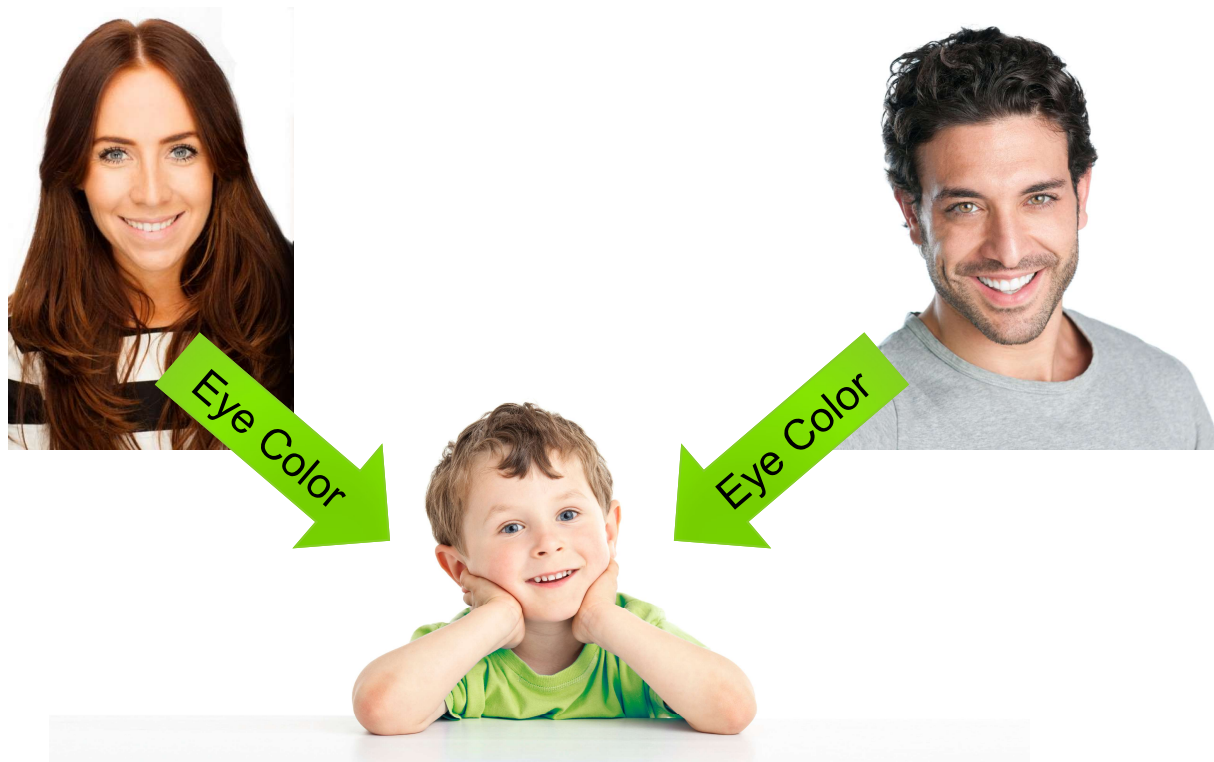
- Section of DNA that can be inherited.



Genes are inherited in pairs

- One set of genes from MOM
- Another set of genes from DAD

- Example:



Allele

- Variation of a gene
- Example:
 - Gene = eye color
 - Allele = brown or blue or green or hazel



- Now it's your turn! Think of a gene and its alleles.

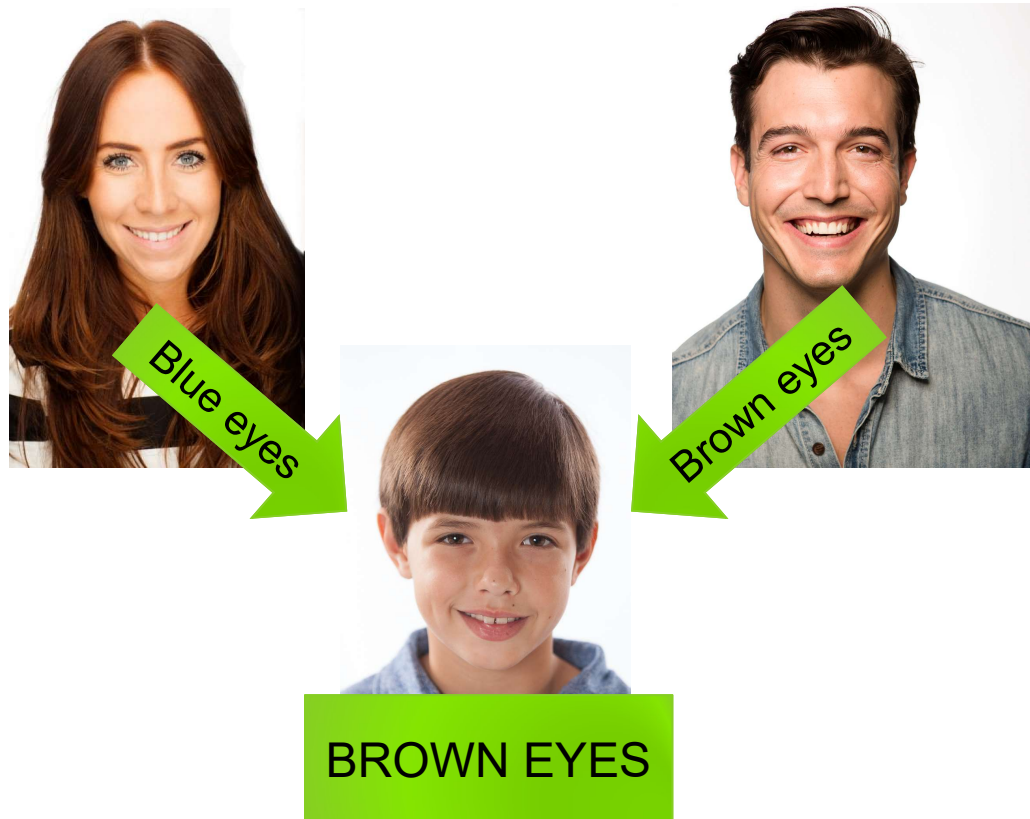


Dominant allele

- The variation that is *always* expressed (shown) in an organism when it is inherited.

Dominant allele

- Example: Brown is the dominant variation for eye color
 - If you inherit ANY brown eye alleles from Mom or Dad, you will have brown eyes!

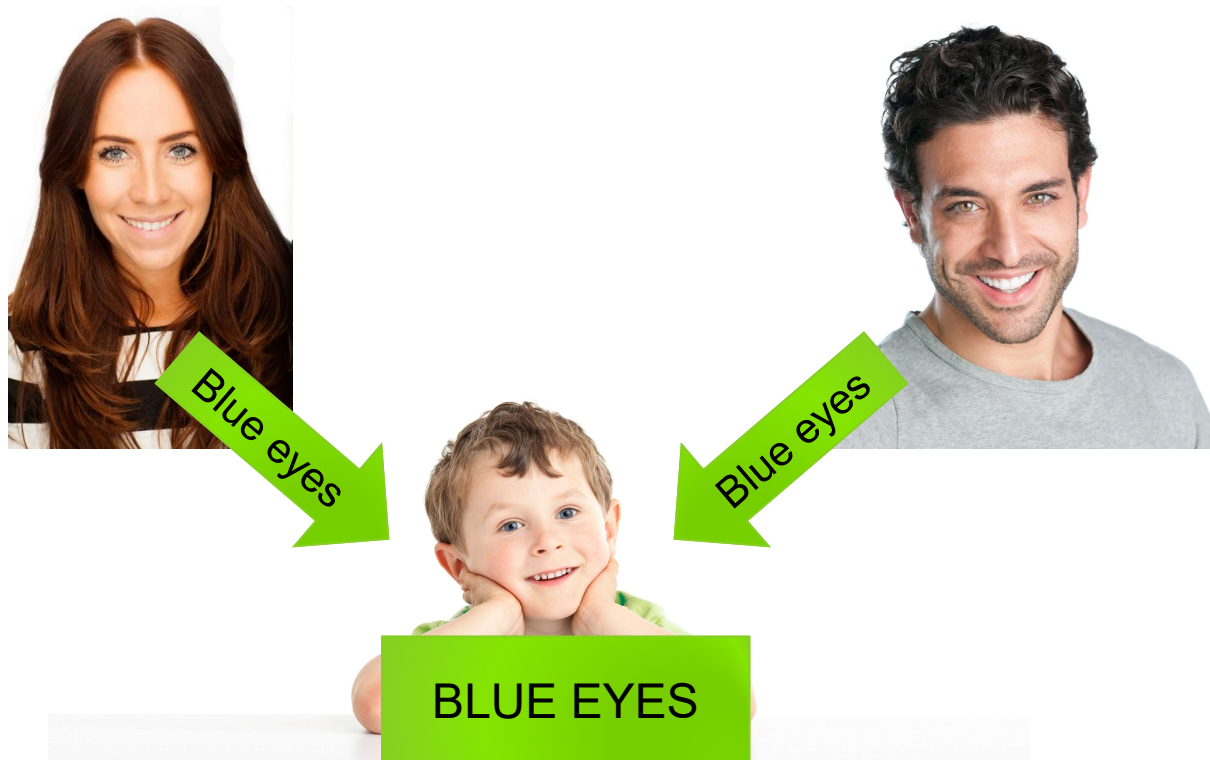


Recessive allele

- The variation that is hidden *unless the organism inherits only recessive alleles from its parents.*

Recessive allele

- Example: Both parents must have blue eye alleles in order for child to have blue eye phenotype.
 - Both Mom and Dad have blue eyes so their child has blue eyes

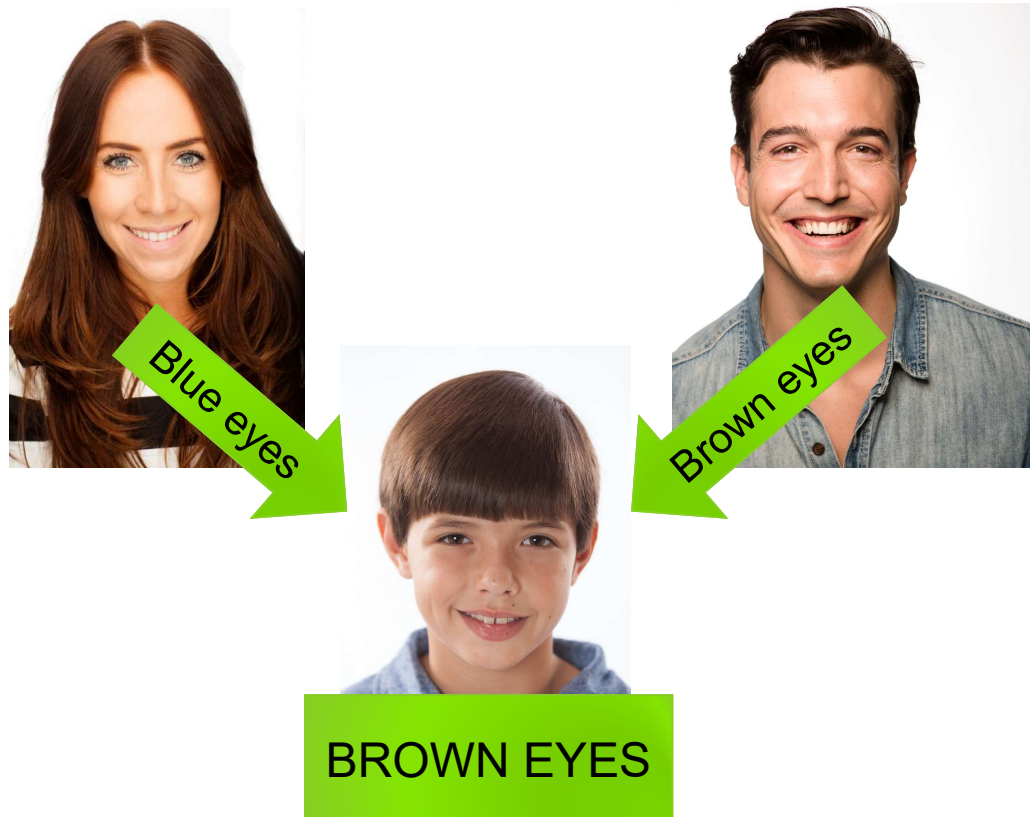


How we write about genes

- We use a letter to represent a gene (EX: “B” = eye color)
- We use an uppercase letter to represent a dominant allele (EX: B = brown, dominant)
- We use a lowercase letter to represent a recessive allele (EX: b = blue, recessive)

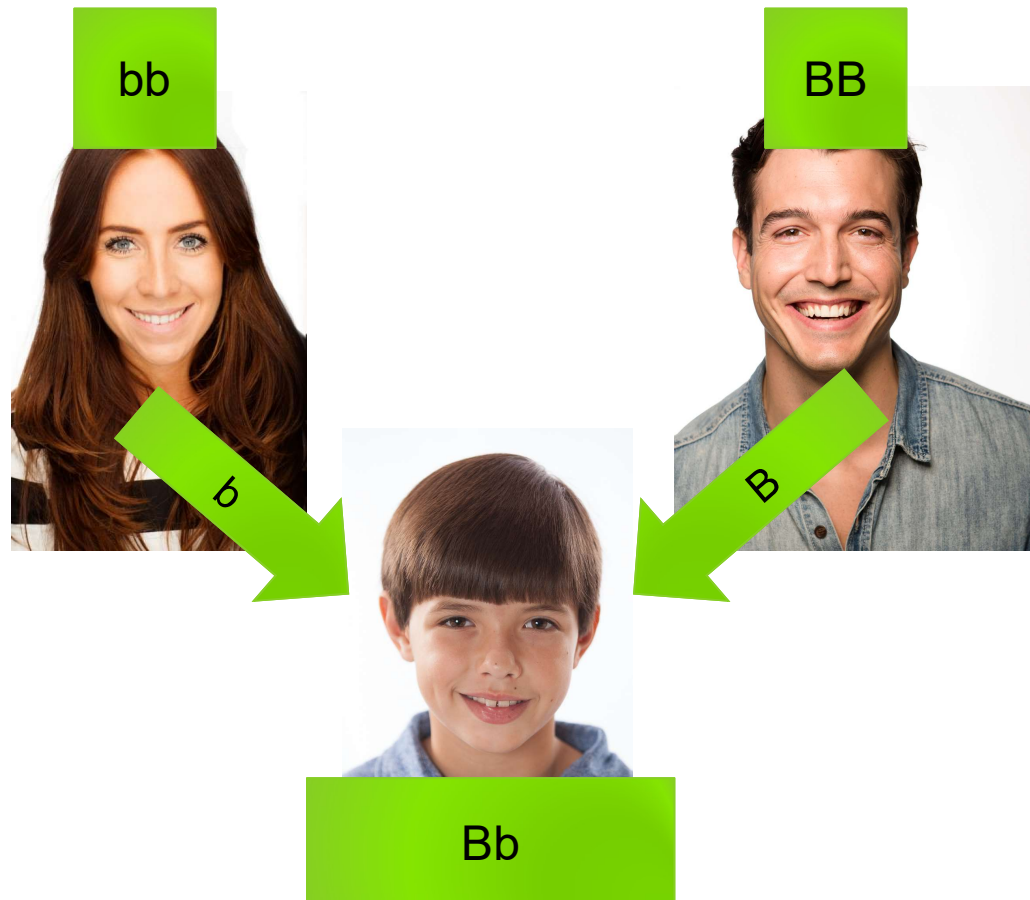
How we write about genes

- Because genes are inherited in pairs we write the letters in pairs too!



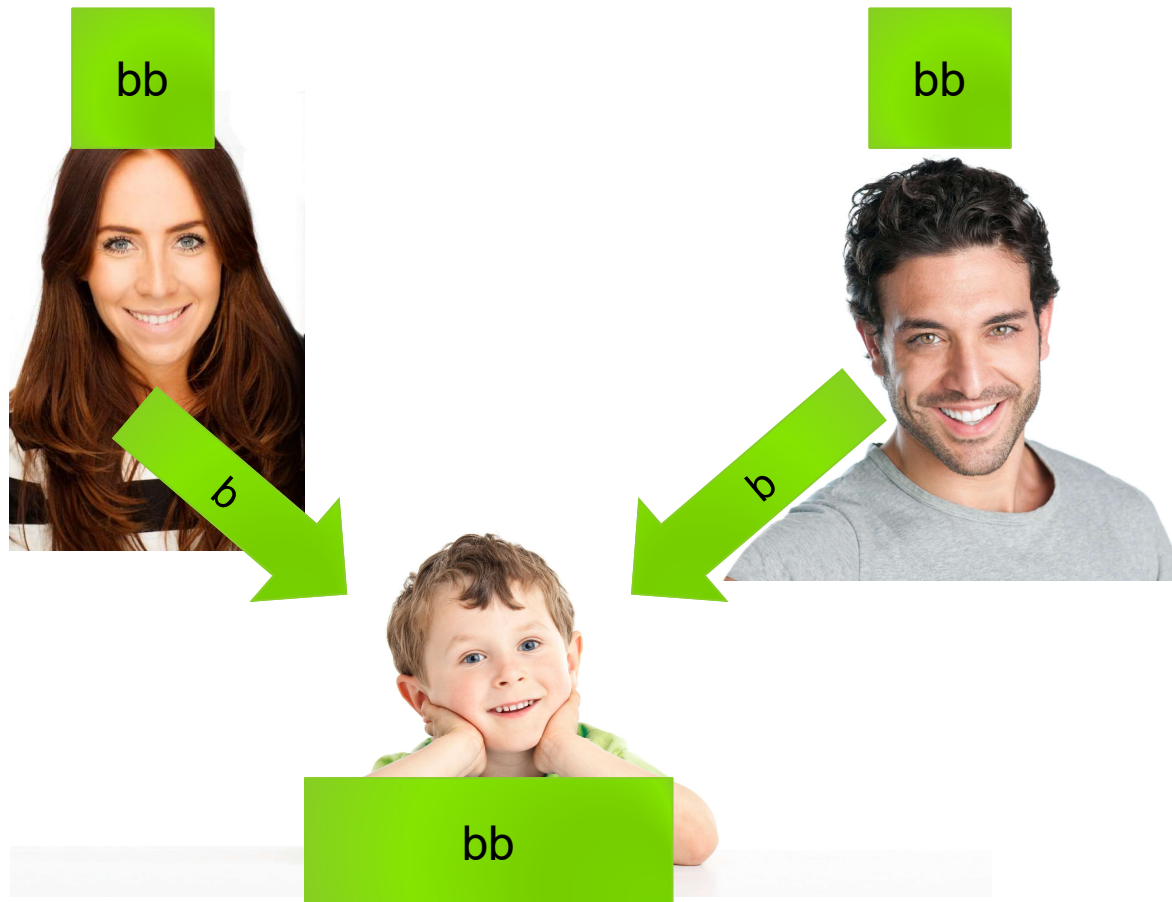
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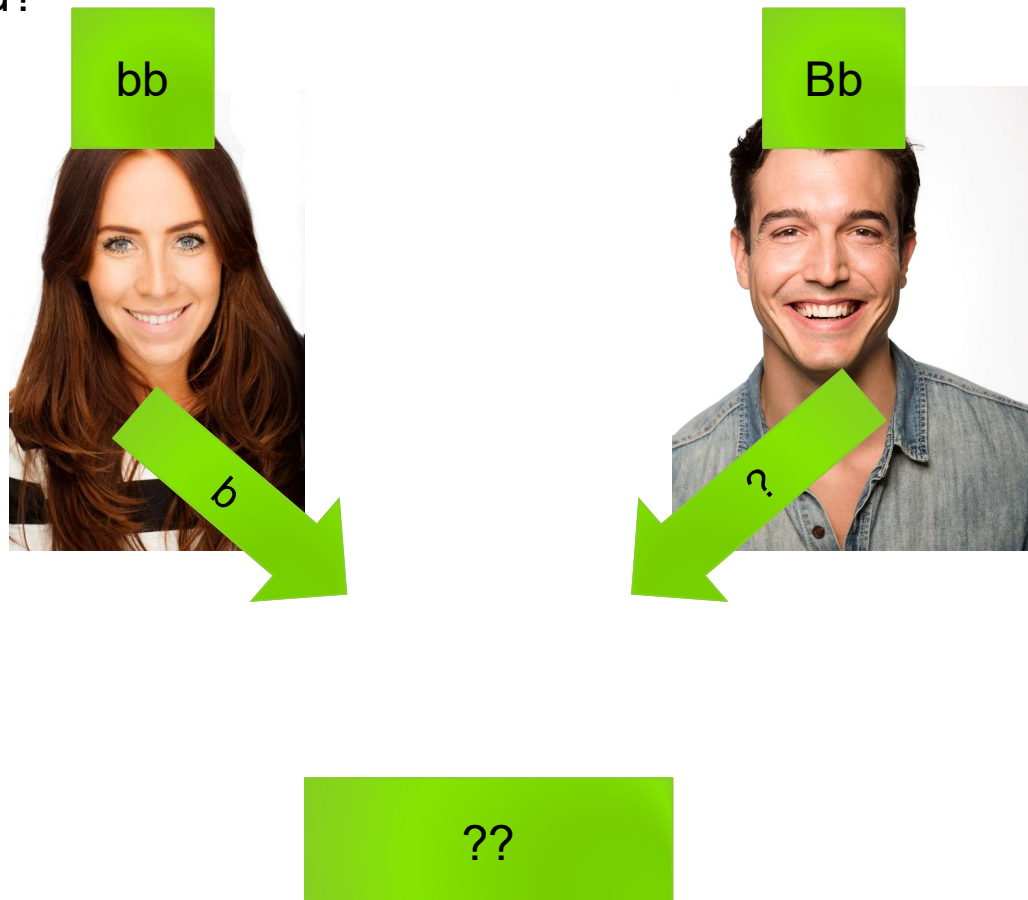
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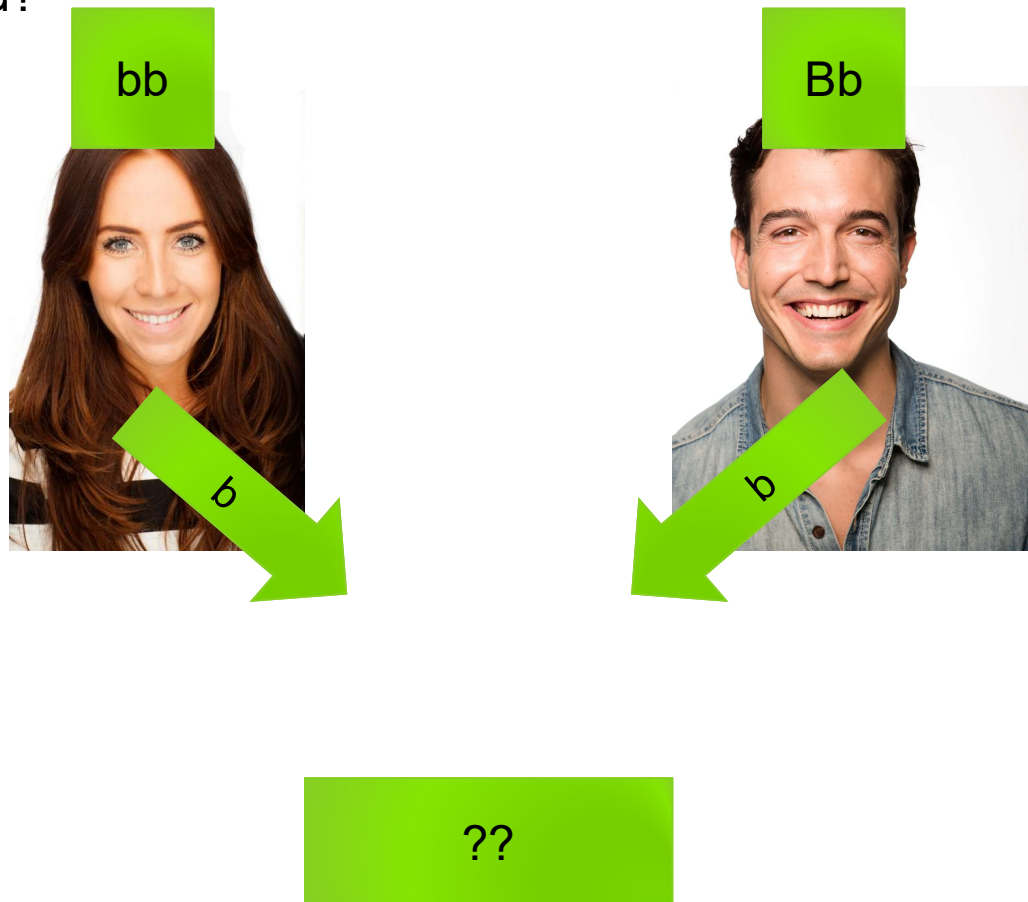
What if...

- The father in this family had one brown allele from HIS father and one blue allele from his mother. He still has brown eyes but is it possible to have a blue eyed child?



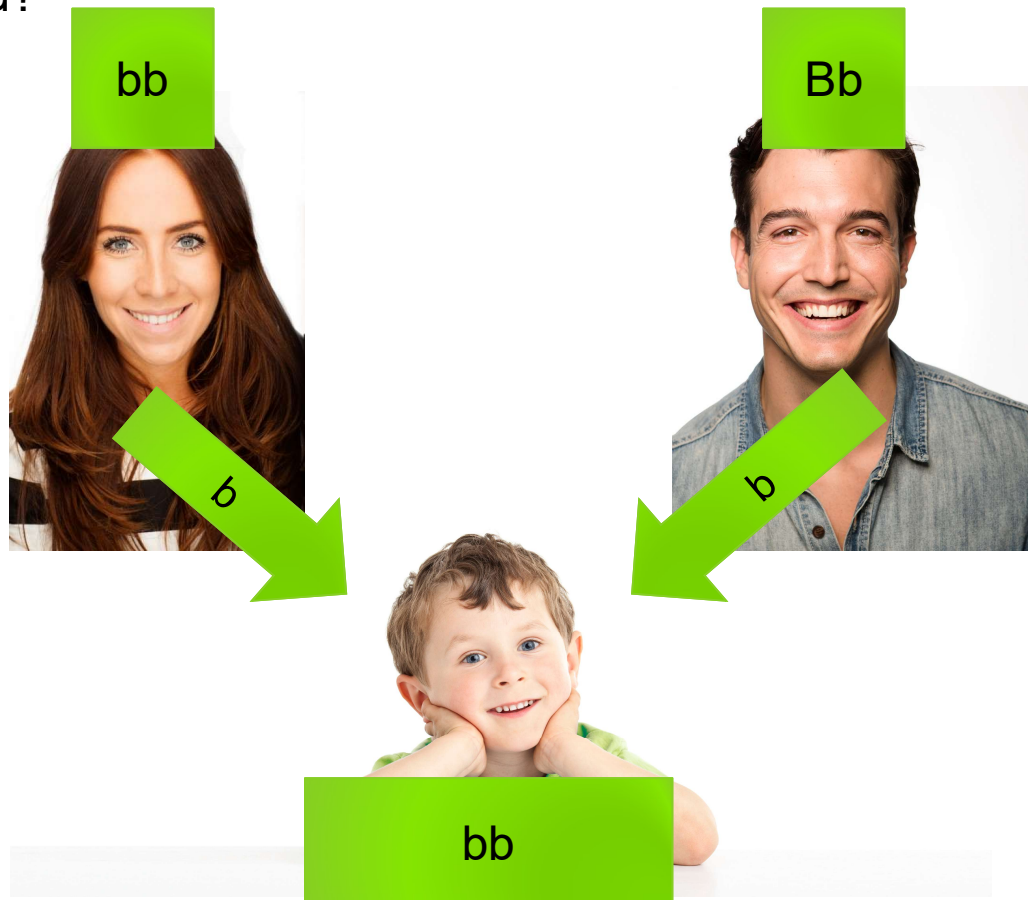
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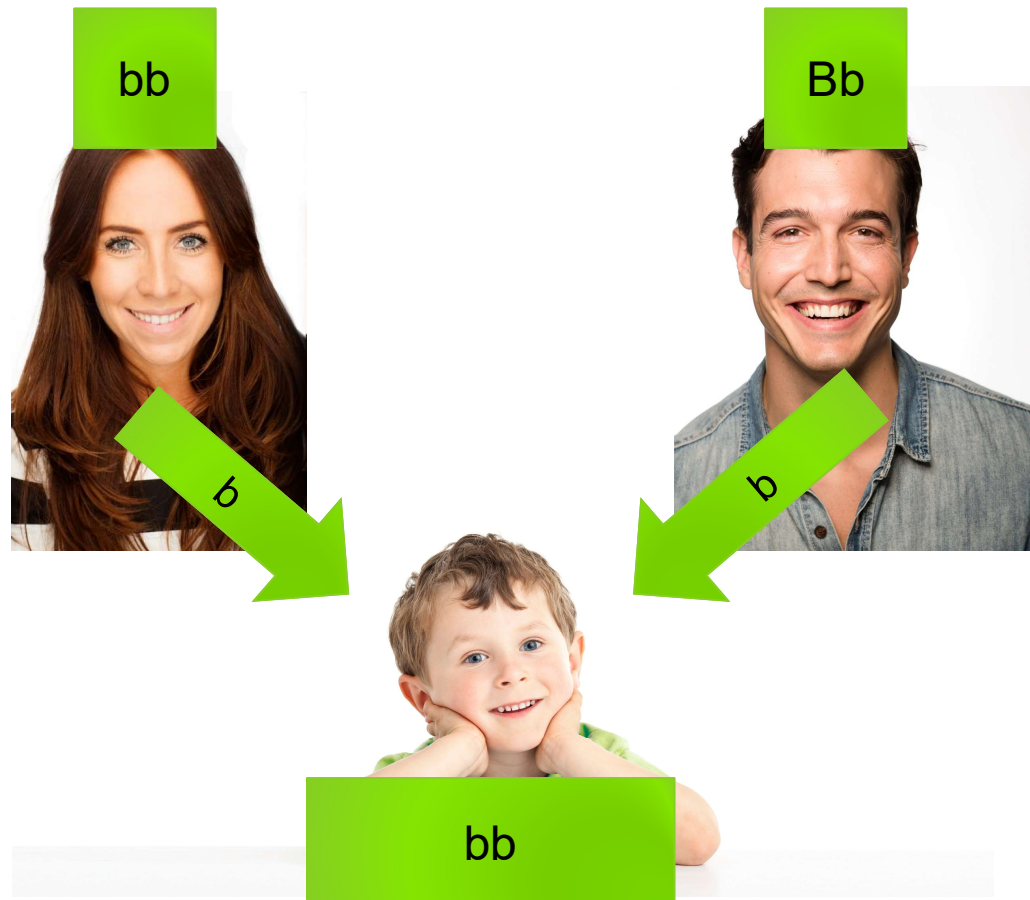
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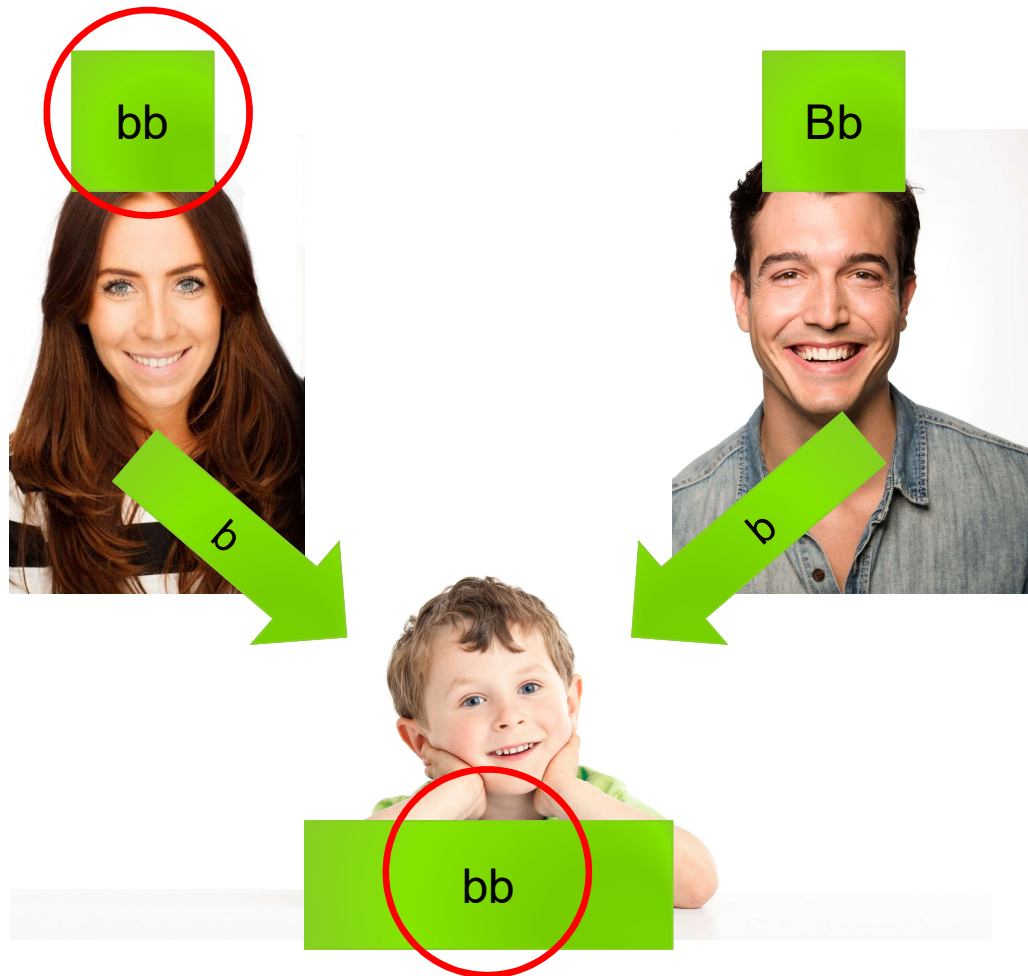
Homozygous

- When an organism has the same alleles for a trait.
- Homo- = “same”



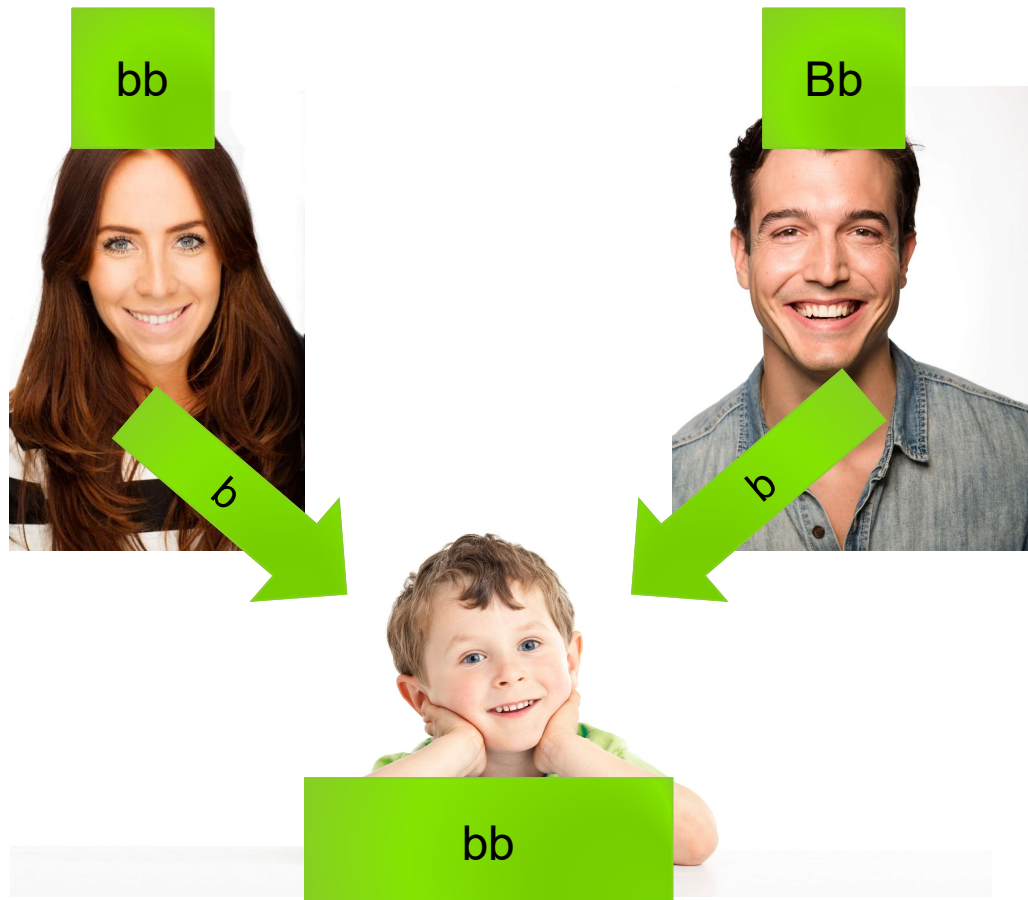
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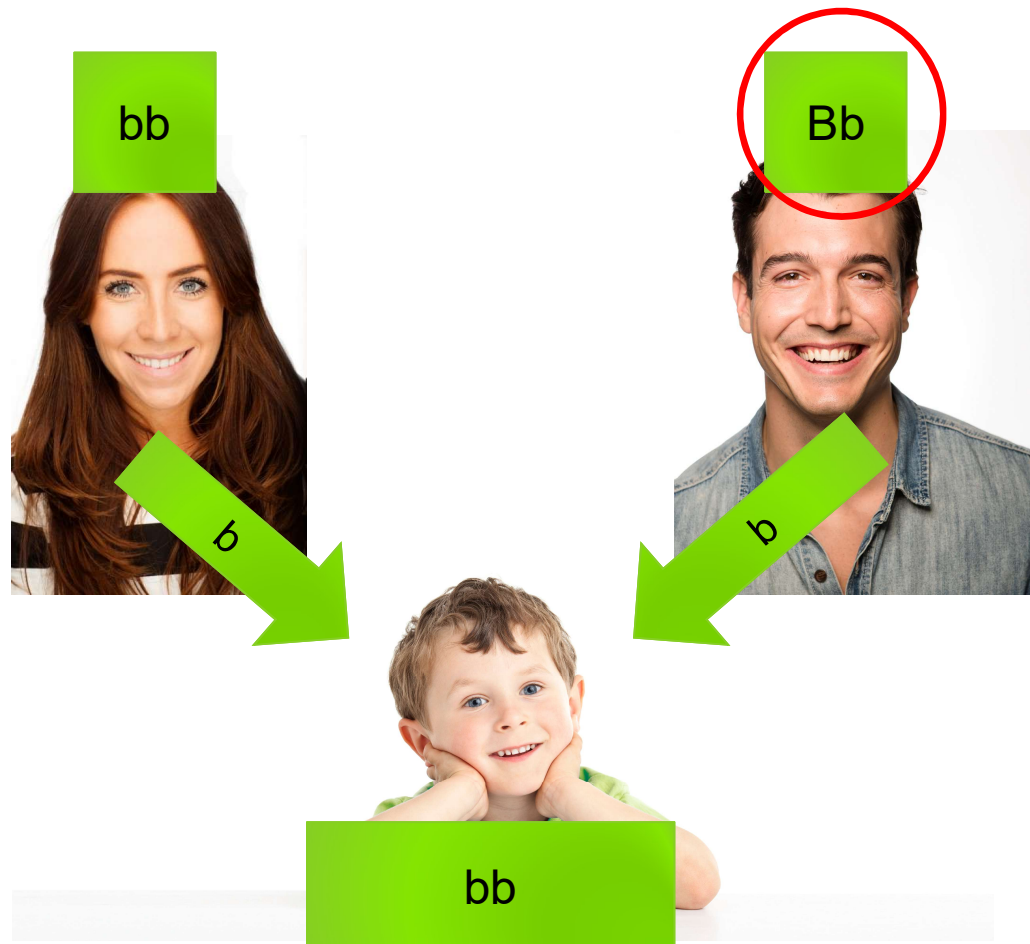
Heterozygous

- When an organism has two different alleles for a trait.
- Hetero- = different



Heterozygous

- When an organism has two different alleles for a trait.



Let's practice!

- For each set of alleles say if it's *homozygous* (Ho) or *heterozygous* (He)

EE

Dd

aa

Yy

Pp

tt

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Monohybrid Cross

- Mendel conducted an experiment to see what the offspring would look like when parents with two different phenotypes for the same trait are crossed.
- Parents: true breeding for purple or white flower color



Monohybrid Cross

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- Parents: *homozygous* for purple or white flower color



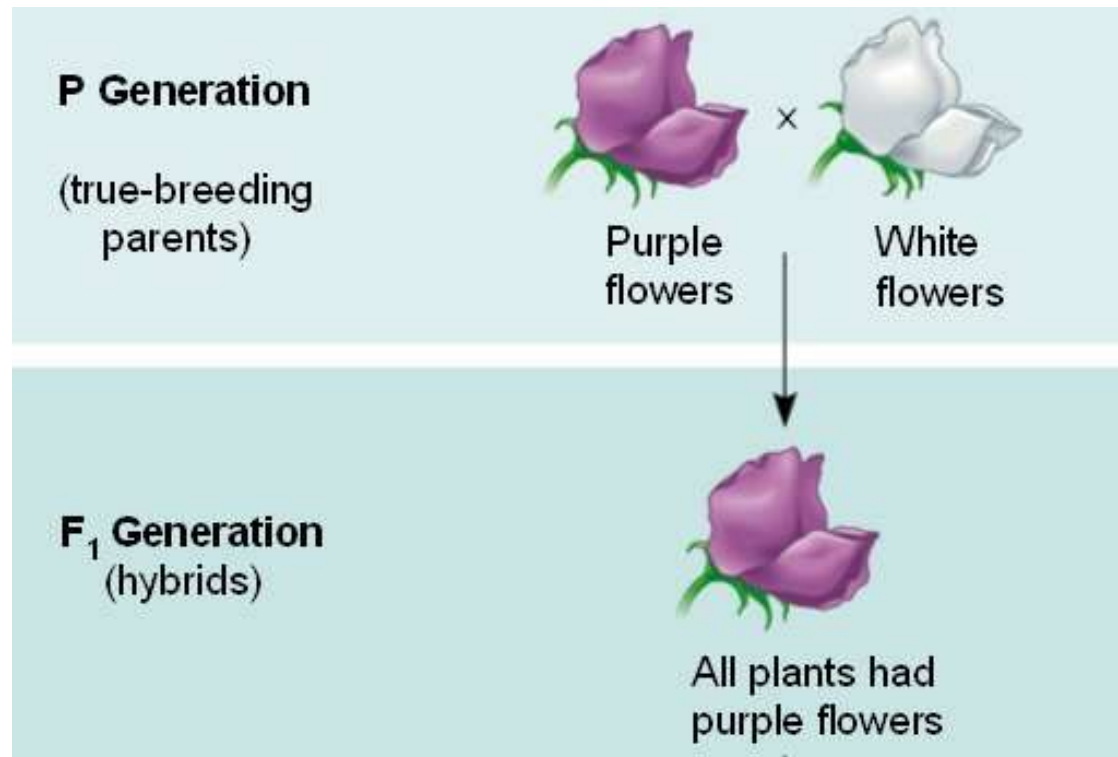


Monohybrid Cross

- What will the F1 (first offspring) generation look like?

Monohybrid Cross

- What will the F₁ (first offspring) generation look like?
- F₁ = all purple flowers (hybrids)



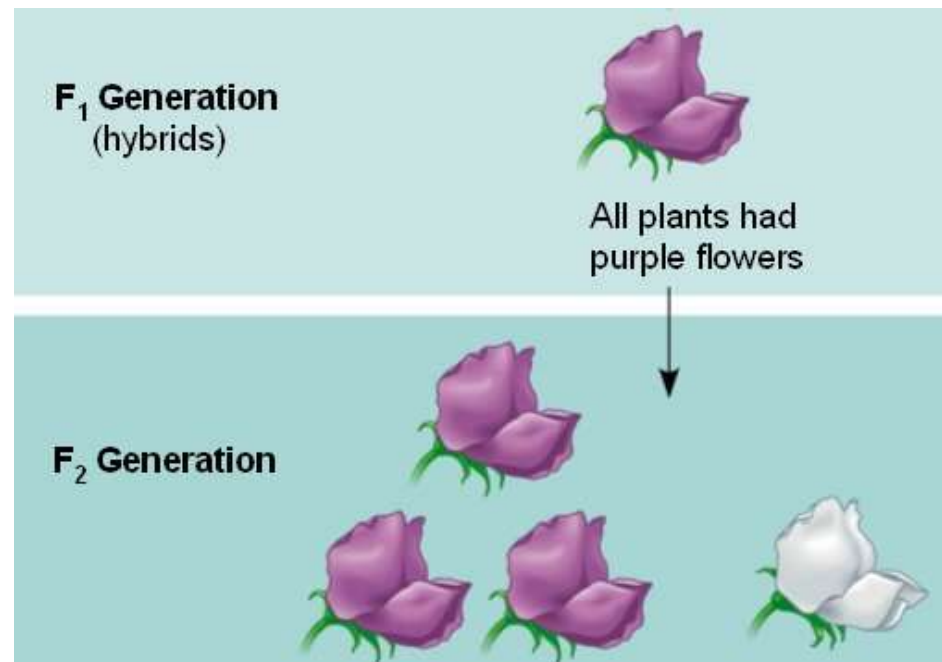


Monohybrid Cross

- What will the F2 (second offspring) generation look like if we cross the F1 generation?

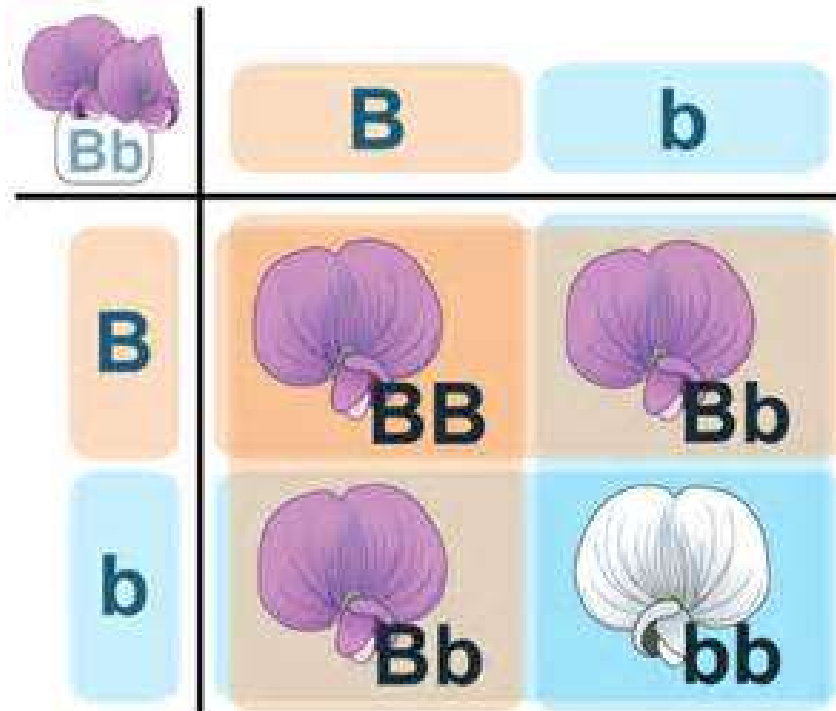
Monohybrid Cross

- What will the F₂ (second offspring) generation look like if we cross the F₁ generation?
- F₂ = Mostly purple, some white flowers



Monohybrid Cross

- Mendel determined that a monohybrid cross will always produce the following ratios:
 - Genotypic ratio = 1:2:1
 - Phenotypic ratio = 3:1





phenotype

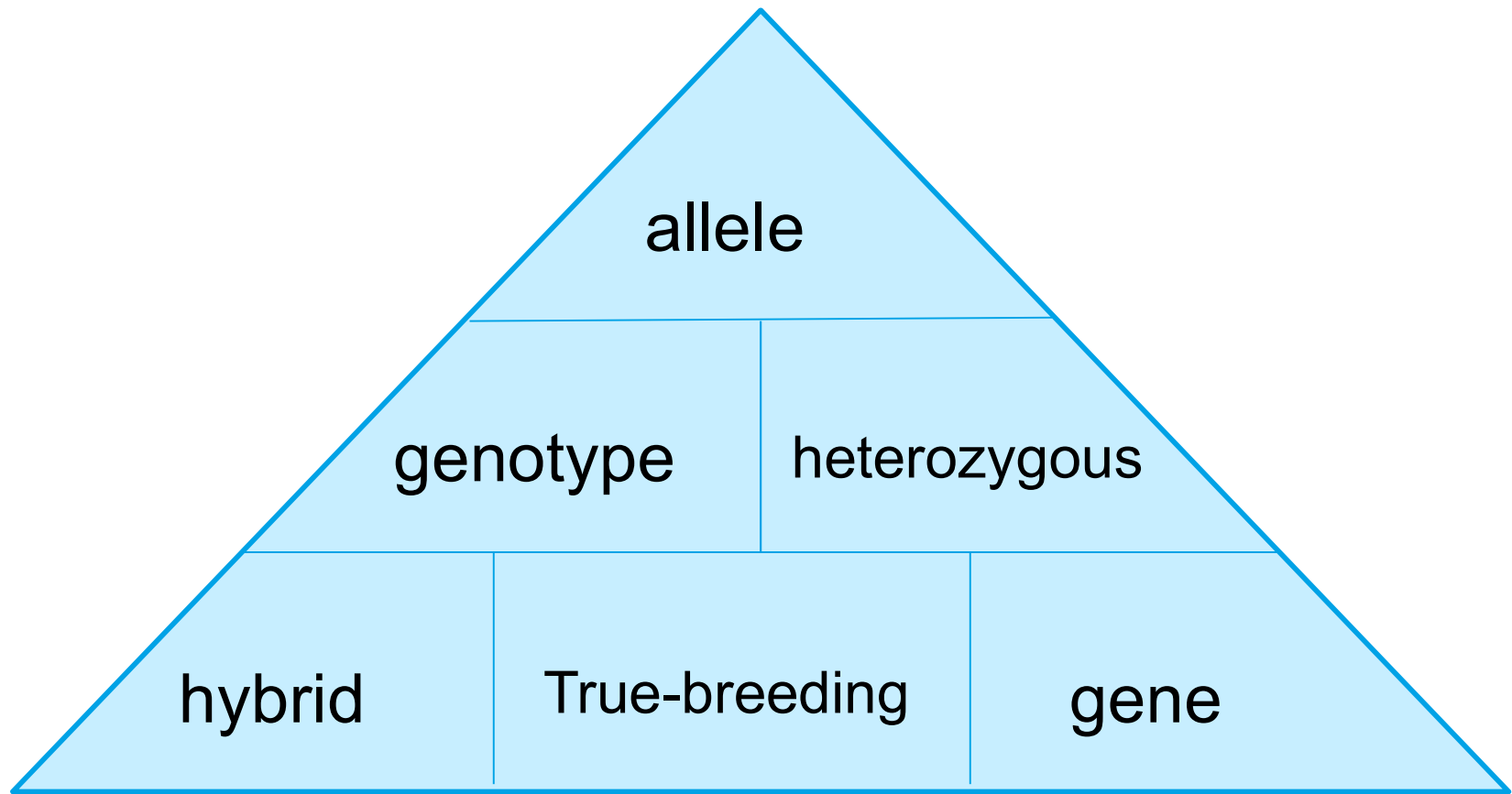
recessive

homozygous

Mendel

peas

dominant



allele

genotype

heterozygous

hybrid

True-breeding

gene