

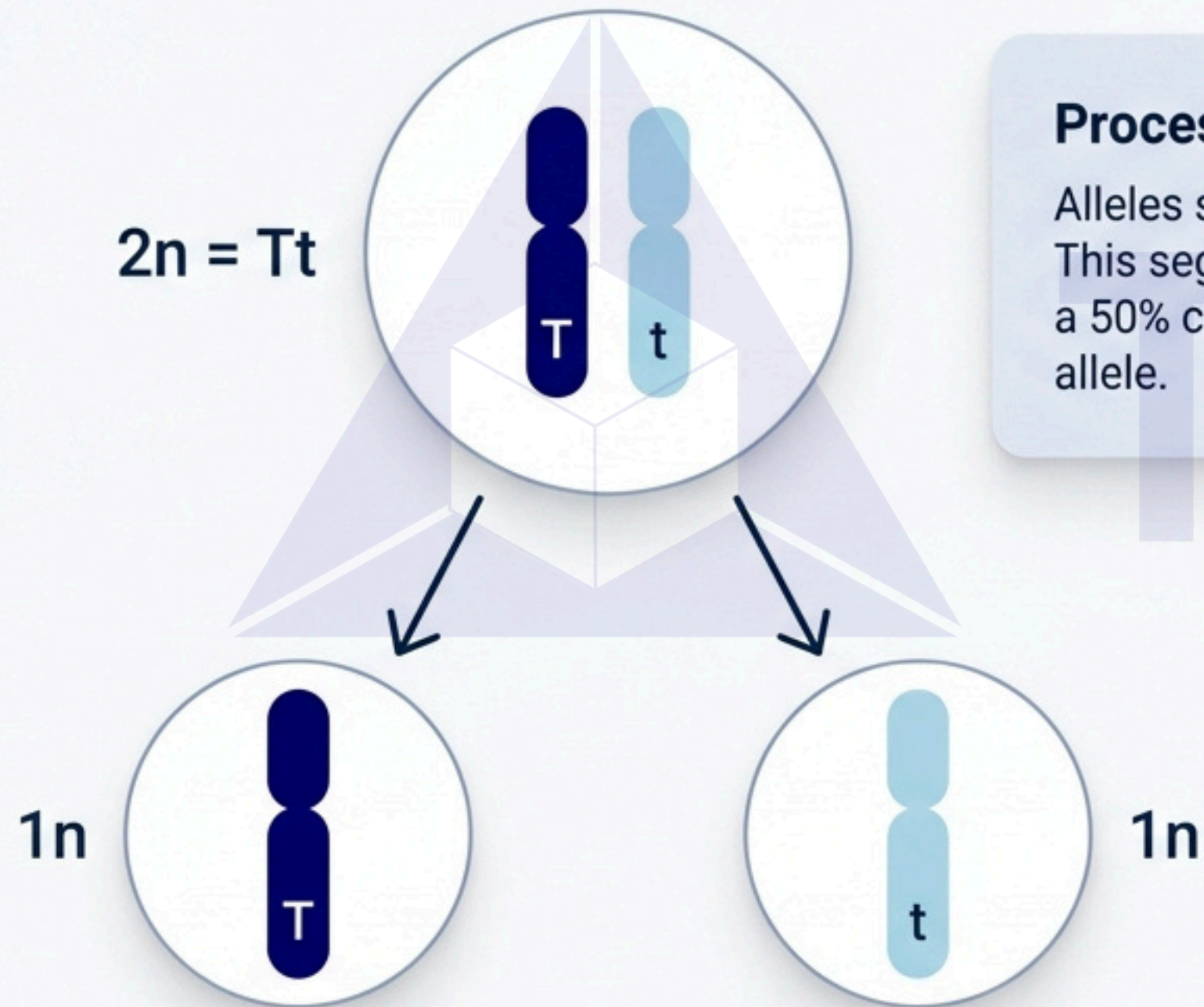
Law of Segregation

The fundamental rule of Mendelian inheritance preventing trait blending.

Key Takeaway: Each gamete receives only one allele.

During gamete formation, the factors or alleles of a pair segregate from each other. Though the parent organism contains two alleles for a trait, these alleles do not blend. They remain distinct and separate, ensuring every gamete is genetically pure for that specific trait.

The Mechanism of Separation



Process Annotation

Alleles separate during gamete formation. This segregation is a random process, creating a 50% chance of a gamete containing either allele.

✗ **Myth:** Traits blend together in offspring.
Fact: Alleles do not show any blending. The recessive trait is recovered entirely unchanged in the F₂ generation, proving alleles remain discrete.



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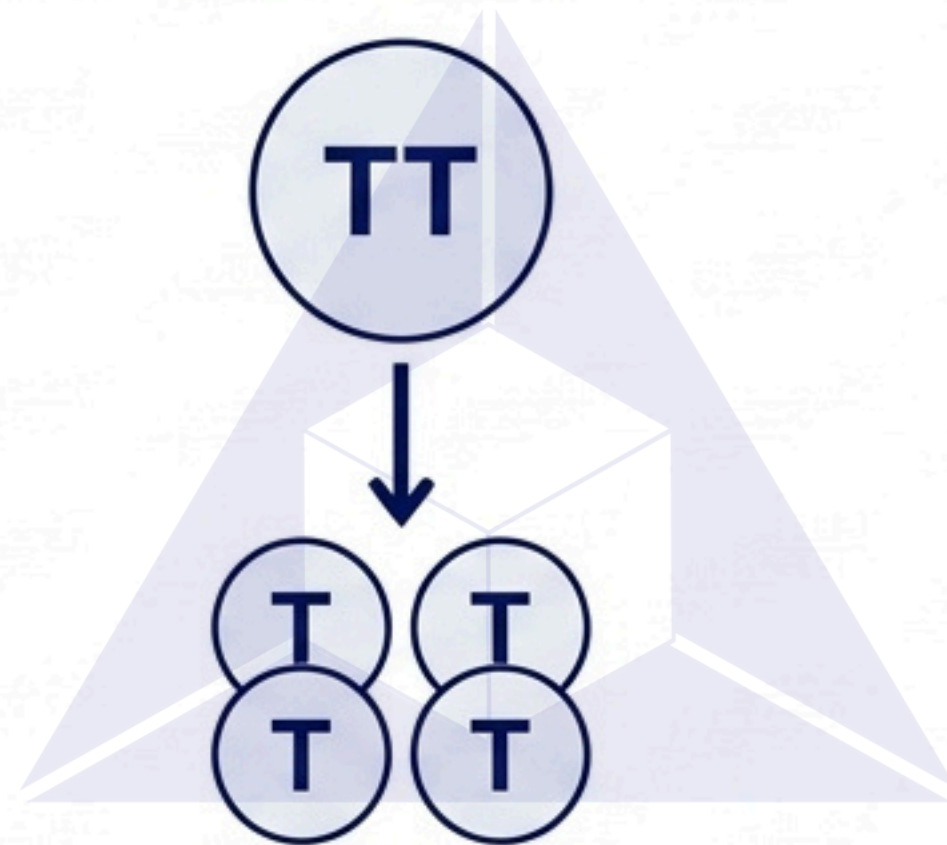
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Gamete Production Matrix

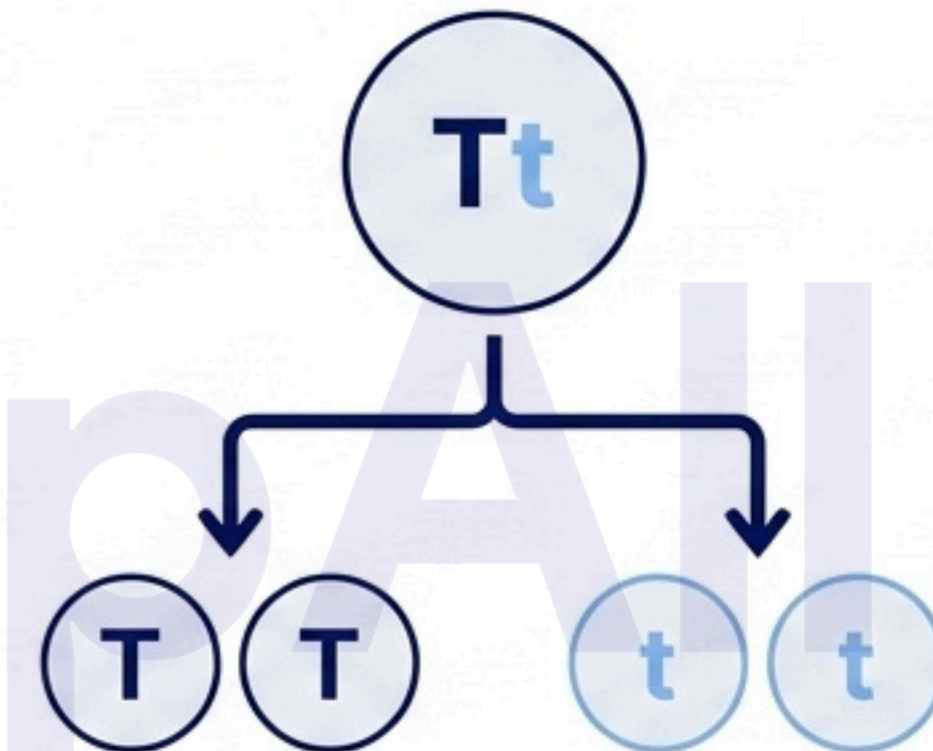
Homozygous Parent



100% Probability

A homozygous parent produces all gametes that are completely similar. A **TT** plant produces only **T** gametes; a **tt** plant produces only **t** gametes.

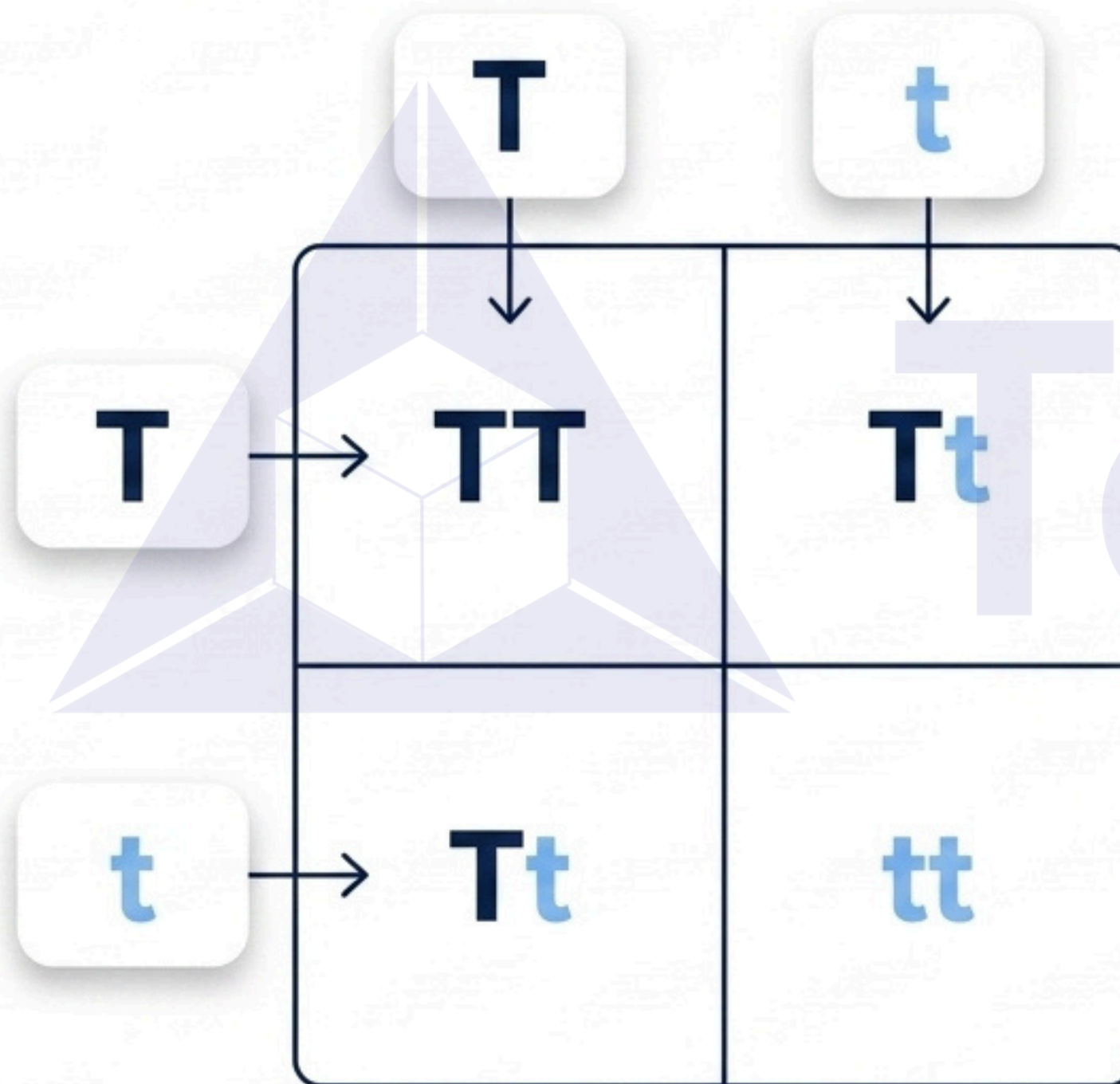
Heterozygous Parent



50/50 Probability

A heterozygous parent produces two kinds of gametes in equal proportion. Each gamete receives exactly one allele, strictly following the Law of Segregation.

The Monohybrid Cross (F1 x F1)



Probability in Action:
Fertilisation is a random process. The combination of these independently segregated gametes mathematically mirrors the binomial expansion $(\frac{1}{2}T + \frac{1}{2}t)^2$.

F2 Generation Outcomes & Ratios

Genotypic Ratio (The Genetic Code)

1/4 Pure Tall

1 1 TT

1/2 Hybrid Tall

2 2 Tt

1/4 Pure Dwarf

1 1 tt

This 1:2:1 ratio represents the exact allelic composition inherited after segregation.

Phenotypic Ratio (The Physical Expression)



3 Tall



1 Dwarf

Because the 'T' allele exhibits **dominance**, both TT and Tt genotypes express as visually identical Tall plants, resulting in a 3:1 observable ratio.



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