

Introduction to genetics and patterns of inheritance انسابير inspire



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الثاني عشر المتقدم ← علوم ← الفصل الأول ← ملفات متنوعة ← الملف

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ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
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المزيد من مادة
علوم:

إعداد: Adel Rania

التواصل الاجتماعي بحسب الصف الثاني عشر المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة علوم في الفصل الأول

الوراثة المعقدة والوراثة البشرية كامبردج

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Introduction to genetics and patterns of inheritance انسابير inspire

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نموذج اختبار تجريبي Exam Mock منهج انسابير

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مراجعة نهائية عامة منهج انسابير

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مراجعة نهائية وفق الهيكل الوزاري الجديد المسار C منهج بريدج

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Introduction to genetics and patterns of inheritance

Mendelian Genetics



التاريخ

25/8/2026



المعلمة

Rania Adel



الصف

الثاني عشر
متقدم انسابير



المادة

Biology



افهم



اكتشف



استكشف



The Genetic **Blueprint.**

**Biology (Grade 11 Advanced) | UAE
Ministry of Education Curriculum**

**Introduction to Genetics &
Patterns of Inheritance**

**Unlocking the Blueprint of Life:
From Mendel's Peas to Punnett
Squares**

Self-Paced Visual Study Guide



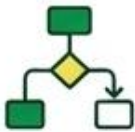
Learning Objectives



Understand trait inheritance and the role of alleles.



Differentiate between genotype/phenotype and dominant/recessive traits.



Apply Mendel's Laws (Segregation & Independent Assortment).



Calculate genetic probabilities using Punnett squares.



Encounter the Phenomenon

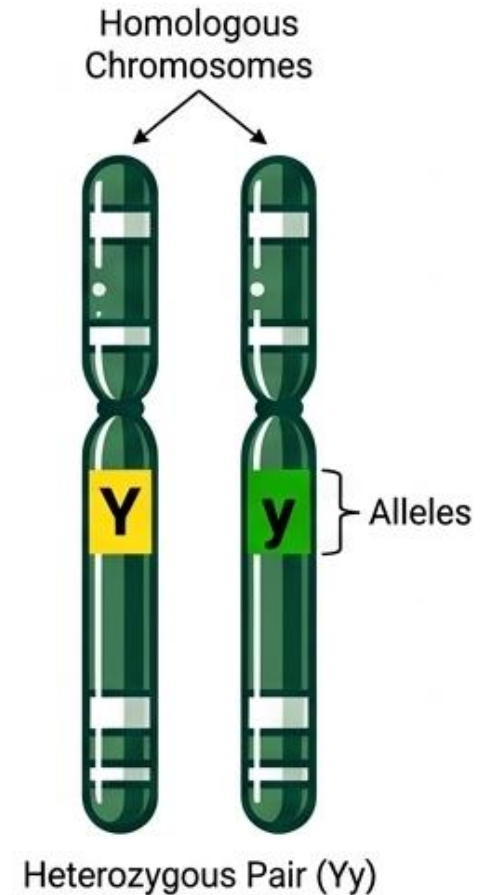


Why are these siblings not identical?

They share the same parents, so they receive their genetic instructions from the exact same source. How does nature create such variation? (Keep this in mind as we explore the blueprint today!)

The Language of Genetics

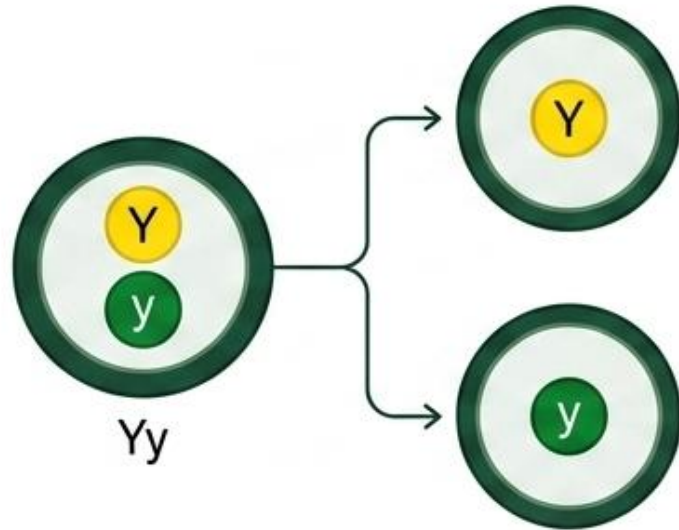
The Basics	Allele: An alternative form of a single gene (e.g., Seed color).	Dominant (Y): The trait that appears and masks the recessive form.	Recessive (y): The trait that is hidden when the dominant allele is present.
What It Is vs. What It Looks Like	Genotype: The organism's underlying allele pairs (e.g., YY, Yy, yy).	Phenotype: The observable outward expression (e.g., Yellow seeds, Green seeds).	
Pair Types	Homozygous: Two of the same alleles (YY or yy). Also called pure-breeding.	Heterozygous: Two different alleles (Yy). Also called hybrids.	



 **Key Takeaway:** Appearance (phenotype) does not always reveal the underlying genetic code (genotype)!

Mendel's Laws of Inheritance

Law of Segregation



Definition

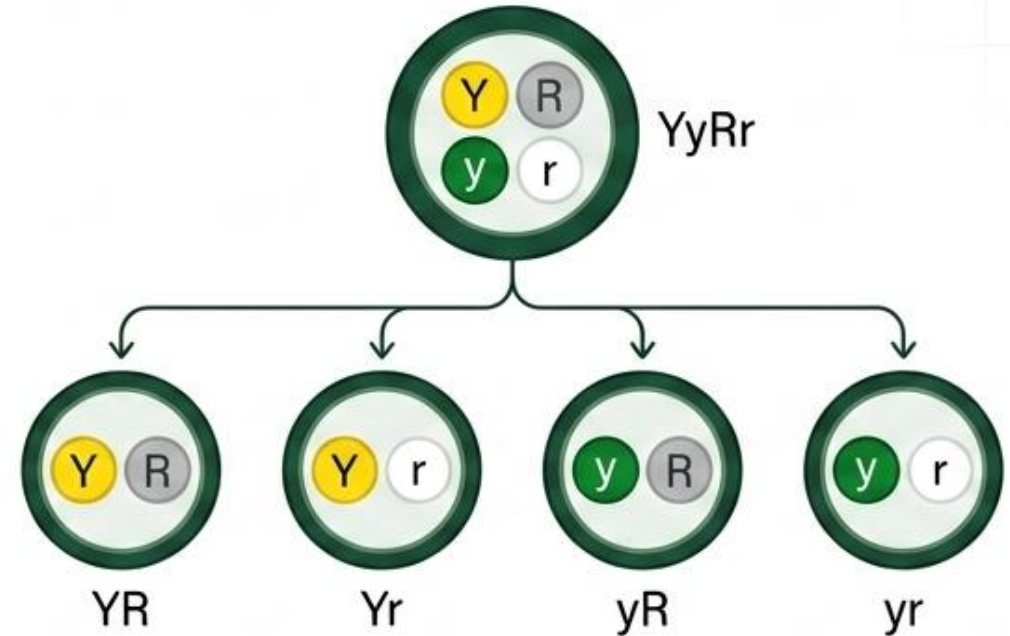
The two alleles for each trait separate during meiosis.



Result

Each gamete receives only one allele. During fertilization, two alleles unite to restore the pair.

Law of Independent Assortment



Definition

A random distribution of alleles occurs during gamete formation.



Result

Genes on separate chromosomes sort independently (e.g., seed color sorts independently of seed shape).

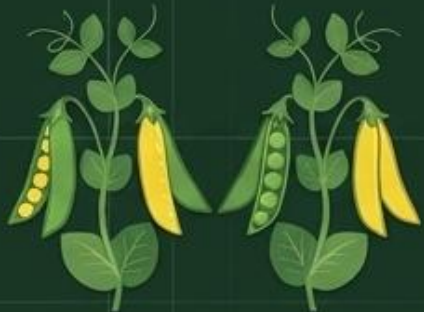
Step-by-Step: Modeling Inheritance

Scenario: Crossing two heterozygous F1 yellow-seed plants ($Yy \times Yy$).

Step 1: Identify Parent Genotypes.

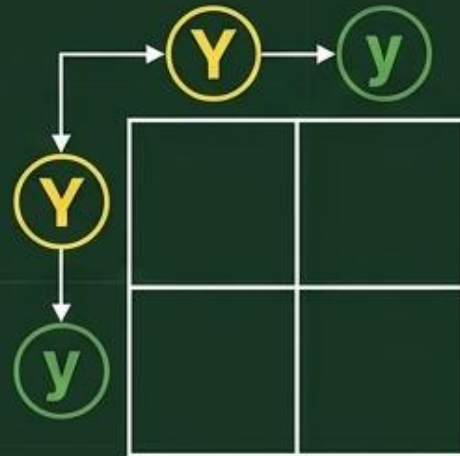
Parent 1: Yy ♀

Parent 2: Yy ♂



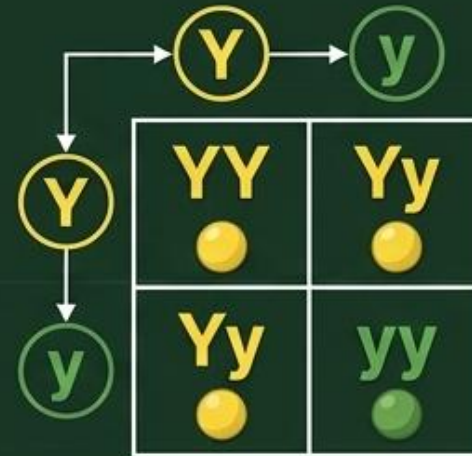
Step 2: Segregate Alleles (Meiosis).

Place Parent 1 gametes (Y, y) across the top. Place Parent 2 gametes (Y, y) down the side.



Step 3: Combine (Fertilization).

Fill the intersecting boxes.



Step 4: Analyze Ratios.

Genotypic Ratio:
1 YY : 2 Yy : 1 yy (1:2:1)

Phenotypic Ratio:
3 Yellow : 1 Green (3:1)



3 Yellow



1 Green

 **Think Like a Geneticist:** A Punnett square doesn't show exact offspring numbers; it models probability.



Practice Question 1: Monohybrid Cross

In pea plants, round seeds (R) are dominant to wrinkled seeds (r). A true-breeding plant with round seeds is crossed with a true-breeding plant with wrinkled seeds to create the F1 generation.

Question: What will be the **genotype** and **phenotype** of the F1 generation?

A) RR, Round

B) Rr, Round

C) rr, Wrinkled

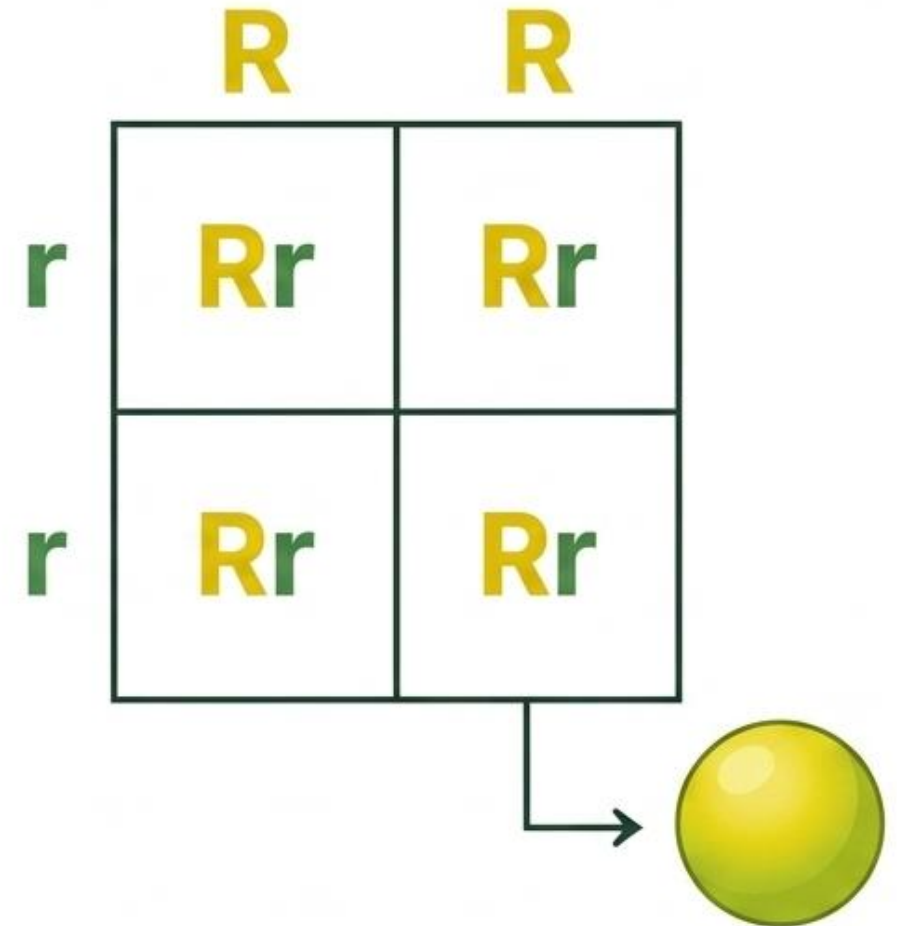
D) Rr, Wrinkled



✓ **Correct Answer: B) Rr, Round**

Explanation & Thought Process

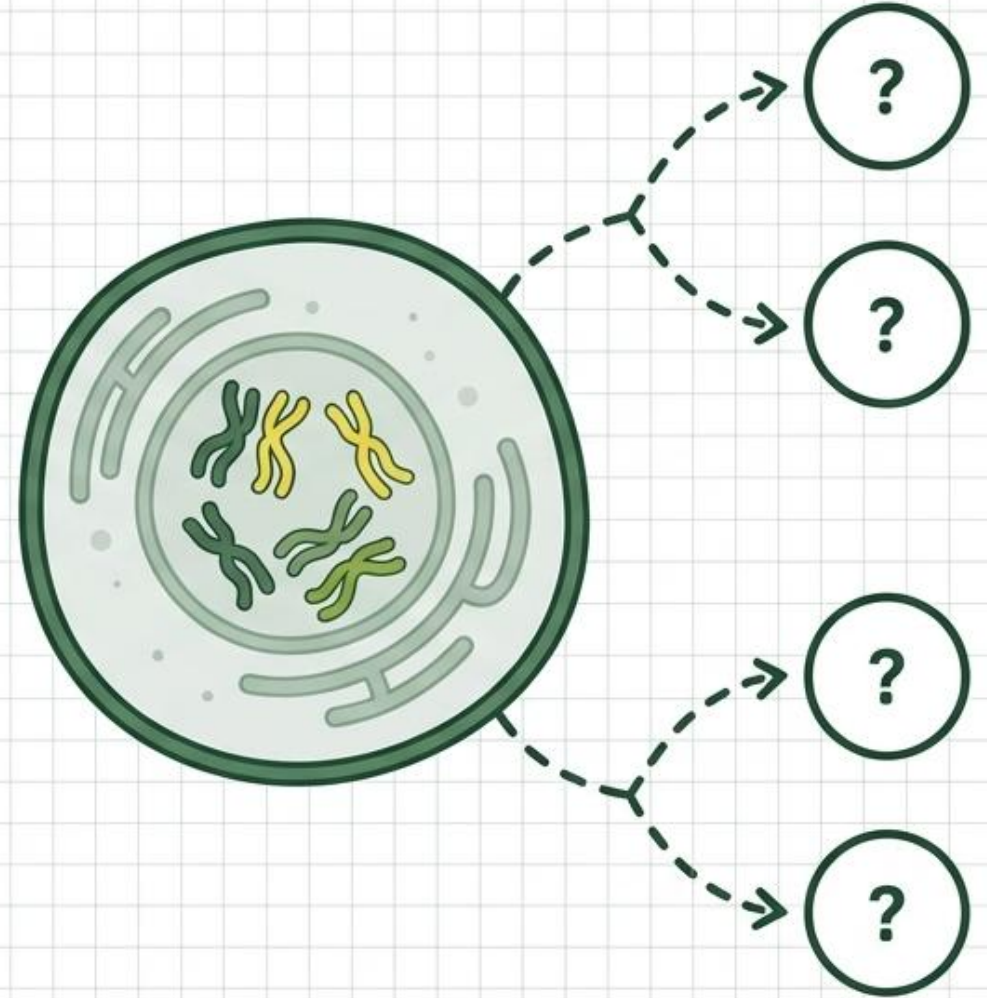
1. **Decode Keywords:** "True-breeding" means homozygous.
2. **Determine Parents:** The round parent is **RR** (dominant). The wrinkled parent is **rr** (recessive).
3. **Segregate:** Parent 1 only gives **R**.
Parent 2 only gives **r**.
4. **Combine:** 100% of F₁ offspring receive one **R** and one **r** → **Genotype Rr** (heterozygous).
5. **Determine Phenotype:** **R** is dominant and masks **r**, so they all appear Round.



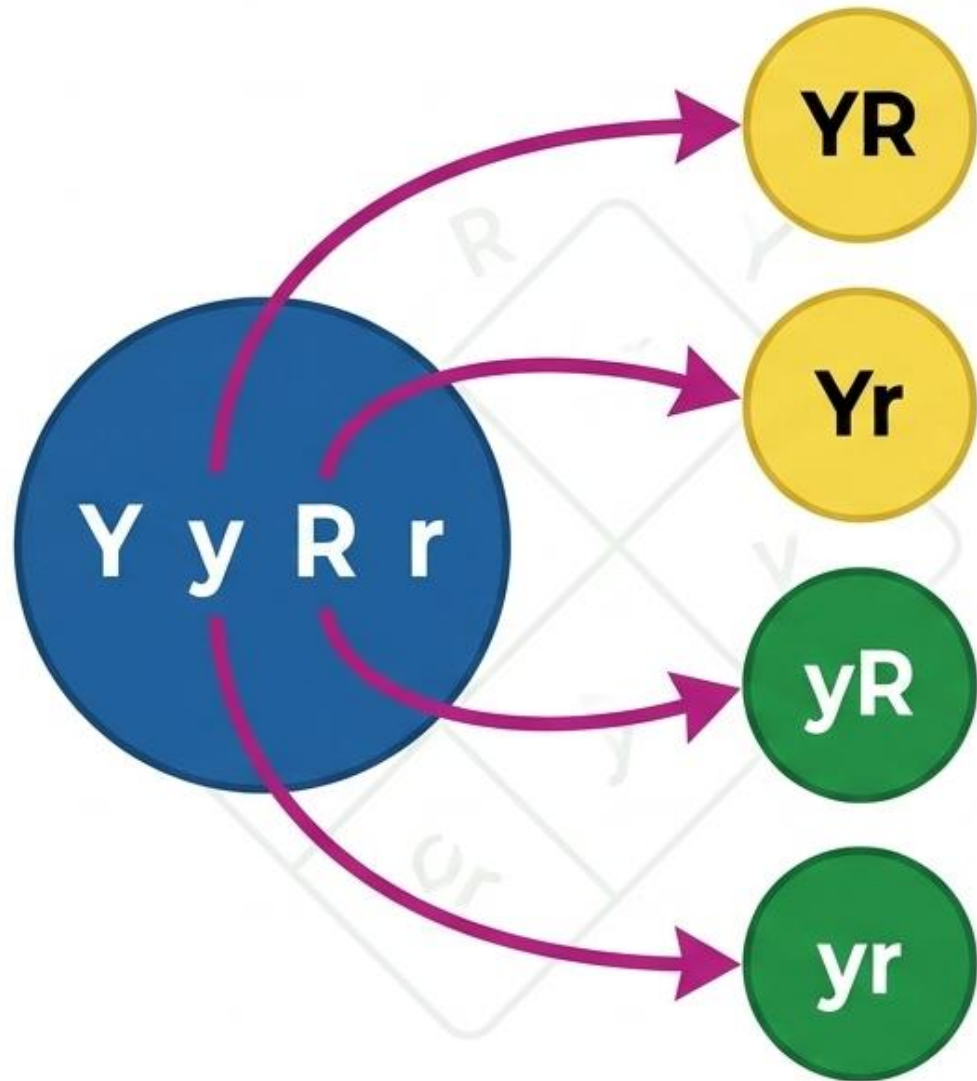
Practice Question 2: Gamete Combinations

You are analyzing a plant that is heterozygous for two distinct traits: seed color and seed shape. Its **genotype is YyRr**.

Question: According to the Law of Independent Assortment, how many different types of allele combinations can be present in the gametes produced by this plant, and what are they?



✓ Correct Answer: 4 possible combinations (YR, Yr, yR, yr).



Explanation & Thought Process

The Rule: Alleles for different traits separate randomly. The Y/y alleles do not dictate where the R/r alleles go.

Each gamete must contain exactly one allele for color and one for shape.

The FOIL Method Distribution:

- **First:** Y pairs with R $\rightarrow$ YR
- **Outer:** Y pairs with r $\rightarrow$ Yr
- **Inner:** y pairs with R $\rightarrow$ yR
- **Last:** y pairs with r $\rightarrow$ yr

Check: All 4 combinations have an equal 25% chance of forming.

Practice Question 3: Dihybrid Phenotypic Ratios

Mendel crossed two **heterozygous dihybrid plants** ($YyRr \times YyRr$). He counted the offspring phenotypes and found four different physical appearances.

Question:

Based on Mendel's experimental results, what is the expected phenotypic ratio of this dihybrid cross?

Hint: Think about how the probability of two independent events is combined.

	YR	Yr	yR	yr
YR				
Yr				
yR				
yr				



Correct Answer: 9 : 3 : 3 : 1

	YR	Yr	yR	yr
YR	 YYRR (Yellow, Round)	 YYRr (Yellow, Round)	 YyRR (Yellow, Round)	 YyRr (Yellow, Round)
Yr	 YYRr (Yellow, Round)	 YYrr (Yellow, Wrinkled)	 YyRr (Yellow, Round)	 Yyrr (Yellow, Wrinkled)
yR	 YyRR (Yellow, Round)	 YyRr (Yellow, Round)	 yyRR (Green, Round)	 yyRr (Green, Round)
yr	 YyRr (Yellow, Round)	 Yyrr (Yellow, Wrinkled)	 yyRr (Green, Round)	 yyrr (Green, Wrinkled)

Explanation & Thought Process

Crossing two dihybrids ($YyRr \times YyRr$) results in 16 probability squares.

The Breakdown:

-  **9** show both dominant traits (Yellow & Round) - **Y_R_**
-  **3** show one dominant, one recessive (Green & Round) - **yyR_**
-  **3** show the other dominant, one recessive (Yellow & Wrinkled) - **Y_rr**
-  **1** shows both recessive traits (Green & Wrinkled) - **yyrr**

Significance: This mathematical ratio is the absolute proof that genes sort independently!

Quick Check & Common Mistakes

Quick Check - Think to yourself!



Question: If a plant has a **recessive** phenotype (like green seeds), do you need to perform a **genetic test** to know its **genotype**?

Answer: No! To express a recessive trait, the genotype must be **homozygous recessive** (**yy**).



Avoid These Exam Traps

Mistake 1: Gametes with Two Alleles 

Wrong: YY. **Right:** Y).
Gametes only carry ONE allele per gene!

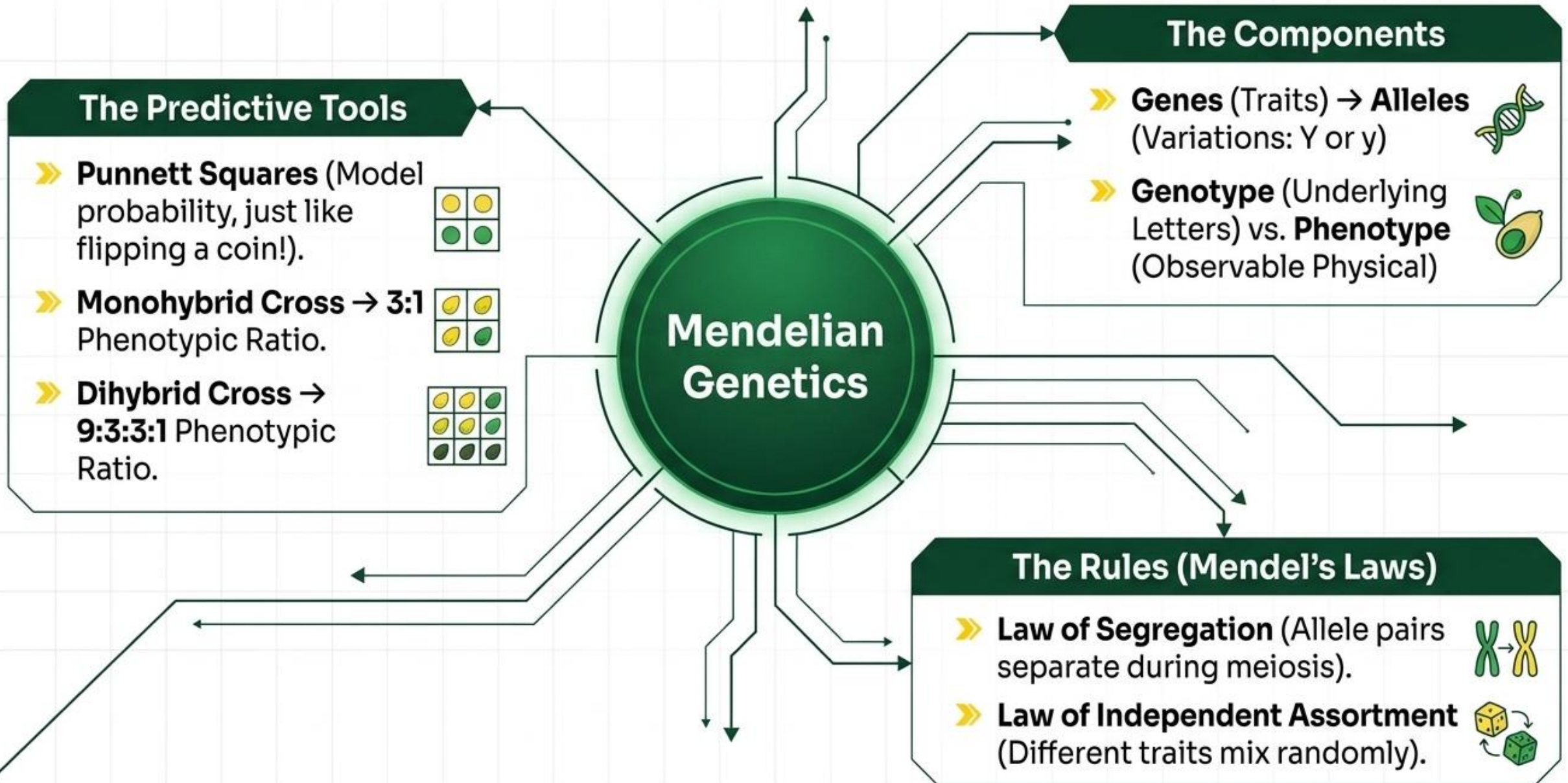
Mistake 2: Confusing Terms  

Genotype = the Genetic code (letters).
Phenotype = the Physical appearance.

Mistake 3: "Dominant" Misconception 

Dominant only means it masks the recessive allele in a heterozygote; it does not indicate population frequency.

★ Final Review: The Blueprint Connected





Unsolved Practice

★ Level 1: Easy (Identify)

Which of the following genotypes represents a heterozygous organism? (a) YY (b) Yy (c) yy

★★ Level 2: Medium (Apply)

In a certain plant, tall stems (T) are dominant to short stems (t). Create a Punnett square for a cross between a homozygous dominant plant and a homozygous recessive plant. What percentage of the offspring will be short?

★★★ Level 3: Challenging (Analyze)



You flip a coin twice. The probability of getting heads both times is $1/4$ ($1/2 \times 1/2$). How does this mathematical principle of probability directly apply to predicting the $1/16$ outcome of a $yyrr$ genotype appearing in a dihybrid cross?

Challenge Question: STEM Career Connection

You are a Genetic Counselor.

A couple seeks your advice. Both individuals have normal skin pigmentation, but both of them had one parent who had **Albinism** (a **recessive genetic disorder**).

Your Task (Do not check for an answer key!):

- 1. Deduce the precise **genotype** of this couple.
- 2. Using the **Law of Segregation** and a **Punnett square**, explain to them the exact **probability** that their future child will be born with **Albinism**.
- 3. Explain why their normal **phenotype** does not guarantee a normal **phenotype** for their child, using specific genetic vocabulary (**heterozygous**, **dominant**, **recessive**, **carrier**).





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