

Using Punnett Squares

- One of the best ways to predict the outcome of a genetic cross is by drawing a simple diagram known as a **Punnett square**.
- Punnett squares allow you to predict **the genotype and phenotype combinations** in genetic crosses using **mathematical probability**.

Monohybrid Crosses

- A **monohybrid cross** is a mating between two organisms with different variations at **one chromosome** of interest.
- In this example we will cross a male and female robin that are **heterozygous** for large beaks. Gene B codes for beak size.



Monohybrid Crosses

What is the genotype of the male and female robin?

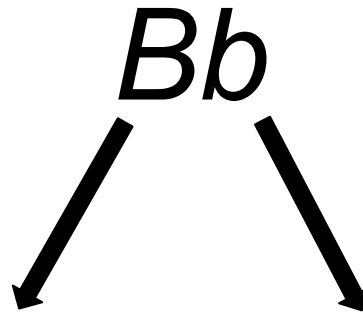


Students, write your response!

Monohybrid Crosses

Step 1: Using the **law of segregation**, determine what **alleles** would be found in all of the possible **gametes** that each parent could produce.

What would be the possible alleles for the male and female robin?



Students, write your response!

Monohybrid Crosses

Step 2: Draw a table with enough spaces for each pair of **gametes** from each parent.

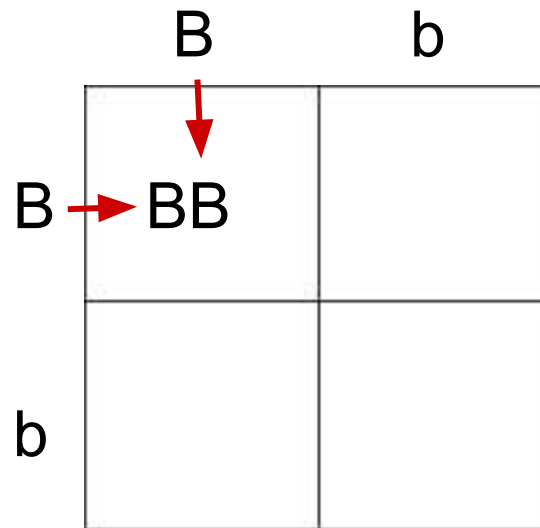
Step 3: Enter the **genotypes** of the **gametes** produced by both parents on the top and left sides of the table.

Step 4: Fill in the table by **combining the gametes'** **genotypes**.



Monohybrid Crosses

What event does the combining of gametes represent?



Students, write your response!

Monohybrid Crosses

Step 5: Determine the **genotypes** and **phenotypes** of each offspring. Calculate the **percentage** of each.

	B	b
B	BB	Bb
b	Bb	bb



Students, draw anywhere on this slide!

Independent Assortment

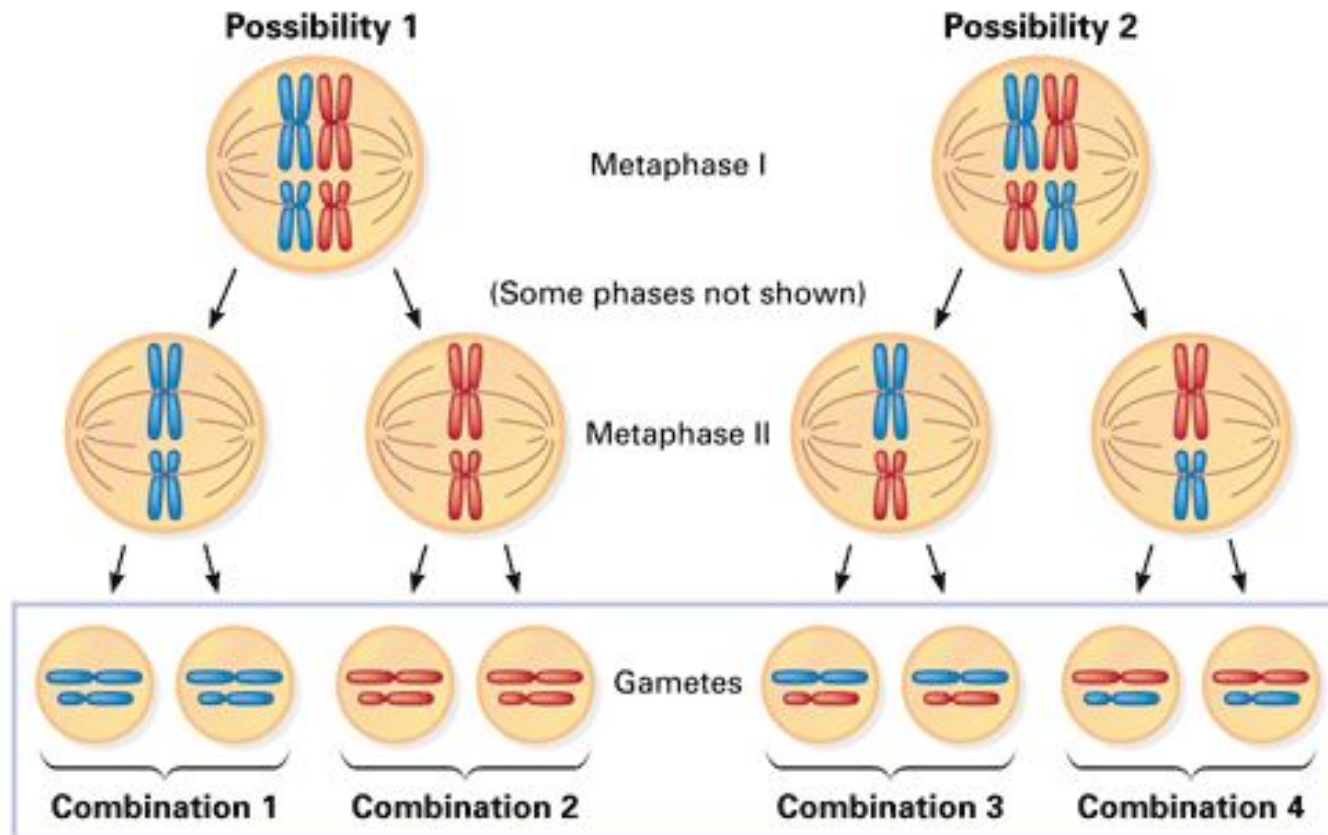
How do alleles segregate when more than one gene is involved?



Students, write your response!

Independent Assortment

- The principle of independent assortment states that **genes for different traits segregate independently** during the formation of gametes.



Dihybrid Crosses

- A **dihybrid cross** is a mating between two organisms with different variations at **two chromosomes** of interest.



Dihybrid Crosses

- In this example, we will cross a male and a female robin. The male robin is **heterozygous** for beak size and tail color. The female robin is **homozygous dominant** for beak size and **homozygous recessive** for tail color.
- Large beaks are dominant over small beaks. Black tails are dominant over gray tails.



Dihybrid Crosses

What are the genotypes and phenotypes of the male and female robins? Gene B codes for beak size and Gene T codes for tail color.

Male:

Female:



Students, draw anywhere on this slide!

Dihybrid Crosses

What are the genotypes and phenotypes of the male and female robins?

Male: **BbTt, Large beak, Black tail**

Female: **BBtt, Large beak, Gray tail**



Dihybrid Crosses

Step 1: Using the **law of independent assortment**, determine what alleles would be found in all of the possible gametes for each parent.

The easiest way to determine allele possibilities is to use the FOIL method.

FOIL = First, Outer, Inner, Last

Dihybrid Crosses

BbTt

x

BBtt

Dihybrid Crosses

Step 2: Draw a Punnett square with enough squares for both parents **gametes (4x4)**.

Dihybrid Crosses

Step 3: Enter the **genotypes** of the **gametes** produced by both parents on the top and left sides of the table.

	Bt	Bt	Bt	Bt
BT				
B				
t				
b				
T				
b				
t				

Dihybrid Crosses

Step 4: Fill in the table by **combining the gametes' genotypes**, representing **fertilization**.

	Bt	Bt	Bt	Bt
BT				
B				
t				
b				
T				
b				
t				

Dihybrid Crosses

Step 5: Determine the **genotypes** and **phenotypes** of each offspring. Calculate the **percentage** of each.

	Bt	Bt	Bt	Bt
BT				
B				
t				
b				
T				
b				
t				