



# **Exploring Mendelian Genetics**

**Chapter 11-3**

# Monohybrid Crosses

- **Monohybrid Cross:** a cross that involves 1 pair of contrasting traits
- A punnett square for a monohybrid cross has 4 boxes

# Example 1

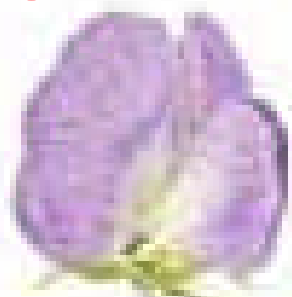
## Homozygous x Homozygous

- This is a cross between parents that are homozygous for a certain trait
- Ex) PP = dominant allele (purple)  
pp = recessive allele (white)

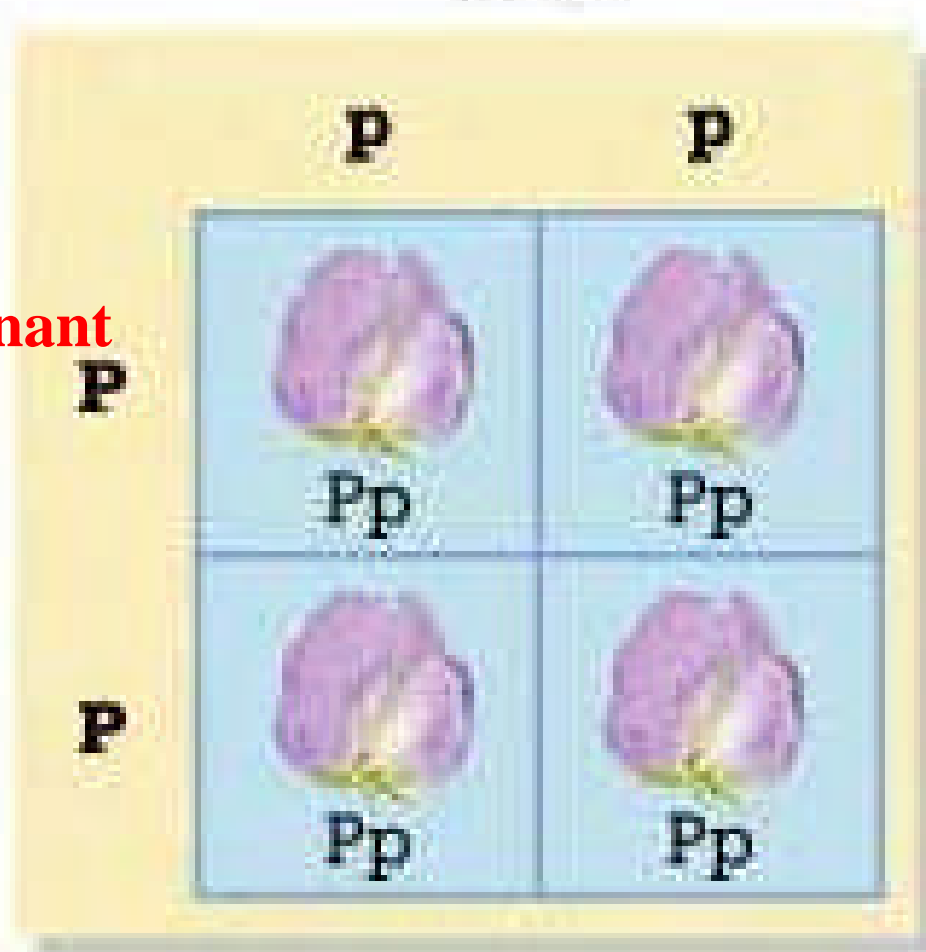


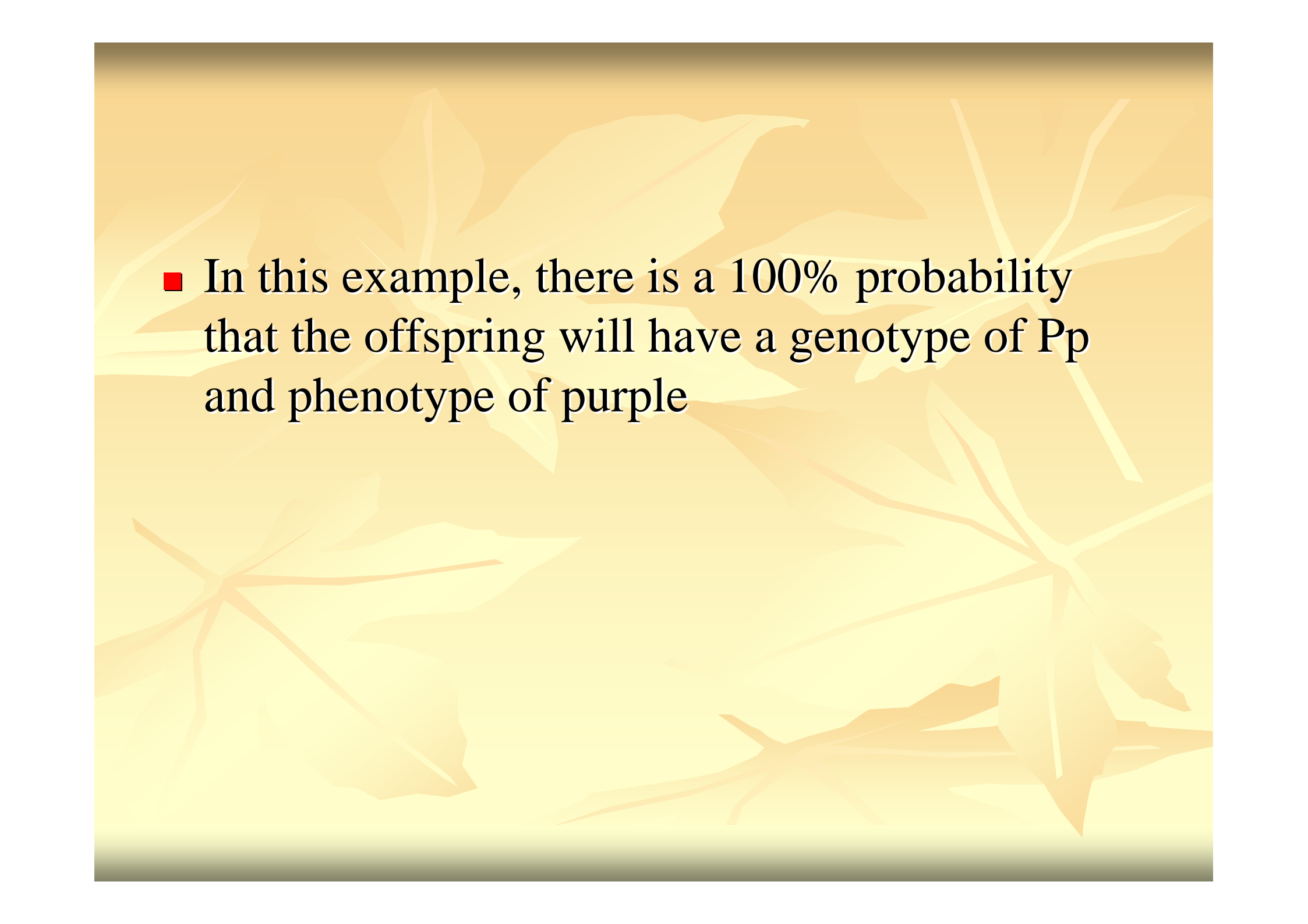
**(pp)** Homozygous recessive

**Homozygous Dominant**



**(PP)**



- 
- In this example, there is a 100% probability that the offspring will have a genotype of Pp and phenotype of purple

## Example 2

### Homozygous x Heterozygous

- This is a cross between one parent that is homozygous for a trait and another parent that is heterozygous
- Ex) B = dominant allele (black)  
b = recessive allele (brown)
- Possible crosses:
  - BB x Bb (H. dominant x heterozygous)
  - bb x Bb (H. recessive x heterozygous)







**(Bb)**

**Heterozygous**

**Homozygous Dominant**



**(BB)**

	<b>B</b>	<b>b</b>
<b>B</b>	 <b>BB</b>	 <b>Bb</b>
<b>B</b>	 <b>BB</b>	 <b>Bb</b>

- In this example the probability of getting a genotype of:
  - $BB = 50\%$
  - $Bb = 50\%$
- The probability of having a black coat is 100%
- Genotypic Ratio – 1BB:1Bb

## Example 3

### Heterozygous x Heterozygous

- This is a cross between parents that are both heterozygous for a certain trait

Example:





$Bb \times Bb$



**(Bb)**



**(Bb)**

	<b>B</b>	<b>b</b>
<b>B</b>	 <b>BB</b>	 <b>Bb</b>
<b>b</b>	 <b>Bb</b>	 <b>bb</b>

■ For this example:

- Genotypic Ratio = 1BB:2Bb:1bb
- Phenotypic Ratio = 3 Black:1Brown
- Can you figure out the percentage?

**REMEMBER 1:2:1 and 3:1**

# Incomplete Dominance

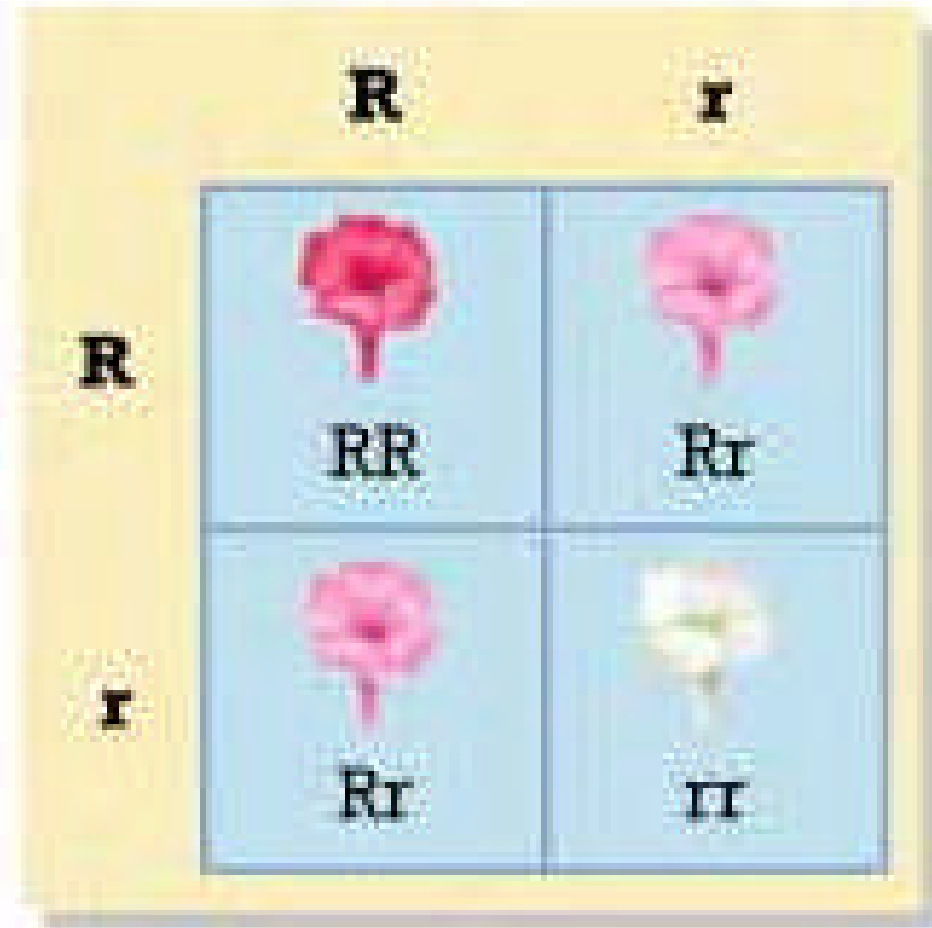
- **Incomplete Dominance:** offspring will have a phenotype that is an intermediate of the two parents
- Genotype is heterozygous
- Neither allele is completely dominant over the other, they blend.
- Ex) Four O' Clock Flowers



**(Rr)**



**(Rr)**



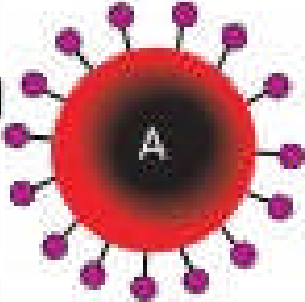
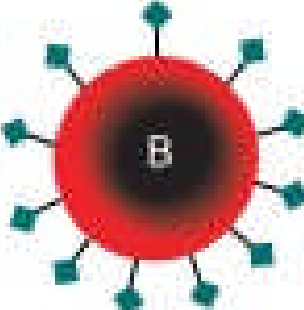
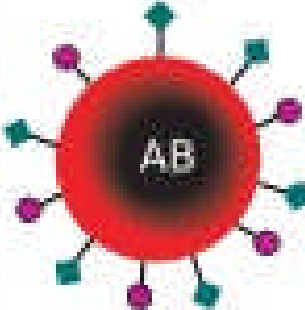
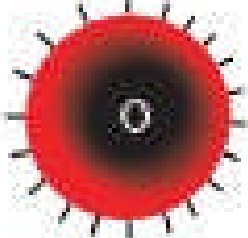
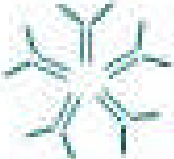





# Incomplete Dominance Cont'd

- $R$  = dominant allele for red flowers  
 $r$  = recessive allele for white flowers
- $RR$  = red flowers  
 $rr$  = white flowers  
 $Rr$  = pink flowers
- Even though the dominant allele is present in the heterozygote, it is not powerful enough to completely cover the white, so we end up with a pink flower

# Codominance

- **Codominance**: both alleles are expressed in a heterozygote
- neither allele is dominant or recessive
- Both show up in the phenotype – there is not an “in between” like with incomplete dominance
- Ex) Blood Types

# Blood Types

	Group A	Group B	Group AB	Group O
Red blood cell type	 <p>A</p>	 <p>B</p>	 <p>AB</p>	 <p>O</p>
Antibodies present	 <p>Anti-B</p>	 <p>Anti-A</p>	None	 <p>Anti-A and Anti-B</p>
Antigens present	 <p>A antigen</p>	 <p>B antigen</p>	 <p>A and B antigens</p>	No antigens

# Codominance Cont'd

- There are four blood types: A, B, O, AB
- O is the recessive allele
- Possible Genotypes:
  - AA or AO = Type A
  - BB or BO = Type B
  - OO = Type O
  - AB = Type AB **CODOMINANT**
- A and B are codominant to each other, both are expressed in the phenotype

# Self Check

- What is a monohybrid cross?
- What is a dihybrid cross?
- What is incomplete dominance? Give an example.
- What is Codominance? Give an example?
- How do you find genotypic and phenotypic ratios?