Zoo-352 Principles of genetics
Lecture 7

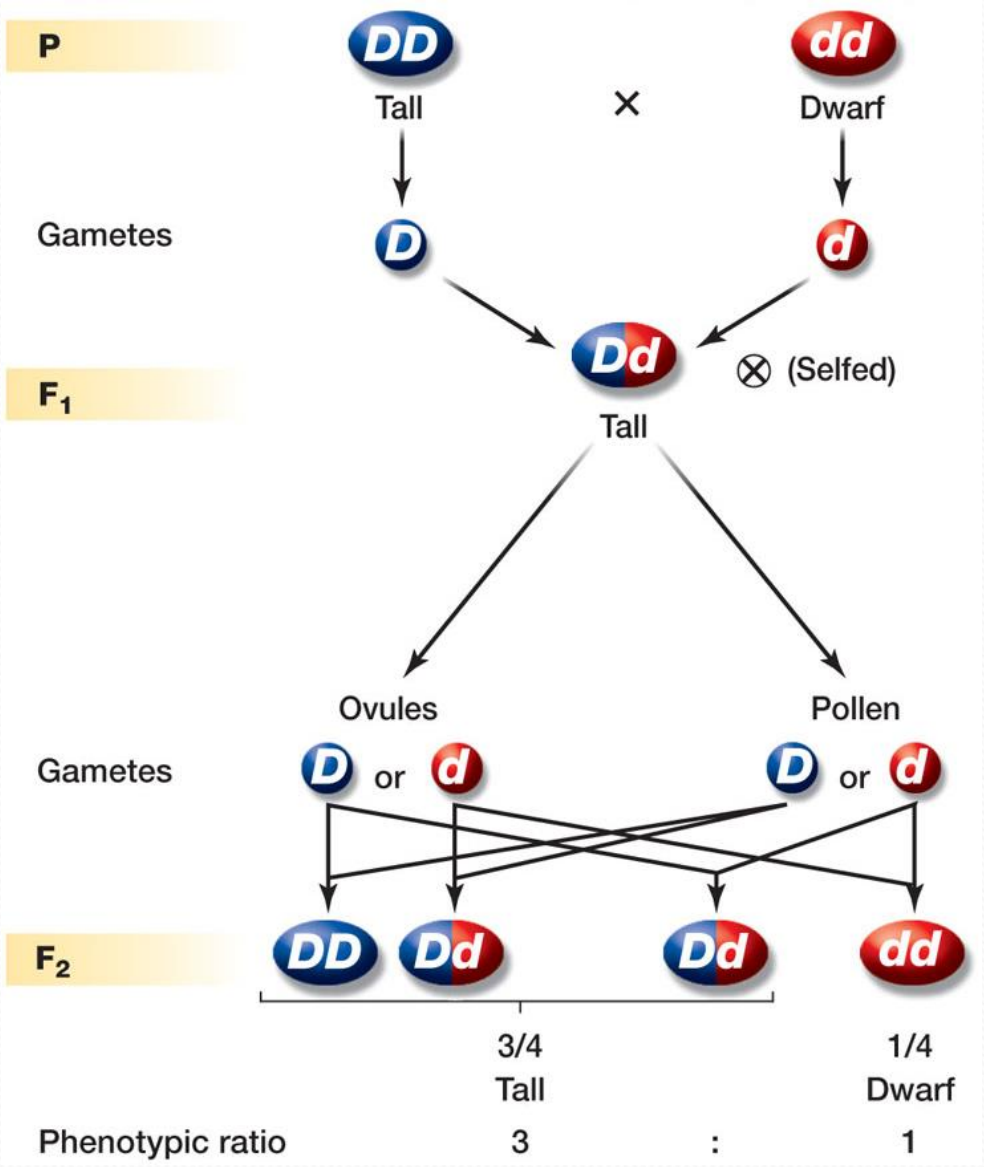
Law of segregation

- Although the genotype of an individual involves two alleles, only one of these alleles is passed on to the gamete, which is either the pollen or ovule in plants.
- The fusion of two gametes, or fertilization, forms a zygote that restores two alleles in the cells.
- The explanation of how alleles are inherited from generation to generation constitutes Mendel's first principle, the law of segregation.

The laws of Mendel in genetics:

1. **First law:** segregation.
2. **Second law:** independent assortment.

Law of segregation



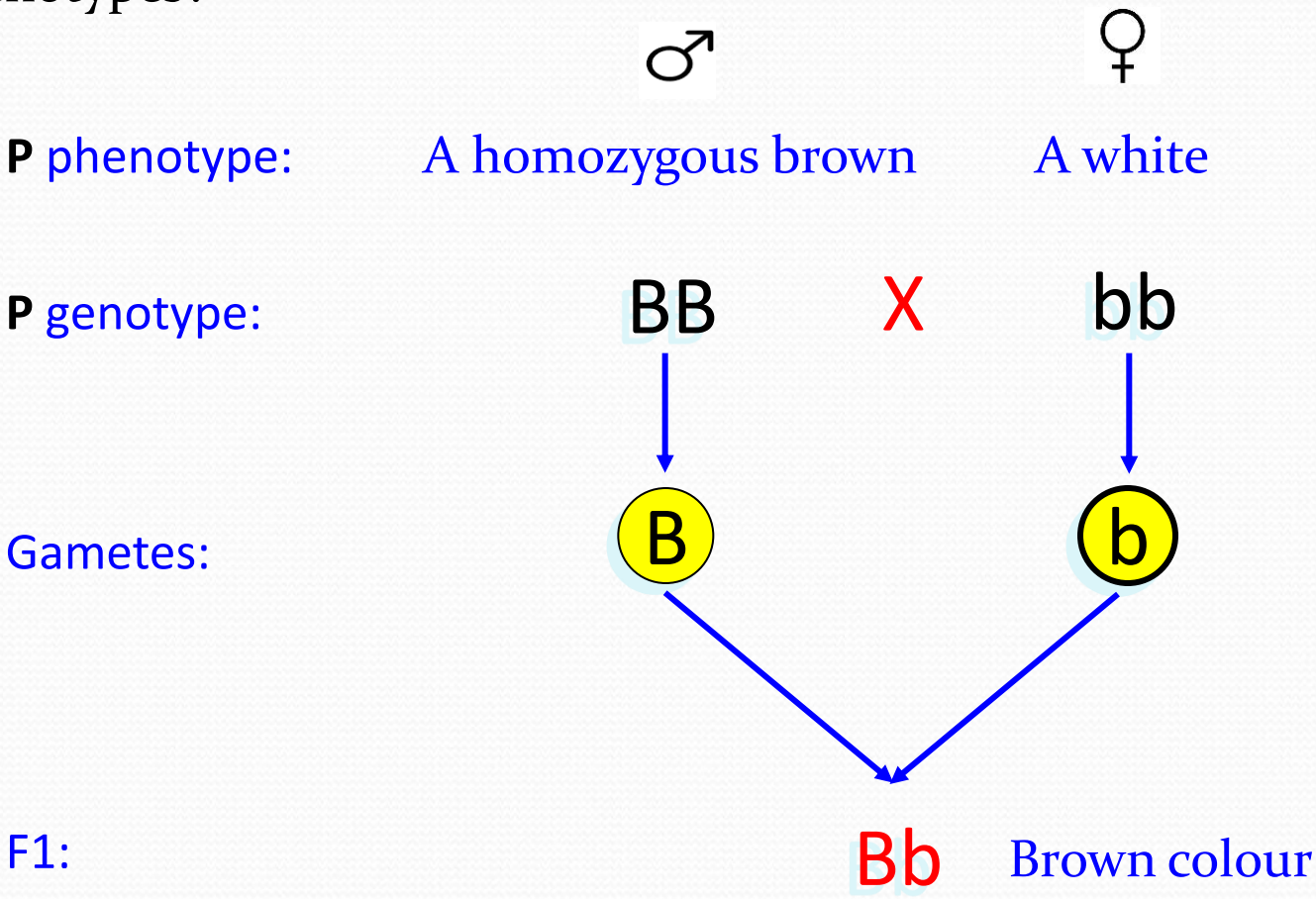
- The law of segregation states that during gamete formation, the two alleles separate (segregate) randomly, with each gamete having an equal probability of receiving either allele.
- In the figure above, we can see that Mendel's law of segregation explains several things:
  - The heterozygous F1 progeny (offspring), which all have the dominant tall characteristic, get one allele from each parent.
  - The DD homozygous can produce only one type of gametes, which contains the dominant D allele, and the dd homozygous can produce only gametes containing the recessive d allele.

- The F1 individuals are uniformly heterozygous Dd. Each F1 individual can produce two kinds of gametes. These two types of gametes randomly fuse during fertilization to produce the F2 generation.
- The F1 progeny are heterozygous because they have two different alleles.
- The F1 progeny have the recessive allele, which accounts for the reappearance of the short phenotype in the F2 generation.
- The hybrid nature of the F1 individuals accounts for the 3:1 ratio of tall-to-short phenotype in the F2 offspring.

Monohybrid Examples

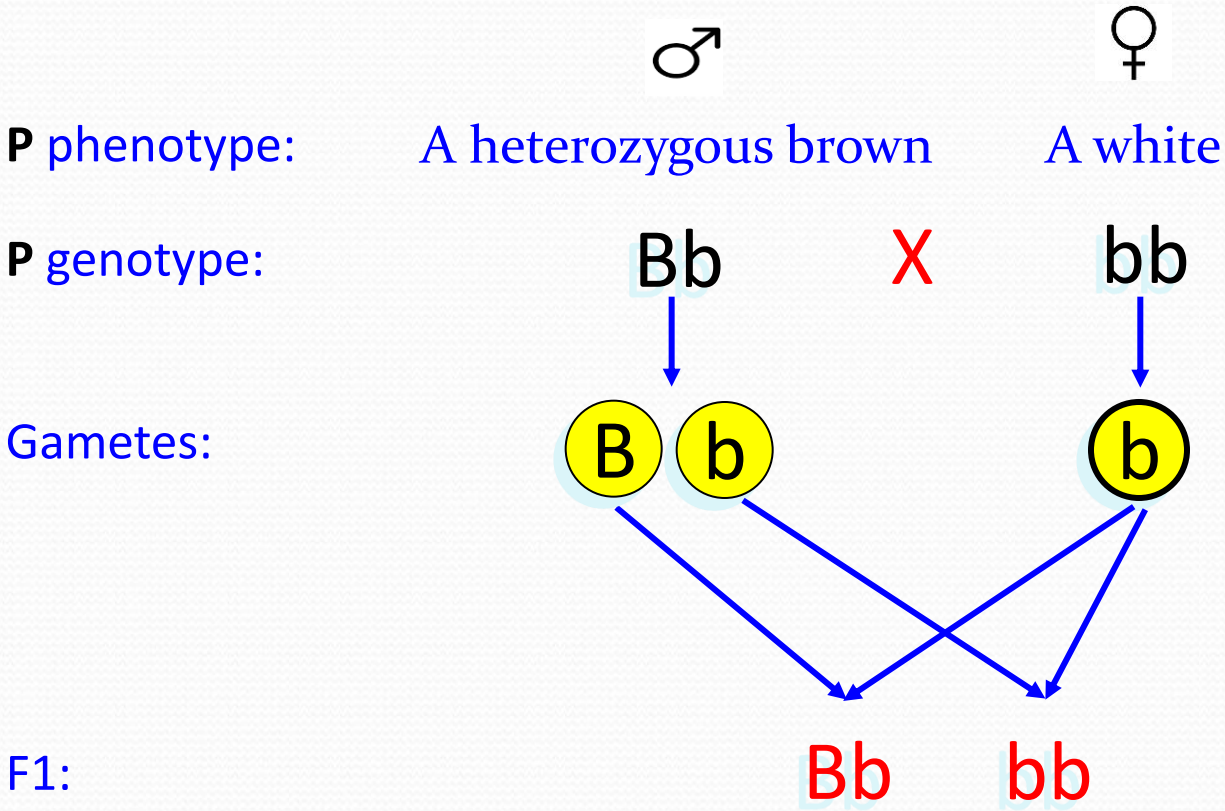
Question 1:

A rancher wants to cross a brown (BB) horse with a white mare. Colour is an unlinked gene and brown is dominant. What are the F1 generation genotypes and phenotypes?



Question 2:

A rancher wants to cross a brown (Bb) horse with a white mare.. What are the genotypic and phenotypic ratios for the F1 generation?

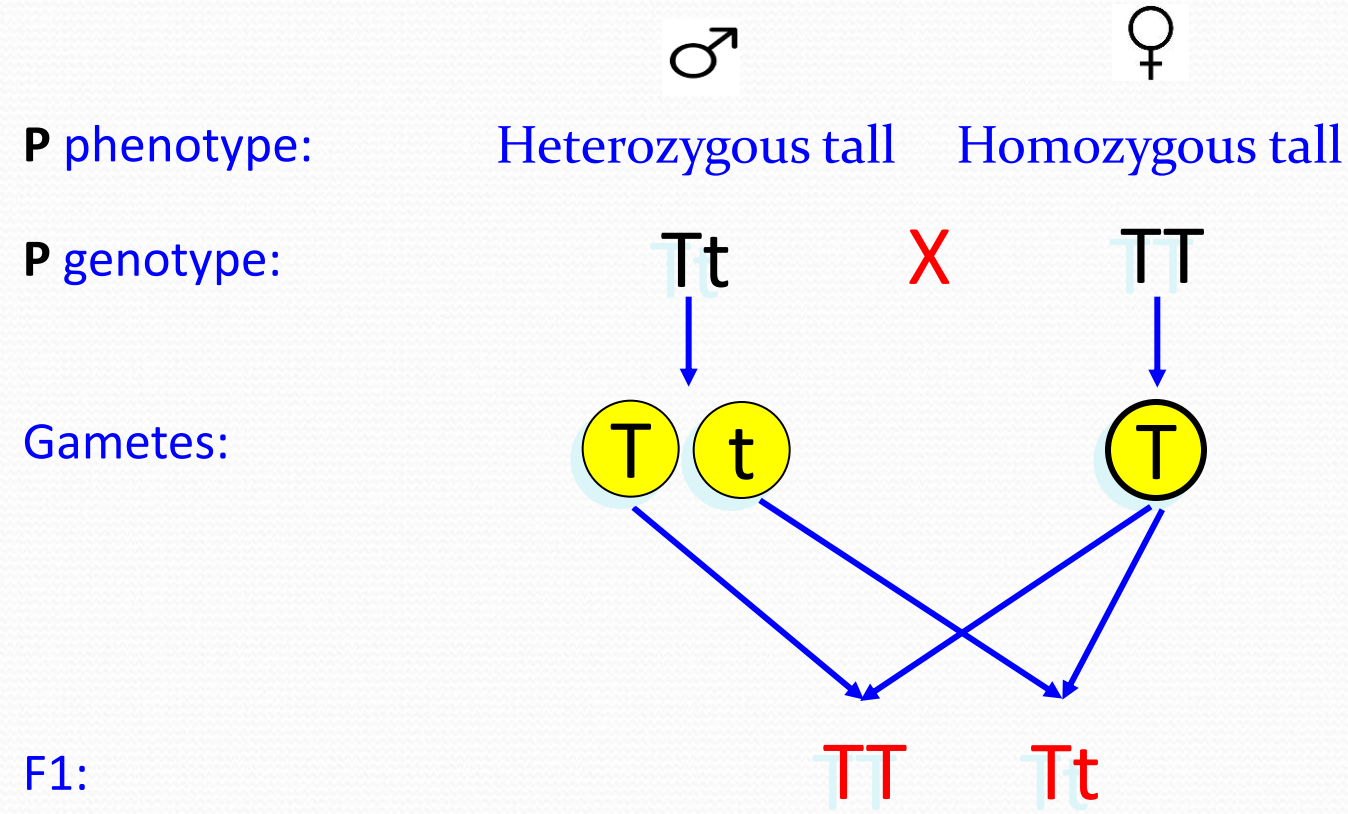


Phenotypic ratio= 1 brown : 1 white (50% brown : 50% white)

Genotypic ratio= 1 Bb : 1 bb (50% Bb : 50% bb)

Question 3:

If an allele for tall plants (T) is dominant to short plants (t). What offspring would you expect from a Tt x TT cross?

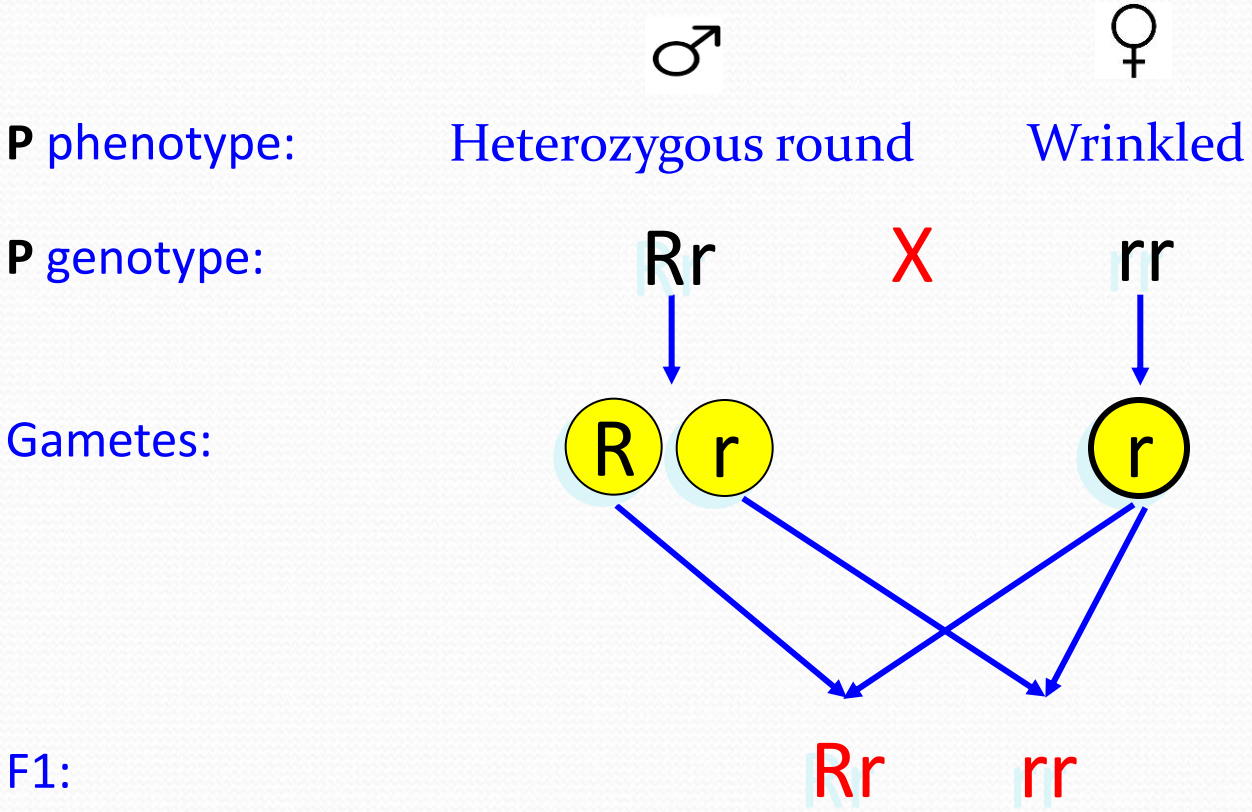


Phenotypic ratio= 100% tall

Genotypic ratio= 1 TT : 1 Tt

Question 4:

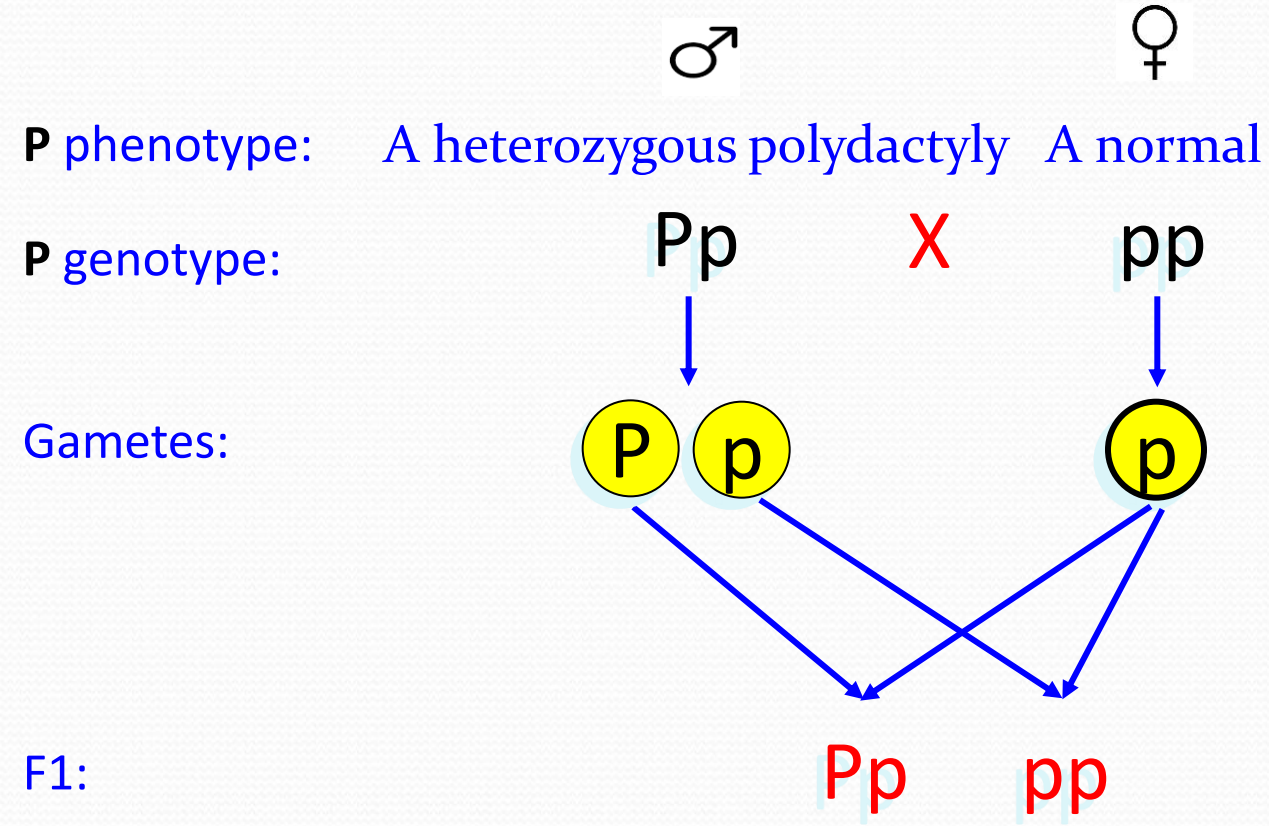
Cross a heterozygous round seeds of pea plant with a wrinkled seeds and determine the probability of producing wrinkled seeds.



The probability of producing wrinkled seeds = 50%

Question 5:

A man heterozygous for polydactyly (extra fingers and toes), a dominant trait, is married to a normal woman. What is the probability of producing an offspring that has extra fingers or toes?



The probability of producing an offspring that has extra fingers or toes? = 50%