Genetics

The study of how traits are passed from parents to offspring

History of Genetics

People used to believe that offspring's traits were a blend of their parents traits

(ex. tall + short = medium)

We now know it's not that simple…

Gregor Mendel

- In the 1840's he studied heredity (the passing of traits from parent to offspring).
- He studied garden pea plants because they are simple and have sexual reproduction (two different kinds of sex cells or gametes)

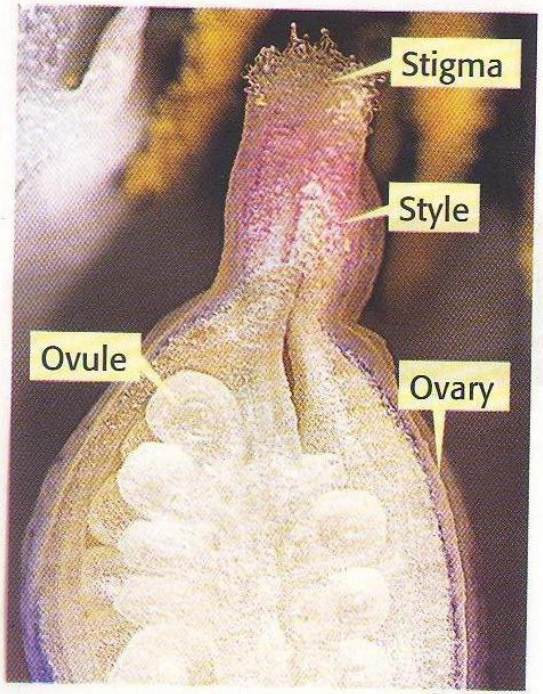
male gamete – sperm (pollen)

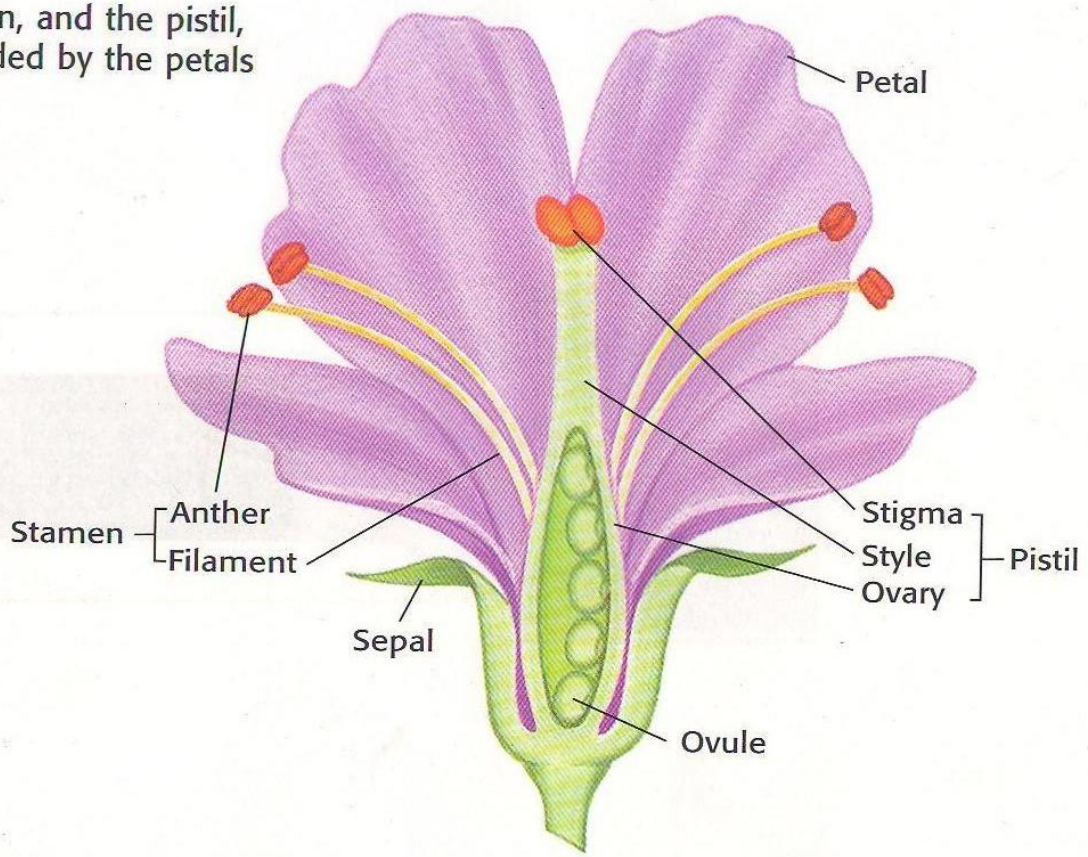
female gamete – egg (ovule)

Fertilization → seed

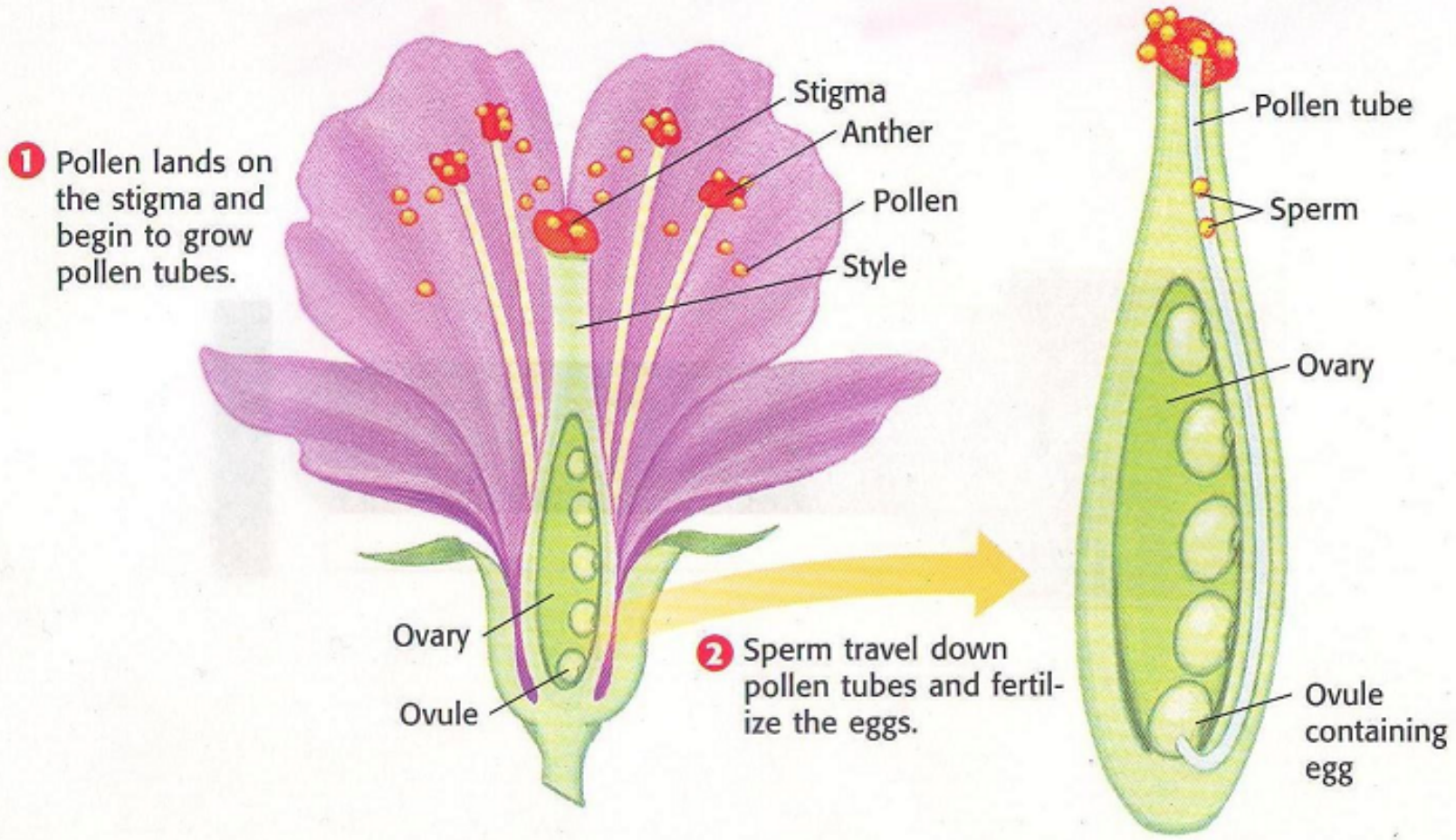
The Structure of a Flower

The stamens, which produce pollen, and the pistil, which produces eggs, are surrounded by the petals and the sepals.

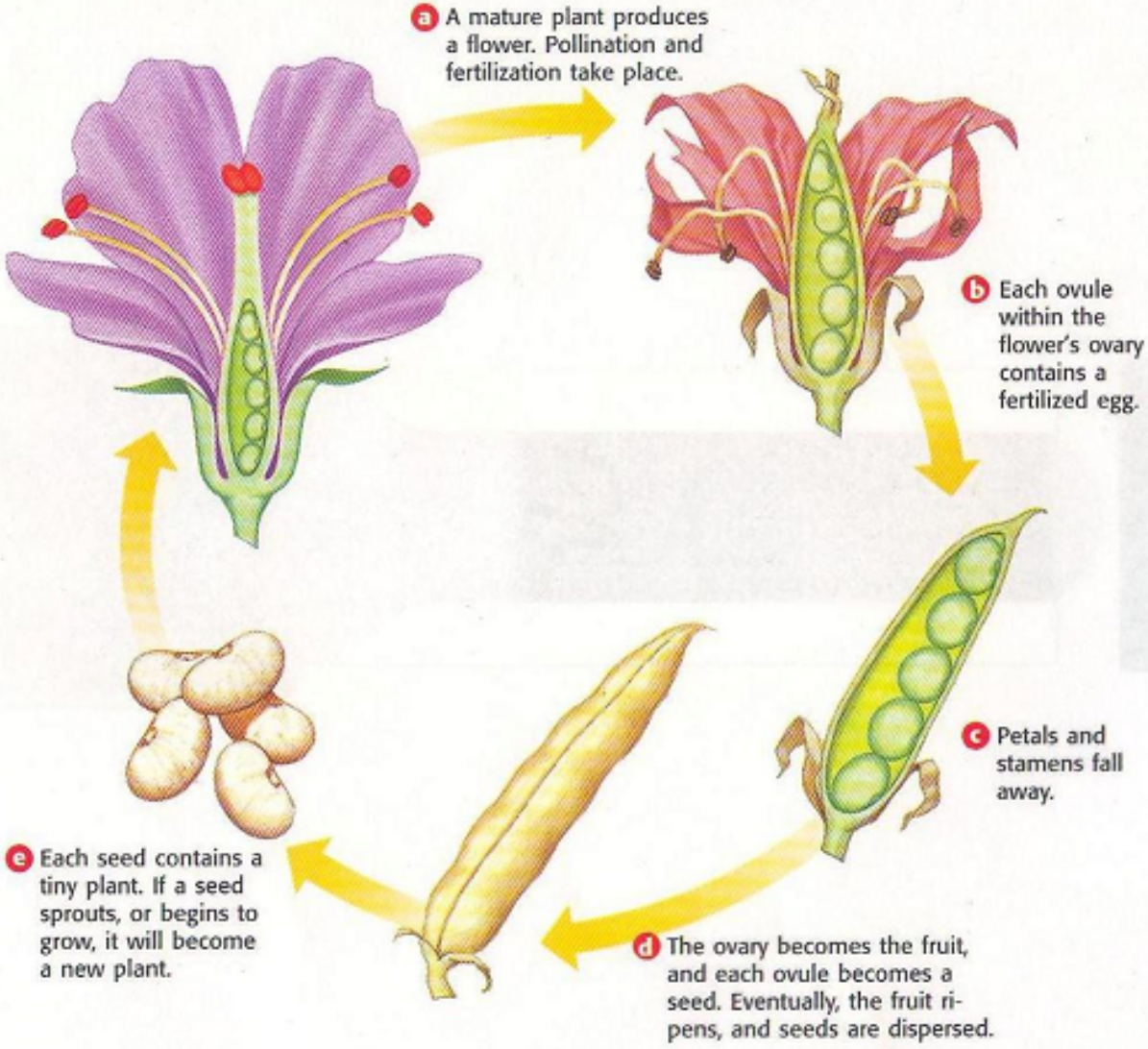




Pollination and Fertilization



Seed Production



C25 Genetics of Pea Plants

Genetics of Pea Plants							
Traits	Seed Shape	Seed Color	Seed Coat Color	Pod Shape	Pod Color	Flower Position	Stem Height
Controlled by Dominant Allele	 Round	 Yellow	 Gray	 Smooth	 Green	 Side	 Tall
Controlled by Recessive Allele	 Wrinkled	 Green	 White	 Pinched	 Yellow	 End	 Short

Mendel crossed two purebred Parent plants (P Generation):

P_1 Tall (6ft.) x Short (2 ft.)

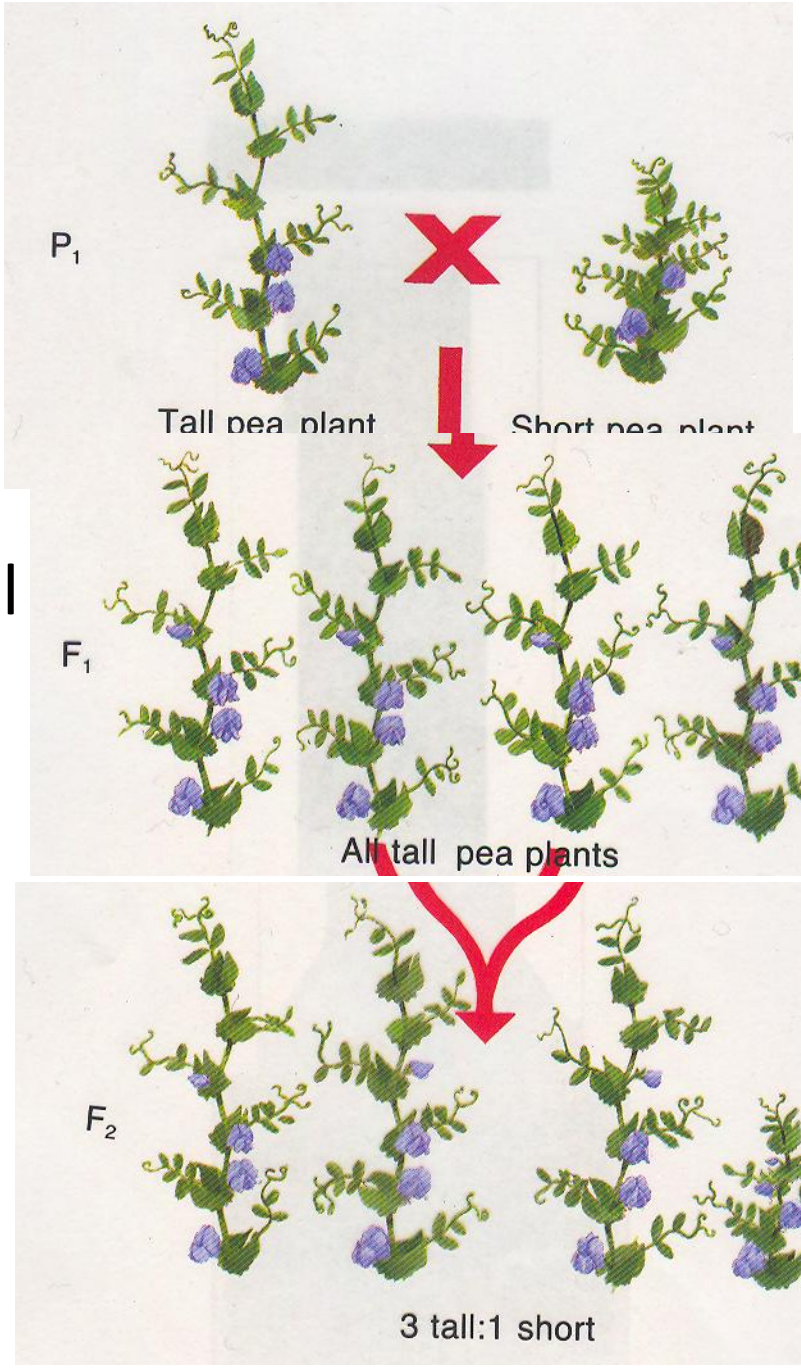
All offspring were tall!

F Generation: F stands for Filial (latin for son or daughter)

F_1 4 Tall

F_2 3 Tall 1 Short 3:1

Mendel realized that traits are controlled by separate "factors" (genes)



Genes are units of heredity that determine a particular trait.

Each gene has different expressions called alleles.

gene	alleles
gene: height	alleles: tall short
gene: eye color	alleles: brown blue hazel
gene: hair color	alleles: blonde brown black red

Every organism gets two alleles for each trait, one from mom and one from dad

dominant allele-this expression always shows up

recessive allele-this expression is hidden by the dominant allele and only shows up if there is no dominant allele

dominant alleles are represented with a capital letter

ex. tall = T

recessive alleles are represented with the lowercase letter of the dominant trait

ex. short = t

dominant allele – curly hair

recessive allele – straight hair

curly C

straight c

dominant allele – yellow seeds

recessive allele – green seeds

yellow Y

green y

dominant allele – purple flowers

recessive allele – white flowers

purple P

white p

dominant allele – rolling tongue

recessive allele – non-rolling tongue

rolling R

non-rolling r

homozygous – two of the SAME alleles

*also called purebred

ex. TT or tt

homo

same

homonym- two words that sound the same but are spelled differently like bear and bare

homophone- two words with the same spelling but different meanings like rose and rose

homosexual- two people of the same gender that are in a relationship

heterozygous – two different alleles

*also called hybrid

ex. Tt

hetero

different

heterogeneous- a mixture of different ingredients

heterosexual- two people of the different genders that are in a relationship

Heterozygous (He) or homozygous (Ho)?

*Say the WHOLE term☺

AA	Ho	Dd	He	Gg	He
Bb	He	EE	Ho	hh	Ho
cc	Ho	ff	Ho	Ii	He

There are two ways to describe the traits of an organism:

genotype – the combination of alleles (ex. Tt)

phenotype – the **ph**ysical appearance (ex. Tall)

In humans, brown eyes (B) are dominant to hazel (b). If a man has brown eyes, what are the possible genotypes?

BB or Bb

If a woman has the genotype bb, what must her **ph**enotype be?

hazel

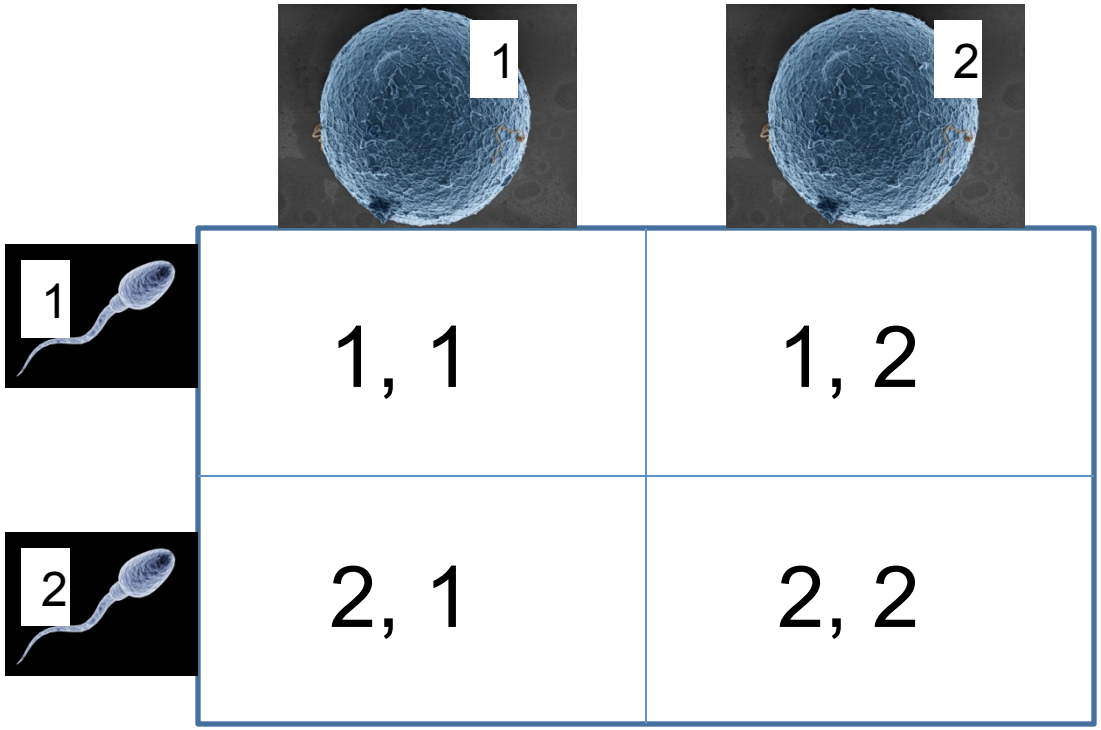
Punnett Squares

- Reginald Crundall Punnett (1875-1967) was a believer in the theories put forward by obscure monk Johann Gregor Mendel (1822-1884), the founder of modern genetics, and wrote the first textbook on the subject. Punnett worked to confirm Mendel's theories experimentally.
- Punnett was also the inventor of the "Punnett Square", which depicts the number and variety of genetic combinations.

Remember: You have two alleles for each trait.

When you give your genetic info to your offspring, you give ½ the info (one allele)

Meiosis is the process that creates gametes with half the genetic information



A punnett square organizes the possible combinations of gametes that can occur during fertilization

Steps for solving a Punnett Square Problem

Step 1. Key to alleles

Step 2. Parental Cross

Step 3. Punnett Square

Step 4. Results

genotype, phenotype, ratio, percent

Step 5. Go back and answer the original questions.

In mice, the dominant allele for eye color is black and the recessive allele is red. If two heterozygous parents are crossed, what will be all the possible genotypes and phenotypes of the offspring?

Step 1. Key to alleles

Black B
red b

Step 2. Parental Cross

P_1 Bb x Bb

Step 1. Key to alleles

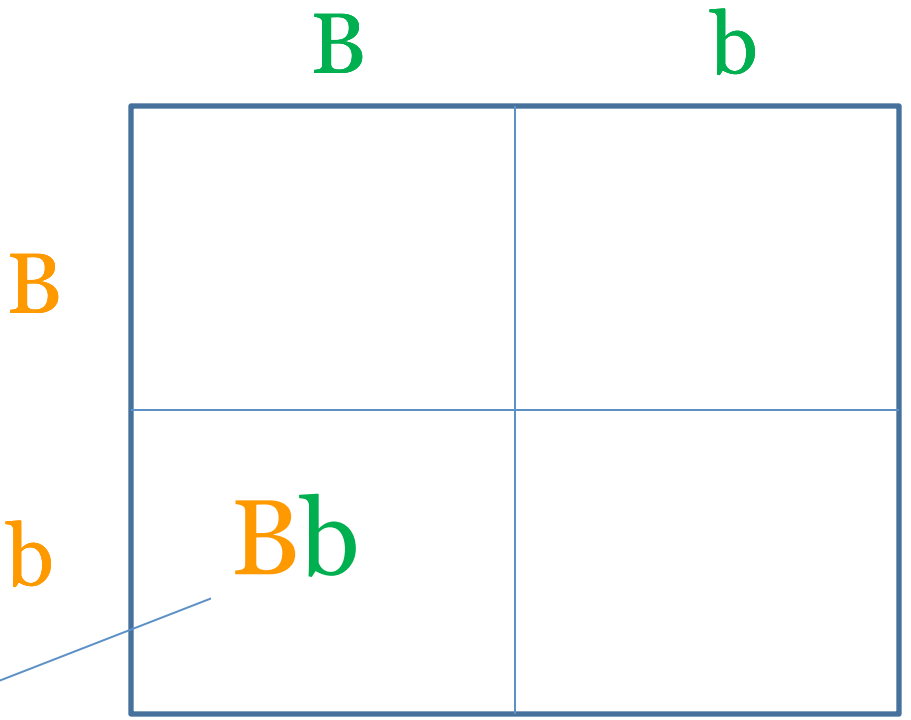
Black B

red b

Step 2. Parental Cross

P_1 Bb x Bb

Step 3. Punnett Square



The standard format is Capital first so flip it!

Step 4. Results (genotype, phenotype, ratio, percent)

- BB, black, 1: 4, 25%
- Bb, black, 2: 4, 50%
- bb, red, 1: 4, 25%

Step 5. Answer the original question

In this case the original question is already answered so, DONE☺

http://www.youtube.com/watch?v=we9_CdNPuJg

In goats, a recessive gene causes the goats to "faint" when they are startled. A farmer breeds two goats (that have never fainted) and their first offspring faints two days after it's birth. What must the parent's genotypes have been? Show the cross to prove it.