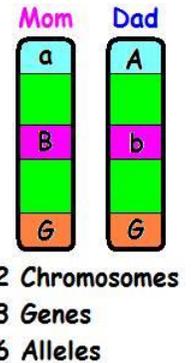


1. Inheritance and Probability

- heredity is controlled by the chromosomes that are inherited by offspring from parents
"Amoeba Sisters: Alleles and Genes" <https://www.youtube.com/watch?v=pv3Kj0UjiLE>
- the instructions for each trait are found in sections of chromosomes called **genes** which are arranged in a **specific order** on each chromosome
- different chromosomes are made up of different genes and different genes control different **traits**
- each trait is controlled by at least 2 forms of a gene called an **allele**
ie. The trait for ear shape in dogs is controlled by a gene that has 2 possible forms (alleles):
 - 1 is for floppy or bent ears (B)
 - 1 is for erect ears (b)
- in sexual reproduction organisms form **gametes** through **meiosis** containing $\frac{1}{2}$ the number of **chromosome** and therefore $\frac{1}{2}$ of the **allele(s)** for a particular trait
- as **each parent** contributes **one gamete**, each contributes half of the chromosomes and therefore half of the alleles to an offspring
 - = offspring are always different from parents because it a **combination** of the parents
ie. A child has mother's hair color and father's nose



Mendel's Laws of Inheritance

"Greatest Genetic Discoveries: Gregor Mendel" <https://www.youtube.com/watch?v=0vAAf4g5iF8>

1. The Law of Dominance

- when two different alleles control a trait the effect of one allele will **mask** the effect of the other allele
 - : the expressed allele is known as **dominant** (represented with a capital letter)
 - : the masked allele is called **recessive** (represented with a small letter)
 - ie) Black (B) is dominant to white (b)
 - A cat with 2 black alleles would be BB & therefore **black**
 - referred to as **homozygous** or pure black
 - A cat with 2 white alleles would be bb & therefore **white**
 - said to be **homozygous** or pure white
 - A cat with 1 black allele & 1 white allele would be Bb & therefore **black**
 - described as heterozygous or **hybrid** black

2. The Law of Segregation

- Meiosis results in gametes that have 1 allele for each trait so when offspring are formed each parent contributes one allele for a trait
- depending on the allele donated by each parent, offspring can inherit:
 - BB x BB 2 dominant alleles (**GG or homozygous dominant**)
 - bb x bb 2 recessive alleles (**gg or homozygous recessive**)
 - BB x bb 1 dominant & 1 recessive allele (**Gg or heterozygous or hybrid**)

Probability: chance that an event will occur

- in genetics we look at the chances of inheriting allele combinations (**genotypes**) and the chance of displaying physical characteristics based on the alleles inherited (**phenotypes**)

[Amoeba Sisters: Monohybrid Crosses](https://www.youtube.com/watch?v=i-OrSv6oxSY) <https://www.youtube.com/watch?v=i-OrSv6oxSY>

Determining Probability

Punnett Square

= diagram which shows the probability of the offspring inheriting certain alleles from a cross between two different individuals

General Steps to Making a Punnett Square

- 1) Determine parents genotype - ex. **BB** or **Bb** or **bb**
- 2) Determine the **possible alleles** each parent can pass on
Ex. A parent who is BB can pass on only one type of allele: **B**
A parent who is Bb can pass on two types: **B** or **b**
- 3) Place the alleles from one parent vertically (across the top) and those for the other parent horizontally (along the side) of the square (= sort alleles)
- 4) Combine the traits together for each square. This represents the possible **genotypes** of each of the offspring
- 5) **Interpret** genotypes & phenotypes as required to determine the chance of one offspring inheriting any given genotype or phenotype (use %'s & ratios)

Example:

A pure white cat is crossed with a heterozygous black cat. Using a punnett square determine the phenotypes and genotypes of the offspring and in what proportion?

Check your answer



Possible Alleles

$bb \times Bb$

$b \quad b \quad B \quad b$

	B	b
b	Bb (Black)	bb (White)
b	Bb (Black)	bb (White)

Interpretation

Genotype: 50% Bb (hybrid); 50% bb (homozygous recessive)

Ratio = 1:1

Phenotype: 50% Black; 50% white

Ratio = 1:1