

## Inheritance Quick Reference

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*Allele*= one version of a simple trait.

Genes in diploid cells have 2 alleles.

*Heterozygous*= Different alleles.

*Homozygous*= Same alleles AKA True-breeding.

A mating is called a cross.

*Monohybrid*= a cross for tracking the inheritance of just one trait.

*Dihybrid*= a cross for tracking the inheritance of two traits.

*Genotype*= Genetic makeup  
*Phenotype*= Physical appearance

*Testcross*= Monohybrid cross with one being homozygous recessive, to establish if other is homozygous.

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Humans have 25,000 genes and 3 million base pairs.

The human Y chromosome has about 19 genes in common with (homologous to) X.

**Gregor Mendel** performed experiments on true-breeding peas to deduce the laws of heredity. He crossed pea plants based on the traits of seed shape, seed color, pod shape, pod color, flower color, flower/pod position, and plant height.

His monohybrid breeding went as follows.

1. He bred two true-breeding parents, i.e. P generation, and created F<sub>1</sub> generation.
2. He bred that with itself, creating F<sub>2</sub> generation.
3. He found that F<sub>2</sub> generation consists of 3:1 (dominant : recessive) for the phenotype, and inferred it was 1:2:1 for genotype.

He established several points:

1. A gene consists of 2 alleles, one from father, one from mother.
2. Alleles can be dominant or recessive.
3. Law of Segregation: allele pairs separate, one for ovum & one for sperm. (Gamete formation.)
4. Law of Independent Assortment: two genes are independent and they segregate independently during meiosis.

Dominant gene gets capital letter. Write it first.

Sex genes nomenclature is X<sup>i</sup>, Y<sup>A</sup>, i/A=allele.

Note that proteins can repress genes.

Generations are labeled P, F<sub>1</sub>, F<sub>2</sub>,...

The classic dihybrid cross of one homozygous dominant with one homozygous recessive has a phenotype result of 9:3:3:1.

**Reginald Punnett** invented the Punnett Square, which predicts the probable results of a cross, given the alleles of the gametes.

1. Get gametes, place them on sides of table. (Remove redundant ones.)
2. Fill in squares to get equally probable outcomes.

*Incomplete dominance* is when both alleles are dominant but not equally. It results in more phenotypes. Example is red/white/pink roses.

*Codominance* is when both alleles are equally dominant. It results in more phenotypes.

Example is ABO blood i.e. I<sup>A</sup>, I<sup>B</sup>, i.

*Lactase* in humans is determined by 3 genes.

Sex chromosome inheritance is an exception to Mendel's laws.

- X and Y share no *sex-related* genes.
- Y's only sex gene is for testes.
- Father's Y goes to sons, X to daughters.

Hemizygous = X<sup>A</sup>Y (males only)

## Pea plants

*Some interesting info.*

The sex organs are the stamen (male) and the carpel (female). Pollen are sperm, and the carpel contains the egg i.e. ovum.

