

## Punnett Square - Probability of Inheritance

In the early 20th century an English geneticist by the name of Reginald Punnett invented a mathematical model for the probability of inheriting specific genetic traits from one's parents. The Punnett Square is a simple model to display possible combinations and probabilities of genotype pairings.

These inherited genetic traits that make up an offspring's genotype are the result of a combination of genes from the parent's gametes which are found in sperm cells and cells from the ova. These gametes normally have one copy of the parent's gene for each trait and when an offspring is formed a combination of each parent's gene is the result.

The Punnett Square can also help illustrate the relationship between dominant and recessive alleles. This can be of particular importance since it is likely that most people are carriers of a number of recessive alleles that can have life-changing and life-threatening results if paired with another individual with similar recessive alleles. The offspring are then susceptible to inheriting these genetic diseases.

Although some genetic traits are not inherited with this simple formula, the Punnett Square has become a standard tool for genetic counselors. The usefulness and simplicity of its use for determining both positive and negative traits in future offspring make it an invaluable mathematical formula.

Genetic contribution  
of one parent

↓   ↓

		g	Y
→	g	gg	Yg
→	Y	Yg	YY

Genetic contribution of the other parent

In the example above the potential combination of genes that the offspring may inherit are shown in blue. This offspring would have a 50% chance of having Yg genotype, 25% chance of gg, and 25% chance of YY. They would also have 75% Y phenotype and 25% g phenotype. These odds would remain for every offspring these parents conceive.

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