

Genetics - The Science of Heredity

Section 3: Punnett Squares

Reginald Punnett created **Punnett squares** to predict the proportions of possible genotypes in offspring. Genotype refers to the genetic makeup of an organism. An organism's phenotype refers to its physical traits.

A Punnett square is a way to visually highlight the four possible combinations of gametes and their offspring in an F_2 generation. Organisms with identical alleles for a particular gene (TT, tt) are **homozygous**, whereas organisms with different alleles for the same gene (Tt) are **heterozygous**.

How to Make a Punnett Square for Monohybrid Cross

Step 1: Start with the parents. Write the genotypes of the two organisms that will serve as parents. In this example we will cross a male and female red-tailed hawk that are heterozygous for large beaks. They each have the genotype Bb and Bb.

Step 2: Determine what alleles would be found in all the possible gametes that each parent could produce.



Step 3: Draw a table with enough squares for each pair of gametes from each parent. Place the genotypes of both parents on the top and left side of the table.

	B	b
B		
b		

Step 4: Write out the new genotypes. Fill in the table by combining the gamete's genotypes.

	B	b
B	BB	Bb
b	Bb	bb

Step 5: Figure out the results by determining the genotype and phenotype of each offspring and calculate the percentage of each. In this example, $\frac{3}{4}$ of the chicks would have large beaks, but only $\frac{1}{2}$ would be heterozygous for this trait (Bb).

A Punnett square can also be created for **dihybrid** crosses. It would be four boxes wide and four boxes tall.

Review:

1. What is the purpose of a Punnett square?
2. Compare homozygous and heterozygous.