



SECTION  
**6.5**

TRAITS AND PROBABILITY  
**Reinforcement**

**KEY CONCEPT** The inheritance of traits follows the rules of probability.

The possible genotypes resulting from a cross can be predicted using a Punnett square. A **Punnett square** is a grid. The axes are labeled with the alleles of each parent organism. The grid boxes show all of the possible genotypes of the offspring resulting from those two parents.

A **monohybrid cross** is used when studying only one trait. A cross between a homozygous dominant organism and a homozygous recessive organism produces offspring that are all heterozygous and have the dominant phenotype. A cross between two heterozygous organisms results in a 3:1 phenotypic ratio in the offspring, where three-fourths have the dominant phenotype and one-fourth have the recessive phenotype. The genotypic ratio resulting from this cross is 1:2:1 of homozygous dominant:heterozygous:homozygous recessive.

A **testcross** is a cross between an organism with an unknown genotype (dominant phenotype) and an organism with the recessive phenotype. If the organism with the unknown genotype is homozygous dominant, the offspring will all have the dominant phenotype. If it is heterozygous, half the offspring will have the dominant phenotype, and half will have the recessive phenotype.

A **diybrid cross** is used when studying the inheritance of two traits. Mendel’s diybrid crosses helped him develop the **law of independent assortment**, which basically states that different traits are inherited separately. When two organisms that are heterozygous for both traits are crossed, the resulting phenotypic ratio is 9:3:3:1.

**Probability** is the likelihood that a particular event, such as the inheritance of a particular allele, will happen. The events of meiosis and fertilization are random, so hereditary patterns can be calculated with probability.

On a separate sheet of paper, draw a Punnett square for a cross between organisms that have the genotypes Bb and bb. Use the Punnett square to answer the following questions.

1. Is this a monohybrid cross or a diybrid cross?

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2. What is the genotypic ratio of the offspring?

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3. What is the phenotypic ratio of the offspring?

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