Heredity Review

Reading

During the mid-1800s, Gregor Mendel was an Austrian monk and scientist. He raised peas in his monastery's garden and made some discoveries. His discoveries were the first of their kind, so Mendel is sometimes called "the father of genetics."

Mendel observed his pea plants as they grew and noticed many differences between them, or many different **traits**. Some plants were tall while others were short. Some had smooth, plump pods while others had wrinkled pods, and the peas could be smooth or wrinkled as well. Some pods were yellow while others were green, and peas came in yellow and green too. The flowers might be white or purple.

Mendel noticed a pattern between parents and offspring, so he began to record each plant's traits and learned how each trait was passed on. Mendel was able to control the plants' pollination to breed specific plants in order to create **controlled experiments**.

Throughout his experiments, Mendel recorded the plant's **phenotype**, or how it is that the plant appears visually. For example, a "short plant" would be a phenotype. He was later able to determine the plant's **genotype**, which we now know is passed on in the plant's **genetic material** or **DNA**. For example, a short plant might have a genotype of `tt`.

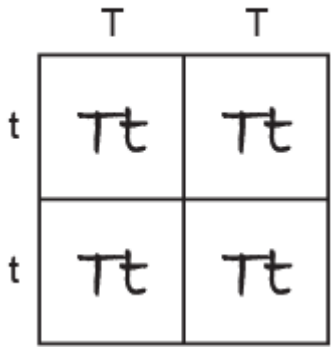
In the example `tt`, each letter represents an **allele**, or a possible gene for a trait. In this case, each lowercase `t` represents a gene for a short plant, so the plant ends up being short. This is a **homozygous recessive** genotype. When you see `TT` instead, the uppercase `T` represents a gene for a tall plant, and the plant ends up being tall. This is a **homozygous dominant** genotype. A **hybrid** or **heterozygous** genotype, however, is a little more interesting. A plant with a genotype of `Tt` has the genes to be short and the genes to be tall, but only the dominant (tall) gene will be expressed.

Looking at a plant, it is impossible to tell a plant's genotype unless you see only the recessive phenotype. In order to tell the genotype of the plant, or to determine an offspring's chances of showing a trait, you must complete a **punnet square**, which helps you compute the possibilities.

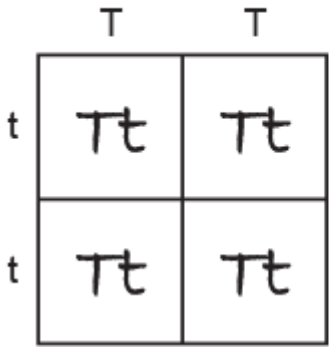
In Example A below, a parent that is known to be homozygous dominant breeds with a plant that is homozygous recessive. All of the offspring will be heterozygous or hybrids.

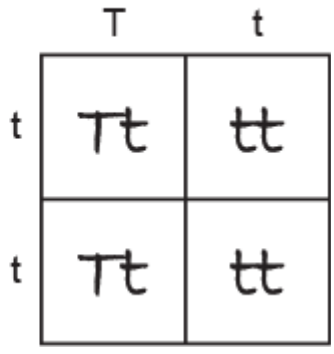
In Example B below, we only know that one parent shows the dominant trait while the other shows the recessive trait. The plant that shows the recessive trait must have a homozygous recessive genotype, but the plant showing the dominant trait can be either homozygous dominant (`TT`) or heterozygous (`Tt`). As a result, we have to complete 2 punnet squares to see all the possibilities.

Example A



Example B





Vocabulary

What is a trait?

What is the difference between a phenotype and a genotype?

What is genetic material or DNA? What are some other names for the same substance?

What does the prefix homo- mean?

What does the prefix hetero- mean?

Activities

1. Complete the punnet square for plant tallness, then describe the phenotypes of the possible offspring.

	T	t
T		
t		

Offspring 1: _____

Offspring 2: _____

Offspring 3: _____

Offspring 4: _____

2. Green pods are dominant and yellow pods are recessive. Complete the punnet square for pod color, then identify the chances of each phenotype and genotype in the offspring.

	P	p
P		
P		

Green pods: _____

Yellow pods: _____

Homozygous dominant: _____

Heterozygous / hybrid: _____

Homozygous recessive: _____

3. Round peas are dominant and wrinkled peas are recessive. Complete the punnet square, then identify the chances of each phenotype and genotype in the offspring.

	P	p
p		
p		

Round peas: _____

Wrinkled peas: _____

Heterozygous / hybrid: _____

Homozygous recessive: _____