Name: _____

Punnett Squares

An animal geneticist studies genes in animals. Genes are passed from parent to offspring and determine the traits an organism has. For example, fur color, scale patterns, and fin length are all determined by genes.



Step 1: Read information about Genes

Read the information below about genes. Then, answer the questions on the next page.

Types of Genes

- There are two types of genes. One type of gene is called a dominant gene. Dominant genes are genes that always "show up." This means that when a child inherits a dominant gene from a parent, the child will have that trait. For example, dark (brown) eyes is a dominant gene. This means that if a child inherits a dark-eyed gene from a parent, the child will have dark eyes.

- Another type of gene is called a recessive gene. Recessive genes only show up if there are no dominant genes. For example, light (blue/green) eyes is a recessive gene. This means that only a child that inherits a light-eyed gene from both parents will have light eyes.

- Important note! Dominant genes cover up any recessive genes. This means if a child inherits one dark-eyed gene and one light-eyed gene, the child will have dark eyes. This is because the dark-eyed gene is dominant.

Name: _____

Punnett Squares

Writing Genes

Each gene is written as two letters next to each other. This is because each gene has two alleles for a trait. An allele is a piece of genetic information that came from one parent. This means that each gene has genetic information from a mother and a father.

- Uppercase letters represent dominant genes.
- Lowercase letters represent recessive genes.

Each of the three examples below show a possible gene combination for eye color in humans. Dark eyes are dominant and represented with an upper case E. Light eyes are recessive and represented with a lower case e.

E E

- This person received a dominant, dark-eyed gene from each parent.
- This person has brown eyes.
- This person can only pass on dark-eyed genes.

E e

- This person received a dominant, dark-eyed gene from one parent and a recessive, light-eyed gene from the other parent.
- This person has brown eyes.
- This person can pass on dark or light eyed genes.

e e

- This person received a recessive, light-eyed gene from each parent.
- This person has light eyes.
- This person can only pass on light-eyed genes.

Read each statement below. If the statement is true, write "True" on the line. If the statement is false, write "False" on the line.

1. A recessive gene can only show up if there is a dominant gene present. _____

2. If a child inherits one dominant gene and one recessive gene for a trait, the child will show the dominant trait. _____

3. Two blue-eyed parents can have a brown-eyed child. _____

4. A child with one brown-eyed gene and one blue-eyed gene will have one eye of each color. _____

5. A capital letter represents a dominant gene. _____

Name: _____

Punnett Squares

Step 2: Learn about Punnett Squares

Read the information below about Punnett squares.

Geneticists use tools to help them predict which traits offspring will inherit from parents. One tool geneticists use is called a Punnett square. A Punnett square is a diagram that lets geneticists see the different gene combinations children could inherit from their parents. The diagram has four boxes. Information about the mother's and father's genes go on the outside of the boxes. Then, the genes are combined inside the boxes to show each possible offspring.

Here is an example of how to make a Punnett square:

Learn about the father and mother

A brown fur father mouse (Ff) mates with a yellow fur mother mouse (ff).

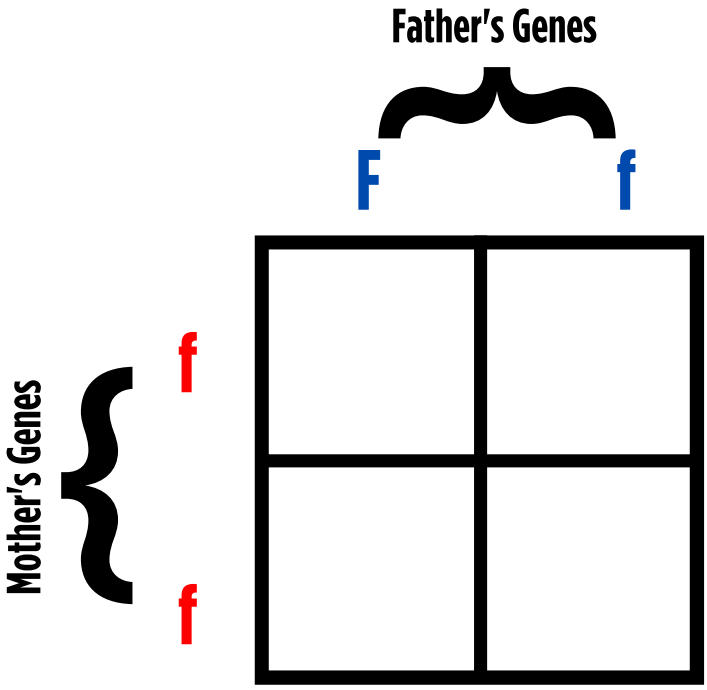
Father Mother

Learn about which allele is recessive and which is dominant

In mice, brown fur color (F) is dominant to yellow fur color (f).

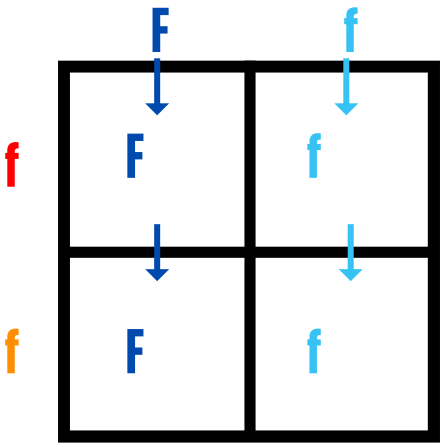
Draw a Punnett square and write allele information outside of square

- The father organism's alleles are written across the top of the Punnett square.
- The mother organism's alleles are written down the left side of the Punnett square.



Name: _____

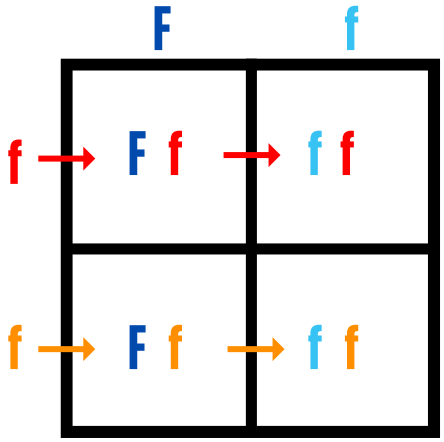
Punnett Squares



Complete Punnett square

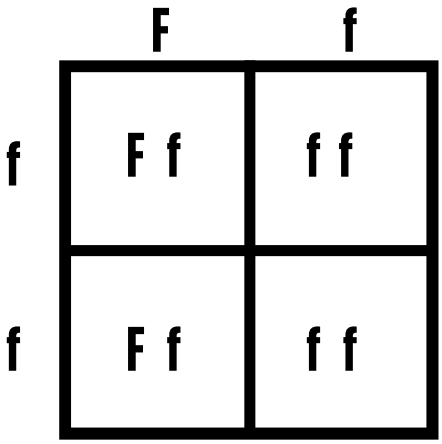
To complete a Punnett square, we use each parent's genes to fill in the center boxes.

- The father's alleles are written in the two boxes below each allele.
- The mother's alleles are written in the two boxes to the right of each allele.



Analyze Punnett square

The finished Punnett square can be used to tell what the offspring might look like. Since there are 4 boxes, each box represents a 1 in 4 or 25% chance that the offspring will have that set of genes.



In this example:

- 0 out of 4 of the boxes has an offspring with the genes of FF.
- 2 out of 4 of the boxes have an offspring with the genes of Ff. These mouse offspring will have brown fur.
- 2 out of 4 of the boxes has an offspring with the genes of ff. These mouse offspring will have brown fur.

Name: _____

Punnett Squares

Step 3: Make your own Punnett square

Imagine that you are an animal geneticist who is learning about cats. In cats, there is a genetic condition called polydactyly. Polydactyly is extra toes on each paw. Polydactyly is passed from parent to offspring.

Follow the steps below to make a Punnet square to figure out the chance of two polydactyl cats having polydactyl offspring.

Learn about the father and mother

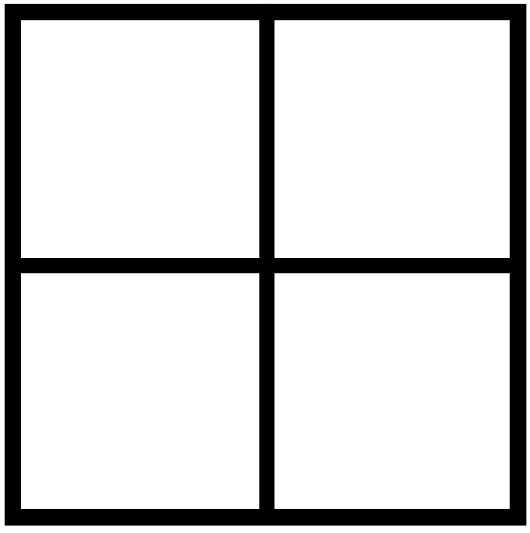
A polydactyl father (Tt) mates with a polydactyl (Tt) mother.

Learn about which allele is recessive and which is dominant

Polydactyly is dominant (T) to non-polydactyly (t)

Complete Punnett square

Write the allele information for the mother cat and father cat outside of square. Then, complete the square to figure out what the offspring might look like.



Name: _____

Punnett Squares

Analyze Punnet square

Answer the questions below about what the cat offspring might look like.

1. By looking at the offspring's genes, how do you know that it has polydactyly?

2. There is a _____ out of _____ chance that an offspring cat will have the genes TT.

3. There is a _____ out of _____ chance that an offspring cat will have polydactyly.

4. Can two parents that have polydactyly have an offspring that does not have polydactyly? Why or why not?

5. Can two parents that do not have polydactyly have an offspring that does have polydactyly? Why or why not?