# Station 1

## Background Information:

Farmers wanting certain traits in their crops or animals have used selective breeding. With selective breeding, farmers would choose individuals with the desirable traits and cross them (allow them to mate) with the hope that their offspring will show the desired traits. For example, turkeys have been selectively bred to produce more white meat, racehorses are selectively bred for speed, and wheat is selectively bred to produce larger heads of grain.

## Punnett Square Problem:

Farmer Joe prefers pea plants that are tall. He received 2 tall pea plants from a neighbor and wants to know if he will get all tall plants next year. Keep in mind that tall pea plants are dominant over short pea plants. If one of farmer Joe's pea plants is pure dominant and the other is a hybrid, using the letter "T" determine the offspring.
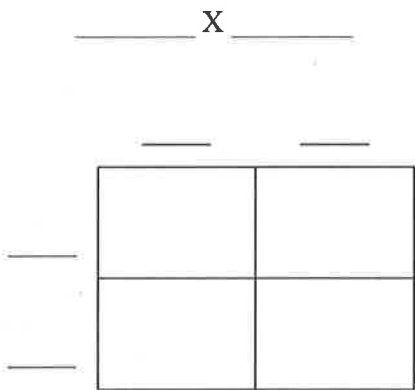
## Questions:

1. Will all of farmer Joe's pea plants be tall next year? (Explain and give Evidence)

2. If farmer Joe uses the offspring of these parents will he always have tall plants? (Explain and give evidence)

3. Farmer Joe does not know anything about genetics. He would like to know how you did the punnett square. Explain the steps you took to do the punnett square. (Number and list the steps)

# Station 1

**Background Information:**

   1.  What is selective breeding?

   2.  Give an example of something that is selectively breed.

**Punnett Square:**

_____ X _____

| Genotype | % | Ratio |
|---|---|---|
| | | |
| | | |

| Phenotype | % | Ratio |
|---|---|---|
| | | |
| | | |

**Answers to Questions (USE COMPLETE SENTENCES!):**

1.

2.

3.

# Station 2

## Background Information:
A punnett square can be used to predict the probability of an organism inheriting a given trait. It can also be used to determine possible genotypes and phenotypes of offspring.

## Punnett Square Problem:
Sally has a widow's peak, and her husband Chad has a straight hairline. Chad knows his genotype is pure recessive (dd). Sally does not know her genotype, but she does know that her Mom is pure recessive and her Dad is pure dominant.

**First**, determine Sally's genotype and give evidence of your answer. (Do not use the punnett square space)

**Second**, use a punnett square to determine the probability (chance) of Chad and Sally having offspring with a widow's peak and with straight hairline.

## Questions:
1. What is the probability (chance) of Chad and Sally having offspring with a widow's peak? (Explain & give evidence)
2. What is the probability (chance) of Chad and Sally having offspring with a straight hairline? (Explain & give evidence)
3. Chad had a straight hairline, explain how he knew what his genotype was without looking at his parents?
4. Since Chad was pure recessive (dd), what are the possible genotypes of his Mom and Dad? (Explain how you know this)

# Station 2

**Background Information:**
1. Give 2 uses for a punnett square.

**Punnett Square:**
**Determine Sally's genotype (explain)**

**Punnett Problem:**

_____ X _____

| Genotype | % | Ratio |
|---|---|---|
|  |  |  |

| Phenotype | % | Ratio |
|---|---|---|
|  |  |  |

**Answers to Questions (USE COMPLETE SENTENCES!):**

1.


2.


3.


4.

# Station 3

## Background Information:

Everybody has a blood type. The most common blood type classification system is the ABO system. There are four types of blood in the ABO system: A, B, AB, and O. Your blood type is established before you are born, by specific genes inherited from your parents. These two genes determine your blood type by causing proteins to exist on the surface of all of your red blood cells. There are 3 alleles or versions of the blood type gene: A, B, and O. Since everybody has 2 copies of these genes, there are 6 possible combinations (genotypes); AA, BB, OO, AB, AO, and BO. Your genes determine your blood type. The following chart shows the blood type associated with the genotype.

| Blood type | Type A | Type B | Type AB | Type O |
|---|---|---|---|---|
| Genotype | AA or AO | BB or BO | AB | OO |

Because there are only 4 types of blood, it is possible to take blood from one person and donate it to another person in a process called transfusion. The blood type of the donor (giver) and the blood type of the receiver must be compatible. If the blood is not compatible, the receiver's body will reject the new blood.

| Blood Type | Receive blood from people with... | Give blood to people with... |
|---|---|---|
| OO | O only | Any type |
| AB | Any type | AB only |
| AA, AO | AA, AO, OO | AA, AO, AB |
| BB,BO | BB, BO, OO | BB, BO, AB |

## Punnett Square Problem:

Mr. Odenbach has type AB blood, genotype AB. Mrs. Odenbach has type O blood, genotype OO. What possible blood types could the baby have?

## Questions:

1. What possible blood types could the baby have? (Explain and give evidence)

2. Using your answer from question 1, explain what possible types of blood the baby could receive.
   (Hint: Set up answer like the following: If the baby is blood type _____ then it could receive ____ blood type because _____. But if the baby is blood type _____ then it could receive ____ blood type because _____. )

# Station 3

**Background Information:**

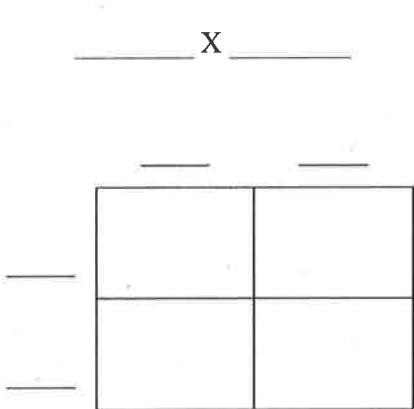1. What are the 4 types of blood?


2. What are the 6 possible blood genotypes?


3. What is a blood transfusion?



4. Someone with a type BO blood can receive blood from what type?


5. Someone with a type OO blood can give blood to what type?



**Punnett Square:**

_____ X _____

| Genotype (Letters) | % | Ratio |
|---|---|---|
|  |  |  |

| Phenotype (Blood Type) | % | Ratio |
|---|---|---|
|  |  |  |

**Answers to Questions (USE COMPLETE SENTENCES!):**

1.



2.

# Station 4

## Background Information:

Some diseases are passed from parents to offspring through their genes, these are considered genetic diseases. Some of the inherited disorders that fall into this category include Tay-sachs disease, sickle-cell anemia, hemophilia, and cystic fibrosis. <u>A child can suffer from one of these diseases only if both parents pass on a recessive gene for the disease.</u> The following chart describes each disease.

| Disease | Description |
|---|---|
| Tay-sachs | Causes the progressive (slow) destruction of the central nervous system |
| Sickle-cell anemia | Red blood cells are not round, they are hard, sticky and crescent shaped, causing them to get stuck in the small blood tubes. They clog the flow causing pain and possible damage to organs. |
| Hemophilia | The blood does not clot normally, causes abnormal bleeding after injury, even a bruise. |
| Cystic fibrosis | Body produces abnormally thick, sticky mucus which clogs the lungs leading to recurring infections |

## Punnett Square Problem:

1. Mrs. Odenbach was tested for the cystic fibrosis gene. It was determined that she is pure dominant (FF). Mr. Odenbach's genotype is unknown. If he is pure dominant (FF), is it possible for the baby to have cystic fibrosis or carry the gene? Do a punnett square to prove your answer.
2. If Mr. Odenbach is a Hybrid, is it possible for the baby to have cystic fibrosis or carry the gene? Do a punnett square to prove your answer.
3. If Mr. Odenbach is pure recessive, is it possible for the baby to have cystic fibrosis or carry the gene? Do a punnett square to prove your answer.

## Questions:

The questions are asked in the punnett square problems.

# Station 4

**Background Information:**

1. What is a genetic disease?

2. If a person has one of these genetic diseases, what is the only genotype they could be? (Explain how you know this)

**Punnett Square:**

**Situation 1**

#1 ___FF_ X _FF___

| Genotype | % | Ratio |
|---|---|---|

| Phenotype | % | Ratio |
|---|---|---|

**Question 1:**

**Situation 2**

#2 ___FF_ X _Ff___

| Genotype | % | Ratio |
|---|---|---|

| Phenotype | % | Ratio |
|---|---|---|

**Question 2:**

# Station 4 Continued

**Situation 3**

#3 ___FF_ X _ff_

| Genotype | % | Ratio |
|---|---|---|
| | | |

| | | |
|---|---|---|
| | |
| | |

| Phenotype | % | Ratio |
|---|---|---|
| | | |

**Question 3:**

**Answers to Questions (USE COMPLETE SENTENCES!):**
## These are answered under the punnett squares.