Name: _____ Date: _____ Period: ____

Genetics: Punnett Squares and Incomplete vs Codominance

Most genetic traits have a stronger, dominant allele and a weaker, recessive allele. In an individual with a heterozygous genotype, the dominant allele shows up in the offspring and the recessive allele gets covered up and doesn't show; we call this **complete dominance**.
However, some alleles don't completely dominate others. In fact, some heterozygous genotypes allow both alleles to partially show by blending together how they are expressed; this is called **incomplete dominance**. Other heterozygous genotypes allow both alleles to be completely expressed at the same time; this is called **codominance**.

Complete dominance =

Incomplete dominance =

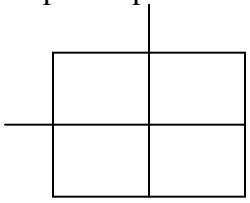
Codominance =

Hybrid = Purebred Line =

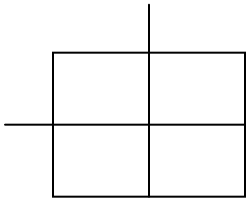
Practice Problems

1. Snapdragons are incompletely dominant for color; they have phenotypes red, pink, or white. The red flowers are homozygous dominant, the white flowers are homozygous recessive, and the pink flowers are heterozygous. Give the genotypes for each of the phenotypes, using the letters "R" and "W" for alleles:
   a. Red snapdragon genotype: _____
   b. Pink snapdragon genotype: _____
   c. White snapdragon genotype: _____

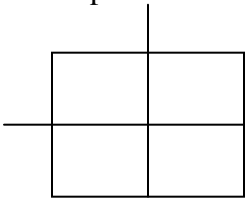
2. Show genetic crosses between the following snapdragon parents, using the punnett squares provided, and record the genotypic and phenotypic ratios below:
   a. pink x pink
   b. red x white
   c. pink x white



Genotypic Ratio: ____:____:____
Phenotypic Ratio: ____:____:____



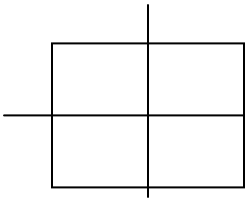
Genotypic Ratio: ____:____:____
Phenotypic Ratio: ____:____:____



Genotypic Ratio: ____:____:____
Phenotypic Ratio: ____:____:____

3. In horses, some of the genes for hair color are incompletely dominant. Genotypes are as follows: brown horses are BB, white horses are WW and a BW genotype creates a yellow-tannish colored horse with a white mane and tail, which is called "palomino". Show the genetic crosses between the following horses and record the genotypic and phenotypic ratios:

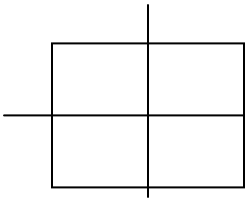
a. brown x white



Genotypic Ratio: ____:____:____

Phenotypic Ratio: ____:____:____

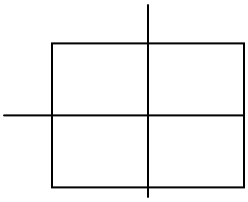
b. brown x palomino



Genotypic Ratio: ____:____:____

Phenotypic Ratio: ____:____:____

c. palomino x palomino



Genotypic Ratio: ____:____:____

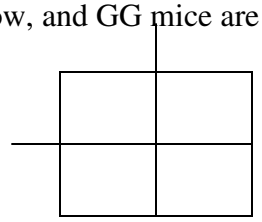
Phenotypic Ratio: ____:____:____

4. Can palominos be considered a purebred line of horses? Why or why not?

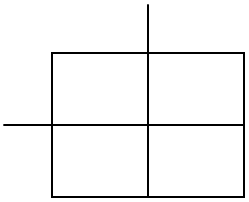
5. Which two colors of horse would you want to breed if you wanted to produce the maximum numbers of palominos in the shortest amount of time?

6. In mice, there is a lethal mutation that causes embryos with the homozygous dominant genotype YY to die before birth. Baby mice with the genotype YG appear yellow, and GG mice are gray.

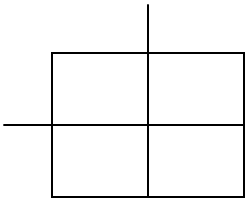
a. If 2 gray parent mice mate, what % of their offspring would be expected to die before birth?



b. If 1 gray mouse and 1 yellow mouse mate, what % of their offspring would be expected to die before birth?



c. If 2 yellow parent mice mate, what percent of their offspring would be expected to die before birth?



Codominance Worksheet (Blood types)

Human blood types are determined by genes that follow the CODOMINANCE pattern of inheritance. There are two dominant alleles (I^A and I^B) and one recessive allele (i).

Blood Type (Phenotype)	Genotype	Can donate blood to:	Can receive blood from:
O	ii	A,B,AB and O (universal donor)	O
AB	I^AI^B	O, AB	A,B,AB and O (universal receiver)
A	I^AI^A or I^Ai	AB, A	O,A
B	I^BI^B or I^Ai	AB,B	O,B

1. Write the genotype for each person based on the description:

    a. Homozygous for the "B" allele _____
    b. Heterozygous for the "A" allele _____
    c. Type O _____
    d. Type "A" and had a type "O" parent _____
    e. Type "AB" _____
    f. Blood can be donated to anybody _____
    g. Can only get blood from a type "O" donor _____

2. Pretend that Brad Pitt is homozygous for the type B allele, and Angelina Jolie is type "O." **What are all the possible blood types of their baby?**

3. Draw a Punnett square showing all the possible blood types for the offspring produced by a type "O" mother and an a Type "AB" father

4. Mrs. Clink is type "A" and Mr. Clink is type "O." They have three children named Matthew, Mark, and Luke. Mark is type "O," Matthew is type "A," and Luke is type "AB." Based on this information:
    a. Mr. Clink must have the genotype _____
    b. Mrs. Clink must have the genotype _____ because _____ has blood type _____
    c. Luke cannot be the child of these parents because neither parent has the allele _____.

5. Two parents think their baby was switched at the hospital. Its 1968, so DNA fingerprinting technology does not exist yet. The mother has blood type "O," the father has blood type "AB," and the baby has blood type "B."
    a. Mother's genotype: _____
    b. Father's genotype: _____
    c. Baby's genotype: _____ or _____
    d. Punnett square showing all possible genotypes for children produced by this couple

    e. Was the baby switched?

6. Two other parents think their baby was switched at the hospital. The mother has blood type "A," the father has blood type "B," and the baby has blood type "AB."
    a. Mother's genotype: _____ or _____
    b. Father's genotype: _____ or _____
    c. Baby's genotype: _____
    d. Punnett square that shows the baby's genotype as a possibility:

    e. Was the baby switched?

7. Based on the information in this table, which man **could not** be the father of the baby? Justify your answer with a Punnett square.

Name	**Blood Type**
Mother	Type A
Baby	Type B
Sammy the player	Type O
George the sleeze	Type AB
The waiter	Type A
The cable guy	Type B

8. Based on the information in this table, which man **could not** be the father of the baby? Justify your answer with a Punnett square.

Name	**Blood Type**
Mother	Type O
Baby	Type AB
Bartender	Type O
Guy at the club	Type AB
Cabdriver	Type A
Flight attendant	Type B

9. Explain why blood type data cannot prove who the father of a baby <u>is</u>, and can only prove who the father <u>is not</u>.