## Genetics: Punnett Squares Practice Packet

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 like spots or stripes; this is called **codominance**. Examples of each are listed below.

Write what each type would be if they were heterozygous.

1. Complete dominance = If a Red (RR) and White flower (rr) were crossbred, resulting in 100% Rr, what phenotype would been seen according to the rules of COMPLETE dominance?
2. Incomplete dominance = If a Red (RR) and White flower (rr) were crossbred, resulting in 100% Rr, what phenotype(s) would been seen according to the rules of IN-complete dominance?
3. Codominance = If a Red (RR) and White flower (WW) were crossbred, resulting in 100% RW, what phenotype(s) would been seen according to the rules of CO-dominance?

# Incomplete dominance practice Problems

4-6. 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 “ r ” for alleles:

a. Red snapdragon b. Pink snapdragon c. White snapdragon

genotype: \_\_\_\_\_\_ genotype: \_\_\_\_\_\_ genotype: \_\_\_\_\_\_

Show genetic crosses between the following snapdragon parents, using the punnett squares provided, and record the genotypic and phenotypic %s below:

a. pink x pink b. red x white c. pink x white

Genotypic Genotypic Genotypic

%: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Phenotypic Phenotypic Phenotypic

%: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7-9. In horses, some of the genes for hair color are incompletely dominant. Genotypes are as follows: brown horses are BB, white horses are bb and a Bb 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 percentages:

a. brown x white b. brown x palomino c. palomino x palomino

Genotypic Genotypic Genotypic

%: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Phenotypic Phenotypic Phenotypic

%: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ %: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

11. 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?

**Genetics: X Linked Genes**

In fruit flies, eye color is a sex linked trait. Red is dominant to white.

1. What are the sexes and eye colors of flies with the following genotypes:

X R X r \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_X R Y \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

X R X R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_X r Y \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What are the genotypes of these flies:

white eyed, male \_\_\_\_\_\_\_\_\_\_\_\_ red eyed female (heterozygous) \_\_\_\_\_\_\_\_

white eyed, female \_\_\_\_\_\_\_\_\_\_\_ red eyed, male \_\_\_\_\_\_\_\_\_\_\_

3. Show the cross of a white eyed female X r X r with a red-eyed male X R Y .

4. Show a cross between a pure red eyed female and a white eyed male.  
 What are the genotypes of the parents:

\_\_\_\_\_\_\_\_\_\_\_& \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many are:

white eyed, male\_\_\_

white eyed, female \_\_\_

red eyed, male \_\_\_\_

red eyed, female \_\_\_\_

5. Show the cross of a red eyed female (heterozygous) and a red eyed male. What are the genotypes of the parents? \_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many are:

white eyed, male\_\_\_white eyed, female \_\_\_

red eyed, male \_\_\_\_ red eyed, female \_\_\_\_

7. In humans, hemophilia is a sex linked trait. Females can be normal, carriers, or have the disease. Males will either have the disease or not (but they won’t ever be carriers)

|  |  |
| --- | --- |
| XHXH = female, normal  XHXhh= female, carrier  XhhXhh = female, hemophiliac | XhhY= male, normal  XHY= male, hemophiliac |

Show the cross of a man who has hemophilia with a woman who is a carrier.

8. What is the probability that their children will have the disease? \_\_\_\_\_\_\_\_\_\_

9. A woman who is a carrier marries a normal man. Show the cross. What is the probability that their children will have hemophilia? What sex will a child in the family with hemophilia be?

10. A woman who has hemophilia marries a normal man. How many of their children will have hemophilia, and what is their sex?