

Punnett Square Review

Complete each of the following problems to practice the 4 different types of crosses

1. In peas, **yellow color (G)** is dominant to **green (g)**. What are the possible genotypes and phenotypes of a cross-pollination of a heterozygous female and a heterozygous male?

2. In pea plants, tall (T) is dominant to dwarf (t). Show the cross between a heterozygous tall and a dwarf plant. What is the phenotypic ratio?



3. Chocolate labs are dominant to yellow labs. If a yellow lab is crossed with a chocolate lab that is heterozygous for the trait, what percentage of labs will be yellow?



4. In goats, a recessive gene causes the goats to "faint" when they are startled. A farmer breeds two goats (that have never fainted) and their first offspring faints two days after its birth. What must the parent's genotypes have been? Show the cross to prove it.



5. A tall plant of unknown genotype is test-crossed. Of the offspring, 869 are dwarf and 912 are tall. What is the genotype of the unknown parent? Show the cross to prove it.

6. In humans, wavy hair is the result of curly hair and straight hair. A curly-haired man and wavy-haired woman have children. What is the likelihood of their children having the same phenotype as the father.

7. Blood types are an example of Co-Dominance. One parent is Type A heterozygous and the other parent is Type B homozygous. What percentage chance will the offspring have of having Type AB blood.

8. Cats can be black, yellow or calico. A calico cat has black and yellow splotches. When a calico cat is crossed with a black cat. What are the phenotypes of the offspring and in what proportion?



9. A woman would like to identify her parent's genotypes. She is Type A and she knows her mother is Type B. Is it possible to determine her father's blood types?

10. In guinea pigs, short hair is dominant to long hair. Also in guinea pigs, black eyes are dominant to red eyes. A male guinea pig that is heterozygous for both traits is crossed with a female that is long haired and red eyed. What is the ratio of offspring that will have short hair and black eyes to short hair and red eyes?

11. In Western salsify plants yellow color is dominant over blue flowers while the heterozygous condition results in plants with green flowers. For each of the following construct a Punnett square and give phenotypic and genotype ratios of the offspring.

- a) a yellow plant and a blue plant
- b) a yellow plant and a green plant
- c) a blue plant and a green plant



12. In some cats the gene for tail length shows 3 phenotypes. Cats with long tails and cats with no tails are homozygous for their respective alleles. Cats with one long tail allele and one no tail allele have short tails. What are the genotypic and phenotypic ratios produced from a cross of a short tail and a tailless cat.

13. In horses, the coat color black is dominant (B) over chestnut (b). The trotting gait is dominant (T) over the pacing gait (t). If a homozygous black pacer is mated to a homozygous chestnut, heterozygous trotter, what will be the ratios for genotype and phenotype be?

14. Imagine that a couple is planning to have children. The male is heterozygous for Huntington's disease and homozygous dominant for Tay-Sachs. The female is homozygous recessive for Huntington's disease and heterozygous for Tay-Sachs. The couple is curious about the possibility and probability of their offspring inheriting Tay-Sachs and/or Huntington's. For humans, Huntington's disease is dominant (H) over the "normal" condition (h), and the "normal" condition is dominant (T) over Tay-Sachs (t). Complete a Punnett square for this cross and record the probabilities for genotypes and phenotypes of the offspring as ratios.

15. Cystic fibrosis is a recessive genetic disorder that causes a thick, sticky mucus to build up in the lungs and digestive tract. Ron is homozygous , exhibiting all symptoms of CF, and Nancy is a carrier, exhibiting some symptoms of CF. Use a Punnett square to predict the probability that one of their children will have cystic fibrosis?