

GENETICS PRACTICE PROBLEMS

Try the online genetics practice problems at:

- <http://biology.clc.uc.edu/courses/bio105/geneprob.htm>
- http://www.biology.arizona.edu/mendelian_genetics/mendelian_genetics.html
- <http://www.k-state.edu/biology/pob/genetics/intro.htm>

Basic conventions

1. For each genotype below, indicate whether it is heterozygous (He) or homozygous (Ho)

AA _____ Ee _____ Ii _____ Mm _____
Bb _____ ff _____ Jj _____ nn _____
Cc _____ Gg _____ kk _____ oo _____
DD _____ HH _____ LL _____ Pp _____

2. What is the difference between a gene that is *dominant* and a gene that is *frequent in a population*?

3. For each of the genotypes below determine what phenotypes would be possible.

Purple flowers are dominant to white flowers.

Bobtails in cats are recessive.

PP _____

TT _____

Pp _____

Tt _____

pp _____

tt _____

Monohybrid crosses

1. Cystic fibrosis is a genetic disorder caused by a single gene that coded for a protein in the cell membranes of the lung cells and cells lining the intestines. If a person inherits two defective copies of the gene, they show CF symptoms. If a person inherits only one defective copy and one “good” copy of the gene, they make enough of the functional CF protein that they show few or no symptoms. This is why the CF gene is considered “recessive.” For each of the cases below, use Punnet squares to determine the chances of the children of the given sets of parents of inheriting two defective copies of the gene, and therefore having CF. Use CF for the “good” (dominant) allele and cf for the “broken” (recessive) allele.

Dad: CF CF

Mom: cf cf

Dad: CF cf

Mom: cf cf

Dad: CF CF

Mom: cf cf

Dad: CF cf
Mom: cf cf

2. Gregor Mendel developed the first models of heredity after he studied inheritance of traits in pea plants. Mendel selected certain traits, such as flower color, plant height, pea color, pea shape, and others. Beginning with purebreeding strains of peas for each trait, he crossed various forms of the traits (white flowers with purple, wrinkled peas with smooth, etc.), examined the traits in the offspring, then crossed the offspring generation and counted how many of the next generation showed the various traits. After nine years of careful gathering, recording, and analyzing data, Mendel described his laws of heredity. He was the first to use the terms “dominant” and “recessive” in describing how traits are inherited and expressed. The following questions relate to peas and their traits.

a. A TT (tall) plant is crossed with a tt (short plant). What percentage of the offspring will be tall?

b. A Tt plant is crossed with a Tt plant. What percentage of the offspring will be short?

c. A heterozygous round seeded plant (Rr) is crossed with a homozygous round seeded plant (RR). What percentage of the offspring will be homozygous (RR)?

d. A homozygous round seeded plant is crossed with a homozygous wrinkled seeded plant.

What are the genotypes of the parents?

_____ x _____

What percentage of the offspring will also be homozygous?

e. In pea plants purple flowers are dominant to white flowers. If two white flowered plants are crossed, what percentage of their offspring will be white flowered?

f. A white flowered plant is crossed with a plant that is heterozygous for the trait. What percentage of the offspring will have purple flowers?

g. Two plants, both heterozygous for the gene that controls flower color are crossed.

What percentage of their offspring will have purple flowers?

What percentage will have white flowers?

3. Guinea pigs were a popular model for observing genetics in early genetic studies (as were fruit flies). Try these problems involving Guinea pig genetics.

a. In guinea pigs, the allele for short hair is dominant.

What genotype would a heterozygous short haired guinea pig have? _____

What genotype would a purebreeding short haired guinea pig have? _____

What genotype would a long haired guinea pig have? _____

b. Show the cross for a pure breeding short haired guinea pig and a long haired guinea pig. What percentage of the offspring will have short hair?