Punnett Square Practice

Name _____ Date _____ Class _____

Monohybrid (Single trait) Cross

1. In humans, albinism (a) is recessive to normal pigmentation (A). Complete a Punnett square between a heterozygous man who marries an albino woman.

a. What are the genotypes of the parents?
Father _____ Mother _____
b. What is the probability of having a child with normal pigmentation? _____
c. What is the probability that the next child will also be normal? _____
d. What is the probability of having a child that is an albino? _____

2. In humans, unattached earlobes (E) is dominant over attached earlobes (e). If one parent is homozygous dominant for free earlobes, while the other has attached earlobes can they produce any children with attached earlobes?

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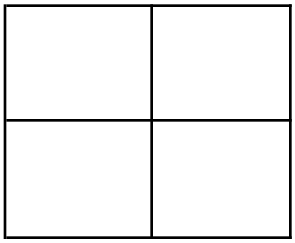

Explain

3. In humans widow's peak (H) is dominant over straight hairline (h). A heterozygous man marries a woman who is also heterozygous.
a. List possible genotypes of their offspring.

b. List the phenotypic ratio for their children.

Working Backwards
Sometimes we only know about the offspring and we want to learn about the parents. For example, when both parents are heterozygous the phenotypic ratio always comes out 3 to 1. If one parent is homozygous recessive and the other is heterozygous, the phenotypic ratio always comes out 1 to 1. Keeping this in mind see if you can solve the next two problems.

1. In pea plants, yellow seeds (G) are dominant and green seeds (g) are recessive. A pea plant with yellow seeds is crossed with a pea plant with green seeds. The resulting offspring have about equal numbers of yellow and green seeded plants. What are the genotypes of the parents? Explain.

2. In another cross, a yellow seeded plant was crossed with another yellow seeded plant and it produced offspring of which about 25% were green seeded plants.
What are the genotypes of both parents?

Back Cross/Test Cross

When an organism has the dominant phenotype, it can be either heterozygous or homozygous dominant (you can't tell by looking at it). In order to find out we must do a test cross using an homozygous, recessive organism.

*For example: In Dalmatian dogs, the gene for black spots is dominant to the gene for liver colored spots. If a breeder has a black spotted dog, how can she find out whether it is homozygous(BB) or heterozygous(Bb)? *B = black spots and b = liver spots*

If the breeder finds a black spotted dog, whose ancestry is not known, she cannot tell by looking at the dog if it is BB or Bb. She should find a liver spotted dog, whose genotype must be "bb" and mate it with the black spotted dog in question. Complete the squares.

	B	***B***
b		
b		

OR

	B	***b***
b		
b		

***If any of the offspring has liver spots, then she can say that she had a heterozygous black spotted dog. If all the offspring had black spots then she can say that the suspect dog was most likely homozygous dominant.*

1. You found a wild, black mouse. Explain how you would determine the genotype of this mouse. **Hint in mice, white fur is recessive*.

a. Draw Punnett squares for your possible crosses.

b. If the actual mating resulted in 24 offspring, 23 with black fur and 1 with white fur. What was the genotype of the wild black mouse? _____

c. If you only had 3 black offspring, can you tell what the genotype was of the suspect mouse? Explain why or why not.

Dihybrid Cross

1. In pea plants, the round seed allele (R) is dominant over the wrinkled seed allele (r), and the yellow seed allele (G) is dominant over the green seed allele(g). The genes for seed texture and those for seed color are on different chromosomes.

A plant heterozygous for seed texture and seed color is crossed with a plant that is wrinkled and heterozygous for seed color. (*R = round, r = wrinkled, G=yellow, g = green)*

a. Construct a Punnett square for this cross.

Genotypes of the parents: Parent 1 _____ Parent 2 _____

Possible Gametes: Parent 1 _____ Parent 2 _____

b. What is the expected **phenotypic** ratio for the offspring?

2. In humans there is a disease called Phenylketonuria (PKU) which is caused by a recessive allele. People with this allele have a defective enzyme and cannot break down the amino acid phenylalanine. This disease can result in mental retardation or death. Let "**E**" represent the normal enzyme.
Also in humans in a condition called galactose intolerance or galactosemia,
which is also caused by a recessive allele. Let "**G**" represent the normal allele for galactose digestion.
If two adults were heterozygous for both traits (EeGg)…

Chances of having a child that:

Is completely normal? _____

Has just PKU? _____

Has just galactosemia? _____

Has both diseases? _____

1. **Deducing Genotypes- fill in the missing alleles only when you can be sure!**

Parent 1	Parent 2	Offspring 1	Offspring 2	Offspring 3
Dd	**dd**	**D___**	**D___**	**____ ____**
G ___	**G ___**	**G___**	**gg**	**____ ____**
____ ____	**R ___**	**rr**	**RR**	**R ____**

2. In man, the ability to taste (T) the chemical PTC is dominant over non-tasting (t) and dark hair (B) is dominant over blonde hair (b). A man with dark hair who is a non-taster marries a woman with blonde hair who is a taster. They have a son who has blonde hair and who is a non-taster and a daughter who is a taster with dark hair.

a. To the extent possible, list the genotypes of each individual.

Dad _____ Mom _____ Son _____ Daughter _____

3. A woman with type A blood has a child with type O blood. She is suing a man with type B blood for child support, she claims that man is the father of her child.

How would you respond to the following statements.

a. The attorney for the alleged father claims "The mother's blood is type A, so the child's type O blood must have come from the father. Because my client has type B blood, he cannot be the father."

b. The attorney for the mother claims "Because further tests prove he is heterozygous, he must be the father."

4. There is evidence that singing voices in humans are sex-influenced.
V_1V_1 produces a bass in males and a soprano females, and V_1V_2 baritone and mezzo-soprano, and V_2V_2 tenor and contralto. If a baritone wishes to raise a family of children who could form a mixed quartet, should he marry a soprano, mezzo-soprano or contralto? Explain your answer.